AO—37—2018

FACULTY OF SCIENCE

B.Sc. (Fifth Semester) EXAMINATION

MARCH/APRIL, 2018

CHEMISTRY

Paper XIII

(Physical & Inorganic Chemistry)

(Tuesday, 20-3-2018)   **Time : 10.00 a.m. to 12.00 noon**

Time—2 Hours   *Maximum Marks—40*

N.B. :—   (*i*)   Use only *one* answer book for both Sections A & B.

     (*ii*)   Use of calculator is allowed.

     (*iii*)   Attempt *all* questions.

     (*iv*)   Use of Logarithmic table is allowed.

(Section A : Physical chemistry)   5×2=10

1.   Answer any *five* of the following :

    (*i*)   State and explain Henry's law.

    (*ii*)   Explain consecutive reactions.

    (*iii*)   Show that in third order reaction time for half change is inversely proportional to initial concentration.

    (*iv*)   State and explain Nernst distribution law.

    (*v*)   Discuss the effect of force constant on bond energy.

    (*vi*)   Explain Raman effect.

    (*vii*)   Explain dimerization anthracene.

2.   Answer any *two* of the following :   2×5=10

    (*a*)   Explain the kinetics of reversible reaction.

    (*b*)   Explain theory and principle of vibrational spectra of simple harmonic oscillator.

                                P.T.O.

(*c*) The pure rotational spectrum of gaseous molecule consists of series of equally spaced lines separated by 4.2 cm^{-1}. Calculate the bond length of molecule.

Reduced mass $= 1.3 \times 10^{-26}$ kg, $h = 6.626 \times 10^{-34}$ Js, $c = 3 \times 10^8$ m/s.

3. Answer any *one* of the following : 1×7=7

(*i*) Show that in case of microwave spectrum, the molecule consists of lines with separation of 2B cm^{-1}.

(*ii*) (*a*) Derive an expression for distribution law when solute undergoes association.

(*b*) The following data were obtained at 298 K for the distribution of I_2 between H_2O and CCl_4. I_2 in H_2O (mole dm^{-3}) $\times 10^2$, I_2 in CCl_4 (mole dm^{-3}).

1.18	1.005
2.35	2.01
3.58	3.015
4.67	4.01

Verify that data obey Nernst distribution law and calculate K_D in favour of CCl_4.

(Section B : Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

(*a*) How are organoaluminium compounds prepared from :

(*i*) Grignard reagent

(*ii*) Organomercury and

(*iii*) Phenyl lithium.

(*b*) What are the applications of organolithium compounds ?

(*c*) Write any *three* properties of organotin compounds.

(*d*) Give the properties of $Ni(CO)_4$.

(*e*) Explain metal-carbon bonding in metal carbonyl.

5. Solve any *two* of the following : 2×2=4

   (*a*) Draw the structure of $Fe_2(CO)_9$ and $Ir_4(CO)_{12}$.

   (*b*) How are tetramethyl titanium and tetraphenyl titanium prepared ?

   (*c*) What are organometallic compounds ? Give its suitable example.

   (*d*) Define transition metal organometallic compounds. Give its example.