Drishti IAS Presents...

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SCIENCE AND TECH

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MCQs

Multiple Choice Questions and Answers

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QUESTIONS

1. Consider the following statements:

1. National Science Day is observed on the day Jagdish Chandra Bose discovered the instrument Crescograph.
2. The Raman Effect is the phenomenon where light gets scattered when passed through a transparent material, leading to changes in wavelength and energy.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

2. Consider the following statements:

1. Amateur Radio (HAM Radio) is a widely enjoyed hobby that uses radio frequencies for non-commercial purposes, fostering technical learning through radio waves.
2. Islands On The Air (IOTA), is a program connecting global radio amateurs with island stations and categorising islands into communication groups since 1964.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

3. Consider the following statements regarding Binary System of Stars:

1. It refers to the pair of stars that are gravitationally bound to each other and orbit around a common centre of mass.
2. An estimated 85% or more of stars are actually part of binary or even multiple-star systems.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

4. Consider the following statements:

1. Planets are formed when the dust and gas swirling around a young star collide and clump together.
2. Planets could also form near supermassive black holes and are termed blanets.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

5. Consider the following statements:

1. A neuron consists of a cell body containing the nucleus, dendrites for receiving input, and an axon for sending messages.
2. Neurons communicate through synapses, where dendrites receive chemical signals, convert them to electrical impulses, and transmit them through axons to other neurons.
3. A neuron is sometimes enveloped by a myelin sheath for faster signal transmission.

How many of the statements given above is/are **not** correct?

A. Only one
B. Only two
C. All three
D. None

6. Consider the following statements:

Statement I: Neutrino is an elementary particle also known as Nature's Ghost Particle.

Statement II: A neutrino is a fermion (an elementary particle with spin of ½) that rarely interacts with matter.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I.
B. Both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.
C. Statement-I is correct, but Statement-II is incorrect.
D. Statement-I is incorrect, but Statement-II is correct.

7. Consider the following statements:

Statement-I: Human eyes can detect only wavelengths of light in the ultraviolet range (between 10 and 400 nanometres (nm)).

Statement-II: Animals have evolved to develop highly sensitive photoreceptors that can detect light of ultraviolet and infrared wavelengths.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I.
B. Both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.
C. Statement-I is correct, but Statement-II is incorrect.
D. Statement-I is incorrect, but Statement-II is correct.

8. Consider the following statements regarding HbA1c Test:

1. The test provides a 2-3 month average of blood glucose levels by measuring sugar-coated red blood cells, offering comprehensive long-term control assessment.
2. A level below 5.7% is deemed normal, while a range of 5.7% to 6.4% indicates a pre-diabetic condition.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

9. Consider the following statements regarding Hyperloop Technology:

1. Hyperloop is a transportation concept developed by Google in 2023 that would use pressurised tubes and capsules to connect mobility hubs in large cities.
2. The capsules, called pods, would float at high speeds using contactless levitation and electromagnetic propulsion systems.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

10. With reference to the Bone Grafting, consider the following statements:

1. Bone grafting involves a surgical technique where transplanted bone is utilized to repair and reconstruct bones affected by disease or injury.
2. Nano Hydroxyapatite-based Porous Composite Scaffolds are biodegradable and have osteoinductive and osteopromotive properties for bone repairing.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

11. Consider the following statements:

Statement-I: Hepatitis is the inflammation of the liver, characterised by irritation or swelling of the liver cells.

Statement-II: Hepatitis is typically caused by hepatotropic viruses, including A, B, C, D, and E, although other viruses like the varicella virus can also lead to the disease.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I.
B. Both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.
C. Statement-I is correct, but Statement-II is incorrect.
D. Statement-I is incorrect, but Statement-II is correct.

12. Regarding H5N1 Bird Flu, consider the following statements:

1. California condors have been severely affected.
2. India experienced its first outbreak in the State of Maharashtra and Gujarat in 2015.

Which of the statements given above is/are correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

13. Regarding the Sickle Cell Disease (SCD), consider the following statements:

1. SCD causes White Blood Cells (WBCs) to assume a sickle or crescent shape rather than their normal round shape.
2. India holds the top position globally in terms of the incidence of SCD births.

Which of the above statements is/are **not** correct?

A. Only 1
B. Only 2
C. Both 1 and 2
D. Neither 1 nor 2

14. The term " Rhodamine B" often heard in the news corresponds to which of the following?

A. Vitamins
B. Virus
C. A Colouring Agent
D. Vaccine

15. Regarding the Reverse Osmosis (RO) Water Purification Method, consider the following statements:

Statement-I: A typical RO system consists of a semi-permeable membrane, with pores 1 to 10 microns in size.

Statement II: The membrane allows water molecules to pass through while blocking larger molecules and ions.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I.
B. Both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.
C. Statement-I is correct, but Statement-II is incorrect.
D. Statement-I is incorrect, but Statement-II is correct.

16. Regarding the Rheumatic Disease, consider the following statements:

1. Rheumatic disease is a broad term encompassing various conditions that impact not only the lungs but also other parts of the respiratory system.
2. Therapeutic options for Rheumatic disease include steroids and disease-modifying antirheumatic drugs (DMARDs).

Which of the above statements is/are correct?

A. Only 1
B. Only 2
C. Both 1 and 2
D. Neither 1 nor 2

17. Regarding Astronomical cycles, consider the following statements:

1. It refers to periodic variations in the Earth's orbit and orientation towards the Sun that impact the amount of solar radiation received by our planet over long periods.
2. These cycles are caused by the gravitational forces between the Earth, Sun, and other planets in the solar system.

Which of the statements given above is/are correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

18. Consider the following statements:

1. Fission is a process in which the nucleus of an atom splits into two or more smaller nuclei and some byproducts.
2. Fusion is defined as the combining of several small nuclei into one large nucleus with the subsequent release of huge amounts of energy.
3. Harnessing nuclear fission, the same process that fuels the Sun, could offer an endless, environmentally friendly energy supply.

How many of the statements given above are correct?

A. Only One
B. Only Two
C. All Three
D. None

19. Consider the following statements:

1. The Connectome Concept depicts a detailed neural network map, resembling a blueprint that shows how neurons exchange electrical and chemical signals.
2. The connectome simplifies scientists' understanding of the brain's complexity and vast data volume, aiding advancements in neuroscience and neurological health research.

Which of the statements given above is/are correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

20. Consider the following statements:

Statement-I: Multiple Independently Targetable Re-entry Vehicle (MIRV) technology originated in the erstwhile USSR, with the deployment of a MIRVed Intercontinental Ballistic Missile (ICBM) in 1970.

Statement-II: MIRV technology enhances the missile's effectiveness by increasing the number of potential targets it can engage.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I.

B. Both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.
C. Statement-I is correct, but Statement-II is incorrect.
D. Statement-I is incorrect, but Statement-II is correct.

21. Regarding Small Satellite Launch Vehicle, consider the following statements:

1. It is a three-stage launch vehicle equipped with two solid propulsion stages and a liquid propulsion-based Velocity Trimming Module (VTM) serving as the terminal stage.
2. It is capable of launching 500kg satellites in 500km planar orbit from Satish Dhawan Space Centre (SDSC).

Which of the statements given above is/are correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

22. Consider the following statements with respect to 'Cavum Clouds':

1. Cavum clouds are formed when aircraft pass through mid-level altocumulus clouds containing supercooled liquid water droplets.
2. As the planes disrupt the air around Altocumulus Clouds, the droplets freeze into ice crystals, which eventually become heavy and fall out of the sky, leaving voids in the cloud layer.
3. This phenomenon was captured by the INSAT 3D satellite of the ISRO.

How many of the above statements are **not** correct?

A. Only one
B. Only two
C. All three
D. None

23. Consider the following statements:

1. Spiking Neural Networks (SNNs) use continuous numerical values for processing data.
2. Lifelong Machine Learning (LML) model involves continuous learning where AI models accumulate knowledge from previous tasks to aid future learning and problem-solving.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

24. Consider the following statements about Genome Sequencing:

1. Genome is composed of three nucleotide bases: adenine (A), cytosine (C), and thymine (T).
2. India announced its first complete human genome in 2003.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

25. Regarding the Claude chatbots, consider the following statements:

1. Claude is a group of Large Language Models (LLMs).
2. The chatbot is capable of handling text, voice messages, and documents.
3. Its responses are entirely devoid of biases.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

26. Regarding the Rare Diseases, consider the following statements:

1. Organisation of Rare Diseases India (ORDI) has suggested that a disease is to be defined as rare if it affects 1 in 10,000 people or less.
2. Rare diseases affect approximately 10% of the global population.
3. India represents one-third of global rare disease cases.

Which of the statements given above is/are **not** correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

27. Regarding Obelisks, consider the following statements:

1. Obelisks are novel virus-like entities comprising diverse RNA molecules found in the human body and the global microbiome.
2. They display rod-like structures similar to iconic monuments and have genetic sequences around 1,000 nucleotides long, showing no discernible similarities to known biological agents.

Which of the statements given above is/are correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

28. Consider the following statements:

Statement-I: Single-use plastic has among the highest shares of plastic manufactured and used.

Statement-II: On the current trajectory of production, it has been projected that single-use plastic could account for 5-10% of greenhouse gas emissions by 2050.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I.
B. Both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.
C. Statement-I is correct, but Statement-II is incorrect.
D. Statement-I is incorrect, but Statement-II is correct.

29. Consider the following statements with respect to 'Hemophilia':

1. A person diagnosed with Hemophilia A lacks a sufficient amount of factor IX (Factor nine).
2. An individual with Hemophilia B lacks an adequate supply of clotting factor VIII (Factor eight).
3. The main treatment for Haemophilia is Replacement Therapy.

How many of the above statements are not correct?

A. Only one
B. Only two
C. All three
D. None

30. Consider the following statements with respect to 'Garbhini-GA2':

1. It is based on genetic algorithms which are optimisation techniques inspired by evolution and natural selection principles.
2. It is a flagship programme of the Department of Biotechnology (DBT), Government of India.
3. It is tailored for accurately determining the gestational age (GA) of foetus in first trimester of pregnancy.

How many of the statements given above are correct?

A. Only one
B. Only two
C. All three
D. None

31. Regarding Battery Electric Vehicles (BEVs), consider the following statements:

1. They are a type of electric vehicle that runs solely on electric power stored in high-capacity batteries.
2. They have a specially designed Internal Combustion Engine (ICE) that does not produce emissions.
3. They use electric motors to drive the wheels, providing instant torque and smooth acceleration.

How many of the statements given above are correct?

A. Only One
B. Only Two
C. All Three
D. None

32. Consider the following statements:

1. Brainoware integrates brain organoids with microelectrodes, forming an 'Organoid Neural Network (ONN)' that directly incorporates living brain tissue into the computing process.
2. Brain organoids are 3D tissues that simulate the structure and function of the human brain and are derived from human embryonic stem cells.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

33. With reference to the E Ink Displays, consider the following statements:

1. E Ink displays are a type of electronic paper display technology that mimics the appearance of traditional ink on paper.
2. It uses millions of tiny microcapsules filled with positively charged white particles and negatively charged black particles suspended in a clear fluid.
3. It uses a backlight and reflects lights the same as happened in LCD and LED displays.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

34. Consider the following statements:

Statement-I: A Brain-Computer Interface (BCI) enables direct communication between the brain and external devices without using traditional neuromuscular pathways.

Statement-II: BCIs involve the use of sensors to detect brain activity, which is then translated into commands for interacting with the external world using their thoughts.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I.
B. Both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.
C. Statement-I is correct, but Statement-II is incorrect.
D. Statement-I is incorrect, but Statement-II is correct.

35. Consider the following statements:

Statement-I: GRAPES-3 experiment discovers new feature above 100 TeV but below the cosmic-ray proton "Knee," suggesting a deviation from single power-law spectrum.

Statement-II: Cosmic rays are the universe's most energetic particles, bombarding Earth uniformly from all directions, inducing fast-moving particle showers comprising electrons, photons, muons.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I.
B. Both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.
C. Statement-I is correct, but Statement-II is incorrect.
D. Statement-I is incorrect, but Statement-II is correct.

36. Recently Volt Typhoon, which was seen in the news is:

A. Cyclone in Northwest Pacific Ocean
B. Chinese state-sponsored group targeting US critical infrastructure
C. First Indigenously built electric car in India
D. None of the above

37. Consider the following:

Statement-I: Typbar TCV is the world's first clinically proven conjugate Typhoid vaccine.

Statement-II: A phase-3 trial in Malwa Plateau, Madhya Pradesh, an endemic region for typhoid fever, showed that Bharat Biotech's Typhoid conjugate vaccine (TCV), Typbar, has long-term efficacy.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement I
B. Both Statement-I and Statement-II are correct and Statement-II is not the correct explanation for Statement-I
C. Statement-I is correct but Statement-II is incorrect
D. Statement-I is incorrect but Statement-II is correct

38. Consider the following statements with respect to 'NISAR Phase II Project':

1. NISAR aims to revolutionise earth resource observation by providing high-resolution data for extensive areas.
2. NASA and ISRO are jointly developing it as a space-borne synthetic aperture radar, scheduled for launch in 2030.

Which of the statements given above is/are not correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

39. Regarding the CAR-T Cell therapy, consider the following statements:

1. It is a type of immunotherapy that uses a patient's immune system to fight cancer.
2. This therapy has been approved for leukemias and lymphomas.
3. CAR-T therapy offers highly economical treatment.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None of the above

40. With reference to the Kyasanur Forest Disease (KFD), consider the following statements:

1. It is caused by the Canine Parvovirus.
2. It was first identified in 2007 in a sick monkey from the Kyasanur Forest in Africa.
3. No vaccines for this virus are currently available in India.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None of the above

41. With reference to the High Altitude Pseudo-Satellite (HAPS), consider the following statements:

1. HAPS is a solar-powered UAV which can generate solar energy and remain in the air for months or years.
2. HAPS operates in the troposphere nearly double the heights of commercial airplanes.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

42. Regarding Lymphatic Filariasis, consider the following statements:

1. It is a Neglected Tropical Disease (NTD) caused by infection with filarial parasites transmitted through dogs.
2. The infection starts in childhood and accumulates through adulthood, resulting in irreversible chronic disease conditions.

Which of the statements given above is/are correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

43. Consider the following statements with respect to different types of hydrogen:

1. If the electricity used for splitting water comes from a renewable source like wind or solar, then the hydrogen thus produced is referred to as green hydrogen.
2. Colors attached to hydrogen indicate the source of electricity used to derive the hydrogen molecule, such as, if coal is used, it is referred to as grey hydrogen.

Which of the statements given above is/are not correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

44. Consider the following statements:

Statement-I: Since its establishment in 2004, Indian National Young Academy of Science (INYAS) has been the sole recognized academy for young scientists in India.

Statement-II: CSIR-National Institute of Science Communication and Policy Research (CSIR-NIScPR) is one of the constituent laboratories of the Council of Scientific & Industrial Research (CSIR) under the Ministry of Science & Technology, Government of India.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I.
B. Both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.
C. Statement-I is correct, but Statement-II is incorrect.
D. Statement-I is incorrect, but Statement-II is correct.

45. Regarding Odysseus spacecraft, consider the following statements:

1. The spacecraft is scheduled for a landing on Jupiter in 2024.
2. The mission is part of the Artemis campaign.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

46. Regarding Guinea Worm Disease, consider the following statements:

1. It is a debilitating parasitic disease.
2. There is no vaccine or medication to treat Guinea worm disease.
3. The government of India received Guinea worm disease-free certification status from the WHO in 2024.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

47. Consider the following statements:

1. Amphipods are a diverse group of malacostracan crustaceans, that share characteristics with crabs, lobsters, and shrimp.
2. Amphipods play a crucial role in the marine food chain and serve as important indicators for assessing the impact of climate change and the health of coastal ecosystems.

3. A new species of marine amphipod, named Parhyale Odian was discovered in Chilika Lake.

How many of the statements given above are correct?

A. Only One
B. Only Two
C. All Three
D. None

48. Regarding Kala Azar, consider the following statements:

1. Kala-azar is a fatal disease caused by a protozoan parasite Leishmania donovani.
2. India became the first country, globally, to be officially validated by the WHO for eliminating Kala Azar as a public health problem.

Which of the statements given above is/are correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

49. Regarding Neural Organoids, consider the following statements:

1. Neural organoids are human pluripotent stem cells (hPSCs)-derived 3D in vitro culture systems that recapitulate the developmental processes and organization of the developing human brain.
2. They have important applications in studying human brain development and neurological disorders such as schizophrenia.

Which of the statements given above is/are not correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

50. Consider the following statements:

1. Trisonic Wind Tunnel at Vikram Sarabhai Space Center marks a milestone in aerodynamic testing for rockets and aircraft.
2. Semi-cryogenics Integrated Engine and Stage Test (SIEST) facility will develop semi-cryogenic engines, enhancing payload capacity, with capabilities to test engines up to 200 tons of thrust.

Which of the statements given above is/are not correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

51. Consider the following pairs:

	Large Language Models (LLMs)	Key Characteristics
1.	Autoregressive Models	Encode input text into a representation
2.	Transformer-based Models	Predict the next word based on past words
3.	Encoder-decoder Models	Artificial neural network for language processing

How many of the above pairs are correctly matched?

A. Only one pair
B. Only two pairs
C. All three pairs
D. None of the above

52. Consider the following statements about Google DeepMind's Genie:

1. It is the first generative interactive environment that has been trained in an unsupervised manner from unlabelled internet videos.
2. It can generate an endless variety of playable (action-controllable) worlds from synthetic images, photographs, and even sketches.

Which of the statements given above is/are correct?

A. Only 1
B. Only 2
C. Both 1 and 2
D. Neither 1 nor 2

53. Consider the following statements with respect to Stem Cells:

1. These are special human cells with the ability to develop into various cell types, such as muscle cells or brain cells.
2. Pluripotent stem cells are able to give rise to all embryonic and adult lineages.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

54. Consider the following statements regarding Cholera:

1. It is an acute diarrhoeal infection caused by ingestion of food or water contaminated with the bacterium Vibrio cholerae.
2. Most of those infected have no or mild symptoms and can be successfully treated with Oral Rehydration Solution (ORS).

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

55. Regarding X-ray Polarimeter Satellite (XpoSat), consider the following statements:

1. It is designed to study X-ray polarisation in the medium X-ray band, offering insights into celestial sources' radiation mechanisms and geometry.
2. It is the world's first mission dedicated to X-ray polarisation in the medium X-ray band.
3. It is a collaboration between ISRO and NASA.

How many of the statements given above are **not** correct?

A. Only One
B. Only Two
C. All Three
D. None

56. Regarding Sickle Cell Disease (SCD), consider the following statements:

1. It is a group of inherited White Blood Cell (WBC) disorders.
2. In SCD, the hemoglobin is abnormal, which causes the WBCs to become hard and sticky and look like a C-shaped farm tool called a sickle.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

57. Consider the following pairs:

	Space Mission	Agency
1.	OSIRIS-REx mission	NASA
2.	Proba-3	ISRO
3.	Martian Moon exploration (MMX) Mission	ESA

Which of the pairs given above is/are correctly matched?

A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

58. Consider the following statements:

Statement-I: Aditya-L1 is aiming to place it into orbit around the Lagrangian point (L1).

Statement-II: Placing a satellite around the L1 point allows continuous observation of the Sun without occultation or eclipse.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I.
B. Both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.
C. Statement-I is correct, but Statement-II is incorrect.
D. Statement-I is incorrect, but Statement-II is correct.

59. Regarding Gravitational waves, consider the following statements:

1. Gravitational waves are ripples in the fabric of spacetime.
2. Albert Einstein forecasted the presence of gravitational waves within his theory of general relativity.
3. India is going to construct the third node of the Laser Interferometer Gravitational-Wave Observatory (LIGO) in the Theni district of Tamil Nadu.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

60. Regarding "PRITHvi VIgyan (PRITHVI)" Scheme, consider the following statements:

1. It is an initiative of the Ministry of Science and Technology in collaboration with NITI Aayog.
2. It aims to enhance Earth System Sciences and offer reliable services for the country by comprehensively addressing all five components of the Earth system.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

61. Regarding New Space India Limited (NSIL), consider the following statements:

1. NSIL, formed under the Companies Act, 2013, is mostly owned by private companies with a smaller government stake.

2. It helps Indian industries engage in advanced space activities and promotes the use of products and services from India's space program.
3. It is set to launch GSAT-20 (GSAT-N2), aboard SpaceX's Falcon-9 in 2024.

How many of the statements given above are correct?

A. Only One
B. Only Two
C. All Three
D. None

62. Consider the following statements:

1. Microorganisms that develop Antimicrobial Resistance (AMR) are sometimes referred to as "superbugs".
2. The World Health Organization (WHO) has identified AMR as one of the top ten threats to global health.
3. Antimicrobial Resistance Surveillance and Research Network (AMRSN) was launched to collect evidence and monitor drug-resistant infection trends in India.

How many of the statements given above are correct?

A. Only One
B. Only Two
C. All Three
D. None

63. Regarding Polymer Electrolyte Membrane Fuel Cell (PEMFC), consider the following statements:

1. PEMFCs convert fuel directly into electricity, resulting in significantly higher efficiency compared to batteries.
2. PEMFCs produce only water as a byproduct, which can be utilized onboard or undergo electrolysis to produce extra oxygen.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

64. Regarding the nanoplastic particles, consider the following statements:

1. Nanoplastics are smaller than microplastics, ranging below 1 micrometer in size.
2. They can move from the intestines and lungs directly into the bloodstream.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

65. Consider the following statements:

1. A heat-tolerant vaccine developed by the Indian Institute of Science (IISc) is effective against all current and future strains of SARS-CoV-2.
2. A receptor-binding domain is a key part of a virus located on its 'spike' domain that allows it to dock to body receptors to gain entry into cells and lead to infection.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

66. Consider the following statements:

1. Most of India's current hydrogen supply is Blue Hydrogen, which is produced using Fossil Fuels in a process that creates CO2 Gas Emissions.
2. Strategic Interventions for the Green Hydrogen Transition Programme (SIGHT) will fund the domestic manufacturing of electrolyzers and produce green hydrogen.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

67. Consider the following statements regarding different parts of the brain:

1. The brain comprises three primary components: the cerebrum, cerebellum, and brainstem.
2. Cerebrum is the brain region traditionally associated with motor control.
3. Cerebellum is the largest part, consists of right and left hemispheres, and plays a key role in higher functions like interpreting sensory information, speech, reasoning.

How many of the statements given above are correct?

A. One Only
B. Two Only
C. All Three
D. None

68. Consider the following statements:

1. Radio Frequency Identification is a technology that uses radio waves to passively identify a tagged object.
2. The Reserve Bank of India has created the National Electronic Toll Collection (NETC) program to fulfill India's electronic tolling needs.

Which of the statements given above is/are **NOT** correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

69. Regarding National Quantum Mission (NQM), consider the following statements:

1. The mission is scheduled for the timeframe from 2023 to 2031.
2. It will be implemented by the Ministry of Electronics and Information Technology.
3. India will be the seventh country to have a dedicated quantum mission.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

70. Consider the following statements with respect to Genetically Modified DMH-11:

1. DMH-11 is a result of a cross between Indian mustard variety 'Varuna' and East European 'Early Heera-2' mustard.
2. It contains two alien genes namely, barnase and barstar,which are isolated from a soil bacterium called Bacillus amyloliquefaciens.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

71. Regarding the Indian Computer Emergency Response Team (CERT-In), consider the following statements:

1. It is the national nodal agency responsible for handling cyber security threats and operates under the Ministry of Home Affairs.
2. It is exempted from the purview of the Right to Information Act, 2005.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

72. Consider the following statements with respect to 'Bharat Health Initiative for Sahyog, Hita and Maitri' (BHISHM) Cube:

1. BHISHM Cube is a state-of-the-art indigenous mobile hospital deployed in Ayodhya.
2. It integrates Artificial Intelligence (AI) and data analytics to facilitate effective coordination and real-time monitoring.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

73. Consider the following statements regarding 'Mpemba Effect':

1. The Mpemba effect contributed to science with its findings that hot water can freeze faster than cold water in similar conditions.
2. Possible causes for Mpemba Effect include formation of microbubbles and role of evaporation.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

74. Consider the following statements:

1. Second-gen Distress Alert Transmitter (DAT-SG) for Indian fishermen to send emergency messages at sea has jointly been developed by DRDO and IIT Kanpur.
2. DAT-SG is a UHF (Ultra High Frequency) transmitter utilizing the NavIC (Navigation in Indian Constellation) receiver module for navigation.

Which of the statements given above is/are correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

75. Regarding Homi Jehangir Bhabha, consider the following statements:

1. India's three-stage nuclear power programme was formulated by him in the 1960s.
2. He founded and directed the Atomic Energy Establishment, Trombay.
3. Bhabha was the first Indian to receive the Adams Prize.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

76. Consider the following statements with respect to Diodes:

1. A diode's primary purpose is to allow current to flow in only one direction using a P-N Junction Diode.
2. The positive side of the semiconductor possesses an abundance of electrons and whereas the negative side has an excess of holes.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

77. Consider the following statements:

1. Leukaemia is the cancer of the white blood cells, which begin in the bone marrow.
2. Bone cancer occurs most often in children and young adults, in the bones of the leg or arm.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

78. Consider the following AI (Artificial Intelligence) models:

1. Dall-E
2. Stable Diffusion
3. Midjourney

How many of the above belong to Large Multi-Modal Models (LMM)?

A. Only one
B. Only two
C. All three
D. None of the above

79. Consider the following statements with respect to 'INSAT-3DR':

1. The Indian Meteorological Department (IMD) uses INSAT-3DR satellite data for weather forecasting and monitoring purposes.
2. It is an advanced meteorological satellite of India configured with an imaging System and an Atmospheric Sounder.
3. The colouration of images from the RGB (Red, Green, Blue) imager on the INSAT 3D satellite relies on Solar Reflectance and Brightness Temperature.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

80. Consider the following applications:

1. Application-Specific Integrated Circuits (ASICs)
2. Field-Programmable Gate Arrays (FPGAs)
3. Central Processing Units (CPUs)

How many of the above can be designed with the use of AI chips?

A. Only one
B. Only two
C. All three
D. None of the above

81. With reference to the Fetal development, consider the following statements:

1. The embryo is the initial cell formed by the fusion of sperm and egg during fertilization.
2. The zygote is the initial developmental stage, spanning from fertilization until approximately the 8th week of pregnancy.
3. The fetus is the later phase of prenatal development marked by the formation of organs and systems.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None of the above

82. Consider the following statements:

Statement-I: Hard Chrome Plating (HCP) is an electroplating process in which a layer of chromium is applied to a surface to improve corrosion and wear resistance.

Statement-II: High-Velocity Air Fuel Spraying (HVAF) spraying process involves low temperatures and high particle velocities, allowing the deposition of coatings using finer-sized powders in the range of 5-15 µm.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I.
B. Both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.
C. Statement-I is correct, but Statement-II is incorrect.
D. Statement-I is incorrect, but Statement-II is correct.

83. Consider the following statements regarding Malaria:

1. Malaria is a life-threatening mosquito borne blood disease caused by plasmodium parasites.
2. Malaria is spread by the bite of an infected female Anopheles mosquito.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

84. With reference to the Plasma waves, consider the following statements:

1. Plasma is a state of matter consisting of charged particles like ions and electrons.
2. Plasma waves are oscillations or disturbances in the electric and magnetic fields that propagate through it.
3. These waves play a significant role in various plasma phenomena, influencing energy transfer, particle acceleration among others.

How many of the above statements are **not** correct?

A. Only one
B. Only two
C. All three
D. None

85. Consider the following statements:

1. Gram-positive bacteria appear pinkish or red, while Gram-negative bacteria retain violet-colored stains.
2. Gram-negative bacteria have a thin peptidoglycan layer in the cell wall, which is sandwiched between two lipid membranes.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

86. With reference to Sickle Cell Disease, consider the following statements:

1. The National Mission for Elimination of Sickle Cell Anemia, initiated in 2023, has the goal of eradicating sickle cell anemia from India by 2050.
2. In 2016, the government issued technical operational guidelines for preventing and controlling sickle cell anemia.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

87. With reference to "Pressmud", consider the following statements:

1. Pressmud, also known as filter cake or press cake, is a residual byproduct in the sugar industry that has gained recognition as a valuable resource for green energy production.
2. It is utilized as a feedstock for biogas production through anaerobic digestion, leading to the creation of Compressed Biogas (CBG).
3. Anaerobic digestion is a process through which bacteria break down organic matter in the absence of oxygen.

How many of the statements given above is/are correct?

A. Only one
B. Only two
C. All three
D. None

88. With reference to Fast Radio Bursts (FRBs) consider the following statements:

1. Fast Radio Bursts (FRBs) are powerful and brief bursts of radio frequency emissions originating from deep space.
2. These mysterious and intense signals last for many days and release energy comparable to hundreds of millions of suns.

Which of the statements given above is/are correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

89. Regarding Monkeypox, consider the following statements:

1. Monkeypox is caused by the Giant Mimivirus.
2. It is a viral zoonotic disease endemic to Latin America.
3. There is no specific treatment or vaccine available for Monkeypox infection.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

90. Consider the following pairs:

Navigation Satellite Systems Operating Country

1. GLONASS China
2. Galileo European Union (EU)
3. BeiDou Russia

How many of the above pairs are correctly matched?

A. Only one pair
B. Only two pairs
C. All three pairs
D. None of the pairs

91. Regarding Neglected Tropical Diseases (NTDs), consider the following statements:

1. NTDs are caused by a variety of pathogens such as viruses, bacteria, protozoa.
2. NTDs are especially common in sub-tropical areas.
3. Tuberculosis, HIV-AIDS and malaria are major NTDs.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

92. Consider the following types of Dark Patterns:

	Types	Deceptive Patterns
1.	**Subscription Trap**	Making Cancellation Complex
2.	**Basket Sneaking**	Inclusion of additional items
3.	**Saas Billing**	Generating recurring payments

How many of the above pairs are correctly matched?

A. Only one pair
B. Only two pairs
C. All three pairs
D. None of the pairs

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	Navigation Satellite Systems	Operating Country
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2.	Galileo	European Union (EU)
3.	BeiDou	Russia

How many of the above pairs are correctly matched?

A. Only one pair
B. Only two pairs
C. All three pairs
D. None of the pairs

94. Regarding Diel Vertical Migration (DVM), consider the following statements:

A. DVM is a synchronized movement of marine organisms, often seen in deep-sea creatures like zooplankton.
B. This pattern helps these organisms find food while avoiding predators, showcasing a strategic survival tactic.
C. It helps in trapping carbon dioxide and aiding in atmospheric carbon concentration regulation.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 only
C. 3 only
D. 1, 2 and 3 only

95. What is mActionSoft, recently seen in news?

A. A mobile application related to Gram Panchayats
B. A mass campaign against corruption
C. A software for managing agricultural data
D. A game for learning about rural development

96. Regarding the Kala Azar, consider the following statements:

1. It is a slow-progressing indigenous disease caused by a protozoan parasite of the genus Leishmania.
2. It is also known as Black Fever or Dumdum Fever.
3. In India, Leishmania donovani is the only parasite causing this disease.

How many of the statements given above are **NOT** correct?

A. Only One
B. Only Two
C. All Three
D. None

97. Regarding a Web Browser, consider the following statements:

1. It provides an interface between the server and the client.
2. It works as a compiler to render HTML (Hypertext Markup Language) which is used to design a webpage.
3. Google Chrome, Microsoft Edge, Mozilla Firefox, and Safari are examples of web browsers.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

98. Regarding the characteristics of Algae, consider the following statements:

1. Despite bearing nuclei and specialised multicellular reproductive structures, they differ from plants by lacking true roots, stems and leaves.
2. They are economically important as a source of crude oil and food, and various pharmaceutical and industrial products for human consumption.

Which of the statements above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

99. With reference to "Pompe Disease", consider the following statements :

1. Pompe Disease is characterized by the buildup of glycogen in the lysosomes of the body cells.
2. This disease is a rare genetic disorder caused by a deficiency of the enzyme acid alpha-glucosidase.
3. Although there is presently no cure for Pompe disease, there are treatment alternatives accessible to address symptoms.

How many of the statements given above is/are correct?

A. Only one
B. Only two
C. All three
D. None

100. Regarding Diamond, consider the following statements:

1. Diamond is a naturally occurring mineral made up of impure carbon.
2. South Africa is the world's largest producer of rough diamonds.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

101. Regarding the future Space Mission of India, consider the following statements:

1. Chandrayaan-4 Mission aims to send humans to space and return them safely to Earth.
2. The first module of Bharatiya Antariksh Station will be launched by 2028.
3. NISAR is a GEO (Geostationary orbit) observatory being jointly developed by NASA and ISRO.

How many of the statements given above are correct?

A. Only one
B. Only two
C. All three
D. None

102. Regarding the future Space Mission of India, consider the following statements:

1. Chandrayaan-4 Mission aims to send humans to space and return them safely to Earth.
2. The first module of Bharatiya Antariksh Station will be launched by 2028.
3. NISAR is a GEO (Geostationary orbit) observatory being jointly developed by NASA and ISRO.

How many of the statements given above are correct?

A. Only one
B. Only two
C. All three
D. None

103. With reference to 'AI Mission', consider the following statements:

1. The mission seeks to enhance services for startups and entrepreneurs while fostering AI applications in critical sectors.
2. It involves building a substantial compute capacity, ranging between 10,000 to 30,000 Graphic Processing Units (GPUs).
3. The India Datasets platform under this mission offer anonymized datasets to startups and researchers.

How many of the statements given above is/are correct?

A. Only one
B. Only two
C. All three
D. None

104. With reference to 'Criticality in Nuclear Power Plants', consider the following statements:

1. A nuclear reactor is said to be critical when the nuclear fuel inside a reactor sustains a fission chain reaction.
2. Each fission reaction releases a sufficient number of neutrons to sustain a series of reactions.
3. Heat is produced in the event of criticality, which is used to generate steam that spins a turbine to create electricity.

How many of the statements given above are **not** correct?

A. Only one
B. Only two
C. All three
D. None

105. With reference to 'mRNA (Messenger Ribonucleic Acid)', consider the following statements:

1. mRNA carries important messages from our DNA (Deoxyribonucleic acid), to the cell's machinery, telling it how to make specific proteins.
2. When a cell needs a specific protein, it directly reads the recipe from DNA and makes a copy called mRNA.
3. mRNA is made up of four building blocks (A, U, C, G), forming words of only three letters.

How many of the statements given above are **not** correct?

A. Only one
B. Only two
C. All three
D. None

106. Regarding Malaria, consider the following statements:

1. It is a life-threatening mosquito-borne blood disease caused by Protozoa.
2. Malaria spreads through infected female Anopheles mosquito bites.
3. The R21/Matrix-M vaccine became the first malaria vaccine to achieve WHO prequalification.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 only
C. 3 only
D. 1, 2 and 3

107. Regarding the Rare Earth Metals, consider the following statements:

1. Rare Earth Metals are a set of seventeen metallic elements including the fifteen lanthanides.
2. India is the second largest exporter of Rare earth metals after China.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

108. Which of the following statements about Nematocysts is **not** correct?

A. They are produced by cells called cnidocytes.
B. They are present in all members of the phylum Cnidaria.
C. They have different types, such as isorhizas, euryteles, and birhopaloids.
D. They are used for locomotion and digestion by cnidarians.

109. Consider the following statements:

Statement-I: Our Sun is not expected to be a neutron star which is a dense and compact stellar object that forms from the remnants of a massive star's core after a supernova explosion.

Statement-II: It has only about one-tenth of the mass needed to eventually become a neutron star.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I
B. Both Statement-I and Statement-II are correct and Statement-II is not the correct explanation for Statement-I
C. Statement-I is correct but Statement-II is incorrect
D. Statement-I is incorrect but Statement-II is correct

110. Regarding Field Pansy, consider the following statements:

1. It belongs to the group of plants called Gymnosperms.
2. The field Pansy relies solely on insects for pollination.

Which of the above statements is/are correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

111. Which of the following is correct about General Artificial Intelligence (AI):

A. It refers to AI designed for specific tasks like playing chess, recognizing faces etc.

B. It refers to AI with the ability to perform any intellectual task that a human can, including reasoning, learning planning etc.

C. It refers to AI with an ability that surpasses human intelligence, excelling in tasks with cognitive abilities.

D. It refers to AI with the ability to generate creative outputs such as pictures, videos and text.

112. Consider the following statements:

1. The electronic soil (eSoil) is a novel conductive cultivation substrate designed specifically for hydroponic systems.
2. Hydroponics is a method of growing plants in a water-based, nutrient-rich solution without the use of soil.

Which of the statements given above is/are correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

113. Consider the following statements regarding Dark energy:

1. It is thought to be responsible for the observed accelerated expansion of the cosmos.
2. Roughly 68% of the universe is dark energy and dark matter makes up about 27%.

Which of the statements given above is/are correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

114. With reference to Neglected Tropical Diseases (NTDs), consider the following statements:

1. NTDs are communicable diseases in tropical regions, thriving in conditions of poverty and poor healthcare access.
2. They are caused by a variety of pathogens such as viruses, bacteria, protozoa and parasitic worms.
3. Examples of NTDs include snakebite envenomation, scabies, yaws, trachoma, Leishmaniasis among others.

How many of the statements given above are **not** correct?

A. Only one

B. Only two

C. All three

D. None

115. With reference to Ketamine Drugs, consider the following statements:

1. Ketamine drug is used to induce general anesthesia that does not require muscle relaxation.
2. It works by blocking the N-methyl-D-aspartate (NMDA) receptor in the brain.
3. The drug is administered through intravenous (IV) mode only for mental illness treatment.

How many of the statements given above are correct?

A. Only one

B. Only two

C. All three

D. None

116. Consider the following statements regarding AMRIT Technology:

1. It is developed by the Indian Institute of Technology (IIT) - Madras for the removal of Arsenic and metal ions from water, addressing water quality issues.
2. It utilizes nano-scale gallium arsenide, which selectively removes Arsenic when water passes through it.

Which of the statements given above is/are **NOT** correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

117. Consider the following statements:

1. The Red Blood Cells are also known as Erythrocytes.
2. RBCs contain the iron-rich protein called haemoglobin that gives blood its red colour.
3. Haemoglobin is essential for the survival of chondrocytes, the cells that form cartilage.
4. Haemoglobin helps chondrocytes cope with low oxygen levels by transporting oxygen within the cells.

How many of the above statements are correct?

A. Only one

B. Only two

C. Only three

D. All four

118. Consider the following statements regarding "NexCAR19":

1. NexCar19 is a type of gene therapy developed indigenously in India designed to target cancer cells and its treatment.
2. NexCAR19 therapy is useful for people with B-cell lymphomas who have not responded to standard treatments for cancer like chemotherapy.
3. The therapy is available for patients aged 30 years and above only as it did not yield efficacious results for adolescents.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None of the above

119. Consider the following pairs:

	Disease	**Type of Virus**
1.	Zika Virus	(a) Mosquito-borne flavivirus
2.	Nipah Virus	(b) Zoonotic Virus
3.	Hepatitis	(c) Epatotropic Viruses

Which of the pairs given above is/are correctly matched?

A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

120. Consider the following statements regarding 'Deepfakes':

1. Generators and discriminators are part of generative adversarial networks that are used in the creation of deepfakes.
2. Restoring lost voices of persons, enhancing artistic expression, and enhancing medical training and simulation are the some of positive uses of deepfakes.
3. Sections 67 and 67A of the Information Technology Act (2000) have provisions that explicitly deal with all the aspects of deep fakes.

How many of the above statements are **not** correct?

A. Only one
B. Only two
C. All three
D. None

121. Consider the following statements with respect to 'Electric Power Transmission':

1. The efficiency of electric current transmission is higher at lower current and higher voltage.
2. Joule's first law states that energy losses are proportional to the square of the current.
3. Energy loss can be managed by adjusting the thickness of the cable, as thicker cables experience more energy loss.

How many of the above statements are **not** correct?

A. Only one
B. Only two
C. All three
D. None

122. Consider the following:

1. Recombinant DNA Technology
2. CRISPR-Cas9
3. RNA Interference (RNAi)
4. Somatic Cell Nuclear Transfer (Cloning)

Which of the above are not Gene Editing technologies?

A. Only two
B. Only three
C. All four
D. None

123. Consider the following statements with respect to 'T-cell Acute Lymphoblastic Leukemia (T-ALL)':

1. T-ALL affects the stem cells in the bone marrow and the production of a particular kind of white blood cell (WBC) called T lymphocytes (T cells).
2. T-ALL is found in both children and adults, but incidence increases with age.
3. It is characterized by the rapid and uncontrolled growth of immature white blood cells called lymphoblasts.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

124. Consider the following statements:

1. Chikungunya is a mosquito-borne disease caused by an RNA virus.
2. Chikungunya was first detected in the early 1970s in Gambia.
3. Zika purified inactivated vaccine - ZPIV can be used to cure Chikungunya.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None of the above

125. Consider the following statements:

1. Lysozyme is a naturally occurring enzyme found in various bodily secretions like tears, saliva, mucus.
2. Lysozyme is the principal component of airway fluid, serving as a model protein in investigating diseases like Amyloidosis.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

126. With reference to the Influenza Virus, consider the following statements:

1. Influenza A and B are the two types of influenza that cause epidemic seasonal infections nearly every year.
2. Influenza C mainly occurs in dogs and pigs and never in human beings.
3. Influenza D is found mainly in cattle. It's not known to infect or cause illness in humans yet.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 1 and 3 only
C. 3 only
D. 1, 2 and 3 only

127. Consider the following statements regarding 'Piezoelectricity':

1. Piezoelectricity is the electric charge that accumulates in certain solid materials in response to applied mechanical stress.
2. Piezoelectricity is used in the production and detection of sound, generation of high voltage electricity, and as a clock generator in electronic devices.
3. Piezoelectricity is a reversible process, i.e. materials exhibiting the piezoelectric effect also exhibit the reverse piezoelectric effect.

How many statements given above are correct?

A. Only One
B. Only Two
C. All Three
D. None

128. The Government of India, announced the upcoming establishment of South East Asia's first Night Sky Sanctuary in which of the following sanctuary?

A. Changthang Wildlife Sanctuary
B. Dibang Wildlife Sanctuary.
C. Pakhui Wildlife Sanctuary.
D. Daying Ering Wildlife Sanctuary.

129. Regarding the NASA's Psyche Mission, consider the following statements:

1. This mission aims to explore the asteroid Psyche, located between Jupiter and Saturn.
2. It is the inaugural spacecraft equipped with a NASA's Deep Space Optical Communications (DSOC) transceiver.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

130. Consider the following statements regarding Fibre Optic Cables:

1. The phenomenon of Total Internal Reflection (TIR) forms the basis for guiding light within optical Fibres.
2. Fibre-optic cable is also much less susceptible to noise and electromagnetic interference than copper wire.
3. It operates with such efficiency that in the majority of cases, approximately 99.7% of the signal reaches the router.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

131. Consider the following statements :

1. Sickle cell disease is a genetic blood disorder characterized by an abnormality in hemoglobin, the protein responsible for carrying oxygen in red blood cells.
2. Sickle cell disease causes red blood cells to adopt a sickle or crescent shape, hindering their movement through vessels, leading to potential complications.
3. Similar to sickle cell disease, individuals with Thalassaemia experience severe anaemia due to low haemoglobin levels, necessitating lifelong blood transfusions.

How many of the statements given above is/are correct?

A. Only one
B. Only two
C. All three
D. None

132. With reference to Human Endogenous Retrovirus Subfamily (HERVH), consider the following statements:

1. No inner cell mass cells express HERVH, a gene crucial for maintaining pluripotency.
2. HERVH protects cells from transposons and prevents DNA damage.

How many of the above statements are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

133. Consider the following statement regarding Gamma Ray Burst:

1. Gamma-ray bursts are long-lived explosions of gamma rays, which are considered as the most powerful type of electromagnetic radiation.
2. They can shine hundreds of times brighter than a typical supernova and approximately a million trillion times brighter than the Sun.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

134. With reference to Amphotericin (AmB), consider the following statements:

1. Amphotericin is used to treat serious and potentially life-threatening fungal infections.
2. This drug binds to ergosterol, which resides on the cell membrane of fungi.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

135. Consider the following statements regarding 'Electric Power Transmission':

1. The efficiency of electric current transmission is higher at a lower current and higher voltage.
2. The energy loss during transmission is proportional to the square of the current, while voltage and current have a 1:1 relationship.
3. Alternating current (AC) is preferred for transmission because it can be easily modified using transformers and has higher efficiency.

How many of the statements given above are correct?

A. Only one
B. Only two
C. All three
D. None

136. With reference to 'CO_2 to CO Conversion Technology', consider the following statements:

1. The CO_2 to CO conversion technology operates through an electrocatalytic process which requires high temperatures in the range of 400-750°C.
2. An electrocatalytic process involves the direct transfer of electrons between an electrode and reactants.
3. CO (Carbon Monoxide) is a crucial chemical in the steel industry, used in the conversion of iron ores to metallic iron in blast furnaces.

How many of the statements given above are correct?

A. Only one
B. Only two
C. All three
D. None

137. Consider the following statements regarding Radiative Cooling Technology (RCT):

1. RCT is a method designed to dissipate heat from an object by emitting thermal radiation into the atmosphere, allowing the object to become cooler.
2. Radiative Cooling Paint cools objects with 96.3% solar reflectivity and 98.5% infrared thermal emissivity.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2

138. Consider the following statements with respect to 'Planet Venus':

1. Venus has been called Earth's twin because of the similarities in their masses, sizes, and densities.
2. The plate tectonics of venus have had a significant influence on the development of Venus's atmosphere, which is rich in carbon dioxide and methane.
3. It is the hottest planet in the solar system because of the high concentration of carbon dioxide and methane which works to produce an intense greenhouse effect.

How many of the above statements are **not** correct?

A. Only one
B. Only two
C. All three
D. None

139. Consider the following statements:

1. Ammonia can store and release a significant amount of energy, making it suitable for long term applications.
2. Ammonia has the potential to produce near-zero carbon dioxide (CO_2) emissions during combustion.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

140. With reference to the Karman Line, consider the following statements:

1. The Karman Line is an imaginary boundary located at 100 km above sea level that separates Earth's atmosphere from space.
2. The Karman Line was established in the 1960s by NASA, the United States' space agency.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

141. Consider the following statements:

1. Among the 5 Plasmodium parasite species that cause malaria in humans, P. vivax is the dominant malaria parasite responsible for causing the disease in Asia.
2. The countries of the Sahel region of Africa alone account for over half of all malaria deaths worldwide.
3. Due to its low prevalence in India, it has no framework that is dedicated solely to the elimination of Malaria.

How many of the above statements are **not** correct?

A. Only one
B. Only two
C. All three
D. None of the above

142. Consider the following statements regarding Parker Solar Probe:

1. Parker Solar Probe is scheduled to be launched by the European Space Agency (ESA).
2. The Probe is set to fly into the Sun's corona to study it closer than any other human-madse object.
3. Corona is a region of the Sun seen from Earth when the Moon blocks out the Sun's bright face during total solar eclipses.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

143. With reference to the 'Gut Microbiome', consider the following statements:

1. The gut microbiome primarily aids in breaking down complex carbohydrates and fibers in the stomach.
2. It can also influence brain function, behaviour, and mental health conditions such as anxiety, depression, and stress.

Which of the above statements is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

144. It is a phenomenon where the quantum states of two or more qubits become correlated in such a way that the state of one qubit instantly affects the state of another, even when they are separated by vast distances.

The above mentioned phenomenon correctly describes Which one of the following properties of quantum technology?

A. Superposition
B. Quantum entanglement
C. Quantum interference
D. None

145. Consider the following statements with respect to 'Quantum States':

1. A Quantum state is a mathematical description of the physical properties of a quantum system.
2. Quantum states provide a complete specification of a system's properties, including its position, momentum, energy, spin, and other observable quantities.

3. Bosons are particles that obey the Pauli exclusion principle, while fermions are particles that can share the same quantum state.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

146. With reference to the chemotherapy of cancer cells, consider the following statements:

1. It involves the targeting of rapidly dividing cancer cells, often leading to programmed cell death or apoptosis.
2. This cell death underlies the unpleasant side-effects of chemotherapy, such as painful inflammation of the oral cavity and the gut, and nausea, diarrhea, anemia, and hair loss.
3. It involves attaching drugs to antibodies designed to recognize proteins predominantly found in cancer cells.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

147. Consider the following statements with respect to 'White Phosphorus Munitions':

1. White phosphorus is a pyrophoric that ignites when exposed to oxygen, producing thick, light smoke as well as intense 815-degree Celsius heat.
2. White phosphorus is dispersed in artillery shells, bombs, and rockets and can be used in nuclear reactors.
3. White phosphorus munitions are under a blanket ban and their use is regulated under the International Humanitarian Law (IHL).

How many of the above statements are **not** correct?

A. Only one
B. Only two
C. All three
D. None

148. Consider the following pairs:

	Mission		**Country**
1.	Apollo 11	a.	United States
2.	Chang'e 1	b.	China
3.	Gaganyaan	c.	India

Which of the pairs given above is/are correctly matched?

A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

149. Consider the following statements:

1. Microalgae are present at the top layer of the ocean surface.
2. Microalgae, though among primary producers in the ocean, have lesser photosynthetic efficiency than terrestrial plants.
3. Microalgae can produce food and absorb CO_2 even in less availability of sunlight and iron.

How many of the statements given above are correct?

A. Only one
B. Only two
C. All three
D. None of the above

150. Consider the following statements:

1. Graphite is a naturally occurring mineral composed of carbon and is one of the three crystalline forms of carbon.
2. Graphite is a good conductor of electricity but a bad conductor of heat.
3. Graphite has lubricating properties due to its layered structure that allows for easy sliding between the layers.

How many of the statements are correct?

A. Only one
B. Only two
C. All three
D. None

151. Consider the following statements regarding Large Language Models (LLMs):

1. LLMs are a specific class of generative AI models that are trained to understand and generate human-like text.
2. These models are built using deep learning techniques, particularly using neural networks.
3. They can generate coherent and contextually relevant text given a prompt or input.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

152. Consider the following statements regarding Mars:

1. It is the second smallest planet in our solar system after Mercury.
2. It possesses two moons, known as Phobos and Deimos.
3. Olympus Mons on mars is the tallest volcano in our solar system.

How many of the above statements are **not** correct?

A. Only one
B. Only two
C. All three
D. None

153. Consider the following statements with respect to 'Avian influenza':

1. Avian influenza, often referred to as bird flu, is a highly contagious viral infection that primarily affects birds, particularly wild birds and domestic poultry.
2. "Detect and Cull" policy is outlined in the National Action Plan for Prevention, Control, and Containment of Avian Influenza to control the Highly Pathogenic Avian Influenza (HPAI).
3. India has witnessed the outbreak of Highly Pathogenic Avian Influenza (HPAI) H5N1 and H5N8 both.

How many of the above statements are **not** correct?

A. Only one
B. Only two
C. All three
D. None

154. With reference to Dengue, consider the following statements:

1. It is transmitted by several species of female mosquito within the genus Anophele which also transmits chikungunya and Zika infection.
2. Wolbachia method can be successfully used to control dengue.
3. India's National Centre for Biological Sciences has developed the country's first and only DNA vaccine candidate for dengue fever.

How many of the statements given above are correct?

A. Only one
B. Only two
C. All three
D. None

155. With reference to Thallium, consider the following statements:

1. Thallium is a non-metal that lacks both taste and color.
2. Thallium's utilization is restricted due to its toxic nature.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

156. Consider the following statements with respect to 'Marine Cloud Brightening':

1. It seeks to boost marine cloud reflectivity (albedo), making clouds whiter and brighter.
2. It involves using water cannons or specialized vessels to release fine seawater droplets into the atmosphere.
3. It is a tactic for addressing extreme ocean heat and as a way to reduce coral bleaching and safeguard marine ecosystems.

How many of the above statements are **not** correct?

A. Only one
B. Only two
C. All three
D. None

157. With reference to Cervical Cancer, consider the following statements:

1. Flaviviruses are the primary cause of Cervical Cancer.
2. Cervical cancer ranks as the first most prevalent cancer among women on a global scale.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

158. With reference to the Tilapia Parvovirus (TiPV), consider the following statements:

1. TiPV is a viral pathogen that primarily affects tilapia, a type of bird.
2. It belongs to the Parvoviridae family, which is known for its small, non-enveloped, single-stranded DNA viruses.
3. India has witnessed its first encounter with TiPV in Tamil Nadu.

How many of the statements above are correct?

A. Only one
B. Only two
C. All three
D. None

159. Consider the following statements with respect to 'Brain Atlas':

1. Neuron cells use electric signals and chemicals to process information.
2. Astrocytes seem to provide support to neurons, ensuring their proper functioning.
3. The hemispheres of Brain are attached by a bundle of nerve fibers called the Cerebrum.

How many of the above statements are **not** correct?

A. Only one
B. Only two
C. All three
D. None

160. Consider the following statements regarding consanguinity:

1. Consanguinity involves both social and genetic dimensions, referring to unions between closely related individuals.
2. The primary genetic concern associated with consanguinity is an increased risk of offspring inheriting genetic disorders due to the sharing of common recessive genes.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

161. Which one of the following statements describes Astigmatism, a type of refractive error:

A. Difficulty seeing distant objects and clear near vision.
B. Irregular cornea or lens shape causes uneven light focus.
C. Age-related difficulty focusing on close objects, typically around middle age.
D. Difficulty seeing nearby objects, relatively clear distant vision.

162. Consider the following statements:

1. The rapid motion of electrons renders them nearly invisible to conventional measurement techniques.
2. Atoms in molecules exhibit movements on the order of femtoseconds, which are incredibly short time intervals, constituting a millionth of a billionth of a second.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

163. Consider the following statements regarding the Planet Venus:

1. It is the second brightest natural object in the night sky after the Moon.
2. Unlike the other planets in our solar system, Venus and Uranus spin clockwise on their axis.
3. It is the hottest planet in the solar system.

How many of the statements given are **not** correct?

A. Only one
B. Only two
C. All three
D. None

164. Consider the following pairs:

	Categories of Cookies		**Meaning**
1.	Session Cookies	:	Temporary in nature
2.	Persistent Cookies	:	Endure on the user's device beyond the conclusion of a browsing session.
3.	Secure Cookies	:	Employed primarily for safeguarding sensitive data, such as login credentials.
4.	Third-party Cookies	:	Employed for tracking and advertising purposes, offering both utility and the potential for intrusion.

How many of the following pairs is/are correctly matched?

A. Only one pair
B. Only two pairs
C. Only three pairs
D. All four pairs

165. With reference to mRNA vaccines, consider the following statements:

1. mRNA stands for messenger RNA, which carries genetic information from RNA to DNA.
2. mRNA vaccines use synthetic mRNA to produce antibodies and memory cells that can fight pathogens.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

166. Consider the following statements regarding the moon:

1. A supermoon occurs when a moon is located at the perigee of its elliptical orbit around Earth.
2. A blue moon is the first full moon in a month.
3. A blood moon occurs during a total lunar eclipse when the Earth aligns between the Moon and the Sun, casting a shadow on the Moon.

How many statements given above is/are correct?

A. One statement only
B. Two statements only
C. All three statements
D. None of the above

167. Consider the following statements regarding Fungi:

1. Fungi are a diverse group of eukaryotic microorganisms.
2. The word 'funga' is used to highlight the importance of fungi.
3. These are primarily decomposers or saprophytes and obtain nutrients by absorbing organic matter from their surroundings.

Which of the following statements given above is/are correct?

A. One Statement only
B. Two statements only
C. All three statements
D. None of the above

168. With reference to dementia that leads to deterioration in cognitive function, consider the following statements:

1. It can be caused by a head injury, a stroke, a brain tumor or due to HIV infection.
2. There is currently no treatment available to cure dementia.

Which of the statements given above is/are correct?

A. Only 1
B. Only 2
C. Both 1 & 2
D. None of the above.

169. **Statement-I:** A gene mutation is a change in the DNA sequence of a gene that does not affect its function or expression.

Statement-II: Gene mutations can be caused by errors during DNA replication, exposure to radiation or chemicals, or other factors.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I
B. Both Statement-I and Statement-II are correct and Statement-II is not the correct explanation for Statement-I
C. Statement-I is Correct but Statement II is incorrect
D. Statement-I is incorrect but Statement-II is correct

170. With reference to the Aditya-L1,consider the following statements:

1. Aditya-L1 is the first space based observatory class Indian solar mission to study the Sun from a substantial distance of 1.5 million kilometers.
2. The mission's journey is longer than India's previous Mars orbiter mission Mangalyaan.
3. The spacecraft is planned to be placed in a polar orbit around the Lagrangian point 1 (L1) of the Sun-Earth system.

How many of the statements given above is/are **not** correct?

A. One only
B. Two only
C. All three
D. None

171. Which one of the following best describes the word Hubble Constant?

A. The mass of the Milky Way galaxy
B. The speed of light in a vacuum
C. The rate of the universe's expansion
D. The distance between Earth and the nearest star

172. Recently, the James Webb Space Telescope released an image of SN1987A also known as the 'String of Pearls'. Which of the following best describes it?

A. It refers to the clearings in Saturn's deep cloud layer that glow when illuminated by the planet's internal heat.
B. It is a supernova that exploded in a neighbouring galaxy, a few decades ago.
C. It is a trail of SpaceX's Starlink satellites that look like moving lights in the night sky.
D. None of the above

173. Consider the following statements:

1. The Large Magellanic Cloud (LMC) and Small Magellanic Cloud (SMC) are two irregular, satellite galaxies that orbit the Milky Way.
2. LMC and SMC serve as excellent laboratories for the study of very active stellar formation and evolution.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

174. With reference to the recently developed lab-grown human embryo model, consider the following statements:

1. The model was created using a combination of stem cells and chemicals.
2. The model was able to spontaneously assemble into different types of cells that form the fetus and its supporting structures.
3. The model was intended to be used for pregnancy and implantation.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

175. Consider the following statements with respect to 'Mosquito Control through Genetic Engineering':

1. The US Environmental Protection Agency authorized the release of the genetically modified OX5034 mosquito in Florida and Texas in 2020.
2. This mosquito is developed with a gene sensitive to an antibiotic, tetracycline.
3. It carries a self-limiting gene that prevents female offspring from surviving, leading to a reduction in mosquito populations.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

176. Which of the following statements is/are correct about Nipah virus?

1. It is a DNA virus of the family Paramyxoviridae, genus Henipavirus.
2. It first appeared in domestic pigs and has been found among several species of domestic animals including dogs, cats, goats, horses and sheep.
3. It spreads through fruit bats or 'flying foxes,' of the genus Pteropus, who are natural reservoir hosts of the Nipah and Hendra viruses.
4. There are vaccines available for both humans and animals.

Select the correct answer using the code given below:

A. 1 and 2 only
B. 2 and 3 only
C. 3 only
D. 4 only

177. Consider the following statements:

1. White LEDs have a broad spectrum of light that includes blue and green wavelengths, which are highly sensitive to many marine organisms.
2. The Earth is getting artificially brighter, at a rate of 2.2% per year.
3. Red light, being the longest wavelength in the visible spectrum, penetrates very deep into the water.

How many of the statements· given above are correct?

A. Only one
B. Only two
C. All three
D. None

178. Which of the following best defines the concept of Reciprocity?

A. Reciprocity refers to the exchange of signals between two points in opposite directions, similar to bouncing a ball off a wall.
B. Reciprocity is the phenomenon where a signal sent from one point to another is sent back from the second point to the first.
C. Reciprocity is the ability of an object to emit and receive signals simultaneously without interference.
D. Reciprocity is a term used in movies to describe situations where characters can't see each other through a window due to lighting conditions.

179. With respect to 'NavIC', consider the following statements:

1. The Ministry of Electronics and Information Technology plans to make NavIC integration mandatory in all devices.

2. Second-generation Navigation satellites for NavIC were launched in May 2023.
3. The new satellites will send signals in L1 frequency, in addition to L5 and S frequency signals.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3

180. Consider the following statement regarding 'Sickle Cell Disease (SCD)':

1. SCD is a group of inherited white blood cell disorders.
2. National Sickle Cell Anemia Eradication Mission aims to eliminate sickle cell anemia from India by 2047.
3. SCD was included in the list of disabilities under the Rights of Persons with Disabilities Act, 2016.

Which of the statements given above is/are correct?

A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

181. Regarding the Global Trends in Antimicrobial Use, consider the following statements:

1. Recently, the WHO has released its 7th report on Antimicrobial use in animals.
2. There is a 13% increase in global antimicrobial usage in animals.
3. Antimicrobial drugs are used to treat or prevent infections in humans, animals, and sometimes plants.

How many of the statements given above are correct?

A. Only one
B. Only two
C. All three
D. None

182. Biohacking, a term recently in news, refers to:

A. hacking into biological systems to steal or manipulate data
B. biological experimentation done to improve the qualities or capabilities of living organisms
C. using biotechnology to create new forms of life or alter existing ones
D. exploiting biological vulnerabilities to cause harm or disruption

183. Which of the following best describes gravitational redshift?

A. The change in the color of an object due to its motion through space.
B. The shift in the frequency of light as it passes through a gravitational field.
C. The increase in the speed of an object as it approaches a massive celestial body.
D. The bending of light around a massive object due to its gravitational pull.

184. Consider the following statements:

1. Jupiter's faint ring system was discovered by the Voyager Mission in 1979.
2. Io is a volcanic moon of Jupiter.
3. Juno is a NASA mission to explore Jupiter and its icy moons.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None of the above

185. Consider the following statements:

1. Gravitational Instabilities occurs in astrophysical systems, particularly in celestial bodies like galaxies, stars, and planetary systems.
2. Less stable spiral galaxies convert gas into stars effectively through gravitational instabilities.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

186. Regarding the growing concern related to Vibrio vulnificus infections in India consider the following statements:

1. It is a deadly bacteria found in marine environments.
2. Despite its potential threat, this pathogen remains largely underreported in India.
3. This bacterium thrives in warm waters above 20°C.

How many of the statements given above are correct?

A. Only one
B. Only two
C. All three
D. None

187. Consider the following statements:

1. A fuel cell is an electrochemical device that converts chemical energy into electrical energy.
2. Green Hydrogen fuel cell use Green Hydrogen as a fuel to drive an electrochemical process that produces electricity, with water and heat as the only by-products.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

188. With reference to the Geospatial Intelligence, consider the following statements:

1. Geospatial technology uses tools like GIS (Geographic Information System), GPS (Global Positioning System) and Remote Sensing for geographic mapping and analysis.
2. The technology may be used to create intelligent maps to help identify spatial patterns in large volumes of data.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

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Which of the statements given above is/are **not** correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

190. Consider the following statements:

1. The Solar Orbiter is a collaborative mission between the European Space Agency (ESA) and NASA.
2. Picoflare jets are small-scale phenomena on the sun that release a significant amount of energy in a short period of time
3. As the solar wind moves away from the Sun, it forms a vast region around it called the heliosphere.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

191. Consider the following statements about Human Immunodeficiency Virus (HIV):

1. HIV is a virus that targets the immune system, especially stem cells (T cells), which are essential for fighting infections.
2. HIV is primarily transmitted through sexual contact, sharing needles for drug use, or from mother to child during childbirth or breastfeeding.
3. Tenofovir disoproxil, Lamivudine, and Dolutegravir (TLD) are medications used to treat HIV.

How many of the given above statements are correct?

A. Only one
B. Only two
C. Only three
D. None of the above

192. Which of the following correctly defines the Kessler Syndrome?

1. The phenomenon of space overpopulation with objects and debris poses a significant hazard to operational satellites, increasing the likelihood of collisions with them.
2. A phenomenon in which the gravitational pull of the Earth causes satellites to decay and re-enter the atmosphere, creating fireballs and sonic booms.
3. A condition in which the radiation belts around the Earth interfere with the electronics and communications of satellites, causing them to malfunction or fail.
4. A situation in which the solar wind and coronal mass ejections from the Sun damage or destroy satellites, creating power outages and geomagnetic storms.

193. With reference to the Cell-Free DNA (cfDNA), consider the following statements:

1. It is released into the extracellular environment under different circumstances, including cell death or other cellular processes.

2. The 'GEMINI' test utilizes cfDNA sequencing to detect lung cancer.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

194. Consider the following statements:

1. Gallium arsenide is the only semiconductor compound.
2. India imports semiconductor chips from China, Taiwan, USA and Iran.
3. The India Semiconductor Mission was launched in 2021.

How many of the statements given above are correct?

A. Only one
B. Only two
C. All three
D. None

195. With reference to Superconductors, consider the following statements:

1. Superconductors are materials that exhibit zero electrical resistance when cooled to extremely low temperatures.
2. Recently discovered material LK-99 is a superconductor at room temperature and pressure.
3. Superconductors conduct electricity with no loss of energy.

Which of the statements given above is/are correct?

A. Only One
B. Only Two
C. All Three
D. None

196. Consider the following statements regarding Mars:

1. The reddish appearance of Mars is due to a nitrogen-rich atmosphere.
2. The largest volcano in the solar system, known as Olympus Mons, is located on Mars.
3. Mars has a thick atmosphere primarily composed of oxygen.
4. Liquid water is abundant on Mars' surface.

How many of the statements given above are correct?

A. Only one
B. Only two
C. Only three
D. All four

197. **Statement-I:** Small Modular Reactors are advanced nuclear reactors that have a power capacity of up to 300 MW(e) per unit, which is about one-third of the generating capacity of traditional nuclear power reactors.

Statement-II: Small Modular Reactors however have lower safety features than traditional nuclear power reactors.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I
B. Both Statement-I and Statement-II are correct and Statement-II is not the correct explanation for Statement-I
C. Statement-I is Correct but Statement II is incorrect
D. Statement-I is incorrect but Statement-II is correct

198. Consider the following statements:

1. Lymphatic filariasis is a neglected tropical disease caused by bacterial infection.
2. India aims to eliminate Lymphatic Filariasis by 2027, three years ahead of the global target, through a mission-driven strategy.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

199. Consider the following statements:

1. Only two countries, the United States and the Soviet Union have managed to complete a soft landing on the Moon in history.
2. The Luna 25 is a Chinese lunar exploration mission focusing on studying soil composition, dust particles, and detecting surface water.
3. Chandrayaan-3 is built for a single lunar day due to lack of heating during lunar nights.

How many of the statements given above are correct?

A. Only one
B. Only two
C. All three
D. None

200. With reference to the Radio Thermoelectric Generators, consider the following statements:

1. It is an innovative power source designed to address challenges in deep space missions.
2. RTGs utilize radioactive materials, such as Plutonium-238 or Strontium-90, which emit heat as they decay over time.
3. Radioisotope Heater Unit (RHU) initiates the process by releasing thermal energy, which serves as the foundation for electricity generation.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

201. Consider the following statements:

1. The mobile application "FloodWatch" for real-time dissemination of flood-related information was launched by the National Disaster Management Authority.
2. The key features of the "FloodWatch" mobile application include providing up-to-date flood situations across the country through real-time flood monitoring.
3. The Interactive Map feature of "FloodWatch" allows users to Check Central Water Commission (CWC) Flood Forecast and Flood Advisory for specific stations.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None

202. With reference to the Solar Cycle, consider the following statements:

1. The solar maximum is the phase when the Sun is most active, with many sunspots and minimum solar flares.
2. The solar minimum is the phase when the Sun is least active, with few or no sunspots and calm surface.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

203. 'Amyotrophic Lateral Sclerosis', recently seen in news is-

A. It is a rare and fatal type of motor neuron disease, characterized by progressive degeneration of nerve cells in the spinal cord and brain.
B. A recently identified bacterium, detected by the US food department in Indian seafood, has led to the imposition of a ban on Indian seafood imports.
C. A novel fungus found in Indian cough syrup exported to Africa has resulted in the tragic deaths of numerous children.
D. The illness that ensues in coastal animals due to ingesting plastic waste collected post-cyclone.

204. Consider the following statements:

Statement 1 : IMEI numbers are fixed for a mobile device throughout its lifetime and cannot be changed.

Statement 2 : IMEI numbers are hard coded into the device's hardware during manufacturing, making them unique and unalterable.

Which of the following is correct in respect of the above statement?

A. Both Statement-1 and Statement-2 are correct, and Statement-2 is the correct explanation for Statement-1
B. Both Statement-1 and Statement-2 are correct, and Statement-2 is not the correct explanation for Statement-1
C. Statement-1 is correct, but Statement-2 is incorrect
D. Statement-1 is incorrect, but Statement-2 is correct

205. Agnibaan SubOrbital Technological Demonstrator (SOrTeD) which was recently in news is a:

A. A satellite launched by ISRO to study the Sun's corona
B. A customisable launch vehicle powered by a 3D-printed engine
C. A reusable spacecraft developed by a private company
D. A hypersonic missile tested by DRDO

206. What does "NBRI Namoh 108" refer to?

A. A new variety of lotus flower with 108 petals, developed by the National Botanical Research Institute (NBRI) in Lucknow.
B. A new variety of rice with 108 grains per plant, developed by the National Bureau of Rice Improvement (NBRI) in Hyderabad.

C. A new variety of mango with 108 seeds per fruit, developed by the National Botanical Research Institute (NBRI) in Lucknow.

D. A new variety of tea with 108 antioxidants per cup, developed by the National Bureau of Research on Indian (NBRI) Tea in Darjeeling.

207. Consider the following statements about the first low-pungent mustard recently developed by Indian scientists:

1. It is based on CRISPR/Cas9 gene editing, which introduces foreign genes into the plant genome.
2. It has lower levels of glucosinolates in the seeds than traditional mustards, which makes the oil and meal more palatable.
3. It has higher levels of glucosinolates in the leaves and pods, which enhance the plant's defense against pests and diseases.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None of the above

208. Consider the following statements regarding Chandrayaan 3:

1. The mission made India the first country to soft land on the south pole of the moon.
2. The mission life of Chandrayaan 3 is at least 14 lunar days.
3. The main objective of Pragyan, the rover, is to study the spectral and Polari metric measurements of Earth from the lunar orbit.
4. Unlike Chandrayaan 2, the Chandrayaan 3 was developed with a "failure-based" design approach.

How many of the above statements are correct?

A. Only one
B. Only two
C. Only three
D. All four

209. Consider the following statements regarding Methylotuvimicrobium buryatense 5GB1C strain of bacteria:

1. It demonstrates the ability to consume methane, a Greenhouse Gas (GHG).
2. It can grow well in environments with low methane concentrations.
3. It can produce biomass that can be used as feed in aquaculture.

How many of the statements given above are correct?

A. Only one
B. Only two
C. All three
D. None

210. Consider the following statement about Eastern Equine Encephalitis:

1. Eastern Equine Encephalitis (EEE) is a bacterial disease that causes inflammation of the brain (encephalitis).
2. It spreads to people and animals by the bite of an infected mosquito.
3. Currently, there are no vaccines available to directly treat Eastern equine encephalitis.

Which of the given above statements is/are **not** correct?

A. 1 and 2 Only
B. 2 and 3 Only
C. 1 Only
D. 3 Only

211. Which of the following statements is/are correct about somatic genetic variants?

A. They are alterations in the DNA sequence that occur in the cells of an individual's body after conception.
B. They can occur for various reasons, such as errors during DNA replication, exposure to environmental factors, or simply as a natural consequence of cellular aging.
C. They can have different effects depending on where they occur in the genome and which genes are affected. Some of them can lead to the development of diseases, including cancer.
D. All of the above

212. Consider the following activities:

1. Tasks that involve intricate craftsmanship
2. Environmental Monitoring
3. Complex Negotiations
4. Inspecting the craters of active volcanoes
5. Collecting breath samples from spouting whales for DNA analysis

At the present level of technology, which of the above activities can be successfully carried out by using drones?

A. 1, 2 and 3 only
B. 2, 3 and 4 only
C. 2, 4 and 5 only
D. 3, 4 and 5 only

213. Consider the following statements regarding India's upcoming space endeavours:

1. Lunar Polar Exploration (LUPEX) mission is an upcoming collaborative effort between ISRO and its French counterpart (CNES).
2. XPoSat (X-ray Polarimeter Satellite) will be India's first dedicated polarimetry mission to study various dynamics of bright astronomical X-ray sources in extreme conditions.
3. NISAR (NASA-ISRO Synthetic Aperture Radar) is a Low Earth Orbit (LEO) observatory being jointly developed by the two.

How many of the above statements are correct?

A. Only one
B. Only two
C. All three
D. None of the above

214. What is the Meissner effect?

A. The expulsion of a magnetic field from the interior of a material during the process of becoming a superconductor.
B. The attraction of a magnetic field to the interior of a material during the process of becoming a superconductor.
C. The generation of a magnetic field from the interior of a material during the process of becoming a superconductor.
D. The cancellation of a magnetic field from the interior of a material during the process of becoming a superconductor.

215. Consider the following statements regarding Metagenomics:

1. Metagenomics studies microbes in their natural environment, focusing on their complex communities.
2. It facilitates direct sequencing of patient samples, which requires the prior knowledge of the infectious agent.
3. It is different from conventional sequencing methods, as it doesn't require culturing or isolating individual species before sequencing their genomes.

How many of the statements given above are **not** correct?

A. Only one
B. Only two
C. All three
D. None

216. Consider the following statements:

1. All organisms have a unique genetic code, or genome, that is composed of nucleotide bases- Adenine (A), Thymine (T), Uracil (U) and Guanine (G).
2. Whole genome sequencing is a laboratory procedure that determines the order of bases in the genome of an organism in one process.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

217. **Statement-I:** Quantum mechanics is a subfield of physics that describes the behavior of particles, atoms, electrons, photons, and almost everything in the molecular and sub molecular realm.

Statement-II: Quantum computers store information as binary 0 and 1 states.

Which one of the following is correct in respect of the above statements?

A. Both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I
B. Both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I
C. Statement-I is Correct, but Statement II is incorrect
D. Statement-I is incorrect, but Statement-II is correct

218. With reference to the National Programme for Prevention & Control of Non-Communicable Diseases (NP-NCD), consider the following statements:

1. A Single National NCD Cell has been established to monitor and manage the programme at national, state and district level.
2. NCD Clinics are being set up at District levels to provide services for early diagnosis, treatment and follow-up for common NCDs.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

219. Consider the following stages of a star's life:

1. White dwarf
2. Red Giant
3. Planetary Nebula

Arrange these stages in chronological order:

A. 3-2-1
B. 2-1-3
C. 3-1-2
D. 2-3-1

220. Consider the following statements regarding Auroras:

1. Auroras consist of gases and particles, including oxygen and nitrogen.
2. They are caused by the interaction of charged particles from the Sun with the Earth's gravitational field and atmosphere.
3. Coronal mass ejections (CMEs) and solar flares enhance auroral activity.

Which of the statements given above is/are correct?

A. 1, 2 and 3
B. 1 and 2 only
C. 2 and 3 only
D. 1 and 3 only

221. Consider the following statements:

1. Petrol is made up of a mix of alkanes and cycloalkanes with a chain length of between 5-12 carbon atoms while Diesel is made up of alkanes of longer chains.
2. Diesel engines offer more torque (rotational or turning force) and are less likely to stall.
3. Petrol has a greater energy content per litre than diesel.

Which of the above statements is/are correct?

A. 1 and 2 only
B. 2 only
C. 1 and 3 only
D. 1, 2, and 3

222. National Technology Day of India is observed in the memory of which of the following?

A. The launch of India's first satellite Aryabhata
B. The successful nuclear tests at Pokhran in 1998
C. The development of India's first indigenous aircraft Hansa-3
D. The establishment of the Indian Space Research Organization

223. With reference to the characteristics of Mitochondria, consider the following statements:

1. They are found in the cells of most eukaryotic organisms.
2. They have their own DNA.
3. They generate the majority of the cell's energy in the form of Adenosine Triphosphate (ATP).

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

224. Which of the following is not correct regarding Carbon dating?

A. It is done based on the fact that Carbon-14 (C-14) is radioactive, and decays at a well-known rate.
B. It cannot be used to determine the age of non-living things like rocks.
C. It can be used to determine the age of things as old as 100,000 years.
D. None of the above.

225. With reference to Alzheimer's Disease, consider the following statements:

1. It is the most common cause of dementia.
2. Only gene mutations can cause the risk of developing Alzheimer's.
3. There's currently no cure for this disease.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

226. With reference to the characteristics of Transformers in Machine Learning (ML), consider the following statements:

1. They are a type of deep learning model used for natural language processing (NLP) and computer vision (CV) tasks.
2. Transformers can process the entire input data at once.
3. They led to the development of pre-trained system Generative Pre-trained Transformer (GPT).

Which of the statements given above is/are correct/

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

227. Which of the following statements is/are correct regarding Calcium-41?

1. It is a rare long-lived radioisotope of calcium.
2. It is not found naturally and can only be produced in laboratories.

3. It is more effective in determining the age of fossilised bones and rocks than carbon-14 dating.

Select the correct answer using the code given below:

A. 1 and 2 only
B. 1 only
C. 2 and 3 only
D. 1 and 3 only

228. Consider the following statements regarding 'Sodium-ion Batteries':

1. Cathode material is the electrode where sodium ions are stored during the battery's discharge process.
2. Sodium-transition-metal-oxide (Na-TM-Oxide) based cathode materials addresses the challenges of air/water-instability and structural-cum-electrochemical instability.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

229. Consider the following statements:

1. Floating-Point Operations per Second (FLOPs) is a metric used to measure computational performance and efficiency in high-performance computing (HPC) and artificial intelligence (AI).
2. India's first supercomputer was PARAM 8000.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

230. Consider the following statements:

1. AI systems like ChatGPT, often require large amounts of data to train their algorithms effectively.
2. The Indian Copyright Act, 1957 provides specific provisions for fair dealing and exceptions to copyright infringement in India.
3. The use of copyrighted materials for training AI models is considered to be in a legal grey area in India.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

231. With reference to the XPoSat (X-ray Polarimeter Satellite), consider the following statements:

1. It is India's pioneering polarimetry mission aimed at studying various dynamics of astronomical sources in extreme conditions.
2. It is only the world's second polarimetry mission using X-Ray.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

232. Which of the following statements is not correct?

A. Folate is the natural form of vitamin B12.
B. Vitamin B12 is synthesized by most bacteria and algae with the help of enzymes.
C. Deficiency of Vitamin B12 causes pernicious anaemia.
D. Vitamin B12 is crucial to the normal functioning of the brain and the nervous system.

233. With reference to the arsenic, consider the following statements:

1. It is an odourless and tasteless metalloid.
2. It is naturally present at high levels in the earth crust and groundwater.
3. Long-term exposure to arsenic can cause cancer.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

234. Which of the following statements is/are correct regarding the water footprint of AI?

1. The water footprint of AI includes both direct water consumption and indirect water consumption.
2. The water footprint of AI is solely determined by the size of the AI model.
3. The worldwide challenge of water shortage is exacerbated by AI technology.

Select the correct answer using the code given below:

A. 1 and 2 only
B. 1 and 3 only
C. 2 only
D. 1, 2 and 3

235. Which of the following statements is/are correct?

1. Leigh Syndrome and Kearns-Sayre syndrome (KSS) are examples of mitochondrial diseases.
2. Mitochondrial Donation Treatment (MDT/MRT) ensures that the baby inherits healthy mitochondria while carrying the genetic material from both biological parents.
3. The procedure is specifically intended for couples who wish to have their genetic child but do not want to use a donor egg.

Select the correct answer using the code given below:

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

236. The news sometimes mentions 'hysterectomy' in relation to Indian labor. 'Hysterectomy' is related to which of the following?

A. A type of surgery
B. A type of medicine
C. A type of disease
D. A type of therapy

237. What is StarBerrySense, recently seen in news?

A. A sensory device used to measure the ripeness of strawberries
B. A space mission for tracking star constellations
C. A low-cost star sensor developed by Indian Space Research Organization (ISRO)
D. A wearable technology that monitors heart rate and blood pressure

238. With reference to Black Holes, consider the following statements:

1. Black holes are regions of space-time where gravity is very weak and objects like light can easily escape from them.
2. They play a role in the formation and evolution of galaxies and the distribution of matter throughout the universe.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

239. Regarding the Cryogenic engines, consider the following statements:

1. An engine that uses liquid nitrogen as a propellant.
2. It has a lower payload carrying capacity than other rocket engines making it as less efficient compared to other rocket engines.
3. Dhawan II is a cryogenic rocket engine developed by ISRO.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 3 and 1 only
D. None of the above

240. Consider the following statements regarding 'Laser Carbon':

1. Laser carbon contains nitrogen that acts as both a catalyst and a cathode in electrolysis.
2. It reduces the energy required for splitting water by lowering the overpotential of the Oxygen Evolution Reaction (OER).

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

241. Consider the following statements regarding Solar Photo Voltaic (PV) waste:

1. Accumulating the PV waste in the landfills will lead to the soil pollution.
2. India is among the least countries which produce PV waste.
3. PV waste is classified as Hazardous waste in India.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 3only
C. 1 and 3 only
D. None of the above

242. Regarding the BioLinux model, consider the following statements:

1. It is an open-source model that was proposed in 2002 by scientists for seeds and plant varieties.
2. It is software whose source code is made available to the public for anyone to view, modify, and distribute under an open-source license.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

243. With reference to Genome sequencing, which of the following cannot be a potential benefit?

A. It can help developing the personalized medicines based on patients' genomes to anticipate and modulate diseases.
B. It can make agriculture more sustainable and reduce the dependence on chemicals.
C. It can help in early detection of diseases even before they develop.
D. It nullifies the potential for scientific racism and the reinforcement of stereotypes based on heredity and racial purity.

244. With reference to Tropospheric Emissions Monitoring of Pollution (TEMPO), consider the following statements:

1. TEMPO is a device that tracks air pollution and their emitter sources all over the world.
2. TEMPO is a radar system sensitive to visible and ultraviolet wavelengths of light.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

245. Which of the following statements is correct regarding multinucleon transfer (MNT) technique?

A. It is a nuclear fusion reaction that occurs when heavy ions collide.
B. It is a technique to separate hydrogen from water.
C. It involves the transfer of more than one nucleon between two colliding nuclei.
D. It is a technique used to detect radioactive emissions.

246. Consider the following pairs related to Cyber Threats:

	Match	**Match 2**
1.	Hijacking Computer's Data	Ransomware
2.	Malicious program hidden Inside Legitimate Program	Trojan Horses
3.	Overloading a Particular Service	Denial of Service Attack

Which of the pairs given above is/are correctly matched?

A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

247. Consider the following statement related to Gravitational Waves:

1. They were first postulated in Albert Einstein's General Theory of Relativity.
2. These waves are not produced by the movement of neutron stars.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

248. Which of the following statements about radioactivity is/are correct?

1. Radioactivity is the process of releasing particles or waves from the stable nuclei of some elements.
2. The three types of radioactive emissions are alpha particles, beta particles, and gamma rays.

Select the correct answer using the following code:

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

249. Which of the following statements is/are correct?

1. LHC (Large Hadron Collider) is a huge experiment that collides two beams of particles to study physics at very high energies.
2. LHC is operated by NASA (National Aeronautics and Space Administration).
3. Hardon is a particle that gives other particles mass.

Select the correct answer using the code given below:

A. 1 and 2 only
B. 2 and 3 only
C. 1 only
D. 1, 2 and 3

250. With reference to the use of Quantum technology in maritime communication, consider the following statements:

1. It can enable faster communication between ships and shore stations.
2. Quantum computers can be used to run complex simulations of weather patterns.
3. It is useful for communication in remote areas where traditional communication methods are limited.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

251. With reference to the Dark Matter, consider the following statements:

1. It is a proven form of matter that exists in the universe but is invisible.
2. It does not interact with light and is essential to explain the structure of the universe.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

252. Consider the following statements about 'Chagas disease':

1. Chagas disease is caused by a bacterium that is transmitted through casual contact with infected humans or animals.
2. There are currently no vaccines available for Chagas disease.

Which of the statements given above is/are **not** correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

253. Consider the following statements about Jagdish Chandra Bose:

1. J.C Bose was a Plant Physiologist and physicist who invented the crescograph.
2. Bose discovered wireless communication and is known as the Father of Radio Science.

Which of the statements given above is/are correct?

A. 1 Only
B. 2 Only
C. Both 1 and 2
D. Neither 1 nor 2

254. Consider the following statements:

1. A total eclipse happens when the Moon completely blocks out the Sun while passing between the Earth and the Sun.
2. A hybrid solar eclipse occurs when the eclipse is total from some locations on Earth and annular from others, due to the viewer's position relative to the Moon's shadow.
3. The Ningaloo Eclipse is a type of total solar eclipse.

Which of the statements given above is/are correct?

A. 1 and 3 Only
B. 2 and 3 Only
C. 1 and 2 Only
D. All of the Above

255. Consider the following statements regarding Starship project:

1. It is designed by NASA to carry both crew and cargo to Earth orbit, the Moon, Mars and beyond.
2. It includes a fully reusable spacecraft.
3. Starship Super Heavy Rocket is powered by an array of Raptor engines, which are fueled by liquid methane and liquid oxygen.

Which of the statements given above is/are correct?

A. 1 only
B. 2 and 3 only
C. 1 and 3 only
D. 3 only

256. What is LockBit, the term often seen in the news?

A. A new video game that has gained popularity.
B. A ransomware that encrypts the victim's data and later a ransom is demanded in lieu of the decryption key.
C. An app to store personal data in password protected form.
D. A programming language used for developing secure software applications.

257. Consider the following statements regarding Malaria disease:

1. It is transmitted to humans through the bites of infected female Anopheles mosquitoes.
2. Till date, there's no vaccine available to cure the disease.
3. The Malaria spread through Plasmodium Vivax is responsible for more deaths than Plasmodium falciparum.

Which of the statements given above is/are **not** correct?

A. 2 only
B. 2 and 3 only
C. 3 only
D. 1 and 2 only

258. Consider the following statements:

1. India is a signatory to Convention on Supplementary Compensation (CSC) but it hasn't rectified the treaty yet.
2. India's Civil Liability for Nuclear Damage Act provides the damage to be equally compensated by the operator and the government.
3. India's CLNDT provides the operator to seek recourse from the supplier in the event that supplies are found to have patent defects.

Which of the statements given above is/are **not** correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

259. Consider the following statements regarding Electromagnetic Ion Cyclotron (EMIC) waves:

1. The EMIC waves are the discreet electromagnetic emissions observed in the Earth's magnetosphere.
2. These waves are generated in the Polar latitudes and propagate along magnetic field lines to its footprint in the high latitude ionosphere.
3. Their signatures can be recorded in both space as well as ground-based magnetometers.

Which of the statements given above is/are correct?

A. 1 and 2 Only
B. 2 and 3 Only
C. 1 and 3 Only
D. All of the Above

260. Consider the following statements related to Uranus:

1. It rotates in the counter clockwise direction.
2. NASA's Voyager 2 made the first visit to Uranus.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

261. Consider the following statements:

1. Common Salt help regulate the balance of fluids in the body.
2. FSSAI has initiated the 'Aaj Se Thoda Kam' campaign to reduce the intake of salt in the diet.
3. Excessive salt intake can have dangerous consequences such as Hypertension.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 only
C. 3 only
D. 1, 2 and 3 only

262. With reference to Proton Beam Therapy, consider the following statements:

1. It is a type of cancer treatment that uses a beam of high-energy protons to destroy cancer cells.
2. Unlike traditional radiation therapy, proton therapy does not damage healthy tissues surrounding the tumor.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

263. Consider the following statements about Indian Pharma Sector:

1. Drugs and Cosmetics Act, 1940 regulates the import, manufacturing and distribution of drugs in India.
2. Ministry of Health is responsible for floating E-pharmacy rules.

Which of the above statements is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

264. Consider the following statements about Dengue:

1. Dengue is a mosquito-borne tropical disease caused by a virus.
2. It is transmitted principally by Aedes aegypti mosquito.
3. Same mosquito can also transmit Chikungunya and Zika virus.

Which of the statements given above is/are correct?

A. 1 only
B. 1 and 2 only
C. 2 only
D. 1, 2 and 3

265. With respect to Helium, consider the following statements:

1. Helium is a noble gas and has an open-shell electronic configuration, making it unstable and unreactive.
2. It has the lowest boiling and melting points of any element and exists only as a gas, except under extreme conditions.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

266. Consider the following statements about Erythritol:

1. It is a type of sugar alcohol commonly used as a sugar substitute in foods and beverages.
2. It has no calories and does not raise blood sugar levels.
3. It is also believed to have a lower Glycemic Index (GI) than other sweeteners.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 only
C. 2 and 3 only
D. 1, 2 and 3

267. Regarding the Bio-Computers, consider the following statements:

1. It is a combination of brain organoids with modern computing methods using machine learning.
2. They can record the neurons firing patterns and mimic sensory stimuli.
3. While Bio brains are slower than human brains at simple arithmetic, they outshine human brain at processing complex information.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 only
C. 3 only
D. 1, 2 and 3 only

268. Consider the following statements:

1. There are four types of seasonal influenza viruses, types A, B, C and D.
2. Influenza A and B viruses circulate and cause seasonal epidemics of disease.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

269. Which of the following is correct about Megha-Tropiques-1 Satellite:

1. It is an Indo-Canada Earth Observation Satellite.
2. It was launched for carrying out tropical weather and climate studies.
3. It was recently in news as the ISRO has successfully carried out the controlled Re-Entry experiment for the decommissioned Megha-Tropiques-1 (MT-1) Satellite.

Select the correct answer using the code given below:

A. 1 and 2 only
B. 2 and 3 only
C. 1 only
D. 1, 2 and 3

270. The word 'Scrub typhus' is sometimes mentioned in the news. Which of the following correctly defines it?

A. It is a life-threatening bacterial infection.
B. It is a cough syrup cause children's death in Ghana.
C. It is a viral zoonotic disease host in a wild pig.
D. None of the Above

271. Which of the following can be a potential use of Gene Editing Technology?

1. Designer babies
2. Disease resistant crops
3. De-extinction of Species

Select the correct answer using the code given below:

A. 1 and 2 only
B. 2 and 3 only
C. 1 only
D. 1, 2 and 3

272. Which of the following is correct about time zone of a lunar mission?

A. Lunar mission runs on time zone of the country operating the spacecraft.
B. Lunar mission runs on time zone of the International Space Station.
C. American time zone is widely accepted by all the countries for lunar missions.
D. Moon's own time zone is used for lunar missions, which was established for Apollo11 mission.

273. Which one of the following best describes Antibiotics?

1. Antibiotics are the drugs that can kill biological organisms in the body while causing no harm to the body.
2. Antibiotics can cure any disease.

Which of the following statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

274. Consider the following statements:

1. Lightning is caused by a difference in electrical charge between the top and bottom of a cloud.
2. Cloud to ground (CG) lightning is harmful as the 'high electric voltage and electric current' leads to electrocution.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

275. Which of the following statements correctly defines Project Netra?

A. An early warning system in space to detect debris and other hazards to Indian satellites.
B. An early warning system in border surveillance along LoC and LAC.
C. An early warning and weather forecasting system of India build for South Asian Nations.
D. None of the Above.

276. Consider the following statements regarding Japanese Encephalitis (JE):

1. It is a bacterial infection that can cause inflammation in the brain.
2. It is transmitted to humans through bites from infected mosquitoes.
3. Vaccination against JE is not included under Universal Immunisation Programme.

Which of the statements given above is/are **not** correct?

A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 3 only

277. Regarding End-to-End Encryption, consider the following statements:

1. It is a secure communication mechanism that allows data to be encrypted on the sender's device.
2. It can easily be decrypted by the intended recipient.
3. Even the service provider can't access the transmitted data.
4. It is used to ensure privacy and security only in messaging platforms.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 4 only
C. 1 and 3 only
D. 3 and 4 only

278. With reference to Expeditions to Venus, Consider the following pairs:

	Match 1	**Match 2**
1.	ISRO	Shukrayaan-1
2.	European Space Agency	Magellan
3.	NASA	DaVinci+ and Veritas

Which of the pairs given above is/are correctly matched?

A. 1 only
B. 1 and 2 only
C. 1 and 3 only
D. 1, 2 and 3

279. With reference to Starberry Sense, consider the following statements:

1. Strarberry Sense is a star sensor developed using Raspberry Pi Zero.
2. ISRO has developed Starberry sense, which is a low-cost star sensor for astronomy.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

280. With reference to the Launch Vehicles Developed by Indian Space Research Organisation (ISRO), consider the following statements:

1. Satellite Launch Vehicle (SLV) is the first rocket developed by ISRO.
2. Polar Satellite Launch Vehicle (PSLV) is the first Indian launch vehicle to be equipped with liquid stages.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

281. With reference to Rabies, consider the following statements:

1. Rabies is a bacterial infection that affects the circulatory system.
2. Dogs are the most common carriers of rabies in India.
3. Rabies is considered Endemic in India.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 3 and 1 only
D. 1, 2 and 3 only

282. Consider the following statements:

1. The Earth's magnetosphere has no role in protection against the particles emitted by the Sun.
2. A geomagnetic storm in the Earth's magnetic field is caused by solar emissions such as Coronal Mass Ejection (CME).

Which of the following statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

283. Consider the following about Daylight Saving Time (DST):

1. DST is the practice of turning the clock ahead as colder weather approaches and back as it becomes warmer again.
2. It is mostly followed by countries near the Equator as they experience high variations in daytime hours between seasons.
3. There is also a disadvantage of DST which includes disruption of circadian rhythm.

Which of the statements given above is/are **not** correct?

A. 1 only
B. 1 and 2 only
C. 3 only
D. 1, 2 and 3

284. Consider the following statements:

1. When perspiration evaporates off the body, it effectively reduces the body's temperature.
2. The rate of evaporation from the body decreases when the atmospheric moisture content is high.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

285. Consider the following statements regarding Diabetes:

1. Type 1 Diabetes is also known as juvenile diabetes, and it occurs when the body fails to produce sufficient insulin.
2. Type 2 diabetes can occur most often in middle-aged and older people.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

286. With reference to Gamma Ray Brust (GRB), consider the following statements:

1. Long Gamma-Ray Brust (LGRBs) is caused due to the collision of two compact objects, such as neutron stars.
2. GRB 200826A is the bright and long-lasting Gamma Ray Brust recorded till date.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. None of the above

287. With reference to Piezoelectric effect, consider the following statements:

1. Piezoelectric effect is a phenomenon in which certain materials produce an electrical charge in response to mechanical stress or pressure.
2. Piezoelectric effect is only observed in Solids.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. None of the above.

288. BHARTI research station is related to which of the following?

A. Arctic Ocean
B. Antarctica
C. Indian Ocean
D. None of the Above

289. With reference to Artificial intelligence, consider the following statements:

1. It describes the action of machines accomplishing tasks that have historically required human intelligence.
2. It is a hardware driven robotic automation.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

290. Regarding GPT-4, consider the following statements:

1. It is more advanced than its predecessors when it comes to creativity, visual comprehension and context.
2. It can process up to 50,000 words of text and facilitate extended conversations.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

291. Consider the following statements:

1. Waste-to-energy projects use non-recyclable dry waste to generate electricity.
2. Pyrolysis and plasma gasification are thermal processes that use high temperatures to break down waste.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

292. Consider the following statements:

1. Governor can call for a Floor Test on the basis of internal differences in the Party Members.
2. Governor has an overriding authority over the council of ministers in case of power to summon the House or the State Legislature.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

293. With reference to optical microscopy and fluorescent microscopy, consider the following statements:

1. Optical microscopy views an object by studying how it re-emits light that it has absorbed.
2. A fluorescent microscope views an object by studying how it absorbs, reflects or scatters visible light.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

294. What is the primary mechanism by which Reverse Osmosis (RO) desalination removes salt from seawater?

A. Pressure-driven diffusion of water molecules through a semi-permeable membrane
B. Chemical reactions that bind and remove salt ions.
C. Physical filtration of salt particles from the water
D. Use of ultraviolet light to break down salt molecules.

295. Consider the following statements:

1. Unhealthy lifestyles are a major contributor to coronary heart disease.
2. Coronary heart disease can be treated by regrowing damaged heart tissue.
3. Coronary heart disease is a condition in which the arteries become narrow due to the buildup of fatty deposits inside the blood vessels.

Which of the statements given above is/are correct?

A. 1 and 3 only
B. 2 only
C. 3 only
D. 1, 2, and 3

296. Consider the following statements:

1. Neutrinos are the most abundant particles in the Universe.
2. Just like positron is an anti-particle of electron, neutrinos are the anti-particles of photons.
3. Neutrinos do not have an electric charge.

Which of the statements given above is/are correct?

A. 1 and 3 only
B. 2 only
C. 2 and 3 only
D. 3 only

297. Which of the following best describes the Raman Effect?

A. The scattering of light by a medium, resulting in a shift in the frequency of the scattered light.
B. The absorption of light by a medium, resulting in a shift in the frequency of the absorbed light.
C. The reflection of light by a medium, resulting in a shift in the frequency of the reflected light.
D. The diffraction of light by a medium, resulting in a shift in the frequency of the diffracted light.

298. What of the following best describes the Tycho, a supernova explosion which was visible to people on Earth in 1572?

A. It is a Type II, caused by the collapse of a massive star's core.
B. It is a Type Ia, caused by a white dwarf star shredding its companion star.
C. It is a Type Ib, caused by the core collapse of a stripped envelope massive star.
D. It is a Type Ic, caused by the core collapse of a massive star that has lost its hydrogen and helium envelope.

299. With reference to Chandrayaan-3 Mission, consider the following statements:

1. It's aimed to land on the lunar South Pole.
2. It will have two major modules- the Propulsion module and the Lander module only.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

ANSWERS

1. Ans: B

Exp:

- National Science Day is observed on the day Indian Physicist Chandrasekhara Venkata Raman discovered the Raman Effect. **Hence, statement 1 is not correct.**
- The Raman Effect is the phenomenon where light gets scattered when passed through a transparent material, leading to changes in wavelength and energy.
- **Hence, statement 2 is correct.**
  - In 1928, on 28th February CV Raman discovered the Raman Effect.
  - He also received the Nobel Prize in Physics in 1930 due to his significant contribution to the field of Physics.

2. Ans: C

Exp:

- A dedicated team of **amateur radio operators (HAMs)** advocating last-mile connectivity, aimed to integrate HAM education in schools for enhanced disaster response, embarked on a significant journey from **cyclone shelters** in **Nachugunta Island, Andhra Pradesh,** to participate in the **Island on the Air (IOTA) expedition.**
- The expedition's success showcases HAM operators' **technical prowess,** emphasises community engagement and preparedness for **natural disasters,** and demonstrates India's amateur radio capabilities while enhancing emergency communication resilience in vulnerable regions.
- **Amateur Radio (HAM Radio)** is a widely enjoyed hobby that **uses radio frequencies** for **non-commercial purposes,** fostering technical learning, community engagement, and global connectivity through radio waves. **Hence, statement 1 is correct.**
- **Islands On The Air (IOTA),** is a program connecting **global radio amateurs** with **island stations,** managed by IOTA Ltd and Radio Society of Great Britain (RSGB), categorising islands into communication groups since 1964. **Hence, statement 2 is correct.**

3. Ans: D

Exp:

- The Binary System of Stars refers to the pair of **stars** that are **gravitationally bound to each other** and orbit around a **common centre of mass. Hence, statement 1 is correct.**
- An estimated 85% or more of stars are actually part of binary or even multiple-star systems. **Hence, statement 2 is correct.**
- **Classification:**
  - **Visual Binaries:** These are the **easiest to identify and consist of two stars** that can be directly resolved and separated using a telescope.
  - **Spectroscopic binaries:** These stars are too close together to be resolved visually even with powerful telescopes.
    - **However, their presence can be detected by observing periodic shifts in their spectral lines.**
  - **Eclipsing Binaries:** These binary systems are aligned in a way that one star periodically passes in front of the other from our perspective.
    - This event creates a **temporary dip in the brightness of the combined system,** allowing astronomers to confirm the presence of the unseen companion and study its properties.

4. Ans: C

Exp:

- Planets are formed when the dust and gas swirling around a young star collide and clump together. A similar process could be in **play near supermassive black holes,** where planets take shape inside the disc and eventually become blanets. **Hence, statement 1 is correct.**
- Scientists in Japan theorized in 2019 that **planets could form near supermassive black holes** from massive dust and gas clouds observed in their vicinity. These planets, termed **"blanets," are not anticipated to resemble Earth. Hence, statement 2 is correct.**

5. Ans: D

Exp:

- The human brain, comprising billions of **neurons,** forms a complex network vital for our existence and cognition. Understanding this intricate network, known as the **connectome,** offers profound insights into brain function and neurological disorders.
- A neuron consists of a **cell body containing the nucleus, dendrites for receiving** input, and an **axon for sending messages. Hence, statement 1 is correct.**
- A neuron is sometimes enveloped by a **myelin sheath** for faster signal transmission. **Hence, statement 3 is correct.**
- Neurons communicate through synapses, where dendrites **receive chemical signals, convert them to electrical impulses,** and transmit them through axons to other neurons. **Hence, statement 2 is correct.**

6. Ans: A

Exp:

- Neutrinos travel through space and pass unimpeded through matter like stars, planets and even people.This is why they're called **"Ghost particles".Hence, statement-I is correct.**
- A neutrino is a **fermion** (an elementary particle with spin of ½) that **interacts only via weak interaction and gravity.Neutrinos** are light elementary particles that very rarely interact with matter. **Hence, statement-II is correct.**
- **Hence, Both Statement I and Statement II are correct, and Statement II is the correct explanation for Statement I.**

7. Ans: D

Exp:

- The specialised cells that respond to the light, called **photoreceptors,** are unique to each animal. For example, while **human eyes can detect only wavelengths of light in the visible range** (between 380 and 700 nanometres (nm)), **honey bees and many birds can also perceive ultraviolet light** (10-400 nm). **Hence, Statement I is not correct.**
- Animals use colours to intimidate their predators, entice mates or conceal themselves. Detecting variations in colours is thus essential to an animal's survival.
- Animals have evolved to develop highly sensitive photoreceptors that can detect light of ultraviolet and infrared wavelengths. **Hence, statement II is correct.**
- **Hence, Statement-I is incorrect, but Statement-II is correct.**

8. Ans: D

Exp:

- India faces a significant health challenge with a large population suffering from **diabetes** and related conditions. The **HbA1C test** plays a crucial role in the **early detection and management of diabetes.**
- The HbA1C test provides a **2-3 month average of blood glucose levels** by measuring **sugar-coated red blood cells,** offering comprehensive long-term control assessment.
  - Unlike **fasting and post-meal tests,** it remains **unaffected by recent meals, ensuring reliability. Hence, statement 1 is correct.**
- An Hb1A1C **below 5.7% is considered normal;** between 5.7 and 6.4% may indicate you are **pre-diabetic;** and **6.5% or higher can indicate diabetes. Hence, statement 2 is correct.**

9. Ans: A

Exp:

- Hyperloop is a transportation concept developed by **Elon Musk** in 2013 that would use **pressurised tubes and capsules** to connect mobility hubs in large cities. **Hence, statement 1 is not correct.**
- The capsules, called **pods,** would float at high speeds using contactless levitation and **electromagnetic propulsion systems,** along with low **aerodynamic drag** (the force which is faced by the vehicle as it moves through the air). **Hence, statement 2 is correct.**
  - Hyperloop would be a green way to travel that could reduce the need for driving or flying and could also free up traditional train lines.
  - Hyperloop technology faces several challenges, including the **high cost of building and maintaining the infrastructure,** the technical complexity of maintaining a vacuum in the tubes, and the safety concerns associated with operating a high-speed transportation system.

10. Ans: D

Exp:

- **Bone grafting** involves a **surgical technique** where transplanted bone is utilized to repair and reconstruct bones affected by disease or injury. **Hence, statement 1 is correct.**
- The primary objective of the invention is to overcome the **drawbacks of the existing remedies.**
  - Other alternatives have been associated with **infection** and **immune** related complications.
- **Nano Hydroxyapatite-based Porous Composite Scaffolds are biodegradable** and have **osteoinductive** and **osteopromotive** properties for **bone repairing. Hence, statement 2 is correct.**

11. Ans: A

Exp:

- **Hepatitis** is the **inflammation of the liver,** characterised by **irritation or swelling** of the liver cells. **Hence, statement 1 is correct.**
- Hepatitis is typically caused by **hepatotropic viruses,** including **A, B, C, D, and E,** although other viruses like the **varicella virus** can also lead to the disease. **Hence, statement 2 is correct.**
- **Hence, option A is correct, because both statement-I and statement-II are correct and statement-II is the correct explanation of statement-I.**

12. Ans: C

Exp:

- **Avian influenza A(H5N1) or H5B1 Bird Flu** is a highly pathogenic virus that primarily circulates among birds but can infect mammals.
- H5N1 originated from a virus outbreak in **China** in 1996 and rapidly evolved into a highly pathogenic strain.
- Since 2020, it has spread across **Europe, Africa, Asia, North America, South America, and even mainland Antarctica.**
- Wild birds, including endangered species like California condors, have been severely affected by H5N1. **Hence, statement 1 is correct.**
  - Mammals like **foxes, pumas, bears** in North America, and farmed minks in Spain and Finland, have also been infected.
- India experienced the first H5N1 outbreak in the State of Maharashtra and Gujarat in 2015. **Hence, statement 2 is correct.**

13. Ans: C

Exp:

- **Sickle Cell Disease (SCD):**
  - **Sickle Cell Disease (SCD)** is an inherited haemoglobin disorder characterised by a genetic mutation that causes **red blood cells (RBCs)** to assume a sickle or crescent shape rather than their normal round shape. **Hence, statement 1 is not correct.**
  - This abnormality in RBCs results in increased rigidity, impairing their ability to circulate effectively throughout the body. Consequently, individuals with SCD often experience complications such as anaemia, organ damage, recurrent and severe pain episodes, and a shortened lifespan.
  - **India ranks third globally** in terms of the **number of SCD births,** following Nigeria and the **Democratic Republic of the Congo. Hence, statement 2 is not correct.**

14. Ans: C

Exp:

- **Rhodamine B** is a colouring agent commonly used in textile, paper, and leather industries. The colourant is **low-cost and is sometimes used to give vibrant hues** to popular street food items such as gobi manchurian and cotton candy.
- **Hence, option C is correct.**

15. Ans: D

Exp:

- **About Reverse Osmosis (RO) Water Purification Method:**
  - RO is a water purification process that **removes contaminants from water by utilising a semi-permeable membrane.**
    - A typical RO system consists of a semi-permeable membrane, **with pores 0.0001 to 0.001 microns in size. Hence, Statement-I is not correct.**
  - In this method, **water is forced through the membrane under pressure,** while contaminants such as **dissolved solids, chemicals, microorganisms,** and other impurities are left behind.
  - The membrane **allows water molecules to pass through** while blocking larger molecules and ions. **Hence, Statement-II is correct.**
  - The RO process effectively removes a wide range of impurities, including salts, heavy metals, bacteria, viruses, and organic compounds, producing clean and purified water.
- **Hence, Statement-I is incorrect, but Statement-II is correct.**

16. Ans: B

Exp:

- **About Rheumatic Disease:**
- Rheumatic disease is an umbrella term that refers to **arthritis** and several other conditions that affect the joints, tendons, muscles, ligaments, bones, and muscles. **Hence, statement 1 is not correct.**
- The most prevalent paediatric rheumatic disorder, **Juvenile Idiopathic Arthritis (JIA)** encompasses various inflammatory arthritis subtypes, posing a significant health challenge among children worldwide.
- JIA's global prevalence ranges from **0.07 to 4 per 1,000 children,** with varying distribution patterns across different regions.Children with JIA commonly experience joint pain, swelling, and functional limitations, particularly noticeable in the morning or after periods of rest.
- Therapeutic options for **JIA which is a sub type ofRheumatic Disease** include steroids, **disease-modifying antirheumatic drugs (DMARDs),** and newer biologic drugs, aimed at modulating the immune system and managing symptoms.
- **Hence, statement 2 is correct.**

17. Ans: C

Exp:

- **Astronomical cycles:**
- It refers to **periodic variations** in the Earth's orbit and orientation towards the Sun that impact the amount of solar radiation received by our planet over long periods. **Hence, statement 1 is correct.**
- These cycles are caused by the **gravitational forces** between the Earth, Sun, and other planets in the solar system. **Hence, statement 2 is correct.**
- These cycles were first theorized by Serbian scientist Milutin Milankovitch in the 1920s to explain the cyclical patterns of ice ages on Earth also called Milankovitch cycles, or Milankovitch oscillations.

18. Ans: B

Exp:

- Fission is a process in which the nucleus of an atom splits into two or more smaller nuclei and some byproducts. **Hence, statement 1 is correct.**
- Fusion is defined as the combining of several small nuclei into one large nucleus with the subsequent release of huge amounts of energy. **Hence, statement 2 is correct.**
- Utilizing fusion, the mechanism fueling the Sun, could offer an inexhaustible and eco-friendly energy solution. **Hence, statement 3 is not correct.**

19. Ans: C

Exp:

- **Connectome:**
- The **Connectome Concept** depicts a detailed **neural network map,** resembling a blueprint that shows how neurons exchange electrical and chemical signals. **Hence, statement 1 is correct.**
- The connectome simplifies scientists' understanding of the brain's complexity and vast data volume, aiding advancements in neuroscience and neurological health research by comprehending brain function and the impact of conditions like ADHD and Alzheimer's disease on neural processes. **Hence, statement 2 is correct.**

20. Ans: D

Exp:

- India has made a significant advancement in missile technology, joining the select group of nations possessing **Multiple Independently Targetable Re-entry Vehicle (MIRV) capabilities.**
- This milestone was achieved through the successful **flight test named Mission Divyastra,** conducted by the **Defence Research and Development Organisation (DRDO).** It marked the first time the indigenously developed Agni-5 missile integrated MIRV technology.
- MIRV technology originated in the **United States,** with the deployment of a **MIRVed Intercontinental Ballistic Missile (ICBM)** in 1970. **Hence, Statement-I is not correct.**
- MIRV allows a **single missile to carry multiple warheads (3-4),** each capable of targeting different locations independently. **Hence, statement-II is correct.**
- MIRV technology enhances the missile's effectiveness by increasing the number of potential targets it can engage.
  - MIRVs can be launched from both land-based platforms and sea-based platforms, such as submarines, expanding their operational flexibility and range.
- **Hence, option D is correct because Statement-I is incorrect, but Statement-II is correct.**

21. Ans: B

Exp:

- **Small Satellite Launch Vehicle (SSLV):**
- Small Satellite Launch Vehicle (SSLV) is a **three-stage Launch Vehicle** configured with **three Solid Propulsion Stages** and a liquid propulsion-based Velocity Trimming Module (VTM) as a terminal stage. **Hence, statement 1 is not correct.**
- SSLV is capable of launching **500kg satellites in 500km** planar orbit from Satish Dhawan Space Centre (SDSC). **Hence, statement 2 is correct.**
  - A planar orbit, also known as a low Earth orbit (LEO), is an orbit around the Earth that lies close to the Earth's equatorial plane. In this type of orbit, the satellite's path forms a relatively flat plane around the Earth.

22. Ans: A

Exp:

- **Cavum clouds** are formed when aircraft pass through mid-level altocumulus clouds containing **supercooled liquid water droplets. Hence, statement 1 is correct.**
- As the planes disrupt the air around Altocumulus Clouds, the droplets freeze into ice crystals, which eventually become heavy and fall out of the sky, leaving voids in the cloud layer. **Hence, statement 2 is correct.**
- This phenomenon was captured by **NASA's Terra satellite** showing **cavum clouds** over the **Gulf of Mexico off Florida's west coast. Hence, statement 3 is not correct.**

23. Ans: A

Exp:

- Spiking Neural Networks (SNNs) are a type of artificial neural network (ANNs) inspired by the human brain's neural structure. Unlike traditional **ANNs, which use continuous numerical values for processing data, SNNs operate based on discrete spikes or pulses of activity.**
- SNNs use **patterns or timings of spikes** to process and transmit information, similar to how neurons in the brain communicate through electrical impulses called spikes. **Hence, statement 1 is not correct.**
- Lifelong Learning (L2) or **Lifelong Machine Learning (LML)** is a **machine learning** paradigm that **involves continuous learning.** It involves accumulating knowledge from previous tasks and using it to help with future learning and problem-solving. **Hence, statement 2 is correct.**

24. Ans: D

Exp:

- The genome represents the **entirety of an organism's hereditary information,** serving as a biological instruction manual inherited from parents.
  - Composed of four nucleotide bases: **adenine (A), cytosine (C), guanine (G), and thymine (T),** the genome contains approximately 3 billion base pairs in humans. **Hence, statement 1 is not correct.**
  - This complex sequence encodes **essential information governing an individual's physical characteristics,** susceptibility to diseases, and other biological traits.
- The **first whole human genome** was sequenced with the collaboration of an international team. It took 13 years and $3 billion, and **was completed in 2003. India announced its first complete human genome in 2009. Hence, statement 2 is not correct.**

25. Ans: B

Exp:

- About Claude:
  - Claude is a group of **Large Language Models (LLMs)** developed by Anthropic.
    - LMs are a specific class of **generative AI** models that are trained to understand and generate human-like text. **Hence, statement 1 is correct.**
  - The chatbot is capable of **handling text, voice messages, and documents. Hence, statement 2 is correct.**
  - The chatbot is **capable of generating faster,** contextual responses compared to its peers.
- **Claude 3:**
  - Among the new releases, **Claude 3 Opus** is the most powerful model, Claude 3 Sonnet is themiddle model that is capable and price competitive, and Claude 3 Haiku is relevant for any use case that requires instant responses.
    - Claude Sonnet powers the Claude.ai chatbot for free at present and users only need an email sign-in.
    - However, Opus is only available through Anthropic's web chat interface and if a user is subscribed to the Claude Pro service on the Anthropic website.
- **Limitations of Claude 3:**
  - Claude 3 performs well in tasks such as answering factual questions and optical character recognition (OCR), meaning the ability to extract text from images.
    - Reportedly, the new model is good at following instructions and completing tasks like writing Shakespearean sonnets.
  - However, it struggles with complex reasoning and mathematical problemsat times. It also **exhibited biases in its responses,** such as favouring a certain racial group over others. **Hence, statement 3 is not correct.**

26. Ans: A

Exp:

- **Rare Diseases:**
  - Rare diseases are loosely defined as occurring infrequently in the population, with prevalence varying between nations.
  - The World Health Organization defines rare diseases as often debilitating lifelong conditions with a prevalence of **1 or less per 1000 population.**
  - India currently does not have a standard definition, but the **Organisation of Rare Diseases India (ORDI)** has suggested that a disease is to be defined as rare if it affects 1 in 5,000 people or less. **Hence, statement 1 is not correct.**
- **Global Rare Diseases Burden:**
  - 300 million people worldwide are affected by rare diseases.
  - Rare diseases affect approximately **3.5% to 5.9% of the population. Hence, statement 2 is not correct.**

- 72% of rare diseases are genetic, with over 7000 characterized by diverse disorders and symptoms.

- **The Landscape of Rare Diseases in India :**
  - India represents **one-third of global rare disease cases,** encompassing over 450 identified diseases. **Hence, statement 3 is correct.**
  - Despite this significant prevalence, rare diseases remainlargely overlooked in India, with limited awareness, diagnosis, and drug development.
  - Over 8 to 10 crore Indians are estimated to suffer from rare diseases, with over 75% being children.

27. Ans: C

Exp:

- **Obelisks:**
- Obelisks are novel **virus-like entities** comprising **diverse RNA** molecules found in the human body and the global microbiome. **Hence, statement 1 is correct.**
- They display **rod-like structures** similar to iconic monuments and have genetic sequences around 1,000 **nucleotides long,** showing no discernible similarities to known biological agents.**Hence, statement 2 is correct.**
- Further research is needed to understand the genome replication, transmission, pathogenicity, evolution, ecological significance, and impact on human health of obelisks.

28. Ans: B

Exp:

- Single-use plastic has among the highest shares of plastic manufactured and used. **Statement-I is correct.**
- On the current trajectory of production, it has been projected that single-use plastic could account for 5-10% of **greenhouse gas emissions by 2050. Statement-II is correct.**
- Statement 1 refers to the peak single-use plastic production, while Statement 2 addresses the projected share of greenhouse gas emissions from single-use plastics by 2050 due to specific circumstances. Both statements are accurate but focus on different aspects of the single-use plastic issue.
- **Hence, option B is correct because both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.**

29. Ans: B

Exp:

- The most common type of Haemophilia is called **Haemophilia A**. This means the person does not have enough **clotting factor VIII** (factor eight). **Hence, statement 1 is not correct.**
- Haemophilia B is less common. A person with **Haemophilia B** does not have enough **factor IX** (factor nine). **Hence, statement 2 is not correct.**
- The main treatment for **Haemophiliais Replacement Therapy. Hence, statement 3 is correct.**

30. Ans: B

Exp:

- The **GARBH-Ini-GA2** is a flagship programme of the Department of Biotechnology (DBT), Government of India. **Hence, statement 2 is correct.**
- GARBH-Ini GA-2 is based on **genetic algorithms**. A genetic algorithm is an optimisation technique inspired by evolution and natural selection principles. **Hence, statement 1 is correct.**
- Researchers at the Indian **Institute of Technology Madras** and the **Translational Health Science and Technology Institute, Faridabad**, have collaborated to develop an India-specific artificial intelligence model named **Garbhini-GA2**, tailored for accurately determining the **gestational age (GA) of foetus** in the second and third trimesters of pregnancy. **Hence, statement 3 is not correct.**

31. Ans: B

Exp:

- **Battery Electric Vehicles (BEVs):**
- BEVs are a type of electric vehicle that runs solely on **electric power** stored in high-capacity batteries. **Hence, statement 1 is correct.**
- They **do not have** an Internal Combustion Engine (ICE) and produce zero tailpipe emissions. **Hence, statement 2 is not correct.**
- BEVs use **electric motors** to drive the wheels, providing instant torque and smooth acceleration. **Hence, statement 3 is correct.**
- BEVs rely on advanced battery technology, primarily Lithium-ion (Li-ion) Batteries.
  - Li-ion batteries offer high energy density, longer range, and improved performance.

32. Ans: C

Exp:

- Brainoware is an innovative computing system that melds brain-like tissue with electronics.
- Brainoware integrates **brain organoids** with microelectrodes, forming an **'Organoid Neural Network (ONN)'** that directly incorporates living brain tissue into the computing process. **Hence, statement 1 is correct.**
  - Brain organoids are 3D tissues that simulate the **structure and function of the human brain**. They

are derived from human embryonic stem cells, and are able to self-organise. **Hence, statement 2 is correct.**

- Brain organoids are similar to the brain's cell composition and structure, and can reflect the brain's developmental process. They are used as models to study human brain development and brain-related diseases.

- ONNs are different from **artificial neural networks**, which are made of **silicon chips** because they use **biological neurons that can adapt and learn** from their environment.

33. Ans: B

Exp:

- E Ink displaysare a type of **electronic paper display technology** that mimics the appearance of traditional ink on paper. **Hence, statement 1 is correct.**
- It uses millions of **tiny microcapsules** filled with positively charged white particles and negatively charged black particlessuspended in a clear fluid. **Hence, statement 2 is correct.**
- E Ink displays are transforming visual technology through their minimal power usage, eye-friendly features, and diverse applications.
- E Ink displays, unlike LCD and LED displays, reflect light similar to paper. This reduces eye strain and uses minimal power since it only consumes energy when the image changes. **Hence, statement 3 is not correct.**

34. Ans: A

Exp:

- **About the Brain-Computer Interface:**
  - A Brain-Computer Interface (BCI) is a technology that enables direct communication between the brain and external devices, such as computers or prosthetics, without using traditional neuromuscular pathways like nerves and muscles. **Hence, statement 1 is correct.**
  - BCIs typically involve the use of sensors to detect brain activity, which is then translated into commands or actions, allowing individuals to control devices or interact with the external world using their thoughts. **Hence, statement 2 is correct.**
- Hence, option A is correct because both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I.

35. Ans: B

Exp:

- The **GRAPES-3** experiment in **Ooty, India**, operated by the **Tata Institute of Fundamental Research** has discovered a new feature in the **cosmic-ray proton spectrum**.
- GRAPES-3 experiment discovers new feature above 100 TeV but below the cosmic-ray proton "Knee," suggesting a deviation from single power-law spectrum. **Hence, statement I is correct**.
- Centuries-old discovery, cosmic rays are the universe's **most energetic particles**, bombarding **Earth** uniformly from all directions, inducing fast-moving particle showers comprising electrons, **photons, muons, protons, neutrons**, etc. **Hence, statement II is correct.**
- **Hence, option B is correct because both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.**

36. Ans: B

Exp:

- **Volt Typhoon:**
- Microsoft has detected covert, targeted malicious activity by the **Chinese state-sponsored** group **Volt Typhoon**, aimed at post-compromise credential access & network system discovery, targeting US critical infrastructure.
- Volt Typhoon affects various sectors including communications, manufacturing, utilities, transportation, construction, maritime, government, IT, and education.
  - Observed behavior indicates a **covert intent** for prolonged undetected espionage and access retention.
- **Hence, option B is correct.**

37. Ans: C

Exp:

- **Typbar TCV:**
- **Typbar TCV** is the world's first clinically proven **conjugate Typhoid vaccine. Hence, statement-I is correct.**
- Recently, phase-3 trial conducted in **Malawi, Africa**, a region endemic for typhoid fever, has demonstrated the long-term efficacy of **Bharat Biotech's Typhoid** conjugate vaccine (TCV), Typbar. The efficacy of the vaccine was seen in children of all age groups studied. **Hence, statement-II is incorrect.**
- **Hence, option C is correct because Statement-I is correct and Statement-II is incorrect.**

38. Ans: B

Exp:

- The Kerala University of Fisheries and Ocean Studies (Kufos) will participate in the advanced NASA-ISRO Synthetic Aperture Radar (NISAR) Phase II research project, focusing on forest biomass and carbon monitoring through radar data.
- This collaboration follows the successful completion of the initial phase of the Indian Space Research Organisation (ISRO)-NISAR program that focused on validating ground truth data in forest biomass across various regions.
- NASA and ISRO are jointly developing a space-borne synthetic aperture radar, scheduled for launch in 2024. **Hence, statement 2 is not correct.**
- NISAR aims to revolutionise earth resource observation by providing high-resolution data for extensive areas. **Hence, statement 1 is correct.**

39. Ans: B

Exp:

- **CAR-T Cell Therapy:**
- CAR-T cell therapy, also known as **chimeric antigen receptor T-cell therapy**, is a type of immunotherapy that uses a patient's own immune system to fight cancer. **Hence, statement 1 is correct.**
- CAR T-cell therapy has been approved for **leukaemias** (cancers arising from the cells that produce white blood cells) and **lymphomas** (arising from the lymphatic system). **Hence, statement 2 is correct.**
- CAR-T therapy can cause serious side effects, including **cytokine release syndrome** (a widespread activation of the immune system and collateral damage to the body's normal cells) and neurological symptoms (severe confusion, seizures, and speech impairment).
- CAR-T therapy is a very expensive treatment. **Hence, statement 3 is not correct**.

40. Ans: D

Exp:

- **About Kyasanur Forest Disease (KFD):**
- Kyasanur Forest Disease (KFD), a **zoonotic illness**, is colloquially referred to as "monkey disease" due to its link with monkey fatalities. It is caused by the **Kyasanur Forest disease Virus (KFDV)**, which primarily affects **humans and monkeys. Hence, statement 1 is not correct**.
- It was first identified in 1957 in a sick monkey from the **Kyasanur Forest** in **Karnataka**. Since then, between 400-500 human cases per year have been reported. Eventually, KFD emerged as a **grave public health problem** spreading through the entire **Western Ghats. Hence, statement 2 is not correct**.
- A vaccine (Formalin inactivated **KFDV vaccine**) does exist for KFD and is used in endemic areas of India. **Hence, statement 3 is not correct**.

41. Ans: A

Exp:

- **High Altitude Pseudo-Satellite (HAPS):**
  - **HAPS is a solar-powered UAV**. It can generate solar energy and remain in the air for months or years. **Hence, statement 1 is correct.**
  - HAPS is designed for persistent surveillance, communications, and specialist science missions.
  - HAPS is a still-developing technology, and the successful test flight puts India among a very small group of countries currently experimenting with this technology.
  - **HAPS** operates in the **stratosphere** (which extends from 6-50 km above the earth's surface), flying at altitudes of **18-20 km**, nearly double the heights of commercial airplanes. This altitude allows them to provide surveillance capabilities akin to satellites. **Hence, statement 2 is not correct**.

42. Ans: B

Exp:

- **Lymphatic Filariasis:**
- Lymphatic filariasis, commonly known **as elephantiasis**, is a Neglected Tropical Disease (NTD) caused by infection with filarial parasites transmitted through **mosquitoes. Hence, statement 1 is not correct.**
- The infection starts in childhood and accumulates through adulthood, resulting in irreversible **chronic disease** conditions. **Hence, statement 2 is correct.**

43. Ans: B

Exp:

- Hydrogen is a key industrial fuel that has a **variety of applications including** the production of ammonia (a key fertilizer), steel, refineries and electricity.
- Hydrogen is the most abundant element in the universe. But pure, or the elemental hydrogen, is very scarce. It almost always exists in compounds like with oxygen to form H2O or water.
- But when electric current is passed through water, it splits it into elemental oxygen and hydrogen through electrolysis. And if the electricity used for this process comes from a renewable source like wind or solar then the hydrogen thus produced is referred to as green hydrogen. **Hence, statement 1 is correct.**

- Colors attached to hydrogen indicate the source of electricity used to derive the hydrogen molecule. For instance, if coal is used, it is referred to as brown hydrogen. **Hence, statement 2 is not correct.**

44. Ans: D

Exp:

- Since its establishment in 2014, Indian National Young Academy of Science (INYAS) has been the **sole recognized academy** for **young scientists** in India, dedicated to fostering science education and networking among young scientists. **Hence, Statement I is not correct**.
- **CSIR-National Institute of Science Communication and Policy Research** (CSIR-NIScPR) is one of the constituent laboratories of the Council of Scientific & Industrial Research (CSIR) under the **Ministry of Science & Technology**, Government of India.
  - It focuses on **science communication**, evidence-based policy research, and studies, publishing a range of materials and conducting research on various topics such as science policy, innovation systems, and **science diplomacy. Hence, statement II is correct.**
- **Hence, option D is correct because Statement-I is incorrect, but Statement-II is correct.**

45. Ans: B

Exp:

- Intuitive Mission's **Odysseus spacecraft**, a private Nova-C lunar lander, is on its way to the Moon after launching on a **SpaceX Falcon 9 rocket** from the National Aeronautics and Space Administration (NASA) Kennedy Space Center in Florida.
- **Odysseus Spacecraft:**
  - The spacecraft is set to land on the Moon on **22nd February 2024. Hence, statement 1 is not correct**.
  - Odysseus is the second private attempt after the **Peregrine lander's failure**.
  - The spacecraft carries six payloads for NASA under the CLPS initiative, testing new technologies and scientific instruments.
  - The mission aims to become the first American spacecraft to land on the Moon in over 50 years. The last time an American spacecraft landed on the Moon was in **1972, with Apollo 17**.
  - The mission is part of NASA's **Commercial Lunar Payload Services (CLPS)** initiative and Artemis campaign. **Hence, statement 2 is correct.**

46. Ans: B

Exp:

- **Guinea Worm Disease:**
  - Guinea worm disease, or Dracunculiasis is caused by the **Guinea worm** (Dracunculus medinensis), **a parasitic nematode** is a debilitating parasitic disease that renders infected individuals non-functional for weeks or months. **Hence, statement 1 is correct.**
  - The parasite is transmitted when people drink stagnant water contaminated with parasite-infected water fleas.
  - There is **no vaccine or medication** to treat Guinea worm disease, but prevention strategies have been successful. **Hence, statement 2 is correct.**
- **India's Success Story:**
  - **India achieved Guinea worm disease elimination in the late 1990s** through rigorous public health measures, including water safety interventions and community education.
    - The government of **India received Guinea worm disease-free certification status** from the WHO in 2000. **Hence, Statement 3 is not correct.**
    - India has eradicated **Smallpox** (1980), **Polio** (2014), **Plague, Rinderpest (the Cattle Plague), Yaws and Maternal** And **Neonatal Tetanus (2015)**.

47. Ans: C

Exp:

- **Amphipods** are a **diverse group** of malacostracan crustaceans, that share characteristics with crabs, lobsters, and shrimp. **Hence, statement 1 is correct.**
- Amphipods play a crucial role in the marine food chain and serve as important indicators for assessing the impact of climate change and the health of coastal ecosystems. **Hence, statement 2 is correct.**
- A new species of marine amphipod, named **Parhyale Odian** after Odisha's native language, Odia, was discovered in Chilika Lake. **Hence, statement 3 is correct.**

48. Ans: A

Exp:

- **Kala Azar:**
- **Kala-azar** (visceral leishmaniasis), also known as **Black Fever** is a fatal disease caused by a protozoan parasite Leishmania donovani. **Hence, statement 1 is correct.**

- It is characterized by irregular bouts of fever, weight loss, enlargement of the spleen and liver, and anemia.

- In Oct 2023, **Bangladesh** became the first country, globally, to be officially validated by the WHO for eliminating Kala Azar as a public health problem. **Hence, statement 2 is not correct.**
  - **India has not yete** liminated Kala Azar but has made substantial progress towards its elimination goal.

49. Ans: D

Exp:

- **Neural Organoids:**
- Neural organoids, also known as cerebral organoids, are **human pluripotent stem cells** (hPSCs)-derived 3D in vitro culture systems that recapitulate the developmental processes and organization of the developing human brain. **Hence, statement 1 is correct.**
  - These provide a physiologically relevant in vitro **3D brain model** for the study of neurological development and disease processes that are unique to the human nervous system.
- They have important applications in studying **human brain development** and neurological disorders such as **schizophrenia**. **Hence, statement 2 is correct.**

50. Ans: D

Exp:

- Prime Minister of India inaugurated three significant space infrastructure projects: SLV Integration Facility (PIF) at Satish Dhawan Space Centre, Sriharikota, Semi-cryogenics Integrated Engine and Stage Test (SIEST) facility at ISRO Propulsion Complex, Mahendragiri and Trisonic Wind Tunnel at Vikram Sarabhai Space Center, Thiruvananthapuram.
  - The Trisonic Wind Tunnel marks a milestone in **aerodynamic testing** for rockets and aircraft. **Hence, statement 1 is correct.**
  - The SIEST facility will develop semi-cryogenic engines, enhancing payload capacity, with capabilities to test engines up to 200 tons of thrust. **Hence, statement 2 is correct.**

51. Ans: D

Exp:

- **About Large Language Models (LLMs):**
- **Definition:**
  - LLMs are large general-purpose language models capable of solving common language problems such as text classification, question answering, and text generation.
  - These models are trained on massive datasets to understand patterns, structures, and relationships within human language.
- **Types of Large Language Models (LLMs):**
  - **Autoregressive Models:** Predict the next word in a sequencebased on previous words. Example: GPT-3. **Hence, pair 1 is not correctly matched**.
  - **Transformer-based Models:** Utilise a specificartificial neural network architecture for language processing. Examples: LaMDA, Gemini (formerly Bard). **Hence, pair 2 is not correctly matched**.
  - **Encoder-decoder Models:** Encode input text into a representation and then decode it into another language or format. **Hence, pair 3 is not correctly matched**.

52. Ans: C

Exp:

- **Google DeepMind's Genie:**
- Google DeepMind is a British-American AI research laboratory that is a subsidiary of Google. DeepMind is based in London and has research centres in Canada, France, Germany, and the US.
- It has introduced **Genie AI (Artificial Intelligence)**, a new model that can generate interactive video games from just a text or image prompt.
- **Generative Interactive Environments (Genie)** is a foundation **world model that is trained on videos sourced** from the Internet.
  - The model can "generate an endless variety of **playable (action-controllable) worlds** from synthetic images, photographs, and even sketches". **Hence, statement 2 is correct.**
- It is the first generative interactive environment that has been trained in an unsupervised **manner from unlabelled internet videos**. **Hence, statement 1 is correct.**

53. Ans: B

Exp:

- Stem cells are special human cells with the ability to develop into various cell types, such as muscle cells or brain cells. **Hence, statement 1 is correct.**
  - They have the potential to repair damaged tissues, offering hope for treating serious illnesses like paralysis and Alzheimer's disease.
- Stem cells are usually categorized as multipotent (able to give rise to multiple cells within a lineage), pluripotent (able to give rise to all cell types in an adult) and totipotent (able to give rise to all embryonic and adult lineages). **Hence, statement 2 is not correct.**

54. Ans: C

Exp:

- Cholera is an **acute diarrhoeal infection** caused by ingestion of food or water contaminated with the **bacterium Vibrio cholerae**. **Hence, statement 1 is correct.**
  - It remains a global threat to public health and an indicator of inequity and lack of social development.
  - Researchers have estimated that each year there are 1.3 to 4.0 million cases of cholera and 21,000 to 143,000 deaths worldwide due to cholera.
- Most of those infected **have no or mild symptoms** and can be successfully treated with Oral Rehydration Solution (ORS). **Hence, statement 2 is correct.**
  - Currently there are three **World Health Organization (WHO)** pre-qualified oral cholera vaccines (OCV): Dukoral®, Shanchol™, and Euvichol®. All three vaccines require two doses for full protection.

55. Ans: B

Exp:

- **X-ray Polarimeter Satellite(XpoSat):**
- **XPoSat** is designed to study **X-ray polarisation** in the medium **X-ray band**, offering insights into celestial sources' radiation mechanisms and geometry. **Hence, statement 1 is correct.**
  - This study is crucial for understanding the physics behind these celestial bodies.
- XPoSat is only the **world's second mission** dedicated to X-ray polarisation in the medium X-ray band. **Hence, statement 2 is not correct**.
  - NASA's Imaging X-ray Polarimetry Explorer (IXPE), launched in 2021, was the first such mission by a space agency.
- **Entirely built bytwo Bengaluru-based institutes—**ISRO's UR Rao Satellite Centre and Raman Research Institute—XPoSat's development began in 2008, with a formal agreement signed with ISRO in 2015. **Hence, statement 3 is not correct**.

56. Ans: D

Exp:

- **Sickle Cell Disease (SCD):**
- SCD is a group of inherited **Red Blood Cell (RBC)** disorders. RBCs contain hemoglobin, a protein that carries oxygen and healthy RBCs are round. **Hence, statement 1 is not correct**.
- In SCD, the **hemoglobin is abnormal**, which causes the **RBCs to become hard** and sticky and look like a C-shaped farm tool called a "sickle. **Hence, statement 2 is not correct**.
- More than **1 crore people** have been screened for SCD under the National Sickle Cell Anaemia Elimination Mission.
  - The **National Sickle Cell Anemia Elimination Mission** launched in 2023 aims to eliminate sickle cell anemia from India by 2047.

57. Ans: A

Exp:

- **NASA's Origins, Spectral Interpretation, Resource Identification, and Security-Regolith Explorer (OSIRIS-REx) spacecraft**, launched on 8th September 2016, has successfully delivered the first asteroid samples from the near-Earth asteroid Bennu (formerly 1999 RQ36) to Earth after a seven-year journey, bringing valuable 4.5 billion-year-old samples. **Hence, pair 1 is correctly matched.**
- **Proba-3 is ESA's – and the world's – first precision formation flying mission**. A pair of satellites will fly together maintaining a fixed configuration as a 'large rigid structure' in space to prove formation flying technologies and rendezvous experiments. **Hence, pair 2 is not correctly matched.**
- The **Japanese Aerospace Exploration Agency, or JAXA**, has a robotic mission in development called the **Martian Moon eXploration**, or MMX, planned for launch around September 2024. **Hence, pair 3 is not correctly matched**.
  - The mission's main science objective is **to determine the origin of Mars' moons**.
- **Hence, option A is correct.**

58. Ans: A

Exp:

- The **Indian Space Research Organisation (ISRO)** is set to perform a crucial manoeuvre to bind **Aditya-L1**, aiming to place it into orbit around theLagrangian point (L1),located approximately 1.5 million km from Earth. **Hence, statement 1 is correct.**
- Placing a satellite in the halo orbit around the L1 point **allows continuous observation of the Sun** without occultation or eclipse, providing an advantage in monitoring solar activities. **Hence, statement 2 is correct and is the correct explanation for statement 1**.

59. Ans: B

Exp:

- **About Gravitational Waves :**
- **Gravitational waves are ripples or vibrations in the very fabric of spacetime**. For instance, when a pebble is dropped in a pond, the resulting ripples are analogous to gravitational waves, but instead of water, they propagate through the fundamental structure of the universe. **Hence, statement 1 is correct.**
- In 1916, **Albert Einstein** forecasted the **presence of gravitational waves** within his **theory of general relativity**. **Hence, statement 2 is correct.**
- Gravitational wave research, as evidenced by the 2017 Nobel Prize, awarded for the first detection using Laser Interferometer Gravitational-Wave Observatory (LIGO), holds immense potential for scientific breakthroughs.
  - Recently, **India gave its go-ahead to construct the third node of the LIGO in Hingoli district of Maharashtra.Hence, statement 3 is not correct.**

60. Ans: B

Exp:

- **PRITHviVIgyan (PRITHVI) Scheme:**
- The Union Cabinet has approved the overarching scheme **"PRITHviVIgyan (PRITHVI)"** of the **Ministry of Earth Sciences**, for implementation during the period from 2021-26 at an overall cost of Rs. 4,797 crore. **Hence, statement 1 is not correct**.
  - The scheme **encompasses five ongoing sub-schemes** namely "Atmosphere & Climate Research-Modelling Observing Systems & Services (ACROSS)", "Ocean Services, Modelling Application, Resources and Technology (O-SMART)", "Polar Science and Cryosphere Research (PACER)", "Seismology and Geosciences (SAGE)" and "Research, Education, Training and Outreach (REACHOUT)".
- Earth System Sciences deal with **all the five components of the earth system:** atmosphere, hydrosphere, geosphere, cryosphere, and biosphere and their complex interactions. The **Ministry of Earth Sciences (MoES)** holistically addresses all the aspects relating to the Earth System Science.
  - The overarching scheme of PRITHVI will holistically address **all the five components** of earth system to improve the understating of the Earth System Sciences and to **provide reliable services** for the country. **Hence, statement 2 is correct.**

61. Ans: B

Exp:

- **New Space India Limited (NSIL):**
- **NSIL,** incorporated on 6th March 2019 (under the **Companies Act, 2013**), is a wholly **owned Government of India company**, under the administrative control of the **Department of Space (DOS). Hence, statement 1 is not correct**.
- Its primary responsibility is **enabling Indian industries** to take up high technology space related activities and is also responsible for promotion and commercial exploitation of the products and services emanating from the Indian space programme. **Hence, statement 2 is correct.**
- The **commercial arm** of the Indian Space Research Organisation **(ISRO)**, NewSpace India Limited (NSIL) is set to launch **GSAT-20 (GSAT-N2)**, aboard **SpaceX's Falcon-9** in 2024. **Hence, statement 3 is correct.**
  - Falcon 9 is the world's **first orbital class reusable**, two-stage rocket designed and manufactured by SpaceX for the reliable and safe transport of people and payloads into Earth orbit and beyond.

62. Ans: C

Exp:

- **Microorganisms** that develop antimicrobial resistance are sometimes referred to as "superbugs".**Hence, statement 1 is correct.**
- The **World Health Organization (WHO)** has identified AMR as one of the **top ten threats** to global health. **Hence, statement 2 is correct.**
- **AMR Surveillance and Research Network (AMRSN):** It was **launched in 2013**, to generate evidence and capture trends and patterns of drug-resistant infections in the country. **Hence, statement 3 is correct.**

63. Ans: C

Exp:

- **Polymer Electrolyte Membrane Fuel Cell (PEMFC):**
- PEMFCs convert fuel directly into **electricity**, resulting in significantly **higher efficiency** compared to batteries. **Hence, statement 1 is correct.**
- PEMFCs **produce only water as a by product**, which can be **utilized onboard** or **undergo electrolys is** to produce extra oxygen, negating the requirement for intricate waste management systems. **Hence, statement 2 is correct.**

64. Ans: C

Exp:

- The latest United States study reveals an alarming reality about **bottled water**, uncovering the presence of hundreds of thousands of **nanoplastic particles** underscoring potential **health risks**.
- Each liter of bottled water contains **110,000 to 370,000 nanoplastic particles**. About **90% of these particles are nanosized, posing a higher risk to human health**.
- Nanoplastics are even smaller than **microplastics**, ranging below 1 micrometer in size. **Hence, statement 1 is correct.**
- Unlike microplastics (ranging between 5 millimeters and 1 micrometer), nanoplastics can move from the intestines and lungs **directly into the bloodstream** before reaching the heart and brain. **Hence, statement 2 is correct.**

65. Ans: A

Exp:

- **Heat-Tolerant Covid-19 Vaccine by IISc:**
- A heat-tolerant vaccine developed by the **Indian Institute of Science (IISc)** researchers is **said to be** effective against all current strains of **SARS-CoV-2** besides having the potential to be quickly adapted for future variants as well (not proved effective against all future variant). **Hence, statement 1 is not correct**.
- According to IISc, while current vaccines are proven to be effective against most SARS-CoV-2 strains, **their efficacy has declined due to rapid mutation by the virus**.
- **Antigen Selection:** After analyzing various proteins found in the virus, the researchers selected two parts of SARS-CoV-2's spike protein, the **S2 subunit and the Receptor Binding Domain (RBD)** for designing their vaccine candidate.
- A **receptor-binding domain** is a key part of a virus located on its 'spike' domain that allows it to dock to body receptors to gain entry into cells and lead to infection. **Hence, statement 2 is correct.**
  - The **spike (S) protein of SARS-CoV-2**, which plays a key role in the receptor recognition and cell membrane fusion process, is composed of two subunits, **S1 and S2**.

66. Ans: B

Exp:

- Currently, India produces 6.5 million Metric Tonnes Per Annum (MMTPA) of hydrogen, predominantly for use in crude oil refineries and fertilizer production.
  - Most of India's current hydrogen supply is **Gray Hydrogen**, which is produced **using Fossil Fuels** in a process that creates CO2 Gas Emissions. **Hence, statement 1 is not correct**.
- **Strategic Interventions for Green Hydrogen Transition Programme (SIGHT)** will fund the domestic manufacturing of electrolyzers and produce green hydrogen. **Hence, statement 2 is correct.**

67. Ans: A

Exp:

- The brain comprises three primary components: **the cerebrum, cerebellum, and brainstem. Hence, statement 1 is correct.**
- **Cerebellum:** The **brain region** traditionally associated with **motor control**, but now increasingly recognised for its role in **higher cognitive** and **emotional functions. Hence, statement 2 is not correct**.
  - It is located at the back of the head, just below the **cerebrum** and behind the **brain stem**. Also called a **"little brain"** due to its similar but smaller structure than the **cerebrum**.
- **Cerebrum:** The **largest part**, consists of **right and left hemispheres**, playing a key role in higher functions like **interpreting sensory information, speech, reasoning, emotions, learning,** and **precise movement control. Hence, statement 3 is not correct**.

68. Ans: D

Exp:

- **Radio Frequency Identification** is a technology that uses **radio waves** to passively identify a tagged object. The system has two basic parts: tags and readers. **Hence, statement 1 is correct.**
  - The reader gives off radio waves and gets signals back from the RFID tag, while the tag uses radio waves to communicate its identity and other information.
- The **National Payments Corporation of India (NPCI)** has created the National Electronic Toll Collection (NETC) program to fulfill India's electronic tolling needs. **Hence, statement 2 is correct.**
  - This program provides a nationwide, interoperable toll payment solution, covering clearing house services for settlement and dispute resolution.

69. Ans: C

Exp:

- **National Quantum Mission (NQM):**
  - The mission planned for **2023-2031**, aims to seed, nurture, and scale up scientific and industrial R&D

and create a vibrant & innovative ecosystem in Quantum Technology (QT). **Hence, statement 1 is correct.**

- It'll be implemented by the DST under the Ministry of Science & Technology. **Hence, statement 2 is not correct.**
- With the launch of this mission, India will be the seventh country to have a dedicated quantum mission after the US, Austria, Finland, France, Canada and China. **Hence, statement 3 is correct**.

70. Ans: C

Exp:

- Dhara Mustard Hybrid-11 (DMH-11) is an indigenously developed transgenic mustard. It is a genetically modified variant of Herbicide Tolerant (HT) mustard.
- DMH-11 is a result of a cross between Indian mustard variety 'Varuna' and East European 'Early Heera-2' mustard. **Hence, statement 1 is correct.**
- It contains two alien genes ('barnase' and 'barstar') isolated from a soil bacterium called Bacillus amyloliquefaciens that enable breeding of high-yielding commercial mustard hybrids. **Hence, statement 2 is correct.**
- **DMH-11** has shown approximately 28% more yield than the national check and 37 % more than the zonal checks and its use has been claimed and approved by the **GEAC**.
  - "Bar gene" maintains the genetic purity of hybrid seed.

71. Ans: B

Exp:

- **Indian Computer Emergency Response Team (CERT-In):**
- **CERT-In** is the national nodal agency responsible for handling cyber security threats, such as hacking and phishing. It operates under the **Ministry of Electronics and Information Technology. Hence, statement 1 is not correct**.
- The Centre has used its powers given under Section 24(2) of the RTI Act to exempt CERT-In from the purview of the transparency law. **Hence, statement 2 is correct.**
  - Section 24(2) of the RTI Act, 2005 allows the Central Government to change the Schedule by adding or removing intelligence or security organizations established by the Government.

72. Ans: D

Exp:

- BHISHM (Bharat Health Initiative for Sahyog, Hita and Maitri) Cube of Project Arogya Maitri, **a state-of-the-art indigenous mobile hospital deployed in Ayodhya**, emerged as a crucial lifesaver during a medical emergency at the Ram Mandir inauguration in Ayodhya, Uttar Pradesh. **Hence, statement 1 is correct.**
  - The Aarogya Maitri project involves India supplying vital medical resources to any developing nation facing the impact of natural disasters or humanitarian crises.
  - BHISHM cube is tailored to treat up to 200 casualties, emphasizing rapid response and comprehensive care. The Aid Cube is equipped with several innovative tools designed to enhance disaster response and medical support during emergencies.
- It integrates **Artificial Intelligence (AI)** and data analytics to facilitate effective coordination, real-time monitoring, and efficient management of medical services in the field. **Hence, statement 2 is correct.**
  - The success of BHISHM Cube underscores the importance of **mobile hospital units in delivering immediate** and effective medical assistance during emergencies.

73. Ans: C

Exp:

- The Mpemba effect has intrigued scientists with its counterintuitive observation that hot water can freeze faster than cold water in similar conditions. **Hence, statement 1 is correct.**
  - Researchers have conducted numerous experiments to determine the causes of the phenomenon, but a consensus conclusion remains wanting.
- Possible causes include **microbubbles, evaporation**, the **presence of frost in cold water**, and the effect of compounds precipitated by boiling. **Hence, statement 2 is correct.**
  - **Microbubbles left suspended in water** that has been heated by boiling. These **promote convection and transfer heat faster** as the water cools.
  - Evaporation, an **endothermic (heat absorb) process,** contributes to faster heat loss in warmer water.

74. Ans: B

Exp:

- Recently, the **Indian Space Research Organisation (ISRO)** has developed the second-generation Distress Alert Transmitter (DAT-SG), an **indigenous** technological solution for Fishermen at sea to send emergency messages from fishing boats. **Hence, statement 1 is not correct**.

- ISRO has developed the DAT-SG which is a **UHF (Ultra High Frequency)** transmitter based on the NavIC (Navigation in Indian Constellation) receiver module. **Hence, statement 2 is correct.**
  - This NavIC receiver module supports position determination as well as broadcast messages reception called NavIC messaging service.

75. Ans: B

Exp:

- **Homi Jehangir Bhabha** (born **30th October 1909**, Mumbai, India) and died on **24th January, 1966** was a pioneering Indian physicist.
- He is regarded as the father of India's nuclear programme. India's three-stage nuclear power programme was formulated by him in the 1950s. **Hence, statement 1 is not correct**.
- He founded and directed two of the institutions that would bring India into the nuclear age: the Tata Institute of Fundamental Research (TIFR) and the Atomic Energy Establishment, Trombay, later renamed the Bhabha Atomic Research Centre (BARC) in his honor. **Hence, statement 2 is correct.**
- Bhabha was the **first Indian to receive the Adams Prize in 1942**, the highest honour given by the University of Cambridge. Bhabha received the award for his "theory of the elementary particles and their interactions". He was also awarded the Padma Bhushan. **Hence, statement 3 is correct.**

76. Ans: B

Exp:

- A diode is an electronic component about **5 mm wide**. It has two points of contact, or terminals, called its **anode** and **cathode**.
- A diode's primary purpose is to allow current to flow in only **one direction**. It achieves this using a P-N Junction Diode.**Hence, statement 1 is correct.**
- The P-N junction occurs at the interface of p-type and n-type semiconductors.
  - The **positive side** of the **semiconductor,** known as the **p-side, possesses an abundance of holes**.
- The **negative side** of the semiconductor, referred to as the n-side, contains an excess of electrons. **Hence, statement 2 is not correct**.

77. Ans: D

Exp:

- **Leukaemia:** Leukaemias is the cancer of the **white blood cells,** which **begin in the bone marrow. Hence, statement 1 is correct.**
  - Leukaemia is cancer of the body's blood-forming tissues, including the bone marrow and the lymphatic system.
    - The lymphatic system is a network of vessels, tissues, and organs that helps maintain fluid balance in the body.
- **Bone Cancer:** It is caused when unusual cells grow out of control in bone. It destroys normal bone tissue.
  - This variety of bone cancer occurs **most often in children and young adults, in the bones of the leg or arm. Hence, statement 2 is correct.**

78. Ans: C

Exp:

- **About Large Multi-Modal Models (LMM):**
- LMMs are models that use multiple senses to mimic human-like perception. This allows AI (Artificial Intelligence) to respond to a wider range of Human communication, making interactions more natural and intuitive.
- LMMs integrate multiple data types, such as images, text, language, audio, and other heterogeneity. This allows the models to understand images, videos, and audio, and converse with users.
- **Some examples** of multimodal LLMs include GPT-4V, MedPalm M, Dall-E, Stable Diffusion, and Midjourney.
- **Hence, option C is correct.**

79. Ans: C

Exp:

- The **Indian Meteorological Department (IMD)** uses INSAT -3D and INSAT-3DR satellite data for weather forecasting/monitoring purposes. **Hence, statement 1 is correct.**
- INSAT-3DR,is an **advanced meteorological satellite of India** configured with an imaging System and an Atmospheric Sounder. **Hence, statement 2 is correct.**
- An atmospheric sounder measures how the physical properties of a column of air vary with altitude.
- It has several **infrared channels** from **longwave** to **shortwave bands** and one **visible band**.
- The colouration of images from the RGB (Red, Green, Blue) imager on the INSAT-3D satellite relies on two factors:
  - **Solar Reflectance:** Itis a ratio of the amount of solar energy reflected by a surface and the amount of solar energy incident on it.
  - **Brightness Temperature:** Itis the relationship between the temperature of an object and the corresponding brightness of its surface. **Hence, statement 3 is correct.**

80. Ans: C

Exp:

- **About AI chips:**
  - AI chips are built with specific architecture and have integrated AI acceleration to support deep learning-based applications.
    - Deep learning, more commonly known as **Active Neural Network (ANN)** or Deep Neural Network (DNN), is a subset of **Machine Learning** and comes under the broader umbrella of AI.
  - It combines a series of computer commands or algorithms that stimulate activity and brain structure.
- **Types of AI Chips Designed for Diverse AI Applications:**
  - Application-Specific Integrated Circuits (ASICs), Field-Programmable Gate Arrays (FPGAs) and Central Processing Units (CPUs).
- **Hence, option C is correct.**

81. Ans: A

Exp:

- **Zygote:** The initial cell formed by the fusion of sperm and egg during fertilisation. **Hence, statement 1 is not correct.**
- Embryo: Early stage of development, from the moment of fertilisation until about the 8th week of pregnancy. **Hence, statement 2 is not correct.**
- Fetus: The later stage of prenatal development, starting from the ninth week until birth, characterized by the development of organs and systems. **Hence, statement 3 is correct.**

82. Ans: B

Exp:

- Hard Chrome Plating (HCP) is an **electroplating process** in which a layer of **chromium** is applied to a surface to **improve corrosion and wear resistance, reduce friction,** and **extend the life of parts** used in extreme working environments. **Hence, statement I is correct**.
- High-Velocity Air Fuel Spraying (HVAF) spraying involves **low temperatures and high particle velocities**, allowing the deposition of coatings using finer-sized powders (5-15 µm). **Hence, statement II is correct**.
  - Scientists synthesized thin hard coatings of a **composite alloy of Tungsten, cobalt, and chromium** by high-velocity air fuel spraying.
- **Hence, option B is correct because both Statement-I and Statement-II are correct, and Statement-II is not the correct explanation for Statement-I.**

83. Ans: D

Exp:

- Malaria is a **life-threatening mosquito borne blood disease** caused by plasmodium parasites. **Hence, statement 1 is correct.**
  - There are **5 Plasmodium parasite species** that cause malaria in humans and 2 of these species – P. falciparum and P. vivax – pose the greatest threat.
- Malaria is spread by the bite of an **infected female Anopheles mosquito. Hence, statement 2 is correct.**
  - The mosquito becomes infected after biting an infected person. The malaria parasites then enter the bloodstream of the next person the mosquito bites. The parasites travel to the liver, mature, and then infect red blood cells.

84. Ans: D

Exp:

- Plasma is a state of matter consisting of charged particles like ions and electrons. **Hence, statement 1 is correct.**
- Plasma waves are **oscillations or disturbances in the electric and magnetic fields** that propagate through plasma state of the materials. **Hence, statement 2 is correct.**
- These waves play a significant role in various plasma phenomena, influencing **energy transfer, particle acceleration, and the behavior of charged particles within plasmas found in space. Hence, statement 3 is correct.**

85. Ans: B

Exp:

- Bacteria are classified into two groups: **Gram-positive or Gram-negative**, depending on whether they retain a specific stain color.
  - Gram-positive bacteria retain a **violet-colored stain**, while Gram-negative bacteria appear **pinkish or red. Hence, statement 1 is not correct.**
- **Gram-negative bacteria** have a thin **peptidoglycan layer in the cell wall**, which is sandwiched between two lipid membranes, giving them a complex structure. **Hence, statement 2 is correct.**
  - This outer membrane acts as a barrier, making them more resistant to antibiotics.

86. Ans: B

Exp:

- **Sickle Cell Disease (SCD):**
- SCD is **a group of inherited red blood cell (RBC) disorders**. RBCs contain hemoglobin, a protein that

carries oxygen and healthy RBCs are round. In SCD, the hemoglobin is abnormal, which causes the RBCs to become hard and sticky and look like a C-shaped farm tool called a "sickle.

- The **National Sickle Cell Anemia Elimination** Mission launched in **2023**, aims to eliminate sickle cell anemia from India by 2047. **Hence, statement 1 is not correct.**
- The government released technical operational guidelines for the prevention and control of sickle cell anaemia in 2016. The **State Haemoglobinopathy Mission has been established in Madhya Pradesh** to address the challenges in screening and management of the disease. **Hence, statement 3 is correct.**

87. Ans: C

Exp:

- Pressmud, also known as filter cake or press cake, is a **residual byproduct in the sugar industry** that has gained recognition as a valuable resource for green energy production. **Hence, statement 1 is correct.**
- This byproduct offers Indian sugar mills an **opportunity to generate additional revenue by utilizing it as a feedstock for biogas production** through **anaerobic digestion**, leading to the creation of **Compressed Biogas (CBG). Hence, statement 2 is correct.**
  - Anaerobic digestion is a process through which bacteria break down organic matter—**such as animal manure, wastewater biosolids, and food wastes**—in the absence of oxygen. **Hence, statement 3 is correct.**
- Typically, the yield of pressmud ranges from 3-4 % by weight with the **input sugarcane processed in a unit.**

88. Ans: A

Exp:

- **Fast Radio Bursts (FRBs):**
- **Fast Radio Bursts (FRBs) are powerful and brief bursts of radio frequency** emissions originating from **deep space**. **Hence, statement 1 is correct.**
- These mysterious and intense signals last only milliseconds but release an amount of energy comparable to hundreds of millions of suns. **Hence, statement 2 is not correct**.
- **Astronomers** have proposed that **magnetars**, a type of neutron star formed from the remnants of **exploding stars**, could be a probable origin for **FRBs**.
- The **rotation of magnetars** is **comparatively slower** than that of other **neutron stars**.
- **Neutron stars** are formed when a **massive star** collapses. The very central region of the **core collapses, crushing** together every **proton** and **electron** into a **neutron**. These newly-createdneutrons can stop the **collapse, leaving behind a neutron star**.
- A **magnetar** possesses a **magnetic field** over a **thousand times stronger** than that of other **neutron stars**, and it is a **trillion times** more powerful than **Earth's magnetic field**.

89. Ans: A

Exp:

- Recently. the **Democratic Republic of the Congo (DRC)** has witnessed a significant increase in **Monkeypox (Mpox)** cases.
  - **Monkeypox** is caused by the **Monkeypox virus (MPXV).Hence, statement 1 is not correct.**
  - It is a **viral zoonotic disease** endemic in densely forested regions of west, central, and **east Africa. Hence, statement 2 is not correct.**
  - There is **no specific treatment or vaccine available** for Monkeypox infection. In the past, theanti-smallpox vaccine, once 85% effective, is no longer widely accessible. **Hence, statement 3 is correct.**

90. Ans: A

Exp:

- **Global Positioning System (GPS)** is one of the few everyday technologies that redefine our sense of location and impact diverse sectors globally. The **GPS** was initiated by the U.S. Department of Defense in 1973. Several countries operate their own Global Navigation Satellite Systems (GNSS) alongside the GPS.
- **GLONASS** is a **Russian Satellite Navigation System. Hence, pair 1 is not correctly matched.**
- **Galileo** is a global navigation satellite system (GNSS) created by the **European Union. Hence, pair 2 is correctly matched.**
- The **BeiDou Navigation Satellite System** is a satellite-based radio navigation system owned and operated by the **China National Space Administration. Hence, pair 3 is not correctly matched.**

91. Ans: A

Exp:

- **About Neglected Tropical Diseases (NTDs):**
- NTDs are a **group of infections that are most common among marginalized communities** in the developing regions of Africa, Asia and the Americas.
  - They are caused by a variety of **pathogens** such as viruses, bacteria, protozoa and parasitic worms. **Hence, statement 1 is correct.**
  - NTDs are especially common in **tropical** areas where people do not have access to clean water

or safe ways to dispose of human waste. **Hence, statement 2 is not correct.**

- These diseases generally receive less funding for research and treatment than malaises like **tuberculosis, HIV-AIDS and malaria**.

- **Examples of NTDs are: snakebite envenomation, scabies, yaws, trachoma, Leishmaniasis** and Chagas disease etc. **Hence, statement 3 is not correct.**

92. Ans: C

Exp:

- **Dark patterns**, also known as deceptive patterns, refer to **strategies employed by websites and apps to make users perform actions** they did not intend to or discourage behaviors that are not advantageous for the companies.
- The CCPA has outlined 13 types of dark patterns in its notification for **prevention and regulation of Dark Patterns, 2023**. They are:
  - **False Urgency:** Creating a false sense of urgency or scarcity to induce immediate purchases.
  - **Basket Sneaking:** Inclusion of additional items at checkout without user consent, resulting in higher payments. **Hence, pair 2 is correct.**
  - **Confirm Shaming:** Using fear or shame to nudge users into specific actions for commercial gains.
  - **Forced Action:** Compelling users to take actions requiring additional purchases or sharing personal information.
  - **Subscription Trap:** Making cancellation complex, hiding options, or forcing payment details for free subscriptions. **Hence, pair 1 is correct.**
  - **Interface Interference:** Manipulating the user interface to misdirect users from intended actions.
  - **Bait and Switch:** Deceptively serving an alternate outcome than advertised based on user actions.
  - **Drip Pricing:** Concealing prices upfront, revealing them post-confirmation, or preventing service use unless additional items are purchased.
  - **Disguised Advertisement:** Posing advertisements as other content to trick users into clicking.
  - **Nagging:** Persistent interactions disrupting and annoying users for commercial gains.
  - **Trick Question:** Deliberate use of confusing language to misguide users.
  - **Saas Billing:** Generating recurring payments in a software as a service (SaaS) model. **Hence, pair 3 is correct.**
  - **Rogue Malwares:** Using ransomware or scareware to mislead users into paying for fake malware removal tools.

93. Ans: A

Exp:

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- The **BeiDou Navigation Satellite System** is a satellite-based radio navigation system owned and operated by the **China National Space Administration. Hence, pair 3 is not correctly matched.**

94. Ans: D

Exp:

- **Diel Vertical Migration (DVM):**
- DVM is **a synchronized movement of marine organisms,** often seen in **deep-sea creatures like zooplankton,** as they migrate vertically in the water column, ascending towards the **surface at night and descending to deeper levels during the day. Hence, statement 1 is correct.**
  - This pattern helps these organisms **find food while avoiding predators**, showcasing a strategic survival tactic. **Hence, statement 2 is correct.**
- At dusk, organisms from the **mesopelagic layer (Deeper Layer or Twilight Zone)** rise to the safety of the **epipelagic zone (Upper Layer),** capitalizing on darkness to feed on microscopic phytoplankton while evading diurnal predators.
- This synchronized migration, finely attuned to natural light cycles, stands as the **planet's largest biomass migration,** occurring daily across all oceans.
- Organisms inhabiting the mesopelagic layer actively **extract substantial carbon from upper ocean layers** while **feeding on surface plankton**, transporting it to deeper waters.
- Within the twilight zone, **migratory animals contribute to the food chain**, passing on consumed carbon to their predators. The resultant **carbon-rich waste sinks** to the ocean floor, becoming a **crucial carbon sink, trapping carbon dioxide and aiding in atmospheric carbon concentration regulation. Hence, statement 3 is correct.**

95. Ans: A

Exp:

- **mActionSoft:** mActionSoft is an Android-based app that allows users to report on the physical progress of works undertaken by the Panchayats. The app was developed by the Ministry of Panchayati Raj. **Hence, option A is correct.**

96. Ans: D

Exp:

- **Kala-Azar:**
- **Visceral leishmaniasis commonly known as kala-azar**, is a **slow-progressing indigenous disease** caused by a protozoan parasite of genus Leishmania. **Hence, statement 1 is correct.**
- It is also known as **Black Fever or Dumdum Fever. Hence, statement 2 is correct.**
- In India, Leishmania donovaniis the only parasite causing this disease. **Hence, statement 3 is correct.**

97. Ans: C

Exp:

- **About Web Browser:**
  - The web browser is an application software to explore **www (World Wide Web).**
  - It provides an interface between the server and the client and requests to the server for web documents and services. **Hence, statement 1 is correct.**
  - It works as a compiler to render HTML (Hypertext Markup Language) which is used to design a webpage.**Hence, statement 2 is correct.**
  - Whenever we search for anything on the internet, the browser loads a web page written in **HTML, including text, links, images**, and other items such as stylesheet and JavaScript functions.
    - Google Chrome, Microsoft Edge, Mozilla Firefox, and Safari are examples of web browsers. **Hence, statement 3 is correct.**

98. Ans: A

Exp:

- Algae are defined as a group of predominantly aquatic, photosynthetic, and **nucleus-bearing organisms that lack the true roots, stems, leaves, and specialized multicellular reproductive structures of plants. Hence, statement 1 is not correct.**
- Their photosynthetic pigments are more varied than those of plants, and their cells have features not found among plants and animals.
- They have ecological roles as oxygen producers and as the food base for almost all aquatic life.
- They are **economically important as a source of crude oil and as sources of food** and a number of pharmaceutical and industrial products for humans. The study of algae is called Phycology. **Hence, statement 2 is correct.**

99. Ans: C

Exp:

- Pompe Disease (also known as Glycogen Storage Disease Type II) is characterized by the **buildup of glycogen in the lysosomes of the body's cells. Hence, statement 1 is correct.**
- This disease is a rare **genetic disorder** caused by a deficiency of the **enzyme acid alpha-glucosidase (GAA)**. This enzyme is crucial for **breaking down glycogen into glucose** within the lysosomes of cells. **Hence, statement 2 is correct.**
  - Lysosomes are membrane-enclosed organelles that contain an array of enzymes capable of breaking down all types of biological polymers—proteins, nucleic acids, carbohydrates, and lipids.
  - Its prevalence estimates range from **1 in 40,000** to **1 in 300,000 births**.
- Although there is presently no cure for Pompe disease, there are treatment alternatives accessible to address symptoms and enhance the patient's quality of life. **Hence, statement 3 is correct.**
  - **Enzyme Replacement Therapy (ERT)** is a common treatment method that entails infusing the deficient enzyme to mitigate glycogen accumulation.

100. Ans: D

Exp:

- **About Diamond:** A diamond is a rare, naturally occurring mineral made up of pure carbon. The word diamond comes from the Greek word Adamas, which means **indestructible. Hence, statement 1 is not correct.**
- **Major Diamond Producing Countries:** Russia, Botswana, Canada, South Africa, and the Democratic Republic of the Congo.
  - **Russia** is the **world's largest producer** of rough diamonds, mining nearly 42 million carats in 2022. **Hence, statement 2 is not correct.**

101. Ans: A

Exp:

- **ISRO's Future Endeavors:**
  - **Chandrayaan-4 Mission:** Planned by ISRO to bring back samples from the Moon within four years.
  - **Gaganyaan:** The Gaganyaan mission aims to **send humans to space and return them safely to Earth.**

The mission will consist of two unmanned flights and one manned flight, using the GSLV Mk III launch vehicle and a human-rated orbital module. **Hence, statement 1 is not correct.**

- **Bhartiya Antariksh station (India's Space Station):** The first module, capable of conducting experiments with robots, will launch by 2028. **Hence, statement 2 is correct.**
- **NISAR: NASA-ISRO SAR (NISAR)** is a **Low Earth Orbit (LEO) observatory** being jointly developed by NASA and ISRO. **Hence, statement 3 is not correct.**

102. Ans: A

Exp:

- **ISRO's Future Endeavors:**
  - **Chandrayaan-4 Mission:** Planned by ISRO to bring back samples from the Moon within four years.
  - **Gaganyaan:** The Gaganyaan mission aims to **send humans to space and return them safely to Earth.** The mission will consist of two unmanned flights and one manned flight, using the GSLV Mk III launch vehicle and a human-rated orbital module. **Hence, statement 1 is not correct.**
  - **Bhartiya Antariksh station (India's Space Station):** The first module, capable of conducting experiments with robots, will launch by 2028. **Hence, statement 2 is correct.**
  - **NISAR: NASA-ISRO SAR (NISAR)** is a **Low Earth Orbit (LEO) observatory** being jointly developed by NASA and ISRO. **Hence, statement 3 is not correct.**

103. Ans: C

Exp:

- The primary objectives of the AI Mission include establishing robust computing **powers for AI within India**. **Hence, statement 1 is correct.**
  - The mission seeks to **enhance services for startups and entrepreneurs** while fostering AI applications in critical sectors such as **agriculture, healthcare, and education.**
- The ambitious plan involves building a substantial compute capacity, ranging between **10,000 to 30,000 Graphic Processing Units (GPUs). Hence, statement 2 is correct.**
- The introduction of the India **Datasets platform** is highlighted, offering non-personal and anonymized datasets to startups and researchers. **Hence, statement 3 is correct.**

104. Ans: D

Exp:

- Criticality is the **first step towards power production**. A nuclear reactor is said to be critical when the nuclear fuel inside a reactor sustains a fission chain reaction. **Hence, statement 1 is correct.**
- Each fission reaction releases a sufficient number of neutrons to **sustain a series of reactions. Hence, statement 2 is correct.**
  - **Fission is a process** in which the nucleus of an atom splits into two or more smaller nuclei, and some byproducts.
- Heat is produced in the event, which is used to generate steam that spins a turbine to create electricity. **Hence, statement 3 is correct.**

105. Ans: A

Exp:

- mRNA (Messenger RNA) carries important messages from our DNA (Deoxyribonucleic acid), to the cell's machinery, telling it how to make specific proteins. **Hence, statement 1 is correct.**
  - Imagine DNA as a library of **cookbooks filled with recipes (genes) to create different proteins.**
- When a cell needs a specific protein, it doesn't directly read the recipe from DNA. Instead, **it makes a copy called mRNA. Hence, Statement 2 is not correct.**
- This mRNA serves as a messenger, carrying the protein-making instructions. It's made up of four building blocks (A, U, C, G), forming words of only three letters. **Hence, statement 3 is correct.**

106. Ans: B

Exp:

- **About Malaria:**
  - It is a life-threatening **mosquito-borne blood disease** caused by **Plasmodium parasites**. It is preventable and curable.
    - Predominantly found in tropical and subtropical regions of Africa, South America, and Asia. **Hence, statement 1 is not correct.**
  - Malaria spreads through infected **female Anopheles mosquito bites**, with parasites multiplying in the liver and subsequently attacking **Red Blood Cells. Hence, statement 2 is correct.**
  - **World Health Organization (WHO)** has recently added the **R21/Matrix-M malaria vaccine** to its list of **prequalified vaccines.**
    - The R21/Matrix-M vaccine became the **second malaria vaccine to achieve WHO**

prequalification, the first one was the **RTS, S/AS01 vaccine. Hence, statement 3 is not correct.**

107. Ans: A

Exp:

- **Rare Earth Metals:**
- Rare Earth Metals are a **set of seventeen metallic elements**. These include the **fifteen lanthanides** on the periodic table in addition to scandium and yttrium which show similar **physical and chemical properties** to the lanthanides. **Hence, statement 1 is correct.**
- **China is the largest exporter** of Rare earth metals **followed by Australia. Hence, statement 2 is not correct.**

108. Ans: D

Exp:

- **Nematocysts:**
- Nematocysts are specialized cells found in **Cnidarians which include jellyfish, corals, sea anemones, and hydras** that serve as potent weapons for hunting prey and defending against predators.
  - Each nematocyst contains a capsule with a coiled, thread-like tubule and toxins capable of rapid ejection with an acceleration surpassing that of a bullet.
- They have different types, such as **isorhizas, euryteles, and birhopaloids**.
- **Cnidarians** contain **cnidocytes** which release nematocysts when triggered by potential prey. Nematocysts pierce prey's outer layer or inject toxins into its body.
  - Toxins in nematocysts have **paralytic (paralysis) or cytolytic (destroying cells)** effects on the prey.
  - Cnidarians use a combination of toxins for predatory or defensive purposes.
- **Hence, option D is correct.**

109. Ans: A

Exp:

- A neutron star is a **dense and compact stellar object that forms from the remnants of a massive star's core** after a **supernova explosion**. These stars are among the densest objects known in the universe, packing an **immense mass into a relatively small size**.
- The **discovery of pulsars in 1967** provided the first evidence of the existence of neutron stars. Pulsars are neutron stars that emit pulses of radiation once per rotation
- But the **Sun's not big enough** for this fate, either: It has **only about one-tenth of the mass needed** to eventually **become a neutron star.Hence, Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I.**

110. Ans: D

Exp:

- Recently, scientists have uncovered evidence of **rapid evolution in a flowering plant** found in Paris, France. The plant, identified as **Field Pansy (Viola arvensis)** is showing signs of self-pollination, a behaviour contradicting the conventional reliance on external pollinators.
- The **Field Pansy (Viola arvensis)**, is a common wildflower that can be found in many parts of **Europe, Asia, and North America.**
- It belongs to the group of plants called **angiosperms**, which produce seeds inside a protective structure called a fruit. **Hence, statement 1 is not correct**.
- The **field pansy has evolved to self-pollinate**, reducing its **reliance on pollinators** due to a decreasing availability of insects. **Hence, statement 2 is not correct.**

111. Ans: B

Exp:

- **Types of AI:**
- **Hence, option B is correct.**

112. Ans: (c)

Exp:

- The electronic soil (eSoil) developed is **a novel conductive cultivation substratetailored specifically for hydroponic systems**. Unlike traditional substrates like mineral wool, which are non-biodegradable and manufactured using energy-intensive processes, eSoil is composed of cellulose, a biopolymer, blended with a conductive polymer known as PEDOT (Poly(3,4-ethylenedioxythiophene)). **Hence, statement 1 is correct.**
- Hydroponics is a method of growing plants in a **water based nutrient rich solution in a soilless media**. It does not use soil, instead the root system is supported **using an inert medium such as perlite, rockwool, clay pellets, peat moss**, or vermiculite. The fundamental is to allow the plants roots to come **in direct contact with the nutrient solution**, while also having access to oxygen, which is essential for proper growth. **Hence, statement 2 is correct.**

113. Ans: C

Exp:

- **Dark Energy**
- Dark energy is a mysterious and elusive form of energy that makes up a significant portion of the total energy content of the universe.
  - It is thought to be responsible for the **observed accelerated expansion** of the cosmos. **Hence, statement 1 is correct.**
- Roughly **68% of the universe is dark energy** and dark matter makes up about 27%. **Hence, statement 2 is correct.**
  - The rest of everything on Earth, everything ever observed with all of our instruments, all normal matter adds up to less than 5% of the universe.

114. Ans: D

Exp:

- **Neglected Tropical Diseases (NTDs):**
- NTDs are **communicable diseases** in **tropical regions**, thriving in **conditions of poverty and poor healthcare access. Hence, statement 1 is correct.**
- The term "neglected" reflects the **lack of attention and resources** despite significant impact on vulnerable communities.
- They are **caused by a variety of pathogens** such as viruses, bacteria, protozoa and parasitic worms. **Hence, statement 2 is correct.**
- These diseases generally receive less funding for research and treatment than malaises like tuberculosis, HIV-AIDS and malaria.
- **Examples of NTDs are:** snakebite envenomation, scabies, yaws, trachoma, Leishmaniasis and Chagas disease etc. **Hence, statement 3 is correct.**

115. Ans: B

Exp:

- Ketamine is a dissociative anaesthetic. Doctors use it to **induce general anesthesia** that does not require muscle relaxation. **Hence, statement 1 is correct.**
  - General anesthesia denotes a **sleep-like state**, while dissociative refers to the state of **detachment from the body and the outside world**.
- Ketamine works by blocking the **N-methyl-D-aspartate (NMDA) receptor** in the brain. **Hence, statement 2 is correct.**
  - This receptor is involved in the **transmission of pain signals and in the regulation of mood**. By blocking the NMDA receptor, ketamine can produce analgesia (pain relief) and euphoria.
- The drug is administered through intravenous (IV), nasal spray, or tablet for mental illness treatment. **Hence, statement 3 is not correct.**

116. Ans: B

Exp:

- **AMRIT Technology:**
- The technology was developed by the **Indian Institute of Technology (IIT) - Madras**. It is designed for the **removal of arsenic and metal ions** from water, addressing water quality issues. **Hence, statement 1 is correct.**
- The technology utilizes **nano-scale iron oxy-hydroxide,** which selectively removes arsenic when water passes through it. **Hence, statement 2 is not correct.**
- AMRIT is applicable for both **domestic and community-level water purification.**
- The technology aligns with the broader goals of the **Jal Jeevan Mission,** which aims to provide safe and potable tap water to rural households in India.

117. Ans: D

Exp:

- **Red Blood Cell**
  - The Red Blood Cells (RBCs) are also known as **Erythrocytes. Hence, statement 1 is correct.**
  - RBCs contain the **iron-rich protein called haemoglobin** that gives blood its red colour. **Hence, statement 2 is correct.**
  - RBCs are the most copious blood cell produced in **bone marrows**. Their main function is to **transport oxygen** from and to various tissues and organs.
- Haemoglobin is **essential for the survival of chondrocytes,** the cells that form cartilage. Without haemoglobin, chondrocytes die and cause embryonic lethality in mice (as experiments were conducted on mice).**Hence, statement 3 is correct.**
- Haemoglobin **helps chondrocytes cope with low oxygen levels** by transporting oxygen within the cells. Without haemoglobin, chondrocytes suffer from hypoxic stress and impaired function. **Hence, statement 4 is correct.**

118. Ans: B

Exp:

- **NexCar19:**
  - **About:**
    - NexCar19 is a **type of Chimeric Antigen Receptor T cell (CAR-T cell) and gene therapy** developed indigenously in India by Immuno ACT, which is a **company incubated at IIT Bombay. Hence, statement 1 is correct.**

- It is designed to target **cancer cells that carry the CD19 protein.**

- **Patient Eligibility:**
  - NexCAR19 therapy is intended for people with **B-cell lymphomas** who have not responded to standard treatments like chemotherapy and have experienced relapse or recurrence of cancer. **Hence, statement 2 is correct.**
  - Initially, the therapy is approved for **patients aged 15 years and older and also proves beneficial for adolescents. Hence, Statement 3 is not correct.**

119. Ans: D

Exp:

- **Zika Virus**
  - The **Zika virus**, a **mosquito-borne flavivirus**, that is primarily spread by Aedes mosquitoes, particularly **Aedes aegypti**.
  - Also, it can also be **transmitted from mother to fetus during pregnancy, as well as through sexual contact, transfusion of blood** and blood products. **Hence, pair 1 is correctly matched.**
- **Nipah Virus:**
  - It is a **zoonotic virus** (it is transmitted from animals to humans).
  - The organism that causes Nipah Virus encephalitis is an **RNA or Ribonucleic acid virus** of the **family Paramyxoviridae**, genus Henipavirus, and is closely related to Hendra virus. **Hence, pair 2 is correctly matched.**
- **Hepatitis**
  - Usually caused by a group of viruses known as the **"hepatotropic" (liver-directed) viruses,** including A, B, C, D and E.
  - Other viruses may also cause it, such as the varicella virus that causes chicken pox. **Hence, pair 3 is correctly matched.**
  - **Hence, option D is correct.**

120. Ans: A

Exp:

Deepfakes:

- Deepfakes are **synthetic media that use AI** to manipulate or generate visual and audio content, usually with the intention of deceiving or misleading someone.
- Deepfakes are created using a **technique called generative adversarial networks (GANs),** which involve two competing neural networks: a **generator and a discriminator.**
  - The generator tries to **create fake images or videos that look realistic,** while the discriminator tries to **distinguish between the real and the fake ones.**
    - The generator learns from the **feedback of the discriminator** and improves its output until it can fool the discriminator. **Hence, statement 1 is correct.**
- Positive Applications of Deep Learning:
  - Deep learning technology has enabled positive advancements, such as **restoring lost voices and recreating historical figures.**
  - Deep learning techniques have been applied in **comedy, cinema, music, and gaming to enhance artistic expression.**
  - It enhances **medical training and simulation** by generating diverse and realistic medical images. It also creates **virtual patients and scenarios** for simulating medical conditions and procedures, improving training efficiency. **Hence, statement 2 is correct.**
- **Approaches Related to Deepfake Regulation:**
- India **does not have specific laws or regulations that ban or regulate the use of deepfake technology.**
- India has called for a global framework on the expansion of **"ethical" AI** tools.
- Existing laws such as **Sections 67 and 67A of theInformation Technology (IT) Act (2000)**have provisions that may be applied to certain aspects of **deep fakes, such as defamation and publishing explicit material.**
- The **Information Technology Rules, 2021,** mandate the removal of content impersonating others and artificially morphed images within 36 hours.
  - None of the provision or section of the IT Act 2000 deal with each and every aspect of the Deepfakes. Hence, statement 3 is not correct.

121. Ans: A

Exp:

- The **efficiency of electric current transmission** is **higher** at **lower current** and **higher voltage. Hence, statement 1 is correct.**
- **Transformers** are used to **increase voltage** and **reduce current** for **efficient transmission.**
- **Joule's first law** states that **energy losses** are proportional to the **square** of the **current. Hence, statement 2 is correct.**

- **Alternating Current (AC)** is preferred for **transmission** because it can be **easily modified** using **transformers** and has **higher efficiency.**
- The **thickness** of the **cable** can be **adjusted** to **control energy loss**, with **thicker cables losing less energy. Hence, statement 3 is not correct.**

122. Ans: D

Exp:

- **Important Gene Editing Techniques:**
- **Recombinant DNA Technology:** This technique involves isolating and cutting specific DNA segments from one organism (source) and inserting them into the DNA of another organism (host). The host organism then incorporates the new DNA into its genome, expressing the desired trait. This technique is widely used in producing genetically modified crops and pharmaceuticals.
- **CRISPR-Cas9:** The CRISPR-Cas9 system is a revolutionary gene editing tool that allows scientists to precisely target and modify specific DNA sequences. It can be used to add, delete, or replace genes in a wide range of organisms, from bacteria to plants and animals.
- **TALENs (Transcription Activator-Like Effector Nucleases):** TALENs are another gene editing technique that can be programmed to target specific DNA sequences. They work similarly to CRISPR-Cas9 and have been used for genetic modification in various organisms.
- **RNA Interference (RNAi):** RNA interference (RNAi) is a natural cellular process that plays a crucial role in regulating gene expression within eukaryotic cells. This triggers the degradation of the target gene's messenger RNA (mRNA), resulting in reduced expression of the corresponding protein.
- **Somatic Cell Nuclear Transfer (Cloning):** This technique involves transferring the nucleus of a somatic cell (any cell except sperm or egg cells) into an egg cell from which the nucleus has been removed. This process creates a genetically identical organism (clone). Dolly the sheep was famously created using somatic cell nuclear transfer.
- **Synthetic Biology:** Synthetic biology involves designing and constructing new biological parts, devices, and systems, as well as redesigning existing biological systems. It often includes the synthesis of DNA sequences, modifying existing genes, and constructing novel genetic circuits.
- **Viral Vectors:** It is modified viruses that can carry specific genes into target cells. They are used in gene therapy to deliver therapeutic genes to treat genetic disorders.
- **Selectable Markers and Reporter Genes:** These are genes introduced alongside the desired gene to assist in the identification and selection of genetically modified organisms. Selectable markers confer resistance to specific antibiotics or chemicals, while reporter genes produce easily detectable proteins (e.g., fluorescent proteins) to indicate successful gene transfer.
- **Agrobacterium-Mediated Transformation:** This method uses the natural ability of the bacterium Agrobacterium tumefaciens to transfer genetic material into plants. The bacterium is engineered to carry the desired gene, and when it infects the plant, the gene is integrated into the plant's genome.
- **Microinjection:** This technique involves using a fine needle to inject foreign DNA directly into the nucleus of a target cell. It is often used in animal genetic modification.
- **Electroporation:** Cells are exposed to an electric field, which temporarily disrupts the cell membrane, allowing foreign DNA to enter.
- **Hence, option D is correct.**

123. Ans: B

Exp:

- **'T-cell acute lymphoblastic leukemia (T-ALL)'** affects the **stem cells** in the **bone marrow** that produce a particular kind of **white blood cells (WBC)** called **T lymphocytes (T cells). Hence, statement 1 is correct.**
- **T-cell acute lymphoblastic leukemia (T-ALL)** is a kind of **blood cancer.**
- **T-ALL** is found in both **children** and **adults,** but incidence decreases with age. **Hence, statement 2 is not correct.**
- It is characterized by the **rapid** and **uncontrolled growth** of **immature white blood cells** called **lymphoblasts. Hence, statement 3 is correct.**

124. Ans: A

Exp:

- **Chikungunya is a mosquito-borne viral disease.** It was first recognized in **1952** during an outbreak in **southern Tanzania. Hence, statement 2 is not correct.**
  - It is a **ribonucleic acid (RNA) virus** that belongs to the alphavirus genus of the family Togaviridae. **Hence, statement 1 is correct.**
- Chikungunya causes fever and severe joint pain, which is often debilitating and varies in duration.

- Dengue and Zika have similar symptoms to chikungunya, **making chikungunya easy to misdiagnose.**
- **Zika purified inactivated virus (ZPIV)vaccine** candidate has been shown to protect animals against Zika virus

- **Presently, there is no cure for chikungunya,** with symptomatic relief being the primary approach. Treatment involves the use of analgesics, antipyretics, rest, and adequate fluid intake. **Hence, statement 3 is not correct.**
  - Recently, the US Food and Drug Administration (FDA) approved the world's inaugural vaccine for chikungunya. This novel vaccine is named **Ixchiq.**

125. Ans: C

Exp:

Lysozyme and Amyloidosis:

- **Lysozyme** is a **naturally occurring enzyme** found in various bodily secretions like **tears, saliva, mucus**. It plays a crucial role in the body's defense system against bacteria. **Hence, statement 1 is correct.**
  - This **enzyme works by breaking down the cell walls of certain bacteria,** essentially disrupting their structure and leading to their destruction.
  - It is also the principal component of **airway fluid**, serving as a model protein in investigating diseases like **Amyloidosis**, which trigger **multi-organ dysfunction**. **Hence, statement 2 is correct.**
- **Amyloidosis** refers to a group of **rare conditions characterized by the accumulation of abnormal protein clumps** called amyloids in various organs and tissues throughout the body.
  - These amyloid proteins, typically made up of **misfolded proteins,** can disrupt normal organ function such as the **heart, kidneys, liver, spleen** and cause damage over time.

126. Ans: B

Exp:

- **Types of Influenza Virus:**
- There are **four types of influenza viruses:** influenza A, B, C, and D
- Influenza A and B are the two types of influenza that cause **epidemic seasonal infections**nearly every year. **Hence, statement 1 is correct.**
- Influenza C mainly occurs in**humans**, but has been known to also occur in dogs and pigs. **Hence, statement 2 is not correct.**
- Influenza D is **found mainly in cattle.** It's not known to infect or cause illness in humans yet. **Hence, statement 3 is correct.**
- **Avian influenza Type A Viruses**
  - Type A viruses are **classified based on two proteins** on their surfaces – Hemagglutinin (HA) and Neuraminidase (NA). There are about 18 HA subtypes and 11 NA subtypes.
  - Several combinations of these two proteins are possible e.g., H5N1, H7N2, H9N6, H17N10, H18N11 etc.
  - **All known subtypes of influenza A viruses can infect birds,** except subtypes H17N10 and H18N11, which have only been found in bats.

127. Ans: C

Exp:

- **Piezoelectricity:**
- Piezoelectricity is the electric charge that accumulates in certain solid materials in response to applied mechanical stress. Piezoelectricity is indeed the phenomenon where certain materials generate electric charge in response to mechanical stress. **Hence, statement 1 is correct.**
- Piezoelectricity is used in the production and detection of sound, generation of high voltage electricity, and as a clock generator in electronic devices. **Hence, statement 2 is correct.**
- Piezoelectricity is a reversible process: materials exhibiting the piezoelectric effect also exhibit the reverse piezoelectric effect, the internal generation of a mechanical strain resulting from an applied electric field. **Hence, statement 3 is correct.**

128. Ans: A

Exp:

- The **Government of India,**announced the upcoming establishment of **South East Asia's first Night Sky Sanctuary** in **Ladakh.**
- It will be located at **Hanle village** in **Eastern Ladakh** as a part of **Changthang Wildlife Sanctuary.**
- It is being set up with the help of **Indian Institute of Astrophysics Bengaluru,** which is affiliated to the **Department of Science & Technology, Govt of India.**
- **Hence, option A is correct.**

129. Ans: B

Exp:

About NASA's Psyche Mission:

- The Psyche mission aims to explore the **asteroid Psyche**, located between **Mars and Jupiter.Hence, statement 1 is not correct.**

- Psyche is a **rare metallic asteroid** believed to be the exposed **nickel-iron core of an early planet**.
- This mission offers a unique opportunity to **directly study a planetary core,** providing invaluable insights into the formation of terrestrial planets like Earth.

- Psyche is the inaugural spacecraft equipped with **NASA's Deep Space Optical Communications (DSOC) transceiver**.
  - The **DSOC technology** encodes data in near-infrared light photons instead of radio waves**. Hence, statement 2 is correct.**

130. Ans: C

Exp:

- **Fibre Optic Cables:**
- Optical Fibres are thin, cylindrical strands composed of glass, with a diameter typically comparable to that of a human hair.
- These fibres possess the **remarkable ability to transmit various forms of information**, including text, images, audio, video, phone calls, and any data that can be digitized, across vast distances at **speeds approaching that of light**.
- **Principle of Total Internal Reflection:** The phenomenon of Total Internal Reflection (TIR) **forms the basis for guiding light within optical Fibres. Hence, statement 1 is correct.**
  - If light travels from a higher refractive index medium (like glass) to a lower one (such as air) at a specific angle, it may not exit the medium **but be entirely reflected back within it.** This phenomenon is called TIR.
- **Signal Encoding:** Information is encoded into optical signals as ra**pidly blinking light pulses**, typically representing binary digits (zeros and ones).
- Benefits:
  - **High Speed:** Fibre provides more bandwidth and has standardized performance up to 10 Gbps and beyond, something that it is impossible to achieve when using copper.
    - More bandwidth means that Fibre can carry more information with far greater efficiency than copper wire.
  - **Not susceptible to interference:** Fibre-optic cable is also much less susceptible to noise and electromagnetic interference than copper wire. **Hence, statement 2 is correct.**
    - It is so efficient, in fact, that roughly 99.7% of the signal reaches the router in most cases. **Hence, statement 3 is correct.**

131. Ans: C

Exp:

- **Sickle Cell Disease:**
  - **About:** Sickle cell disease is a genetic blood disorder characterized by an abnormality in hemoglobin, the **protein responsible for carrying oxygen in red blood cells. Hence, Statement 1 is correct.**
    - It causes **red blood cells to adopt a sickle or crescent shape,** hindering their movement through vessels, leading to potential complications like **severe pain, infections, anaemia, and strokes. Hence, Statement 2 is correct.**
      - In India alone, an estimated **30,000-40,000 children** are born with sickle cell disease annually.
- **Thalassaemia:** Similar to **sickle cell disease,** individuals with **thalassaemia experience severe anaemia due to low haemoglobin levels,** necessitating lifelong blood transfusions and **chelation therapy** to manage iron accumulation. **Hence, Statement 3 is correct.**
  - Major symptoms include **fatigue, paleness or jaundice, shortness of breath, delayed growth, facial bone deformities (in severe cases)** among others.

132. Ans: B

Exp:

HERVH:

- In 2016, researchers made a surprising discovery while analyzing gene expression data from early human embryos.
- Research identified a group of **non-committed cells** (they did not become a part of the later stages of the embryo) **within the inner cell mass** that undergo **early elimination.**
  - Most inner cell mass cells express **HERVH, a gene crucial for maintaining pluripotency. Hence, statement 1 is not correct.**
  - However, the **non-committed cells, destined for elimination, do not express HERVH.**

- **The Role of HERVH in Cell Fate:**
  - The absence of HERVH in non-committed cells revealed a startling connection to "jumping genes" or **transposons** (dangerous little pieces of **Deoxyribonucleic Acid (DNA) that can insert themselves into different regions of the genome,** damaging it and **leading to cell death).**

- HERVH protects cells from transposons, preventing DNA damage and ensuring the survival of cells committed to forming the developing embryo.**Hence, statement 2 is correct.**

133. Ans: B

Exp:

- **Gamma Ray Burst**
- **Gamma-ray bursts** are **short-lived explosions of gamma rays**, the most energetic form of light. **Hence, statement 1 is not correct.**
- Lasting from a **few milliseconds to several hours,** they shine hundreds of times brighter than a typical supernova and about a million trillion times as bright as the Sun. **Hence, statement 2 is correct.**
- Observed in distant galaxies, they are the **brightest electromagnetic events known to exist in the universe.**

134. Ans: C

Exp:

- **Amphotericin** is used to treat serious and potentially life-threatening **fungal infections. Hence, statement 1 is correct.**
- It is on the **World Health Organization's** List of **Essential Medicines.**
- It was isolated from **Streptomyces nodosus** which is a **bacterial species** in the genus **Streptomyces.**
- **AmB** is known for its **high toxicity** in **humans,** particularly in **renal cells (cells in the kidney).**
- This drug targets the **membrane of the fungal cell** by binding to **ergosterol** which preserves the integrity of the **cell membrane. Hence, statement 2 is correct.**

135. Ans: C

Exp:

Basics of Transmitting Electricity:

- **About:**
  - Any power supply system has three broad components: **generation, transmission, and distribution.** Electricity is generated at power plants as well as smaller renewable-energy installations.
  - Then it is transmitted using a distributed network of **stations, substations, switches, overhead and underground cables, and transformers,** among other elements.
- **Transmission Efficiency:**
  - The efficiency of electric current transmission is **higher at lower current and higher voltage.** This is because **energy loss during transmission is proportional to the square of the current,** while voltage and current have a 1:1 relationship. **Hence, statements 1 and 2 are correct.**
    - Transformers are used to increase voltage and reduce current for efficient transmission.
- **Alternating Current (AC):**
  - AC is preferred for transmission because **it can be easily modified using transformers and has higher efficiency.** However, higher AC frequencies increase resistance in the material. **Hence, statement 3 is correct.**
    - AC power is the most common way to transfer electric power because voltage continuously changes polarity, causing the current to flow in alternating directions. **The AC frequency corresponds to the rate at which the voltage changes direction.**
- **Installed Electricity Generation Capacity (Fuelwise) as on May 2023**:
- Total Installed Capacity (Fossil Fuel & Non-Fossil Fuel) is 417 GW.
- The share of various energy sources in the total Electricity Generation are:
  - Fossil fuel (including Coal) is 56.8%,
  - Nuclear fuel 1.60% and
  - Non-Fossil fuel is 41.4%.

136. Ans: B

Exp:

CO2 to CO Conversion Technology

- **Working Process:**
  - The CO2 to CO conversion technology operates through an **electrocatalytic process.**
  - Unlike traditional methods that **require high temperatures (400-750 °C),** and the presence of the equivalent amount of hydrogen, this process can operate at **ambient temperatures (25-40 °C)** in the presence of water, **eliminating the need for high-temperature conditions. Hence, Statement 1 is not correct.**
- **Electrocatalytic Process**
  - It is a catalytic process that involves the **direct transfer of electrons between an electrode and reactants.**
  - This process is environmentally friendly, efficient, and inexpensive. It can be used in many sustainable energy technologies. **Hence, Statement 2 is correct.**

- **Significance for the Steel Industry:**
  - CO is a crucial chemical in the steel industry, used in the **conversion of iron ores to metallic iron in blast furnaces.**
    - CO is a widely used chemical in the industry especially in the form of syngas. **Hence, Statement 3 is correct.**

137. Ans: C

Exp:

Radiative Cooling Technology:

- **Radiative cooling technology** is a method designed to **dissipate heat from an object by emitting thermal radiation** into the atmosphere, allowing the object to become cooler. **Hence, statement 1 is correct.**
- It leads to the **creation of cool surfaces by emitting thermal radiation directly into the extremely cold universe (around 3 Kelvin)**, using the atmospheric transmission window (8 - 13 µm).
  - Notably, this process occurs without any reliance on electricity.

138. Ans: A

Exp:

- **Venus** has been called **Earth's twin** because of the similarities in their **masses, sizes,** and **densities. Hence, statement 1 is correct.**
- **Venus** and its **tectonic history,** has intriguing implications for the **planet's atmospheric composition** and **potential** for **ancient microbial life.**
- The **plate tectonics** of **venus**have had a significant influence on the **development of Venus's atmosphere**, which is rich in **carbon dioxide** and **nitrogen. Hence, statement 2 is not correct.**
- **Venus** may have been home to **microbial life** billions of years ago due to **tectonic activities.**
- It is the **hottest planet** in the **solar system** because of the **high concentration of carbon dioxide** which works to produce an **intense greenhouse effect. Hence, statement 3 is not correct.**
- **Radiative Cooling Paint:** It is derived from a **novel magnesium oxide (MgO)-polyvinylidene fluoride (PVDF) polymer nanocomposite** prepared from materials that are earth-abundant, cheap, non-toxic and non-harmful.
  - It showcases remarkable cooling capabilities with **high solar reflectivity and infrared thermal emissivity.**
  - The **MgO-PVDF** with dielectric nanoparticles resulted in **high solar reflectance (96.3%) and exceptional thermal emission (98.5%). Hence, statement 2 is correct.**

139. Ans: C

Exp:

- **Advantages of Using Ammonia as a Fuel:**
- **High Energy Density**: Ammonia has a **high energy density**, which means it **can store and release a significant amount of energy,** making it suitable for long term applications. **Hence, statement 1 is correct.**
  - Ammonia has 9 times the energy density of lithium-ion batteries and 3 times that of compressed hydrogen.
- **Low Carbon Emissions:** Ammonia has the potential to **produce near-zero carbon dioxide (CO_2) emissions during combustion**, making it an environmentally friendly choice, especially when compared to fossil fuels. **Hence, statement 2 is correct.**
- **Bridge Fuel**: Ammonia can **serve as a bridge fuel,** helping reduce dependence on traditional fossil fuels and offering a **transitional buffer toward cleaner energy sources.**
  - **Also,** using ammonia can enhance a nation's energy security by diversifying the energy mix and reducing reliance on a single energy source.

140. Ans:B

Exp:

- The Karman Line is indeed an imaginary boundary located at 100 km above sea level that separates Earth's atmosphere from space.**Hence, Statement 1 is correct.**
- The Karman Line was established by the Fédération AéronautiqueInternationale (FAI), not NASA.**Hence, Statement 2 is not correct.**
- The Karman Line was established to **regulate airspace and marks the altitude beyond which a traditional aircraftcan't fly.**
  - Any aircraft flying beyond it needs a propulsion system to pull away from the earth's tug.
- It also acts as a legal reference that separates airspace that a country can claim to own from space itself, which is governed like international waters.

141. Ans: B

Exp:

- Malaria is a life-threatening disease caused by the Plasmodium parasite. This parasite is transmitted to humans through the bites of infected female Anopheles mosquitoes.

- There are 5 Plasmodium parasite species that cause malaria in humans and 2 of these species, P. falciparum and P. vivax, pose the greatest threat.
  - P. falciparum is the deadliest malaria parasite and the most prevalent on the African continent.
  - **P. vivax is the dominant malaria parasite in most countries outside of sub-Saharan Africa. Hence, statement 1 is correct.**
  - The other malaria species which can infect humans are P. malariae, P. ovale and P. knowlesi.
- **Prevalence:**
  - It is mostly found in tropical countries. **Four African countries accounted for just over half of all malaria deaths** worldwide: **Nigeria** (31.3%), **the Democratic Republic of the Congo** (12.6%), United Republic of **Tanzania** (4.1%) and **Niger** (3.9%). **Hence, statement 2 is not correct.**
- **Elimination Strategies:**
  - **Global:**
    - The WHO Global Technical Strategy for Malaria 2016–2030, updated in 2021, sets ambitious but achievable global targets, including:
    - reducing malaria case incidence by at least 90% by 2030
    - reducing malaria mortality rates by at least 90% by 2030
    - eliminating malaria in at least 35 countries by 2030
    - preventing a resurgence of malaria in all countries that are malaria-free.
  - India:
    - National Framework for Malaria Elimination (2016-2030)
    - Malaria Elimination Research Alliance-India (MERA-India). Hence, statement 3 is not correct.

142. Ans: B

Exp:

Parker Solar Probe:

- **National Aeronautics and Space Administration (NASA)** is scheduled to launch 'Parker Space Probe' for a planned seven-year mission to study the Sun closer than any human-made object. **Hence, statement 1 is not correct.**
- It is set to fly into the sun's corona within 3.8 million miles from the solar surface, seven times closer than any other spacecraft. **Hence , Statement 2 is correct.**
- Corona is a region of the Sun seen from Earth when the Moon blocks out the Sun's bright face during total solar eclipses.
  - The probe is capable of enduring wicked heat while zooming through the solar corona to study this outermost part of the stellar atmosphere that gives rise to the solar wind. **Hence, statement 3 is correct.**

143. Ans: C

Exp:

- **Human Microbiome's Linkage with Bodily Functions:**
- Digestive Health and Nutrient Absorption:
  - The gut microbiome, primarily in the intestines, **aids in breaking down complex carbohydrates,** fibers, and other indigestible compounds that the human body can't process on its own.**Hence, statement 1 is correct.**
  - Microbes assist in the fermentation process, producing essential nutrients such as vitamins (e.g., B vitamins and vitamin K) that the body can absorb and utilize.
- **Immune System Regulation:**
  - The microbiome interacts closely with the immune system, influencing its development, training, and responses.
  - A well-balanced microbiome helps regulate immune responses, preventing inappropriate reactions and enhancing the ability to fight off infections.
- Metabolic Health and Weight Regulation:
  - The composition of the gut microbiome has been linked to metabolic disorders like obesity and type 2 diabetes.
  - Certain microbes may affect metabolism, energy extraction from food, and storage of fats, ultimately impacting body weight and metabolic health.
- Mental Health and Brain Function:
  - The gut-brain axis represents the bidirectional communication between the gut and the brain through neural, hormonal, and immunological pathways.
  - The gut **microbiome can influence brain function, behavior,** and mental health conditions such as anxiety, depression, and stress by producing neurotransmitters and interacting with the central nervous system.**Hence, statement 2 is correct.**

144. Ans: B

Exp:

- **Quantum Technology:**
  - Quantum Technology is based on the principles of **Quantum mechanics** that was developed in the early 20th century to describe nature at the **scale of atoms and elementary particles.**
- **Properties of Quantum Computing:**
  - **Superposition:** One of the fundamental properties of quantum computing is superposition. In classical computing, a bit can be in one of two states, 0 or 1. In quantum computing, a qubit can exist in a superposition of these states, meaning it can represent both 0 and 1 simultaneously. This property allows quantum computers to process a vast amount of information in parallel, making them highly efficient for certain types of calculations.
  - **Entanglement:** Quantum entanglement is a phenomenon where the **quantum states of two or more qubits become correlated in such a way that the state of one qubit instantly affects the state of another**, even when they are separated by vast distances. Entanglement allows for the creation of quantum gates and algorithms that exploit this unique connection to perform complex operations and computations.
  - **Quantum Interference**: Quantum interference is a property that arises from the superposition of qubits. It allows quantum computers to combine and manipulate the probability amplitudes associated with different states to enhance the likelihood of obtaining the correct answer to a problem while reducing the likelihood of incorrect results.
- **Hence, option B is correct.**

145. Ans: B

Exp:

- A **Quantum state** is a **mathematical description** of the **physical properties** of a **quantum system**. **Hence, statement 1 is correct.**
- **Quantum phenomena** often defy our **common sense** and **challenge** our **classical understanding** of the world.
- **Quantum states** provide a complete specification of a **system's properties,** including its **position, momentum, energy, spin,** and other **observable quantities. Hence, statement 2 is correct.**
- One of these phenomena is the difference between two types of **quantum particles**: **bosons** and **fermions**.
- **Bosons** are particles that can share the **same quantum state,** while **fermions** are particles that obey the **Pauli exclusion principle. Hence, statement 3 is not correct.**

146. Ans: B

Exp:

- **Chemotherapy** is a **fundamental cancer treatment** but **poses significant challenges.**
- **Chemotherapy of cancer cells** involves the **targeting** of **rapidly dividing cancer cells,** often leading to **programmed cell death** or **apoptosis. Hence, statement 1 is correct.**
- However, this mechanism also affects **non-cancerous cells.** Any tissue with a significant number of **normal cells** that are also dividing, such as cells in the **digestive tract,** the **bone marrow,** and **hair follicles** are also affected by **chemotherapeutic agents** and **suffer apoptosis.**
- This **cell death** underlies the **unpleasant side-effects** of **chemotherapy,** such as **painful inflammation** of the **oral cavity** and the **gut,** and **nausea, diarrhea, anemia,** and **hair loss. Hence, statement 2 is correct.**
- **Researchers** have developed **Antibody-Drug Conjugates (ADCs)** as a more targeted approach for certain **cancer types.**
- **Antibody-Drug Conjugates (ADCs)** involve **attaching drugs to antibodies** designed to recognize **proteins** predominantly found in **cancer cells. Hence, statement 3 is not correct.**

147. Ans: B

Exp:

- Global human rights organizations **Amnesty International** and **Human Rights Watch have** accused the **Israel Defense Forces (IDF)** of using white **phosphorus munitions** in **Gaza** and **Lebanon,** in violation of **International Humanitarian Law (IHL).**
- **White phosphorus** is a **pyrophoric** that **ignites** when exposed to **oxygen, producing thick, light smoke** as well as **intense 815-degree Celsius heat. Hence, statement 1 is correct.**
- **Pyrophoric substances** are those which **ignite** spontaneously or very quickly **whencomes in contact with air.**
- **White phosphorus** is dispersed in **artillery shells, bombs,** and **rockets.** It can also be delivered via felt (textile) wedges soaked in the chemical. It is not used in **Nuclear Reactors. Hence, statement 2 is not correct.**

- **White phosphorus munitions** are not under a **blanket ban,** though their use is regulated under the **International Humanitarian Law (IHL). Hence, statement 3 is correct.**

148. Ans: (d)

Exp:

- **Apollo 11** was the American spaceflight that first landed humans on the Moon. **Hence, pair 1 is correctly matched.**
- **Chang'e 1** was an uncrewed Chinese lunar-orbiting spacecraft, part of the first phase of the Chinese Lunar Exploration Program. **Hence pair 2 is correctly matched.**
- **Gaganyaan**project envisages demonstration of human spaceflight capability by launching crew of 3 members to an orbit of 400 km for a 3 days mission and bring them back safely to earth, by landing in Indian sea waters. **Hence, pair 3 is correctly matched.**
- Hence, option (d) is correct.

149. Ans: A

Exp:

- **Microalgae** are photosynthetic microorganisms that can be found in diverse natural environments, such as water, rocks, and soil. They **present higher photosynthetic efficiency than terrestrial plants**, andare responsible for a significant fraction of the world's oxygen production. **Hence, statement 2 is not correct.**
- Marine microalgae play a pivotal role in the oceanic food chain and carbon dioxide absorption.
  - However, as climate change continues, global warming is causing surface ocean waters to warm, resulting in reduced nutrient availability due to less mixing between the surface waters and nutrient-rich deeper waters.
  - So nutrients become scarce at the surface, impacting the primary producers such as **microalgae that are present in the top layer. Hence, statement 1 is correct.**
- This scarcity of nutrients, including iron, impacts the primary producers like microalgae, causing them to produce less food and capture less carbon dioxide from the atmosphere.
- Microalgae **need sunlight and ample iron** to produce food and absorb carbon dioxide, but 35% of the ocean's surface lacks sufficient iron for their growth. **Hence, statement 3 is not correct.**

150. Ans: B

Exp:

Graphite

- **About:**
  - Graphite is a naturally occurring mineral composed of carbon. It is **one of the three crystalline forms of carbon**, with the other two being diamond and amorphous carbon (such as charcoal or carbon black). **Hence, statement 1 is correct.**
- Structure:
  - Graphite has a hexagonal crystal structure in which carbon atoms are arranged in layers or sheets. These layers are weakly bonded together, **allowing them to easily slide past each other, giving graphite its lubricating properties. Hence, statement 3 is correct.**
- **Properties:**
  - Graphite is a **good conductor of both electricity and heat.**It is used in the production of electrodes for batteries and in the electronics industry. **Hence, statement 2 is not correct.**
- **Applications:**
  - Graphite is commonly known for its use in pencils. **The "lead" in pencils is actually a mixture of graphite and clay.**
  - Other applications includecrucibles, foundry facings, polishes, arc lamps, batteries, brushes for electric motors, and cores of nuclear reactors.

151. Ans: C

Exp:

- **LLMs :** LLMs are a specific class of **generative AI** models that are trained to understand and generate human-like text. **Hence, statement 1 is correct.**
  - These models are built using deep learning techniques, particularly using neural networks. **Hence, statement 2 is correct.**
  - They can generate coherent and contextually relevant text given a prompt or input. **Hence, statement 3 is correct.**
  - One of the most well-known examples of LLMs is OpenAI's GPT (Generative Pre-trained Transformer).
- **Generative AI:**
  - Generative AI refers to the subset of artificial intelligence that focuses on creating systems

capable of generating content that is similar to what a human might produce.
    - These systems learn from patterns in existing data and then use that knowledge to produce new, original content.
    - This content can take various forms, such as text, images, music, and more.

152. Ans: D

Exp:

- Mars, the **fourth planet from the Sun**, takes its name from the Roman God of war. It is often referred to as the **"Red Planet" due to its distinctive reddish appearance**.
- Mars, being the second smallest planet in our solar system after Mercury, **boasts a diameter of approximately 6,791 kilometers**, making it about **half the size of Earth.**
    - It possesses two moons, known as **Phobos and Deimos**. **Hence, statements 1 and 2 are correct.**
    - The planet experiences **extreme cold,** with **equatorial temperatures reaching 20°C** and **polar regions plunging as low as -140°C** due to its greater distance from the sun.
- Mars is home to **Olympus Mons**, the **tallest volcano in our solar system**, roughly three times the height of Mount Everest. **Hence, statement 3 is correct.**
- A Martian day is **24 hours and 37 minutes**, slightly longer than an Earth day, but a **Martian year lasts nearly twice as long**, spanning **687 Earth days** due to its extended orbit around the Sun.
- Mars' axis of rotation is **tilted 25 degrees** with respect to the plane of its orbit around the Sun. This is similar to Earth, **which has an axial tilt of 23.4 degrees.**
    - **Mars has distinct seasons,** but they last longer than seasons here on Earth.

153. Ans: D

Exp:

- **Avian influenza**, often referred to as **bird flu**, is a **highly contagious viral infection** that primarily affects **birds**, particularly **wild birds** and **domestic poultry**.**Hence, statement 1 is correct.**
- **"Detect and Cull"** policy is outlined in the **National Action Plan for Prevention, Control, and Containment of Avian Influenza** to control the **Highly Pathogenic Avian Influenza (HPAI). Hence, statement 2 is correct.**
- In 1996, **highly pathogenic avian influenza H5N1 virus** was first identified in domestic waterfowl in **Southern China.** The virus is named A/goose/Guangdong/1/1996.
- **H5N8** was first observed in India in **November 2016**, mainly affecting**wild birds** across **five states**, with **Kerala** reporting the most cases.
- **India** has witnessed the outbreak of **Highly Pathogenic Avian Influenza (HPAI) H5N1** and **H5N8** both**. Hence, statement 3 is correct.**

154. Ans: B

Exp:

Dengue:

- **About:**
    - Dengue is a mosquito-borne tropical disease caused by the dengue virus (Genus Flavivirus), transmitted by several species of female mosquito within the genus Aedes, principally **Aedes aegypti. Hence, statement 1 is not correct.**
        - This mosquito also transmits **chikungunya and Zika infection.**
- **Dengue Vaccine:**
    - The dengue vaccine CYD-TDV or Dengvaxia was approved by the US Food & Drug Administration in 2019, the first dengue vaccine to get the regulatory nod in the US.
        - **Dengvaxia** is basically **a live, attenuated dengue virus** which has to be administered in people of ages 9 to 16 who have laboratory-confirmed previous dengue infection and who live in endemic areas.
    - Researchers at **India's National Centre for Biological Sciences**, in collaboration with nine other institutions in India, Africa, and the US, have developed India's **first and only DNA vaccine** candidate for dengue fever. **Hence, statement 3 is correct.**
        - In preliminary trials on mice, the candidate generated a robust immune response and improved survival rates after exposure to the disease.
- **Controlling Dengue Using Bacteria:**
    - Researchers from the World Mosquito Program have **used mosquitoes infected with Wolbachia bacteria to successfully control dengue, leading to a 77% reduction in incidence in Indonesia. Hence, statement 2 is correct.**

155. Ans: B

Exp:

- **About:**
    - Thallium(Tl) is a chemical element with the **atomic number 81**, was discovered by **Sir William Crookes in 1861.**

- It is a soft, heavy, inelastic metal.
- Thallium is **tasteless and odourless** and has been used by murderers as a difficult-to-detect poison.

- **Appearance:**
  - A soft, silvery-white **metal** that tarnishes easily. **Hence, statement 1 is not correct**
- **Sources:**
  - It is found in trace amounts in the **earth's crust.**
  - It is found in **several ores.** One of these is pyrites, which is used to produce sulfuric acid. Some thallium is obtained from pyrites, but it is mainly obtained as a by-product of copper, zinc and lead refining.
- **Uses:**
  - Thallium's utilization is **restricted due to its toxic nature**.
  - Thallium sulfate, once a **rodent killer,** is now banned for household use in many developed nations. **Hence, statement 2 is correct.**

156. Ans: D

Exp:

- **Marine cloud brightening (MCB)** seeks to boost marine cloud reflectivity (albedo), making clouds **whiter** and **brighter. Hence, statement 1 is correct.**
- The concept of **cloud brightening** traces back to **British cloud physicist John Latham** who proposed this idea in **1990.**
- It involves using **water cannons** or **specialized vessels to release fine sea water droplets** into the atmosphere. **Hence, statement 2 is correct.**
- **MCB** has the potential to **lower sea surface temperatures** in targeted areas, potentially reducing the frequency and severity of **coral bleaching** events.
- It is a tactic for addressing **extreme ocean heat** and as a way to reduce **coral bleaching** and **safeguard marine ecosystems. Hence, statement 3 is correct.**

157. Ans: D

Exp :

- Cervical cancer **develops in a woman's cervix** (the entrance to the uterus from the vagina). Almost all cervical cancer cases (99%) are linked to infection with **high-risk human papillomaviruses (HPV)**, an extremely common virus transmitted through sexual contact. **Hence, statement 1 is not correct.**
- Cervical cancer is the **fourth most** common cancer among women globally. About 90% of the new cases and deaths worldwide in 2020 occurred in **low- and middle-income countries..Hence, statement 2 is not correct.**

158. Ans: B

Exp:

Tilapia Parvovirus:

- India has witnessed its first encounter with **Tilapia Parvovirus (TiPV)**, in Tamil Nadu causing a significant impact on the **country's aquaculture. Hence, statement 3 is correct.**
  - This virus has been reported in **farm-bred tilapia**, a freshwater fish species, and has raised concerns due to its high mortality rates.
- **About:**
  - TiPV is a **viral pathogen** that primarily affects tilapia (a fish). **Hence, statement 1 is not correct.**
  - It belongs to the**Parvoviridae family,** known for its small, non-enveloped, single-stranded DNA viruses. **Hence, statement 2 is correct.**
- **Emergence and Impact**
  - First reported in China in 2019 and Thailand in 2021. India is the third country to report the occurrence of TiPV.
    - TiPV has caused mortality rates ranging from 30% to 50% on fish farms.
    - In laboratory settings, it has led to 100% mortality, highlighting its devastating impact.

159. Ans: A

Exp:

- **Neuron cells** use **electric signals** and **chemicals** to process information. **Hence, statement 1 is correct.**
- **Microglia serve** as **immune cells,** attacking foreign invaders and pruning some of the **branches** on **neurons** to improve their **signaling.**
- **Astrocytes** seem to provide support to **neurons,** ensuring their **proper functioning. Hence, statement 2 is correct.**
- Much of the **brain's diversity** is situated outside the **cerebral cortex.**
- **Cerebrum** is the **largest area** of the **brain. Cerebrum**divides the **brain** into two halves called **hemispheres.**
- The hemispheres of **Brain** are attached by a **bundle of nerve fibers** called the **corpus callosum. Hence, statement 3 is not correct.**
- **Cerebral cortex** is the **outer layer** that lies on top of the **cerebrum.**

160. Ans: C

Exp:

- Consanguinity involves both social and genetic dimensions. Socially, it means marrying blood

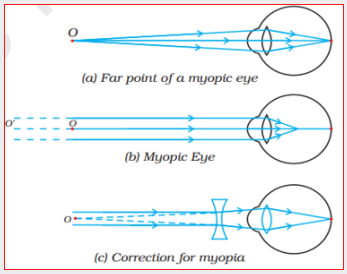
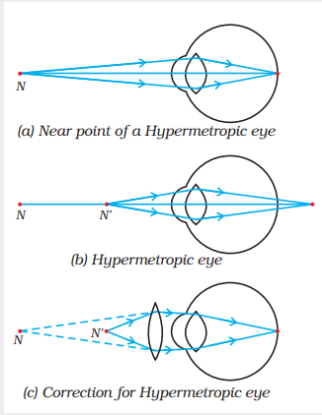
relatives, such as cousins or siblings,while genetically, it refers to **unions between closely related individuals,** often termed inbreeding**. Hence, statement 1 is correct.**

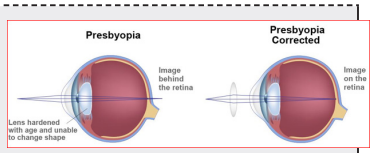
- It is a construct that has implications for both **family and population genetics.**

- **Challenges of Consanguinity:**
  - **Increased Risk of Genetic Disorders:** The most significant challenge of consanguinity is the **increased risk of offspring inheriting genetic disorders** due to the sharing of common recessive genes. **Hence, statement 2 is correct.**
    - Conditions such as **cystic fibrosis** disability are more prevalent among offspring of close relatives.
  - **Limited Genetic Diversity**: Marrying close relatives can lead to **limited genetic diversity in the population,** potentially reducing the overall resilience to diseases and environmental changes.
  - **Complex Family Dynamics:** In consanguineous families, complex family dynamics can develop, as multiple roles and relationships intersect.
  - This can lead to conflicts and tensions related to **decision-making and family hierarchies.**
  - **Potential Erosion of Individual Autonomy:** In closely-knit consanguineous communities, there can be an **erosion of individual autonomy,** where decisions related to marriage, family planning, and other life choices are heavily influenced by the **family or community,** potentially limiting personal freedom.
  - **Silenced Voices in Domestic Violence Cases:** In consanguineous relationships, women may be **discouraged from reporting domestic violence** due to familial and cultural pressures to preserve family respect.
    - This silence can perpetuate the cycle of abuse, making it difficult to seek help or intervention in cases of domestic violence.

161. Ans: B

Exp:

Types of Refractive Errors	Description	Correction	
Myopia (Nearsightedness)	Difficulty seeing distant objects, clear near vision. Light focuses in front of the retina.	Corrected with a concave lens.	
Hypermetropia (Farsightedness)	Difficulty seeing nearby objects, relatively clear distant vision. Light focuses behind the retina.	Corrected with a convex lens.	

Presbyopia	Age-related difficulty focusing on close objects, typically around middle age.	Corrected with bifocal lenses (both convex and concave).	
Astigmatism	Blurred or distorted vision at any distance. Irregular cornea or lens shape causes uneven light focus.	Corrected with a cylindrical lens.	

- **Hence, option B is correct.** The above mentioned table mentions that option A is related to Myopia (Nearsightedness), option C is related to Presbyopia and option D is related to Hypermetropia (Farsightedness).

162. Ans: C

Exp:

- **Electrons** are fundamental particles with a **negative charge** and they orbit the dense nucleus. For a long time, **scientists had to rely on indirect methods to understand electron behavior,** akin to taking a photograph of a fast-moving race car with a long exposure time resulting in a blurry image.
  - The rapid motion of electrons rendered them **nearly invisible to conventional measurement techniques. Hence, statement 1 is correct.**
- Atoms in molecules exhibit movements on the order of **femtoseconds**, which are **incredibly short time intervals**, constituting a **millionth of a billionth of a second. Hence, statement 2 is correct.**
  - Electrons, being lighter and interacting even faster, operate within the **attosecond realm**, **a billionth of a billionth of a second (1×10^{-18} of second).**

163. Ans: D

Exp:

Venus:

- It is named after the Roman goddess of love and beauty. It is the second planet from the Sun and sixth in the solar system in size and mass.
- It is the second brightest natural object in the night sky after the Moon, probably that is the reason why it was the first planet to have its motions plotted across the sky, as early as the second millennium BC. Hence, statement 1 is correct.
- Unlike the other planets in our solar system, Venus and Uranus spin clockwise on their axis. Hence, statement 2 is correct.
- It is the hottest planet in the solar system because of the high concentration of carbon dioxide which works to produce an intense greenhouse effect. Hence, statement 3 is correct.

164. Ans: D

Exp:

- **Categories of Cookies:**
  - **Session Cookies:** Temporary in nature, **these cookies function as digital post-it notes for websites**, residing in a user's computer memory **solely during active browsing sessions**.
  - **Persistent Cookies:** Analogous to **digital bookmarks**, persistent cookies endure on the **user's device beyond the conclusion of a browsing session.**
    - They retain and recall information such as login credentials, language preferences, and previous interactions with advertisements.
  - **Secure Cookies:** Distinguished by their **transmission over encrypted connections,** these cookies are employed primarily for safeguarding sensitive data, such as login credentials.
  - **Third-party Cookies:** Originating from domains distinct from the one currently being visited, these cookies are frequently**employed for tracking and advertising purposes,** offering both utility and the potential for intrusion.
- **Hence, option D is correct.**

165. Ans: A

Exp:

- mRNA stands for **messenger RNA,** a molecule that carries **genetic information from DNA to the protein-making machinery of the cell. Hence, statement 1 is not correct.**
- mRNA vaccines use synthetic mRNA that encodes a specific protein from a pathogen, such as the spike protein of the coronavirus.

- When the mRNA vaccine is injected into the body, some of the cells take up the mRNA and use it to produce the protein. The protein then triggers an immune response that **produces antibodies and memory cells that can recognize and fight the pathogen** in the future.**Hence, statement 2 is correct.**

- mRNA vaccines are faster and cheaper to produce, as they do not require cell culture or complex purification processes.
- mRNA vaccines are also more flexible and adaptable, as they can be easily modified to target new variants or strains of pathogens.

166. Ans: B

Exp:

Super Blue Moon

- A super blue moon combines a **supermoon and a blue moon**.
- A supermoon occurs when the **moon aligns closely with Earth during its orbit, making it appear larger and brighter**.
  - This alignment, called perigee,contrasts with apogeewhen the moon is farthest in its elliptical orbit around Earth. While the difference is subtle, near the horizon, an optical illusion can make it seem larger.
  - Hence, statement 1 is correct.
- A blue moon is the **second full moon in a month**. Despite its name, **a blue moon isn't blue**; it's the traditional name for the second full moon in a month. **Hence, statement 2 is not correct.**
  - Sometimes, smoke or dust in the air can scatter red wavelengths of light, as a result of which the moon may, in certain places, appear more blue than usual, but this has nothing to do with the name "blue" moon.

Blood Moon:

- A blood moon occurs during a **total lunar eclipse** when **the Earth aligns between the Moon and the Sun,** casting a shadow on the Moon. **Hence, statement 3 is correct.**
- Only the **red-tinted light refracted by Earth's atmosphere reaches the Moon's surface**, giving it a reddish glow.
  - The term "blood moon" can also refer to a reddish Moon caused by atmospheric conditions or autumn foliage.

167. Ans: C

Exp:

Flora Fauna and 'Funga':

- Recently, **United Nations Biodiversity** has urged people globally to use the word **'funga'** whenever they say **'flora and fauna',** in order to **highlight** the **importance of fungi. Hence, statement 2 is correct.**
- UN Biodiversity urged to use the word 'Funga':
  - According to **UN Biodiversity,** "It is time for **fungi** to be recognised and protected on an equal footing with **animals** and **plants** in **legal conservation frameworks.**
  - This is not the first time when a request has been made to include **fungi** along with **flora and fauna.**
  - There would be **no life on Earth** without **fungi, yeasts, molds** and **mushrooms** as they are critical to decomposition and forest regeneration, mammalian digestion, carbon sequestration, the global nutrient cycle, and antibiotic medication.
- **Fungi:**
  - **Fungi or fungus** are a diverse group of **eukaryotic microorganisms or macroscopic organisms** that belong to their own **biological kingdom**, distinct from **plants, animals**, and **bacteria**. **Hence, statement 1 is correct.**

- **Characteristics:**
  - **Eukaryotic:** Like **plants, animals,** and **protists, fungi** have complex, **membrane-bound cell organelles** and a **true nucleus.**
  - **Heterotrophic: Fungi** are primarily **decomposers** or **saprophytes**, meaning they obtain nutrients by **absorbing organic matter** from their **surroundings**. **Hence, statement 3 is correct.**
  - **Secrete Enzymes:** Fungi secrete enzymes to **break down complex organic compounds** into simpler substances, **which they can then absorb.**

168. Ans: C

Exp:

- Dementia is an **umbrella term encompassing diseases that affect memory, cognitive abilities, and behaviour, hindering daily activities.**
- **Risk factors** for dementia include smoking, excessive **alcohol consumption, physical inactivity, social isolation, head injuries, and conditions like diabetes, hearing loss, depression, obesity, and hypertension.**
  - **Symptoms:**
    - Memory loss, Difficulties with thinking, Visual perception, Self-management, Problem solving or language and the ability to focus and pay attention.
    - Personality changes, like depression, agitation, paranoia, and mood swings.
  - **Causes:**
    - When brain cells are damaged then dementia may occur. It can be caused by a head injury, a stroke, a brain tumour or due to HIV infection.Hence, statement 1 is correct.
  - **Treatment:**
    - There is currently no treatment available to cure dementia, though numerous new treatments are being investigated in various stages of clinical trials.Hence, statement 2 is correct.

169. Ans: D

Exp:

Minimal-Genome Cells Evolve as Fast as Normal Cells

- **Gene:**
  - A gene is a **segment of Deoxyribonucleic acid (DNA)** that codes for a specific protein or function. Genes are the **basic units of heredity** and can be **inherited from parents or mutated by environmental factors.**
- **Gene Mutation:**
  - A gene mutation is a **change in the DNA sequence of a gene** that may affect its function or expression. **Hence, statement 1 is not correct.**
  - Gene mutations can be caused by errors during **DNA replication, exposure to radiation or chemicals, or other factors. Hence, statement 2 is correct.**
- **Genome:**
  - A genome is the **complete set of genetic information of an organism** or a virus.
- **Genetic Sequencing:**
  - It is the process of determining the **order of nucleotides or bases (A, G, C, and T) in a DNA or RNA molecule**
- **Genome Editing:**
  - It is a type of genetic engineering in which DNA is **inserted, deleted, modified or replaced** in the genome of a living organism.
- **Genetic Modification:**
  - It is the **process of changing the DNA of an organism**, such as a bacterium, plant or animal, **by introducing elements of DNA from a different organism.**

170. Ans: B

Exp:

Aditya-L1 Mission:

- **Aditya-L1** is the first space based observatory class Indian solar mission to study the Sun from a substantial distance of **1.5 million kilometers**. It will take approximately **125 days** to reach the L1 point.**Hence, statement 1 correct.**
  - Aditya-L1 is also ISRO's second astronomy observatory-class mission after **AstroSat (2015).**
  - The mission's journey is notably shorter than India's previous **Mars orbiter mission, Mangalyaan.**
  - **Hence, statement 2 is not correct.**
- The spacecraft is planned to be **placed in a halo orbit** around the **Lagrangian point 1 (L1) of the Sun-Earth system.**
- **Hence, statement 3 is not correct.**

171. Ans: c

Exp:

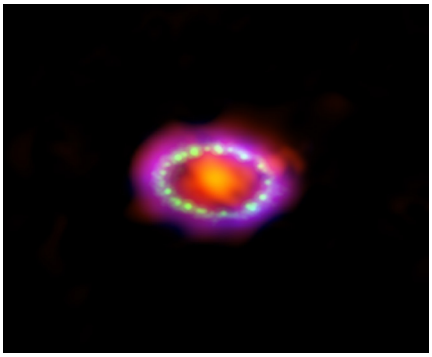
- Recently, some researchers from India and the US have **proposed a novel method to determine the Hubble constant**.

- **Hubble Constant:**
  - In 1929, Edwin Hubble formulated Hubble's law, providing the first mathematical description of the universe's expansion. The precise rate of this expansion, t**ermed the Hubble constant,** remains a contentious issue in cosmology.
  - Two details are required to calculate the value of the Hubble constant:
    - The distance between the observer and astronomical objects,
    - The velocity at which these objects are moving away from the observer as a result of the expansion of the universe.

172. Ans: B

Exp:

- The James Webb Space Telescope (JWST) captured an image of **SN1987A, a supernova that exploded decades ago,** offering new insights into its history and evolution.
  - **SN1987A exploded in 1987,** becoming the nearest and brightest supernova visible from earth in nearly four centuries.
    - SN1987A is situated 170,000 light-years away from Earth in the Large Magellanic Cloud.
    - Now, the JWST is revealing intricate details of this cosmic event that have remained hidden until now.
- **SN1987A is often referred to as a "string of pearls"** as it showcases a series of luminous rings composed of gases and dust expelled by the dying star in its various phases of collapse and explosion.
- **Hence, option B is correct.**



173. Ans: C

Exp:

- The **Magellanic Clouds** are two **irregular, satellite galaxies** that orbit the Milky Way. **Hence, statement 1 is correct.**
  - One is the Large Magellanic Cloud (LMC) and another is the Small Magellanic Cloud (SMC).
- While the Magellanic Clouds are **visible to the unaided eye in the Southern Hemisphere,** they cannot be observed from most northern latitudes.
- They serve as excellent laboratories for the **study of very active stellar formation and evolution. Hence, statement 2 is correct.**

174. Ans: B

Exp:

- Recently, Scientists have achieved a remarkable feat by creating a **lab-grown "human embryo" model** using **stem cells and chemicals**, shedding light on **early embryo development. Hence, statement 1 is correct.**
- Researchers from Israel utilized a combination of **stem cells and chemicals to create a model of a 14-day-old human embryo.**
- The model was a**ble to spontaneously assemble into different types of cells** that **form the fetus,** provide nutrients to the fetus, lay out the plan for body development, and create structures like the placenta and umbilical cord to support the fetus**. Hence, statement 2 is correct.**
- A challenge faced was that only **1% of the mixture came together on its own, showing a need for better efficiency.**
- These models are intended **solely for studying early fetal development.**
  - They are generally destroyed after 14 days, and implantation is not permitted. **Hence, statement 3 is not correct.**
- Significance:
  - Models help uncover errors in Deoxyribonucleic acid (DNA) duplication and chromosome distribution.
  - Researchers found that DNA duplication abnormalities occur early in the process, affecting cell division.
  - These models enable the study of **gene functions** and their roles in fetal development.
  - Research during these initial stages is vital as **most miscarriages and birth defects happen in this period.**
  - Understanding normal embryo development and genetic factors can improve **invitro fertilization outcomes.**

175. Ans: C

Exp:

- The **US Environmental Protection Agency** authorized the release of the **genetically modified OX5034 mosquito** in **Florida** and **Texas** in **2020. Hence, statement 1 is correct.**
- This mosquito is developed with a **gene sensitive** to an antibiotic, **tetracycline. Hence, statement 2 is correct.**
- It carries a **self-limiting gene** that prevents **female offspring** from **surviving, leading** to a **reduction** in **mosquito populations. Hence, statement 3 is correct.**

176. Ans: B

Exp:

Key Highlights of the Nipah Virus

- About:
  - It is a **zoonotic virus** (it is transmitted from animals to humans).
  - The organism that causes Nipah Virus encephalitis is an RNA or **Ribonucleic acid virus** of the family Paramyxoviridae, genus Henipavirus. **Hence, statement 1 is not correct.**
  - It **first broke out in Malaysia and Singapore** in 1998 and 1999.
  - The disease is named after a village in Malaysia, Sungai Nipah, where it was first detected.
  - It **first appeared in domestic pigs** and has been found among several species of domestic animals including dogs, cats, goats, horses and sheep. **Hence, statement 2 is correct.**
- **Transmission:**
  - The disease spreads through **fruit bats** or 'flying foxes,' of the genus Pteropus, who are natural reservoir hosts of the Nipah and Hendra viruses. **Hence, statement 3 is correct.**
- The **virus is present in bat urine** and potentially, bat faeces, saliva, and birthing fluids.
- **Prevention:**
  - Currently, there are **no vaccines for both humans and animals.** Intensive supportive care is given to humans infected by the Nipah virus. **Hence, statement 4 is not correct.**

177. Ans: B

Exp:

- Some of the common types of artificial lights in the marine environment are **LED, fluorescent, metal halide, and plasma lamps**. **White LEDs produce broad spectrum light that is sensed by a wide range of organisms** and have a peak at short wavelengths (blue and green light) to which many marine organisms are particularly sensitive. **Hence, statement 1 is correct.**
- The **Earth is getting artificially brighter, at a rate of 2.2% per year.** As a result of these brighter nights, the impacts of **artificial light at night (ALAN)** have become an increasing focus in terrestrial ecology. **Hence, statement 2 is correct.**
  - As per studies, **non-natural light increased the brightness of Skyglow**, by 9.2-10% every year between 2011 and 2022
- Encouraging land-based **Lights Out efforts** (local, state, and regional campaigns to darken skies) to help **migrating birds** that are drawn to light at night. It will also benefit marine systems near coastal cities.
  - **Increasing the usage of red light in coastal areas** as much as possible and **putting up barriers to shield the coastline from artificial light.**
    - Red light, having the longest wavelength in the visible spectrum, doesn't penetrate as far into the water. Hence, statement 3 is not correct.

178. Ans: B

Exp:

Reciprocity:

- Reciprocity means that **if a signal is sent** from one point to another, it is sent back from the second point to the first. **Hence, option B is correct.**
  - For Example: It's like when you shine a flashlight at a friend, they can shine it back at you because the light can go both ways through the air.
- However, there are **situations where reciprocity doesn't work as expected**.
  - For example, in some movies, a person being questioned can't see the police officers through a window, but the officers can see them.
  - Also, in the dark, one can see someone under a streetlight, but they can't see that person.

179. Ans: D

Exp:

- The Union government is considering mandating NavIC integration in all smartphones sold in India by 2025, particularly targeting 5G phones. **Hence, statement 1 is correct.**
- Manufacturers could receive additional incentives through Production-Linked Incentive (PLI) schemes for using chips that support NavIC technology, fostering domestic chip design and production.

- To bolster NavIC's adoption, ISRO had launched second-generation Navigation satellites in May 2023 that will enhance interoperability with other satellite-based navigation systems and expand usage. **Hence, statement 2 is correct.**
- The second-generation satellites will send signals in a third frequency, L1, besides the L5 and S frequency signals that the existing satellites provide. **Hence, statement 3 is correct.**
- The L1 frequency is among the most commonly used in the Global Positioning System (GPS) and will increase the use of the regional navigation system in wearable devices and personal trackers that use low-power, single-frequency chips.

180. Ans: C

Exp:

- SCD is a group of inherited **red blood cell** disorders. In SCD, the red blood cells become hard and sticky and look like a C-shaped farm tool called a "sickle." **Hence, statement 1 is not correct.**
- The National Sickle Cell Anemia Eradication Mission aims to eliminate sickle cell anemia from India by 2047. **Hence, statement 2 is correct.**
- SCD was included in the list of disabilities under the Rights of Persons with Disabilities Act, of 2016. **Hence, statement 3 is correct.**

181. Ans: A

Exp:

- Recently, the **World Organisation for Animal Health (WOAH)** has released its **7th report on Antimicrobial use** in animals, covering the period from 2017 to 2019. **WOAH (founded as OIE)** is one of the **standard-setting bodies recognized by the Agreement** on the Application of Sanitary and Phytosanitary Measures. **Hence, statement 1 is not correct.**

Some of the major findings of the report includes:

- **Dip in AntiMicrobial Use:**
  - There is a **13% decrease in global antimicrobial usage in animals** three years from 2017 to 2019.
  - Out of 80 countries, 49 in Asia, Far East, Oceania, and Europe reported an **overall reduction in antimicrobial use.**
    - Conversely, 31 countries in African and American regions reported an overall increase in antimicrobial usage during the same period. Hence, statement 2 is not correct.
- Antimicrobial drugs, commonly known as Antibiotics, are **substances that either kill or inhibit** the growth of microorganisms such as **bacteria, fungi, viruses,** and parasites.
- They are used to **treat or prevent infections in humans,** animals, and sometimes plants. **Hence, statement 3 is correct.**

182. Ans: B

Exp:

Biohacking

- Biohacking has gained more attention and popularity in recent years, it is the practice of **modifying or enhancing one's own body** or **biology** using various methods, such as diet, supplements, devices, implants, or genetic engineering.
  - Biohacking can have different goals, such as **improving health, performance, well-being, or appearance**, or **exploring the limits and possibilities of human nature.**
  - The most well-known type of **biohacking is genetic engineering,** where individuals experiment with new technologies to **enhance their physical appearance or capabilities. Hence, option B is the correct answer.**
- However, biohacking also raises ethical and safety concerns, particularly when individuals engage in risky or unproven procedures.

183. Ans: B

Exp:

- Gravitational redshift is a consequence of Einstein's theory of general relativity. When light passes through a region with a strong gravitational field, like near a massive celestial body such as a planet or star, its frequency decreases.
  - This means that the light shifts towards the red end of the electromagnetic spectrum, which is why it's called "gravitational redshift."
- **Hence, option B is correct.**

184. Ans: B

Exp:

- Fifth in line from the Sun, Jupiter is, by far, the largest planet in the solar system – more than twice as massive as all the other planets combined.
  - Jupiter, Saturn, Uranus and Neptune are called Jovian or Gas Giant Planets.
- In **1979, the Voyager mission** discovered Jupiter's faint ring system. **Hence, statement 1 is correct.**
  - Nine spacecraft have visited Jupiter. Seven flew by and two have orbited the gas giant. Juno, the most recent, arrived at Jupiter in 2016.

- **Juno is a solar-powered NASA spacecraft** that makes long, looping **orbits around giant planet Jupiter. Hence, statement 3 is not correct.**
  - **JUICE is a mission of the European Space Agency (ESA) to explore Jupiter and its icy moons,** namely Ganymede, Callisto, and Europa. JUICE is an acronym for Jupiter Icy Moons Explorer.
  - Juno was launched on 5th August, 2011.The spacecraft traveled roughly 3 billion kilometers before arriving at Jupiter in 2016.
    - Recently, Juno conducted its 53rd close flyby of Jupiter, capturing a remarkable image of Jupiter and its volcanic moon Io, on 31st July 31, 2023.
      - **Io is known for its intense volcanic activity,** with hundreds of erupting volcanoes spewing molten lava and sulfurous gasses.
      - It is **slightly larger than Earth's Moon,** and is tidally locked to Jupiter. **Hence, statement 2 is correct.**

185. Ans: C

Exp:

- Gravitational Instabilities refer to a **fundamental physical phenomenon that occurs in astrophysical systems**, particularly in celestial bodies like **galaxies, stars, and planetary systems**. **Hence, statement 1 is correct.**
  - These instabilities are driven by the force of **gravity** and play a crucial role in **shaping the structure, evolution, and dynamics of these cosmic entities.**
- Conversion of Gas to Stars:
  - In spiral galaxies with lower stability, **gravitational instabilities efficiently convert a significant amount** of gas into stars. **Hence, statement 2 is correct.**
    - This process led to the depletion of gas reservoirs in these galaxies.

186. Ans:C

Exp:

- **Vibrio vulnificus** is a **bacterium** that can cause severe infections in humans. It can result **from eating undercooked seafood,** especially oysters, which may containthe bacteria. **Hence, statement 1 is correct.**
- Despite its potential threat, this pathogen **remainslargely underreported in India**. **Hence, statement 2 is correct.**
- This bacterium **thrives in warm waters above 20°C.** India's average sea surface temperature of 28°C provides a perfect habitat.Climate change, with increased rainfall and reduced coastal salinity, further supports the growth of Vibrio vulnificus. **Hence, statement 3 is correct.**

187. Ans: C

Exp:

Green Hydrogen Fuel Cell

- Green Hydrogen Fuel Cells are a clean, reliable, quiet, and efficient source of high-quality electric power.
- They use Green Hydrogen as a fuel to drive an **electrochemical process** that produces electricity, with water and heat as only by-products. **Hence, statement 2 is correct.**
- Green Hydrogen:
  - Green hydrogen is a type of **hydrogen produced through a process called electrolysis, using renewable energy** sources like wind or solar power.
  - It involves splitting water (H_2O) into its constituent elements, hydrogen (H_2) and oxygen (O_2), **with zero greenhouse gas emission**s.
- **Fuel Cell:**
  - A fuel cell is an electrochemical device that **converts chemical energy (in this case, hydrogen) into electrical energy. Hence, statement 1 is correct.**
    - It consists of two electrodes (anode and cathode) separated by an electrolyte.

188. Ans: D

Exp:

Geospatial Intelligence:

- Geospatial technology **uses tools like GIS (Geographic Information System), GPS (Global Positioning System) and Remote Sensing** for geographic mapping and analysis. **Hence, statement 1 is correct.**
- These tools **capture spatial information about objects, events and phenomena** (indexed to their geographical location on earth, geotag). The location data **may be Static or Dynamic.**
  - **Static location data** include position of a road, an earthquake event or malnutrition among children in a particular region while **dynamic location data** include data related to a moving vehicle or pedestrian, the spread of an infectious disease etc.

- The technology may be used **to create intelligent maps to help identify spatial patterns in large volumes of data. Hence, statement 2 is correct.**
- The technology**facilitates decision making based on the importance and priority of scarce resources.**

189. Ans: D

Exp:

Geospatial Intelligence:

- Geospatial technology **uses tools like GIS (Geographic Information System), GPS (Global Positioning System) and Remote Sensing** for geographic mapping and analysis. **Hence, statement 1 is correct.**
- These tools **capture spatial information about objects, events and phenomena** (indexed to their geographical location on earth, geotag). The location data **may be Static or Dynamic.**
  - **Static location data** include position of a road, an earthquake event or malnutrition among children in a particular region while **dynamic location data** include data related to a moving vehicle or pedestrian, the spread of an infectious disease etc.
- The technology may be used **to create intelligent maps to help identify spatial patterns in large volumes of data. Hence, statement 2 is correct.**
- The technology**facilitates decision making based on the importance and priority of scarce resources.**

190. Ans: C

Exp:

Solar Orbiter:

- The Solar Orbiter is a collaborative mission between the **European Space Agency (ESA) and NASA** that aims to investigate the **Sun's magnetic fields, energetic particles, and plasma** in their pristine state before they are altered during their journey. **Hence, statement 1 is correct.**
- The mission was launched in February 2020.

Picoflare Jets:

- **Picoflare jets** are **small-scale phenomena on the sun** that release a significant amount of energy in a short period, typically lasting only a few dozen seconds. **Hence, statement 2 is correct.**
  - These jets, named aspico, as they**carried approximately one-trillionth as much energy as the largest flares that the sun is believed to be able to produce**.
    - 'Pico' is an order of magnitude that denotes 1012, or one trillionth of a unit.

Solar Winds:

- The solar wind is created by the **outward expansion of plasma** (a collection of charged particles) from the **Sun's corona** (outermost atmosphere).
- As the **Sun rotates (once every 27 days)**, it winds up its magnetic field lines above its polar regions into a large **rotating spiral,** creating a **constant stream of "wind."**
- As the solar wind moves away from the Sun, it **forms a vast region around it called the "heliosphere."** This bubble extends well beyond the orbits of most planets in our solar system. **Hence, statement 3 is correct.**

191. Ans: c

Exp:

- Human Immunodeficiency Virus (HIV) is a virus that attacks the immune system, specifically the body's stem cells (T cells), which help the immune system fight off infections.
  - Hence, statement 1 is correct.
- HIV is primarily transmitted through sexual contact, sharing needles for drug use, or from mother to child during childbirth or breastfeeding.
  - Hence, statement 2 is correct.
- While there is no cure for HIV, antiretroviral therapy (ART) can effectively control the virus and allow people with HIV to lead long and healthy lives. Preventative measures, such as safe sex practices and needle exchange programs, are also crucial in reducing HIV transmission.
- **Tenofovir disoproxil, Lamivudine, and Dolutegravir (TLD):**
  - The mainstay of treatment for more than 85% HIV is Tablet TLD (a fixed-dose combination of three antiretroviraldrugs,namely,Tenofovir+Lamivudine +Dolutegravir.)
  - The World Health Organization has recommended it as the preferred first-line HIV treatment for adults and adolescents since it rapidly suppresses the virus that causes AIDS, has fewer side effects and is easy to take.
  - Hence, statement 3 is correct.

192. Ans: a

Exp:

Space Debris

- **About:**
  - Space debris refers to man-made objects in Earth's orbit that no longer serve a useful purpose.

- This includes defunct satellites, spent rocket stages, and fragments of debris from collisions or other events.

- **Threats from Space Debris:**
  - **Threat to Marine Life:**
    - Even when falling into the oceans, which is more likely since 70% of the earth's surface is ocean, large objects can be a threat to marine life, and a source of pollution.
  - **Threat for Operational Satellites:**
    - The floating space debris is a potential hazard for operational satellites and colliding with them can leave the satellites dysfunctional.
- This overpopulation of space with objects and debris is referred to as Kessler Syndrome.**Hence, option a is the correct answer.**
  - **Reduction of Orbital Slots:**
    - The accumulation of space debris in specific orbital regions can limit the availability of desirable orbital slots for future missions.
  - **Space Situational Awareness:**
    - The increasing amount of space debris makes it more challenging for satellite operators and space agencies to accurately track and predict the orbits of objects in space.

193. Ans: C

Exp:

Cell-Free DNA (cfDNA):

- **About:**
  - cfDNA refers to **fragments of DNA that exist outside of cells**, specifically in various body fluids. Unlike the majority of **DNA which is enclosed within cells.**
  - cfDNA is released into the **extracellular environment** under different circumstances, including **cell death or other cellular processes. Hence, statement 1 is correct.**
  - These cfDNA fragments contain **genetic information** and can offer insights into a person's health status, potential diseases, and genetic variations.
- **Applications:**
  - **Non-Invasive Prenatal Testing (NIPT):**
    - Cell-free DNA serves as a valuable tool for screening chromosomal abnormalities in developing foetuses, such as Down syndrome.
    - NIPT replaces invasive procedures such as amniocentesis, minimizing risks for both expectant mothers and foetuses.
  - **Early Cancer Detection:**
    - Identifyingcancers at their initial stages for prompt treatment.
    - wThe 'GEMINI' test utilizes cfDNA sequencing to detect lung cancer with high accuracy. Hence, statement 2 is correct.
    - Combining cfDNA analysis with existing methods enhances overall cancer detection.

194. Ans: (a)

Exp:

- Semiconductors are materials which have a conductivity between conductors and insulators. They can be pure elements - silicon and germanium or compounds - gallium, arsenide and cadmium selenide. **Hence, statement 1 is not correct.**
- India imports semiconductor chips from China, Taiwan, USA and Japan **but not from Iran. Hence, option 2 is not correct.**
- The India Semiconductor Mission (ISM) was launched in 2021 with a total financial outlay of Rs76,000 crore under the aegis of the Ministry of Electronics and IT (MeitY). **Hence, statement 3 is correct.**

195. Ans: (c)

Exp:

- A group of South Korean scientists have recently claimed the discovery of a material they named LK-99. According to their reports, LK-99 is a superconductor at room temperature and pressure. **Hence, statement 2 is correct.**
- Superconductors are materials that exhibit zero electrical resistance when cooled to extremely low temperatures. **Hence, statement 1 is correct.**
  - This property allows them to conduct electricity with no loss of energy. **Hence, statement 3 is correct.**

196. Ans: A

Exp:

Mars

- **About:** Mars is the fourth planet from the Sun in our solar system. It is often referred to as the **"Red Planet"** due to its reddish appearance caused by **iron oxide (rust) on its surface. Hence, statement 1 is not correct.**
- **Atmosphere:** Mars has a thin atmosphere primarily composed of **carbon dioxide (95.3%), with traces of nitrogen and argon. Hence, statement 3 is not correct.**

- Major Surface Features:
  - **Olympus Mons:** The largest known volcano in the solar system. **Hence, statement 2 is correct.**
  - **Valles Marineris**: A massive canyon system.
  - **Polar Ice Caps:** Ice caps made of water and frozen carbon dioxide (dry ice) at the poles.
  - **Dusty Surface:** The surface is covered in fine dust and rocks.
  - **Liquid Wate**r: Liquid water is rare, but evidence suggests past liquid flows. **Hence, statement 4 is not correct.**

197. Ans: (C)

Exp:

- Small Modular Reactors are **advanced nuclear reactors** that have a power capacity of up to **300 MW(e) per unit,** which is about one-third of the generating capacity of traditional **nuclear power reactors.**
- **Hence, Statement-I is Correct .**
- SMRs, which can produce a large amount of low-carbon electricity, are,
  - **Small:** Physically a fraction of the size of a conventional nuclear power reactor.
  - **Modular:** Making it possible for systems and components to be factory-assembled and transported as a unit to a location for installation.
  - **Reactors:** Harnessing nuclear fission to generate heat to produce energy.
- Their designs incorporate **enhanced safety features**, reducing the risk of uncontrolled radioactive material release. **Hence, Statement-II is not Correct .**
  - SMRs are designed to operate for 40-60 years with capacity factors exceeding 90%.

198. Ans: B

Exp:

- Lymphatic filariasis, commonly known as **elephantiasis,** is a **neglected tropical disease** caused by **parasitic infection** which is transmitted through the bite of infected mosquitoes. **Hence, statement 1 is not correct.**
  - **Lymphatic filariasis** is caused by **infection with parasites classified as nematodes (roundworms)** of the family Filariodidea.
  - Lymphatic filariasis infection involves asymptomatic, acute, and chronic conditions.
    - In chronic conditions, it leads to **lymphoedema (tissue swelling) or elephantiasis (skin/tissue thickening) of limbs** and hydrocele (scrotal swelling).
- **India aims to eliminate Lymphatic Filariasis by 2027,** three years ahead of the global target, through a mission-driven strategy. **Hence, statement 2 is correct.**

199. Ans: A

Exp:

- Only three countries have managed to complete a soft landing on the Moon in history: the United States, the Soviet Union, and China. **Hence, statement 1 is not correct.**
- Luna 25 marks **Russia's return to lunar exploration after 47 years,** aiming to reclaim its reputation in space exploration. Luna 25 is lighter and **lacks a rover,** focusing on studying **soil composition, dust particles, and detecting surface water.Hence, statement 2 is not correct**.
- Luna 25 is designed for a year-long mission, equipped with heating mechanisms and a non-solar power source. In contrast, Chandrayaan-3 is built for a single lunar day due to lack of heating during lunar nights. **Hence, statement 3 is correct.**

200. Ans: C

Exp:

- **Radio Thermoelectric Generators (RTGs)** is an **innovative power source** designed to address **challenges** in **deep space missions. Hence, statement 1 is correct.**
- **Radio Thermoelectric Generators (RTGs)** utilize**radioactive materials**, such as **Plutonium-238** or **Strontium-90,** which **emit heat** as they **decay over time. Hence, statement 2 is correct.**
- **Radioisotope Heater Unit (RHU)** is the part of the reactor which initiates the process by releasing **thermal energy,** which serves as the foundation for **electricity generation. Hence, statement 3 is correct.**

201. Ans: B

Exp:

- Recently, the **Central Water Commission (CWC)** under the **Ministry of Jal Shakti,** launched the mobile application **"FloodWatch"** for disseminating flood-related information in real-time. **Hence, statement 1 is not correct.**
- **Key Features of FloodWatch:**
  - Real-time flood monitoring **provides up-to-date flood situations across the country. Hence, statement 2 is correct.**
  - App utilizes near **real-time river flow data from various sources** to enhance accuracy.

- Interactive Map feature enables users to check **CWC Flood Forecast (24 hours) or Flood Advisory (7 days)** by selecting stations directly from the map or using the search box. **Hence, statement 3 is correct.**
- "FloodWatch" incorporates advanced technologies like **satellite data analysis, mathematical modelling, and real-time monitoring** to ensure accurate flood forecasts.

202. Ans: B

Exp:

Solar Cycle:

- **Solar Maxima and Minima** refer to the two phases of the **Solar Cycle** that occur over an approximately **11-year period.** These cycles are characterized by changes in the number **of sunspots, solar flares, and other solar phenomena.**
  - The solar maximum is the phase **when the Sun is most active,** with many sunspots and intense eruptions.**Hence, statement 1 is not correct.**
  - The solar minimum is the phase **when the Sun is least active**, with few or no sunspots and calm surface. **Hence, statement 2 is correct.**

203. Ans: a

Exp:

- Amyotrophic Lateral Sclerosis is a rare and fatal type of motor neuron disease. It is characterized by progressive degeneration of nerve cells in the spinal cord and brain.
  - Hence option a is correct.
- It's often called Lou Gehrig's disease, after a famous baseball player who died from the disease.
  - ALS is one of the most devastating disorders that affects the function of nerves and muscles. As motor neurons degenerate and die, they stop sending messages to the muscles, which causes the muscles to weaken, start to twitch (fasciculations), and waste away (atrophy).
- **Causes:**
  - Causes are not yet, in a few cases, genetics is involved.
  - ALS research is looking into possible environmental causes of ALS.
- **Symptoms:**
  - With ALS, there may be weakness in a limb that develops over a matter of days or, more commonly, a few weeks. Then, several weeks to months later, weakness develops in another limb. Sometimes the initial problem can be slurred speech or trouble swallowing.
- **Treatment:**
  - There is no cure and proven treatment for ALS.

204. Ans: a

Exp:

- The IMEI (International Mobile Equipment Identity) number is a unique identification number assigned to mobile devices such as smartphones, tablets, and other cellular-enabled devices.
- It has 15 digits and is like a phone's unique identity. It serves as a digital fingerprint for each device and is used to uniquely identify them on mobile networks.
  - The telecom department and the customs department work together to check and record the IMEI numbers of handsets that come into India.
  - The IMEI number is essential for various purposes, including device authentication, network management, tracking, and security.
- IMEI numbers are fixed for a mobile device throughout its lifetime and cannot be changed. **Hence statement 1 is correct.**
- IMEI numbers are indeed hard coded into a mobile device's hardware during manufacturing, making them unique identifiers that remain fixed throughout the device's lifetime. This process ensures that each mobile device has a distinct and unalterable IMEI number.
  - Hence statement 2 is correct.

205. Ans: B

Exp:

Agnibaan SubOrbital Technological Demonstrator (SOrTeD):

- The Agnibaan SOrTeD is a **customisable launch vehicle** that could be launched in **one or two stages**. It is powered by AgniKul's patented Agnilet engine. **Hence, option B is the correct answer.**
  - Agnilet, is a **3D-printed, 6 kilonewton (kN) semi-cryogenic engine** that uses liquid oxygen and kerosene as propellants.
- Unlike **traditional sounding rockets that launch from guide rails**, Agnibaan SOrTeD will **take off vertically and follow a predetermined trajectory,** executing precisely **orchestrated maneuvers during its flight.**
  - It is capable of carrying payloads up to 100 kg to an altitude of 700 km in five different configurations.
- Agnibaan SOrTeD will be the first step towards launching the **world's first 3D-printed rocket into space.**

206. Ans: A

Exp:

Namoh 108 Lotus Variety

- Recently, the Union Minister of Science & Technology, unveiled the innovative **'Namoh 108' lotus variety**, developed by the **Council of Scientific & Industrial Research -National Botanical Research Institute (CSIR-NBRI), Lucknow. Hence, option A is the correct answer.**
- Having been discovered in **Manipur several years ago,** this lotus variety boasts 108 petals, leading to its designation as **'NBRI Namoh 108,'** a name derived from both its **petal count and its religious significance.**
  - Blossoms from **March to December, rich in nutrients.**
- The flower's genome was sequenced, making it the **only Indian lotus variety with a sequenced genome.**
- The flower's characteristics were **modified to facilitate cultivation outside Manipur.**

207. Ans: B

Exp:

- Indian scientists have developed the first ever low-pungent mustard that is pest and disease-resistant. It is based on CRISPR/Cas9 gene editing, while **being non-GM and transgene-free. Hence, statement 1 is not correct.**
- The low-pungent mustard showcased glucosinolate levels in their seeds that were **lower than the 30 ppm threshold set for canola-quality seeds.**
  - Traditional mustard seeds (Brassica juncea) that are grown in India **contain about 120-130 parts per million (ppm) of glucosinolates.**
  - Glucosinolate is a group of sulphur and nitrogen-containing compounds contributing to the characteristic pungency of their oil and meal.
  - Oilseeds yield oil for cooking, and **their leftover meal,** a protein-rich ingredient, is used in **animal feed.Hence, statement 2 is correct.**
  - Interestingly, the **leaves and the walls of the pods around the seeds displayed higher amounts of glucosinolates. Hence, statement 3 is correct.**
  - This increase was attributed to a disruption in the transport of these compounds. This heightened accumulation of glucosinolates in the leaves and pods plays a **crucial role in bolstering the plant's ability to resist pests.**
- As a result of these genetic modifications, the edited mustard lines exhibited robust defense mechanisms against both fungal and insect pests.

208. Ans: B

Exp:

- **Chandrayaan-3** has made history by becoming the **first mission to soft-land on the lunar south pole,** a region that has never been explored before. **Hence, statement 1 is correct.**
  - India now joins the **United States, Russia, and China** as one of the few countries to successfully land on the Moon.
- Chandrayaan-3's successful landing came after the setback of the Chandrayaan-2 mission's landing failure in 2019.
  - Lessons from the Chandrayaan-2 mission were applied to **Chandrayaan-3, focusing on a "failure-based" design approach** to anticipate and mitigate potential issues. **Hence, statement 4 is correct.**
  - Critical changes included strengthening the lander's legs, increasing fuel reserves, and enhancing landing site flexibility.
- Chandrayaan-3 is expected to **operate for at least one lunar day (14 Earth days)** on the lunar surface. **Hence, statement 2 is not correct.**
  - The **Pragyan rover** will **move around the landing site** within a radius of 500 meters, **conducting experiments and sending data and images** to the lander.
    - The Vikram lander will relay the data and images to the orbiter, which will then transmit them to Earth.
  - The propulsion module that carried the lander and rover configuration till 100 km lunar orbit also has a Spectro-polarimetry of Habitable Planet Earth **(SHAPE) payload to study the spectral and Polari metric measurements of Earth from the lunar orbit. Hence, statement 3 is not correct.**
- **Therefore, option B is correct.**

209. Ans: C

Exp:

- Bacterial Strain's Role in Methane Reduction:
  - The Methylotuvimicrobium buryatense 5GB1C strain of bacteria has been **identified as a methane (a GHG) consumer.Hence, Statement 1 is correct.**
  - The bacteria's ability to consume methane at low concentrations, as low as 200 ppm, makes it a **promising candidate for methane removal technology. Hence, Statement 2 is correct.**

- While other Methane-eating bacteria (methanotrophs) grow best when the methane concentration is around 5,000-10,000 parts per million (ppm).

- **Utilization of Bacterial Biomass:**
  - As the bacteria consumes methane, they generate **biomass that can be utilized as feed in Aquaculture**. **Hence, Statement 3 is correct.**
  - For every tonne of methane consumed, the bacteria can produce **0.78 tonnes of biomass** with a dry weight.

210. Ans: c

Exp:

- **Eastern Equine Encephalitis (EEE)** is a Mosquito-borne illnesses viral disease that causesinflammation of the brain (encephalitis).
  - **Hence, statement 1 is not correct.**
- It spreads topeople and animals by the bite of an infected mosquito.
  - **Hence, statement 2 is correct.**
- **EEE** was first identified in **horses** in **Massachusetts, United States**, in 1831.
- EEE is caused by the Eastern Equine Encephalitis Virus (EEEV), which belongs to thegenus Alphavirus and the family Togaviridae.
- Roughly 33% of individuals who are infected do not survive, typically passing away between 2 to 10 days after the symptoms first appear.
- Currently, there are no vaccines available to directly treat Eastern equine encephalitis. To mitigate the risk of infection, individuals are advised to take several precautionary steps, including avoiding mosquito bites by using repellents and wearing protective clothing.
  - **Hence, statement 3 is correct.**

211. Ans: D

Exp:

Somatic Genetic Variants:

- Somatic genetic variants, also known as somatic mutations or somatic changes, refer to alterations in the DNA sequence that occur in the cells of an individual's body after conception. **Hence, statement A is correct.**
- Somatic mutations can occur for various reasons, such as errors during DNA replication, exposure to environmental factors (like radiation or chemicals), or simply as a natural consequence of cellular aging. **Hence, statement B is correct.**
- Somatic mutations can have different effects depending on where they occur in the genome and which genes are affected. **Some of them can lead to the development of diseases, including cancer. Hence, statement C is correct.**
- All the options are correct. Hence, option D is correct.

212. Ans: c

Exp:

Activity done by drones:

- Aerial Photography and Videography:
- Surveillance and Reconnaissance
- Search and Rescue Operations
- Agriculture and Precision Farming
- **Environmental Monitoring**
- Infrastructure Inspection
- Delivery Services
- Mapping and Surveying
- **Inspecting the craters of active volcanoes**
- **Collecting breath samples from spouting whales for DNA analysis**
  - Hence, statements 2, 4 and 5 are correct.

Activities which cannot be done by drones:

- **Tasks that involve intricate craftsmanship**
- **Complex Negotiations**
- Human Interaction
- Sensitive Medical Procedures
- Legal and Ethical Decision-Making
- Creative and Artistic Expression
  - **Hence, statements 1 and 3 are not correct.**

213. Ans: B

Exp:

ISRO's Future Expeditions:

- **LUPEX: Lunar Polar Exploration (LUPEX) mission,** a collaborative effort between **ISRO and JAXA(Japan)**, is poised to explore the Moon's polar regions. **Hence, statement 1 is not correct.**
  - It will be specifically designed to venture into permanently shaded areas.
  - Investigating the presence of water and assessing the potential for a sustainable long-term station are among LUPEX's objectives.
- **XPoSat (X-ray Polarimeter Satellite):** It is **India's first dedicated polarimetry mission** to study various dynamics of bright astronomical X-ray sources in extreme conditions. **Hence, statement 2 is correct.**

- The spacecraft will carry two scientific payloads in a low earth orbit.

- **NISAR: NASA-ISRO Synthetic Aperture Radar (NISAR)** is a **Low Earth Orbit (LEO)** observatory being jointly developed by NASA and ISRO. **Hence, statement 3 is correct.**
  - NISAR will map the entire globe in 12 days and provide spatially and temporally consistent data for understanding changes in Earth's ecosystems, ice mass, vegetation biomass, sea level rise, ground water and natural hazards including earthquakes, tsunamis, volcanoes and landslides.

214. Ans: A

Exp:

Superconductors:

- About:
  - A superconductor is a material that can **conduct electricity or transport electrons from one atom to another with no resistance.**
  - No heat, sound or any other form of energy would be released from the material when it has **reached critical temperature** (Tc), or the temperature at which the material becomes superconductive.
    - The critical temperature for superconductors is the temperature at which the electrical resistivity of metal drops to zero.
  - Superconductors also exhibit the **Meissner effect, which is the expulsion of a magnetic field from the interior of a material** during the process of becoming a superconductor. **Hence, option A is correct.**
- **Examples: Aluminium, niobium, magnesium diboride,** etc.

215. Ans: A

Exp:

Metagenomics:

- Metagenomics is the **study of microbes in their natural living environment,** which involves the complex microbial communities in which they usually exist. **Hence, statement 1 is correct.**
- The study examines the **genomic composition of an entire organism,** including each of the microbes that exist within it. It facilitates direct sequencing of patient samples, **removing the need for prior knowledge of the infectious agent. Hence, statement 2 is not correct.**
  - For instance,a single gram of soil consists of 4000 to 5000 different species of microbes, while human intestines consist of 500 different types of bacteria.
    - It enables us to understand the diversity, abundance, and interaction of microbes in any system.
  - It is different from **conventional sequencing methods,** which requires **culturing or isolating individual species** before **sequencing their genomes. Hence, statement 3 is correct.**

216. Ans: B

Exp:

Whole Genome Sequencing:

- All or**ganisms have a unique genetic code, or genome, that is composed of nucleotide bases-** Adenine (A), Thymine (T), Cytosine (C) and Guanine (G). **Hence, statement 1 is not correct.**
- The unique Deoxyribonucleic Acid (DNA) fingerprint, or pattern **can be identified by knowing the sequence of the bases in an organism**.
  - Determining the order of bases is called sequencing.
- Whole **genome sequencing is a laboratory procedure that determines the order of bases in the genome** of an organism in one process. **Hence, statement 2 is correct.**

217. Ans: C

Exp:

- Quantum computing is a rapidly emerging technology that harnesses the laws of quantum mechanics to solve problems that are too complex for classical computers.
- Quantum mechanics is a subfield of physics that describes the behavior of particles — atoms, electrons, photons, and almost everything in the molecular and sub molecular realm. **Hence, Statement-I is Correct.**
- It is an exciting new technology that will shape our world tomorrow by providing us with an edge and a myriad of possibilities.
- It is a fundamentally different way of processing information compared to today's classical computing systems.
- While today's classical computers store information as binary 0 and 1 states, quantum computers draw on the fundamental laws of nature to carry out calculations using **quantum bits (Qubits)**. **Hence, Statement-II is not Correct.**

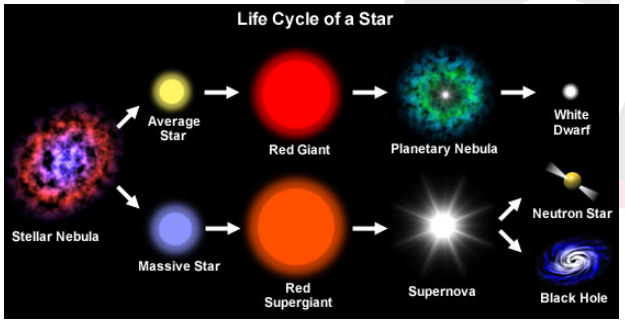
218. Ans: B

Exp:

- **Non-Communicable Diseases (NCD) Cells** are being established at **National, State and District levels** for **programme monitoring and management. Hence, statement 1 is not correct.**
- Provision has been made under the programme to provide **free diagnostic facilities** and **drugs for patients** attending the **NCD clinics.**
- **Non-Communicable Diseases (NCD) Clinics** are being set up at **District** and **CHC levels,** to provide services for **early diagnosis, treatment** and **follow-up** for common **Non-Communicable Diseases (NCDs). Hence, statement 2 is correct.**

219. Ans: D

Exp:



Hence, option D is correct.

220. Ans: D

Exp:

Auroras

- A significant **geomagnetic storm** is anticipated, triggered by **a strong solar storm.** This occurrence has the potential to **"supercharge" auroras,** creating a **spectacular visual display in the night sky**.
- Auroras are **luminous phenomena that occur near the North (Aurora Borealis) and South Poles (Aurora Australis).**
- They are caused by the **interaction of charged particles from the Sun with the Earth's magnetic field and atmosphere. Hence, statement 2 is not correct.**
- Auroras consist of **gases and particles, including oxygen and nitrogen. Hence, statement 1 is correct.**
- The collisions of these particles with the atmosphere **release energy in the form of light.**
- The colors observed in auroras depend on the **type of gas and altitude of the collisions.**
- **Geomagnetic Storms and Auroras**:
  - Geomagnetic storms, triggered by **solar events like coronal mass ejections (CMEs) and solar flares, enhance auroral activity. Hence, statement 3 is correct.**
    - CMEs are eruptions of plasma and magnetic fields from the Sun, while solar flares are bursts of energy.
    - CMEs often occur alongside solar flares, which are explosions on the Sun's surface, but they are also known to occur independently.

221. Ans: A

Exp:

- **Petrol** is made up of a mix of alkanes and cycloalkanes with a **chain length of between 5-12 carbon atoms**. These boil between 40°C and 205°C
- Gas Oil or **Diesel** is made up of alkanes containing**12 or more carbon atoms.** These have a boiling point between 250°C and 350°C. **Hence, statement 1 is correct.**
- The **higher fuel economy of diesel enginesover petrolpowertrains** is one factor. This stems from the **greater energy content per litre of diesel,** and the inherent efficiency of the diesel engine. **Hence, statement 3 is not correct.**
- **Diesel engines do not use high-voltage spark ignition** (spark plugs), and thus **use less fuel per kilometre,** as they have higher compression ratios, making it the **fuel of choice for heavy vehicles.**
- Also, **diesel enginesoffer more torque** (rotational or turning force) and **are less likely to stall** as they are controlled by a mechanical or electronic governor, thereby proving to be **better for haulage. Hence, statement 2 is correct.**

222. Ans: B

Exp:

National Technology Day 2023

- The **Indian Prime Minister** inaugurated the **National Technology Day 2023 program.** The event marked the beginning of the **celebration of the 25th year of National Technology Day,** which would be held from **May 11th to May 14th** featuring dedicated multiple projects related to scientific and technological advancement in the country, with a total worth of more than **Rs 5,800 crore.**

- The projects for which the foundation stone was laid included the **Laser Interferometer Gravitational Wave Observatory - India (LIGO-India) in Hingoli,** the **Homi Bhabha Cancer Hospital and Research Centre in Jatni, Odisha**, and the **Platinum Jubilee Block of Tata Memorial Hospital in Mumbai.**
- The projects dedicated to the nation included the **Fission Molybdenum-99 Production Facility** and the **Rare Earth Permanent Magnet Plant in Mumbai** and **Visakhapatnam** respectively, the **National Hadron Beam Therapy Facility and the Radiological Research Unit in Navi Mumbai** and the **Women & Children Cancer Hospital Building in Navi Mumbai.**
- The theme of the event was "**School to Start-ups - igniting young minds to innovate,"** Government's initiatives such as the **Atal Tinkering Labs and Atal Innovation Centers,** is nurturing innovation and entrepreneurship in India.
- The Prime Minister also highlighted the significance of **May 11th in India's history,** as it **commemorates the day when India's scientists achieved a remarkable feat in Pokhran Nuclear Testing 1998. Hence, option B is correct.**

223. Ans: D

Exp:

Mitochondria:

- **About:**
  - Mitochondria are **membrane-bound organelles** found in the cells of most **eukaryotic organisms. Hence, statement 1 is correct.**
  - They are often referred to as the "powerhouses" of cells because they generate the **majority of the cell's energy** in the form of **adenosine triphosphate** (ATP).**Hence, statement 3 is correct.**
- **Functions:**
  - Mitochondria carry out **cellular respiration**, a process that converts nutrients into ATP.
  - Mitochondria convert energy from **carbohydrates, fats, and proteins into a usable form for the cell.**
  - They metabolize **glucose to produce ATP**, which powers various cellular processes.
  - Mitochondria participate incell signaling pathways, influencing processes like cell growth, differentiation, and apoptosis.
- **Inheritance:**
  - Mitochondria have their own DNA, known as **mitochondrial DNA (mtDNA)**, which encodes a **small number of essential proteins. Hence, statement 2 is correct.**
  - In most animals, **mtDNA is inherited solely from the mother.**
  - Mutations in mtDNA can lead to **mitochondrial disorders** and various health conditions.

224. Ans: C

Exp:

- Carbon dating is a widely used method to establish the age of organic materials, things that were once living.
  - Living things have carbon in them in various forms.
- The dating method is based on the fact that **Carbon-14 (C-14) is radioactive, and decays at a well-known rate.**
  - C-14 is an isotope of carbon with an atomic mass of 14.
  - The most abundant isotope of carbon in the atmosphere is C-12.
    - A very small amount of C-14 is also present.
  - The ratio of C-12 to C-14 in the atmosphere is almost static and is known.
- However, carbon dating cannot be applied in all circumstances. **It cannot be used to determine the age of non-living things like rocks, for example.**
  - Also, the **age of things that are more than 40,000-50,000 years old cannot be arrived at through carbon dating.**
    - This is because after 8-10 cycles of half-lives, the amount of C-14 becomes almost very small and is almost undetectable.
- **Statement 3 is incorrect; hence, option C is the correct answer.**

225. Ans: C

Exp:

Alzheimer's Disease:

- **About:**
  - Alzheimer's disease is a **progressive neurodegenerative disorder** that affects the **brain, leading to memory loss, cognitive decline,** behavioral changes, problems with words in speaking or writing, poor judgment, changes in mood and personality, confusion with time or place, etc.
  - Alzheimer's disease is the most **common cause of dementia,** accounting for **60-80% of dementia cases.Hence, statement 1 is correct.**
- **Causes and Risk Factors:** Currently the causes of Alzheimer's are not fully known, still factors that may contribute to Alzheimer's include:

- **Age:** Advancing age is the primary risk factor, with the **majority of cases occurring in individuals over 65.**
- **Genetics:** Certain gene mutations, such as those in the **APP, PSEN1, and PSEN2 genes,** can increase the risk of developing Alzheimer's.
- **Amyloid Protein:** Alzheimer's disease is thought to be caused by the abnormal build-up of amyloid-beta and tau proteins in and around brain cells.
  - Amyloid-beta protein clumps together to form plaques between nerve cells in the brain, while tau protein forms twisted tangles inside neurons.
- **Lifestyle Factors:** Chronic conditions like **cardiovascular disease, diabetes, obesity, smoking**, and a sedentary lifestyle may contribute to the risk. **Hence, statement 2 is not correct.**

- **Diagnosis:**
  - Cognitive and neuropsychological tests to assess memory, thinking, and problem-solving abilities.
  - Imaging techniques (MRI, PET scans) to identify brain changes.
  - **Biomarker tests** (cerebrospinal fluid analysis, amyloid PET) to detect amyloid plaques.
- **Treatment and Management:**
  - There's currently **no cure for Alzheimer's disease**. But there is medicine and supportive therapies available that can temporarily reduce the symptoms. **Hence, statement 3 is correct.**

226. Ans: D

Exp:

Transformers in Machine Learning (ML):

- Transformers are a type of **deep learning model** used for **natural language processing** (NLP) **and computer vision** (CV) **tasks.Hence, statement 1 is correct.**
- They utilize a mechanism called "**self-attention**" to process sequential input data.
- Transformers can process the entire input data at once, capturing context and relevance. **Hence, statement 2 is correct.**
- They can handle longer sequences efficiently and overcome the vanishing gradients problem faced by recurrent neural networks (RNNs).
- Transformers were introduced in 2017 through the paper ***"Attention is All You Need"*** by Google Brain.
- They have become popular and led to the development of pre-trained system **Generative Pre-trained Transformer (GPT). Hence, statement 3 is correct.**

227. Ans: D

Exp:

- Scientists have recently suggested using Calcium-41 for Radiometric Dating as an alternative to Carbon-14 for determining the age of fossilized bones and rocks.
- **Calcium-41 is a rare long-lived radioisotope of calcium** with a half-life of 99,400 years. **Hence, statement 1 is correct.**
- Calcium-41 is **produced in the Earth's crust when cosmic rays from space collide (hence, found naturally)** with calcium atoms in soil or rocks. **Hence, statement 2 is not correct.**
- This isotope has the potential to be employed in **dating methods for objects that are older than what can be accurately determined using carbon-14 dating.Hence, statement 3 is correct.**
  - Carbon-14 dating is effective for dating organic materials up to about 50,000 years old.

228. Ans; C

Exp:

- **Cathode material** in **Sodium-ion Batteries** is the electrode where **sodium ions** are stored during the **battery's discharge process. Hence, statement 1 is correct.**
- **Sodium-ion batteries** are currently emerging as a **potential alternative to current lithium-ion battery technology** due to their lower cost, higher availability, and reduced impact on the environment.
- **Sodium-transition-metal-oxide (Na-TM-Oxide)** based cathode materials addresses the challenges of **air/water-instability** and **structural-cum-electrochemical instability. Hence, statement 2 is correct.**

229. Ans: C

Exp:

FLOPs in Computing:

- **About:**
  - **FLOPs, or Floating-Point Operations per Second**, is a **metric** used to measure **computational performance and efficiency** in **high-performance computing (HPC) and artificial intelligence (AI)**. **Hence, statement 1 is correct.**
    - The world's fastest computer in terms of PFLOPs is the Hewlett Packard Enterprise Frontier, or OLCF-5 with the capability to touch a peak performance of 1,685.65.
    - India's first supercomputer called PARAM 8000 was launched in 1991. Hence, statement 2 is correct.

- Floating-point operations involve mathematical calculations with real numbers that have fractional parts.
- Using floating-point encoding, **extremely long numbers can be handled** relatively easily.

- **Significance:**
  - FLOPs are not the sole metric to evaluate a computer's performance. Factors like **memory bandwidth, latency, and architectural features also contribute.**
    - However, FLOPs provide a baseline for comparing computational capabilities, particularly in tasks dominated by floating-point calculations.
- **Unit of Computing Speed:**
  - **Teraflops:**
    - It is a unit of computing speed equal to one million million (1 trillion) (10^12) FLOPS.
  - **Petaflops:**
    - It is a unit of computing speed equal to 1000 TFLOPS (10^15).
  - **Exaflops:**
    - It is a unit of computing speed equal to one billion billion (10^18) FLOPS.

230. Ans: D

Exp:

Relationship Between Copyright Infringement and Artificial Intelligence (AI):

- **Use of Copyrighted Material as Training Data:**
  - AI systems like **ChatGPT**, often **require large amounts of data to train their algorithms** effectively. **Hence, statement 1 is correct.**
    - This includes copyrighted material such as images, texts, and music, which may raise copyright infringement concerns.
  - AI technologies can be used to replicate or mimic existing copyrighted works. The algorithms can analyse and generate content that closely resembles protected works, raising questions about the legality and ethical implications of such replication.
- **Fair Use and Transformative Use:**
  - **Fair use is a legal doctrine of the US** (as US Supreme Court observed recently) that **allows for limited use of copyrighted material without permission,** under certain circumstances.
    - Determining whether an AI-generated work qualifies as fair use requires considering factors such as the purpose, nature, amount, and effect of the use.
  - Transformative use, which involves adding new meaning or expression to a copyrighted work, is often a crucial factor in fair use analysis.

Current Legal Position of AI-generated Content in India:

- **Indian Copyright Act, 1957 and The Patents Act, 1970** provides specific provisions forfair dealing and enumerated exceptions to copyright infringement. **Hence, statement 2 is correct.**
- The use of copyrighted materials for training AI models is considered to be in a **legal grey area. Hence, statement 3 is correct.**
  - As it stands now, copyright laws do not safeguard any creation that is wholly generated by AI, regardless of whether it stemmed from a human-crafted text prompt.

231. Ans: C

Exp:

XPoSat:

- **About:**
  - XPoSat stands for X-ray Polarimeter Satellite.
  - It is India's **pioneering polarimetry mission** aimed at studying **various dynamics of astronomical sources in extreme conditions. Hence, statement 1 is correct.**
    - It is only the world's second polarimetry mission using X-Ray after NASA's Imaging X-ray Polarimetry Explorer (IXPE) that was launched in 2021. Hence, statement 2 is correct.
  - XPoSat is a collaboraton between the ISRO and the Raman Research Institute (RRI)
- **Scientific Payloads of XPoSat:**
  - XPoSat will carry two scientific payloads: **Polarimeter Instrument in X-rays (POLIX)** and X-ray Spectroscopy and Timing (SPECT) in a low Earth orbit.
    - POLIX payload will enable the measurement of polarimetry parameters such as the degree and angle of polarization in the medium X-ray energy range of 8-30 keV photons originating from astronomical sources.
    - SPECT payload will provide valuable timing and spectroscopic information within the energy range of 0.8-15 keV of X-ray photons.

232. Ans: A

Exp:

- **Vitamin B12**, also known as cyanocobalamin, is **synthesized by most bacteria and algae with the help of enzymes.**
  - **Folate is the natural form of vitamin B9**, water-soluble and naturally found in many foods.
    - It is also added to foods and sold as a supplement in the form of folic acid.
- Vit. B12 is synthesized in microorganisms that enter the human food chain through incorporation into food of animal origin.
  - It is also **crucial to the normal functioning of the brain and the nervous system.**
- **Deficiency of Vitamin B12 causes pernicious anaemia.** It is rarely caused due to lack of Vitamin B12 in the diet but because of the absence of the intrinsic factor in the stomach leading to failure of absorption of Vitamin B12.
- **Statement A is incorrect; Hence, Option A is the correct answer.**

233. Ans: D

Exp:

Arsenic:

- **About:**
  - It is an **odourless and tasteless metalloid** widely distributed in the earth's crust. **Hence, statement 1 is correct.**
  - It is naturally **present at high levels in the earth crust and groundwater** of a number of countries. It is highly toxic in its inorganic form. **Hence, statement 2 is correct.**
- **Arsenic Poisoning:**
  - It can get into the human body through drinking water as well as eating food that has been contaminated with arsenic.
  - **Arsenicosis** is the medical word for **arsenic poisoning,** which occurs due to accumulation of large amounts of arsenic in the body.
  - It **leads to adverse health effects through inhibition of essential enzymes,** which ultimately leads to death from multi-system organ failure.
  - Long-term exposure to arsenic from drinking-water and food can cause **cancer and skin lesions.** It has also been associated with **cardiovascular disease** and **diabetes. Hence, statement 3 is correct.**
  - In utero and early childhood exposure has been linked to **negative impacts on cognitive development** and increased deaths in young adults.

234. Ans: (b)

Exp:

- The water footprint of AI can be divided into two components: direct water consumption and indirect water consumption.
  - Direct water consumption refers to the **water that is evaporated or discharged as waste during the cooling process** of data center servers.
  - Indirect water consumption refers to the water that is used to produce the **electricity that powers data center servers.**
- **Hence, statement 1 is correct.**
- The water footprint of AI can vary depending on several factors, such as the type and size of the AI model, the location and efficiency of the data center, and the source and mix of electricity generation. **Hence, statement 2 is not correct.**
- Water scarcity is a global issue, and **AI technologies contribute to the problem**. AI infrastructure requires significant amounts of freshwater for cooling, which strains limited water resources. **Hence, statement 3 is correct.**

235. Ans: D

Exp:

- The examples of **mitochondrial diseases** are **Leigh Syndrome, Kearns-Sayre syndrome (KSS), Mitochondrial Myopathy** and **Mitochondrial DNA Depletion Syndrome. Hence, statement 1 is correct.**
- **Mitochondrial Donation Treatment (MDT/MRT)** ensures that the **baby inherits healthy mitochondria** while carrying the **genetic material from both biological parents. Hence, statement 2 is correct.**
- The procedure is specifically intended for couples who wish to have their **genetic child** but do not want to use a **donor egg. Hence, statement 3 is correct.**

236. Ans: A

Exp:

- **Hysterectomy** is a surgery that involves partial or complete removal of the uterus of a woman. It has emerged as an important issue in debates on health care and medical ethics in India**. There have been reports of female sugarcane labourers undergoing hysterectomy. Hence, option A is correct.**

237. Ans: C

Exp:

StarBerrySense:

- The **Indian Space Research Organisation (ISRO)** recently launched a Low-cost star sensor called **StarBerrySense,** mounted on the **PSLV Orbital Experimental Module (POEM),** which has **performed well during its first-ever space test.** Hence, option c is the correct answer.
- StarBerrySense is a low-cost sensor designed to quickly **calculate the orientation of a spacecraft by identifying stars in its field of view.**

238. Ans: B

Exp:

- **About:**
  - Black holes are regions of space-time where **gravity is so strong that nothing, not even light, can escape from them. Hence, statement 1 is not correct.**
  - They are formed when a **massive star collapses in on itself at the end of its life,** creating an incredibly dense object with a gravitational pull that is so strong that it **warps space-time around it.**
- **Types of Black Holes:**
  - **Stellar Black Hole:** It is formed by the **collapse of a single massive star**
  - **Intermediate Black Hole:** Their masses are between **100 and 100,000 times that of the sun.**
  - **Supermassive Black Hole:** Their masses ranging from **millions to billions of times that of the sun**, found at the centres of most galaxies including our own **Milky Way galaxy.**
- **Importance:**
  - Black holes are important fo**r understanding the universe and its evolution.**
  - They play a role in the **formation and evolution of galaxies** and the distribution of matter throughout the universe. **Hence, statement 2 is correct.**
  - Studying black holes can also help us **understand the fundamental properties of space, time, and gravity.**

239. Ans: D

Exp:

- A cryogenic engine **uses liquid hydrogen and liquid oxygen as propellants,** which are stored at extremely low temperatures to achieve lift-off and place heavier objects in space**. Hence, statement 1 is not correct.**
- A **cryogenic engine is more efficient than other rocket engines as it provides more thrust for every kilogram** of propellant it burns, **enhancing the payload carrying capacity of the rocket**. **Hence, statement 2 is not correct.**
- **Dhawan II is a privately developed fully cryogenic rocket engine by Skyroot,** named after **Satish Dhawan,** an eminent Indian rocket scientist who played a crucial role in the development of India's space program.
  - The engine development was **partly supported by NITI Ayog's ANIC-ARISE program** which promotes technologies including the use of green rocket propellants**. Hence, statement 3 is not correct.**

240. Ans- B

Exp:

- Laser Carbon can replace expensive metal-based catalysts in the electrolysis of water to produce hydrogen.
  - Although its catalytic activity is not as good as metal-based catalysts, it can be improved by using different polymers in the fabrication process.
- It is a porous carbon material containing **nitrogen that acts as both a catalyst and an anode in electrolysis. Hence, statement 1 is not correct.**
- It reduces the energy required for splitting water by lowering the overpotential of the **Oxygen Evolution Reaction (OER).Hence, statement 2 is correct.**

241. Ans: C

Exp:

- PV waste has led to **waste accumulation at landfills, polluting the soil and surroundings.** Incinerating the encapsulant also releases sulphur dioxide, hydrogen fluoride, and hydrogen cyanide into the atmosphere. **Hence, statement 1 is correct.**
- **Globally, India has the world's fourth-highest solar PV deployment.** The installed solar capacity was nearly 62GW in November 2022. This leads to a huge amount of solar PV waste. **Hence, statement 2 is not correct.**
- The waste generated from **PV modules and their components is classified as 'hazardous waste' in India** due to the presence of hazardous materials such as heavy metals. This requires specific guidelines and provisions for their treatment and disposal. **Hence, statement 3 is correct.**

242. Ans: A

Exp:

- An open-source model was proposed in 2002 by scientists **for seeds and plant varieties**, calling it the

"BioLinux model", and scholars and civil-society members alike discussed and built on it. **Hence, statement 1 is correct.**

- **BioLinux model** is related to seeds and plant varieties. It is **not related to coding or Software.**
  - **Open-Source Software (OSS)** is software whose source code is made available to the public for anyone to view, modify, and distribute under an open-source license. This license typically allows users to access and modify the source code, as well as to redistribute the software without any restriction on the use or distribution. **Hence statement 2 is not correct.**

243. Ans: D

Exp:

Genome India Project (GIP)

- Recently, the **Ministry of Science and Technology** has approved an ambitious gene-mapping project called the **Genome India Project (GIP).**

Significance of the GIP

- **Precision Healthcare:**
  - GIP aims to develop personalized medicine based on **patients' genomes to anticipate and modulate diseases.**
  - By mapping disease propensities to genetic variations, interventions can be targeted **more effectively, and diseases can be anticipated before they develop.**
  - Hence, statements A and C are correct.
- **Sustainable Agriculture:**
  - Similar benefits will come to agriculture if there is a better understanding of the **genetic basis of the susceptibility of plants to pests**, insects and other issues hampering productivity.
  - This can **reduce dependence** on chemicals.
  - Hence, statement B is correct.

Associated Challenge

- **Scientific Racism:**
  - The GIP raises concerns about the **potential for scientific racism and the reinforcement of stereotypes** based on heredity and racial purity. **Hence, statement D is not correct.**
  - In a country like India, which is already divided by identity politics, genetic mapping may **further deepen these divisions.**

244. Ans: D

Exp:

- TEMPO is a NASA device that can track**air pollution over North America from space.** It will allow scientists to monitor air pollutants and their emission sources.
  - TEMPO will have multiple applications from measuring levels of various pollutants to providing air quality forecasts and helping the development of emission-control strategies. **Hence, statement 1 is not correct.**
- TEMPO is not a radar system, it is a grating spectrometer, sensitive to visible and ultraviolet wavelengths of light. **Hence, statement 2 is not correct.**

245. Ans: C

Exp:

- In pursuit of a 'magic number', Physicists in Japan have recently discovered a new isotope of uranium.

Major highlight of the discovery

- The researchers accelerated uranium-238 nuclei into plutonium-198 nuclei at the KEK Isotope Separation System (KISS). In a process called **multinucleon transfer**, the two isotopes exchanged protons and neutrons. **Hence, option C is correct.**

246. Ans: D

Exp:

Types of Cyber Threats

- **Ransomware:** This type of **malware hijacks computer data and then demands payment (usually in bitcoins)** in order to restore it. **Hence, pair 1 is correctly matched.**
- **Trojan Horses:** A **Trojan horse attack uses a malicious program that is hidden inside a seemingly legitimate one. Hence, pair 2 is correctly matched.**
  - When the user executes the presumably innocent program, the malware inside the Trojan can be used to open a backdoor into the system through which hackers can penetrate the computer or network.
- **Denial of Service (DOS) Attack**: The **deliberate act of overloading a particular service like website** from multiple computers and routes with the aim of disrupting that service. **Hence, pair 3 is correctly matched.**

247. Ans: A

Exp:

- **Gravitational waves** were predicted by **Albert Einstein's theory of general relativity in 1915,** but it wasn't until 2015 that they **were directly detected for the first time by the Laser Interferometer Gravitational-Wave Observatory (LIGO). Hence, statement 1 is correct.**

- Gravitational waves are ripples in the fabric of spacetime caused by the **acceleration of massive objects, such as black holes or neutron stars. Hence, statement 2 is not correct.**
- Gravitational waves are incredibly difficult to detect because they are very weak and interact very little with matter.
  - However, **LIGO's highly sensitive instruments were able to detect tiny vibrations in space-time** caused by gravitational waves passing through the Earth.

248. Ans: (b)

Exp:

- Radioactivity is the phenomenon of **spontaneous emission of particles or waves from the unstable nuclei** of some elements, not stable nuclei. **Hence, statement 1 is incorrect**
- The three types of radioactive emissions are alpha particles, beta particles, and gamma rays. **Hence, statement 2 is correct.**

249. Ans: C

Exp:

- The LHC is an experiment that collides two beams of particles to study physics at very high energies. **Hence, statement 1 is correct.**
- LHC is the **largest science experiment** in the world and is operated by **CERN** (European Organization for Nuclear Research). **Hence statement 2 is not correct.**
- A hadron is any **member of a class of subatomic particles that are built from quarks and thus react through the agency of a strong force.** The hadrons embrace mesons, baryons (e.g., protons, neutrons, and sigma particles), and their many resonances. **Hence, statement 3 is not correct.**

250. Ans: D

Exp:

Quantum Technology in Maritime Communication:

- Secure Communication:
  - Quantum **encryption can be used to ensure secure communication between ships** and shore stations, making it difficult for hackers to intercept or eavesdrop on the communication.
- **High-speed Communication:**
  - Quantum technology can enable **faster communication between ships and shore stations** by using quantum entanglement to transmit information instantaneously over long distances. **Hence, statement 1 is correct.**
  - This could be particularly useful for communication in remote areas where traditional communication methods are limited. Hence, statement 3 is correct.
- **Precision Navigation:**
  - Quantum sensors can be used to improve navigation accuracy by measuring the **Earth's magnetic field with high precision.**
  - This could help ships navigate through narrow channels, avoid obstacles, and improve overall safety.
- **Improved Weather Forecasting:**
  - Quantum computers can be used to **run complex simulations of weather patterns,** which can provide accurate and timely information to mariners about impending storms or other dangerous weather conditions. **Hence, statement 2 is correct.**

251. Ans: B

Exp:

What is Dark Matter?

- **About**:
  - Dark matter is a hypothetical form of matter that is believed to exist in the universe but is invisible. **Hence, statement 1 is not correct.**
  - It does not interact with light.
- **Importance of Dark Matter:**
  - Dark matter is essential to explaining the observed structure of the universe. **Hence, statement 2 is correct.**
  - It helps to account for the distribution of matter in galaxies and the cosmic web. Understanding dark matter is important for developing a complete understanding of the universe and its evolution.

252. Ans: (a)

Exp:

- Chagas disease is **not caused by a bacteria but by the protozoanTrypanosoma cruzi**, transmitted by **a family of bugs called 'triatomines'** or **'kissing bugs'**.
- Chagas disease **can't propagate by casual contact** with infected humans or animals. **Hence, statement 1 is not correct.**
- There are currently no vaccines available for Chagas disease, but antiparasitic medicines like Benznidazole and Nifurtimox can treat the disease.
- **Hence, statement 2 is correct.**

253. Ans: (c)

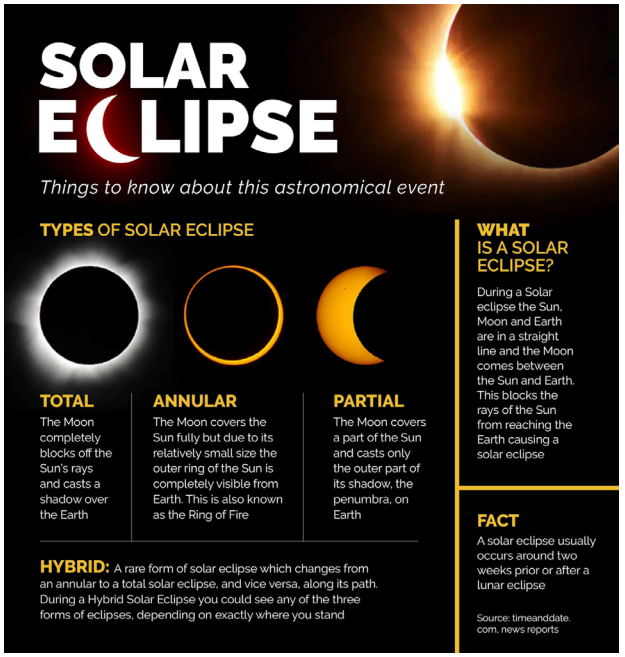
Exp:

- He was a **Plant Physiologist and physicist** who invented the **crescograph,** a device for measuring the growth of plants. He for the first time demonstrated that plants have feelings. **Hence, statement 1 is correct**
- Bose discovered **wireless communication and was named the Father of Radio Science** by the **Institute of Electrical and Electronics Engineering.**
- Bose is widely believed to be the **first one to generate electromagnetic signals in the microwave range. Hence, statement 2 is correct**

254. Ans: (c)

Exp:

- A total eclipse happens when the Moon completely blocks out the Sun while passing between the Earth and the Sun. **Hence, statement 1 is correct.**
- A hybrid solar eclipse occurs when the eclipse is total from some locations on Earth and annular from others, due to the viewer's position relative to the Moon's shadow. **Hence, statement 2 is correct.**
- The Ningaloo Eclipse was witnessed on April 20, 2023. It is a rare 'hybrid solar eclipse', caused by the curvature of the earth's surface and a shift from annular to total eclipse. **Hence, statement 3 is not correct.**



255. Ans: b

Exp:

Starship Project:

- **SpaceX's Starship spacecraft** and Super Heavy rocket – collectively referred to as Starship – represent a **fully reusable transportation system** designed to carry both crew and cargo to Earth orbit, the Moon, Mars and beyond.
- **Hence, statement 1 is not correct and 2 is correct.**
- Starship Super Heavy is powered by an array of Raptor engines, which are fuelled by liquid methane (CH_4) and liquid oxygen (LO_X). **Hence, statement 3 is correct.**

256. Ans: b

Exp:

LockBit Ransomware:

- LockBit, formerly known as "ABCD" ransomware, is a type of computer virus that **enters someone's computer and encrypts important files** so they can't be accessed.
- LockBit is usually used to attack companies or organizations **that can afford to pay a lot of money to get their files** back.
- It hides its harmful files by making them **look like harmless image files.** The people behind LockBit trick people into giving them access to the company's network by pretending to be someone trustworthy.
- Once they're in, LockBit disables **anything that could help the company recover their files and puts a lock on all the files** so that they can't be opened without a special key that only the LockBit gang has.
- **Hence, option b is the correct answer.**

257. Ans: b

Exp:

What is Malaria?

- **About:**
  - Malaria is a life-threatening disease caused by the **Plasmodium parasite.**
  - This parasite is transmitted to humans **through the bites of infected female Anopheles mosquitoes. Hence, statement 1 is correct.**
  - While **Plasmodium falciparum is responsible for more deaths, Plasmodium vivax is the most widespread** of all of the malaria species. **Hence, statement 3 is not correct.**

- **Vaccine:**
  - Till now, no malaria vaccine has shown the benchmark efficacy of 75% set by WHO. Still, WHO gave a go-ahead for the **first malaria vaccine called RTS,S** to be rolled out in high transmission African countries understanding the urgency of malaria control and prevention.
  - Similar to RTS,S vaccine the Oxford University has developed a vaccine called R21 which is still waiting for the WHO's approval.
  - **Hence, statement 2 is not correct.**

258. Ans: A

Exp:

Laws on Civil Nuclear Liability:

- **International Conventions:**
  - The international nuclear liability regime consists of multiple treaties and was strengthened after the 1986 Chernobyl nuclear accident.
  - The umbrella **Convention on Supplementary Compensation (CSC)** was adopted in 1997 with the aim of establishing a minimum national compensation amount.
    - India has ratified CSC in 2016. Hence, statement 1 is not correct.
- **India's Civil Liability for Nuclear Damage Act (CLNDA) of 2010:**
  - India enacted the Civil Liability for Nuclear Damage Act (CLNDA) in 2010 to put in place a speedy compensation mechanism for victims of a nuclear accident.
  - The CLNDA provides for strict and **no-fault liability on the operator of the nuclear plant**, where it will be held liable for damage regardless of any fault on its part.
  - In case the damage claims exceed ₹1,500 crore, the CLNDA expects the government to step in. **Hence, statement 2 is not correct.**
  - The act also provides for **supplier liability** over and above that of the operator.
    - Under this provision the operator of the nuclear plant, after paying their share of compensation has the right of recourse where the nuclear incident has resulted because of an act of supplier or his employee which includes supply of equipment or material with patent or latent defects or sub-standard services. Hence, statement 3 is correct.

259. Ans: C

Exp:

- The EMIC waves are the discreet electromagnetic emissions observed in the Earth's magnetosphere. **Hence, statement 1 is correct.**
- These waves are generated in the **equatorial latitudes** and propagate along magnetic field lines to its footprint in the high latitude ionosphere. **Hence, statement 2 is not correct.**
- Their signatures can be recorded in both space as well as ground-based magnetometers. **Hence, statement 3 is correct.**

260. Ans: B

Exp:

- **Uranus is an ice giant due to the chemical makeup of its interior**, with most of its mass being a hot and dense fluid of icy materials like water, methane, and ammonia.
- Uranus rotates on its side, with a 90-degree angle from the plane of its orbit. This leads to extreme seasons and long periods of sunlight and darkness.
  - Uranus is among only two planets in our solar system that rotate clockwise along with Venus. Hence, statement 1 is not correct.
- In 1986, **NASA's Voyager 2 made the first - and so far, the only - visit to Uranus. Hence, statement 2 is correct.**

261. Ans: D

Exp:

- Salt as a Sodium chloride is an **essential nutrient that plays several important roles** in the body. Sodium is an electrolyte that **helps to regulate the balance of fluids in the body and aids in the transmission of nerve impulses** and muscle contractions. **Hence, statement 1 is correct.**
- FSSAI has initiated the 'Aaj Se Thoda Kam' social media campaign. Despite these efforts, the average sodium consumption of Indians remains alarmingly high. Studies have found that the typical daily intake of sodium in India is around 11 grams, which is much higher than the recommended intake of 5 grams per day. **Hence, statement 2 is correct.**
- Excessive salt intake can have dangerous consequences such as **Hypertension,** heart disease, and stroke. **Hence, statement 3 is correct.**

262. Ans: C

Expl:

- Proton Beam Therapy (PBT) is a type of cancer treatment that uses a beam of high-energy protons to destroy cancer cells. **Hence, statement 1 is correct.**

- A proton is a positively charged elementary particle that is a fundamental constituent of all atomic nuclei.
- Unlike traditional radiation therapy, which uses X-rays, PBT can precisely target the tumour while minimising radiation exposure to surrounding healthy tissue. **Hence, statement 2 is correct.**
- PBT is typically delivered via a large, complex machine called a cyclotron, which accelerates protons to high speeds and delivers them to the tumour site.

263. Ans: C

Exp:

- The **Drugs and Cosmetics Act, 1940** regulates the import, manufacturing and distribution of drugs in India. **Hence, Statement 1 is correct.**
  - However, there is no statutory definition of "e-pharmacy" either under the Drugs and Cosmetics Act, 1940 or the Pharmacy Act, 1948.
- However, the electronic sale of physician-prescribed drugs from online drug store sites is expressedunder the IT Act, 2000.
- The **Draft e-pharmacy rules were floated by the Ministry of Health and family welfare in 2018. Hence Statement 2 is correct.**
- In February 2023, the Ministry of Health and Family Welfare issued show cause notices to at least 20 companies, including Tata-1mg, Flipkart, Apollo, PharmEasy, Amazon, and Reliance Netmeds for selling medicines online.

264. Ans: D

Exp:

- Dengue is a mosquito-borne tropical disease caused by the dengue virus (Genus Flavivirus), transmitted by several species of mosquito within the genus Aedes, principally Aedes aegypti. **Hence Statement 1& 2 are correct.**
  - This mosquito also transmitschikungunya and Zika infection. **Hence statement 3 is correct.**

265. Ans: B

Exp:

- **About Helium:**
  - Helium is a noble gas and has a **closed-shell electronic configuration, making it stable and unreactive. Hence, statement 1 is not correct.**
  - It has the **lowest boiling and melting points** of any element and exists only as a gas, except under extreme conditions. **Hence, statement 2 is correct.**
- **Discovery of Helium:**
  - Helium was first discovered in 1868 by French astronomer Jules Janssen and English astronomer Joseph Norman Lockyer, who observed a yellow spectral line in the light emitted by the sun during a solar eclipse.
  - Helium gets its name from the Greek word "helios," which means sun.
- **Sources and Extraction of Helium:**
  - Helium is the second most abundant element in the universe, after hydrogen. However, it is relatively rare on Earth, with most of it being produced by the decay of radioactive elements in the Earth's crust.
  - Natural gas is the primary source of helium on Earth.
    - Helium is extracted from natural gas using a process called cryogenicdistillation.

266. Ans: D

Expl:

- Erythritol is a type of **sugar alcohol commonly used as a sugar substitute in foods and beverages**. **Hence, statement 1 is correct.**
- Unlike traditional sugars, it **has no calories and does not raise blood sugar levels**. **Hence, statement 2 is correct.**
  - Artificial sweeteners are **common replacements for table sugar in low-calorie, low-carbohydrate and "keto" products** (high in fat and low in carbohydrates).
- Erythritol is also **believed to have a lower Glycemic Index (GI)** than other sweeteners, **meaning it may not impact insulin levels as strongly. Hence, statement 3 is correct.**
  - GI is a value **used to measure how much specific foods increase blood sugar levels**.

267. Ans: A

Exp:

- **About Bio Brain:**
  - Researchers plan to **combine brain organoids with modern computing methods using machine learning** to create "bio-computers".**Hence, statement 1 is correct.**
  - They will **grow organoids inside structures with multiple electrodes** that can record the firing patterns of neurons and mimic sensory stimuli. **Hence, statement 2 is correct.**

- Machine-learning techniques will then be used **to analyse the effect of neuron response patterns on human behaviour** or biology.
- Scientists have already grown human neurons on a microelectrode array and trained them to generate electrical activity similar to what electrons would generate while playing table tennis.

- **Opportunities for 'Bio-Computers':**
  - **Brain organoids developed using stem cells from individuals** with diseases like Parkinson's disease and microcephaly can aid drug development for these conditions.
  - These organoids **can provide insights into the biological basis of human cognition**, learning, and memory by comparing the data on brain structure, connections, and signalling between healthy and patient-derived organoids.
  - While **human brains** are slower than computers at simple arithmetic, they **outshine machines at processing complex information**. **Hence, statement 3 is not correct.**

268. Ans: C

Exp:

- Across India, an **outbreak of a respiratory illness with symptoms of cold, sore throat and fever accompanied by fatigue** has been observed recently.
- The Indian Council of Medical Research (ICMR) **confirmed that Influenza Sub-type H3N2 has been causing this illness**.
  - It further warned **that the virus appeared to lead to more hospitalisations than other Influenza subtypes**.
- There are **four types of seasonal influenza viruses**, types A, B, C and D. **Hence, statement 1 is correct.**
- **Influenza A and B viruses circulate and cause seasonal epidemics** of disease. **Hence, statement 2 is correct.**
  - Influenza A viruses are the only influenza **viruses known to cause flu pandemics** (i.e., global epidemics of flu disease).

269. Ans: B

Exp:

- Recently, the Indian Space Research Organisation (ISRO) has successfully carried out the **controlled Re-Entry experiment for the decommissioned Megha-Tropiques-1 (MT-1) Satellite. Hence, Statement 3 is correct.**
- It is an **Indo-French Earth Observation Satellite**, which was launched in October 2011 for carrying out **tropical weather and climate studies**. **Hence, statement 1 is not correct. and, statement 2 is correct.**
- The main objective of this mission is to understand the life cycle of convective systems that influence the tropical weather and climate and their role in the associated energy and moisture budget of the atmosphere in tropical regions.

270. Ans: A

Exp:

Scrub Typhus:

- Scrub typhus, **a life-threatening infection caused by *Orientia tsutsugamushi* bacteria — is a major public health threat in South and Southeast Asia**. As per estimates, nearly one million cases are reported from South and Southeast Asia with 10% mortality. **India is one of the hotspots with at least 25% of the disease burden**. **Hence, option A is correct.**
- Scrub typhus is a major public health threat **because of the high mortality rate in patients with severe disease despite diagnosis and treatment**. It is **transmitted to humans by bites from tiny, infected larvae of mites**. Only the larval stage of the mite requires a blood meal, which is usually from rodents. **Combination therapy using both doxycycline and azithromycin is far more effective in treating severe scrub typhus** than monotherapies of either drug by itself.
- The infection does not cause typical symptoms, thus making correct and early diagnosis difficult. Also, **awareness about infection and disease is very low despite the high disease burden and mortality rate**. Increasing awareness can clearly bring down the mortality rate.

271. Ans: D

Exp:

- Genome editing technology creates hybrids between living and extinct organisms. Scientists insert edited DNA from an extinct species into the nucleus of a reproducing cell. They use this technique to resurrect more species, including those whose remains are not well-preserved. **Hence, Statement 3 is correct.**
- The term designer baby refers to a baby who has been genetically modified through germline gene editing. Germline editing is the technique used for modifying the DNA of an organism. Particular traits set by parents or scientists are given to a human embryo or egg or sperm to produce a child of the desired trait. **Hence, Statement 1 is correct.**

- Genome editing has been revolutionizing plant biology and biotechnology by enabling precise, targeted genome modifications. **Editing provides new methods for genetic improvement of plant disease resistance and accelerates resistance breeding. Hence, Statement 2 is correct.**

272. Ans: A

Exp:

- European Space Agency (ESA) wants to give the moon its own time zone. National Aeronautics and Space Administration (NASA) is shooting for its first flight to the moon with astronauts in more than a half-century in 2024, with a lunar landing as early as 2025.
- For now, **a moon mission runs on the time of the country that is operating the spacecraft**. An internationally accepted lunar time zone would make it easier for everyone, especially since more governments and companies are aiming for the moon. **Hence, Option A is correct.**

273. Ans:A

Exp:

- Antibiotics are remarkable drugs capable of killing biological organisms in one's body without harming the body. These are used for everything from preventing infections during surgeries to protecting cancer patients undergoing chemotherapy. **Hence, statement 1 is correct.**
- Antibiotics are drugs that are used to treat or prevent certain types of bacterial infections. They either kill bacteria or prevent their reproduction and spread. Antibiotics have no effect on viral infections. This includes the common cold, flu, and the majority of coughs and sore throats.**Hence, statement 2 is not correct.**

274. Ans: C

Expl:

- Lightening is a very rapid and massive discharge of electricity in the atmosphere. It is the process of occurrence of a natural 'electrical discharge of very short duration and high voltage between a cloud and the ground or within a cloud', accompanied by a bright flash and sound, and sometimes thunderstorms.
  - Inter cloud or intra cloud (IC) lightning are visible and harmless.
  - Cloud to ground (CG) lightning is harmful as the 'high electric voltage and electric current' leads to electrocution. **Hence, statement 2 is correct.**
- It is a result of the difference in electrical charge between the top and bottom of a cloud. **Hence, statement 1 is correct.**
- The lightning-generating clouds are typically about 10-12 km in height, with their base about 1-2 km from the Earth's surface. The temperatures at the top range from -35°C to -45°C.

275. Ans: A

Exp:

Protecting Earth's Orbit from Space Debris

- Space Debris: Space debris refers to the **collection of artificial objects in orbit around the Earth** that have lost their utility or are no longer in use.
- These objects include **non-functional spacecraft, abandoned launch vehicle stages, mission-related debris**, and fragmentation debris.
- **Initiatives to Curb Space Debris:**
  - India:
    - In 2022, ISRO set up the System for Safe and Sustainable Operations Management (IS 4 OM) to continually monitor objects posing collision threats.
    - **'Project NETRA'**is also an early warning system in space to detect debris and other hazards to Indian satellites.
      - 'Project NETRA' is an early warning system in space to detect debris and other hazards to Indian satellites.
      - Once operational, it will give India its own capability in Space Situational Awareness (SSA) like the other space powers. **Hence, option A is correct.**

276. Ans: B

Exp:

- **Japanese Encephalitis (JE) is a viral infection** that can cause inflammation in the brain. **Hence, statement 1 is not correct.**
  - It is caused by a flavivirus that belongs to the same genus as dengue, yellow fever and West Nile viruses.
  - Japanese encephalitis virus (JEV) is also a major cause of Acute Encephalitis Syndrome (AES) in India.
- The disease is **transmitted to humans through bites from infected mosquitoes** of the Culex species. **Hence, statement 2 is correct.**
  - These mosquitoes breed mainly in rice fields and large water bodies rich in aquatic vegetation.

- There is no antiviral treatment for patients with JE.
  - Treatment, available, is supportive to relieve symptoms and stabilise the patient.
- Safe and effective JE vaccines are available to prevent the disease.
  - JE vaccination is **also included under the Universal Immunisation Program** of the Government of India. **Hence, statement 3 is not correct.**

277. Ans: C

Exp:

- **About End-to-End Encryption (E2E):**
  - E2E encryption is a **secure communication mechanism** that allows data to be encrypted on the sender's device, transmitted securely over the internet or any communication channel, and then **decrypted only by the intended recipient**. **Hence, statement 1 is correct.**
  - The message can **only be decrypted by the intended recipient** using a **unique decryption key** that is **only accessible by the recipient's device**. **Hence, statement 2 is not correct.**
    - This means that no one else, **not even the service provider, can access the content of the message or data** being transmitted. **Hence, statement 3 is correct.**
  - E2E encryption is used to **ensure privacy and security in various communication platforms**, such as **messaging apps, email services, and file-sharing services,** as it provides a high level of protection against unauthorized access, interception, or eavesdropping by hackers, governments, or services providers. **Hence, statement 4 is not correct.**

278. Ans: C

Exp:

- **Shukrayaan-1** is a proposed mission by the **Indian Space Research Organisation (ISRO)** to study Venus. The orbiter will likely study the planet's geological and volcanic activity, emissions on the ground, wind speed, cloud cover, and other planetary characteristics from an elliptical orbit. **Hence pair 1 is correct**.
- **Magellan** was a **NASA mission to Venus** that was launched on May 4, 1989.The Magellan spacecraft was the **first to image the entire surface of Venus using radar**, which allowed scientists to create detailed topographic maps of the planet. **Hence pair 2 is not correct**.
- **DAVINCI+ and VERITAS** are two upcoming missions planned by **NASA** to explore Venus.
  - DAVINCI+ is a mission that will study **Venus's atmosphere**, particularly the composition of its gases and how it interacts with the surface.
  - VERITAS, on the other hand, is an **orbiter mission** that will study Venus's geology and topography. **Hence pair 3 is correct**.

279. Ans: A

Exp:

- Starberry Sense is developed by using **Raspberry Pi Zero** with is available at low cost. The **Raspberry Pi Zero is a compact size** (smaller than a credit card) computer with **low power consumption,** and ability to run **custom software make** it a suitable platform for a star sensor application. **Hence statement 1 is Correct.**
- The **Strarberry Sense** star sensor is **less expensive** than those on the market by less than 10% based on the commercial/off-the-shelf components which are **readily available.**
- **Indian Institute of Astrophysics (IIA)** has developed Starberrysense , a low-cost star sensor for astronomy. **Hence Statement 2 is not correct.**

280. Ans: C

Exp:

Launch Vehicles Developed by ISRO:

- **Satellite Launch Vehicle (SLV):** The first rocket developed by ISRO was simply called SLV, or Satellite Launch Vehicle. **Hence, statement 1 is correct.**
  - It was followed by the Augmented Satellite Launch Vehicle or ASLV.
- **Augmented Satellite Launch Vehicle (ASLV):** SLV and ASLV both could carry small satellites, weighing up to 150 kg, to lower earth orbits.
  - ASLV operated till the early 1990s before PSLV came on the scene.
- **Polar Satellite Launch Vehicle (PSLV)**: PSLV's first launch was in 1994, and it has been ISRO's main rocket ever since. Today's PSLV, however, is vastly improved and several times more powerful than the ones used in the 1990s.
  - It is the **first Indian launch vehicle to be equipped with liquid stages**. **Hence, statement 2 is correct.**
  - PSLV is the most reliable rocket used by ISRO to date, with 52 of its 54 flights being successful.
  - It successfully launched two spacecraft – **Chandrayaan-1 in 2008 and Mars Orbiter Spacecraft in 2013** – that later travelled to Moon and Mars respectively.

- **Geosynchronous Satellite Launch Vehicle (GSLV):** GSLV is a much more powerful rocket, meant to carry heavier satellites much deeper into space. To date, GSLV rockets have carried out 18 missions, of which four ended in failure.
  - It can take 10,000 kg of satellites to lower the earth's orbits.
  - The indigenously developed Cryogenic Upper Stage (CUS), forms the third stage of GSLV Mk II.
  - Mk-III versions have made ISRO entirely self-sufficient in launching its satellites.
    - Before this, it used to depend on the European Arianne launch vehicle to take its heavier satellites into space.
  - ISRO **has renamed the GSLV Mark-III as Launch Vehicle Mark-III.** A GSLV – for the Geostationary Orbit (GEO) – will continue to be called so.
    - The LVM3 will go everywhere —GEO, Medium Earth orbit (MEO), LEO, and missions to the moon, sun.

281. Ans: b

Exp:

- Rabies is a **viral infection** that affects the **central nervous system of mammals, including humans**. It is caused by the rabies virus and is transmitted through the saliva of infected animals, most commonly through bites. **The virus attacks the brain and nervous system,** and if left untreated, it is almost always fatal. **Hence Statement 1 is not correct.**
- In India, **dogs are responsible for about 97% of human rabies**, followed by cats (2%), jackals, mongooses and others (1%). **Hence Statement 2 is correct.**
- **India is endemic for rabies**, and accounts for 36% of the world's rabies deaths. **Hence statement 3 is correct**.

282. Ans: B

Exp:

- A **geomagnetic storm** refers to the **disruptions to the Earth's magnetic field caused by solar emissions.**
  - When a **Coronal Mass Ejection (CME)** or a high-speed solar stream reaches our planet, it slams into the magnetosphere. **Hence, statement 2 is correct.**
- The Earth's magnetosphere is created by its magnetic fields and it usually p**rotects us from the particles emitted by the Sun. Hence, statement 1 is not correct.**
  - When a CME or a high-speed stream arrives at Earth, it peels open the planet's magnetosphere, kind of like an onion. This allows energetic solar wind particles to stream down and hit our atmosphere over the poles.
- Solar weather events like this can also supercharge auroras, sometimes making them visible in places where they wouldn't have been otherwise.

283. Ans: B

Exp:

- Daylight Saving Time (DST) is the practice of turning the clock ahead as warmer weather approaches and back as it becomes colder again. **Hence, statement 1 is not correct.**
- The purpose of doing so is that people will have one more hour of daylight in the afternoon and evening during the warmer season of the year.
- The daylight-saving time is followed in over 70 countries on various dates.
- India does not follow daylight saving time; countries near the Equator do not experience high variations in daytime hours between seasons. **Hence, statement 2 is not correct.**
- There is also a disadvantage of DST which includes disruption of the body clock or circadian rhythm. **Hence, statement 3 is correct.**

284. Ans: C

Exp:

- When the body gets too hot, it begins to perspire or sweat to cool itself off. If the perspiration is not able to evaporate, the body cannot regulate its temperature. Evaporation is a cooling process. **When perspiration is evaporated off the body, it effectively reduces the body's temperature. Hence, statement 1 is correct.**
- **When the atmospheric moisture content (i.e., relative humidity) is high, the rate of evaporation from the body decreases.** The human body feels warmer in humid conditions. The opposite is true when the relative humidity decreases because the rate of perspiration increases. The body actually feels cooler in arid conditions.**Hence, statement 2 is correct.**

285. Ans: C

Exp:

- Type 1 Diabetes is also known as juvenile diabetes (as it mostly affects children of age 14-16 years), this type occurs when the body fails to produce sufficient insulin. **Hence, statement 1 is correct.**
- Type 1 Diabetes is predominantly diagnosed in children and adolescents. Although the prevalence is less, it is much more severe than type 2.

- Type 2 Diabetes affects the way the body uses insulin. While the body still makes insulin.
- Type 2 diabetes can occur at any age, even during childhood. However, this type of diabetes occurs most often in middle-aged and older people. **Hence, statement 2 is correct.**

286. Ans: d

Exp:

- LGRBs **last for more than two seconds** and are **thought to be caused by the collapse of massive stars, known as supernovae**. These explosions release a tremendous amount of energy and create a black hole at their center. **Hence, statement 1 is not correct.**
- **GRB 221009A is a 5-minute-long radiation and it is the bright and long-lasting GRB recorded to date.** GRB 200826A is a short GRB. **Hence, statement 2 is not correct.**

287. Ans: A

Exp:

- The **piezoelectric effect** is a phenomenon in which **certain materials produce an electrical chargein response to mechanical stress or pressure.**
  - This effect occurs when the material is subjected to a force that causes its molecules to become polarized, meaning that the positive and negative charges within the material are separated from each other. **Hence, statement 1 is correct.**
- The Piezoelectric effect can be observed in solids and liquids. **Hence, statement 2 is not correct.**

288. Ans:(b)

Exp:

- The Dakshin Gangotri station (decommissioned), the Maitri station and **BHARTI** were established to carry out research in Antarctica. **Hence option (a) is correct.**

289. Ans: A

Exp:

- **Artificial Intelligence (AI):**
  - It describes the **action of machines accomplishing tasks** that have **historically required human intelligence.**
  - It includes technologies like machine learning, pattern recognition, big data, neural networks, self-algorithms etc. **Hence, statement 1 is correct.**
  - The origin of the concept can be traced back to the greek mythology, although it is only during modern history when stored program electronic computers were developed.
    - Example: Millions of algorithms and codes are there around the humans to understand their commands and perform human-like tasks. Facebook's list of suggested friends for its users, a pop-up page, talking about an upcoming sale of the favourite brand of shoes and clothes, that comes on screen while browsing the internet, are the work of artificial intelligence.
  - **A Complex Technology:** AI involves complex things such as feeding a particular data into the machine and making it react as per the different situations. It is basically about creating self-learning patterns where the machine can give answers to the never answered questions like a human would ever do.
  - **AI is a Different Technology**
    - AI is different from hardware driven robotic automation. Instead of automating manual tasks, AI performs frequent high volume computerised tasks reliably. Hence, statement 2 is not correct.
    - AI is often misunderstood for machine learning. AI is a broader concept with a bunch of technologies that include machine learning and other technologies like natural language processing, inference algorithms, neutron networks etc.

290. Ans: A

Exp:

- **About GPT-4:**
  - According to OpenAI, **GPT-4 is more advanced than its predecessors** when it comes to **creativity, visual comprehension and context**. **Hence, statement 1 is correct.**
- It also possesses the ability to collaborate with users on various creative projects, including **music, screenplays, technical writing**, etc.
  - It can process up to **25,000 words of text and facilitate extended** conversations. **Hence, statement 2 is not correct.**
  - **GPT-4 can encompass more than just text** – it also accepts images as input.
- On the contrary, **GPT-3 and GPT-3.5 only operated in one modality, text, allowing users only to ask questions by typing** them out.
  - GPT-4 is **more multilingual** and OpenAI has demonstrated that **it outperforms GPT-3.5 and other Large Language Models (LLMs)** by accurately answering thousands of multiple-choice across 26 languages.
- It handles English best with an 85.5% accuracy, but Indian languages like Telugu aren't too far behind either, at 71.4%.

291. Ans: C

Exp:

- Waste-to-energy projects use non-recyclable dry waste to generate electricity and ease the Solid Waste Management (SWM) burden. **Hence, statement 1 is correct.**
- Solid waste in India is 55-60% biodegradable organic waste, which can be converted into organic compost or biogas; 25-30% non-biodegradable dry waste; and around 15% silt, stones, and drain waste.
- Of the non-biodegradable dry waste, only 2-3% – including hard plastics, metals, and e-waste – is recyclable.
- The remainder consists of low-grade plastic, rags, and cloth that can't be recycled.
- Pyrolysis and plasma gasification are thermal processes that use high temperatures to break down waste. **Hence, statement 2 is correct.**

292. Ans: D

Exp:

Governor's Power to Call for Floor Test:

- Recently, the Supreme Court (SC) has said that the Governor cannot call for a Floor Test on the basis of internal differences in the Party Members. **Hence, statement 1 is not correct.**
- The SC while hearing a case about a dispute between two factions in a political party, discussed the powers and role of the Governor in calling for a trust vote.

SC's Observations on the Governor's Floor Test Call:

- In 2016, the SC in *Nabam Rebia and Bamang Felix vs Deputy Speaker case* (the Arunachal Pradesh Assembly case) said that the power to summon the House is not solely vested in the Governor and should be exercised with aid and advice of the Council of Ministers and not at his own. **Hence, statement 2 is not correct.**
  - The Court highlighted the facts that the Governor is not an elected authority and is a mere nominee of the President, such a nominee cannot have an overriding authority over the representatives of the people, who constitute the House or Houses of the State Legislature.

293. Ans: D

Exp:

- About Fluorescence Microscopy:
  - An **optical microscope** views an object by studying how it **absorbs, reflects or scatters visible light. Hence, statement 1 is not correct.**
  - A fluorescent microscope views an object by **studying how it reemits light that it has absorbed,** i.e., how it fluoresces. This is its **basic principle. Hence, statement 2 is not correct.**
    - The object is illuminated with light of a specific wavelength. Particles in the object absorb this light and reemit it at a higher wavelength. These particles are called fluorophores; the object is infused with them before being placed under the microscope.

294. Ans: A

Exp:

- Pressure-driven diffusion of water molecules through a semi-permeable membrane is the primary mechanism by which Reverse Osmosis (RO) desalination removes salt from seawater. The high pressure applied to the seawater on one side of the membrane causes the water molecules to flow through the membrane, while the salt ions are left behind, resulting in desalinated water. **Hence, option A is correct.**

295. Ans: A

Exp:

- **About Coronary Heart Disease:**
  - **Coronary heart disease (CHD)** is a condition in which the **blood vessels** that supply the heart with oxygen-rich blood become narrow due to the **buildup of fatty deposits (plaques) inside the arteries. Hence, statement 3 is correct.**
  - Over time, these deposits can **harden and narrow the arteries,** reducing the flow of blood to the heart.
- **Causes:**
  - **Unhealthy lifestyles,poor diets, physical inactivity, tobacco use, and harmful levels of alcohol consumption** are the major contributors to **coronary heart disease. Hence, statement 1 is correct.**
    - Damaged heart tissue cannot be regrown in humans, and the only option is to undergo heart transplant, which comes with its own complications. Hence, statement 2 is not correct.

296. Ans: D

Exp:

- **Neutrinos are the second most abundant particles** in the Universe **after photons** (light particles), produced in copious amounts in the cores of stars. **Hence, statement 1 is not correct.**

- Because they are so ubiquitous, their properties are windows into the microscopic structure of the universe.

- **Significance:** Probing of oscillations of neutrinos and their relations with mass are crucial in studying the origin of the universe.
- **Sources of Neutrinos:** Neutrinos are created by various radioactive decays; during a supernova, by cosmic rays striking atoms etc.
- **Anti-Particles:**
  - Every elementary particle has an antiparticle. If the two meet, they will destroy each other in a flash of energy.
  - The electron's antiparticle is the positron. Similarly, **neutrinos have anti-neutrinos.Hence, statement 2 is not correct.**
  - However, an electron is distinguishable from a positron because they have opposite charges.
    - Neither neutrinos nor anti-neutrinos have electric charge, nor any other properties to really differentiate between them. Hence, statement 3 is correct.

297. Ans: A

Expl:

- The Raman Effect is the scattering of light by a medium, resulting in a shift in the frequency of the scattered light. **Hence, option A is correct.**

298. Ans: B

Expl:

- The explosion, called Tycho, was visible to people on Earth in 1572, and the shock wave from the blast is still propagating through the cosmos.
- Tycho is classified as a Type Ia supernova, which occurs when a white dwarf star shreds its companion star, triggering a violent explosion and sending debris hurtling into space at tremendous speeds.
- Tycho released as much energy as the Sun would emit over ten billion years and blasted particles out into space near the speed of light.
- Researchers used IXPE to reveal the magnetic field geometry close to Tycho's shock wave to investigate further how particles are accelerated there and to study polarised X-rays from the supernova remnant.
- **Hence, option B is correct.**

299. Ans: A

Exp:

- Chandrayaan-3 is **India's third moon mission and is a follow-up of Chandrayaan-2** of July 2019, **which aimed to land a rover on the lunar South Pole. Hence, statement 1 is correct.**
  - The mission is **scheduled to be launched later in 2023 by Launch Vehicle Mark 3 (LVM3)** from the Satish Dhawan Space Centre at Sriharikota.
- The**subsequent failure of the Vikram lander led to the pursuit of another mission to demonstrate the landing capabilities needed for the Lunar Polar Exploration Mission** proposed in partnership with Japan for 2024.
- **The Mission will have three major modules-** the Propulsion module, Lander module and Rover. **Hence, statement 2 is not correct.**
  - The propulsion module **will carry the lander and rover configuration till 100 km lunar orbit.**
  - The Lander **will have the capability to soft land at a specified lunar site and deploy the Rover which will carry out in-situ chemical analysis** of the lunar surface during the course of its mobility.