B—45—2019

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL 2019

(CGPA Pattern)

CHEMISTRY

Paper XIII

(Physical and Inorganic Chemistry)

(Wednesday, 20-3-2019)   **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*) Explain the kinetics of dimerization of anthracene.

    (*b*) Prove that in case of third order reaction half-life time is inversely proportional to square of initial concentration of reactant.

    (*c*) Discuss consecutive reactions.

    (*d*) What are factors affecting intensity of spectral line ?

    (*e*) Explain the transition $6 \longrightarrow 6^*$ with energy level diagram.

    (*f*) Discuss any *two* applications of Nernst distribution law.

    (*g*) State and explain Henry's Law.

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

    (*a*) The fundamental vibrational frequency of diatomic molecule is 2650 cm^{-1}. Calculate the force constant of this molecule. The atomic masses are 57.00×10^{-27} kg and 1.5×10^{-27} kg. ($c = 3 \times 10^8$ m/s, $\pi = 3.142$ and $1 \ cm^{-1} = 10^2 \ m^{-1}$)

P.T.O.

(b)   Derive kinetic expression for third order reaction.

(c)   Explain the quantum theory of Raman Scattering.

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

(a)   Draw energy level diagram showing allowed transitions for diatomic molecule as SHO.

Derive an expression $I = \mu r_0^2$ for rigid diatomic rotating molecule.

(b)   (i)   What are the limitations of Nernst distribution law.

(ii)   Experiments in the study of the distribution of an organic solute between water (c_1) and chloroform (c_2) gave the following results :

Concentration in aqueous solution (c_1) :   0.250   0.430

Concentration in chloroform solution (c_2) :   1.852   5.430

Determine molecular state of solute in chloroform.

Section B

(Inorganic Chemistry)

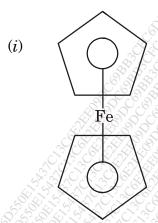4. Solve any *three* of the following :   3×3=9

(a)   Explain covalent and electron deficient organometallic compound with suitable examples.

(b)   Give any *three* methods of preparation of organolithium compound.

(c)   Write applications of organotitanium compounds.

(d)   How will you prepare Nickel tetracarbonyl from :

(i)   NiS

(ii) $Ni(CN)_2$

(iii) NiI_2

(e)   Explain the structure of Nickel tetracarbonyl with old and new approach.

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

(*a*) Give the characteristics of mononuclear carbonyl.

(*b*) Explain the preparation of organoaluminum compound by :

(*i*) Grignard reagent

(*ii*) Organomurcuric compound.

(*c*) Describe the structure of organolithium compound.

(*d*) Write the IUPAC name of :

(*i*)

Fe

(*ii*) $Fe(CO)_5$.