1. MOLE CONCEPT

1. A quantity of hydrogen gas occupies a volume of 30.0 mL at a certain temperature and pressure. What volume would half this mass of hydrogen occupy at triple the absolute temperature if the pressure were one-ninth that of the original gas?

(1) 270 mL (2) 90 mL (3) 405 mL (4) 135 mL

2. A metal carbonate decomposes according to following reaction

$$M_2CO_3(s) \longrightarrow M_2O(s) + CO_2(g)$$

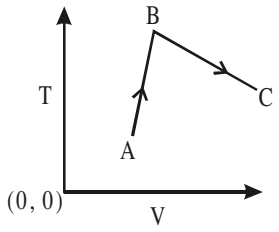
Percentage loss in mass on complete decomposition of $M_2CO_3(s)$
(Atomic mass of M = 102)

(1) $\frac{100}{3}\%$ (2) $\frac{50}{3}\%$ (3) $\frac{25}{3}\%$ (4) 15%

3. How many litres of oxygen at 1atm & 273K will be required to burn completely 2.2 g of propane (C_3H_8)

(1) 11.2 L (2) 22.4 L (3) 5.6 L (4) 44.8 L

4. In the given isobaric process shown by graph between T & V.



(1) Moles decreases throughout

(2) Moles first increases then decreases

(3) Moles first decreases then increases

(4) Moles cannot be predicted form given data

5. 0.8 M $FeSO_4$ solution requires 160ml, 0.2M $Al_2(Cr_2O_7)_3$ in acidic medium, Calculate volume of $FeSO_4$ consumed -

(1) 480 ml (2) 240 ml (3) 720 ml (4) 40 ml

6. If a pure compound is composed of $\mathbf{X_2Y_3}$ molecules and consists of **60 % X** by weight what is the atomic weight of **Y** in term of atomic weight of **X** (Atomic mass of X = M_x) ?

(1) $\frac{9}{4}M_x$ (2) $\frac{4}{9}M_x$ (3) $\frac{2}{3}M_x$ (4) $\frac{3}{2}M_x$

7. 10 mole of A_2B_3 contains 100gm of A atom & 60 gm of B atoms. Choose the correct statements -

(A) Molecular weight of A_2B_3 is equal to 16

(B) Atomic weight of A is equal to 5

(C) Weight of one atom of B is equal to 2

(D) Atomic weight of B is equal to 6

(1) A, B, C (2) A, B (3) C, D (4) A, B, D

8. Select the incorrect statement(s)

(A) During a reaction, moles and mass of atoms remain constant

(B) For reaction $2A + 3B \longrightarrow C + 3D$, for maximum product formation per gram of reactant mixture, mass ratio of A & B must be 2 : 3

(C) Both molarity and mole fraction are temperature dependent

(D) 22.7 litre of water at S.T.P. conditions contains 6×10^{24} protons.

(1) A, B, C (2) B, C, D (3) A, C, D (4) A, B

9. A 150 ml mixutre of CO and CO_2 is passed through a tube containing excess of red hot charcoal. The volume become 200 ml due to reaction.

$CO_2(g) + C(s) \longrightarrow 2CO(g)$

Select the correct statement(s).

(A) mole percent of CO_2 in the original mixture is 50

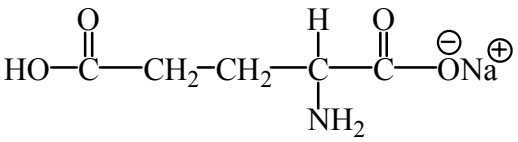
(B) mole fraction of CO in the original mixture is 0.66

(C) the original mixture contains 50 ml of CO_2

(D) the orginal mixture contain 50 ml of CO.

(1) A, B (2) B, D (3) A, C (4) B, C

10. Monosodium glutamate (MSG) is salt of one of the most abundant naturally occuring non-essential amino acid which is commonly used in food products like in **"MAGGI"** having structural formula as



Mass % of Na in MSG is-

(1) 14.8 (2) 15.1 (3) 13.6 (4) 16.5

11. One gram of the silver salt of an organic dibasic acid yields, on strong heating, 0.6 g of silver aproximately. Determine the molecular formula of the acid. [Atomic weight of Ag = 108]

(1) $C_4H_6O_4$ (2) $C_4H_6O_6$ (3) $C_2H_6O_2$ (4) $C_5H_6O_5$

12. A sample of pure Cu (4.00g) heated in a stream of oxygen for some time, gains in weight with the formation of black oxide of copper (CuO). The final mass is 4.90 g. What percent of copper remains unoxidized (Cu = 64)

(1) 90 % (2) 10 % (3) 20 % (4) 80 %

13. 40 gm of a carbonate of an **alkali metal** or **alkaline earth metal** containing some inert impurities was made to react with excess HCl solution. The liberated CO_2 occupied 12.315 lit. at 1 atm & 300 K. The correct option is

(1) Mass of impurity is 1 gm and metal is Be (2) Mass of impurity is 3 gm and metal is Li

(3) Mass of impurity is 5 gm and metal is Be (4) Mass of impurity is 2 gm and metal is Mg

14. 1 mole of H_2SO_4 will exactly neutralise :

(A) 2 mole of ammonia (B) 1 mole of $Ba(OH)_2$

(C) 0.5 mole of $Ca(OH)_2$ (D) 2 mole of KOH

(1) A, B, D (2) A, B, C (3) B, C, D (4) A, C, D

15. 12 g of Mg was burnt in a closed vessel containing 32 g oxygen. Which of the following is /are correct.

(A) 2 gm of Mg will be left unburnt.

(B) 0.75 gm-molecule of O_2 will be left unreacted.

(C) 20 gm of MgO will be formed.

(D) The mixture at the end will weight 44 g.

(1) B, C, D (2) A, B, C (3) B, C (4) C, D

16. 50 gm of $CaCO_3$ is allowed to react with 68.6 gm of H_3PO_4 then select the correct option(s)-

$$3CaCO_3 + 2H_3PO_4 \rightarrow Ca_3(PO_4)_2 + 3H_2O + 3CO_2$$

(A) 51.67 gm salt is formed

(B) Amount of unreacted reagent = 35.93 gm

(C) $n_{CO_2} = 0.5$ moles evolved

(D) 0.7 mole CO_2 is evolved

(1) B, C, D (2) A, C, D (3) A, B, C (4) A, B, D

17. 'A' reacts by following two parallel reactions to give B & C If half of 'A' goes into reaction I and other half goes to reaction-II. Then , select the correct statement(s)

$$A + N \xrightarrow{I} B + L$$

$$A + N \xrightarrow{II} \frac{1}{2}B + \frac{1}{2}(C) + L$$

(A) B will be always greater than C

(B) If 2 mole of C are formed then total 2 mole of B are also formed

(C) If 2 mole of C are formed then total 4 mole of B are also formed

(D) If 2 mole of C are formed then total 6 mole of B are also formed

(1) A, D (2) B, C (3) A, C (4) B, D

18. Select the correct statement(s) for $(NH_4)_3PO_4$.

(A) Ratio of number of oxygen atoms to number of hydrogen atoms is 1 : 3

(B) Ratio of number of cations to number of anions is 3 : 1

(C) Ratio of number of gm-atoms of nitrogen to gm-atoms of oxygen is 3 : 2

(D) Total number of atoms in one mole of $(NH_4)_3PO_4$ is 20.

(1) C, D (2) B, C (3) A, B (4) A, D

19. The ratio of mass percent of C and H of an organic compound ($C_XH_YO_Z$) is 6 : 1. If one molecule of the above compound ($C_XH_YO_Z$) contains half as much oxygen as required to burn one molecule of compound C_XH_Y completely to CO_2 and H_2O. The empirical formula of compound $C_XH_YO_Z$ is

(1) C_2H_4O (2) $C_3H_4O_2$ (3) $C_2H_4O_3$ (4) $C_3H_6O_3$

20. For per gram of reactant, the maximum quantity of N_2 gas is produced in which of the following thermal decomposition reactions ?
(Given : Atomic wt. – Cr = 52u, Ba = 137u)
(1) $2NH_4NO_3(s) \rightarrow 2N_2(g) + 4H_2O(g) + O_2(g)$ (2) $Ba(N_3)_2(s) \rightarrow Ba(s) + 3N_2(g)$
(3) $(NH_4)_2Cr_2O_7(s) \rightarrow N_2(g) + 4H_2O(g)$ (4) $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$

21. An unknown chlorohydrocarbon has 3.55% of chlorine. If each molecule of the hydrocarbon has one chlorine atom only; chlorine atoms present in 1 g of chlorohydrocarbon are :
(Atomic wt. of Cl = 35.5 u;
Avogadro constant = 6.023×10^{23} mol^{-1})
(1) 6.023×10^{21} (2) 6.023×10^{23} (3) 6.023×10^{20} (4) 6.023×10^{9}

22. An ideal gaseous mixture of ethane (C_2H_6) and ethene (C_2H_4) occupies 28 litre at 1atm, 0°C. The mixture reacts completely with 128 gm O_2 to produce CO_2 and H_2O. Mole fraction of C_2H_6 in the mixture is–
(1) 0.6 (2) 0.4 (3) 0.5 (4) 0.8

23. For a chemical reaction occuring at constant pressure and temperature.
$2A(g) + 5B(g) \longrightarrow C(g) + 2D(g)$
(1) contraction in volume is double the volume of A taken if B is taken in excess.
(2) contraction in volume is more than the volume of B taken if A is in excess.
(3) volume contracts by 20 mL if 10 mL A is reacted with 20 mL B.
(4) no change in volume due to reaction

24. Each volume of a gaseous organic compound containing C, H and S only produce 1 volume CO_2, 2 volume H_2O vapours and 1 volume SO_2 gases on complete combustion. The molecular formula of compound is -
(1) CH_2S (2) CH_4S (3) C_2H_4S (4) C_2H_6S

25. A 2 L sample of a gaseous hydrocarbon is burnt in excess oxygen. The only products of the reaction are 8L of $CO_2(g)$ and 10L of $H_2O(g)$, all at 100ºC and 1 atm pressure. The formula of the hydrocarbon is -
(1) C_5H_{12} (2) C_4H_5 (3) C_4H_{10} (4) C_8H_{10}

26. 1120 ml of ozonised oxygen ($O_2 + O_3$) at 1 atm & 273K weighs 1.76 gm. The reduction in volume on passing this through alkaline pyrogallol solution is -
(1) 896 ml (2) 224 ml (3) 448 ml (4) 672 ml

27. Two gases A and B which react according to the equation
$aA_{(g)} + bB_{(g)} \longrightarrow cC_{(g)} + dD_{(g)}$
to give two gases C and D are taken (amount not known) in an Eudiometer tube (operating at a constant Pressure and temperature) to cause the above.
If on causing the reaction there is no volume change observed then which of the following statement is/are correct.
(A) (a + b) = (c + d)
(B) average molecular mass may increase or decrease if either of A or B is present in limited amount.
(C) Vapour Density of the mixture will remain same throughout the course of reaction.
(D) Total moles of all the component of mixture will change.
(1) A, C (2) B, C (3) A, D (4) B, D

28. 20 ml mixture of C_3H_8 and CO gas when burnt in excess of oxygen produce 40 ml CO_2 gas. Choose the correct statement(s). (Volume of gases measured under same T & P) (Considering H_2O liquid)

(A) Volume of C_3H_8 in the mixture is 15 ml

(B) Volume of CO in the mixture is 10 ml

(C) Total volume contraction due to combustion is 35 ml.

(D) The volume of oxygen used for combustion is 75 ml

(1) A, D (2) A, B (3) B, C (4) C, D

29. 10 ml of a gaseous mixture containing C_2H_x and C_3H_8 exactly requires 40 ml O_2 for complete combustion and produces 25 ml CO_2 and 30 ml H_2O vapour. The correct information (s) is/are

(A) Total volume contraction = 5 ml

(B) Volume contraction due to combustion of C_2H_x = 0

(C) x = 4

(D) Volume of C_2H_x in the initial mixture = 5 ml

(1) A, B, C (2) B, C, D (3) C, D, A (4) A, B, D

30. 100 ml mixture of CO and CO_2 mixed with 30 mL of O_2 and sparked in eudiometer tube. The residual gas after treatment with aq. KOH has a volume of 10 mL which remains unchanged when treated with alkaline pyrogallol. If all the volumes are under the same conditions, point out **correct** options(s):

(A) The volume of CO that reacts, is 60 mL

(B) The volume of CO that remains unreacted, is 10 mL

(C) The volume of O_2 that remains unreacted, is 10 mL

(D) The volume of CO_2 that gets absorbed by aq.KOH, is 90 mL.

(1) A, B, C (2) A, B, D (3) B, C, D (4) A, C, D

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**3**	**2**	**3**	**3**	**3**	**2**	**2**	**2**	**4**	**3**	**4**	**2**	**2**	**1**	**1**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**3**	**1**	**3**	**3**	**4**	**3**	**2**	**1**	**2**	**3**	**1**	**1**	**3**	**2**	**2**