CHT14 - Chemistry (Paper-II) : Discipline Specific Elective Chemistry-VI : Physical Chemistry

P. Pages : 2

Time : Three Hours

|||||||||| *0633*

Max. Marks : 50

_____

Notes :
1. All questions are compulsory and carry equal marks.
2. Diagrams and Chemical equation should be given wherever necessary.
3. Illustrate your answers wherever necessary with the help of neat sketches.
4. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted. Non programmable Electronic Calculator is allowed.
5. Discuss the reaction, mechanism wherever necessary.

1. a) Draw Jablonski diagram and explain radiative and non radiative transitions. **5**

b) Explain the effect of temperature on molar polarisation of molecules. How does it help in finding the dipole moment of a substance. **5**

OR

c) Explain the reasons for high quantum yield. **2½**

d) State and explain second law of photochemistry. **2½**

e) Distinguish between photochemical and thermochemical reactions. **2½**

f) What is dipole moment? Explain its application in differentiating cis-and trans-isomers. **2½**

2. a) Obtain an expression for wave number of spectral lines in terms of rotational constant in pure rotational spectra. **5**

b) Explain vibrational energy in an anharmonic oscillator with suitable energy level diagram explain normal modes of vibrations in CO_2 molecule. **5**

OR

c) Discuss the applications of rotational spectra. **2½**

d) The fundamental vibrational frequency of HCl is $2890\,cm^{-1}$. Calculate the force constant of this molecule. The atomic masses of H & C1 are 1.673×10^{-27} kg and 58.06×10^{-27} kg respectively. **2½**

e) Explain the concept of non-rigid rotor. **2½**

f) State selection rule for vibrational spectrum in simple Harmonic oscillator. Show that only one absorption line will be obtained in vibrational spectrum of simple harmonic oscillator. **2½**

3. a) Define adsorption. Deduce an expression for Langmuir unimolecular adsorption isotherm. How does it can be verified. **5**

b) What are Lyophilic and lyophobic sol. Discuss the condensation method for preparation of colloidal sol. **5**

OR

c) Write a note on electroosmosis. **2½**

d) What is critical micellee concentration? Explain the effect of temperature on CMC. **2½**

e) What is Freundlich adsorption isotherm? What are its limitations. **2½**

f) Distinguish between physical and chemical adsorption. **2½**

4. a) What are nuclides? How are they classified explain the stability of nucleus on the basis of binding energy cure. **5**
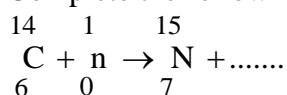
b) Explain the application of radioisotopes in- **5**
   i) Reaction mechanism   ii) Medicinal application

OR

c) Write a note on proportional counter method for radioactivity measurement. **2½**

d) What are the general characteristics of radioactive decay. **2½**

e) Define natural and artificial radioactivity. Give one example of each. **2½**

f) The half life period of a certain radioactive element in 100 sec. Calculate the time during which 1g of the element is reduced to 0.01g. **2½**

5. Attempt **any ten.** **10**

   i) What is quantum yield?

   ii) State Grotthuss Draper law of photochemical equivalence.

   iii) Define group moment.

   iv) Which of the following molecule shows pare rotational spectra HCl, N_2, CH_4, H_2O.

   v) Define frequency separation.

   vi) Define degree of freedom of motion of a molecule.

   vii) What is Adsorption chromatography?

   viii) What is ultrafiltration?

   ix) Define Gold number

   x) Define (i) isotope (ii) Isobar

   xi) What is carbon dating?

   xii) Complete the following nuclear reaction
   $$^{14}_{6}C + ^{1}_{0}n \rightarrow ^{15}_{7}N + ...$$

****