[83/A29 Eng]

SEAT No._____

No. of printed pages: 3

SARDAR PATEL UNIVERSITY

B. Sc. Examination (First semester)

Monday, 13th November-2017

2.00 pm to 4.00 pm

US01CCHE02 (Inorganic Chemistry)

Total Marks: 70

Q-1 Choose the most appropriate option for each of the following. **[10]**

(i) Which one is the mathematical expression for Heisenberg's uncertainty principle?
(a) $Ve = 1/2mv^2$ (b) $\lambda = h/mv$
(c) $\Delta x \cdot \Delta p \geq h/4\pi$ (d) $\Delta\lambda = h/mc\ (1-\cos\theta)$

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

(iii) The electron affinity of _____ elements is either close to zero or slightly –ve.
(a) Alkali metals (b) Alkaline earth (c) Halogen (d) Nobel gases

(iv) sp^3 hybridization orbital has _____ % s-character.
(a) 75 (b) 50 (c) 25 (d) 0

(v) How many series of transition elements are there in periodic table?
(a) three (b) two (c) five (d) four

(vi) Which is the geometrical arrangement of sp^2 hybrid orbital?
(a) linear (b) tetrahedral
(c) trigonal planar (d) trigonal bipyramid

(vii) The structure of I_3^- ion is _____ .
(a) square planar (b) linear (c) tetrahedral (d) octahedral

(viii) Which pair follows isoelectronic principle?
(a) BF_4^- & CH_4 (b) NO_3^- & NO_2^+ (c) CO_2 & SO_3 (d) none

(ix) The value of bond order in H_2^+ ion is
(a) 0.5 (b) 1.0 (c) 2.0 (d) 1.5

(x) According to MO theory number of electrons in antibonding orbital of O_2 is _____.
(a) 2 (b) 4 (c) 6 (d) 0

P.T.O.

Q-2 Attempt any ten questions of following. **[20]**

(i) Give the three dimensional Schrodinger wave equation and also give the terms involved in it.

(ii) Give the equations used to convert the Cartesian coordinates in to spherical polar coordinates.

(iii) Define: Intervening electrons and Shielding effect.

(iv) Define ionization energy and electron affinity.

(v) Electron affinity values of N and P are very low, explain.

(vi) On the basis of Hannay and Smith equation calculate the percentage ionic character in gaseous HF and HCl molecules. [Given: $\chi_H = 2.1$, $\chi_F = 4.0$, $\chi_{Cl} = 3.2$]

(vii) State and explain octate rule.

(viii) State the general rule for trigonal bipyramid structure.

(ix) All bond angles in XeF_4 are 90° even though there are two lone pairs around Xe atom in XeF_4 molecule, explain.

(x) Why He_2 does not exist?

(xi) Why O_2 molecule is paramagnetic?

(xii) Which type of combonation of atomic orbitals produces σ-molecular orbitals?

Q-3 Attempt the following.

(a) Derive de-Broglie's wave equation and give the significance of it. **[05]**

(b) Calculate the uncertainty in the velocity of N_2 molecule which is to be located within 0.05 Å. (Atomic weight of N = 14.0 gm/mole, $N_A = 6.023 \times 10^{23}$ molecules/mole, H = 6.626×10^{-34} J.Sec). **[05]**

OR

Q-3 Attempt the following.

(a) Give the value of angular wave function $\Theta_{l,m} \times \Phi_m$ for p-orbitals and also deduce their shape from these value. **[05]**

[Given:– $\Theta_{1,0} = \sqrt{\frac{3}{2}}\cos\theta$; $\Theta_{1,\pm1} = \sqrt{\frac{3}{4}}\sin\theta$; $\Phi_0 = \frac{1}{\sqrt{2\pi}}$ and $\Phi_{\pm1} = \frac{1}{\sqrt{2\pi}}(\cos\phi \pm i\sin\phi)$]

(b) Discuss the factors affecting the magnitude of σ and Z_{eff} and their variation in periodic table. **[05]**

Q-4 Attempt the following.

(a) Discuss the merits of the long form of periodic table. **[05]**

(b) Calculate the electronegativity of carbon atom from the data given as E_{H-H} = 104.2 Kcal/mole, E_{C-C} = 83.1 Kcal/mole, E_{C-H} = 98.8 Kcal/mole and χ_H = 2.1 **[05]**

OR

Q-4 Attempt the following.

(a) Discuss the variation of ionization energy values of elements of III-A group. **[05]**

(b) CsOH is basic while IOH is acidic, explain. **[05]**

Q-5 Write a note on VSEPR theory and Discuss the structure of PCl_5 and SF_6 molecules with the help of VSEPR theory. **[10]**

OR

Q-5 Write a note on valence bond theory. Describe the hybridization of atomic orbital of carbon in CH_4. **[10]**

Q-6 Attempt the following.

(a) p-p combination of orbitals yields two different type of molecular orbitals. Explain. **[05]**

(b) Describe molecular orbital treatment of N_2 molecule. **[05]**

OR

Q-6 Attempt the following.

(a) Describe LCAO method to obtain wave function of molecular orbital. **[05]**

(b) Describe molecular orbital treatment of F_2 molecule. **[05]**

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