REVISION TEST SERIES

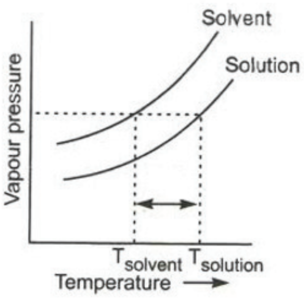
C1--SET A

Class 12 - Chemistry

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 35**

SECTION A. Each Carries 1 mark

1. The following graph shows: **[1]**



a) Depression in freezing point of the solvent
b) Osmotic pressure
c) Elevation in boiling point of the solvent
d) Relative lowering of vapour pressure

2. 15 g of a solute in 100 g of water makes a solution to freeze at -1 °C. 30 g of a solute in 100g of water will give a depression in f.pt. equal to: **[1]**

a) 0.5°C
b) 2°C
c) -2°C
d) 1°C

3. An unripe mango placed in a concentrated salt solution to prepare pickle, shrivels because: **[1]**

a) it gains water due to endo osmosis
b) it gains water due to reverse osmosis
c) it loses water due to exo osmosis
d) it loses water due to reverse osmosis

4. Calculate partial pressure at which the solubility of oxygen gas in water at 20^{o}C is 0.10 g/L. Assume the density of the solution is 1 g/mL. (K_H = 3.486 $\times$ 10^4 bar) **[1]**

a) 3.42 bar
b) 0.99 bar
c) 2.65 bar
d) 1.96 bar

5. **Assertion (A):** Increasing pressure on water decreases its freezing point. **[1]**
Reason (R): The density of water is maximum at 273 K.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

6. **Assertion (A):** Λ_m for weak electrolytes shows a sharp increase when the electrolytic solution is diluted. **[1]**
Reason (R): For weak electrolytes degree of dissociation increases with dilution of solution.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

7. Consider the following cell reaction: $2Fe(s) + O_2(g) + 4H^+(aq) \longrightarrow 2Fe^{2+}(aq) + 2H_2O(l)$ $E^o = 1.67$ V **[1]**

At $[Fe^{2+}] = 10^{-3}$M, $P(O_2) = 0.1$ atm and pH = 3, the cell potential at 25^{o}C is:

a) 1.87 V

b) 1.57 V

c) 1.47 V

d) 1.77 V

8. The standard Gibbs energy for the given cell reaction in kJ mol^{-1} at 298 K is: **[1]**

$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$, E° = 2V at 298K

(Faraday's constant, F = 96000 C mol^{-1})

a) 384

b) -192

c) 192

d) -384

9. The molar conductivity of NaCl, HCl and CH_3COONa at infinite dilution are 126.45, 426.16 and 91 S $cm^2 mol^{-1}$ respectively. The molar conductivity of CH_3COOH at infinite dilution is: **[1]**

a) 698.28 S cm^2 mol^1

b) 390.71 S cm^2 mol^1

c) 201.28 S cm^2 mol^1

d) 540.48 S cm^2 mol^1

SECTION B. Each carries 2 marks

10. What are the values of ΔH and ΔV for an ideal solution of two liquids? **[2]**

11. Why is an increase in temperature observed on mixing chloroforms with acetone? **[2]**

12. How much electricity in terms of Faradays is required to produce 20g of calcium from molten $CaCl_2$? **[2]**

OR

Derive an expression for the pH of electrolyte in the following half cell. $PtH_2(1atm)|H^+(aq)$. The reduction potential is - 0.30 V.

13. Calculate E_{cell} for following: **[2]**

$2Cr(s) + 3Fe^{2+}(aq) \rightarrow 2Cr^{3+}(aq) + 3Fe(s)$

$Cr(s)|Cr^{3+}(aq)(0.1M)||Fe^{2+}(aq)(0.01M)|Fe(s)$

$E^{\ominus}_{(Cr^{3+}/Cr)} = -0.74\ V$

$E^{\ominus}_{(Fe^{2+}/Fe)} = -0.44\ V$

SECTION C. Each carries 3 marks

14. What is the mole fraction of a solute, in 2.5 m aqueous solution? **[3]**

OR

19.5 g of CH_2FCOOH is dissolved in 500 g of water. The depression in the freezing point of water observed is 1.0°C. Calculate the Van't Hoff factor and dissociation constant of fluoroacetic acid.

15. Silver is deposited on a metallic vessel by passing a current of 0.2 amps. for 3 hrs. Calculate the weight of silver deposited. (At mass of silver = 108 amu,1 F = 96500 C)′ **[3]**

16. In the button cell widely used in watches and other devices the following reaction takes place: **[3]**

$Zn(s) + Ag_2O(s) + H_2O(l) \rightarrow Zn^{2+}(aq) + 2Ag(s) + 2OH^-(aq)$

Determine $\Delta_r G^{(-)}$ and $E^{(-)}$ for the reaction

Given $Zn \rightarrow Zn^{2+} + 2e^{-}$, E^0 = 0.76V

Given $Ag \rightarrow Ag^{+} + 2e^{-}$, E^0 = 0.344V

SECTION D. Each carries 5 marks

17. a. Define the relationship between lowering of vapour pressure and mole fraction of the volatile liquid. **[5]**

b. i. Benzoic acid completely dimerises in benzene. What will be the vapour pressure of a solution containing 61 g of benzoic acid per 500 g benzene when the vapour pressure of pure benzene at the temperature of experiment is 66.6 torr.

ii. What would have been the vapour pressure in the absence of dimerisation?

iii. Derive a relationship between mole fraction and vapour pressure of a component of an ideal solution in the liquid phase and vapour phase.

OR

Two students use same stock solution of $ZnSO_4$ and a solution of $CuSO_4$. The e.m.f. of one cell is 0.03 V higher than the other. The concetration of $CuSO_4$ in the cells with higher e.m.f. value is 0.5 M. Find out the concentration of $CuSO_4$ in the other cell. (2.303 RT/F = 0.06)

SECTION E-CASE BASED QUESTIONS

18. **Read the text and answer the questions** **[4]**

Fuel cells convert the energy produced during the combustion of fuels directly into electrical energy. Probably the most successful fuel cell so far is a hydrogen-oxygen fuel cell, which has been used in spacecraft. The electrodes consist of porous screens of titanium coated with a layer of a platinum catalyst. Concentrated KOH or NaOH solution is placed between the electrodes to serve as the electrolyte. Hydrogen and oxygen gases are bubbled through the porous electrodes into the electrolyte solution.

The following electrode reaction occur:

At anode : $2H_2$ (g) + $4OH^-$ (aq) $\Rightarrow$ 4HO(l) + $4e^-$

At cathode : O_2 (g) + $2H_2O$ (l) + $4e^-$ $\Rightarrow$ $4OH^-$ (aq)

Overall reaction : $2H_2$ (g) + O_2 (g) $\Rightarrow$ $2H_2O$ (l)

In this cell, the gaseous materials are consumed and continuously supplied. The thermodynamic properties of fuel cell reaction at $25°C$ are:

ΔH° = - 285.8 kJ mol^{-1}, ΔG° = - 237.2 kJ mol^{-1}, E° = 1.23 V

i. What is the value of ΔS° for the fuel cell reaction at $25°C$?

ii. If the potential of the half cell reaction at cathode is E° = 0.41, then what is the value of E° for the half cell reaction at the anode?

iii. If the concentrations of OH^- ions in the cell are doubled then what would happen to the cell potential?

iv. Calculate the thermodynamic efficiency of H_2-O_2 fuel cell

[Hint : $\frac{\Delta G}{\Delta H} = \frac{\Delta FE}{\Delta H}$]

OR

v. The amount of a substance deposited by the passage by 1 amp of current for 1 sound. This is equivalent to what?