

[Time: Three Hours]

[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 statements(**Any twelve**) **(12)**

- i) pH of the solution containing 4 g of NaOH in 100 dm<sup>3</sup> of solution is \_\_\_\_ (Atomic Wt of NaOH = 40).  
 a) 41                      b) 10                      c) none of them.
- ii) The best indicator for titrating HCl with NH<sub>4</sub>OH is \_\_\_\_\_.  
 a) litmus                      b) methyl orange                      c) phenolphthalein
- iii) The pH of Human blood is \_\_\_\_\_.  
 a) 7.0                      b) 8.3                      c) 7.3
- iv) If a portion of the electromagnetic spectrum has a short wavelength it also has \_\_\_\_\_.  
 a) low energy                      b) high frequency                      c) low frequency
- v) Electromagnetic radiation contains discrete packets of energy called as \_\_\_\_\_.  
 a) photons                      b) potential energy                      c) bytes
- vi) Crystalline solids \_\_\_\_\_.  
 a) are isotropic                      b) possess sharp melting point  
 c) possess irregular geometry
- vii) Number of electrons in valence shell of beryllium in BeH<sub>2</sub> is \_\_\_\_\_.  
 a) 2                      b) 6                      c) 4
- viii) On the basis of VSEPR theory the molecular geometry of PCl<sub>5</sub> is \_\_\_\_\_.  
 a) trigonal bipyramidal                      b) octahedral                      c) linear
- ix) The Steric number for water molecule is \_\_\_\_\_.  
 a) 4                      b) 2                      c) 8

- x) The bond angle in  $\text{BeCl}_2$  is \_\_\_\_\_.  
a)  $120^\circ$                       b)  $90^\circ$                       c)  $180^\circ$
- xi) A graphical plot of potential vs pH of an aqueous electrochemical system is called as \_\_\_\_\_ diagram.  
a) Pourbaix                      b) Frost                      c) Walsh
- xii) The reducing power of halide ions is in the order \_\_\_\_\_.  
a)  $\text{I}^- > \text{Br}^- > \text{Cl}^- > \text{F}^-$                       b)  $\text{F}^- > \text{Cl}^- > \text{Br}^- > \text{I}^-$   
c)  $\text{F}^- > \text{I}^- > \text{Br}^- > \text{Cl}^-$
- xiii) Compounds having one or more benzene ring are called \_\_\_\_\_ compounds.  
a) non benzenoid                      b) benzenoid                      c) heterocyclic
- xiv) The number of  $\pi$ -electrons in Cyclopentadiene is \_\_\_\_\_.  
a) 2                      b) 4                      c) 6
- xv) Pyridine has a six membered ring containing five carbon atoms and one \_\_\_\_\_ atom.  
a) nitrogen                      b) sulphur                      c) oxygen
- xvi) Nitrobenzene on further nitration gives \_\_\_\_\_ as the predominant product.  
a) o-dinitrobenzene                      b) m-dinitrobenzene  
c) p-dinitrobenzene
- xvii) \_\_\_\_\_ group has electron releasing inductive (+I) effect.  
a)  $-\text{OH}$                       b)  $-\text{CN}$                       c)  $-\text{CHO}$
- xviii) The bond angle in planar cyclobutane is \_\_\_\_\_.  
a)  $90^\circ$                       b)  $108^\circ$                       c)  $120^\circ$

**(B)** State whether the following statements are True or False **(3)**  
**(Any Three).**

- i) pH of 0.01 M HCl is 2.
- ii) Space lattice is a random of atoms in space to form a two-dimensional structure.
- iii) The number of bond pairs in silicon tetra chloride is three.
- iv) The number of lone pairs in methane molecule is two.
- v) Cycloheptatriene is aromatic in nature.
- vi) Transannular strain is present in large ring systems.

(C)

Match the following columns (Any Five).

(5)

Column A		Column B	
(i)	Glucose	(a)	Cyclopropenyl cation
(ii)	Fluorescence	(b)	Iodimetry
(iii)	The titration in which free iodine is used	(c)	$-\text{NO}_2$
(iv)	Decrease in oxidation number	(d)	Emits light at a longer wavelength
(v)	Nonbenzenoid	(e)	Iodometry
(vi)	Deactivating group	(f)	non- electrolyte
		(g)	Emits light at a shorter wavelength
		(h)	Oxidizing agent

Q. 2

Attempt any Four of the following

- (A) Derive Henderson's equation for the pH of acidic buffer. (5)
- (B) The pH of a 0.02M solution of ammonia is 10.78. Calculate the (5)
- $\text{OH}^-$  ion concentration
  - degree of dissociation
  - dissociation constant  $K_b$
- (C) Derive the expression for ionic product of water. (5)
- (D) Calculate the frequency in wave number and energy of one photon (5)
- of radiation whose wavelength is 550nm.
- [Given  $c=3 \times 10^8 \text{ m/s}$ ;  $h=6.626 \times 10^{-34} \text{ Js}$ ]
- (E) Give differences between crystalline solid and amorphous solid. (5)
- (F) State the law of symmetry. Explain the various axis of symmetry (5)
- for a cubic crystal.

**Q. 3****Attempt any Four of the following**

- (A) Draw Lewis dot structure of the following (5)  
a)  $\text{BF}_3$     b)  $\text{NH}_4^+$
- (B) Define polarizability of an anion. Explain any two factors which favour covalent character of an ionic bond. (5)
- (C) Differentiate between ionic and covalent bond. (5)
- (D) Explain the application of VSEPR theory for predicting the shape of  $\text{SF}_6$  molecule. (5)
- (E) Balance the following equation with stepwise explanation: (5)  
 $\text{MnO}_4^{2-} + \text{H}_2\text{O} \rightarrow \text{MnO}_4^- + \text{MnO}_2 + \text{OH}^-$  (basic medium)
- (F) Explain the reaction involved in the atmospheric oxidation of ferrous ions in aqueous solution. (5)

**Q. 4****Attempt any Four of the following**

- (A) Explain Baeyer strain theory. (5)
- (B) i) Draw the various conformations of Cyclohexane (3)  
ii) What is the order of stabilities of various conformations of Cyclohexane. (2)
- (C) Explain the aromaticity of naphthalene and anthracene. (5)
- (D) What are nitrating agents? State the advantages of using nitrating mixture. (5)
- (E) Discuss the concept of antiaromaticity with suitable examples. (5)
- (F) Explain Hammond's postulate with the help of reaction energy diagram. (5)

**Q 5****Attempt any Four of the following**

- (A) What is buffer capacity? Calculate the pH of a solution when 200  $\text{cm}^3$  of 0.2M ammonium hydroxide is mixed with 300  $\text{cm}^3$  of 0.15M ammonium chloride. The dissociation constant of ammonium hydroxide is  $1.7 \times 10^{-5}$ . (5)
- (B) i) Explain the term electromagnetic spectrum. (2)  
ii) Determine the Miller indices of the following planes intersecting at  $\infty$  a: 2b:  $\frac{1}{2}$  c. (3)
- (C) i) Find the oxidation number of Cr in  $\text{Cr}_2\text{O}_7^{2-}$  and  $\text{CrO}_2\text{Cl}_2$ . (2)  
ii) Write the applications of Latimer diagrams. (3)

- (D) Explain the titration curve for the reaction between  $\text{KMnO}_4$  and  $\text{Fe(II)}$  solution. (5)
- (E) Explain the following (5)
- a) Flipping in Cyclohexane.
  - b) Pitzer strain.
- (F) Discuss the general characteristics of Aromatic compounds. (5)

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