Atoms and Molecules

CHAPTER 3

NCERT FOCUS

ANSWERS

Topic 1

1. Total mass of reactants = mass of sodium carbonate + mass of acetic acid
= 5.3 g + 6 g = 11.3 g
Total mass of products = mass of sodium acetate + mass of carbon dioxide + mass of water
= 8.2 g + 2.2 g + 0.9 g = 11.3 g
Thus, the mass of reactants is equal to the mass of products, therefore the observations are in agreement with the law of conservation of mass.

2. 1 g of hydrogen reacts with = 8 g of oxygen
∴ 3 g of hydrogen reacts with = 8 × 3 = 24 g of oxygen
Thus, 24 g of oxygen gas would be required to react completely with 3 g of hydrogen gas.

3. The postulate that "atoms can neither be created nor destroyed in a chemical reaction" is the result of the law of conservation of mass.

4. The postulate that "A chemical compound always consists of the same elements combined together in the same proportion by mass" is the law of definite proportions.

5. Atomic mass unit is defined as the mass unit equal to exactly one-twelfth ($1/12^{th}$) of the mass of one atom of carbon-12. It is denoted by u (unified mass).
i.e. $1\ u = 1.66 \times 10^{-24}$ g

6. (i) Aluminium sulphate (ii) Calcium chloride
(iii) Potassium sulphate (iv) Potassium nitrate
(v) Calcium carbonate

7. It is not possible to see an atom with naked eye because of its extremely small size (atomic radius is of the order of 10^{-10} m).

8. (i) Sodium oxide

Symbol	Na	O
Charge	+1	–2

Formula = Na_2O

(ii) Aluminium chloride

Symbol	Al	Cl
Charge	+3	–1

Formula = $AlCl_3$

(iii) Sodium sulphide

Symbol	Na	S
Charge	+1	–2

Formula = Na_2S

(iv) Magnesium hydroxide

Symbol	Mg	(OH)
Charge	2	1

Formula = $Mg(OH)_2$

9. $\underset{3\ g}{C} + \underset{8\ g}{O_2} \rightarrow \underset{11\ g}{CO_2}$
Total mass of reactants = mass of C + mass of O_2
= 3 + 8 = 11 g
Total mass of reactants = total mass of products
Hence, the law of conservation of mass is proved.
Further, it also shows that carbon dioxide contains carbon and oxygen in a fixed ratio by mass, which is 3 : 8. Thus, it also proves the law of constant proportions. 3 g of carbon must also combine with 8 g of oxygen only. This means that (50 – 8) = 42 g of oxygen will remain unreacted.

10. (a) Quick lime is CaO. Elements present are calcium and oxygen.
(b) Hydrogen bromide is HBr. Elements present are hydrogen and bromine.
(c) Baking powder is $NaHCO_3$. Elements present are sodium, hydrogen, carbon and oxygen.
(d) Potassium sulphate is K_2SO_4. Elements present are potassium, sulphur and oxygen.

11. (a) Magnesium chloride

Symbol	Mg	Cl
Charge	+2	–1

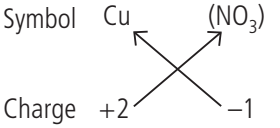
Formula = $MgCl_2$

(b) Calcium oxide

Symbol	Ca	O
Charge	+2	–2

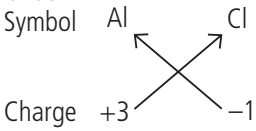
Formula = Ca_2O_2 or CaO

(c) Copper nitrate



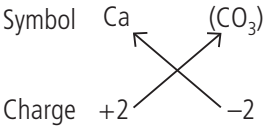
Formula = $Cu(NO_3)_2$

(d) Aluminium chloride



Formula = $AlCl_3$

(e) Calcium carbonate



Formula = $Ca_2(CO_3)_2$ or $CaCO_3$

12. A polyatomic ion is a group of atoms carrying positive or negative charge.

e.g., Polyatomic ions	Symbol
Ammonium	NH_4^+
Hydroxide	OH^-
Nitrate	NO_3^-
Hydrogen carbonate	HCO_3^-
Sulphate	SO_4^{2-}
Sulphite	SO_3^{2-}
Phosphate	PO_4^{3-}
Carbonate	CO_3^{2-}

Topic 2

1. Molecular mass of H_2 = 2 × atomic mass of H
= 2 × 1 u = 2 u

Molecular mass of O_2 = 2 × atomic mass of O
= 2 × 16 u = 32 u

Molecular mass of Cl_2 = 2 × atomic mass of Cl
= 2 × 35.5 u = 71 u

Molecular mass of CO_2 = atomic mass of C + 2 × atomic mass of O
= 12 + (2 × 16) = (12 + 32) u = 44 u

Molecular mass of CH_4 = atomic mass of C + 4 × atomic mass of H
= 12 + (4 × 1) = (12 + 4) u = 16 u

Molecular mass of C_2H_6
= 2 × atomic mass of C + 6 × atomic mass of H
= (2 × 12 + 6 × 1) u = (24 + 6) u = 30 u

Molecular mass of C_2H_4
= 2 × atomic mass of C + 4 × atomic mass of H
= (2 × 12 + 4 × 1) u = (24 + 4) u = 28 u

Molecular mass of NH_3 = atomic mass of N + 3 × atomic mass of H
= (14 + 3 × 1) u = (14 + 3) u = 17 u

Molecular mass of CH_3OH
= atomic mass of C + 3 × atomic mass of H + atomic mass of O + atomic mass of H
= (12 + 3 × 1 + 16 + 1) u = (12 + 3 + 17) u = 32 u

2. Formula unit mass of ZnO = atomic mass of Zn + atomic mass of O
= (65 + 16) u = 81 u

Formula unit mass of Na_2O = 2 × atomic mass of Na + atomic mass of O
= (2 × 23 + 16) u = 62 u

Formula unit mass of K_2CO_3 = 2 × atomic mass of K + atomic mass of C + 3 × atomic mass of O
= (2 × 39 + 12 + 3 × 16) u = (78 + 12 + 48) u = 138 u

3. (a) Molar mass of C_2H_2
= 2 × atomic mass of C + 2 × atomic mass of H
= (2 × 12 + 2 × 1) u = (24 + 2) u = 26 u

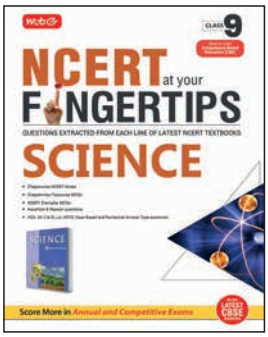
(b) Molar mass of S_8 = 8 × atomic mass of S
= (8 × 32) u = 256 u

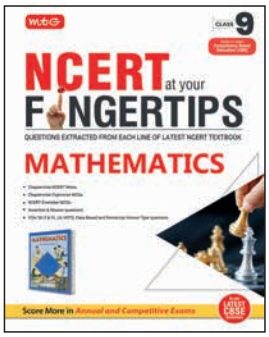
(c) Molar mass of P_4 = 4 × atomic mass of P
= (4 × 31) u = 124 u

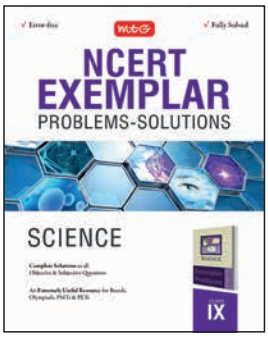
(d) Molar mass of HCl = atomic mass of H + atomic mass of Cl
= (1 + 35.5) u = 36.5 u

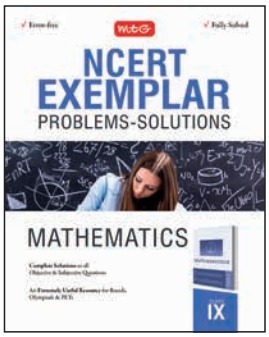
(e) Molar mass of HNO_3
= atomic mass of H + atomic mass of N + 3 × atomic mass of O
= (1 + 14 + 3 × 16) u = (1 + 14 + 48) u = 63 u

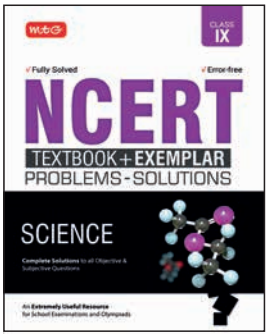
BEST SELLING BOOKS FOR CLASS 9

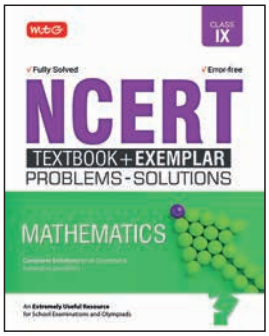


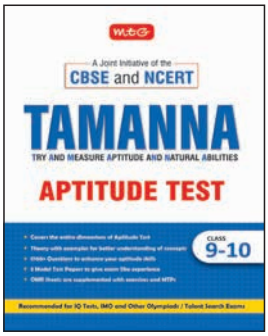


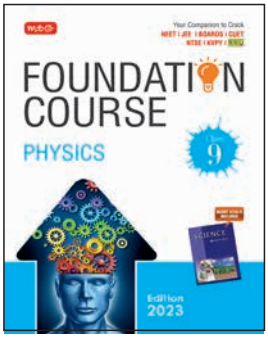


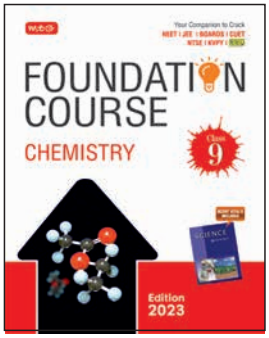


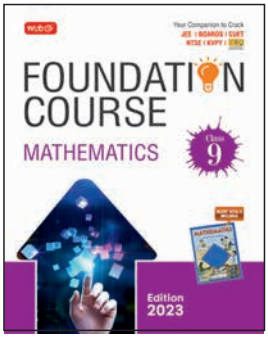


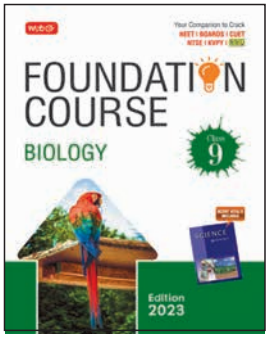


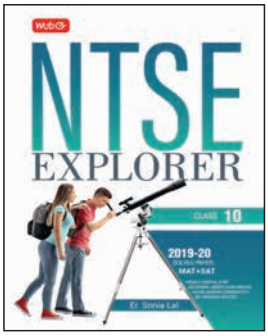


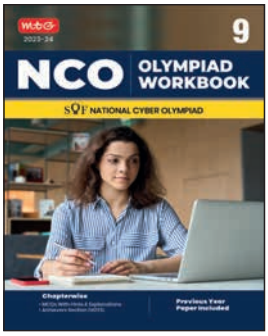


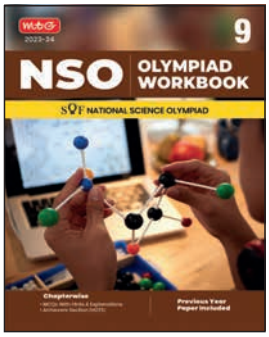


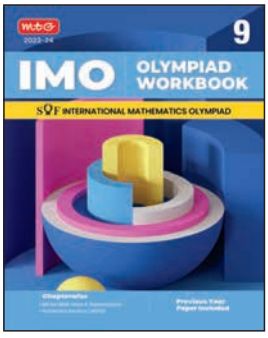


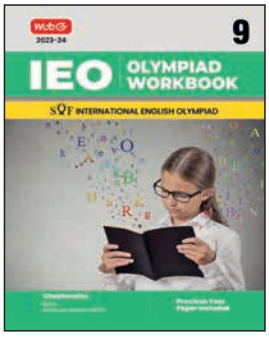


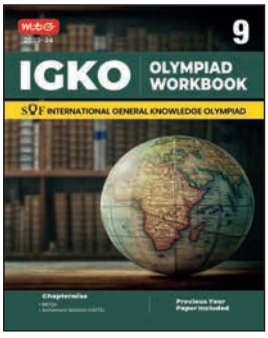


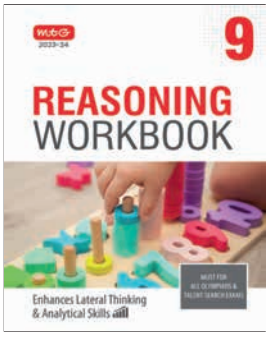












Visit www.mtg.in for complete information