DEPARTMENT OF GOVERNMENT EXAMINATIONS

HIGHER SECONDARY FIRST YEAR EXAMINATION MAY-2022

KEY ANSWER FOR CHEMISTRY - ENGLISH MEDIUM

Maximum Marks - 70

Answer all the Questions

Part -I

15 x 1 = 15

Q.NO	Option	A Type	Q.NO	Option	В Туре
1	c)	C ₈ H ₁₈	1	a)	1p + 2n
2	b)	- 2°C	2	c)	(1) – (iv), (2) – (iii), (3) – (i), (4) – (ii)
3	a)	-C(CH ₃) ₃ > -CH(CH ₃) ₂ >- CH ₂ - CH ₃ > -CH ₃	3	b)	NO
4	b)	NO	4	c)	Mass / volume
5	d)	d) Both assertion and reason are true but reason is not the correct explanation of assertion	5	c)	C ₈ H ₁₈
6	c)	Mass / volume	6	a)	Lithium
7	b)	for a system at equilibrium Q is always less than the equilibrium constant	70	a)	-C(CH ₃) ₃ > -CH(CH ₃) ₂ >- CH ₂ - CH ₃ > -CH ₃
8	c)	(1) – (iv), (2) – (iii), (3) – (i), (4) – (ii)	8	c)	Stark effect
9	a)	Lithium	9	b)	for a system at equilibrium Q is always less than the equilibrium constant
10	b)	MgCl ₂	10	d)	tautomers
11	a)	1p + 2n	11	b)	MaCl ₂
12	a)	O ₂ ²⁻	12	b)	- 2°C
13	c)	Stark effect	13	a)	O ₂ ² -
14	d)	near the hydrogen chloride bottle	14	d)	Both assertion and reason are true but reason is not the correct explanation of assertion
15	d)	tautomers	15	d)	near the hydrogen chloride bottle

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Part – II

Answer any SIX Questions and Questions No.24 is Compulsory.

6 X 2 =12

16	Gram equivalent mass is defined as the mass of an element (compound or ion) that combines or displaces 1.008 g hydrogen or 8 g oxygen or 35.5 g chlorine. Correct definition		2
17	n = 2 represents L shell, $2n^2$ Maximum number of electron in L shell is 2 x 2^2 = 8 electrons	1	2
18	Types of Covalent (Molecular) hydrides	1	
	i) electron precise (CH ₄ , C ₂ H ₆ , SiH ₄ , GeH ₄),	1/2	2
	ii) electron deficient (B ₂ H ₆)	1/2	
	iii) electron-rich hydrides (NH ₃ , H ₂ O).		
19	The spontaneity of any process depends on three different factors.		
	i) If the enthalpy change of a process is negative, then the process is	1/2	
	exothermic (ΔH is negative)		
	ii) If the entropy change of a process is positive, (ΔS is positive)	1/2	2
	iii) The Gibbs free energy which is the combination of the above two		۷
	(ΔH -TΔS) should be negative for a reaction to occur spontaneously	1	
	$\Delta H - T\Delta S < 0$ (OR)		
	i) $\Delta H < 0$ ii) $\Delta S > 0$ iii) $\Delta G < 0$		
20	Sign convention of heat		
	i) If heat flows into the system from the surrounding, energy of a system	1	
	increases. Hence it is taken to be positive (+q).		_
	ii) If heat flows out of the system into the surrounding, energy of the	1	2
	system decreases. Hence, it is taken to be negative (-q).	1	
21	4NO + 6H ₂ O ⇌ 4NH ₃ + 5O ₂ (Correct balanced equation)		
	(unbalanced equation 1M)	2	2
	Isotonic solutions		
22	Two solutions having same osmotic pressure at a given temperature are		
	called isotonic solutions.	2	2
	(Correct definition)		
23	Conversion of ethyl chloride into ethane:		
	$CH_3CH_2Cl + H_2 \xrightarrow{Ni(or)Pd} CH_3-CH_3+HCl$ Ethane	2	2
	Explanation only 1 M		

24	Compulsory questions:		
	$C_6H_5Cl + 2NH_3 \xrightarrow{250^{0}C} C_6H_5NH_2 + NH_4Cl$ i) Chlorobenzene Aniline	1	2
	C ₆ H ₅ Cl+2Na+Cl-C ₆ H ₅ Ether C_6 H ₅ C_6 H ₅ +2NaCl Biphenyl	1	

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Part – III

Answer any SIX Questions and Questions No.33 is Compulsory.

6 X 3 = 18

25 i) <u>C</u> O ₂	41/	
	1½	
x + 2(-2) = 0 $2(+1) + x + 4(-2) = 0$		3
x = 4 $2 + x - 8 = 0$ $x = +6$	11/2	3
i) It is defined as the amount of energy released (required in the case n		
gases) when an electron is added to the valence shell of an isolated ne	eutral 2	
gaseous atom in its ground state to form its anion.		3
ii) It is expressed in kJ mol ⁻¹ $A + e \rightarrow A^- + EA$	1	
27 John Dalton stated that		
"the total pressure of a mixture of non-reacting gases is the sum	of	
partial pressures of the gases present in the mixture".	3	3
Correct statement		
28 $\Delta P = W_B \times M_A$	0	
$\frac{\Delta P}{P_A^{\circ}} = \frac{w_B \times M_A}{w_A \times M_B}$	2	
The molar mass of the solute (M _B) can be calculated using the known v	values 1	3
of wa, wb, Ma and the measured relative lowering of vapour pressure.	'	
29 Electronic configuration of hydrogen atom is 1s ¹	1/2	
Valence shell electronic configuration of fluorine atom : 2s ² 2px ² , 2py ² ,	2pz ¹ ½	3
When half filled 1s orbital of hydrogen linearly overlaps with a half filled	d 2pz	J
orbital of fluorine, a σ-covalent bond is formed between hydrogen and fluorine. (OR)		
fluorine. (OR)		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		
1s 2p _z sp overlapping		
30 Optical Isomerism		
Compounds having same physical and chemical property but differ only	y	3
in the rotation of plane of the polarized light are known as optical isome	ers and	5
the phenomenon is known as optical isomerism		
Correct statement		

31	S.NO	Nucleophiles	Electrophiles		
	1	Nucleophiles are reagents that has high affinity for electro positive centre.	Electrophiles are reagents that are attracted towards negative charge or electron rich centre.	1	
	2	All Lewis bases act as nucleophiles.	All Lewis acids act as electrophiles		
	3	Ex: Neutral Nucleophiles:	Ex: Neutral electrophiles :	1	3
		NH ₃ , H ₂ O, R-OH, R-O-R'	CO ₂ , AlCl ₃ , BF ₃ , FeCl ₃ :CCl ₂		
		-Ve charged nucleophiles X- (Cl ⁻ , Br ⁻ , I ⁻) RCOO ⁻ , RO ⁻ , OH ⁻ , CN ⁻ (any one example)	+Ve charged Electrophiles: H ⁺ , X ⁺ , O ⁺ , N ⁺ (any one example)	1	,
32	Alkenes	react with Baeyer's reagent to fo	orm vicinal diols. The purple solution		
	(Mn ⁷⁺) k	pecomes dark green (Mn ⁶⁺), and	then produces a dark brown		
	precipit	ate (Mn ⁴⁺)	(OR)		
		$CH_2 = CH_2 + H_2O$ [O]	CH ₂ -CH ₂		3
		Cold dil. KMnC 273 K	O ₄ OH OH + MnO ₂ ↓ dark brown		
		2/3 K	ethane-1,2-diol		
33	Compu	Isory questions:			
		$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$		1	
		$K_{C} = \frac{[NH_{3}]^{2}}{[N_{2}][H_{2}]^{3}}$		1	3
		$= \frac{1.8 \times 10^{-2} \times 1.8 \times 10^{-2}}{1.2 \times 10^{-2} \times 3 \times 10^{-2} \times 3 \times 10^{-2}}$		1	

Part - IV

Answer all the Questions

 $5 \times 5 = 25$

34	a) i) $n = 4$ I = 0, 1, 2, 3 four sub-shells \Rightarrow s, p, d, f	1/2	
	$I = 0 \qquad m_I = 0 \; ; \qquad \qquad \text{one 4s orbital.}$ $I = 1 \qquad m_I = -1, \; 0, \; +1 \; ; \qquad \qquad \text{three 4p orbitals.}$ $I = 2 \qquad m_I = -2, \; -1, \; 0, \; +1, \; +2 \; ; \qquad \qquad \text{five 4d orbitals.}$	1/2 1/2 1/2 1/2	3
	$I = 3$ $m_I = -3, -2, -1, 0, +1, +2, +3;$ seven 4f orbitals Over all (16)Sixteen orbital	1/2	

	ii) Electronic configuration of N atom is 1s ² 2	s ² 2p ³		
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		1	2
			1	
	(OR)			
	b) Pauling Method : $d = r_{C+} + r_{A-} - \cdots - r_{C+}, \ r_{A-} \ \text{are the radius of the cation and ar}$	` '	1	
	i.e. $r_{C^+} \alpha \frac{1}{(Z_{eff})_{C^+}}$	and (2)	1	
	$r_{A^-} \alpha \frac{1}{(Z_{eff})_{A^-}}$	(3)	1	
	Where Z_{eff} is the effective nuclea Dividing the equation 2 by 3	r charge and Z _{eff} = Z - S	1	
	$\frac{\mathbf{r}_{\mathrm{C}^{+}}}{\mathbf{r}_{\mathrm{A}^{-}}} = \frac{\left(\mathbf{Z}_{\mathrm{eff}}\right)_{\mathrm{A}^{-}}}{\left(\mathbf{Z}_{\mathrm{eff}}\right)_{\mathrm{C}^{+}}} - \frac{1}{2}$		1	5
	On solving equation(1) and (4) the values of	rc+ and r _A - can be calculated		
35	a) i) Reason for the anomalous behaviour	of beryllium		
	1) Its small size and high polarising power	7	1	
	2) Relatively high electronegativity and ionisa	tion enthalpy as compared to other		
	members	.1 . 11	1	
	3) Absence of vacant d-orbitals in its valence		1	
	ii) Comparison of Properties of Beryllium			
	Beryllium Forms covalent compounds	Other elements of the family form ionic compounds		
	High melting and boiling point	Low melting and boiling point		5
	Does not react with water even at elevated	React with water		
	temperature		2	
	Does not combine directly with hydrogen	Combine directly with hydrogen		
	Does not combine directly with halogens.	Combine directly with halogens		
	Halides are covalent	Halides are electrovalent.		
	(Correct two points)			

b) Characteristics of internal energy (U): i) The internal energy of a system is an extensive property. It depends on the amount of the substances present in the system. If the amount is doubled, the internal energy is also doubled. ii) The internal energy of a system is a state function. It depends only upon the state variables (T, P, V, n) of the system. The change in internal energy does not depend on the path by which the final state is reached. iii) The change in internal energy of a system is expressed as $\Delta U = U_I - U_I$ iv) In a cyclic process, there is no internal energy change. $\Delta U(c_{volic}) = 0$ v) $\Delta U = U_I - U_I = -ve (U_I < U_I)$ 1 36 a) Determination of molar mass of solute from elevation of boiling point If the solution is prepared by dissolving we g of solute in w _A g of solvent, then the molality is, $m = \frac{Number of moles of solute \times 1000}{Neight of solvent in grams} \qquad$		(OR)		
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iv) In a cyclic process, there is no internal energy change. $\Delta U(\text{cyclic}) = 0$ v) $\Delta U = U_f - U_i = -\text{ ve } (U_f < U_i)$ vi) $\Delta U = U_f - U_i = +\text{ ve } (U_f > U_i)$ 1 36 a) Determination of molar mass of solute from elevation of boiling point If the solution is prepared by dissolving w _B g of solute in w _A g of solvent, then the molality is, $m = \frac{\text{Number of moles of solute} \times 1000}{\text{weight of solvent in grams}} \qquad$		does not depend on the path by which the final state is reached.		5
iv) In a cyclic process, there is no internal energy change. $\Delta U_{(syclic)} = 0$ y_2 $y_1 \Delta U = U_f - U_i = -ve (U_f < U_i)$ $y_1 \Delta U = U_f - U_i = +ve (U_f > U_i)$ 1 36 a) Determination of molar mass of solute from elevation of boiling point If the solution is prepared by dissolving we g of solute in wa g of solvent, then the molality is, $m = \frac{Number of moles of solute \times 1000}{weight of solvent in grams} \qquad$		iii) The change in internal energy of a system is expressed as $\Delta U = U_f - U_i$	1/2	
v) $\Delta U = U_r - U_i = -ve (U_r < U_i)$ vi) $\Delta U = U_f - U_i = +ve (U_r > U_i)$ 36 a) Determination of molar mass of solute from elevation of boiling point If the solution is prepared by dissolving w _B g of solute in w _A g of solvent, then the molality is, $m = \frac{Number of moles of solute \times 1000}{weight of solvent in grams} \qquad$		iv) In a cyclic process, there is no internal energy change. $\Delta U(cyclic) = 0$		
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If the solution is prepared by dissolving w _B g of solute in w _A g of solvent; then the molality is, $ m = \frac{\text{Number of moles of solute} \times 1000}{\text{weight of solvent in grams}} \qquad \dots \dots$		vi) $\Delta U=Uf-Ui=+$ ve $(U_f>U_i)$	_	
$m = \frac{1}{\text{weight of solvent in grams}} \qquad \dots \dots$	36	If the solution is prepared by dissolving w _B g of solute in w _A g of solvent,		
$\label{eq:weight of solvent in grams} \text{Number of moles of solute} = \frac{W_B}{M_R} \qquad$				
$M_{\text{R}} = \text{Molar mass of the solute Therefore,}$ $m = \frac{w_{\text{B}} \times 1000}{M_{\text{B}} \times w_{\text{A}}} \qquad$		$m = \frac{1}{\text{weight of solvent in grams}}$ (1)	1	
$m = \frac{w_{_B} \times 1000}{M_{_B} \times w_{_A}} \qquad$		Number of moles of solute = $\frac{W_B}{M_R}$ (2)	1	
$M_{\text{B}} \times w_{\text{A}} \qquad \qquad 1$ $\Delta T_{\text{b}} = \frac{K_{\text{b}} \times w_{\text{B}} \times 1000}{M_{\text{R}} \times w_{\text{A}}} \qquad \qquad (4)$ $M_{\text{olar mass can be calculated by using (4)}}$ $M_{\text{B}} = \frac{K_{\text{b}} \times w_{\text{g}} \times 1000}{\Delta T_{\text{b}} \times w_{\text{A}}} \qquad \qquad (5)$ 1 (OR) $b) \text{ i) Bond length}$ The distance between the nuclei of the two covalently bonded atoms is called bond length. $ii) \text{ Bond angle}$		Where, M_B = molar mass of the solute Therefore,		
$M_{B} = \frac{K_{b} \times w_{B} \times 1000}{\Delta T_{b} \times w_{A}} \qquad$		$m = \frac{w_B \times 1000}{M_B \times w_A} \qquad \dots $	1	
$M_{\rm B} = \frac{K_{\rm b} \times w_{\rm B} \times 1000}{\Delta T_{\rm b} \times w_{\rm A}} \qquad$		$\Delta T_b = \frac{K_b \times W_B \times 1000}{M_R \times W_A} \qquad \dots \tag{4}$	1	
b) i) Bond length The distance between the nuclei of the two covalently bonded atoms is called bond length. ii) Bond angle		Molar mass can be calculated by using (4)		
b) i) Bond length The distance between the nuclei of the two covalently bonded atoms is called bond length. ii) Bond angle		$M_{B} = \frac{K_{b} \times W_{B} \times 1000}{\Delta T_{b} \times W_{A}} \qquad \dots (5)$		
b) i) Bond length The distance between the nuclei of the two covalently bonded atoms is called bond length. ii) Bond angle			1	
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bond length. ii) Bond angle		b) i) Bond length		
ii) Bond angle		The distance between the nuclei of the two covalently bonded atoms is called	1	
		bond length.		
Covalent hands are directional in nature and are oriented in specific directions		ii) Bond angle		
Covalent bonds are directional in nature and are offented in specific directions		Covalent bonds are directional in nature and are oriented in specific directions		
in space. This directional nature creates a fixed angle between two covalent 2		in space. This directional nature creates a fixed angle between two covalent	2	
bonds in a molecule and this angle is termed as bond angle.		bonds in a molecule and this angle is termed as bond angle.		

			5
	iii) Bond enthalpy		
	The bond enthalpy is defined as the minimum amount of energy required to		
	break one mole of a particular bond in molecules in their gaseous state. The	2	
	unit of bond enthalpy is kJ mol ⁻¹ .	_	
37	a) The extent of ionic character in a covalent bond can be related to the electro		
	negativity difference to the bonded atoms. In a typical polar molecule, $A^{\delta-}B^{\delta+}$,	2	
	the electronegativity difference (χ_A - χ_B) can be used to predict the percentage of		
	ionic character as follows.		5
	If the electronegativity difference (χ_A - χ_B), is		Ü
	i) equal to 1.7, then the bond A-B has 50% ionic character	1	
	ii) if it is greater than 1.7, then the bond A-B has more than 50% ionic character,	1	
	iii) if it is lesser than 1.7, then the bond A-B has less than 50% ionic character.	1	
	(OR)	'	
	b) i) 2-bromo-3-methylbutane	1	
	ii) methoxymethane	1	
	iii) 2-hydroxybutanal	1	
	iv) buta-1,3-diene	1	5
	v) 4-chloropent-2-yne	1	
38	a) i) nitrobenzene		
	Nitration:		
	When benzene is heated at 330K with a nitrating mixture (Con. HNO ₃ + Con.		
	H ₂ SO ₄), nitro benzene is formed by replacing one hydrogen atom by nitronium	2	
	ion(electrophile) Concentrated H ₂ SO ₄ is added to produce nitronium ion NO ₂ ⁺		
	NO_2		
	$+ \text{HNO}_3 \xrightarrow{\text{Conc. H}_2\text{SO}_4} + \text{H}_2\text{O}$		
	330K		
	nitrobenzene		
	ii) benzene sulphonic acid		
	Sulphonation: Benzene reacts with fuming sulphuric acid (Con H ₂ SO ₄ + SO ₃)	2	
	and gives benzene sulphonic acid. The electrophile SO ₃ is a molecule. Although		
	it does not have positive charge, it is a strong electrophile. This is because the		5
	octet of electron around the sulphur atom is not reached. The reaction is		
	reversible and desulphonation occurs readily in aqueous medium.		
	Terrene and decamplication decamp is adjusted in adjusted in adjusted in adjusted in a djustic i		

			H_2SO_4 + H_2O		
			ee molecules of Cl ₂ in the presence of sun		
light or U\	light t	o yield Benzene I	Hexachloride (BHC) C ₆ H ₆ Cl ₆ . This is known as		
gammaxa	ne or L	indane which is a	a powerful insecticide.		
			(or)		
		benzene	Cl ₂ UV or H Cl H Cl H Cl H BHC	1	
			(OR)		
b) 1. Ethen reaction.	e react	mi Væ	Chloroethane CH₃ - CH₂Cl as (B) by addition HCl → CH₃ - CH₂Cl	1	
2. Chloroet	hane re	eacts with ammonia	a to give Ethylamine CH ₃ -CH ₂ NH ₂ as (C). It is a		
primary am	ine and	d Carbylamine test	is the characteristic test for 1° amine.		
		CH ₃ - CH ₂ Cl +	$- NH_3 \rightarrow CH_3 - CH_2NH_2 + HCI$	1	
	Α	$CH_2 = CH_2$	Ethene (or) Ethylene	1	5
	В	CH ₃ - CH ₂ Cl	Chloroethane (or) Ethyl chloride	1	

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