Exam. Code : 103201
Subject Code : 1267

B.A./B.Sc. Ist Semester

CHEMISTRY

(Inorganic Chemistry-A)

Time Allowed—Three Hours] [Maximum Marks—35

Note :—Attempt any **FIVE** questions, selecting at least **ONE** question from each section. Each question carries **7** marks.

SECTION—A

1. (a) Give electronic configuration of Fe^{2+} and Al^{3+}. 1

   (b) State Heisenberg's uncertainty principle and Hund's rule of maximum multiplicity. 2

   (c) Explain the significance of principal quantum number, angular momentum number, magnetic quantum number, electron spin and magnetic spin quantum number. 4

2. (a) Calculate the kinetic energy of moving electron which has a wavelength of 4.5 pm [Given : Mass of electron = 9.1×10^{-31} kg; h = 6.63×10^{-34} kg m^2s^{-1}]. 2.5

(b) Give reasons for the following :

(i) 4s orbital has less energy than 3d-orbital

(ii) Half-filled and fully-filled orbitals are extra stable

(iii) 1s orbital is spherically symmetrical. 4.5

SECTION—B

3. (a) Out of N and O, which has higher electronegativity and why ? 2

(b) What is electron affinity ? Discuss various factors which affect electron affinity and also give its variation in a period and in a group in periodic table. 5

4. (a) Arrange the hydrogen halides in decreasing order of their ionic character : HBr, HCl, HI, HF.

Also give suitable explanation in support of your answer. 2

(b) What is electronegativity ? Discuss Pauling Scale and Mulliken concept of electronegativity. 5

SECTION—C

5. (a) Discuss the points of differences between valence bond theory and molecular orbital theory of covalent bonding. 3

(b) Draw molecular orbital energy level diagram of CO. Also calculate its bond order. 4

6. (a) Discuss the shapes of CO_3^{2-} and PF_6^- on the basis of hybridization. 4

(b) Give reasons for the following :

(i) NO^+ has shorter bond length than NO, even though later has extra electron.

(ii) Both CH_4 and H_2O have tetrahedral geometry but their bond angles are different. 3

SECTION—D

7. (a) Discuss the radius-ratio rule for prediction of structure of ionic crystals. 3

(b) What is Born-Haber cycle ? How is it used to calculate the lattice energy of NaCl ? 4

8. (a) Melting point of NaCl is higher than that of $AlCl_3$. Give suitable reason. 1

(b) What is the coordination number of Ca^{2+} and F^- ions in calcium fluoride structure ? 1

(c) What are Fajan's rules ? How do they help in deciding the covalent character in a bond ? 5