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SARDAR PATEL UNIVERSITY
B.Sc. Semester-1 Examination
US01CCHE02- Inorganic Chemistry

Date: 27th November, 2013 **Time:** 2:30 pm to 4:30 pm
Day: Wednesday **Total Marks:** 70

Q.1 Answer the following Multiple Choice Questions. **(10)**

(1) Electrons residing between the nucleus and outer most shell are called:
(a) intervening electron (b) valence shell electron
(c) excited electron (d) outer most shell electron

(2) What is the value of shielding constant for 1s electron in oxygen?
(a) 0.35 (b) 0.85 (c) 0.30 (d) 1.0

(3) Hamiltonian operator ($\hat{H}$)do not contain..... energy part.
(a) rotational (b) potential (c) kinetic (d) none of these

(4) What is the percentage of *p* character in sp^3 hybridized orbital?
(a) 25% (b) 33.33% (c) 50% (d) 75%

(5) Which elements are not accommodate in the main body of the periodic table?
(a) Transition (b) Inner transition (c) Metallic (d) only Lanthanides

(6) Which repulsion between electron-pairs is strongest one?
(a) lone pair-bond pair (b) lone pair-lone pair
(c) bond pair-bond pair (d) lone pair & atom

(7) Which pair follows isoelectronic principle?
(a) BF_4^- & CH_4 (b) BF_4^- & NH_4^+ (c) NO_3^- & NO_2^+ (d) none of these

(8) What is the geometrical arrangement of sp^3 hybridization?
(a) linear (b) trigonal (c) trigonal planar (d) tetrahedral

(9) A π-bond is formed by the overlap of:
(a) *s-s* orbital (b) *s-p* orbital
(c) *p-p* overlap sidewise manner (d) *P-P* overlap end-to-end fashion

(10) ..... molecular species has unpaired electron.
(a) N_2 (b) F_2 (c) O_2^- (d) O_2^{-2}

Q.2 Answer the following short questions. (Any Ten) **(20)**

(i) Define electro-negativity and shielding effect.
(ii) Write the mathematical expression for Hamiltonian operator.
(iii) Give the details obtained from the plots of $R_{n,l} \rightarrow r$.
(iv) Ionization energy of B (Z=5) is lower than that of Be (Z=4). Explain.
(v) Explain the term `electron affinity.'
(vi) List the factor affecting the magnitude of electro negativity.
(vii) What are isoelectronic species?
(viii) Why any hybrid orbital can form strong bond than atomic orbital?
(ix) Give the shape of CH_4, CO_3^{-2}, N_3^- and PCl_5.
(x) Explain: *s-s* linear combination of atomic orbital.
(xi) Be_2 does not exist. Explain.
(xii) Give the note for linear combination of atomic orbital.

(P.T.O)

Q.3 Answer the following. **(10)**

(A) Derive de-Broglie's wave equation. Discuss its significance.

(B) Explain the factors affecting shielding constant and effective nuclear charge.

OR

Q.3 Answer the following. **(10)**

(A) Derive the relation between Cartesian co-ordinates and spherical polar co-ordinates.

(B) Calculate σ and Z_{eff} for 3*d* electron in Mn (Z=25) and Cu (Z=29).

Q.4 Answer the following. **(10)**

(A) Define electron affinity. Discuss the factors affecting the magnitude of electron affinity.

(B) Explain variation of Ionization energy in III-A group.

OR

Q.4 Answer the following. **(10)**

(A) Give the merits of long form of periodic table.

(B) Calculate the electro-negativity of lead (Pb) following Allred-Rochow method. (Given Covalent radius of Pb=1.53 A^0 and atomic number of Pb=82.)

Q.5 Answer the following. **(10)**

(A) Explain octet rule in detail with suitable illustration and exception.

(B) The shape of molecule is distorted in presence of lone pair and by difference in electro-negativity. Explain.

OR

Q.5 Answer the following. **(10)**

(A) Define hybridization. Discuss the *sp* hybridization in BeF_2 molecule.

(B) Chlorine trifluoride(ClF_3) has distorted trigonal bipyramidal shape while triiodide ion(I_3^-) has linear shape. Explain by VSEPR theory.

Q.6 O_2 molecule is paramagnetic where as O_2^{-2}(peroxide ion) is diamagnetic. Explain giving diagram on the basis of molecular orbital theory. **(10)**

OR

Q.6 Describe molecular orbital treatment of B_2 molecule and F_2 molecule. **(10)**

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