

B.Sc. (with Credits)-Regular-Semester 2012 Sem VI
B.Sc.4511-Chemistry-II (Physical Chemistry) Paper-II

P. Pages : 2

Time : Three Hours



GUG/W/16/5628

Max. Marks : 50

- Notes : 1. All questions are compulsory.
2. All questions carry equal marks.

1. a) What is meant by atomic orbitals? Explain the probability distribution curves of 2s and 3p orbitals. 5
- b) What do you understand by LCAO approximation? How it can be used to calculate the energy of H_2^+ ? 5

OR

- c) Write Schrodinger wave equations for hydrogen like atom in Cartesian and polar Co-ordinates. 2½
- d) Explain azimuthal and magnetic quantum number. 2½
- e) Give postulates of molecular orbital theory. 2½
- f) Distinguish between bonding and antibonding molecular orbitals. 2½
2. a) State Beers – Lambert's Law. Derive its mathematical equation. 5
- b) Explain the term dipole moment. Explain its applications in determination of
i) Percentage of ionic character. 5
ii) Shape of molecule.

OR

- c) State and explain Stark – Einstein Law of photochemical equivalence. 2½
- d) Explain fluorescence and phosphorescence. 2½
- e) Give graphical method for the determination of dipole moment of substance. 2½
- f) Bond length of NaCl molecule is found to be 2.36 Å while its dipole moment is found to be 8.50. Calculate the percentage ionic character of this substance. 2½
3. a) Derive expression for the frequency of rotational lines in a pure rotational spectrum. What are the conditions to show rotational spectra. 5
- b) Write expression for the vibrational energy of diatomic molecule taking it as a simple harmonic oscillator. 5
Represent the vibrational energy level of such molecule diagrammatically.

OR

- c) What are the factors which affect the intensity of spectral line? Explain briefly. 2½
- d) Calculate the force constant of HI bond if vibrational frequency $6.6 \times 10^{13} \text{ s}^{-1}$ and its reduced mass is $1.648 \times 10^{-27} \text{ kg}$. 2½
- e) Discuss the applications of rotational spectroscopy. 2½
- f) Describe the normal modes of vibrations in H_2O molecule. 2½
4. a) What is adsorption? Explain Freundlich adsorption isotherm. Give its limitations. 5
- b) Explain electrophoresis and electro-osmosis. 5

OR

- c) Write Langmuir's theory of adsorption. 2½
- d) Distinguish between lyophilic and lyophobic sol. 2½
- e) What do you understand by the term critical micelle concentration? what is the effect of temp. on cmc? 2½
- f) Write a note on adsorption chromatography. 2½
5. Attempt **any ten**. 10
- i) Give significance of principal quantum number. 1
- ii) Draw probability distribution curve for antibonding molecular orbital. 1
- iii) Write the formula of energy of a Hydrogen like atom. 1
- iv) Define chemiluminescence. 1
- v) What is quantum yield? 1
- vi) What are the units of dipole moment in CGS and SI system? 1
- vii) Which of following molecule show rotational spectra? 1
- i) H_2 ii) HCl
- viii) Write selection rule for pure vibrational spectra. 1
- ix) What is zero point energy? 1
- x) What is chemisorption? 1
- xi) Define gold number. 1
- xii) What is ultrafiltration? 1
