Duration: 3 hours   **Total marks: 100**

Please check whether you have got the right question paper

NB: 1. All questions are compulsory
      2. Answers to the same questions must be written together
      3. Figures to the right indicate full marks
      4. The use of log table/ non programmable calculator is allowed

Q 1   (A)   **Select the correct option and complete the following**   **(12)**
                     statements.

i)   _____ is a salt of strong electrolytes.
          a) Na_2SO_4 b) CH_3COONa c) $Ba(OH)_2$

ii)   pH of 0.25 M HCl is _____ in an aqueous medium.
          a) 0.6021   b) 6.021   c) 0.2061

iii)   Electromagnetic radiation propagates in the form of _____.
           a) longitudinal waves b) surface waves c) transverse waves

iv)   Crystalline solids _____.
          a) are isotropic   b) possess sharp melting point c) possess
             irregular geometry

v)   The Steric number for water molecule is_____.
          a) 4   b) 2   c) 8

vi)   The bond angle in $HgCl_2$ is _____.
          a) 120°   b) 90°   c) 180°

vii)   The strongest oxidising agent in the electrochemical series
          is_____.
          a) hydrogen b) fluorine c) lithium

viii)   A graphical plot of potential vs pH of an aqueous.
          electrochemical system is called as _____ diagram.
          a) Pourbaix   b) Frost c) Walsh

ix)   Nitrobenzene on further nitration gives_____as the
          predominant product.
          a) o-dinitrobenzene b) m-dinitrobenzene   c) p-
             dinitrobenzene

x)   The number of pi electrons in cycloheptatriene is _____.
          a) 6   b) 4   c) 8

xi)   The distance between the flagpole 'H' atoms in the boat form of
          cyclohexane is_____.
          a) 2.81 A °   b)1.83 A°   3.02 A°

xii) The _____ bonds in chair form of cyclohexane are parallel
to the axis of symmetry.
a) axial   b) equatorial   c) flag pole

(B) **State whether the following statements are True or False** **(3)**
i) The pH is a qualitative measure of the acidity or basicity of a solution.
ii) The process of reducing the sulphide ores into more reducible oxide is known as roasting.
iii) Chlorine atom has strong withdrawing inductive effect.

(C) **Match the following columns** **(5)**

	Column -A		Column- B
i	Weak base	**a.**	4 and 9
ii	Delayed emission of radiation	**b**	pyridine
iii	The normal pH range of natural water is between	**c.**	o-p directing group
iv	Covalency of N	**d.**	fluorescence
v	–Cl	**e.**	3
		f.	phosphorescence
		g.	6 and 7

Q. 2 **(A)** (i) Calculate $[H_3O^+]$,$[OH^-]$ and pH of a 0.2M solution of HCN ($K_a = 7.2 \times 10^{-10}$). **(5)**
(ii) Explain the concept of ionic product of water. **(3)**

OR

(A) (i) Define the term 'degree of ionization'.What are the factors that affects the degree of ionization? **(5)**
(ii) 4.9g of H_2SO_4 is present in 500cm^3 of a solution. Calculate the pH of a solution (Mol.Wt of H_2SO_4 =98). **(3)**

(B) (i) Calculate the a) frequency in wavenumber **(5)**
　　　　　　　　b) energy of one photon of radiation.
　　whose wavelength is 350nm (c=3 $\times 10^8$ m/s: h = 6.626 $\times 10^{-34}$ Js).

(ii) Give three differences between crystalline solid and amorphous **(3)**
solid.

OR

(B) (i) State the law of symmetry. Explain the various axis of **(5)**
symmetry for a cubic crystal.

(ii) Give three characteristics of electromagnetic radiation. **(3)**

(C) (i) Define a) Triprotic acid **(2)**
　　　　　b) pOH

(ii) Define a) Unit cell **(2)**
　　　　　b) lattice plane

OR

(C) (i) Define a) Diprotic acid **(2)**
　　　　　b) Buffer action

(ii) Define a) Scattering of radiation **(2)**
　　　　　b) Spectroscopy

Q. 3 **(A)** (i) Define polarizability of an anion. Explain any two factors which **(5)**
favour covalent character of an ionic bond.

(ii) Draw Lewis dot structure of the following. **(3)**
a) BF_3　　b) NH_3

OR

(A) (i) What is VSEPR theory? Describe the basic ides of VSEPR **(5)**
theory given by Gillespie and Nyholm.

(ii) Explain the following with suitable examples. **(3)**
a) covalent bond　b) ionic bond

(B) (i) Balance the following equation with stepwise explanation using **(5)**
oxidation number method
$Mn^{2+} + S_2O_8^{2-} \rightarrow MnO_4^{-} + HSO_4^{-}$ (acidic medium).
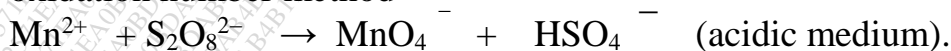
(ii) Give the applications of Latimer diagram. **(3)**

OR

(B) (i) Write the chemical equation for the redox reaction between **(5)** Ce^{4+} and Fe^{2+}. Calculate the E_{system} for the titration of 10.0 cm^3 of 0.1 M Fe^{2+} solution with
     a) 1.0 cm^3
     b) 10 cm^3
of 0.1M standard solution of Ce^{4+} in the presence of dilute sulphuric acid at 298K.
Given: [$E^0_{Pt/Fe^{3+}, Fe^{2+}} = 0.771V$, $E^0_{Pt/Ce^{4+}, Ce^{2+}} = 1.44V$]

    (ii) Write all the disproportionation reaction of Cu^+ **(3)**

(C) (i) Explain the application of VSEPR theory for predicting the **(4)** shape and F −Cl− F bond angle in ClF_3 [At No of Cl =17].
<center>**OR**</center>
(C) (i) Explain the application of VSEPR theory for predicting the **(4)** shape and F −Xe− F bond angle in XeF_2 [At No of Xe=54].

Q. 4 (A) (i) Draw the chair and boat forms of cyclohexane and explain their **(5)** stabilities.
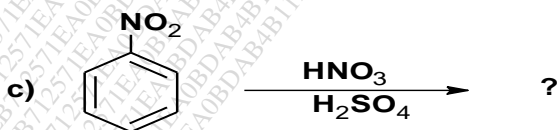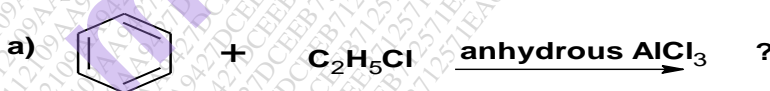   (ii) Discuss the concept of flipping of cyclohexane. **(3)**
<center>**OR**</center>
(A) (i) Explain with suitable examples Baeyer Strain theory. **(5)**
    (ii) Draw the resonating structures of Naphthalene and Anthracene. **(3)**

(B) (i) Discuss the characteristic properties of aromatic compounds. **(5)**
    (ii) Complete the following reactions. **(3)**

a) + C_2H_5Cl $\xrightarrow{\text{anhydrous } AlCl_3}$?

b) $\xrightarrow[H_2SO_4]{HNO_3}$?

c) $\xrightarrow[H_2SO_4]{HNO_3}$?

<center>**OR**</center>
(B) (i) Give the general mechanism of aromatic electrophilic **(5)** substitution.
    (ii) Explain the Van der Waals strain in cycloalkanes. **(3)**

(C) (i) Explain Hammond's postulates. **(4)**

OR

(C) (i) Classify the following groups as ortho-para (o-p) directing or meta(m) directing groups. **(4)**

a) $-NH_2$ b) $-CH_3$ c) $-COOH$ d) $-SO_3H$

Q 5   Attempt any Four of the following

(A) Derive Henderson's equation for the pOH of basic buffer. **(5)**

(B) a) Explain the term electromagnetic spectrum. **(2)**

b) Determine the Miller indices of the following planes intersecting at ∞ a: 3b: ½ c. **(3)**

(C) Find out the oxidation number of Cr in the following. **(5)**

i) $K_2 Cr_2 O_7$ ii) $K_2 CrO_4$ iii) Cr_2O_3 iv) $Cr(OH)_3$ v) $CrCl_3$

(D) Explain the role of $KMnO_4$ as an oxidizing agent with suitable example. **(5)**

(E) What is Friedel Crafts alkylation reaction? Explain its mechanism. **(5)**

(F) Explain activated aromatic rings in electrophilic substitution reaction using resonance structures. **(5)**

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