

Structure of the Atom: In-Text Questions

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Q.1 What are canal rays?

Sol. Positively charged radiations are called canal rays. These rays contain positively charged particles known as protons. These rays were discovered by Goldstein in 1886.

Q.2 If an atom contains one electron and one proton, will it carry any charge or not?

Sol. An atom with one electron and one proton, will not carry any charge because an electron is a negatively charged particle, whereas a proton is a positively charged particle. Both charged particles have an equal magnitude of charge. So, the atom is neutral.

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Q.1 On the basis of Thomson's model of an atom, explain how the atom is neutral as a whole.

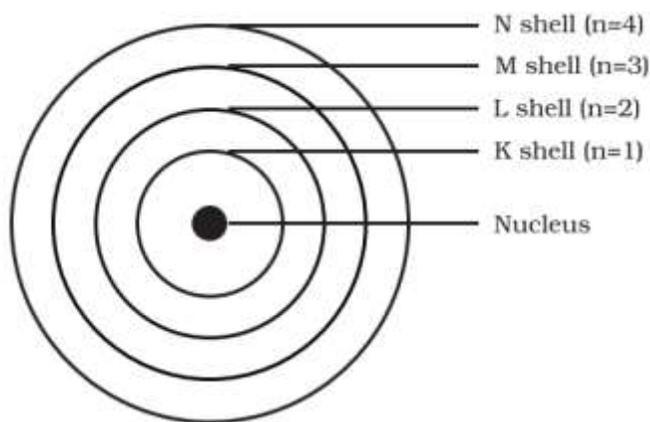
Sol. According to J.J. Thomson's model of an atom, an atom is a positively charged sphere with electrons embedded in it. An atom consists of both negatively and positively charged particles. These negative and positive charged particles have equal magnitude charge and opposite nature. Thus, they make an atom neutral.

Q.2 On the basis of Rutherford's model of an atom, which subatomic particle is present in the nucleus of an atom?

Sol. On the basis of Rutherford's model of an atom, protons which are positively-charged particles are present in the nucleus of an atom.

Q.3 Draw a sketch of Bohr's model of an atom with three shells.

Sol.



Q.4 What do you think would be the observation if the α -particle scattering experiment is carried out using a foil of a metal other than gold?

Sol. If the α -particle scattering experiment is carried out using a foil of a metal other than gold then there will be no change in the observation. In the α -scattering experiment, a gold foil was taken because of its malleable property and a thin foil of gold can be made very easily. But it is difficult to make such thin sheet from any other metals.

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Q.1 Name the three sub-atomic particles of an atom.

Sol. The three sub-atomic particles of an atom:

- (a) Protons: Positively charged
- (b) Electrons: Negatively charged
- (c) Neutrons: No charge

Q.2 Helium atom has an atomic mass of 4 u and two protons in its nucleus. How many neutrons does it have?

Sol. The mass of an atom is the sum of number of protons and neutrons present in its nucleus.

Atomic mass = Number of protons + Number of neutrons

$4 = 2 + \text{Number of neutrons}$

Number of neutrons = $4 - 2 = 2$

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Q.1 Write the distribution of electrons in carbon and sodium atoms?

Sol. The distribution of electrons in carbon and sodium atoms:

(i) Carbon: Atomic Number = 6

Number of protons = 6

Since, in any atom: Number of protons = Number of electron

So, Number of electrons = 6

For first shell, K-shell = 2 electrons

For second shell, L-shell = 4 electrons

So the electronic configuration of carbon: 2, 4

(ii) Sodium: Atomic Number = 11

Number of protons = 11

Since, in any atom: Number of protons = Number of electron

So, Number of electrons = 11

For first shell, K-shell = 2 electrons

For second shell, L-shell = 8 electrons

For third shell, M-shell = 1 electron

So the electronic configuration of Sodium: 2, 8, 1

Q.2 If K and L shells of an atom are full, then what would be the total number of electrons in the atom?

Sol. The maximum number of electrons that can be hold by K is 2 and by L-shell is 8. Since K and L-shells of an atom are full. So, the total number of electrons in the atom is $(2 + 8) = 10$ electrons.

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Q.1 How will you find the valency of chlorine, sulphur and magnesium?

Sol. **Valency is defined as the combining capacity of an atom of an element.** The distribution of electrons in chlorine: 2, 8, 7

Chlorine needs 1 electron to complete its octet or outermost shell. So, its valency is 1.

The distribution of electrons in Sulphur: 2, 8, 6

Sulphur needs 2 electrons to complete its octet or outermost shell. So, its valency is 2.

The distribution of electrons in Magnesium: 2, 8, 2

Sulphur needs to lose 2 electrons to complete its octet or outermost shell. So, its valency is 2.

Q.2 If number of electrons in an atom is 8 and number of protons is also 8, then (i) what is the atomic number of the atom and (ii) what is the charge on the atom?

Sol. Given: Number of electrons = 8
Number of protons = 8

- (i) As we know that
The atomic number = Number of protons.
Therefore, the atomic number of the atom is 8.
- (ii) Here, the number of both electrons and protons is equal, so the net charge on the atom is 0.

Q.3 With the help of Table 4.1, find out the mass number of oxygen and sulphur atom.

Sol. As we know that,
Mass number of oxygen = Number of protons + Number of neutrons
Mass number of oxygen = $8 + 8 = 16$
Mass number of sulphur = $16 + 1 = 32$

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Q.1 For the symbol H, D and T tabulate three sub - atomic particles found each of them.

Sol.

Symbol	Proton	Neutron	Electron
H	1	0	1
D	1	1	1
T	1	2	1

Q.2 Write the electronic configuration of any pair of isotopes and isobars.

Sol. Two isotopes of carbon: ${}_6\text{C}^{12}$ and ${}_6\text{C}^{14}$
The electronic configuration of ${}_6\text{C}^{12}$ is 2, 4.
The electronic configuration of ${}_6\text{C}^{14}$ is 2, 4.
Isotopes of same element have same electronic configuration.

A pair of isobars are ${}_{29}\text{Ca}^{40}$ and ${}_{18}\text{Ar}^{40}$
The electronic configuration of ${}_{29}\text{Ca}^{40} = 2, 8, 8, 2$
The electronic configuration of ${}_{18}\text{Ar}^{40} = 2, 8, 8.$