OSDAV Public School (Kaithal)
Subject: Chemistry(043)
July Unit Test
Class: XI
Set-A

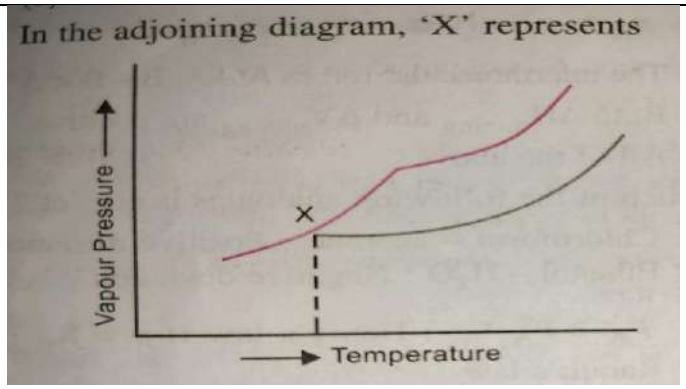
Time: 1:30Hour **M.M. 35**

General Instructions:-

All questions are compulsory.

(a) There are 16questions in this question paper.
(b) SECTION A consists of 8multiple -choice questions carrying 1 mark each.
(c) SECTION B consists of 4short answer questions carrying 2 marks each.
(d) SECTION C consists of 3 short answer questions carrying 3 marks each.
(e) SECTION D consists of 1 long answer questions carrying 5 marks each.
(f) All questions are compulsory.
(g) Use of log tables and calculators is not allowed.

SECTION-A

Q.No.	Questions	Marks
1.	At equilibrium the rate of dissolution of a solid solute in a volatile liquid solvent is..... a.Less than the rate of crystallisation b.Greater than therate of crystallisation c.Equal to the rate of crystallisation d. Zero	1
2.	Which one of the following pairs will form an ideal solution? a.Chloroform and Acetone b.Ethanol and acetone c.Phenol and Aniline. d. n-Hexane and n-Heptane	1
3.	 a.Boiling point of the solute. b.Freezing point of solution c.Freezing point of solute. d. Boiling point of solvent	1
4	Which of the following statement is not correct about an inert electrodes in a cell? a. It does not participate in the cell reaction. b.It provides surface area either for oxidation or for reduction reaction. c.It provides surface area for the conduction of electrons. d. It provides surface area for Redox reaction.	
5	The number of Faradays(F) required to produce 20 g of calcium from molten CaCl2 is a. 1. b. 2. c.3. d 4	
6.	The electrochemical cell stops working after some time because a. Electrode potential of both the electrodes becomes zero. b.Electrode potentials of both the electrodes becomes equal. c.One of the electrodes is eaten away. d. The cell reaction gets reversed.	1

7	In the following questions (7 to8) a statement of Assertion (**A**) followed by a statement of Reason (**R**) is given. Choose the correct answer out the following choices: 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. **Assertion:** When NaCl is added to water , a depression in freezing point is observed.. **Reason:** The lowering of vapour pressure of a solution causes depression in the freezing point.	**1**
8	**Assertion:** Copper sulphate solution can be kept in a zinc vessel. **Reason:** Zinc is more reactive than copper.	**1**
	SECTION-B	
9	Between 1M glucose solution and 1M NaCl solution which one will have higher boiling point and why?	**1+1**
10	Write down cell reaction of Fuel cell.	**2**
11	What do you mean by isotonic solutions ? Give one example.	**1+1**
12	Vapour pressure of pure waterat 298 K is 23.8mm Hg.50 g of Urea(NH2CONH2) is dissolved in 850 g of water.Calculate the vapour pressure of solution and relative lowering in Vapour Pressure.	**1+1**
13	What are the functions of Salt bridge in an electrochemical cell	**2**
	SECTION-C	
14	An aqueous solution containing 12.48 g of Barium chloride (molar mass of Ba Cl_2= 208.34 g/mol) in 1 kg of water boils at 373.0832 K . Calculate the Van't Hoff Factor and degree of dissociation of $BaCl_2$. (K_b for H_2O = 0.52 Km^{-1})	**3**
15	a) Define Kohlrausch's Law . b) If the molar conductivities at infinite dilution of Nacl , HCl and CH_3COONa are 126.4 , 426.1 and 91.0 Scm^2 mol^{-1} respectively . What will be that of acetic acid ?	**1+2**
16	Write the cell reaction and Calculate the emf of following cell: Zn (s) / Zn+2 (0.01M) // Ag+ (0.001M) /Ag (s) Given E° Zn+2/Zn= -0.76V , E°Ag+/Ag= +0.80V (Log 2 = 0.3010 , Log 3 = 0.4771 , Log 10 = 1)	**3**
17	1.Give reasons: a. Why molar conductivity increases with increase in dilution? b. Why mercury cell delivers a constant potential during its life time 2. Write the product of electrolysis along with proper reactions at anode and cathode for Aq.AgNO3 using Ag electrode	**1** **1** **2**
	SECTION-D	
18(a)	a) What happens when RBC are placed in 1.2% NaCl solution b) Define Reverse osmosis c) What type of deviations from ideal solutions are shown when chloroform is mixed with acetone . How does the volume of solution changes when both the above mentioned components are mixed?	**3**
18(b)	KH for CO_2 in water is $1.67x10^8$ Pa at 298K. Calculate the mass of CO_2 that can be dissolved in 500 ml of water at a pressure of 2.5 atmosphere at 298K. (1 atm= $1.013 x10^5$ Pa)	**2**

OSDAV Public School, Kaithal
Marking Scheme
July Unit Test (2024-25)
Subject: CHEMISTRY(043)
Class:XII

SET-A

1	**c**	**1**
2	d	1
3	b	1
4	d	1
5	a	1
6	b	1
7	a	1
8.	d	1
9	The Higher the osmotic pressure, the more hypertonic, the solution there are more particles in 1M NaCl than in 1M glucose because of dissociation. Therefore, NaCl is more hypertonic. NaCl solution will show higher elevation of boiling point.	1 1
10	Cathode Reaction: $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$ Anode Reaction: $2H_2 + 4OH^- \rightarrow 4H_2O + 4e^-$ Net Cell Reaction: $2H_2 + O_2 \rightarrow 2H_2O$	1 1
11	Isotonic solutions are solutions having same osmotic pressure. 1.0 M glucose solution is isotonic with 1.0 M fructose solution as both solutions have same osmotic pressure. When isotonic solutions are separated by a semipermeable membrane, there is no flow of solvent in either direction.	1 1
12	It is given that vapour pressure of water, = 23.8 mm of Hg Weight of water taken, w1 = 850 g Weight of urea taken, w2 = 50 g Molecular weight of water, M1 = 18 g mol−1 Molecular weight of urea, M2 = 60 g mol−1 Now, we have to calculate vapour pressure of water in the solution. We take vapour pressure as p1. Now, from Raoult's law, we have:	 1/2

	$$\frac{p_1^0 - p_1}{p_1^0} = \frac{n_2}{n_1 + n_2}$$	1/2
	$$\Rightarrow \frac{p_1^0 - p_1}{p_1^0} = \frac{\frac{w_2}{M_2}}{\frac{w_1}{M_1} + \frac{w_2}{M_2}}$$	1/2
	$$\Rightarrow \frac{23.8 - p_1}{23.8} = \frac{\frac{50}{60}}{\frac{850}{18} + \frac{50}{60}}$$	1/2
	$$\Rightarrow \frac{23.8 - p_1}{23.8} = \frac{0.83}{47.22 + 0.83}$$	
	$$\Rightarrow \frac{23.8 - p_1}{23.8} = 0.0173$$	
	$$\Rightarrow p_1 = 23.4 \text{ mm of Hg}$$	
	Hence, the vapour pressure of water in the given solution is 23.4 mm of Hg and its relative lowering is 0.0173.	
13	A Salt bridge is used to maintain electrical neutrality inside the circuit of a galvanic cell. A Salt bridge acts as an electrical connection between two half cells. A Salt bridge prevents the diffusion of solution from one cell to the other.	1+1
14	Given: $w_B = 12.48$ g, $w_A = 1$ kg = 1000 g, m_B ($BaCl_2$)	
	= 208.34 g/mol.	
	$\Delta T_b = 373.0832 - 373 = 0.0832$ K	
	$K_b = 0.52$ K kg mol^{-1}	
	$\because \quad \Delta T_b = i K_b m = i K_b \times \frac{w_B}{m_B} \times \frac{1000}{w_A(g)}$	1
	$0.0832 = i \times 0.52 \times \frac{12.48}{208.34} \times \frac{1000}{1000}$	
	$i = 2.67$	
	$BaCl_2 \longrightarrow \underset{\alpha}{Ba^{2+}} + \underset{2\alpha}{2Cl^-}$ α = degree of dissociation	1
	$\underset{1-\alpha}{}$	
	$i = \frac{1 + 2\alpha}{1} = 1 + 2\alpha$ or $1 + 2\alpha = 2.67$	
	$\alpha = \frac{1.67}{2} = 0.835$	1

15	a) " At infinite dilution the molar conductivity of the electrolyte at infinite dilution is the sum of the ionic conductivities of cations and anions, this is called kohlrausch's law". □0 = λ0+ + λ0− . b) $\Lambda^\circ_{NaCl} = 126.4\ S\ cm^2\ mol^{-1}$ $\Lambda^\circ_{HCl} = 425.9\ S\ cm^2\ mol^{-1}$ $\Lambda^\circ_{CH_3COONa} = 91.0\ S\ cm^2\ mol^{-1}$ $\Lambda^\circ_{CH_3COOH} = \Lambda^\circ_{CH_3COONa} + \Lambda^\circ_{HCl} - \Lambda^\circ_{NaCl}$ $= 91.0 + 425.9 - 126.4 = 390.5\ S\ cm^2\ mol^{-1}$	1 1 1
16	From the given cell representation, Ag^+/Ag couple act as cathode Zn^{2+}/Zn couple act as anode $E^\circ_{cell} = E^\circ_{cathode} - E^\circ_{anode}$ $E^\circ_{cell} = 0.80 - (-0.76)$ $E^\circ_{cell} = 1.56\ V$ The given cell reaction is, $Zn(s) + 2Ag^+(aq) \rightarrow Zn^{2+}(aq) + 2Ag$ $n = 2$ By Nernst equation, $E_{cell} = E^\circ_{cell} - \frac{0.059}{n}\log\frac{[Zn^{2+}]}{[Ag^+]^2}$ $E_{cell} = E^\circ_{cell} + \frac{0.059}{n}\log\frac{[Ag^+]^2}{[Zn^{2+}]}$ $E_{cell} = 1.56 + \frac{0.059}{2}\log\frac{[0.01]^2}{[0.1]}$ $E_{cell} = 1.56 + \frac{0.059}{2}\log(1 \times 10^{-3})$ $E_{cell} = 1.56 - \frac{0.059}{2} \times 3$ $E_{cell} = 1.56 - 0.088 = 1.472\ V$	1 1 1
17	a)When solution is diluted, the total number of ions increases due to increase in the degree of dissociation. Hence, molar conductance increases with dilution. But the number of ions per unit volume decreases. Hence, specific conductance decreases with dilution. b)Cathode - Reduction Ag+ + e− □ Ag Anode - Oxidation Ag □ Ag+ + e−	1 1 1
18 a)	i) It would fill with water and burst. The red blood cell would shrink as it loses water to the salt solution in the test tube.	1 1

18 b)	ii) The process of movement of solvent through a semipermeable membrane from the solution to the pure solvent by applying excess pressure on the solution side is called reverse osmosis. Reverse osmosis is a membrane treatment process primarily used to separate dissolved solutes from water. iii) The interaction between them is intermolecular hydrogen. The total vapour pressure of the mixture will be below the vapour pressure of ideal compounds due the strong hydrogen bond between compound A and B. There will be lowering of vapor pressure from ideal solutions hence, shows negative deviation It is given that: $K_H = 1.67 \times 10^8$ Pa $p_{CO_2} = 2.5$ atm $= 2.5 \times 1.01325 \times 10^5$ Pa $= 2.533125 \times 10^5$ Pa According to Henry's law: $p_{CO_2} = K_H x$ $\Rightarrow x = \frac{p_{CO_2}}{K_H}$ $= \frac{2.533125 \times 10^5}{1.67 \times 10^8}$ $= 0.00152$ We can write, $x = \frac{n_{CO_2}}{n_{CO_2} + n_{H_2O}} \approx \frac{n_{CO_2}}{n_{H_2O}}$ n_{CO_2} is negligible as compared to n_{H_2O} [Since,] In 500 mL of soda water, the volume of water = 500 mL [Neglecting the amount of soda present] We can write: 500 mL of water = 500 g of water $= \frac{500}{18}$ mol of water = 27.78 mol of water	1 1 1/2 1/2 1/2

	$\frac{n_{CO_2}}{n_{H_2O}} = x$ Now, $\frac{n_{CO_2}}{27.78} = 0.00152$ $n_{CO_2} = 0.042 \text{ mol}$ Hence, quantity of CO_2 in 500 mL of soda water = (0.042 × 44)g = 1.848 g	1/2

OSDAV Public School, Kaithal
Marking Scheme
July Unit Test (2024-25) **SET-B**
Subject: CHEMISTRY(043)
Class:XII

1	**b**	**1**
2	a	1
3	d	1
4	b	1
5	a	1
6	c	1
7	a	1
8.	d	1
9	Given I = 5A Time = 20 × 60 = 1200 s ∴ Charge = current × time = 5 × 1200 = 6000 C According to the reaction. Ni^{2+} (aq.) + 2e → Ni (s) Nickel deposite by (2 × 96487) C = 58.7 g ∴ Nickel deposite by 6000 C = $\frac{58.7 \times 6000}{2 \times 96487}$ = 1.825 g	1/2 1/2 1/2 1/2
10	$T = 300\ K$ $W = 30\ g$ $V = 1\ L$ $\pi_1 = 4.98\ bar$ $\pi_2 = 1.52\ bar$ $C_2 = ? \pi_1 = C_1RT \quad ; \quad \pi_2 = C_2RT$ $\frac{\pi_1}{\pi_2} = \frac{C_1}{C_2}$ $C_2 = \frac{\pi_2}{\pi_1} \times C_1$ $C_2 = \frac{1.52}{4.98} \times \frac{30}{180 \times 1}$ $= 0.0508\ M$	1/2 1/2 1

11	Ionization of acidified water: $H_2O \rightleftharpoons H^+ + OH^-$ $H_2SO_4 \rightleftharpoons 2H^+ + SO_4^{2-}$ Ions present in solution are SO_4^{2-}, OH^- and H^+ +ve charge move towards cathode whereas -ve charge move towards anode. Reaction at cathode: $H^+ + e^- \rightarrow H$ $H + H \rightarrow H_2$ Reaction at anode OH^- ion discharge in preference to SO_4^{2-} $OH^- \rightarrow OH + e^-$ $4OH \rightarrow 2H_2O + O_2$ Hence, during electrolysis of acidulated water, hydrogen is collected at cathode and oxygen is collected at anode.	1 1
12	Generally a primary cell known as Leclanche cell is used in the transistor. Anode Reaction: $Zn \rightarrow Zn^{2+} + 2e^-$ Cathode Reaction: $MnO_2 + NH_4^+ + e^- \rightarrow MnO(OH) + NH_3$	1 1
13	Henry's law states that the solubility of the gas is directly proportional to the pressure of the gas at a constant temperature. This means that the more the pressure of the gas is, the more soluble the gas is. Also, if the pressure of the gas is low, we can say that the gas is not soluble or it is less soluble. pA= KH XA Gas must be ideal and should not undergo any compound formation with solvent.	1 1
14	Weight of non volatile organic solvent $= 5g$ Weight of solvent, $(\text{water}) = 95g$ Molecular mass of solvent $(M) = 18$ g Molecular mass of non volatile solute, $m = ?$ p° the vapour pressure of pure solvent at $373K = 760$ mm Vapour pressure of solution $= 745$ mm Substituting the value in the given below expression : $\frac{p^\circ - p}{p^\circ} = \frac{w \times M}{m \times W}$ $\frac{760-745}{760} = \frac{5 \times 18}{m \times 95}$ $m = \frac{5 \times 18 \times 760}{95 \times 15} = 48g$ The process of movement of solvent through a semipermeable membrane from the solution to the pure solvent by applying excess pressure on the solution side is called reverse osmosis.	1/2 1/2 1/2 1/2 1
15	a)The solution shows positive deviation from Raoult.s law. b)i= 2 as it is a electrolyte and dissociate to give 2 ions. Thus as vant hoff factor is higher forKCl , thus depression in freezing point will be higher. Thus 1M urea solution has higher freezing point. c)Azeotropic mixture is a mixture of two or more liquids with a similar boiling point and a similar composition in their vapour phase. Azeotropic mixture either has a higher or lower boiling point than its components.	1 1 1

16	From the given cell representation, Ag^+/Ag couple act as cathode Zn^{2+}/Zn couple act as anode $E^0_{cell} = E^0_{cathode} - E^0_{anode}$ $E^0_{cell} = 0.80 - (-0.76)$ $E^0_{cell} = 1.56$ V The given cell reaction is, $Zn(s) + 2Ag^+(aq) \rightarrow Zn^{2+}(aq) + 2Ag$ $n = 2$ By Nernst equation, $E_{cell} = E^o_{cell} - \frac{0.059}{n}\log\frac{[Zn^{2+}]}{[Ag^+]^2}$ $E_{cell} = E^o_{cell} + \frac{0.059}{n}\log\frac{[Ag^+]^2}{[Zn^{2+}]}$ $E_{cell} = 1.56 + \frac{0.059}{2}\log\frac{[0.01]^2}{[0.1]}$ $E_{cell} = 1.56 + \frac{0.059}{2}\log(1 \times 10^{-3})$ $E_{cell} = 1.56 - \frac{0.059}{2} \times 3$ $E_{cell} = 1.56 - 0.088 = 1.472$ V	1 1 1
17	a) Zinc has higher standard oxidation potential than Iron. Tin, copper and nickel have lower oxidation potential than iron. as zinc has more tendency to undergo oxidation than iron, it acts as anode and provides protection to iron also known as cathodic protection. b) Conductivity varies with the change in the concentration of the electrolyte. The number of ions per unit volume decreases on dilution. So conductivity decreases with decrease in concentration. Therefore conductivity of CH3COOH decreases on dilution c) When solution is diluted, the total number of ions increases due to increase in the degree of dissociation	1 1 1
18 a)	$P_{N_2} = P_T \times$ mole fraction $= 5 \times 0.8 = 4$ From Henry's law $P_{N_2} = K_H \times X_{N_2}$ $X_{N_2} = 4 \times 10^{-5}$ $X_{N_2} = \frac{n_{N_2}}{n_{N_2} + n_{water}}$ $n_{N_2} << n_{water}$ $X_{N_2} = \frac{n_{N_2}}{n_{water}}$ $n_{N_2} = 4 \times 10^{-4}$	1/2 1/2 1

18 b)	$= \frac{\text{...}}{(78\text{g mol}^{-1})\times(0.5\text{ kg})}$ $= 0.5\text{ mol kg}^{-1}$ Placing the values in Eq. (i), we find the value of van't Hoff factor (i) $i = \frac{1}{(1.86\text{ K kg mol}^{-1})\times(0.5\text{ mol kg}^{-1})}$ $= 1.0753$ Step II: Calculation of degree of dissociation of the acid Suppose degree of dissociation at the given concentration is \alpha $CH_2FCOOH \overset{aq}{\rightleftharpoons}$ (Initial conc. C mol kg^{-1} At equilibrium $C(1-\alpha)$ Total = $C(1+\alpha)$ $\therefore i = \frac{C(1+\alpha)}{C} = 1+\alpha$ $\alpha = i - 1 = 1.0753 - 1 = 0.0753$ Step III: Calculation of dissociation constant for the acid (Molal)C = 0.5m (From Eq. (ii)) $K_a = \frac{[CH_2FCOO^-][H^+]}{[CH_2FCOOH]} = \frac{C\alpha.C\alpha}{C(1-\alpha)} = \frac{C\alpha^2}{(1-\alpha)}$ $K_a = \frac{(0.5)(0.0753)^2}{(1-0.0753)} = \frac{(0.5)\times(0.0753)^2}{(0.9247)} = 3.07\times10^{-3}$	1 1 1

OSDAV Public School, Kaithal

July Unit Test

SET-B

Class : XII

Subject : Chemistry

Time: 1 hr 30 mins **M.M. : 35**

General Instructions:-

All questions are compulsory.

(a) There are 18 questions in this question paper with internal choice.

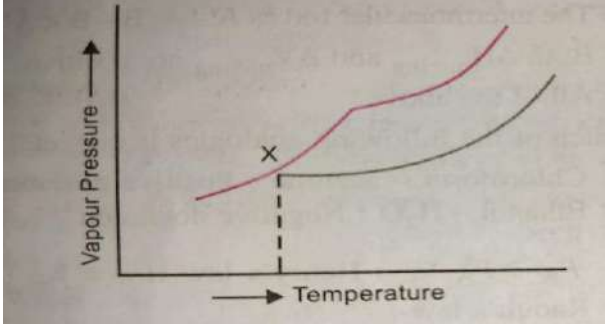
(b) SECTION A consists of 8 multiple -choice questions carrying 1 mark each.

(c) SECTION B consists of 5 short answer questions carrying 2 marks each.

(d) SECTION C consists of 4 short answer questions carrying 3 marks each.

(e) SECTION D consists of 1 long answer questions carrying 5 marks.

(f) Use of log tables and calculators is not allowed.

Q.No.	Questions
	SECTION-A
1	The electrochemical cell stops working after some time because a. Electrode potential of both the electrodes becomes zero. b.Electrode potentials of both the electrodes becomes equal. c.One of the electrodes is eaten away. d. The cell reaction gets reversed.
2	The number of Faradays(F) required to produce 20 g of calcium from molten $CaCl_2$ is a. 1. b. 2. c.3. d 4
3	Which of the following statement is not correct about an inert electrodes in a cell? a. It does not participate in the cell reaction. b.It provides surface area either for oxidation or for reduction reaction. c.It provides surface area for the conduction of electrons. d. It provides surface area for Redox reaction.
4	In the adjoining diagram, 'X' represents 

	a.Boiling point of the solute. b.Freezing point of solution c.Freezing point of solute. d. Boiling point of solvent
5	Which one of the following pairs will form an ideal solution? a.Chloroform and Acetone b.Ethanol and acetone c.Phenol and Aniline. d. n-Hexane and n-Heptane
6	At equilibrium the rate of dissolution of a solid solute in a volatile liquid solvent is..... a.Less than the rate of crystallisation b.Greater than therate of crystallisation c.Equal to the rate of crystallisation d. Zero

7	Given below are two statements labelled as Assertion (A) and Reason (R) Select the most appropriate answer from the options given below: 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 **Assertion:** When NaCl is added to water , a depression in freezing point is observed. **Reason:** The lowering of vapour pressure of a solution causes depression in the freezing point.	1
8	**Assertion:** Copper sulphate solution can be kept in a zinc vessel. **Reason:** Zinc is more reactive than copper.	1
	SECTION-B	
9	A solution of $Ni(NO_3)_2$ is electrolysed between platinum electrodes using a current of 5 Ampere for 20 minutes. What mass of nickel will be deposited at cathode { Given atomic mass of Ni = 58.7g }	2
10	At 300 K , 30 g of glucose present per litre solution has an osmotic pressure of 4.98 bar.If the osmotic pressure of another glucose solution is 1.52 bar at same temperature, Calculate the concentration of other solution.	2
11	a.Predict the product of electrolysis of a Acidulated water.Write proper reactions occurring at anode and cathode. b. What advantage does fuel cell have over primary and secondary batteries?	2
12	Name the cell which is used in Transistors. Write the reactions taking place at the anode and cathode of this cell.	2
13	State Henry's Law and its mathematical expression and write its applications?	2

	SECTION-C	
14	a . Define Reverse Osmosis b . The vapour pressure of a 5% solution of a non volatile organic substance at 373K is 745mm . Calculate the molecular mass of the solute (vapour pressure of pure water at 373K = 760mm)	1 2
15	a. What will be the nature of solution when ethyl alcohol and water are mixed. b. Out of 1 M Urea solution and 1M KCl solution which has higher freezing point and why? c. What are Azeotropic mixtures.	1 1 1
16	Write the cell reaction and Calculate the emf of following cell: Zn (s) / Zn^{+2} (0.01M) // Ag^{+} (0.001M) /Ag (s) Given $E^{0}_{Zn+2/Zn}$ = -0.76 V ; $E^{0}_{Ag+/Ag}$ = +0.80 V (Log 2 = 0.3010 , Log 3 = 0.4771 , Log 10 = 1)	3
17	Give asons: re Why does an alkaline medium inhibit the rusting of iron? a. Why Zinc is better than tin in protecting iron from corrosion? b. Why conductivity of CH_3COOH decreases on dilution? c.	1 1 1
	SECTION -D	
18	a. The Henry's law constant for the solubility of N_2 gas in water at 298 K is 1.0 x 10^5 atm. The mole fraction of N_2 in air is 0.8. What is the number of moles of N_2 from air dissolved in 10 moles of water at 298K b. and 5 atm pressure. 19.5g of CH3FCOOH is dissolved in 500g of water. The depression in freezing point of water observed is 1.0 K. Calculate the van't Hoff factor and dissociation constant of the acid. (K_f = 1.86 K kg/mol)	2 3