

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1261

F

Unique Paper Code : 2172521201

Name of the Paper : DSC: Chemical Bonding and
Elements in Biological
System

Name of the Course : B.Sc. Life Science with
Chemistry

Semester : II

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **four** questions.
3. **All** questions carry equal marks.

1. (a) Draw Born Haber cycle and calculate the lattice energy of NaCl from the following data:

Heat of sublimation of sodium = 108 kJ mol^{-1}

Dissociation energy of $\text{Cl}_2 = 243.0 \text{ kJ mol}^{-1}$

P.T.O.

Ionization energy of sodium = $495.2 \text{ kJ mol}^{-1}$

Electron affinity of chlorine = $-348.3 \text{ kJ mol}^{-1}$

Enthalpy of formation of NaCl = $-381.8 \text{ kJ mol}^{-1}$

(b) Explain:

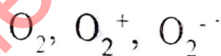
(i) Why H_2 is known while He_2 is not?

(ii) Why is the bond angle of H-O-H in water 104.5° while the bond angle of H-N-H in ammonia is 107° ?

(c) Write the toxic effects of Hg (II). Give the reasons for its toxicity. How can it be treated? (5,5,5)

2. (a) Write down the main postulates of VSEPR theory.

(b) Discuss the stability order and magnetic behaviour of the following species:



(c) (i) Calculate the % ionic character for HCl molecule when the electronegativities of H and Cl are 2.2 and 3.16, respectively.

(ii) Discuss the importance of Zinc in the human body. (5,5,5)

3. (a) Draw the MO energy level diagram of NO. Calculate its bond order and discuss the stability of NO and NO⁺.
- (b) What is hydrogen bonding? Explain with examples how it affects the melting point/boiling points of compounds.
- (c) Discuss the working of the sodium-potassium pump. How is it important for a cell? (5,5,5)
4. (a) Predict which of the following molecules have net dipole moment:
- (i) CHCl₃
 - (ii) BeCl₂
 - (iii) NF₃
 - (iv) CO₂
- (b) Write short note on:
- (i) Resonance
 - (ii) s-p mixing in molecular Orbitals
- (c) What do you understand by essential and non-essential metal ions in the bio-system? Draw the Dose-response curve for essential elements and non-essential metal ions in a human body.(5,5,5)

P.T.O.

5. (a) Define Lattice energy and solvation energy. What is the role of these terms in deciding the solubility of ionic solids?—

(b) Explain the following:

(i) All three N-O bond lengths in NO_3^- (nitrate ion) are equal.

(ii) PCl_5 is more reactive than SF_6 .

(c) Discuss the role of magnesium in chlorophyll & in energy production? (5,5,5)

6. (a) Explain Fajan's Rules and on the basis of these rules compare the covalent character in the following salts

(i) NaCl and CuCl

(ii) AgI and AgCl .

(b) Discuss the geometry, hybridization and shape of the following molecules/ions on the basis of VSEPR theory:



(c) Describe the role of iron metal ion along with its impact in case of excess and deficiency of it in the human body? (5,5,5)

(1000)