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B—43—2019

FACULTY OF SCIENCE

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

MARCH/APRIL, 2019

(Regular/CBCS 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) Write a note on solvent extraction.
 - (b) Discuss solubility and distribution law.
 - (c) What are the applications of Nernst's distribution law.
 - (d) What are factors affecting intensity of spectral lines.
 - (e) Discuss the transition $\sigma - \sigma^*$ and $\pi \rightarrow \pi^*$ with the help of electronic energy level diagram.
 - (f) Define opposing reaction. Give its any *two* examples.
 - (g) Show that magnitude of rate constant depends on the unit in which concentration is expressed.
 - (h) Explain the kinetics of dimerisation and anthracene.

P.T.O.

2. Answer any *two* of the following :

2×5=10

- (a) Discuss kinetics of consecutive reaction.
- (b) Explain the pure rotational Raman spectra of linear diatomic molecule.
- (c) The pure rotational spectrum of gaseous diatomic molecule consist of a series of equally spaced lines separated by 20.00 cm^{-1} . Calculate the bond length of the molecule. The reduced mass of molecule is $1.70 \times 10^{-27} \text{ kg}$.

$$(h = 6.626 \times 10^{-34} \text{ Js}, c = 3 \times 10^8 \text{ m/s}, \pi = 3.14, 1 \text{ cm}^{-1} = 10^2 \text{ m}^{-1})$$

3. Answer any *one* of the following :

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- (a) Derive an expression for energy of diatomic molecule as simple harmonic oscillator. Draw energy level diagram and show allowed transition.
- (b) (i) State and explain Nernst distribution law.
- (ii) The experimental study of the distribution of phenol between water and chloroform gave the following results :

Concentration in aqueous solution	0.09	0.16
Concentration in chloroform solution	0.25	0.79

Determine the molecular state of phenol in chloroform.

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following :

3×3=9

- (a) Write any *three* applications of organoaluminium compounds.
- (b) What is the action of the following on organolithium compounds :
- (i) Carbon monoxide
- (ii) Alkyl halide
- (iii) BCl_3 .

- (c) Give any *three* methods of preparation of organotitanium compounds.
- (d) Complete the following reactions :
- (i) $\text{Ni} + 4\text{CO} \rightarrow ?$
- (ii) $\text{Ni}(\text{CN})_2 + 4\text{CO} \rightarrow ?$
- (iii) $\text{NiS} + 4\text{CO} \rightarrow ?$
- (e) What are mononuclear metal carbonyls ? Give its characteristics.
5. Solve any *two* of the following : 2×2=4
- (a) How will you prepare ethyllithium from :
- (i) alkyl chloride and
- (ii) dialkyl mercury ?
- (b) What are electron deficient organometallic compounds ? Give its suitable example.
- (c) Give the agriculture uses of organotin compounds.
- (d) Draw the structure of :
- (i) $\text{Fe}_3(\text{CO})_{12}$ and
- (ii) $\text{Ir}_4(\text{CO})_{12}$.