HU-4

B. Sc. (Sem. II) (CBCS) (W.E.F. 2019)
Examination
May - 2023
Chemistry : C - 201
(New Course)

Time : $2\frac{1}{2}$ / Total Marks : **70**

Instructions :
    (1)   This question paper contains five questions and all are compulsory.
    (2)   Figures to the right indicate full marks.

1   (a)   Answer the following : 1 mark each   **4**
        (1)   Define Radius ratio
        (2)   What is Semiconductor ?
        (3)   Give one example of Hexadentate Ligand.
        (4)   Define Isomerism.

    (b)   Answer in brief : (any one of the following) 2 marks each   **2**
        (1)   Explain Schottky defect.
        (2)   Explain Hydration isomerism with example.

    (c)   Answer in detail : (any one of the following) 3 marks each   **3**
        (1)   Derive the r^+ / r^- ratio for tetrahedral structure.
        (2)   Explain Ionization isomerism with an example.

    (d)   Write a short note on any one of the following: 5 marks each **5**
        (1)   Explain Born Haber cycle in detail.
        (2)   Explain different types of ligands along with an example
            of each of them,

2   (a)   Answer the following : 1 mark each   **4**
        (1)   What is general outer electronic configuration of
            transition metal elements ?
        (2)   Write the Braggs' equation.
        (3)   Define a Unit Cell.
        (4)   What is an Amorphous Solid ?

(b) Answer in brief : (any one of the following) 2 marks each **2**
    (1) Give the names, symbols, atomic numbers and electronic configurations of the First Transition Series Elements.
    (2) Explain in short the importance of X-ray for crystal structure.

(c) Answer in detail : (any one of the following : 3 marks each **3**
    (1) Explain the reversal in energies of 3d and 4s orbitals in transition series elements.
    (2) Give the names and the structure of different types of cubic lattices.

(d) Write a short note on any one of the following : 5 marks each **5**
    (1) Explain in detail the magnetic properties of First Transition Series Elements along with the formula for calculating the magnetic moment.
    (2) Discuss the Laws of Crystallography with figures and diagrams wherever necessary.

3 (a) Answer the following : 1 mark each **4**
    (1) What are Cycloalkanes ?
    (2) Give the General formula of cycle alkanes.
    (3) The smallest cycloalkane is _____
    (4) Which conformer is most stable for n-butane ?

(b) Answer in brief : (any one of the following) 2 marks each **2**
    (1) Explain any two preparation methods for small ring cycloalkanes.
    (2) Give reasons: Why cyclopropane is more reactive than cyclohexane?

(c) Answer in detail : (any one of the following) 3 marks each **3**
    (1) Discuss any two addition reactions of cycloalkanes.
    (2) Explain different types of strains in the cycloalkanes.

(d) Write a short note on any one of the following : 5 marks each **5**
    (1) Explain conformational analysis of Ethane.
    (2) Write a short note on Bayer strain theory with limitations.

4 (a) Answer the following : 1 mark each **4**
    (1) What is a sigma complex in Organic Reaction Mechanisms?
    (2) Define annulenes.
    (3) Give examples of Meta directing groups.
    (4) Give examples of aromatic compounds.

(b) Answer in brief : (any one of the following) 2 marks each   **2**
   (1) Explain the effect of substituents on reactivity.
   (2) How many π electrons are present in Anthracene ?

(c) Answer in detail : (any one of the following) 3 marks each   **3**
   (1) Explain Huckel's rule.
   (2) Discuss the limitations of Friedel craft reactions.

(d) Write a short note on any one of the following : 5 marks each **5**
   (1) Explain Nitration of Benzene with Mechanism.
   (2) Explain Friedel craft alkylation reaction with mechanism.

5 (a) Answer the following : 1 mark each   **4**
   (1) What is the term degree of hydrolysis ?
   (2) Give the equation of relation between K_a and K_b.
   (3) NH_4Cl is salt of ____ acid and _____ base.
   (4) Give an example of a weak electrolyte.

(b) Answer in brief : (any one of the following) 2 marks each   **2**
   (1) Give an example of salt of weak acid and strong base
      and strong acid and weak base.
   (2) Explain buffer capacity.

(c) Answer in detail : (any one of the following) 3 marks each   **3**
   (1) Discuss common ion effect.
   (2) The solubility of $BaSO_4$ is 2.33×10^{-4} gm/ml at 20°C,
      calculate the solubility product of $BaSO_4$ assuming that
      the salt is completely ionized.

(d) Write a short note on any one of the following : 5 marks each **5**
   (1) Derive the equation for the pH of acidic and basic buffer
      solution.
   (2) Derive relation between K_h, K_w and K_a. Relation between
      K_h and degree of hydrolysis and pH for salt of strong
      acid and weak base.

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