SOLUTION-1

1. Normality of 10.6% (w/v) Na_2CO_3 solution is

1) 1N 2) 2N 3) 3N 4) 4N

Hint: N= (w/v)%x10/GEW

=10.6X10/53=2N

2. The weight of NaOH(in gm) present in 100ml of 0.5M NaOH solution is

2) 1 2) 3 3) 2 4) 4

Solution: Wt=MX GMW X V in lit.=0.5X40X100/1000 =2gm

3; An aqueous solution of 6.3g oxalic acid dihydrate is made up to 250ml. Volume of 0.1N NaOH required to completely neutralize 10ml of this solution is

1)40 ml 2) 20 ml 3) 10 ml 4) 4 ml

Solution of oxalic acid N_1=(wtX1000)/(GEWX V in ml)=6.3x1000/63X250 =0.4N

$V_aN_a=V_bN_b$ i.e 10Xo.4=V_bX0.1 →V_b=40ml

4. Equivalent weight of hypo in the reaction $Na_2S_2O_3 + Cl_2 + H_2O \longrightarrow Na_2SO_4 + 2HCl + S$ **, if M is molecular weight of hypo is**

1) M 2) M/2 3) M/3 4) 2M

Solution; oxidation state of 'S' in Hypo=+2.5, in Na_2SO_4 is +6 and in elementary form is zero. In reactant side total oxidation state per molecule=+5

In product side total ox, state of 's'=+6+0=+6

$\therefore$ Change in ox. State per molecule=6-5=1 $\therefore$ Equivalent weight of hypo=M/1=M

5) Molarity of pure water (density=1gm/ml) is

1)40M 2) 4M 3) 55.6M 4) 25M

Solution: wt of 1lit water=1000gm=1000/18=55.55 moles, M=n/v in lt=55.55/1=55.55M

6) Which one of these solutions has highest normality?

1)8g KOH per 100ml

3) 0.5M H_2SO_4

4) 6g NaOH per 100ml

5) 1N H_3PO_4

Hint: $N = \frac{\text{wt of solute}}{\text{Gram equivalent weight}} \times \frac{1000}{\text{Vol of solution in ml}}$

7) 10. 6 g Na_2CO_3 is dissolved in water to get 2 M solution. The volume of the solution (in ml) is

1) 50 ml 2) 40 ml 3) 100 ml 4) 10 ml

Solution: Molarity (M) $= \left(\frac{W}{G.M.W}\right)_{solute} \times \frac{1000}{\text{vol.in ml}}$ i.e $2 = \frac{10.6}{106} \times \frac{1000}{V_{ml}}$

$\therefore$ Vol. of solution = 50 ml

$\therefore$

8) The volume of 0.2M H_2SO_4 solution containing 10 milli equivalents of solute is

1)50 ml 2) 40 ml 3) 100 ml 4) 25 ml

Solution: N=MX basicity=0.2X2=0.4N, milli equivalents =N X Vin ml

i.e 10=0.4XV $\therefore$V=25ml

9) The number of moles of oxalic acid required to decolorize completely 0.4 mole of acidified $KMnO_4$ solution is

1)0.4 2) 0.5 3) 1 4) 2

Solution: $2KMnO_4 + 3H_2SO_4 + 5H_2C_2O_4 \rightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 10CO_2$

10. Assertion (A): Molarity of 0.05N solution of HNO_3 is 0.05M

Reason (R): Molarity & normality of a solution are always equal

The correct answer is

2) Both A and R are true and R is correct explanation of A

3) Both A and R are true and R is not correct explanation of A

4) A is true but R is false

4) Both A and R are false

11) Solid solution in the following is

1) NaCl in water 2) Amalgam 3) Soda water 4) Camphor in air

12) The volume of 0.1N H_2SO_4 solution required to exactly neutralize 5.6g of KOH is

1)250 ml 2) 500 ml 3) 25 ml 4) 1000 ml

Solution: 5.6gm=5.6/56=0.1gm equivalents of KOH

For complete neutralization, equivalents of KOH= equivalents of H_2SO_4

i.e 0.1= 0.1X Vin lt. $\therefore$V=1lit

13) Molarity of 0.2% (w/v) NaOH solution is

1)0.2 2) 2 3) 0.05 4) 0.5

Solution: 0.2% (w/v) NaOH solution means 0.2 g of NaOH is dissolved in 100 ml of solution.

Molarity $=\left(\frac{W}{G.M.W}\right)_{solute}\times\frac{1000}{vol.in\,ml}=\frac{0.2}{40}\times\frac{1000}{100}$ = 0.05M.

14) 20 ml of 0.2 N HCl and 40 ml of 0.4 N HNO_3 are mixed and the solution is diluted up to 100 ml. The normality of the resultant solution is

1)0.1 N 2) 0.15 N 3) 0.2N 4) 0.4 N

Solution:

$$\therefore N_{Total}=\frac{N_1V_1+N_2V_2}{V_{Total}}=\frac{0.2\times20+0.4\times40}{100}=\frac{20}{100}=0.2N$$

15) Which of the following is more concentrated?

1)1M H_2SO_4 2) 1m H_2SO_4 3) 1% H_2SO_4 4)1N H_2SO_4

Hint: For poly basic acids the concentration in 1M>1m>1N>1%

16) 20ml of 10N HCl and 10ml of 5 N HCl are mixed and made upto 1 litre with distilled water. The normality of the resulting solution is

1)0.25 N 2) 0.3 N 3) 0.20 N 4) 0.1 N

Solution: $\therefore N_{Total}=\frac{N_1V_1+N_2V_2}{V_{Total}}$ $=\frac{10\times20+10\times5}{1000}=0.25N$

17) What is the normality of 0.3 M H_3PO_4 in the following reaction?

$$H_3PO_4 + 2OH^- \longrightarrow HPO_4^{2-} + 2H_2O$$

1)0.15 N 2) 0.30 N 3) 0.10 N 4) 0.60 N

Solution: as the acid looses two H^+ ions, its basicity is 2.

$\therefore$ N=MX basicity=0.3X2=0.6N

18) Volume of water to be added to 1 litre of a solution of 1.123 N acid solution to make it 1N solution

1)900ml 2) 246 ml 3) 123 ml 4) 100 ml

Solution: volume of water added=$V_1 (M_1 - M_2)/ M_2$

=1000(1.123-1)/1=123ml

19) Normality of the acid solution obtained by diluting 250 ml of 0.4N H_2SO_4 with 1000ml of water is

1)0.1 2) 0.16 3) 0.2 4) 0.08

Solution: For dilution $V_1N_1 = V_2N_2$

250X0.4=1250XV_2 i.e V_2=0.08N

20) 10.6g of Na_2CO_3 was exactly neutralized by 100ml of H_2SO_4 solution. Molarity of H_2SO_4 solution is

1)1.0 2) 2 3) 0.5 4) 2.5

Solution: 10.6gm=10.6/53=0.2 gm equivalents of Na_2CO_3

For complete neutralization, equivalents of Na_2CO_3 = equivalents of H_2SO_4

i.e 0.2= N_a X 100/1000 thus N of H_2SO_4 =2N $\therefore$M=N/basicity=2/2=1M

21) A volatile solvent can be separated from non volatile solute by

1) Evaporation 2) Distillation 3) Can't be separated 4) Filtration

22) The molarities of two solutions A & B are 0.1M and 0.2M respectively. If 100ml of A is mixed with 25ml of B there is no change in volume. Then final molarity of the solution is

1)0.16 M 2) 0.18 M 3) 0.12 M 4) 0.28 M

Solution: $M = \frac{M_1V_1 + M_2V_2}{(V_1 + V_2)} = \frac{0.1\times100 + 0.2\times25}{100+25}$ =0.12 M

23) 200 ml of $KMnO_4$ solution is exactly reduced by 100 ml, 0.5M oxalic acid solution. The molarity of $KMnO_4$ solution

1)0.1 2) 0.16 3) 0.2 4) 0.08

Solution: $2KMnO_4 + 3H_2SO_4 + 5H_2C_2O_4 \rightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 10CO_2$

$$\frac{M_1V_1}{\underset{(KMnO_4)}{n_1}} = \frac{M_2V_2}{\underset{(H_2C_2O_4)}{n_2}} \quad \therefore \frac{M_1 \times 200}{2} = \frac{0.5 \times 100}{5}, \ M_1 = 0.1M$$

$\therefore$ Molarity of $KMnO_4$ = 0.1 M

24) 250ml of Na_2CO_3 solution contains 2.65g of Na_2CO_3. 10 ml of this solution is added to xml of water to obtain 0.001M Na_2CO_3 solution. The value of x in ml

1)1000 2) 990 3) 9990 4) 90

Solution: M_1=2.65X1000/106X250=0.1

Volume of water added i.e $x=V_1(M_1 - M_2)/M_2$

=10 (0. 1-0.001)/0.001=990ml

25) In acidic medium, dichromate ion oxidizes ferrous ion to ferric ion. If the gram molecular weight of potassium dichromate is 294 gram, its gram equivalent weight is (in grams)

1)294 2) 147 3) 49 4) 24.5

Solution: in acid medium change in ox.state per molecule of dichromate=6

GEW=GMW/6=294/6=49

26) Which of the following is more concentrated?

1)1% H_3PO_4 2) 1M H_3PO_4 3) 1m H_3PO_4 4)1N H_3PO_4

27) Molarity of 1 %(W/V) H_2SO_4 solution is approximately

1)2.5 2) 1 3) 0.18 4) 0.1

Solution: M= (w/v) % X10/GMW =1X10/98=0.102M

28) What volume of 0.8M solution contains 0.4 mole of solute?

1)100 ml 2) 125 ml 3) 500 ml 4) 62.5 ml

Solution:M=n/V inlit or V inlit=n/M=0.4/0.8=0.5lit=500ml

29) Equivalent weight of a trivalent metal is 9. The molecular weight of its oxide is

1)75 2) 36 3) 51 4) 102

Solution: GAW of metal= GEWX valency =9X3=27, as metal is trivalent, its oxide is M_2O_3.

GMW of M_2O_3 = 2X27 +3X16=102

30) 0.5 mole of H_3PO_4 is dissolved in sufficient water and made upto 500ml in a standard flask. The concentration of the solution is

1)0.5 M 2) 1 m 3) 1 M 4) 1 N

Solution: M=nX1000/V in ml=0.5X1000/500 =1M

31) Which of the following method of expressing concentration is independent of temperature and have no units?

1) Molality 2) Mole fraction 3) Molarity 4) Normality

32) Equivalent weight of $KMnO_4$ in neutral medium is

1) M/3 2) M/1 3) M/5 4) M/6

33) Number of equivalents in 98gm H_3PO_3 is

1)2 2) 1 3) 3 4) 1/2

34) With increase in temperature both normality and molarity of a solution

1) Decreases 2) Increases 3) Remains same 4) Doubles

35) When a solution is diluted n times, the molarity and normality

1) Decreases by 2n times 2) Decreases by n times

3) Decreases by n/2 times 4) Increases by n times

Hint: N orM inversely proportion to volume.

36) An example for gas in solid solution is

1) Alloy 2) Occlusion of H_2 in pd

3) Soda water 4) Iodine in air

37) A solution whose concentration is exactly known is called

1) Centimolar solution 2) Saturated solution

3) Standard solution 4) Any of the above

38) More convenient method of expressing concentration is

1) Molarity 2) Normality 3) % by weight 4) All of these.

39) 100ml of CH_3OH (d = 0.32 g/ml) was taken in a 1000ml flask and water is added upto the mark to prepare solution. The molarity of solution is (volumes are additive)

1)1 2) 2 3) 0.1 4) 0.5

Solution: wt of solute=VXd=100X0.32=32gm

M=wt X1000/GMWXV in ml= 32X1000/32X1000 = 1M

40) The molarity of resulting solution formed by mixing equal volumes of 1M HCl and 1M HNO_3 is

1)2 2) 1 3) 1.5 4) 2.5

Solution: $M = \frac{M_1V_1 + M_2V_2}{(V_1+V_2)} = \frac{1\times V + 1\times V}{V+V} = 1M$

41) 0.6g of a metal carbonate is neutralized by 300ml of centimolar HCl solution. The equivalent weight of metal carbonate is

1)100 2) 50 3) 150 4) 200

Solution: wt of metal carbonate/GEW =N_a XV_a in lt

0.6/GEW=0.01X300/1000, ∴ GEW = 200

42) A solution is labeled as 10N. To prepare 100ml of 0.1N solution, the volume of water to be added to the concentrated solution is

1)90 ml 2) 99 ml 3) 990 ml 4) 1 ml

Solution: V_1 N_1= V_2 N_2 , V_1 =100X0.1/10=1ml

∴ Volume of water added=V_2-V1 =100-1=99ml

43) The solubility of a gas in liquid increases with

1) Increase in temperature 2) reduction of gas pressure

3) Decrease in temperature and increase in gas pressure 4) amount of liquid taken.

44) The volume of water that must be added to a mixture of 250ml of 6M HCl and 650ml of 3M HCl to obtain 3M solution is

1) 75ml 2) 150ml 3). 300ml` 4) 250ml

Solution: $M = \frac{M_1V_1 + M_2V_2}{(V_1 + V_2 + vol.of water)}$

45) Equal volumes of 0.1 M $NaNO_3$ and 0.2 M NaCl solutions are mixed. The concentration of nitrate ions in the resultant mixture will be

1) 0.1 M 2) 0.2 M 3) 0.05 M 4) 0.15 M

Solution: As equal volumes are mixed the vol.of solution is doubled.[NO_3^-]=0.1/2= 0.05N or M

46) The following are some statements about solution

i) In a binary solution, two components are present

ii) A homogenous solution consists of two phases

iii) In a binary solution, component generally present in higher amount is known as solvent

1) All are correct
2) Only (i) and (ii) are correct
3) Only (i) and (iii) are correct
4) (ii) and (iii) are correct

47) Match the following

List-I	**List-II**
A. gas in liquid	**1. camphor in air**
B. liquid in gas	**2. bronze**
C. liquid in solid	**3. water in air**
D. solid in solid	**4. Oxygen in water**
	5. amalgam The correct answer is

	A	**B**	**C**	**D**
1)	5		4 3	2
2)	1		2 3	4
3)	4	3	5	2
4)	2	4	1	3

48) 0.84g of metal carbonate reacts exactly with 40ml of $\frac{N}{2}$ H_2SO_4 solution. Equivalent weight of metal is

1)84g 2) 21g 3) 42g 4) 12g

Solution: wt of metal carbonate/GEW =N_a XV_a in lt

0.84/GEW=0.5X40/1000, ∴ GEW of metal carbonate = 42

GEW of METAL= 42- GEW of CO_3^{-2}=42-30=12g.

49) Solubility of a solute in a solvent depends on

1) Nature of solute 2) Nature of solvent 3) Temperature 4) All the above

50) Correct relation is

1. Molarity x Eq. Wt = Normality x Mol. Wt
2. Molarity x Mol.wt = Normality x Eq. Wt
3. Molarity x Normality = M.wt x Eq. Wt
4. $\frac{Molarity}{M.wt} = \frac{Normality}{Eq.wt}$

51) In acidic medium, molarity of 0.3N $K_2Cr_2O_7$ solution is

1)0.3 2) 0.05 3) 1.8 4) 0.15

Solution: N=MX change in ox. State per mole, M=0.3/6=0.05

52) The concentration of sulphate ions in 0.1M potash alum solution is

1)0.4M 2) 0.3 M 3) 0.2 M 4) 0. 1 M

S0lution; Formula of potash alum is K_2SO_4 $Al_2(SO_4)_3$ $24H_2O$.i molecule contains 4 sulphate ions. ∴[$SO4^{-2}$]=0.1X4=0.4

53) In 46% (w/w) aqueous solution of ethyl alcohol the mole fraction of alcohol is

1)0.5 2) 0.25 3) 0.75 4) 0.65

Solution: 46%w/w means 100gm solution contains 46gm of alcohol

∴ Wt of alcohol= 46gm. Wt of water =100-46=54gm.

Moles of alcohol=n=46/46=1 and moles of water i.e N=54/18=3

∴ Mole fraction of alcohol =n/n+N =1/1+3=0.25

54) If 0.46g of Ethanol is dissolved in 1000 g of H_2O, the molality of the ethanol solution is

1)0.1m 2) 0.02m 3) 0.2m 4) 0.01m

Solution: Wt of ethanol (solute) =0.46g, Wt. of water (solvent) = 1000 g

G.M. W of ethanol = 46 g

Molality = $\left(\frac{W}{G.M.W}\right)_{solute} \times \frac{1000}{\text{wt of solvent in gms}} = \frac{0.46}{46} \times \frac{1000}{1000} = 0.01m$

55) The molality of a 9.8% (w/w) solution of H_2SO_4 is

1)1.1m 2) 2.2m 3)1m 4)2m

Solution: 9.8% (w/w) solution means 9.8 g of the solute are present in 100g of solution.

Wt of solute = 9.8g, wt of solvent = 100-9.8 = 90. 2g

Molality =

$$\left(\frac{W}{G.M.W}\right)_{Solute} \times \frac{1000}{\text{wt. of solvent in gm}} = \frac{9.8}{98} \times \frac{1000}{90.2} = 1.1m$$

56) The molality of 4% (w/v) NaOH solution having the density 1.02 g/ml. is

1)1.2m 2) 0.98m 3)1.02m 4)1m

Solution: 4% (w/v) NaOH solution contains 4g of NaOH is 100ml of the solution.

Density of the solution = 1.02 g/ml

Wt of the solute in 100 ml of the solution = 4g

Wt of 100 ml of the solution = $100 \times 1.02 = 102\,g$

Wt. of solvent = Wt of solution - Wt of solute = 102-4= 98 g.

$\therefore$ Molality $= \left(\frac{W}{G.M.W}\right)_{Solute} \times \frac{1000}{\text{wt of solvent in gms}} = \frac{4}{40} \times \frac{1000}{98} = 1.02m$

57) 6 g of urea is mixed with 16. 2g of H_2O the mole fraction of urea in the mixture is

1)6/22.2 2)22.2/6 3)0.9 4)0.1

Solution: Mole fraction of $urea = \frac{n_{urea}}{n_{urea} + n_{H_2O}} = \frac{\left(\frac{6}{60}\right)}{\left(\frac{6}{60} + \frac{16.2}{18}\right)} = \frac{0.1}{0.1 + 0.9} = 0.1$

58). In a normal solution of $BaCl_2$, normalities of Ba^{+2} and Cl^- are in the ratio

1) 2:1 2) 1:2 3) 1:1 4) 2:3

Solution: $BaCl_2 \rightarrow. Ba^{+2} + 2\,Cl^-$ 1N 1N 2N

59) Match List-I with List-II

List-I	List-II
A. Molarity	**i) no units**
B. Molality	**ii) gm.equivalents/lit**
C. Normality	**iii) mol/lit**
D. Mole fraction	**iv) moles/ kg. Solvent**
	v) gm. equivalents/ kg. Solvent

The correct match is:

	A	B	C	D
1)	(iv)	(iii)	(ii)	(i)
2)	(iv)	(v)	(ii)	(i)
3)	(iii)	(iv)	(i)	(ii)
4)	(iii)	(iv)	(ii)	(i)

60) If 20 ml of 1M HCl solution is exactly neutralized by 10 ml of Ca $(OH)_2$ solution, the strength of $Ca(OH)_2$ in grams per liter of the solution is

1)37 2) 74 3)111 4)148

Solution: $2HCl + Ca(OH)_2 \longrightarrow CaCl_2 + 2H_2O$

$$\frac{M_1V_1}{\underset{(HCl)}{n_1}} = \frac{M_2V_2}{\underset{(Ca(OH)_2)}{n_2}} \Rightarrow \frac{1\times 20}{2} = \frac{M_2\times 10}{1},\ M_2 = 1.0M$$

Molarity of Ca $(OH)_2$ = 1.0 M

Strength of Ca $(OH)_2$ solution = Molarity XM.wt = 1X74= 74 g/litre .

61) A gaseous mixture contains four gases A, B, C and D. The mole fraction of "B" is 0.5. The mole fraction of "A" is

1) 0.525 2) 0.375 3) 0.625 4) 0.732

Solution: As X_B=0.5, $X_A+X_C+X_D$=1-0.5=0.5 ∴ X_A<0.5

62) The maximum allowable level of carbon monoxide in air is 9mg per dm^3, the level in ppm is

1) 9 2) 18 3) 90 4) 900

Solution; 1 dm^3=1lit, 1mg/lit=1ppm

KEY:

1) 2	2)3	3) 1	4) 1	5) 3	6)3	7) 1	8)4	9)3	10)3
11)2	12)4	13) 3	14)3	15)1	16) 1	17)4	18) 3	19) 4	20) 1
21)2	22) 3	23)1	24)2	25)3	26)2	27)4	28)3	29)4	30)3
31) 2	32)1	33) 1	34) 1	35) 2	36)2	37) 3	38)1	39)1	40)2
41)4	42)2	43) 3	44)4	45)3	46) 3	47)3	48) 4	49) 4	50) 2
51)2	52) 1	53)2	54)4	55)1	56)3	57)4	58)2	59)4	60)2
61) 2	62)1								