# SE-408

M.Sc. (1st Semester)
Examination, Dec., 2016

## CHEMISTRY

Paper - IV

Spectroscopy & Maths / Bio.

*Time* : Three Hours] [*Maximum Marks* : 80
[*Minimum Pass Marks* : 29

Note : Answer from both the Sections as directed. The figures in the right-hand margin indicate marks.

### SECTION-A

1. Answer the following questions : 1×10

(a) What is the unit of force constant in C.G.S. system ?

(b) What is reduced mass ?

(c) Write number of allowed modes of vibration for non-linear triatomic molecule $H_2O$.

(d) What is Raman Shift ?

(e) What is Zero Point Energy ?

(f) Write selection rule for Raman Spectra.

## Mathematics for Chemists

(For student without Mathematics in B.Sc.)

(g) Define dot product.

(h) Solve $\int \log x \, dx =$ ?

(i) What is Curl ?

(j) What is Probability ?

## Biology for Chemists

(For student without Biology in B.Sc.)

(g) Write the function of triglyceride.

(h) Differentiate between Prokaryotic and Eukaryotic cell.

(i) Explain Catabolism in one sentence.

(j) What is Gluconeogenesis ?

2×5

2. Answer the following questions :

(a) What do you understand by electromagnetic radiation ?

(b) Explain Born-Oppenheimer approximation.

(c) Write Resonance Raman spectroscopy in brief.

## Mathematics for Chemists

(For student without Mathematics in B.Sc.)

(d) What is Minima and Maxima ?

(e) Differentiate between RMS and Most Probable Error.

## Biology for Chemists

(For student without Biology in B.Sc.)

(d) Explain ATP — the Biological Energy currency.

(e) Discuss in brief the role of sugar in biological recognition.

## SECTION-B

Attempt one question from each Unit :

### Unit-I

3. Explain the following with suitable examples : 12

(a) Reflection

(b) Dispersion

(c) Polarisation and Scattering

*OR*

Discuss the factors affecting intensity of spectral lines. Calculate frequency, wave number and energy of photon with 2000Å wavelength radiation.

## Unit-II

4. (a) Write note on Nuclear and Electron spin interaction. 4

(b) Explain the effect of Isotopic substitution on the transition frequencies. 8

*OR*

Explain the nature of Rotational spectral line in rigid and Non-rigid rotator. 12

## Unit-III

5. Explain force constant and bond length determination in Infrared spectroscopy. Calculate force constant for HCl from fundamental vibrational frequency $8{\cdot}667\times10^{13}\ s^{-1}$. 12

*OR*

(a) Discuss the principle of IR spectroscopy. 8

(b) Explain Hot Bands. 4

## Mathematics for chemists

(For students without Mathematics in B.Sc.)

### Unit-IV

6. (*a*) If $A=\begin{bmatrix}1 & 0\\ 3 & 2\end{bmatrix}$ and $B=\begin{bmatrix}3 & 5\\ 2 & 1\end{bmatrix}$, find $AB$ and $BA$ and show $AB \neq BA$. 6

(*b*) Show

$i \times (a \times i) + j \times (a \times j) + k \times (a \times k) = 2a$ 6

*OR*

(*a*) Write applications of differential calculus to thermodynamic properties. 8

(*b*) Solve $\int \log \cos x = ?$ 4

### Unit-V

7. (*a*) What is differential equation of first order ? 4

(*b*) Find the differential equation for a bimolecular homogeneous reaction 8

$$A + B \rightarrow C$$

*OR*

(*a*) Define permutation and combination. 4

(*b*) How many permutations can be made out of the letters of the word "BUSINESS". How many of these will begin with B and end with N ? 4

(*c*) Find $n$, if $^{9}P_{5} + 5^{9}P_{4} = {}^{10}P_{n}$. 4

## Biology for Chemists

(For student without Biology in B.Sc.)

### Unit-IV

6. (*a*) What are Biomolecules ? 6

(*b*) Throw light on building blocks of Biomacromolecules. 6

*OR*

Write notes on any **two** of the following : 12

(*a*) Pentose phosphate pathway

(*b*) Krebs's cycle

(*c*) Carbohydrate metabolism

## Unit-V

7. Explain the structure and function of triglyceride and cholesterol. 12

*OR*

(*a*) Write amino acid sequencing. 6

(*b*) Explain enzymatic hydrolysis of proteins to peptide. 6

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