Unique Paper Code	: 42171103
Name of the Paper	: Atomic Structure Bonding, General Organic Chemistry and Aliphatic Hydrocarbons
Name of the Course	: **B.Sc. (Programme)**
Semester	: I

Duration : 3 hours **Maximum marks: 75**

(Write your Roll No. on the top immediately on receipt of this question paper)

Attempt SECTION A and SECTION B on different answer sheets

Questions1 & 4 carry19 marks each and questions 2,3,5 and 6 carry18.5 marks each.

SECTION A
(INORGANIC CHEMISTRY)
Attempt ANY TWO questions

1.

(a) Prepare a MO energy level diagram for the CN^- ions and use sketches to show clearly how the AOs interact to form MOs.
(b) Which of the following molecule is polar or non-polar and give the shapes and structural formulae of the following molecules.
(i) BCl_3 (ii) H_3O^+ (iii) PCl_3 (iv) SF_6 (v) XeF_4
(c) Why do we need transfer the Cartesian coordinates (*x, y, z*) to Spherical polar coordinate (r, θ, ϕ)
(d) Write time independent Schrodinger equation in three dimensional systems and explain various terms involved. (5,5,5,4)
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2. (a) If you wish to locate an electron in an atom within a distance of 0.1Å. What is the uncertainty involved in the measurement of its velocity?
(b) (i)$SnCl_4$ is more covalent than $SnCl_2$ Explain.
(ii)Why NaCl is soluble in water whereas AgCl and CuCl are insoluble.
(c) (i)Write electron configurations of Cr and Ti and Explain:
(ii)Define the terms resonance and Draw resonating structure of CO_3^{2-} and N_3^-.
(d) Predict the molecular hybridization and geometry for the follow molecules SO_4^{2-}, IF_2^-, H_3O^+ and XeO_2F_4 using VSEPR theory? (5,5,3.5,5)

3. (a) Calculate the lattice energy of Cesium Chloride using following data: $\Delta H_S = +79.9$ kJ mol^{-1} ,$\Delta H_{I.E} = +374.05$ kJ mol^{-1} , $\Delta H_A = +241.84$ kJ mol^{-1} ,$\Delta H_{EA} = -397.90$ kJ mol^{-1}

$\Delta H = -623.00$ kJ mol^{-1}

(b) Write short notes on the following:

i) Find the possible values for the l and m_l quantum numbers for a 4s electrons and 5d electron.

ii) Show that e^{ikx} is an eigenfunction of the operator $\frac{d}{dx}$. What is the eigenvalue?

(c) Give a short answer for the following

i) sketch the shape of the orbital for $4d(x^2-y^2)$

ii) Sketch the radial probability function $a_0 r^2 R^2$ for $4d_{xy}$ and $3p_z$ orbital

iii) Calculate the first excited state energy of $^3_1$H ion?

(d)Write the limitation of VSEPR, VBT and MO theories. (5,5,5,3.5)