Carbon Dating

Why in News?

Recently, a Varanasi district court has **rejected the plea to conduct carbon-dating of the disputed structure** known to have been found inside the premises of the Gyanvapi Mosque.

What is Carbon Dating?

- **About:**
  - 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.
  - The Carbon Dating method **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.
- **Uses:**
  - It has **proved to be a versatile technique of dating fossils** and archaeological specimens from 500 to 50,000 years old.
  - The method is **widely used by geologists, anthropologists, archaeologists,** and investigators in related fields.
- **Working of Carbon Dating:**
  - Because plants and animals get their carbon from the atmosphere, they too acquire C-12 and C-14 in roughly the same proportion as is available in the atmosphere.
    - **Plants get their carbon through photosynthesis**; animals get it mainly through food.
  - When they die, their interactions with the atmosphere stops.
  - While C-12 is stable, the radioactive C-14 reduces to one half of itself in about 5,730 years — known as its **‘half-life’.**
  - The **changing ratio of C-12 to C-14 in the remains of a plant or animal** after it dies can be measured and can be used to deduce the approximate time when the organism died.

What about the Dating Method other than Carbon Dating?

- **Radiometric Dating Methods**:
  - In this method, decays of other radioactive elements that might be present in the material become the basis for the dating method.
  - **Some Types of this Method:**

- **Potassium-Argon Dating:**
    - The radioactive isotope of potassium decays into argon, and their ratios can give a clue about the age of rocks.
- **Uranium-Thorium-Lead Dating:**
    - Uranium and thorium have several radioactive isotopes, and all of them decay into the stable lead atom. The ratios of these elements present in the material can be measured and used to make estimates about age.

Source: IE