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Eng.

Sardar Patel University  
B.Sc. First Semester Examination  
US01CCHE02 - Inorganic Chemistry  
NOVEMBER 2016

No. of Printed Pages: 2

Date: 21-11-2016

Time: 10.00 A.M TO 12.00 P.M

Total Marks: 70

**Q.1 MULTIPLE CHOICE QUESTION:**

[10]

- (1) The position of which element in modern periodic table is still a matter of dispute?  
(a) He (b) H (c) Li (d) C
- (2) What is the percentage of p character in  $sp^3$  hybridized orbital?  
(a) 25% (b) 33.33% (c) 50% (d) 75%
- (3) Which molecule does not follow the octet rule?  
(a)  $Cl_2$  (b)  $BF_3$  (c) HF (d)  $NH_3$
- (4) The structure of  $SF_6$  molecule is  
(a) Square planar (c) Tetrahedral (b) linear (d) Octahedral
- (5) Which elements are not accommodated in the main body of the periodic table?  
(a) Transition (b) Inner transition (c) Metallic (d) only Lanthanides
- (6) What is the basis of modern periodic table?  
(a) Ionization energy (b) Atomic number  
(c) Atomic weight (d) electro negativity
- (7) Which of the following orbital possesses spherical symmetry?  
(a) 5f (b) 4p (c) 3d (d) 3s
- (8) Hamiltonian operator (H) do not contain ..... energy part.  
(a) Rotational (b) Potential (c) Kinetic (d) None of these
- (9) What is the bond order of  $C_2$  molecule?  
(a) 1 (b) 2 (c) 3 (d) 1.5
- (10) The bond angle of N-H-N bond in  $NH_3$  is \_\_\_\_  
(a)  $104^\circ.27'$  (b)  $107^\circ.48'$  (c)  $180^\circ$  (d)  $90^\circ$

**Q-2 ANSWER THE FOLLOWING SHORT QUESTION (ANY TEN)**

[20]

- (1) State and give mathematical expression of Heisenberg's uncertainty principle.
- (2) Write the mathematical expression for Hamiltonian operator.
- (3) What is Mendeleef's periodic law?
- (4) What is octet rule?
- (5) Define stabilization energy?
- (6) Define electro-negativity and shielding effect
- (7) List the factors affecting the magnitude of electro negativity.
- (8) Give the shape of  $H_2O$  and  $PCl_5$  molecules.
- (9) What are isoelectronic species
- (10) Define bond order.
- (11) Why  $B_2$  molecule is paramagnetic?
- (12) What are bonding molecular orbital?

**Q-3** Derive the three dimensional Schrodinger's wave equation. Give significance of  $\psi$  and  $\psi^2$ . [10]

**OR**

**Q-3** Discuss Slater's rule for the calculation of shielding constant ( $\sigma$ ). Calculate  $\sigma$  and  $Z_{\text{eff}}$  for 3d electron in Mn ( $Z=25$ ) and Cu ( $Z=29$ ) [10]

**Q-4 ATTEMPT THE FOLLOWING**

- (a) Discuss the factors affecting the magnitude of electro negativity. [5]
- (b) Discuss the variation of electro negativity in a group for s- & p- block elements. [5]

**OR**

**Q-4 ATTEMPT THE FOLLOWING**

- (a) Define ionization energy. Discuss the factors affecting the magnitude of ionization energy. [5]
- (b) Define electron affinity. Discuss the factors affecting the magnitude of electron affinity. [5]

**Q-5 ATTEMPT THE FOLLOWING**

- (a) Discuss the Sidgwick-Powell theory to explain shape molecule.. [5]
- (b) Chlorine trifluoride ( $\text{ClF}_3$ ) has distorted trigonal bipyramidal shape while  $\text{I}_3^-$  (triiodide ion) has linear shape. Explain by VSEPR theory. [5]

**OR**

**Q-5 ATTEMPT THE FOLLOWING**

- (a) Define hybridization. Discuss the sp hybridization in  $\text{BeF}_2$  molecule. [5]
- (b) Discuss valence bond theory giving suitable example. [5]

**Q-6 ATTEMPT THE FOLLOWING**

- (a) Describe LCAO method to obtain wave function of molecular orbital. [5]
- (b)  $\text{O}_2$  molecule is paramagnetic, explain on the basis of MO theory. [5]

**OR**

**Q-6 ATTEMPT THE FOLLOWING**

- (a) Describe molecular orbital treatment of  $\text{C}_2$  molecule. [5]
- (b) P-P combination of orbital yields two different types of molecular orbitals, Explain. [5]

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