(This question paper contains 3 printed pages.)

Unique Paper Code: 32175901

Name of the Paper: GE-1: Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons

Name of the Course: General Elective: Chemistry for Honours Course

Semester: I/ III

Duration: 1.5 hours

Maximum Marks: 37.5

Instructions for Candidates

- 1. Attempt any TWO questions from Section A
- 2. All questions carry 18.75 marks each.
- 3. Attempt all parts of a question together.
- 4. Upload Section A and Section B separately.

SECTION A

1)

- a) Explain the following on the basis of molecular orbital theory:
 - i) Magnetic character of O_2^{1-} ion
 - ii) Monoatomic nature of Helium
 - iii) Bond order of N_2 molecule
- b) i) The radial probability distribution curve obtains for an orbital wave function (Ψ) has 3 peaks and 2 radial nodes. The valence electron of which one of the following metals does this wave function correspond to Cu, Li, K, Na.
 ii) Am 5a and 2d mb ab all and a construction of the following metals does this wave function correspondes to Cu, Li, K, Na.
 - ii) Are 5g and 3d sub-shell permissible? Give reasons.
- c) i) Define resonance energy, and draw the possible resonance structures for azide ion. ii) The dipole moment of HI molecule is 0.384 Debye and bond distance is 1.60. Calculate the % ionic character of the HI molecule (Electronic charge = 1.602×10^{-19} C)

[6.75,6,6]

- 2)
- a) Explain the following:

- i) In SF₆, all the S-F bonds are equal while in PF₅ all the P-F bonds are not equal.
- ii) BeF₂ is linear but SF₂ is angular although both are triatomic.
- b) i) Why S orbital are spherical in nature. Draw the structure of p-orbitals.ii) Dipole moment of NH₃ is higher than NF₃.
- c) i) Write time independent Schrodinger Wave equation for Hydrogen atom and explain all the terms involved in it.

ii) Write Born Lande equation and explain all the terms involved in it.

[6.75,6,6]

3)

- a) i) Using MOT, explain why N₂ has greater dissociation energy than N₂⁺, whereas O₂ has lower dissociation energy than O_2^+ .
 - ii) How many electrons in an atom can have the following set of quantum numbers? n = 3, l = 0 & n = 3, l = 2, s = +1/2
- b) On the basis of VSEPR theory, explain the shape and geometry of following:
 i) ClO₃⁻
 ii) X₂E
 - ii) XeF4
- c) i) Write the electronic configuration for Cu, Cu^+ , Cu^{2+} and show which oxidation state is more stable and why?

ii) The mass of an electron is 9.1 X 10^{-31} Kg. If its kinetic energy is 3.0 X 10^{-25} J, calculate the wavelength.

[6.75,6,6]