DPP SOLUTION

- Subject – Physical Chemistry
- Chapter – Some Basic Concept of Chemistry

DPP No.- 10

By – Amit Mahajan Sir

Question-

Which of the following relations is incorrect for solutions?

1. $3N\ Al_2(SO_4)_3 = 0.5M\ Al_2(SO_4)_3$ — $0.5 \times 6 = 3N$
2. $3M\ H_2SO_4 = 6N\ H_2SO_4$ — $3 \times 2 = 6N$
3. $1M\ H_3PO_4 = 1/3N\ H_3PO_4$ — $1 \times 3 = 3N$
4. $1M\ Al_2(SO_4)_3 = 6N\ Al_2(SO_4)_3$ — $1 \times 6 = 6N$

$N = M \times n_f$

Ans. (3)

Question-

Determine the volume/volume percent solution made by combining 25 mL of ethanol with enough water to produce 200 mL of the solution. (Gram atomic mass of C = 12 g, O = 16 g and H = 1 g)

1. 12.5
2. 20
3. 40
4. 25

% age of V/V = $\frac{\text{Volume of solute}}{\text{solution}} \times 100$

$= \frac{25}{200} \times 100 = 12.5\%$

Ans. (1)

Question-

$M = \frac{n_B}{2V}$

250 ml of 0.5M KCl is diluted with water to 500 ml of solution, the number of chloride ions in the resulting solution are (Gram atomic mass of K = 39 g and Cl = 35.5 g)

1. 6.02×10^{23}
2. 7.52×10^{22}
3. 1×10^{24}
4. 3.76×10^{23}

KCl + H_2O

$V_1 = 250$ ml, $M_1 = 0.5$ M

$V_2 = 500$ ml, $M_2 = ?$

$M_1V_1 = M_2V_2$

$0.5 \times 250 = M_2 \times 500$

$M_2 = \frac{0.5}{2} = 0.25$ M KCl

0.25 moles KCl present in 1000 ml of solution.

100 ml, moles = 0.25

500 ml, moles $= 0.25 \times \frac{500}{1000} = \frac{2}{2} = 0.125$ moles

Ans. (2)

$$\underline{1KCl} \rightarrow 1K^{+} + 1Cl^{-}$$

0.125 mole $\qquad$ 0.125 mole

$$0.125 \text{ mole} = N_A \times 0.125$$

$$= 6 \times 10^{23} \times \frac{125}{1000}$$

$$\simeq \frac{3}{4} \times 10^{23}$$

$$\simeq 0.75 \times 10^{23}$$

$$7.5 \times 10^{22}$$

Question-

solvent

CH_3OH → solute

What is the quantity of water that should be added to 16 g methanol to make the mole fraction of methanol as 0.25? (Gram atomic mass of C = 12 g, O = 16 g, H = 1 g)

1. 27 g
2. 12 g
3. 18 g
4. 36 g

$w_A = ?$

$M_A(H_2O) = 18\ g/mol$

$w_B = 16\ g$

$M_B(CH_3OH) = 12 + 4 + 16 = 32\ g/mol$

$n_B = \frac{16}{32} = 0.5$

$\chi_B = 0.25 = \frac{n_B}{n_A + n_B}$

$\frac{\chi_B}{\chi_A} = \frac{n_B}{n_A}$

$\frac{0.25}{0.75} = \frac{0.5}{w_A/18}$

$\frac{25}{100} \quad \frac{1}{4} = \frac{0.5}{n_A + 0.5}$

$\Rightarrow w_A = 0.5 \times 18 \times 3 = 27\ g$

$n_A + 0.5 = 2$

$n_A = 2 - 0.5 = 1.5$

$\frac{w_A}{M_A} = 1.5$

$w_A = 18 \times 1.5$

$= 27\ g$

Ans. (1)

Question-

Mole fraction of the solute in a 1.00 molal aqueous solution is

$M_A(H_2O) = 18\ g/mol$

$\chi_B = ?$

$$m = \frac{\chi_B \times 1000}{\chi_A \times M_A}$$

1. 0.1770
2. 0.0177
3. 0.0344
4. 1.7700

$$1 = \frac{\chi_B \times 1000}{(1-\chi_B) \times 18}$$

$$18 - 18\chi_B = 1000\chi_B$$

$$1018\chi_B = 18$$

$$\chi_B = \frac{18}{1018} = 0.0177$$

$$\frac{2\phi}{1024} = \frac{1}{501}$$

$$\frac{1}{500} = 0.02$$

Ans. (2)

Question-

$[NO_3^-] = M_{NO_3^-} = ?$

What is the concentration of nitrate ions if equal volumes of 0.1 M $AgNO_3$ and 0.1 M NaCl are mixed together? (Gram atomic mass of Ag = 108 g, N = 14 g, O = 16 g, Na = 23 g, Cl = 35.5g)

1. 0.1 M
2. 0.2 M
3. 0.05 M
4. 0.25 M

$1\,AgNO_3 + 1\,NaCl \rightarrow 1\,AgCl\downarrow + 1\,NaNO_3$

n: $0.1 \times V$ $\quad$ $0.1 \times V$

L.R.: $\frac{0.1V}{1}$ $\quad$ $\frac{0.1V}{1}$

$1\,NaNO_3 \rightarrow 1\,NO_3^-$

$[NO_3^-] = M_{NO_3^-} = \frac{0.1V}{2V}$

$= 0.05\ M$

$M = \frac{n}{V(L)}$

$n = M \times V(L)$

$eq_{NaCl} = eq_{NaNO_3}$

$0.1 \times V \times 1 = moles \times 1$

$moles = 0.1V = moles_{NO_3^-}$

$moles_{NaNO_3}$

Ans. (3)

Question-

The molarity of the solution containing 2.8% mass-volume solution of KOH is (Gram atomic mass of K = 39 g, O = 16 g, H = 1 g)

1. M/10
2. M/2
3. M/5
4. 1M

2.8 g solute (KOH) present in 100 ml solution

$M_{KOH} = 39 + 16 + 1 = 56\ g$

$M = \frac{n_B}{V(L)} = \frac{2.8 \times 1000}{56 \times 100} = \frac{28}{56} = \frac{1}{2}\ M$

2.8 g 100 ml

Ans. (2)

Question-

$[OH^-] = M_{OH^-}$

What is the [OH^-] the final solution prepared by mixing 20.0 mL of 0.050M HCl with 30.0 mL of 0.10M $Ba(OH)_2$?

1. 0.10M
2. 0.40M
3. 0.0050M
4. 0.12M

$HCl + Ba(OH)_2 \rightarrow BaCl_2 + H_2O$

milli g.eq left $= |20 \times 0.05 \times 1 - 30 \times 0.1 \times 2|$

milligeq $OH^- = |1 - 6| = 5$

$N_{OH^-} = \frac{5}{50} = \frac{1}{10} = 0.1N$

$M_{OH^-} = \frac{N_{OH^-}}{n_{factor\ OH^-}} = \frac{0.1}{1} = 0.1M$

Ans. (1)

Question-

The molality of a sulphuric acid solution is 0.2 . Calculate the total weight of the solution having 1000 gm of solvent. (Gram atomic mass of S = 32 g, O= 16 g, H = 1 g)

1. 1000 g
2. 1098.6 g
3. 980.4 g
4. 1019.6 g

$m_{H_2SO_4} = 0.2$

$w_A = 1000$ g, $M_B(H_2SO_4) = 98$ g/mol

0.2 mole of H_2SO_4 present in 1000 g of solvent

$$n_B = 0.2 = \frac{w_B}{M_B}$$

$$w_B = \frac{0.2}{10} \times 98 = \frac{19.6}{10} = 19.6 \text{ g}$$

mass of sol^n $= w_A + w_B$
$= 1000 + 19.6$
$= 1019.6$ g

Ans. (4)

Question-

The density (in g mL^{-1}) of a 3.60 M sulphuric acid solution that is 29% (H_2SO_4 molar mass = 98 g mol^{-1}) by mass will be :

1. 1.22
2. 1.45
3. 1.64
4. 1.88

M = 3.6 M

% by mass = 29 %

d of soln = ?

$$M = \frac{\%\text{ by mass} \times d \times 10}{M_B}$$

$$3.6 = \frac{29 \times d \times 10}{98}$$

$$d = \frac{98 \times 3.6}{29 \times 10} = 1.22 \text{ g/ml}$$

$$\frac{36}{29} \approx \frac{35}{28} = \frac{5}{4} = 1.25$$

Ans. (1)

Question-

How many significant figures are in 0.0008 ?

1. 1
2. 2
3. 3
4. 4

Ans. (1)

Question-

The multiple 5×0.2 after rounding off will be

1. 1
2. 1.0
3. 1.00
4. 1.000

Ans. (1)

Question-

Add (0.001 + 0.02) upto the correct number of significant figures

0.001
0.02
0.021

1. 0.021
2. 0.02
3. 0.003
4. 0.001

Ans. (2)

Question-

One fermi is

1. 10^{-13} cm
2. 10^{-15} cm
3. 10^{-10} cm
4. 10^{-12} cm

1 fermi $= 10^{-15}$ m $= 10^{-15} \times 100$ cm $= 10^{-13}$ cm

Ans. (1)

Question-

Significant figures in 0.00051 are

1. 5
2. 3
3. 2
4. 4

Ans. (3)

Question-

1 m^3 in equal to

1. 100 litre
2. 10000 litre
3. 10 litre
4. 1000 litre

$1 m^3 = 10^3 dm^3$

$1 m = 10 dm$

$1 m \times 1 m \times 1 m = 10 dm \times 10 dm \times 10 dm =$

$1 m^3 = 10^3 dm^3$

$= 10^3 L$

$1 dm^3 = 1 L$

Ans. (4)

Question-

A picometre is written as

1 10^{-9} m

2 10^{-10} m

3 10^{-11} m

4 10^{-12} m

1 pm $= 10^{-12}$ m

Ans. (4)

Question-

Convert 25365 mg to S.I. unit

1. 253.65 g
2. 25.365×10^{-3} kg
3. 25.365 kg
4. 253.65 kg

$25365\,mg = \frac{25365}{1000}\,g$

$= \frac{25365}{1000 \times 1000}\,Kg$

$= 25.365 \times 10^{-3}\,Kg$

$1\,Kg = 1000\,g$

Ans. (2)

Thank You...