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B.Sc. (Hons.) Chemistry (Semester – 1st)
INORGANIC CHEMISTRY-I
SUBJECT CODE: BCHMS1-101
Paper ID: [19131601]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a. Define Aufbau principle? Give example?

b. The electronic configuration of some neutral atoms is given below:
(i) $1s^2\ 2s^2p^6\ 3s^2$ (ii) $1s^2\ 2s^2p^6\ 3s^1$ (iii) $1s^2\ 2s^2\ 2p^5$ (iv) $1s^2\ 2s^2p^4$
Which of these will have the lowest ionisation energy?

c. Discuss the significance of Ψ and Ψ^2?

d. Write the electronic configuration of diatomic molecules having bond order two and three?

e. Differentiate between valence bond theory and molecular orbital theory?

f. What do you understand by hybridisation? Explain giving examples?

g. What is the difference between co-ordinate bond and covalent bond?

h. Explain with the help of Fazan's rule which one is more covalent LiCl or KCl? Why?

i. Which of the following configuration is correct for the copper atom: $[Ar]3d^{10}\ 4s^1$ or $[Ar]3d^9\ 4s^2$? Give reason?

j. Is B_2 molecule paramagnetic or diamagnetic? Discuss.

Section – B **(5 marks each)**

Q2. Explain on the basis of MO theory as to why-
(i) Oxygen molecule is paramagnetic while nitrogen molecule is diamagnetic?
(ii) Hydrogen forms diatomic molecule while helium remains monoatomic?

Q3. (a) Draw and explain the various term involved in Born-Haber cycle for the formation of NaCl?
(b) Write a short note on Dipole-dipole forces and London dispersion forces?

Q4. Define the following and explain their trends in a period and in a group:
(i) Electron affinity (ii) Electronegativity (iii) Atomic radius (iv) Ionisation energy

Q5. What are quantum numbers? Discuss all the quantum numbers in detail?

Q6. Discuss in detail the band model of metallic bond? What type of energy bands are obtained in?
(i) sodium metal (ii) an insulator (iii) a semi-conductor

Section – C **(10 marks each)**

Q7. (a) What do you understand by Heisenberg's uncertainty principle and concept of probability? Explain that the concept of probability follows from Heisenberg's uncertainty principle? (7)

(b) Discuss the basis of Hund's rule? (3)

Q8. (a) With the help of molecular orbital diagrams explain why-

(i) The bond order in N^{2+} ion is less than in N^2 molecule whereas the bond order in O^{2+} is greater than that in O^2 molecule.

(ii) The bond length of CO^+ is larger than that of CO. (7)

(b) Bond angle of NH_3 is greater than NF_3. Why? (3)

Q9. What is meant by screening effect? Describe Slater's rules? How are these rules useful in determining the effective nuclear charge for any electron in an atom? What are the limitations of these rules?