

U.G. 3rd Semester Examination-2024**CHEMISTRY****[HONOURS]****Course Code : CHEM-H-CC-T-6****[CBCS]**

Full Marks : 40

Time : $2\frac{1}{2}$ Hours*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any five questions : $2 \times 5 = 10$
- a) Calculate the limiting radius ratio of a planar lattice.
 - b) Give example of the type of compounds where 3c-4e H-bond may form. Give the orbital overlap diagram.
 - c) What is titanium white? Mention some uses of it.
 - d) What do you mean by non-equivalent hybridization?
 - e) What is an intrinsic semiconductor? Give an example.
 - f) LiCl is more soluble in water than Lil-
Comment.

[Turn over]

g) What will happen when rutile is heated with carbon and chlorine at 900°C ?

h) What is Born-Haber cycle?

2. Answer any two questions: $5 \times 2 = 10$

a) i) In liquid and gas phases, all P-F lengths of PF_5 are same, while in crystals they are different.— Explain.

ii) Analyse the trend of the thermal stabilities of BeCO_3 , CaCO_3 , SrCO_3 and BaCO_3 . $3+2$

b) Differentiate between zone refining and electrolytic refining. What is meant by flux? Explain the role of different types of fluxes during metal extraction. $2+1+2$

c) i) Construct the Qualitative MO energy level and interaction diagram of CO molecule.

ii) Compare the bond orders and spin multiplicities of CO and NO, NO^- and NO^+ . $3+2$

d) Discuss the Wurtzite structure of zinc sulphide. How does it differ from zinc blend structure? Calculate the radius ratio for cubic site. $2+1+2$

3. Answer any two questions: $10 \times 2 = 20$

a) i) Construct the MO diagram of the H_2O molecule. Calculate the bond order.

ii) Analyse the formation of n-type semiconductor.

iii) What is band theory? Explain with an example. $4+3+3$

b) i) Give a flow chart diagram of the extraction of nickel from Sudbury ore indicating the chemical reactions involved in it.

ii) Describe the froth-flotation process for concentration or dressing of sulphide ores.

iii) What are the limitations of radius ratio rule. $4+3+3$

c) i) What is F centres in a lattice? Give examples of metal deficient lattice defects.

ii) Calculate the dipole moment of CH_3OH using law of parallelogram, where O-H and O-Me bond moments respectively are 1.53 and 1.16D.

- iii) Boiling points of H_2 , D_2 , T_2 respectively are 20, 23 and 25 K. Explain. 4+4+2
- d) i) Draw the MO energy level diagram of BeH_2 molecule.
- ii) Compare the bond order of CO, NO and NO^+ .
- iii) Explain the irregular tetrahedral shape of $POCl_3$ molecule with Cl-P-Cl bond angle being 103° .
- iv) PCl_5 has the shape of a trigonal bipyramid whereas IF_5 has the shape of a square pyramid. Account for this difference.
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