Carbon Dating Chemistry Questions with Solutions

Q1. The carbon -14 dating method is based on the fact that:

a.) ratio of carbon–14 and carbon–12 is constant
b.) carbon–14 is the same in all objects
c.) carbon–14 is highly insoluble
d.) All of the above

Correct Answer– (a.) ratio of carbon–14 and carbon–12 is constant.

Q2. Radio carbon dating is done by estimating in a specimen:

a.) The amount of ordinary carbon still present.
b.) The amount of radiocarbon still present.
c.) The ratio of the amount of $^{14}_{6}C$ to $^{12}_{6}C$ still present.
d.) The ratio of the amount of $^{12}_{6}C$ to $^{14}_{6}C$ still present.

Correct Answer– (c.) The ratio of the amount of $^{14}_{6}C$ to $^{12}_{6}C$ still present.

Q3. C-14 is used in the carbon dating of dead objects due to which of the following reasons?

a.) Its half-life is 10^3 years.
b.) Its half-life is 10^4 years.
c.) It is found in nature abundantly and in a definite ratio.
d.) It is found in dead animals abundantly.

Correct Answer– (c.) It is found in nature abundantly and in a definite ratio.

Q4. Carbon dating is-

a.) a process of treatment of diseases in animals.
b.) a process to determine the age of archaeological samples.
c.) a medicine for the treatment of cancer.
d.) a process to determine the age of a meteorite.

Correct Answer– (b.) a process to determine the age of archaeological samples.

Q5. The half-life of carbon used in the carbon dating technique is about:

a.) 500 years

b.) 5000 years
c.) 50 years
d.) 5×10^4 years

Correct Answer– (b.) 5000 years

Q6. Who discovered the radioactive carbon decaying?

Answer. Willard Libby proposed a technique for dating organic materials in 1946 by measuring their carbon-14 content, a newly discovered radioactive isotope of carbon.

Q7. What is the isotope used in carbon dating?

Answer. Radiocarbon dating (also known as carbon dating or carbon-14 dating) is a technique for determining the age of an organic object by utilising the properties of radiocarbon (^{14}C), a radioactive isotope of carbon.

Q8. How does carbon dating work?

Answer.

- Carbon-14 is a weakly radioactive isotope of carbon that serves as an isotopic chronometer.
- C-14 dating can only be used on organic and some inorganic materials (not applicable to metals).
- The three main radiocarbon dating methods are gas proportional counting, liquid scintillation counting, and accelerator mass spectrometry.

Q9. Can carbon dating be used in humans?

Answer. In cases involving unidentified human remains, measuring carbon-14 levels in human tissue could assist forensic scientists in determining the age and year of death. Carbon-14 dating (also known as radiocarbon dating) has long been used by archaeologists to estimate the age of various objects.

Q10. Is carbon-14 toxic to humans?

Answer. No. Even large amounts of the isotope exposed to the environment pose no risk to people. The radiation barely penetrates the body's outermost layer of skin.

Q11. What is the basic principle of the carbon dating method?

Answer. Radiocarbon (carbon 14) is an unstable and weakly radioactive isotope of the element carbon. Carbon 12 and carbon 13 are stable isotopes.

Carbon 14 is constantly formed in the upper atmosphere as a result of the interaction of cosmic ray neutrons with nitrogen 14 atoms. It oxidises quickly in the air to form carbon dioxide and enters the global carbon cycle.
Carbon 14 is assimilated by plants and animals throughout their lives. When they die, they stop exchanging carbon with the biosphere, and their carbon 14 content begins to decrease at a rate determined by the radioactive decay law.
Radiocarbon dating is essentially a technique for determining residual radioactivity.

Q12. How accurate is carbon dating?

Answer. In many cases, advances in technology have allowed radiocarbon dating to become accurate to within a few decades.

Q13. How is Carbon-14 made?

Answer. Carbon-14 is constantly formed in nature as a result of neutrons interacting with nitrogen-14 in the Earth's atmosphere; the neutrons required for this reaction are produced by cosmic rays interacting with the atmosphere.

Every day, a large number of cosmic rays enter the Earth's atmosphere. When a cosmic ray collides with an atom in the atmosphere, it produces a secondary cosmic ray in the form of an energetic neutron, which then collides with nitrogen atoms. When a neutron collides with a nitrogen-14 atom, it transforms into a carbon-14 atom and a hydrogen atom.

Q14. How is carbon-14 used to determine the age of fossils?

Answer. Carbon from the atmosphere is absorbed by all living things, including radioactive carbon-14. When a plant or animal dies, it no longer absorbs carbon. However, the radioactive carbon-14 it has accumulated is still decaying. Scientists can estimate how long ago the plant or animal died by measuring the amount of carbon-14 left over.

Q15. Why Isn't Carbon Dating Used to Determine the Age of Fossils?

Answer. Radiocarbon (carbon-14) is an extremely unstable element that rapidly degrades into nitrogen. After only 5,730 years, half of the original amount of carbon-14 will decay back to the stable element nitrogen-14. After only 57,300 years, at this rate of decay, there will be almost no carbon-14 atoms left (or ten half-lives).

So, if fossils are truly millions of years old, as evolutionary scientists claim, they would contain no carbon-14 atoms. Indeed, if all of the atoms that make up the Earth were radiocarbon, there should be no carbon-14 atoms left after only 1 million years.

Practise Questions on Carbon Dating

Q1. Carbon dating is best suited for determining the age of fossils if their age in years is of the order of-

a.) 10^3
b.) 10^4
c.) 10^5
d.) 10^6

Correct Answer– (b.) 10^4.

Q2. Fill in the blank.
Radiocarbon dating is based on the principle that all living matter possesses a certain amount of a radioactive form of ____.

Answer. Radiocarbon dating is based on the principle that all living matter possesses a certain amount of a radioactive form of carbon.

Q3. Explain carbon dating.

Answer. The age or date of organic matter is determined by the relative proportions of the carbon isotope - carbon-14 that it contains.
As radioactive carbon-14 decays and is not replaced by exchange with the atmosphere, the ratio between them changes. Carbon dating is a technique for estimating the age of once-living materials. It is based on the decay rate of the radioactive carbon isotope ^{14}C, a form of carbon consumed by all living organisms.

Q4. What is measured using the carbon dating method?

Answer. The carbon dating technique is used to estimate the age of living/fossil organisms. It is based on the decay rate of a radioactive carbon isotope, which is a type of carbon that all living organisms consume while alive.

Q5. Where can you find carbon-14?

Answer. Carbon from the atmosphere is absorbed by all living things, including radioactive carbon-14. It is mostly found in atmospheric carbon dioxide because collisions between nitrogen atoms and cosmic rays constantly produce it.