Ch 4 Structure of Atom Class 9 Important Questions NCERT Science

Q 1. Name the three sub-atomic particles of an atom.
Answer: The sub-atomic particles of an atom are

Protons → Positively charged
Electrons → Negatively charged
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?
Answer:

Atomic mass of He = 4u.
Atomic mass = No. of protons + No. of neutrons
∴ 4 = 2 + no. of neutrons.
∴ No. of neutrons = 4 – 2 = 2
Helium atom has 2 neutrons.

Q 3. How will you find the valency of chlorine, sulphur and magnesium?
Answer:

Valency is the combining capacity of an atom of an element.
Chlorine, Atomic Number = 17
∴ Protons = 17, Electrons = 17
∴ Distribution of electrons = K L M
2 8 7
Chlorine needs 1 electron to complete its outermost orbit/shell.
∴ Its valency is – 1 (gains 1 electron).
Sulphur, Atomic number = 16
∴ Protons = 16, Electrons = 16

∴ Distribution of electrons = K L M
2 8 6
Sulphur needs 2 electrons to complete its outermost shell.
∴ Its valency is – 2 (gains 2 electrons)
Magnesium, Atomic number = 12
∴ Protons = 12, electrons = 12
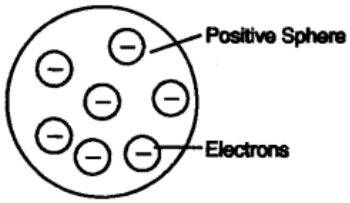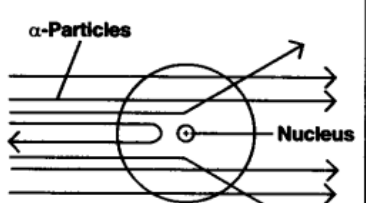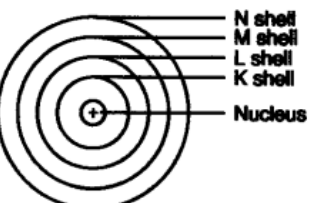∴ Distribution of electrons = K L M
2 8 2
Magnesium needs to donate 2 electrons from its outermost shell to become stable.
∴ Its valency is + 2 (donates 2 electrons).

Q4. Compare all the proposed Bohr's models of an atom given in this chapter.
Answer:

Thomson	Rutherford	Bohr
• Sphere of positive charge	• Sphere of positive charge in centre called nucleus. All mass of an atom resides in the nucleus	• Positive charge in centre called nucleus.
• Electrons are spread randomly all over in the sphere	• Electrons revolve around the nucleus in well defined orbits.	• Electrons revolve in discrete orbits and do not radiate energy.
• Thomson's Model	• Rutherford's Model	• Bohr's Model
• Positive charge = Negative charge. • Atom is electrically neutral.	• Size of nucleus is very small as compared to size of atom.	• The orbits were termed as energy shells labelled as K, L, M, N or n = 1, 2, 3, 4 (numbered)

Q 5. Explain with examples:
(i) Atomic number (ii) Mass number,
(iii) Isotopes and (iv) Isobars.
Give any two uses of isotopes.
Answer: (i) Atomic number: The atomic number of an element is equal to the number of protons in the nucleus of its atom. e.g., Oxygen has 6 protons hence atomic no. = 6.
(ii) Mass number: The mass number of an atom is equal to the number of protons and neutrons in its nucleus.
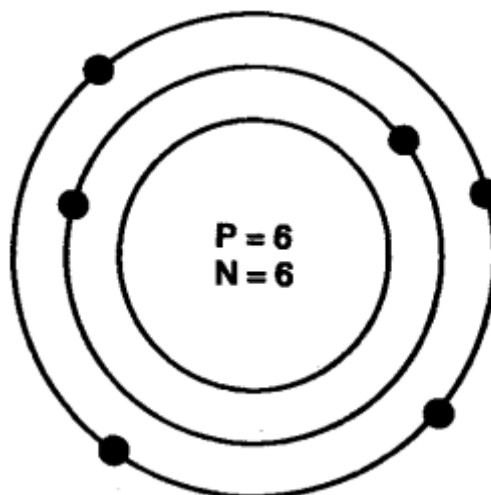Nucleons = number of protons + number of neutrons Example: Protons + Neutrons = Nucleus = Mass number 6 + 6 = 12

(iii) Isotopes: Isotopes are atoms of the same element which have different mass number but same atomic number.

(iv) Isobars: Isobars are atoms having the same mass number but different atomic numbers.

Both calcium and argon have same mass number but different atomic number.
Two uses of isotopes are:

(i) An isotope of iodine is used in the treatment of goitre.
(ii) An isotope of uranium is used as a fuel in nuclear reactors.

E.g., $^{40}_{20}Ca$ $^{40}_{18}Ar$

Q 6. Na⁺ has completely filled K and L shells.
Explain.
Answer: Sodium atom (Na), has atomic number =11
Number of protons =11
Number of electrons = 11
Electronic configuration of Na = K L M − 2 8 1
Sodium atom (Na) looses 1 electron to become stable and form Na⁺ ion. Hence it has completely filled K and L shells.

The average atomic mass of a sample of an element X is 16.2 u. What are the percentages of isotopes $^{16}_8X$ and $^{18}_8X$ in the sample?
Answer: Let the percentage of $^{16}_8X$ be x and the percentage of $^{16}_8X$ be 100 − x.

$$\therefore \quad \left(16 \times \frac{x}{100}\right) + \frac{18\,(100-x)}{100} = 16.2$$

$$\frac{16x}{100} + \frac{1800-18x}{100} = 16.2$$

$$\therefore \quad \frac{16x-18x+1800}{100} = 16.2$$

$$\therefore \quad -2x + 1800 = 16.2 \times 100$$

$$\therefore \quad -2x = 1620 - 1800$$

$$\therefore \quad -2x = -180$$

$$\therefore \quad x = \frac{180}{2} = 90$$

$$\therefore \quad ^{16}_6X = 90\%$$

$$\text{and} \quad ^{18}_8X = 10\%$$

Q 7. Complete the following table.

Atomic Number	Mass Number	Number of Neutrons	Number of Protons	Number of Electrons	Name of the Atomic Species
9	–	10	–	–	–
16	32	–	–	–	Sulphur
–	24	–	12	–	–
–	2	–	1	–	–
–	1	0	1	0	–

Answer:

Atomic Number	Mass Number	Number of Neutrons	Number of Protons	Number of Electrons	Name of the Atomic Species
9	19	10	9	9	Fluorine
16	32	16	16	16	Sulphur
12	24	12	12	12	Magnesium
1	2	1	1	1	Hydrogen Deuterium
1	1	0	1	0	Hydrogen

Q 8. Write the electronic configuration of any one pair of isotopes and isobar.

Answer. Isotopes: Atoms of same element having same atomic number but different mass number.

∴ Electronic configuration of isotopes remain the same.

E.g., $^{12}_{6}C$ $^{14}_{6}C$

Electronic configuration

K	L
2	4

K	L
2	4

Isobars: Atoms of different elements with different atomic number but same mass number.

E.g., $^{40}_{20}Ca$ $^{40}_{18}Ar$

Electronic configuration

K	L	M	N
2	8	8	2

K	L	M
2	8	8

Q 9. What are canal rays?

Answer: Canal rays are positively charged radiations which led to the discovery of positively charged sub-atomic particle called proton.

Q.10 What do you think would be the observation if the a-particle scattering experiment is carried out using a foil of a metal other than gold?

Answer: On using any metal foil, the observations of the a-particle scattering experiment would remain the same as all atoms would have same structure.