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SARDAR PATEL UNIVERSITY
F.Y. B.Sc.
SEMESTER-I EXAMINATION
Inorganic Chemistry (US01CCHE02)
Date: 23/11/2010, Tuesday
Time: 11:30 a.m. to 1:30 p.m.

INSTRUCTION: Answers of all the questions (including multiple choice questions) should be written in the provided answer book only.

Q1 Attempt the following:

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- i. Which one of the following elements has highest electron affinity?
(a) Ne (b) Cl (c) K (d) F
- ii. Which wave function describes the shape of an orbital?
(a) Radial wave function (b) Angular wave function (c) Cartesian wave function (d) Schrodinger wave function
- iii. How does the value of Z_{eff} change on moving down a group in the periodic table?
(a) Increases (b) Remains constant (c) Decreases (d) none
- iv. Which of the following bonds will be most polar?
(a) Na-F (b) O-F (c) C-F (d) H-H
- v. What is the percentage s character in sp^2 hybridization?
(a) 25 (b) 33.33 (c) 50 (d) 100
- vi. What is the basis of modern periodic table?
(a) Ionization energy (b) Atomic number (c) Atomic Weight (d) Electronegativity
- vii. How many lone pairs are present on the oxygen atom of a water molecule?
(a) 0 (b) 1 (c) 2 (d) 3
- viii. What is the geometric arrangement of sp^2 hybrid orbitals?
(a) Octahedral (b) Tetrahedral (c) Trigonal bipyramidal (d) Triangular
- ix. What is the value of bond order in He_2 molecule?
(a) 0 (b) 1 (c) 2 (d) 3
- x. Which type of combination of orbitals takes place in H_2 molecule?
(a) s-s (b) p-p (c) s-p (d) p-d

Q2 Attempt any ten

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- i. State the De Broglie's hypothesis and derive De Broglie's equation.
- ii. Write the mathematical expression for Hamiltonian Operator.
- iii. Define: Effective nuclear charge and Shielding effect.
- iv. "CsOH is basic while IOH is acidic": Explain.
- v. "Successive ionization energy is always greater than preceding ones": Explain.
- vi. Why does nitrogen have higher ionization energy than that of oxygen?
- vii. State and explain the octet rule in brief.
- viii. What are isoelectronic species? Give suitable example.
- ix. Explain the hybridization involved in BeF_2 molecule.
- x. List the conditions for atomic orbitals to form molecular orbitals.
- xi. Calculate the bond order in H_2 molecule and H_2^+ ion.
- xii. Discuss the s-s linear combination of orbitals.

- Q3 Attempt the following:**
- (a) Derive Schrodinger equation for a wave travelling in one dimension. [05]
 - (b) Explain the factors affecting shielding constant and effective nuclear charge along with their variations in the periodic table. [05]

OR

- Q3 Attempt the following:**
- (a) Derive the relation between Cartesian coordinate and spherical polar coordinates. [05]
 - (b) A cricket ball weighing 100 gm is to be located to within 0.1 \AA^0 . What is the uncertainty in its velocity? Does the cricket ball obey uncertainty principle? Why? (Given: $h = 6.626 \times 10^{-34} \text{ J.sec.}$) [05]

- Q4 Attempt the following:**
- (a) Describe Allred – Rochow's and Mulliken's method for calculation of electronegativity. [05]
 - (b) State and explain the factors affecting ionization energy. [05]

OR

- Q4 Attempt the following.**
- (a) Discuss the factors affecting electronegativity. [05]
 - (b) Discuss the variations in the value of electron affinity in the main group elements of the periodic table. [05]

- Q5 Attempt the following:**
- (a) Using VSEPR theory, predict the geometry of ammonia and water molecules. [05]
 - (b) ' ClF_3 has a bent T shape while I_3^- is linear' : Explain. [05]

OR

- Q5 Attempt the following:**
- (a) What is hybridization? Describe the hybridization of atomic orbitals in CH_4 . [05]
 - (b) Give an account of Sidgwick-Powell theory. [05]

- Q6 Attempt the following:**
- (a) Giving MO diagram, discuss the bond order and magnetic properties of N_2 molecule. [05]
 - (b) Discuss the s-p and p-p combination of atomic orbitals. [05]

OR

- Q6 Attempt the following:**
- (a) Explain the O-O bond order in O_2 , O_2^- and O_2^{2-} on the basis of Molecular orbital theory. [05]
 - (b) Give an account of LCAO method. [05]

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