RACE # 3

1. The haemoglobin of most mammals contains approximately 0.33% of iron by mass. The molecular mass of haemoglobin is 67200. The number of iron atoms in each molecule of haemoglobin is

(A) 3 (B) 4 (C) 2 (D) 6

$$\%\,Fe = \frac{\text{atomic mass} \times \text{atomicity}}{\text{molecular mass}} \times 100$$

$$0.33 = \frac{56 \times x}{67200} \times 100 \Rightarrow x = 396 \simeq 4$$

2. Percentage of Se in peroxidase anhydrous enzyme is 0.5% by weight (at.wt. = 78.4) then min.mol. wt. of peroxidase anhydrous enzymes is :-

(A) 1.568×10^4 (B) 1.568×10^3 (C) 15.68 (D) 2.136×10^4

$$\%\,Se = \frac{\text{Atomic weight} \times \text{atomicity}}{\text{Molecular mass}} \Rightarrow 0.5 = \frac{78.4 \times 1}{x} \times 10000$$

$$x = 1.568 \times 10^4$$

3. A compound contains 38.8% C, 16.0% H and 45.2% N. The empirical formula of the compound would be

(A) CH_3NH_2 ✓ (B) CH_3CN (C) C_2H_5CN (D) $CH_2(NH)_2$

E	mass	molc	S.R
C	38.8	$\frac{38.8}{12} = 3.23$	$\frac{3.23}{3.32} = 1$
H	16.	$\frac{16}{1} = 16$	$4.82 \simeq 5$
N	45.2	$\frac{45.2}{14} = 3.76$	$\frac{3.76}{3.23} = 1$

C_1H_6N

CH_3NH_2

4. A compound of X and Y has equal mass of them. If their atomic weights are 30 and 20 respectively. Molecular formula of that compound (its mol. wt. is 120) could be -

(A) X_2Y_2 (B) X_3Y_3 (C) X_2Y_3 ✓ (D) X_3Y_2

E	mass	molc	S.R
X	60g	$\frac{60}{30} = 2$	
Y	60g	$\frac{60}{20} = 3$	

Assuming both has mass = 60g

X_2Y_3

EF mass = 60 + 60 = 12

$n = \frac{\text{Molecular mass}}{\text{EF mass}} = \frac{120}{120} = 1$

MF = 1 (EF) = 1 (X_2Y_3)

5. A hydrocarbon contains 80% of carbon, and its V.D. = 15 then the hydrocarbon is -

(A) CH_4 (B) C_2H_4 (C) C_2H_6 (D) C_2H_2

E	mass	molc	S.R
C	80	$\frac{80}{12} = 6.66$	$\frac{6.66}{6.66} = 1$
H	20	$\frac{20}{1} = 20$	$\frac{20}{6.66} = 3$

EF = CH_3

EFormula mass = 12+3
= 15

Molecular mass = 2 x V.D
= 2 x 15
= 30

$n = \frac{30}{15} = 2$

MF = n(EF)
= $2(CH_3) = C_2H_6$

6. A carbon compound containing carbon and oxygen has molar mass equal to 288. On analysis it is found to contain 50% by mass of each element. Therefore molecular formula of the compound is

(A) $C_{12}O_9$ (B) C_4O_3 (C) C_3O_4 (D) C_9O_{12}

E	mass	molc	S.R
C	50	$\frac{50}{12}$	4
O	50	$\frac{50}{16}$	3

Ratio = $\frac{50}{12} \times \frac{16}{50} = 4/3$

C_4O_3 = EF

EFmass = 48 + 48 = 96

molecular mass = 288

$n = \frac{288}{96} = 3$

MF = n(EF)

$= 3(C_4O_3)$

$= C_{12}O_9$

7. Two oxides of a metal contain 50% and 40% metal M respectively. If the formula of the first oxide is MO_2, the formula of the second oxide will be

(A) MO_2 (B) MO_3 (C) M_2O (D) M_2O_5

1st oxide

E	mass	mole	SR
M	50	$50/x$	
O	50	$50/16$	

$$\frac{\frac{50}{M}}{\frac{50}{16}} = \frac{1}{2}$$

$M = 32$

2nd oxide

E	mass	mole	SR
M	40	$\frac{40}{32}$	
O	60	$\frac{60}{16}$	

$$\frac{40}{32} \times \frac{16}{60} = \frac{1}{3}$$

MO_3

8. In a hydrocarbon, there is 3gm of carbon per gm of hydrogen present in the molecule. Therefore, molecular formula of the hydrocarbon is

(A) CH_4 (B) C_2H_6 (C) C_3H_8 (D) C_4H_{10}

E	mass	mole	SR
C	3g	$\frac{3}{12} = 0.25$	$\frac{0.25}{0.25} = 1$
H	1g	$\frac{1}{1} = 1$	$\frac{1}{0.25} = 4$

CH_4

9. On analysis, a certain compound was found to contain iodine and oxygen in the ratio of 254 gm of iodine (at. mass 127) and 80 gm oxygen (at. mass 16). What is the formula of the compound

(A) IO (B) I_2O (C) I_5O_3 (D) I_2O_5

E	mass	mole	SR
I	254	$\frac{254}{127} = 2$	2
O	80	$\frac{80}{16} = 5$	5

I_2O_5

10. The number of atoms of Cr and O are 4.8×10^{10} and 9.6×10^{10} respectively. Its empirical formula is -

(A) Cr_2O_3 (B) CrO_2 (C) Cr_2O_4 (D) none

		SR
moles of Cr =	$\frac{4.8 \times 10^{10}}{6 \times 10^{23}} = 0.8 \times 10^{-13}$	1
moles of O =	$\frac{9.6 \times 10^{10}}{6 \times 10^{23}} = 1.6 \times 10^{-13}$	2

CrO_2

11. A given sample of pure compound contains 9.81 gm of Zn, 1.8×10^{23} atoms of chromium, and 0.60 mol of oxygen atoms. What is the simplest formula -

(A) $ZnCr_2O_7$ (B) $ZnCr_2O_4$ (C) $ZnCrO_4$ (D) $ZnCrO_6$

El.	mass	mole	SR
Zn	9.81	$\frac{9.81}{65} = 0.15$	$\frac{0.15}{0.15} = 1$
Cr	—	$\frac{1.8 \times 10^{23}}{6 \times 10^{23}} = 0.3$	$\frac{0.3}{0.15} = 2$
O	—	$= 0.6$	$\frac{0.6}{0.15} = 4$

$ZnCr_2O_4$

12. When 100 gm of C_2H_4 is polymerised to produce polyethylene according to the equation $nC_2H_4 \rightarrow (C_2H_4)_n$ Then, how many gm polyethylene $(C_2H_4)n$ would be produced ?

At. wt : C-12 ; H - 1

(A) 100 gm (B) 100n gm (C) $\frac{100n}{2}$ gm (D) $\frac{100}{28} \times n$ gm.

According to mass conservation.

13. 8.4 g $MgCO_3$ on heating leaves behind a residue weighing 4.0 g, then carbon dioxide released into the atmosphere at S.T.P. will be

(A) 2.24 L (B) 4.48 L (C) 1.12 L (D) 0.56 L

$MgCO_{3(s)} \longrightarrow$ Residue $MgO_{(s)} + CO_{2(g)}$

8.4g 4g x

$8.4 = 4 + x$

$x = 4.4g$

moles of $CO_2 = \frac{4.4}{44} = 0.1$

Volume of $CO_2 = 22.4 \times 0.1 = 2.24L$

14. When 10 ml of propane (gas) is combusted completely, volume of $CO_2(g)$ obtained in similar condition is

(A) 10 ml (B) 20 ml (C) 30 ml (D) 40 ml

1 : 3

$C_3H_8(g) \longrightarrow 3CO_2(g)$

10 ml x

$\frac{1}{10} = \frac{3}{x}$ $x = 30$ ml

16. 0.54 gm of metal "M" yields 1.02 gm of its oxide M_2O_3. The at. wt. of metal "M" is

(A) 9 (B) 18 (C) 27 (D) 54

Not to solve

17. Suppose two elements X and Y combine to form two compounds XY_2 and X_2Y_3 when 0.05 mole of XY_2 weight 5 g while 3.011×10^{23} molecules of X_2Y_3 weighs 85 g. The atomic masses of X and Y are respectively

(A) 20, 30 (B) 30, 40 (C) 40, 30 (D) 80, 60

let atomic mass of X = a

atomic mass of Y = b

	XY_2	X_2Y_3
molar mass	$a+2b$	$2a+3b$
mass	5	85
mol	0.05	$\frac{3.011 \times 10^{23}}{6.022 \times 10^{23}} = 0.5$

$$\text{mole} = \frac{\text{mass}}{\text{molar mass}}$$

$$0.05 = \frac{5}{a+2b}$$

$$a+2b = 100$$

$$0.5 = \frac{85}{2a+3b}$$

$$2a+3b = 170$$

$$b = 30, \qquad a = 40$$

Ans

19. One of the following combinations illustrate law of reciprocal proportions

(A) N_2O_3, N_2O_4, N_2O_5 (B) NaCl, NaBr, NaI (C) CS_2, CO_2, SO_2 (D) PH_3, P_2O_3, P_2O_5

20. The law of multiple proportions is illustrated by

(A) Carbon monoxide and carbon dioxide (B) Potassium bromide and potassium chloride

(C) Water and heavy water (D) Calcium hydroxide and barium hydroxide.

21. If law of conservation of mass was to hold true, then 20.8 gm of $BaCl_2$ on reaction with 9.8 gm of H_2SO_4 will produce 7.3 gm of HCl and $BaSO_4$ equal to

(A) 11.65 gm (B) 23.3 gm (C) 25.5 gm (D) 30.6 gm

$x = 23.3g$

$BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + HCl$

20.8 9.8 x 7.3

22. 12 g carbon combines with 64 g sulphur to form CS_2. 12 g carbon also combines with 32 g oxygen to form CO_2. 10 g sulphur combines with 10 g oxygen to form SO_2. These data illustrate the

(A) Law of multiple proportions (B) Law of definite proportions

(C) Law of reciprocal proportions (D) Law of gaseous volumes.