

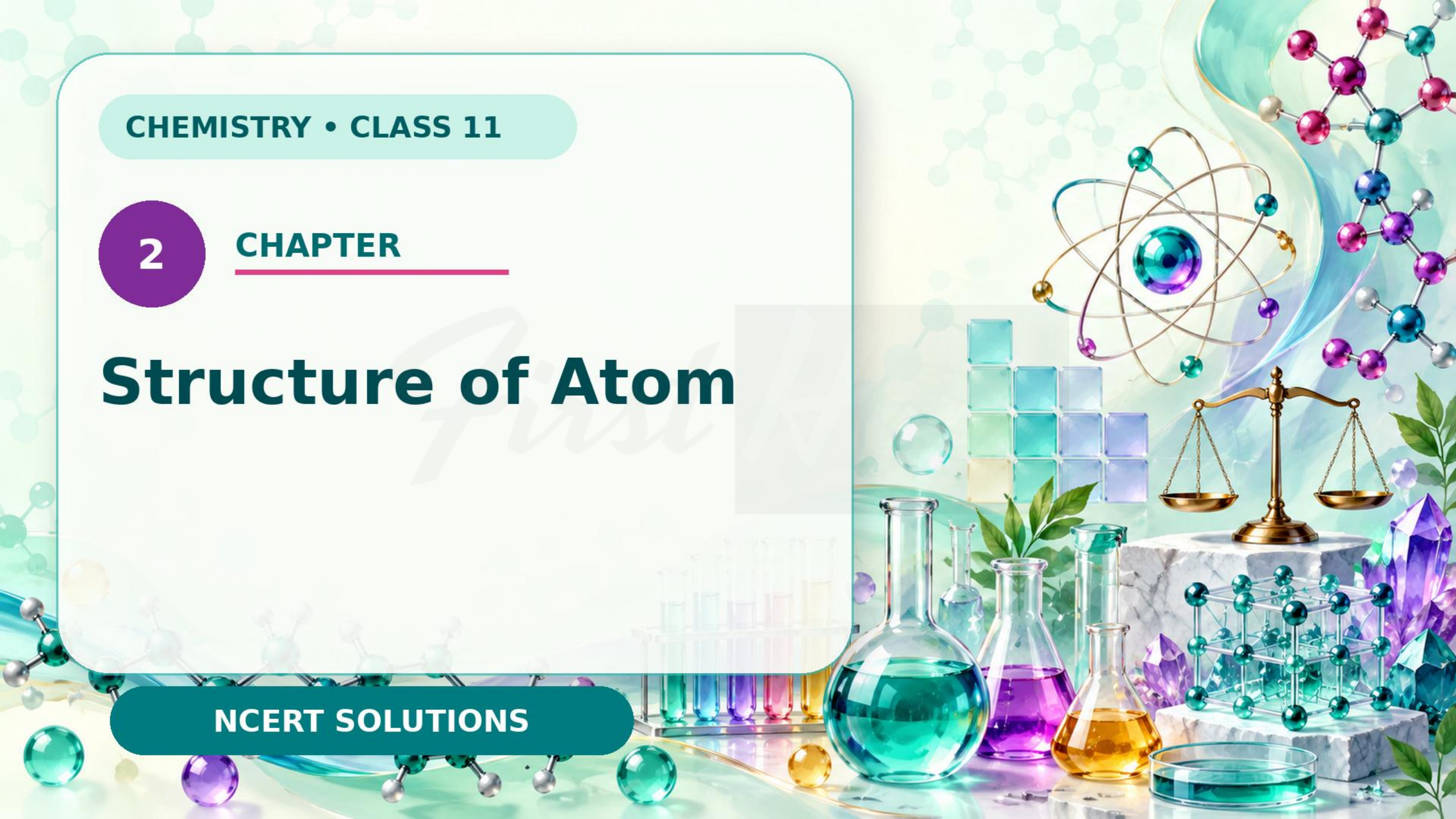
CHEMISTRY • CLASS 11

2

CHAPTER

Structure of Atom

NCERT SOLUTIONS



EXERCISE SOLUTIONS: 2.1

- 2.1 (i) How many electrons together weigh one gram?
(ii) Calculate the mass and charge of one mole of electrons.

$$m_e = 9.109 \times 10^{-31} \text{ kg}; \quad N_a = 6.022 \times 10^{23} \text{ mol}^{-1}; \quad e = 1.602 \times 10^{-19} \text{ C}$$

(i) Number of electrons

Answer:

Convert the total mass to kilograms, then divide by the mass of one electron.

$$1 \text{ g} = 10^{-3} \text{ kg}$$

$$\begin{aligned} N &= \frac{10^{-3}}{9.109 \times 10^{-31}} \\ &= 1.098 \times 10^{27} \text{ electrons} \end{aligned}$$

(ii) Mass and charge

Answer:

$$\begin{aligned} \text{Mass} &= N_a m_e \\ &= (6.022 \times 10^{23})(9.109 \times 10^{-31}) \\ &= 5.485 \times 10^{-7} \text{ kg} = 5.485 \times 10^{-4} \text{ g} \end{aligned}$$

$$\begin{aligned} \text{Charge} &= -N_a e \\ &= -(6.022 \times 10^{23})(1.602 \times 10^{-19}) \\ &= -9.647 \times 10^4 \text{ C} \end{aligned}$$

The negative sign shows the charge of electrons.

EXERCISE SOLUTIONS: 2.2 (i)-(ii)

2.2 (i) Find the total number of electrons in one mole of methane.

Answer:

Count the electrons of carbon and all four hydrogen atoms.

$$\text{CH}_4: 6 + 4(1) = 10 \text{ electrons per molecule}$$

$$\begin{aligned} N(e^-) &= 10 \times 6.022 \times 10^{23} \\ &= 6.022 \times 10^{24} \text{ electrons} \end{aligned}$$

(ii) Find the number and total mass of neutrons in 7 mg of ^{14}C . Mass of one neutron = $1.675 \times 10^{-27} \text{ kg}$.

Answer:

$$\text{Neutrons per atom} = 14 - 6 = 8$$

$$n(^{14}\text{C}) = \frac{0.007}{14} = 5.0 \times 10^{-4} \text{ mol}$$

$$\begin{aligned} N(\text{neutrons}) &= 8(5.0 \times 10^{-4})(6.022 \times 10^{23}) \\ &= 2.4088 \times 10^{21} \end{aligned}$$

$$\begin{aligned} \text{Total mass} &= (2.4088 \times 10^{21})(1.675 \times 10^{-27}) \\ &= 4.035 \times 10^{-6} \text{ kg} \end{aligned}$$

EXERCISE SOLUTIONS: 2.2 (iii)

- (iii) Find (a) the number and (b) the total mass of protons in 34 mg NH_3 at STP.
Will the answers change with temperature or pressure?

Answer: Count the protons in each ammonia molecule, then multiply by the number of molecules.

$$\text{Protons in } \text{NH}_3 = 7 + 3(1) = 10$$

$$34 \text{ mg} = 0.034 \text{ g}$$

$$n(\text{NH}_3) = \frac{0.034}{17} = 0.002 \text{ mol}$$

$$\begin{aligned} \text{(a) } N(\text{protons}) &= 10(0.002)(6.022 \times 10^{23}) \\ &= 1.2044 \times 10^{22} \text{ protons} \end{aligned}$$

$$\begin{aligned} \text{(b) } \text{Mass} &= (1.2044 \times 10^{22})(1.673 \times 10^{-27}) \\ &= 2.015 \times 10^{-5} \text{ kg} \end{aligned}$$

No. For the same fixed mass of ammonia, the number and total mass of protons do not depend on temperature or pressure.

EXERCISE SOLUTIONS: 2.3-2.4

2.3 Find the protons and neutrons in these nuclei:



Answer: Protons = Z ; neutrons = $A - Z$.

Nucleus	Protons	Neutrons
${}^{13}_6\text{C}$	6	7
${}^{16}_8\text{O}$	8	8
${}^{24}_{12}\text{Mg}$	12	12
${}^{56}_{26}\text{Fe}$	26	30
${}^{88}_{38}\text{Sr}$	38	50

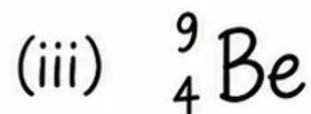
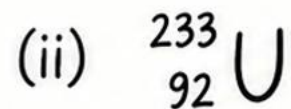
2.4 Write the complete atomic symbol for

(i) $Z = 17, A = 35$; (ii) $Z = 92, A = 233$;

(iii) $Z = 4, A = 9$.

Answer:

Write the mass number at upper left and the atomic number at lower left of the element symbol.





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