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W—40—2018

FACULTY OF SCIENCE

B.Sc. (Fifth Semester) EXAMINATION

OCTOBER/NOVEMBER, 2018

CHEMISTRY

Paper XIII

(Physical and Inorganic Chemistry)

(Thursday, 11-10-2018)

Time : 10.00 a.m. to 12.00 noon

Time—Two Hours

Maximum Marks—40

N.B. :- (i) Use only one answer-book for both Sections A and B.

(ii) Use of calculator is allowed.

(iii) Attempt *all* questions.

(iv) Use of Logarithmic table is allowed.

Section A

(Physical & Inorganic)

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

(i) State and explain Nernst distribution law.

(ii) Explain chain reaction with suitable example.

(iii) Explain the term partition chromatography.

(iv) What are third order reaction ? Give *two* examples.

(v) What are the factors that affect the width of spectral lines ? Explain any *one* factor.

(vi) Explain $\sigma \rightarrow \sigma^*$ and $\pi \rightarrow \pi^*$ transitions.

(vii) Explain consecutive reactions.

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

(a) Derive the equation for rate constant of third order reaction.

P.T.O.

- (b) Prove that frequency separation between successive lines in pure rotational Raman spectrum is $4B \text{ cm}^{-1}$.
- (c) The vibrational frequency of a diatomic is 2880 cm^{-1} . Calculate force constant. The atomic masses are $56 \times 10^{-27} \text{ kg}$ and $1.5 \times 10^{-27} \text{ kg}$.
($c = 3 \times 10^8 \text{ m/s}$)
3. Answer any *one* of the following : 7×1=7
- (i) Derive an expression for energy of transition from $J \rightarrow J + 1$ level in rigid diatomic rotator. Show allowed transition with the help of energy level diagram.
- (ii) (a) Derive an expression for Nernst distribution law when solute undergoes dissociation. 3
- (b) In the distribution of an organic solute between water (C_1) and chloroform (C_2), the following results were obtained : 4
- | | |
|--------------------------------|--------------|
| C_1 (mole.dm ⁻³) | 0.190, 0.368 |
| C_2 (mole.dm ⁻³) | 0.42, 1.538 |
- Determine the molecular state of solute in chloroform.

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9
- (a) Give any *three* methods of preparation of $\text{Ni}(\text{CO})_4$.
- (b) Explain the structure of $\text{Ni}(\text{CO})_4$.
- (c) Write the application of organotitanium compounds.
- (d) What is the action of :
- (i) alkyl iodide
 - (ii) halogen and
 - (iii) carbon dioxide.
- on organolithium compounds.

- (e) Give the methods of preparation of organotin compounds.
5. Solve any *two* of the following : 2×2=4
- (a) Draw the structure of Al_2Me_6 . What is its IUPAC name ?
- (b) Classify ionic and covalent organo-metallic compounds of the following :
- Butyl sodium, Dimethyl cadmium, Phenyl sodium, Diphenyl zinc.
- (c) Give any *two* applications of organotin compounds.
- (d) Write the IUPAC name of $\text{Fe}_2(\text{CO})_9$ and $\text{Co}_2(\text{CO})_8$.