1. SOLUTIONS

PREVIOUS EAMCET BITS

1. 20 ml of 0.1M acetic acid is mixed with 50 ml of Potassium acetate. K_α of acetic acid = 1.8×10^{-5} at 27^0C. The concentration of Potassium acetate if pH of the mixture is 4.8 **(2009 E)**

1) 0.1M 2) 0.04 M 3) 0.4 M 4) 0.02M

Ans : 2

Sol: $K_\alpha = 1.8\times10^{-5}$

$\therefore pK_a = 4.74$

$$pH = pK_a + \log\frac{[Salt]}{[Acid]}$$

$$4.8 = 4.74 + \log\frac{[Salt]\times 7}{0.2}$$

$$0.06 = \log\frac{[salt]\times 7}{0.2}$$

Taking Antilogs

$$1.148 = \frac{[salt]\times 7}{0.2}$$

Or $[Salt] = \frac{1.148\times 0.2}{7} = 0.04M$

2. After removing the hard shell of an egg by dissolving in dil. HCl, a semipermeable membrane is visible. If such an egg is kept in a saturated solution of common salt the size of the egg will **(2009 M)**

1) Shrink 2) grow

3) remain the same 4) first shrink and then grow larger

Ans : 1

Sol: Solvent water flows from egg to salf solution. So egg shrinks

3. Molality of an aqueous solution that produces an elevation of boiling point of 1.00 K at 1 atm pressure (K_b for water = 0.512 K.Kg.mol-1) **(2009 M)**

1) 0.512 M 2) 0.915 M 3) 1.95 M 4) 5.12 M

Ans : 3

Sol: molality = DT/K_b = 1/0.512 = 1.95 m

4. When 25 grams of a non-volatile solute is dissolved in 100 grams of water, the vapour pressure is lowered by $2.25\times10^{-1}mm$. If the vapour pressure of water at 20^0C is 17.5 mm, what is the molecular weight of the solute ? **[2008 E]**

1. 206 2. 302 3. 350 4. 276

Ans : 3

Sol: $RLVP = \frac{2.25\times10^{-1}}{17.5}$

$$RLVP = \frac{n_2}{n_1}$$

$$\frac{2.25\times10^{-1}}{17.5} = \frac{25}{M}\times\frac{18}{100}$$

$$M = \frac{25\times18\times17.5}{2.25\times10^{-1}\times100} = 350$$

5. The volume of two HCl solutions A(0.5)^N and B(0.1N) to be mixed for preparing 2l of 0.2 N HCl solution **(2008 M)**

1) 0.5 *l* of A+1.5 *l* of B
2) 1.5 *l* of A + 0.5*l* of B
3) 1*l* of A + 1*l* of B
4) 0.75*l* of A+1.25*l* of B

Ans:1

Sol: Conc. Of solution A = 0.5 N

Conc. Of solutions B = 0.1 N

Solution required is of 0.2N conc. This is nearer to solution B

So try (1) or (4)

Conc. Of final soln.= $\frac{(0.5\times0.5)+(1.5\times0.1)}{2}$

= $\frac{0.25+0.15}{2}$ = $\frac{0.4}{2}$ = 0.2N

6. 138 grams of ethyl alcohol is mixed with 72 grams of water. The ratio of mole fraction of alcohol to water is **(2007 E)**

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

Ans : 1

Sol : $n_{C_2H_5OH} = \frac{138}{46} = 3$; $n_{H_2O} = \frac{72}{18} = 4$

Mole fraction ratio : 3:4

7. In an oxidation reduction reaction, dichromate $\left(Cr_2O_7^{-2}\right)$ ion is reduced to Cr^{+3} ion. The equivalent weight of $K_2Cr_2O_7$ in this reaction is **(2007 M)**

1) $\frac{Molecular\ weight}{3}$
2) $\frac{Molecular\ weight}{6}$
3) $\frac{Molecular\ weight}{1}$
4) $\frac{Molecular\ weight}{2}$

Ans : 2

Sol: In Cr_2, O_7^{-2}, the oxidation number of Cr is +6

In Cr^{+3} the oxidation number of Cr is +3

Change in oxidation number for 2 Cr atoms is 6

$\therefore$ Eq. Wt of $K_2Cr_2O_7$ in the reaction = $\frac{its\,mol.wt}{6}$

8. In the redox reaction,

2 $KMnO_4$+ $3H_2SO_4 + 5H_2C_2O_4 \rightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 10CO_2$. The volume of 0.1M. $KMnO_4$ required to Oxidise 25mL of 0.25 M. $H_2C_2O_4$ solution is **(2007 M)**

1)25 L 2) 125 mL

3) 25 mL 4) 1.25 L

Ans : 3

Sol: 0.1 M-KMnO4 means 0.5N – $KMnO_4$

0.25 M $H_2C_2O_4$ means 0.5 N – $H_2C_2O_4$

$V_1N_1 = V_2N_2$

$25 \times 0.5 = V_2 \times 0.5$

Volume of $KMnO_4$

$V_2 = \frac{25 \times 0.5}{0.5}$ = 25 ml

9. Which of the following set of a variables give a straight line with a negative slope when plotted? **(2006 E)**

(P = Vapour pressure; T = Temperature in K)

y-axis	x-axis
1) P	T
2) $\log_{10}$ P	1/T
3) $\log_{10}$ P	T
4) $\log_{10}$ P	$\log_{10}$ 1/T

Ans : 2

Sol: Clausius and Clapeyron showed graph of 1/T Vs log p is a straight line.

10. Acidified $KMnO_4$ oxidizes oxalic acid to CO_2. What is the volume (in litres) of 10^{-4}m $KMnO_4$ required to completely oxidize 0.5 litres of 10^{-2} M oxalic acid in acid medium **(2006 M)**

1)125 2) 1250 3) 200 4) 20

Ans : 4

Sol: Normality of $KMnO_4$ = $5 \times 10^{-4} N$

Normality of oxalic acid = $2 \times 10^{-2} N$

$V_1N_1 = V_2N_2$

$V_1 \times 5 \times 10^{-4} = 0.5 \times 2 \times 10^{-2}$

$V_1 = \frac{10^{-2}}{5 \times 10^{-4}} = 20lit$

11. The vapour pressure of water at 23^0C is 19.8 mm. 0.1 mole of glucose is dissolved in 178.2 g of water. What is the vapour pressure (in mm) of the resultant solution ? **(2005 E)**

1)19.0 2) 19.602 3) 19.402 4) 19.202

Ans : 2

Sol: number of moles of water $= \frac{178.2}{18} = 9.9$

number of moles of glucose = 0.1

Total number of moles = 9.9 + 0.1 = 10

Mole fraction of solute = $\frac{0.1}{10} = 0.01$

$$\left[\frac{P_A^0 - P_A}{P_A^0}\right] = 0.01$$

$$P_A^0 - P_A = 19.8 \times 0.01 = 0.198$$

$\therefore$ Vap. Pressure of solution,

$$P_A = 19.8 - 0.198 = 19.602 \text{ mm}$$

12. In an oxidation reduction reaction, MnO_4 ion is converted to Mn^{2+}. What is the number of equivalents of $KMnO_4$ (mol. wt = 158) present in 250 ml of 0.04 M $KMnO_4$ solution ? **(2005 M)**

1) 0.02 2) 0.05 3) 0.04 4) 0.07

Ans : 2

Sol: $$MnO_4^- \rightarrow M_n^{2+}$$

$\therefore$ O.N. decreases from +7 to +2

$\therefore$ Equivalent weight of $KMnO_4$ = $\frac{its\ molecular\ weight}{5}$

Number of moles $KMnO_4$ present = $\frac{250}{1000} \times 0.04 = 0.01$

$\therefore$ Number of equivalents of $KMnO_4$ = $5 \times 0.01 = 0.05$

13. 'x' grams of water is mixed in 69 grams of ethanol. Mole fraction of ethanol in the resultant solution is 0.6. What is the value of 'x' in grams? **(2004 E)**

1) 54 2) 36 3) 180 4) 18

Ans : 4

Sol: Mole fraction of water in solution = 1-0.6 = 0.4

No. of moles of water in solution = n

Number of moles of alcohol = $\frac{3}{2}$

$$\frac{n}{n + 3/2} = 0.4$$

n = 0.4n+0.6

0.6n = 0.6

$$n = \frac{0.6}{0.6} = 1$$

$\therefore$ Weight of water in solution = 18 g

14. 250ml of a solution contains 6.3 grams of oxalic acid (mol.wt. = 126). What is the volume (in litres) of water to be added to this solution to make it a 0.1N solution? **(2004 M)**

1) 750 2) 7.5 3) 0.075 4) 0.75

Ans : 4

Sol: Eq. Wt. of oxalic acid = $\frac{126}{2} = 63$

Normality of oxalic acid

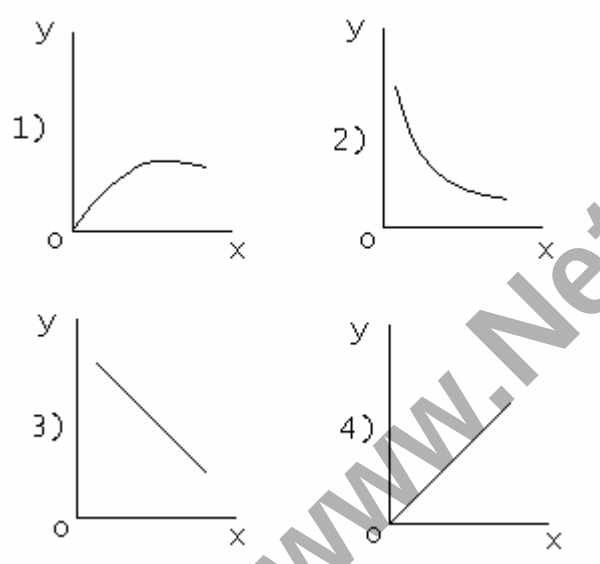
$$= \frac{6.3 \times 1000}{63 \times 250} = 0.4N$$

Equation for dilution

$$V_2 = \frac{V_1 N_1}{N_2} = \frac{0.250 \times 0.4}{0.1} = 1lit$$

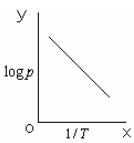
Volume of water added = 1-0.25 = 0.75 lit

15. Which one of the following represents the graph between log P (on Y-axis and 1/T on X-axis? (P= vapour pressure of a liquid, T= absolute temperature) **(2003 E)**



Ans : 3

Sol: Clausius and clepeyron equation



16. 3.65 grams of HCl is disolved in 16.2 grams of water. The mole fraction of HCl in the resulting solution is **(2003 M)**

1) 0.4 2) 0.3 3) 0.2 4) 0.1

Ans : 4

Sol: $\eta_{HCl} = \frac{3.65}{36.5} = 0.1$

$$\eta_{H_2O} = \frac{16.2}{18} = 0.9$$

$\therefore$ Mole fraction of HCl = $\frac{0.1}{1} = 0.1$

17. Equal volumes of 0.1 M and 0.2 M NaCl solutions are mixed. The concentration of nitrate ions in the resultant mixture will be _____ **(2002 M)**

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

Ans : 3

Sol: $\left[NO_3^-\right]$ in 0.1M $AgNO_3$ = 0.1 M

When mixed with equal volume of 0.2M

NaCl solution, the volume of solution is double. So concentration of NO_3^- is halved.

$\therefore \left[NO_3^-\right] = 0.1/2 = 0.05M$

18. 250 ml of a solution carbonate solution contains 2.65 grams of Na_2CO_3. If 10 ml of this solution is diluted to one litre, what is the concentration of the resultant solution? (molecular weight of Na_2CO_3 = 106) **(2001 E)**

1) 0.1 M 2) 0.001 M 3) 0.01 M 4) 10^{-4} M

Ans : 2

Sol: Number of moles of Na_2CO_3 = $\frac{2.65}{106}$

Volume of solution in litres

= $\frac{250}{1000} = 0.25lit = \frac{1}{4}lit$

Molar concentration of solution = $\frac{2.68}{106} \times \frac{4}{1} = \frac{10.60}{106} = 0.1M$

10 ml of this solution is diluted to 1000 ml i.e., made 100 times

$\therefore$ Molar concentration of final solution = $\frac{0.1}{100} = 0.001M$

19. 250 ml of a sodium carbonate solution contains 2.65 grams of Na_2CO_3. 10 ml of this solution is added to x ml of water to obtain 0.001 M Na_2CO_3 solution. What is the value of x in ml?(Molecular weight of Na_2CO_3=106) **(2001 M)**

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

Ans : 2

Sol: Number of moles of Na_2CO_3 = $\frac{2.65}{106}$

Volume of solution in litres = 0.25 lit = 1/4 lit.

$\therefore$ Molarity of Na_2CO_3 solution

= $\frac{2.65}{106} \times \frac{4}{1} = 0.1M$

$V_2M_2 = V_1M_1$

$V_2 \times 0.001 = 10 \times 0.1$

$\therefore$ Volume of final solution prepared,

$V_2 = \frac{10 \times 0.1}{0.001} = 1000ml$

$\therefore$ Volume of water added =1000-10 =990 ml.

20. A non-volatile solute (A) is dissolved in a volatile solvent (B). The vapour preasure of solution is Ps. The vapour pressure of pure solvent is poB . If X is mole fraction .Which of the following is correct? (2000 E)

1. $P_S = P^0{}_B \times X_A$ 2. $P^0{}_B = P_S \times X_B$ 3. $P_S = P^0{}_B \times X_B$ 4. $P^0{}_B = P_S \times X_A$

Ans : 3

Sol : According to "Raoults " law

21. What is the volume (in ml)Of 0.1M potassium permanganate solution required to completely oxidise 100ml of 0.5M ferrous sulphate solution in acidic medium? (2000M)

1. 20 2. 200 3. 50 4. 100

Ans: 4

Sol: $2KMnO_4 + 10FeSO_4 + 8H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 5Fe_2(SO_4)_3 + 8H_2O$

$KMnO_4 \quad FeSO_4$

$\frac{M_1V_1}{n_1} = \frac{M_2V_2}{n_2}$

$\frac{0.1 \times V_1}{1} = \frac{0.5 \times 100}{5}$

$V_1 = \frac{1 \times 0.5 \times 100}{0.1 \times 5} = 100ml$

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