CHEMISTRY 9th (New Book)

CHAPTER NO 2 STRUCTURE OF ATOM

EXERCISE MCQS AND SHORT QUESTIONS

1.	18	2.	Electrons and protons were discovered
3.	All the isotopes have the same atomic number, so there is no need to give them separate places.	4.	Neutron
5.	^{16}O	6.	14.0021
7.	It helps determine the age of organic matter.	8.	Particles are held together by a strong nuclear force.
9.	By revolving around the nucleus	10.	27.8%

i. Why is almost all the mass of an atom concentrated in its nucleus?

Almost all the mass of an atom is concentrated in its nucleus because the nucleus contains protons and neutrons, which are much heavier than electrons. A proton is 1836 times heavier than an electron, so the electron's mass is negligible by comparison.

ii. Why are elements different from one another?

Elements are different from one another because they have different numbers of protons in their nuclei. This number, called the atomic number, determines the element's identity and properties.

iii. How many neutrons are present in $^{210}_{83}Bi$?

Given: Atomic Number (Z) = 83, Atomic Mass (A) = 210

Formula: Number of Neutrons = A - Z

Solution: 210 - 83 = 127 neutrons

iv. Why is tritium ($^{3}_{1}H$) a radioactive element?

Tritium is a radioactive element because it has an unstable nucleus (with one proton and two neutrons) that undergoes radioactive decay to become more stable.

v. How can an atom absorb and emit energy?

An atom absorbs energy when its electrons move from lower energy levels to higher energy levels (excited states). It emits energy when these electrons fall back to lower energy levels, releasing the excess energy as light or other forms of electromagnetic radiation.

CONSTRUCTED RESPONSE QUESTIONS

i. Why does the energy of an electron increase as we move from the first shell to the second shell?

The energy of an electron increases because the second shell is farther from the nucleus. As a result, the electrostatic attraction between the nucleus and the electron decreases, and the electron gains more potential energy.

ii. Why is it needed to lower the pressure of the gas inside the discharge tube?

The pressure is decreased to reduce the number of gas molecules. With fewer molecules, there is less hindrance to the cathode rays, allowing them to move freely from the cathode to the anode. At high pressure, frequent collisions prevent the formation of a clear discharge path.

iii. What is the classical concept of an electron? How has this concept changed with time?

Classical Concept: An electron was viewed as a small, negatively charged particle that revolves around the nucleus in defined shells or orbits.

Modern Concept: Electrons are now described as having a wave-particle duality. Their location is defined by a probability cloud (orbital), and it is impossible to predict their exact position with 100% certainty. There is only a certain probability of finding an electron at a given distance from the nucleus.

iv. Why are the nuclei of radioactive elements unstable?

The nuclei of radioactive elements are unstable because they have an imbalance in their neutron-to-proton ratio. This imbalance causes the nucleus to undergo radioactive decay (such as beta decay, where a neutron turns into a proton), emitting radiation to achieve a more stable state.

v. During discharge tube experiments, how did scientists conclude that the same type of electrons and protons are present in all elements?

Scientists concluded this by observing three consistent phenomena across different gases:

I. The consistent behavior of cathode rays (electrons) and anode rays (protons).
II. The same charge-to-mass ratio for electrons and protons, regardless of the gas used.
III. The same emission spectra patterns, indicating identical energy level transitions.