[Time : 3 Hours] **[Total Marks : 100]**

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/non-programmable 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**) **12**

(i) Substances with higher reduction potentials are strong _____ .
(a) reducing agents (b) oxidising agents (c) acids

(ii) All metals lying above in electrochemical series can liberate H_2 gas by reaction with _____ .
(a) bases (b) covalent compounds (c) acids

(iii) In galvanic cell, electrons are given off _____ electrode.
(a) by anode (b) at cathode (c) by platinum

(iv) A system with zero degrees of freedom is known as _____ .
(a) bi-variant (b) non variant (c) mono-variant

(v) The eutectic temperature of lead silver system is _____ .
(a) 762K (b) 576K (c) 726K

(vi) All metals lying above hydrogen in electrochemical series can liberate H_2 gas by reaction with _____ .
(a) acids (b) bases (c) covalent compounds

(vii) In first transition series _____element has its 3d level exactly half filled.
(a) Sc (b) Cr (c) Co

(viii) Solution containing hydrated Ti^{3+} is ___in colour.
(a) purple (b) red (c) yellow

(ix) ____ among following shows ferromagnetism.
(a) Ti (b)V (c) Ni

(x) The complex $[NiCl]_4^{2-}$ has _____ structure
(a) tetrahedral (b) square planar (c) square pyramidal

(xi) Fe^{2+} salts give blue colour with _____
(a) KOH (b) K- ferrocyanide (c) K –ferricyanide

(xii) The molecular formula of chromium carbonyl is_____
(a) $Cr(CO)_4$ (b) $Cr(CO)_5$ (c) $Cr(CO)_6$

(xiii) e to presence of electron withdrawing group strength of carboxylic acid _____.
(a) increases (b) decreases (c) remains Same

(xiv) Aromatic carboxylic acid on heating with soda lime forms _____.
(a) alkane (b) arene (c) aldehyde

(xv) Carboxylic acid is prepared from grignard reagent by action of _____.
(a) H_2SO_4 (b) CO_2 (c) HCl

(xvi) _____ are salts of sulfonic acids.
(a) Detergents (b) Paints (c) Perfumes

(xvii) Naphthalene on reaction with concentrated H_2SO_4 at 160° C forms _____.
(a) 1- naphthalene sulphonic acid
(b) 2- naphthalene sulphonic acid
(c) 7- naphthalene sulphonic acid

(xviii) Nitro Benzene on reaction with oleum forms _____.
(a) m-nitro sulphonic acid (b) o-nitro sulphonic acid
(c) p-nitro sulphonic acid

(B) State whether the following statements are true or false. (any **three**) **3**
(i) Any uni-univalent type of salt can be used in preparation of salt bridge
(ii) Aqueous salt solution is an classic example of single phase system.
(iii) With the increase in covalent character, acidic character of transition compound increases.
(iv) Ionisation isomerism is a form of stereoisomerism in coordination compounds
(v) Acetic acid is stronger than chloro acetic acid.
(vi) In IPSO substitution – SO_3H group is replaced by NO_2 group

(C) Match the column. (any **five**) **5**

(i) Salt bridge	(a) Crossed Claisen condensation
(ii) Clpyeron equation	(b) Ambidentate ligand
(iii) SCN^-	(c) To connect two half cells
(iv) Mo	(d) Half filled state
(v) Acyl nucleophilic subsitution	(e) $dP/_{dT} = \frac{\Delta H_f}{T(V_{liq.} - V_{vapour})}$
(vi) Reaction of different esters	(f) To minimize liquid junction potential
	(g) Forms tetrahedral intermediate
	(h) $dP/_{dT} = \frac{\Delta H}{T\Delta V}$
	(i) Hydrolysis reaction

2. Attempt any **four** of the following.
(A) Differentiate between concentration cells and chemical cells. **05**
(B) Explain any two applications of Nernst equation in the study of galvanic cells? **05**
(C) The emf of a cell Zn | $ZnSO_4$ || $CuSO_4$|Cu at 25°C is 0·3 V and the temperature coefficient of emf is -1·4 x 10^{-4} V per degree. Calculate the heat of reaction per mole for the reaction that taking place inside the cell. **05**
(D) Justify the number of phases and components present in the following system – **05**
$CaCO_3$ (solid) ⇋ CaO (solid) + CO_2 (gas)
(E) Derive Gibbs phase rule thermodynamically. **05**
(F) The boiling point of a given solvent is 352·2K at 1·013 x 10^5 N m^{-2}. Calculate the boiling point of the given solvent at 0·63 x 10^5 N m^{-2}. (molar heat of vaporization of a solvent at 352.2 K is 31·8 kJ mol^{-1}; R= 8·314 JK^{-1} mol^{-1}) **05**

3. Attempt any **four** of the following.
(A) Explain the terms with suitable examples:- **05**
(i). Primary and secondary valency (ii). Geometrical isomerism.
(B) Name the important oxides of titanium and vanadium. Give properties of any two oxides of vanadium. **05**
(C) Explain in brief different evidences for the formation of co-ordination compounds. **05**
(D) Comment on the colour property of transition metals. **05**

(E) Give an account of Werner's theory of coordination compounds. **05**

(F) Write a note on" Variable oxidation states of transition elements' **05**

4. Attempt any **four** of the following.

(A) a) How will you prepare –
   i) benzamide from benzoic acid **02**
   ii) benzoyl chloride from benzoic acid?

b) Explain Claisen condensation with mechanism. **03**

(B) a) Give preparation of Benzoic acid from- **03**
   a) toluene b) Grignard reagent.

b) Explain oxidation of 1-propanol. **02**

(C) a) Explain sulphonation of naphthalene at different temperatures. **03**

b) How will you convert :
   a) bromobenzene to benzoic acid.
   b) salicylic acid to methyl salicylate? **02**

(D) a) What is IPSO substitution? Explain with example. **03**

b) What is decarboxylation? Give an example. **02**

(E) a) What is the effect of substituents on acid strength of aliphatic acids? **04**

b) Draw structure of 2-methyl butanoic acid. **01**

(F) Discuss HVZ reaction giving mechanism and applications. **05**

5. Attempt any **four** of the following.

(A) What are the advantages and disadvantages of quinhydrone electrode in the determination of pH? **05**

(B) Ether boils at 306K at 1.00 x 10^5 Pa pressure. At what temperature will it boil at a pressure of 9.85 x 10^3 Pa? Given that the molar enthalpy of vaporization of ether is 2.74 x 10^4 J mol^{-1}. **05**

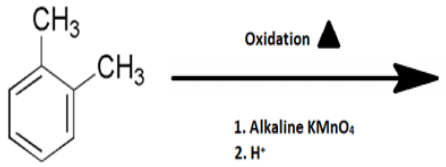
(C) Represent the electronic configuration of 3d transition elements and mention the names of elements with special stability. **05**

(D) What are the different rules for nomenclature of coordination compounds? Explain with examples. **05**

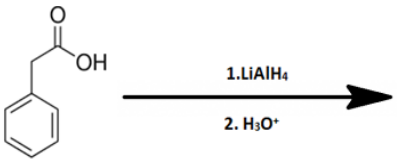
(E) Explain following reactions with example. **05**
   i) Fischer's Esterification
   ii) Ammonolysis

(F) Complete the following reactions-- **05**

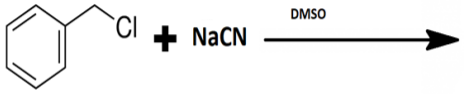
a)



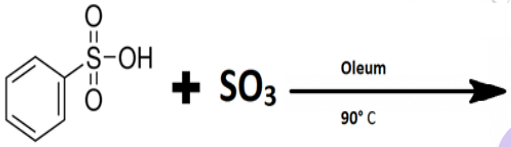
b)



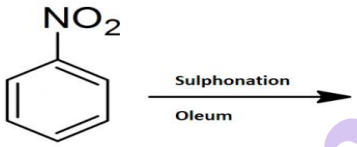
c)



d)



e)



== XXXXXX ==