

CHEMISTRY PAPER-I

(Inorganic Chemistry-A)

Time Allowed : Three Hours

Maximum Marks : 45

Note- (i) Attempt five questions in all, selecting one question from each Unit.

(ii) Unit-V is compulsory.

UNIT-I

1. (a) Write Schrodinger Wave Equation in terms of spherical polar co-ordinates. How spherical polar co-ordinates are related to Cartesian co-ordinates ?
 - (b) What do you mean by Radial Probability Distribution ? Draw RPDC for (i) $n = 3, l = 0$ (ii) $n = 3, l = 1$.
 - (c) (i) How many Nodal Planes are present in $3d_{x^2-y^2}$ and $3p_z$ orbital ?
 - (ii) Is set of quantum numbers possible or not ? $n = 4, l = 3, m = -3, s = 0$.
 - (iii) Why s-orbital is spherically symmetrical ?
2. (a) How many orientations are possible for p and f-orbitals ?
 - (b) Explain Radial Wave functions and Angular Wave function.
 - (c) Write Schrodinger Wave Equation in terms of Cartesian co-ordinates.
 - (d) Write the name of element and its electronic configuration having atomic number 29.
 - (e) Write relations of de-Broglie equation and Heisenberg Uncertainty Principle.

UNIT-II

3. (a) What is Effective nuclear charge ? Calculate effective nuclear charge of an electron present in 3p orbital chlorine atom. 3
- (b) Why electron affinity of 18th group elements are zero ? 2
- (c) Which have smaller EA and why – F or Cl ? 2
- (d) Out of which compound, C has maximum electronegativity and why – CH_4 , C_2H_4 and C_2H_2 ? 2
4. (a) Which has smaller size and why – O^- or O^{2-} ? 2
- (b) Why successive electron affinities have negative values ? 2
- (c) How many total blocks are there in Periodic Table ? Write their general electronic configuration. 3
- (d) Calculate electronegativity of Fluorine. Given bond energies as $E_{\text{H-H}} = 104.2 \text{ K Cal/mole}$; $E_{\text{F-F}} = 36.6 \text{ K Cal/mole}$; $E_{\text{H-F}} = 136.6 \text{ K Cal/mole}$ and electronegativity of H = 2.1. 2

-Unit-III

5. (a) Complete the reactions :
- (i) $\text{Xe (g)} + \text{PtF}_6 \text{ (g)} \rightarrow ?$
- (ii) $\text{XeF}_6 + 3\text{H}_2\text{O (excess)} \rightarrow ?$
- (iii) $\text{XeF}_4 + \text{BF}_4 \rightarrow ?$
- (b) Discuss bonding and shape of XeF_6 molecule. 3
- (c) Why do Helium and Neon not form Clathrates ? 2
- (d) XeO_3 acts as oxidising or reducing agent ? 1
6. (a) Why lithium forms normal oxide, sodium forms peroxide and Potassium forms superoxide, when burnt in air ? 3
- (b) Why alkali metals dissolved in ammonia (l) to give blue coloured solution, the resulting solution is oxidising or reducing in nature? 3
- (c) Describe the difference in structure of BeH_2 and CaH_2 . 3

UNIT-IV

7. (a) Discuss Linear Combination of atomic orbital (LCAO). 3
- (b) Calculate percentage of ionic character of C-Cl bond in CCl_4 , if electronegativity of Carbon and Chlorine are 3.5 and 3.0 respectively. 3
- (c) Discuss bonding and structure of ICl_2^- on basis of VSEPR theory.

8. (a) To dipole moment of HX molecule is 1.92 D and bond distance is 1.20 Å. Calculate percentage ionic character. 3
- (b) Draw molecular orbital diagram of CN molecule. 3
- (c) Discuss bonding and geometry of SF₄ molecule. 3

UNIT-V

9. (a) Can uncertainty principle be applied on stationary electron ?
- (b) What are Eigen Values ?
- (c) Arrange in order of increasing size : Na⁺, Li⁺, Ba²⁺, B³⁺.
- (d) How many elements are present in 3rd period ?
- (e) Can you dissolve Sodium Hydride in water ?
- (f) Which out of two Mg(OH)₂ or Ca(OH)₂ is stronger base ?
- (g) How many Lone pairs of e⁻ and Bond pairs of electrone are in C/F₃?
- (h) What type of Molecular orbital is formed by combination of 2p_y and 2p_x atomic orbitals.
- (i) Although CCl₄ has polar bonds but its dipole moments is zero why ? 9×1=9