

U.G. 3rd Semester Examination-2020

CHEMISTRY

[HONOURS]

Course Code : CHEM-H-CC-T-06

Full Marks : 40

Time : 2½ 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 **two** questions : 1×2=2
 - a) Write the resonating structures of SCN⁻.
 - b) Write down the name and formula of principal ore of Uranium.
 - c) Define Madelung constant.
2. Answer any **four** questions: 2×4=8
 - a) Explain importance of Kapustinskii expression for determination of lattice energy.
 - b) Boron (B₂) is paramagnetic while carbon (C₂) is diamagnetic. Justify the statement.
 - c) Trimethylamine, (CH₃)₃N, is pyramidal while trisilylamin, (H₃Si)₃N, is planar– Explain.

- d) What do you mean by non-equivalent hybridization? Give example.
- e) Calculate formal charge in each atom of nitric acid.
- f) Calculate the void space in a body centered cubic lattice.

3. Answer any **two** questions: 5×2=10

- a) i) What do you mean by μ-hydrogen bonding? Give an example.
- ii) Explain the role of hydrogen bonding in biological system. 2+3=5
- b) i) Compare calcination and roasting.
- ii) Calculate the lattice energy of KCl [Given interionic separation 3.14Å, n=9, A=1.746, ε₀= 8.85×10⁻¹² C²J⁻¹m⁻¹]. 2+3=5
- c) i) Find the electron affinity of iodine with the help of following data (in kcal mol⁻¹).
 $\Delta H_f = -68.8$, $U_{NaI} = -165.4$, $\Delta H(s) (Na) = 25.9$, $IE(Na) = 118.4$, $\Delta H_{diss} (\frac{1}{2}I_2) = 51.0$
- ii) Draw the shape of PCI₃F₂ with proper explanation. 3+2=5

4. Answer any **two** questions: $10 \times 2 = 20$
- a) i) Draw the molecular orbital diagram of BeH_2 .
- ii) Predict the shape of I_3^- ion and XeF_6 molecule and mention the state of hybridization of central element.
- iii) Explain the structural differences between wurtzite and zinc blend.
- iv) Which type of crystal defect is found in FeO ? $2 + (2 \times 2) + 3 + 1 = 10$
- b) i) Mention the flow chart diagram for the extraction of nickel from its ore. Write down the chemical equations involved in it.
- ii) Determine the limiting radius ratio value for coordination number 4.
- iii) Explain conductivity of metal in terms of band theory. $4 + 2 + 4 = 10$
- c) i) Differentiate between Schottky and Frenkel defects.
- ii) Conductivity of germanium increases on addition of small amount of arsenic –explain.

iii) What do you mean by δ -molecular orbitals? Define μ -bond.

iv) Why carbon reduction is not a suitable method for extraction of Al from its ore?

$$3 + 2 + (2 + 1) + 2 = 10$$
