

Seat No. _____

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[121/A20]
Eng

SARDAR PATEL UNIVERSITY

B. Sc. - Ist - Semester Examination

Saturday, 27th October - 2018

02:00 P.M. To 04:00 P.M.

US01CCHE02 - Inorganic Chemistry

Note: (1) All the questions are compulsory

Total marks: 70

(2) Figures to right indicate full marks.

Q : 1 Give the most correct choice to the following multiple choice questions. (10)

- _____ wave function decides the shape of the atomic orbital.
(a) Angular (b) Eigen (c) Radial (d) Angular & radial
- _____ is not one of the relation between Cartesian coordinate and polar coordinates.
(a) $r \sin\theta \cos\phi$ (b) $r \sin\theta$ (c) $r \cos\theta$ (d) $r \sin\theta \sin\phi$
- How many intervening electrons are there for the 4s electron of Cu(Z=29) -atom?
(a) 27 (b) 29 (c) 28 (d) 26
- Amongst IIIrd A group elements, _____ has very little tendency to form M³⁺ ion.
(a) thallium (b) indium (c) aluminum (d) boron
- sp²- hybrid orbital has _____% s - character.
(a) 33.33 (b) 25 (c) 50 (d) 66.66
- How many lone pair(s) are there on nitrogen atom of ammonia molecule?
(a) Zero (b) One (c) Three (d) Two
- Gaseous PCl₅ molecule has _____ geometry.
(a) square planar (b) tetragonal pyramid (c) trigonal bipyramid (d) octahedral
- Each molecular orbital is defined by four quantum numbers represented as _____.
(a) n, l, m, s (b) n, l, λ , s (c) n, l, δ , s (d) none of these
- Antibonding molecular orbitals are formed by
(a) subtraction of atomic orbitals (b) addition of atomic orbitals
(c) multiplication of atomic orbitals (d) combination of atomic orbitals
- Which one of the following is not diamagnetic?
(a) C₂ molecule (b) O₂ molecule (c) N₂ molecule (d) O₂²⁻ molecular ion

Q : 2 Attempt any ten short answer type questions of the following. (20)

- Draw the graphs of $R_{n,l} \rightarrow r$ for 1s, 2s and 3s orbitals.
- Define:- (a) Intervening electrons (b) Probability function 'D'.
- Calculate Z_{eff} experienced by an electron residing in K shell of N (Z=7) atom.
- "Successive ionization energy is always greater than preceding one." Explain.
- Define the terms :- (a) Periodic table (b) Electron affinity
- List the factors affecting the magnitude of electro negativity.

(1)

(CPTO)

- vii. Carbon can form maximum two covalent bonds in its ground state. Explain.
- viii. Which compounds violate the octet rule? How?
- ix. State the general rule for trigonal bipyramid structure giving suitable example.
- x. Explain $s-p$ linear combination of atomic orbitals.
- xi. List the essential conditions for atomic orbitals to form molecular orbitals.
- xii. Define stabilization energy and calculate stabilization energy for He_2 molecule.

Q : 3 [a] Derive de-Broglie's matter-wave equation and give its physical significance. [5]

[b] Calculate σ and Z_{eff} for 4s electron in :- (i) Mn ($Z=25$) (ii) Cu ($Z=29$) [5]

OR

Q : 3[a] Discuss the factors affecting the magnitude of shielding constant and effective nuclear charge. [5]

[b] Calculate the de-Broglie's wave length of carbon dioxide molecule moving with a velocity of 1.2×10^6 cm/sec at 300 K temp. [Given: Atomic weight: C=12 g/mole, O=16 g/mole and $h=6.626 \times 10^{-34}$ J. second] [5]

Q : 4[a] What is modern periodic law? The long form of periodic table is more superior than Mendeleef's periodic table. Explain. [5]

[b] Discuss the factors affecting the magnitude of ionization energy. [5]

OR

Q : 4[a] "CsOH is basic, where as IOH is acidic." Explain. [5]

[b] On the basis of Hanny and Smith's equation, calculate the % age ionic character of (i) H-F (ii) H-I covalent bonds. [Given:- $\chi_{\text{F}}=4.0$, $\chi_{\text{H}}=2.2$ and $\chi_{\text{I}}=2.7$] [5]

Q : 5 Describe the valence bond theory giving suitable examples and explain sp^2 - hybridization in BF_3 molecule. [10]

OR

Q : 5 Discuss the structure of NH_3 and gaseous PCl_5 molecules on the basis of VSEPR - theory and explain 'octet rule' in detail with suitable example. [10]

Q : 6[a] Describe LCAO - method to obtain wave function of molecular orbitals. [5]

[b] Oxygen molecule is paramagnetic. Explain on the basis of MOT. [5]

OR

Q : 6[a] Write note on π - bonding. [5]

[b] " $p-p$ combination of atomic orbitals yields two different type of molecular orbitals." Explain. [5]

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