Paper / Subject Code: 78808 / Chemistry : Paper I

[Time: 3 Hours]

[Total Marks: 100]

12

Please check whether you have got the right question paper.

- N.B: 1. All Questions are compulsory.
 - 2. Figures to the right indicate full marks.
 - 3. Use of log-table/nonprogrammable calculator is allowed.

4. Answers for the same question as far as possible should be written together.

1. (A) Select the correct option and complete the following sentences. (any **twelve**)

- (i) In Galvanic cell, any electrical work done is on the expense of _____.
 a) increase in free energy b) decrease in free energy c) decrease in chemical free energy
 (ii) In an electrochemical cell, the reduction reaction always takes place at the electrode
- (ii) In an electrochemical cell, the reduction reaction always takes place at the electrode which is at ______ potential.
- (a) higher oxidation (b) reduction (c) higher reduction
 (iii) Quinhydrone is a mixture of ______.
 (a) quinine and hydroquinone (b) quinone and hydroquinone
 (c) equimolar mixture of quinone and hydroquinone

(iv) The least number of variable factors required to specify the mixture of gases are

- (v) Clapeyron equation can be used to study the effect of pressure on ______.
 (a) melting points of solids (b) boiling points of liquids (c) melting points of solids and boiling points of liquids
 (vi) The eutectic point of two component system is ______.
 (vi) a) bi-variant (b) non variant (c) mono-variant
 (vii) Cr³⁺ ions form ______ color precipitate on addition of lead acetate and acetic
- (vii) Cr^{3+} ions form _____ color precipitate on addition of lead acetate and acetic acid.
- a) greenb) yellowc) red(viii)Coordination no. of Fe in K_3 [Fe (C₂O₄)₃] is ______.
- a) three b) six c) four
 (ix) The number of unpaired electrons in [Ni(CO)₄] is / are
 a) Zero b) one c) two

- a) cobalt b) scandium c) manganese
 (xii) According to IUPAC nomenclature, the name of the positively charged ligands end with the suffix _____.
 - a) 'ate' b) 'ium' c) 'o'
- (xiii) Reaction of phenyl magnesium bromide with dry ice followed by acid hydrolysis gives_____.

- a)phenolb)benzoic acidc)benzene(xv)The weakest acid among the following
 - a)p-toluic acid b)p-nirobenzoic acid c)benzoic acid
- (xvii) Coversion of diester having α-hydrogen atom into cyclic β-keto ester on heating with base is known as ______.
 a)Dieckmann condensation b)Clasien condensation c)Benzoin condensation

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(xviii) Acetic acid when heated with P₂O₅ gives ______ a) ethanol b) acetic anhydride c) acetone.

- (B) State whether the following statements are true or false. (any three)
 - (i) Valency of an ion can be determined by measuring an emf of an electrolyte concentration cell without transference.
 - (ii) In phase diagram of one component system, along the curves, the system is bivariant.
 - (iii) Oxalate ion is a chelating ligand.
 - (iv) Diamagnetic substances are attracted towards the magnetic field.
 - (v) An intermediate formed in nucleophilic acyl substitution have tetrahedral structure.
 - (vi) Formic acid is weaker acid than acetic acid.
- (C) Match the column. (any **five**)
 - (i) Invariant system
 - (ii) Salt bridge
 - (iii) Patronite
 - (iv) Ilmenite
 - (v) HVZ reaction
 - (vi) Sulfonation of benzene
- (a) Ore of scandium
- (b) Ore of Titanium
- (c) Degrees of freedom
- (d) α -halogen acid
- (e) Ore of Manganese
- (f) F = 0

- (g) Ore of vanadium
- (h) Nucleophilic substitution reaction
- (i) γ -halogen acid
- (j) Electrophilic substitution reaction
- (k) To minimize liquid junction potential

2.	Attempt any	four	of the	following.
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(A)	Explain - any two applications of Electrochemical series.	05
(B)	Derive Nernst equation for determination of emf of a galvanic cell.	05
(C)	The basic reaction which takes place in cell is -	05
	$Cd + Hg_2SO_4 = CdSO_4 + 2Hg$	
	The emf of a cell is 1.018V at 298K. Its temperature coefficient at constant pressure is	
	$(-3.9) \times 10^{-5} \text{ VK}^{-1}$. Calculate ΔG , ΔS and ΔH for the given cell reaction of Weston Cell.	
(D)	State and explain the phase rule and the terms involved in it.	05
(E)	Define congruent melting point. Explain it with labelled diagram for sodium –potassium system.	05
(F)	Ether boils at 306K at 1.00×10^5 Pa pressure. At what temperature will it boil at a pressure of	05
	9.85 x 10^3 Pa? Given that the molar enthalpy of vaporization of ether is 2.74 x 10^4 J mol ⁻¹ .	
Atte	mpt any four of the following.	
(A)	i) Give the characteristic properties of transition elements.	03
	ii) Write the tests by which presence of iron can be detected in the given salt.	02
(B)	i) Name the first five elements of 3d series of transition elements and give their electronic configuration.	05
	ii) Give an account of the special stability of d^0 , d^5 and d^{10} configurations with reference to first transition series.	
(C)	i) Explain the isomerism exhibited by $[Co (Cl)_3 (NH_3)_3]$ complex.	05
	ii) What is hydrate isomerism? Explain with a suitable example.	
(D)	Account for the following:	05
	i) Manetic moment of transition elements is determined by using spin only formula.	
	ii) Lanthanum though is a d block element, is always considered as a member of f block	
	elements.	

3.

05

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	(E) (F)	 Comment on the following statements. i) Colour of transition metal compounds can be explained on the basis of d-d transition of electrons. ii) Cu²⁺ salts are coloured but Zn²⁺ salts are colourless. What are inner orbital and outer orbital complexes? Explain the same with the help of [Fe (H₂O)₆]³⁺ and [Fe (CN)₆]³⁻. Comment on their magnetic property. 	05 05
4.	Atter (A)	npt any four of the following. i) How will you prepare benzoic acid from	03
	(11)	a) alkyl benzene b) aromatic alcohol c) phenyl cyanide ?	00
		ii) What is the action of following reagents on benzene sulfonic acid a) PCl_5 b) oleum at $90^{0}C$?	02
	(B)	What is nucleophilic acyl substitution? How will you convert an amide into carboxylic acid? Give its mechanism.	05
	(C)	i) What is aryl sulfonation? Give one example. What are different sulfonating agents? ii) How picric acid is prepared from phenol via sulfonation and Ipso substitution?	03 02
	(D)	Explain Hell-Volhard-Zelinskii reaction with mechanism.	05
	(E)	What happens when	05
		a)Ethyl benzoate is heated with ammonia	
		b) Naphthalene is heated with conc. H_2SO_4 at 80°C.	
		d) Benzovl chloride is heated with excess of ammonia	
		e) Benzoic acid is treated with LiAlH ₄ followed by acid hydrolysis.	
	(F)		05
		OR -ROH OR	
		OR Name the reaction and give its machanism	
		Name the reaction and give its mechanism.	
5.	Atter	npt any four of the following.	
	(A)	Explain the origin of liquid junction potential and show how it can be minimized.	05
	(B)	Give a brief account of meta-stable equilibrium in sulphur system.	05
	(C)	i) Name the different oxides of vanadium. Mention the oxidation state of vanadium	05
		in each of them.	
	`	ii) Explain the role of Ti^{3+} salts in titrimetric analysis.	
	(D)	Distinguish between -	05
		i) double salt and complex compound	
	(E)	What is Claisen condensation? Explain its mechanism with suitable example.	05
	(F)	i) Explain why sulphonic acids are stronger than carboxylic acids.	03
		ii) What is desulfonation? Explain with suitable example.	02

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