This question paper contains **3** printed pages]

W—39—2018

FACULTY OF SCIENCE
B.Sc. (Third Year) (Fifth Semester) EXAMINATION
OCTOBER/NOVEMBER, 2018
(CBCS Pattern)
CHEMISTRY

Paper XIII

(Physical and Inorganic Chemistry)

(Thursday, 11-10-2018)   **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours*   Maximum *Marks*—40

N.B. :— (*i*)   Use same answer-book for Section A and Section B.

(*ii*)   Use of logarithmic table and non-functional calculator is allowed.

(*iii*)   Attempt *All* questions.

Section A
(Physical Chemistry)

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

   (*a*)   Discuss the Liquid-Liquid chromatography.

   (*b*)   What are limitations of Nernst distribution law ?

   (*c*)   Derive an expression for distribution law when solute undergo dissociation.

   (*d*)   What are factors affecting width of spectral lines ?

   (*e*)   Explain experimental method of Raman Spectroscopy.

   (*f*)   What is third order reaction ? Give its any *two* examples.

   (*g*)   Show that the time required for completion of any fraction of third order reaction is inversely proportional to the square of initial concentration of the reactant.

   (*h*)   Discuss the kinetics of decomposition of HI.

       P.T.O.

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

(*a*) Discuss kinetics of opposing reaction.

(*b*) State and explain Franck-Codon principle.

(*c*) The pure rotational spectrum of the gaseous diatomic molecule consist of series of equally spaced lines separated by 3.60 cm^{-1}. Calculate the internuclear distance of the molecule. The reduced mass of molecule is 1.15×10^{-26} kg. ($h = 6.626 \times 10^{-34}$ Js, $c = 3 \times 10^8$ m/s, $\pi = 3.14$, 1 cm$^{-1} = 10^2$ m^{-1})

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

(*a*) Derive an expression for the energy of the transition from $J \rightarrow J + 1$ level in rotational spectra of rigid diatomic molecule.

(*b*) (*i*) Derive an expression for distribution law when solute undergo association.

(*ii*) The distribution of organic solute between water and carbon tetrachloride, the following results were obtained :

Concentration in Water	0.047	0.082
Concentration in CCl$_4$	0.127	0.390

Determine molecular state of the solute in CCl$_4$.

Section B

(Inorganic Chemistry)

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

(*a*) How will you prepare organotin compounds from :

(*i*) Organoaluminium compound

(*ii*) Wurtz reaction

(*iii*) Grignard reagent.

(*b*) What is the action of the following on organolithium compounds ?

(*i*) Halogen

(*ii*) BCl$_3$

(*iii*) Carbon monoxide.

  (*c*) Give any *three* applications of organotitanium compounds.

  (*d*) Explain the structure of $Ni(CO)_4$ according to old approach.

  (*e*) Define metal carbonyls. Draw the structures of the two isomers of $Co_2(CO)_8$.

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

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

  (*b*) Give any *two* uses of organoaluminium compounds.

  (*c*) Write any *two* properties of organotitanium compounds.

  (*d*) Draw the structure of :

    (*i*) $Fe_2(CO)_9$ and

    (*ii*) $Fe_3(CO)_{12}$.