OSDAV Public School (Kaithal)
First Unit Test(May,2024)
Subject: Chemistry(043)
Class: XII **Set-A**

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

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.	An azeotropic solution of two liquids has a boiling point higher than either of the two when it: a.shows negative deviation from Raoult Law b.shows positive deviation from Raoult Law c.Is saturated d.shows no deviation from Raoult Law	**1**
2.	To increase the solubility of CO_2 gas in soft drinks, the bottle is sealed under a.Low pressure b. High temperature c.Constant pressure d. High Pressure	**1**
3.	In comparison to a 0.01 M solution of glucose, the depression in freezing point of a 0.01 M $MgCl_2$ solution is .... a. the same b.about twice. c.about three times d.about six times	**1**
4	Which of the following is not a good conductor of electricity? a.Sodium acetate. b.Ethanol. . c.Sodium chloride d.Potassium hydroxide	
5	Amount of charge required for the reduction of one mole of $(Cr_2O_7)^{-2}$ into Cr^{3+} a. 1F. b.3F. c.4F. d.6F	
6.	Cell Constant of a conductivity cell a.Changes with change in concentration of the electrolyte b.Changes with the nature of electrolyte c.Changes with change in temperature of electrolyte d.Remains constant for a cell	**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:** Relative lowering in vapour pressure is a colligative property. **Reason:** Relative lowering in vapour pressure depends upon the mole fraction of solvent.	**1**
8	**Assertion:** Molarity conductivity of an electrolyte increases with dilution. **Reason:** Ions move faster in dilute solutions.	**1**

	SECTION-B	
9	What do you expect to happen when RBC are placed in (a) 1% NaCl solution. (b) 0.5% NaCl solution	**1+1**
10	Write down cell reaction of lead storage battery during discharging.	**2**
11	Calculate the freezing point of a solution containing 0.5g KCl (molar mass 74.5g/mol) dissolved in 100 g water, assuming KCl to be 92% ionized.Kf= 1.86 KKg/mol	**2**
12	Calculate the mass of a non volatile solute (molar mass 40 g/mol) which should be dissolved in 114 g octane to reduce its vapour pressure to 80%.	**2**
	SECTION-C	
13	Calculate the depression in the freezing point of water when 10g of the $CH_3CH_2CHClCOOH$ is added to 250g of water. $K_a = 1.4X10^{-3}$, K_f= 1.86 KKg/mol.	**3**
14	The electrical resistance of a column of 0.05M NaOH solution of diameter 1 cm and length 50 cm is 5.55 X 10 ^3 ohms. Calculate it's restivity, conductivity and molar conductivity.	**3**
15	A voltaic cell is set up at 25°C with half cells, Al3+(0.001M) and Ni2+(0.50M). Write an equation for the reaction that occurs when cell generates an electric current and determine EMF of cell. Given that E°Ni2+/Ni = -0.25 V E°Al3+3 =-1.66V. Log(125)= 2.096	**3**
	SECTION-D	
16(a)	What are the products of electrolysis of molten NaCl?	**1**
16(b)	Why do gases nearly always tend to be less soluble in liquids as the temperature is raised?	**1**
16(c)	Give an example of a material used for making semipermeable membrane for carrying out reverse osmosis.	**1**
16(d)	What do you mean by Osmotic pressure ? What is the effect of Temperature on osmotic pressure?	**2**

OSDAV Public School (Kaithal)
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Subject: Chemistry(043)
Class: XII **Set-B**

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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.
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(e) SECTION D consists of 1 long answer questions carrying 5 marks each.
(f) All questions are compulsory.
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SECTION-A

Q.No.	Questions	Marks
1.	An unripe mango placed in a concentrated salt solution to prepare pickel shrivels because: a. Of endosmosis. b. it loses water due to reverse osmosis c. it gains water due to reverse osmosis. d.it loses water due to osmosis	**1**
2.	The value of Henry Constant KH is: a.greater for gases with higher solubility. b.Constant for all gases c.Not related to solubility of gases. d.greater for gases with lower solubility	**1**
3.	In comparison to a 0.01 M solution of glucose, the depression in freezing point of a 0.01 M MgCl2 solution is .... a. the same b.about twice. c.about three times d.about six times	**1**
4	Which of the following is not a good conductor of electricity? a.Sodium bromide. b.Diethyl ether c.Potaddium iodide d.Potassium chloride	
5	Amount of charge required for the reduction of one mole of (MnO4)-into Mn2+ a. 1F. b.3F. c.4F. d.5F	
6.	Molar conductivity of ionic solutions depends on.... a. temperature b.distance between electrodes c.surface area of electrodes d.All of these	**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:** Molarity conductivity of an electrolyte increases with dilution. **Reason:** Ions move faster in dilute solutions.	**1**
	SECTION-B	
9	What role does the molecular interaction play in solution of alcohol and water?	**2**

	Explain it.	
10	Write down cell reactions for dry cell .	**1+1**
11	Calculate the freezing point of a solution containing 0.5g KCl (molar mass 74.5g/mol) dissolved in 100 g water, assuming KCl to be 92% ionized.Kf= 1.86 KKg/mol	**2**
12	Calculate the mass of a non volatile solute (molar mass 40 g/mol) which should be dissolved in 114 g octane to reduce its vapour pressure to 80%.	**2**
	SECTION-C	
13	Calculate the depression in the freezing point of water when 10g of the $CH_3CH_2CHClCOOH$ is added to 250g of water. $K_a = 1.4X10^{-3}$, K_f= 1.86 KKg/mol.	**3**
14	The electrical resistance of a column of 0.05M NaOH solution of diameter 1 cm and length 50 cm is 5.55 X 10 ^3 ohms. Calculate it's restivity, conductivity and molar conductivity.	**3**
15	A voltaic cell is set up at 25°C with half cells, Al3+(0.001M) and Ni2+(0.50M). Write an equation for the reaction that occurs when cell generates an electric current and determine EM cell. Given that E°Ni2+/Ni = -0.25 V E°Al3+3 =-1.66V. Log(125)= 2.096	**3**
	SECTION-D	
16(a)	What are the products of electrolysis of aq. Copper sulphate solution using inert electrodes.	**1**
16(b)	Why do gases nearly always tend to be less soluble in liquids as the temperature is raised?	**1**
16(c)	Give an example of a material used for making semipermeable membrane for carrying out reverse osmosis.	**1**
16(d)	What do you mean by Osmotic pressure ? What is the effect of Temperature on osmotic pressure?	**2**

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

SET-A

1	**a**	
2	d	1
3	c	1
4	b	1
5	d	1
6	d	1
7	c	1
8.	b	1
9	(a) RBC will shrink as water is going out from the cell. (b) RBC will swell up as water will enter into the cell.	1 1
10	follows :— *At anode :* $Pb(s) + SO_4^{2-}(aq) \longrightarrow PbSO_4(s) + 2e^-$ (Oxidatio *At cathode :* $PbO_2(s) + SO_4^{2-}(aq) + 4H^+(aq) + 2e^- \longrightarrow PbSO_4(s) + 2H_2O$ (Reductio *Overall reaction :* $Pb(s) + PbO_2(s) + 4H^+(aq) + 2SO_4^{2-}(aq) \longrightarrow 2PbSO_4(s) + 2H_2O$	1 1
11	$KCl \rightarrow K^+ + Cl^-$ $n = 2$ $i = 1 - \alpha + n\alpha$ $i = 1 + \alpha$ $\Delta T_f = iK_f m$ $= (1 + 0.92) \times 1.86 \times \frac{0.5 \times 1000}{74.5 \times 100}$ $\Delta T_f = 0.24$ $\Delta T_f = T_f^o - T_f'$ $T_f' = -0.24\ °C$	1/2 1/2 1
12	**Ans.** Reduction of vapour pressure to 80% means that if $p° = 100$ mm, then $p_s = 80$ mm. Applying complete formula $\frac{p° - p_s}{p°} = \frac{n_2}{n_1 + n_2} = \frac{w_2/M_2}{w_1/M_1 + w_2/M_2}$ $\frac{100 - 80}{100} = \frac{w_2/40}{114/114 + w_2/40}$ (Mol. mass of octane $C_8H_{18} = 114$ g mol^{-1}) or $\frac{20}{100} = \frac{w_2/40}{1 + w_2/40}$ or $\frac{1}{5}\left(1 + \frac{w_2}{40}\right) = \frac{w_2}{40}$ or $w_2 = 10$ g Note that complete formula is required because concentration of solution is greater than 5%. Complete formula can also be applied in the form $\frac{p° - p_s}{p_s} = \frac{w_2/M_2}{w_1/M_1}$ or $\frac{100 - 80}{80} = \frac{w_2/40}{114/114}$ or $\frac{1}{4} = \frac{w_2}{40}$ or $w_2 = 10$ g	1/2 1/2 1

<table>
<tr><td>13</td><td>Molar mass of $CH_3CH_2CHClCOOH = 15 + 14 + 13 + 35{\cdot}5 + 45 = 122{\cdot}5\ g\ mol^{-1}$
10 g of $CH_3CH_2CHClCOOH = \frac{10}{122{\cdot}5}$ mole $= 8{\cdot}16 \times 10^{-2}$ mole
∴ Molality of the solution (m) $= \frac{8{\cdot}16 \times 10^{-2}\ mole}{250\ g} \times 1000\ g\ kg^{-1} = 0{\cdot}3264$
If α is the degree of dissociation of $CH_3CH_2CHClCOOH$, then
$CH_3CH_2CHClCOOH \rightleftharpoons CH_3CH_2CHClCOO^- + H^+$
Initial conc. $C\ mol\ L^{-1}$ 0 0
At eqm. $C(1-\alpha)$ $C\alpha$ $C\alpha$
∴ $K_a = \frac{C\alpha . C\alpha}{C(1-\alpha)} = C\alpha^2$ or $\alpha = \sqrt{\frac{K_a}{C}} = \sqrt{\frac{1{\cdot}4 \times 10^{-3}}{0{\cdot}3264}} = 0{\cdot}065$
To calculate van't Hoff factor :
$CH_3CH_2CHClCOOH \rightleftharpoons CH_3CH_2CHClCOO^- + H^+$
Initial moles 1
Moles at eqm. $1-\alpha$ α α Total $= 1 + \alpha$
$i = \frac{1+\alpha}{1} = 1 + \alpha = 1 + 0{\cdot}065 = 1{\cdot}065$; $\Delta T_f = i\,K_f\,m = (1{\cdot}065)(1{\cdot}86)(0{\cdot}3264) = \mathbf{0{\cdot}65°}$.</td><td>1

1

1</td></tr>
<tr><td>14</td><td>Solution. (i) Calculation of Resistivity. Electrical resistance of the solution, $R = 5{\cdot}55 \times 10^3\ \Omega$
Area of cross-section of the column (a) $= \pi r^2 = 3{\cdot}14 \times \left(\frac{1}{2}\right)^2 cm^2 = 0{\cdot}785\ cm^2$
Length of the column (l) = 50 cm
Applying the formula, $R = \rho \frac{l}{a}$
$\rho = \frac{R \times a}{l} = \frac{(5{\cdot}55 \times 10^3\ \Omega)(0{\cdot}785\ cm^2)}{50\ cm} = 87{\cdot}135\ \Omega\ cm$, i.e., Resistivity ($\rho$) $= \mathbf{87{\cdot}135\ \Omega\ cm}$
(ii) Calculation of conductivity. Conductivity (κ) $= \frac{1}{\rho} = \frac{1}{87{\cdot}135\ \Omega\ cm} = \mathbf{0{\cdot}01148\ S\ cm^{-1}}$
(iii) Calculation of molar conductivity
Molar conductivity ($\wedge_m$) $= \frac{\kappa \times 1000}{Molarity} = \frac{(0{\cdot}01148\ S cm^{-1})(1000\ cm^3 L^{-1})}{(0{\cdot}05\ mol L^{-1})} = \mathbf{229{\cdot}6\ S\ cm^2\ mol^{-1}}$</td><td></td></tr>
<tr><td>15</td><td>Cell Reaction :
2Al +3 Ni2+ ----------------> 2Al3+. + 3 Ni
E°Cell. = -0.25 -(-1.66)
= 1.41 V
E cell= E°cell- 0.0591/6[Al3+]2/[Ni2+]3
= 1.41 - (0.0591/6) (10^-3)^2/(0.50)^3
= 1.46 Volt</td><td>1

1

1</td></tr>
<tr><td>16</td><td>(a) Sodium will be deposited on cathode and Chlorine gas will be evolved on anode.
(b) Dissolution of gas in liquid is an exothermic process.As the temperature is increased, equilibrium shifts backward.
(c)Cellulose acetate
(d) The minimum excess pressure that has to be applied on the solution to prevent the entry of the solvent into solution through the semipermeable membrane.
Osmotic pressure is directly proportional to temperature.</td><td>1

1
1

1

1</td></tr>
</table>

OSDAV Public School, Kaithal

Marking Scheme **SET-B**

May Unit Test (2024-25)

Subject: CHEMISTRY(043)

Class:XII

1 **d**
2 d 1
3 c 1
4 b 1
5 d
1
6 a 1
7 a 1
8. b 1

9 There is strong hydrogen bonding in alcohol molecules as well as water molecules.On mixing , the molecular interactions are weakened.Hence their solution will show positive deviations from ideal behaviour.As a result, the solution will have higher vapour pressure and lower boiling point than that of water and alcohol. 1 1

10
At anode : $Zn(s) \longrightarrow Zn^{2+}(aq) + 2e^-$ 1
At cathode : $2MnO_2(s) + 2NH_4^+(aq) + 2e^- \longrightarrow Mn_2O_3(s) + 2NH_3(g) + H_2O$ 1
(*i.e.*, Mn has been reduced from oxidation state +4 to +3).

11
$KCl \rightarrow K^+ + Cl^-$ 1/2
$n = 2$
$i = 1 - \alpha + n\alpha$
$i = 1 + \alpha$ 1/2
$\Delta T_f = iK_f m$
$= (1 + 0.92) \times 1.86 \times \frac{0.5 \times 1000}{74.5 \times 100}$
$\Delta T_f = 0.24$
$\Delta T_f = T_f^o - T_f'$
$T_f' = -0.24\ ^oC$ 1

12
Ans. Reduction of vapour pressure to 80% means that if p^o = 100 mm, then p_s = 80 mm. 1/2
Applying complete formula

$$\frac{p^o - p_s}{p^o} = \frac{n_2}{n_1 + n_2} = \frac{w_2/M_2}{w_1/M_1 + w_2/M_2}$$ 1/2

$$\frac{100 - 80}{100} = \frac{w_2/40}{114/114 + w_2/40}$$ (Mol. mass of octane C_8H_{18} = 114 g mol^{-1})

or $\frac{20}{100} = \frac{w_2/40}{1 + w_2/40}$ or $\frac{1}{5}\left(1 + \frac{w_2}{40}\right) = \frac{w_2}{40}$ or $w_2 = 10$ **g**

Note that complete formula is required because concentration of solution is greater than 5%.
Complete formula can also be applied in the form 1

$$\frac{p^o - p_s}{p_s} = \frac{w_2/M_2}{w_1/M_1}$$ or $\frac{100 - 80}{80} = \frac{w_2/40}{114/114}$ or $\frac{1}{4} = \frac{w_2}{40}$ or $w_2 = 10$ **g**

13
Molar mass of $CH_3CH_2CHClCOOH$ = 15 + 14 + 13 + 35·5 + 45 = 122·5 g mol^{-1}

10 g of $CH_3CH_2CHClCOOH = \frac{10}{122{\cdot}5}$ mole $= 8{\cdot}16 \times 10^{-2}$ mole 1

$\therefore$ Molality of the solution $(m) = \frac{8{\cdot}16 \times 10^{-2}\ \text{mole}}{250\text{g}} \times 1000\ \text{g kg}^{-1} = 0{\cdot}3264$

If α is the degree of dissociation of $CH_3CH_2CHClCOOH$, then

	$CH_3CH_2CHClCOOH$	$\rightleftharpoons$ $CH_3CH_2CHClCOO^-$	+ H^+
Initial conc.	C mol L^{-1}	0	0
At eqm.	C (1 − α)	Cα	Cα

$\therefore$ $K_a = \frac{C\alpha . C\alpha}{C(1-\alpha)} = C\alpha^2$ or $\alpha = \sqrt{\frac{K_a}{C}} = \sqrt{\frac{1{\cdot}4 \times 10^{-3}}{0{\cdot}3264}} = 0{\cdot}065$

To calculate van't Hoff factor : 1

	$CH_3CH_2CHClCOOH$	$\rightleftharpoons$ $CH_3CH_2CHClCOO^-$	+ H^+	
Initial moles	1			
Moles at eqm.	1 − α	α	α	Total = 1 + α

$i = \frac{1+\alpha}{1} = 1 + \alpha = 1 + 0{\cdot}065 = 1{\cdot}065$; $\Delta T_f = i\,K_f m = (1{\cdot}065)(1{\cdot}86)(0{\cdot}3264) = \mathbf{0{\cdot}65^o}$.

1

14

Solution. (*i*) **Calculation of Resistivity.** Electrical resistance of the solution, $R = 5.55 \times 10^3\ \Omega$

Area of cross-section of the column (a) $= \pi r^2 = 3.14 \times \left(\frac{1}{2}\right)^2 cm^2 = 0.785\ cm^2$

Length of the column (l) = 50 cm

Applying the formula, $R = \rho \frac{l}{a}$

$$\rho = \frac{R \times a}{l} = \frac{(5.55 \times 10^3\ \Omega)(0.785\ cm^2)}{50\ cm} = 87.135\ \Omega\ cm,\ i.e.,\ \text{Resistivity}\ (\rho) = \mathbf{87.135\ \Omega\ cm}$$

(*ii*) **Calculation of conductivity.** Conductivity $(\kappa) = \frac{1}{\rho} = \frac{1}{87.135\ \Omega\ cm} = \mathbf{0.01148\ S\ cm^{-1}}$

(*iii*) **Calculation of molar conductivity**

$$\text{Molar conductivity}\ (\Lambda_m) = \frac{\kappa \times 1000}{\text{Molarity}} = \frac{(0.01148\ S\ cm^{-1})(1000\ cm^3\ L^{-1})}{(0.05\ mol\ L^{-1})} = \mathbf{229.6\ S\ cm^2\ mol^{-1}}$$

15 Cell Reaction :

2Al +3 Ni2+ ----------------> 2Al3+.   + 3 Ni 1

E°Cell. = -0.25 -(-1.66)

= 1.41 V

E cell= E°cell- 0.0591/6[Al3+]2/[Ni2+]3 1

= 1.41 - (0.0591/6) (10^-3)^2/(0.50)^3

= 1.46 Volt 1

(a) Copper will be deposited on cathode and O2 will be evolved at anode. 1

(b) Dissolution of gas in liquid is an exothermic process.As the temperature is

16 increased, equilibrium shifts backward.

(c)Cellulose acetate 1

(d) The minimum excess pressure that has to be applied on the solution to prevent the 1

entry of the solvent into solution through the semipermeable membrane.

Osmotic pressure is directly proportional to temperature. 1

1