STOICHIOMETRY

1	**The significant figures in 3400 are** (1) 2 (2) 5 (3) 6 (4) 4
2	**The number of significant figures in 6.0023 are** (1) 5 (2) 4 (3) 3 (4) 1
3	**Given $P=0.0030\,m$, $Q=2.40m$, $R=3000\,m$, Significant figures in P,Q and R are respectively** (1) 2, 2, 1 (2) 2, 3, 4 (3) 4, 2, 1 (4) 4, 2, 3
4	**The number of significant figures in 60.0001 is** (1) 5 (2) 6 (3) 3 (4) 2
5	**A sample was weighted using two different balances. The result's were (i) 3.929 g (ii) 4.0 g. How would the weight of the sample be reported** (1) 3.929 g (2) 3 g (3) 3.9 g (4) 3.93 g
6	The number of significant figures in $N_o-6.022\times10^{23}$ (Avogadro's number) are 1) Three 2) Four 3) Five 4) All
7	**Volume of a gas at STP is 1.12×10^{-7} cc. Calculate the number of molecules in it** (1) 3.01×10^{20} (2) 3.01×10^{12} (3) 3.01×10^{23} (4) 3.01×10^{24}
8	**The number of moles of oxygen in $1\,L$ of air containing 21% oxygen by volume, in standard conditions, is** (1) 0.186 *mol* (2) 0.21 *mol* (3) 2.10 *mol* (4) 0.0093 *mol*
9	**The equivalent weight of a metal is 9 and vapour density of its chloride is 59.25. The atomic weight of metal is** (1) 23.9 (2) 27.3 (3) 36.3 (4) 48.3
10	**Equivalent weight of a bivalent metal is 37.2. The molecular weight of its chloride is** (1) 412.2 (2) 216 (3) 145.4 (4) 108.2
11	**The number of molecules in 4.25 g of ammonia are** (1) 0.5×10^{23} (2) 1.5×10^{23} (3) 3.5×10^{23} (4) 1.8×10^{32}
12	**Number of *gm* of oxygen in 32.2 g $Na_2SO_4.10H_2O$ is** (1) 20.8 (2) 22.4 (3) 2.24 (4) 2.08
13	**19.7 *kg* of gold was recovered from a smuggler. How many atoms of gold were recovered (Au =197)** (1) 100 (2) 6.02×10^{23} (3) 6.02×10^{24} (4) 6.02×10^{25}
14	**The empirical formula of a compound is CH_2O. 0.0835 moles of the compound contains 1.0 g of hydrogen. Molecular formula of the compound is** (1) $C_2H_{12}O_6$ (2) $C_5H_{10}O_5$ (3) $C_4H_8O_8$ (4) $C_3H_6O_3$

15	**Haemoglobin contains 0.33% of iron by weight. The molecular weight of haemoglobin is approximately 67200. The number of iron atoms (At. wt. of Fe = 56) present in one molecule of haemoglobin is** (1) 6 (2) 1 (3) 4 (4) 2
16	**The percentage of P_2O_5 in diammonium hydrogen phosphate $(NH_4)_2HPO_4$ is** (1) 23.48 (2) 46.96 (3) 53.78 (4) 71.00
17	**The percentage of Se in peroxidase anhydrous enzyme is 0.5% by weight (atomic weight=78.4). Then minimum molecular weight of peroxidase anhydrous enzyme is** (1) 1.568×10^4 (2) 1.568×10^3 (3) 15.68 (4) 3.136×10^4
18	**Approximate atomic weight of an element is 26.89. If its equivalent weight is 8.9, the exact atomic weight of element would be** (1) 26.89 (2) 8.9 (3) 17.8 (4) 26.7
19	An element with mass number 81 contains 31.7% more neutrons as compared to protons. Find the symbol of the atom 1) $^{81}_{34}Se$ 2) $^{81}_{35}Br$ 3) $^{81}_{36}Kr$ 4) $^{81}_{37}Rb$
20	10^{21} molecules are removed from 200 mg of CO_2. The moles of CO_2 left are 1) 2.88×10^{-3} 2) 28.8×10^{-3} 3) 288×10^{-3} 4) 28.8×10^{3}
21	Choose the incorrect match regarding equivalent weight Acid — Equivalent wt. 1) H_3PO_2 — M 2) H_3PO_4 — M/3 3) H_3BO_3 — M/3 4) H_2SO_4 — M/2
22	What will be the equivalent weight of metal if vapour density of chloride salt of trivalent metal is 81.25 1) 18.66 2) 56 3) 162.5 4) 28
23	The equivalent weight of $CuSO_4$ when it is converted to $Cu_2I_2\left[M = mol.wt\right]$ 1) $\frac{M}{1}$ 2) $\frac{M}{2}$ 3) $\frac{M}{3}$ 4) 2M
24	A metal 'M' of equivalent mass E forms an Oxide of Molecular formula M_xO_y. The Atomic mass of the metal is given by the correct equation 1) $2E\left(\frac{y}{x}\right)$ 2) xyE 3) $\frac{E}{y}$ 4) $\frac{y}{E}$
25	Non-stoichiometric compound has formula $Ni_{0.98}O_1$, Ni is present as Ni^{2+} and Ni^{3+} inthis oxide. Fraction of metal which will exist as Ni^{3+} would be 1) 5.08% 2) 7.01% 3) 4.08% 4) 6.05%
26	2.34 g pure sample of $MgSO_4.7H_2O$ is heated to evaporate all of its water content. Maximum mass loss of the sample will be :- (1)1.8g (2)0.7 g (3) 1.198 g (4)0.36 g
27	How many moles of ferric-alum $(NH_4)_2SO_4.Fe_2(SO_4)_3.24H_2O$ can be made from the sample of Fe containing 0.0056 g of it ? (1) 10^{-4} mol (2) 0.5×10^{-4} mol (3) 0.33×10^{-4} mol (4) 2×10^{-4} mol
28	Law of multiple proportions is illustrated by one of the following pairs 1) H_2S and SO_2 2) NH_3 and NO_2 3) Na_2S and Na_2O 4) $FeCl_2$ and $FeCl_3$

29	3.0 gms of an organic compound on combustion give 8.8 gm of CO_2 and 5.4 gm of water. The empirical formula of the compound is 1) CH_3 2) C_2H_4 3) C_2H_2 4) C_2H_6
30	15 cm^3 of hydrocarbon requires 45 cm^3 of oxygen for complete combustion and 30 cm^3 of CO_2 is formed. The formula of hydrocarbon is 1) C_3H_6 2) C_2H_2 3) C_4H_{10} 4) C_2H_4
31	The simplest formula of a compound containing 50 % of element X (at. mass 10) and 50% of element Y (at. mass 20) is 1) X_2Y 2) XY_2 3) X_2Y_3 4) XY
32	If 20.0 g of $CaCO_3$ is treated with 20.0 g of HCl, how many grams of CO_2 can be obtained according to the following reaction : $CaCO_3$ (s) + 2HCl (aq) $\rightarrow$ $CaCl_2$ (aq) + H_2O (l) + CO_2(g) 1) 8.80 g 2) 27.4 g 3) 4.20 g 4) 13.7 g
33	The volume of SO_2 produced at S.T.P by the combustion of 50 g of sulphur containing 4 % sand by weight will be 1) 33.6 L 2) 22.4 L 3) 11.2 L 4) 44.8 L
34	XL of nitrogen at N.T.P contains 3.0 x 10^{22} molecules. The number of molecules in $\frac{X}{2}$ L of ozone at N.T.P will be 1) 3.0 x 10^{22} 2) 1.5 x 10^{22} 3) 1.5 x 10^{21} 4) 1.5 x 10^{20}
35	The number of moles of $KMnO_4$ and $K_2Cr_2O_7$ separately required to oxidize one mole Ferrous Oxalate in acidic medium are _____ & _____ respectively 1)0.6, 0.5 2)0.75, 0.8 3)0.5, 0.75 4)3.5
36	The crystalline salt $Na_2SO_4.xH_2O$ on heating loses 55.9 % of its weight. The formula of crystalline salt is 1) $Na_2SO_4.5H_2O$ 2) $Na_2SO_4.7H_2O$ 3) $Na_2SO_4.2H_2O$ 4) $Na_2SO_4.10H_2O$
37	What is the volume of CO_2 liberated (in litres) at 1 atmosphere and 0^0 C when 10 g of 100 % pure calcium carbonate is treated with excess dilute sulphuric acid ? (Atomic mass Ca=40, C – 12, O = 16) 1) 0.224 2) 2.24 3) 22.4 4) 224
38	The equivalent mass of HCl in the given reaction is (M = molecular wt of HCl) $K_2Cr_2O_7 + 14HCl \rightarrow 2KCl + 2CrCl_3 + 3Cl_2 + H_2O$ 1) $\frac{M}{1}$ 2) $\frac{M}{2}$ 3) $\frac{M}{6}$ 4) $\frac{14M}{6}$
39	Equivalent mass of H_3PO_2 when it disproportionate into PH_3 and H_3PO_3 is (M = molecular wt of H_3PO_2) 1)M 2)M/2 3)M/4 4) 3M/4
40	In the following reaction, $AS_2S_3 + H^+ + NO_3^- \rightarrow NO + H_2O + AsO_4^{3-} + SO_4^{2-}$ the equivalent mass of AS_2S_3 is related to its molecular mass by 1)M/2 2)M/4 3)M/24 4)M/28
41	The equivalent mass of an element is 4.Its chloride has a vapour density 59.25. Then the valency of the elements is 1)4 2)3 3)2 4)1
42	6×10^{-3} mole $K_2Cr_2O_7$ reacts completely with 9×10^{-3} mole x^{n+} to give XO_3^- and Cr^{3+}. The value of n is 1)1 2)2 3)3 4)none of these
43	Equivalent weight of hydrated oxalic acid is 1)44 2)45 3)63 4)126

44	What is the equivalent weight of NH_3 in the given reaction ? $3CuO + 2NH_3 \rightarrow 3Cu + N_2 + 3H_2O$ 1)17 2)$\frac{17}{4}$ 3)$\frac{17}{2}$ 4)$\frac{17}{3}$

KEY

1	**ANS-1** Sol: (1) As we know that all non zero unit are significant number. Hence significant figure is 2.
2	**ANS-1** Sol: (1) Number of significant figures in 6.0023 are 5 because all the zeroes stand between two non zero digit are counted towards significant figures.
3	**ANS-2** Sol: (2) Given $P = 0.0030\,m$, $Q = 2.40m$ & $R = 3000\,m$ In $P(0.0030)$ initial zeros after the decimal point are not significant. Therefore, significant figures in $P(0.0030)$ are 2. Similarly in $Q(2.40)$ significant figures are 3 as in this case final zero is significant. In $R = (3000)$ all the zeroes are significant hence, in R significant figures are 4.
4	**ANS-2** Sol: (2) All the zeroes between two non zero digit are significatn. Hence significant figures is 6.
5	**ANS-4** *Sol:* (4) Round off the digit at 2nd position of decimal 3.929 = 3.93.
6	**ANS-2** **(2)** The digits between two non zero digits will be significant
7	**ANS-2** Sol: (2)$\because$ 22400cc of gas at STP has 6×10^{23} molecules $\therefore$ 1.12×10^{-7} of gas at STP has $\frac{6\times10^{23}\times1.12\times10^{-7}}{22400} = .03\times10^{14} = 3\times10^{12}$.
8	**ANS-4** Sol: (4) 1L of air =210cc O_2 22400cc = 1 mole $210\ cc = \frac{1}{22400}\times210 = 0.0093$.

9	**ANS-1** Sol: (1) Given equivalent weight of metal = 9 Vapour density of metal chloride = 59.25 $\therefore$ molecular weight of metal chloride $= 2 \times V.D = 2 \times 59.25 = 118.5$ $\therefore$ valency of metal $= \frac{\text{molecular weight of metal chloride}}{\text{equivalnet weight of metal} + 35.5}$ Valency of metal $= \frac{118.5}{9 + 35.5} = \frac{118.5}{44.5} = 2.66$ Therefore atomic weight of the metal = equivalent weight $\times$ valency $= 9 \times 2.66 = 23.9$
10	**ANS-3** Sol: (3) Equivalent weight of bivalent metal = 37.2 $\therefore$ Atomic weight of metal $= 37.2 \times 2 = 74.4$ $\therefore$ Formula of chloride $= MCl_2$ Hence, molecular weight of chloride $(MCl_2) = 74.4 + 2 \times 35.5 = 145.4$
11	**ANS-2** Sol: (2) Molecular weight of NH_3 is 17 According to the mole concept 17 gm NH_3 has molecules $= 6.02 \times 10^{23}$ $\therefore$ 1 gm NH_3 has molecules $= \frac{6.02 \times 10^{23}}{17}$ $\therefore$ 4.25 gm NH_3 has molecules $= \frac{6.02 \times 10^{23} \times 4.25}{17} = 1.5 \times 10^{23}$ $molecule$
12	**ANS-2** Sol: (2) $Na_2SO_4.10H_2O = 2 \times 23 + 32 + 4 \times 16 + 10 \times 18 = 46 + 32 + 64 + 180 = 322gm$ 322gm $Na_2SO_4.10H_2O$ contains = 224 gm oxygen 32.2gm $Na_2SO_4.10H_2O$ contains $= \frac{32.2 \times 224}{322} = 22.4$ gm
13	**ANS-4** Sol: (4) Amount of gold $= 19.7kg = 19.7 \times 1000gm = 19700gm$ No. of moles $= \frac{19700}{197} = 100$ $\therefore$ No. of atoms $= 100 \times 6.023 \times 10^{23} = 6.023 \times 10^{25}$ atoms.
14	**ANS-1** Sol: (1) $\because$ 0.0835 mole of compound contains 1gm of hydrogen $\therefore$ 1gm mole of compound contain $= \frac{1}{0.0835} = 11.97 = 12gm$ of hydrogen. 12 gm of H_2 is present in $C_2H_{12}O_6$

15	**ANS-3** Sol: (3) $\because$ $100gm\ Hb$ contain $= 0.33gm\ Fe$ $\therefore$ $67200gm\ Hb = \frac{67200 \times 0.33}{100} gm\ Fe$ gm atom of $Fe = \frac{672 \times 0.33}{56} = 4$.
16	**ANS-3** Sol: (3) $\underset{2(36+1+31+64)=264}{2(NH_4)_2HPO_4} \equiv \underset{62+80=142}{P_2O_5}$ % of $P_2O_5 = \frac{\text{wt. of } P_2O_5}{\text{wt of salt}} \times 100 = \frac{142}{264} \times 100 = 53.78\%$.
17	**ANS-1** Sol: (1) $0.5gm\ Se \rightarrow 100gm$ peroxidase anhydrous enzyme $78.4gm\ Se \rightarrow \frac{100 \times 78.4}{0.5} = 1.568 \times 10^4$ Minimum m.w. $\rightarrow$ molecule at least contain one selenium.
18	**ANS-4** Sol: (4) Atomic weight = Equivalent weight × Valency $= 8.9 \times 3 = 26.7 \left(\text{Valency} = \frac{26.89}{8.9} \approx 3 \right)$.
19	**ANS-2** : **(2)** : Mass number of the element $= 81$ *i.e.*, $p + n = 81$ Let the number of protons be Z. Number of neutrons $= Z + \frac{31.7}{100} \times Z$ mass number (81)= Z+ $Z + \frac{31.7}{100} \times Z$ $Z = \frac{81}{2.317} = 34.9$ Symbol of the element $= \frac{81}{35}Br$
20	**ANS-1** : **(1)**
21	**ANS-3**
22	: **(1)** : $Valency = \frac{2 \times vapour\ density}{E + 35.5}$ $H_2SO_4 \Rightarrow \frac{2 \times 81.25}{E + 35.5} \Rightarrow 3E + 106.5 = 162.5$ 3E=56 E=18.66

23	**ANS-1**
24	**ANS-1** : **(1)** : Let atomic mass of metal M is 'a' Mass of metal $= a \times x$ Mass of Oxygen $= 16 \times y$ Equivalent mass of element $= \frac{\text{Mass ofelement}}{\text{Mass of oxygen}} \times 8$ $E = \frac{ax}{16y} \times 8$ $\quad a = 2E\frac{y}{x}$
25	**ANS-3** : **(3)** : Given Compound is $Ni_{0.98}O_1$ Number of Ni^{+3} ions= x Number of Ni^{+2} ions = 0.98- x Number of O^{-2} ions = 1 $\therefore (+3)x + (-2)(0.98-x) + (-2)1 = 0$ $x + 1.96 - 2 = 0$ $x = 0.04$ $Ni^{+3} = \frac{0.04}{0.98} \times 100 = 4.08\%$
26	**ANS-3** : **(3)** : $MgSO_4 \cdot 7H_2O(s) \rightarrow MgSO_4(s) + 7H_2O(l)$ 246 g 126 g 246 g $MgSO_4 \cdot 7H_2O$ gives = 126 g H_2O 2.34 g $MgSO_4 \cdot 7H_2O$ gives = 1.26 g H_2O

27	**ANS-2** : (2) : Moles of Fe $= \frac{0.0056}{56} = 10^{-4} mol$ 1 mol of alum = 2 mol of Fe 2 mol of Fe = 1 mol of alum 10^{-4} mol Fe $\frac{1}{2} \times 10^{-4} mol$ $= 0.5 \times 10^{-4}$ mol
28	**ANS-4** In $FeCl_2$ and $FeCl_3$, the ratio of weights of Cl that combine with fixed weight of Fe is 2 : 3
29	**ANS-1** $W\ \%\ of\ C = \frac{12}{44} x \frac{8.8}{3} x100 = 80\%$ $W\% of\ H = \frac{2}{18} x \frac{5.4}{3} x100 = 20\%$ 80 % of C & 20% of H gives the EF as CH_3
30	**ANS-4** $C_xH_y + (x + \frac{y}{4})O_2 \rightarrow XCO_2 + \frac{y}{2}H_2O$ 15 mL 45 mL 30 mL 1 mL 3 mL 2 mL $\therefore x = 2;\ x + \frac{y}{4} = 3 \Rightarrow \frac{y}{4} = 1; y = 4$ $\therefore$ Hydrocarbon is C_2H_4
31	**ANS-1** X Y $\Rightarrow \frac{50}{10} = 5; \frac{50}{20} = 2.5$ $\Rightarrow \frac{5}{2.5} = 2; \frac{2.5}{2.5} = 1$ $\therefore$ EF = X_2Y
32	**ANS-1** $CaCO_3$ is limiting reagent 100 g of $CaCO_3 \rightarrow$ 44g of CO_2 20 g of $CacO_3 \rightarrow ? = 8.8$ g

33	**ANS-1** 96 % of 50 g = 48 g 32 g of S $\rightarrow$ 22.4 L of SO_2 48 g $\rightarrow$? = 33.6 L
34	**ANS-2** According to Avagardro's Law $\frac{V_1}{n_1} = \frac{V_2}{n_2}$ $\frac{X}{3x10^{22}} = \frac{X}{2xn_2} \therefore n_2 = 1.5 \times 10^{22}$
35	**ANS-1** $3KMnO_4 + 5FeC_2O_4$ $\quad$ $3K_2Cr_2O_4 + 6FeC_2O_4$ 3moles 5 moles $\quad$ 3moles 6 moles ? 1 mole $\quad$? 1 mole
36	**ANS-4** 44.1 g of salt $\rightarrow$ 55.9 g of H_2O 142 g of salt $\rightarrow$? = 180 g $\Rightarrow$ 10 moles of water
37	**ANS-2** $CaCO_3 \rightarrow CaO + CO_2$ 100 g $\rightarrow$ 22.4 L 10 g $\rightarrow$? = 2.24 L
38	**ANS-4** 14 mole HCl loses 6 mole e^-; $\therefore$ 1 mole HCl loses $\frac{6}{14} mole\ e^-$ $\therefore$ eq. Mass of $HCl = \frac{M}{\left(\frac{6}{14}\right)}$ $\Rightarrow \frac{36.5 \times 14}{6} = 85.1$
39	**ANS-4** n- factor $= \frac{n_1 \times n_2}{n_1 + n_2} = \frac{4 \times 2}{4+2} = \frac{4}{3}$ Eq. Mass $= \frac{mol\ mass}{n - factor} = \frac{M \times 3}{4}$

40	**ANS-4** n- factor $= \left\|2\times 2+8\times 3\right\| \Rightarrow 28$
41	**ANS-2** $Eq.mass$ of chloride $= E_{Element}+E_{Chlorine}$ $\frac{M_{Mass}}{n_f}=E_{Element}+E_{Chlorine}$ $\frac{59.25\times 2}{x}=4+35.5$ $x=3$
42	**ANS-1** $K_2Cr_2O+X^{n+}\rightarrow X^{5+}O_3^-+Cr^{3+}$ $6\times 10^{-3}\times 6=(5-n)\times 9\times 10^{-3}\Rightarrow n=1$
43	**ANS-3** $C_2H_2O_4.2H_2O$
44	**ANS-4** $2N^{3-}\rightarrow (N_2)^0+6e^-$ 2 mole of $NH_3=1mole\,N_2$ Thus equivalents $2\times n=1\times 6$ $n=6/2=3$ $\therefore$ Eq. wt $=\frac{M}{3}=\frac{17}{3}$