



I Semester M.Sc. Examination, January 2017  
(2010-11 Scheme) (NS)  
C104 : CHEMISTRY

Time : 3 Hours

Max. Marks : 80

**Instruction** : Answer Part A and Part B in separate answer books.

PART – A  
(Analytical Chemistry)

44

Answer question No. 1 and any three of the remaining.

1. Answer any seven of the following : (7×2=14)
- Differentiate between Q-test and F-test. What are their significance in chemical analysis ?
  - The following results were obtained in the determination of chloride present in a sample – 59.83, 60.04, 60.45, 59.88, 60.32 and 60.24. Determine the standard deviation and coefficient of variance.
  - Explain the terms – number of theoretical plates (N) and height of theoretical plates (H).
  - What is percentage extraction of iron (III) from 100 ml of 6 M hydrochloric acid with 20 ml of diethylether assuming the distribution ratio is 100 ?
  - The absorptivity of a coloured complex was  $3.20 \times 10^3$  at 240 nm. Calculate the absorbance of a  $5 \times 10^{-5}$  M solution in 50 mm cell when it was measured at 240 nm.
  - What are the prerequisites of a super critical fluid ? Give an example.
  - Write the principle of radiotracer technique.
  - The fluorescence efficiency depends on the intensity of excitation source. Why ?
2. a) What is meant by neutron activation analysis ? Derive an expression for the analysis of a radioactive sample by this technique.  
b) Describe the principle and working of a scintillation counter. (5+5)
3. a) Explain the effect of substituent and structural rigidities on the fluorescence efficiency.  
b) How are the errors classified ? Write the distribution of random errors in Gaussian curve. (5+5)
4. a) With a neat sketch explain the HPLC instrumentation and the role of each component in it.  
b) Write the principle of paper chromatography. Mention its types. (5+5)
5. a) Give a brief account of photometric titrations.  
b) Explain the working principle of surface turbidimeter. Write its applications. (5+5)

P.T.O.



PART – B  
Mathematics for Chemists

36

Answer any three questions.

(3×12=36)

1. a) If  $\vec{A} = 2i + j - k$ ,  $\vec{B} = i + 2j + k$  and  $\vec{C} = i + j - 2k$ . Find  $\vec{A} \cdot (\vec{B} \times \vec{C})$   
and  $\vec{A} \times (\vec{B} \times \vec{C})$ . 4
- b) Solve  $x + y - z = 0$ ,  $x + 2y + z = 8$  and  $x - y + z = 2$  by Cramer's rule. 4
- c) Find the eigen values and eigen vectors of the following matrix  $\begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix}$ . 4
2. a) Find the  $n^{\text{th}}$  derivative of  $\sin(ax + b)$ . 4
- b) The distance  $s$  feet travelled by a particle in time  $t$  seconds is given by  
 $s = t^3 - 6t^2 + 15t + 2$ . Find the velocity when the acceleration is zero. 4
- c) Integrate :  $\int \frac{1}{(x+1)(x-2)^2} dx$ . 4
3. a) If  $u = x^3 + y^3 + z^3 + 3xyz$ , show that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 3u$ . 4
- b) Solving the following differential equation.  $\frac{dy}{dx} + y \cot x = 4x \operatorname{cosec} x$  at  
 $y\left(\frac{\pi}{2}\right) = 0$ . 4
- c) Solve :  $y'' + 2y' + y = \cosh\left(\frac{x}{2}\right)$ . 4
4. a) Find the Fourier series expansion of the function  $y = x^2$ ,  $-\pi \leq x \leq \pi$ . 4
- b) If  $A$  and  $B$  are independent, then prove that  $A'$  and  $B'$  are also independent. 4
- c) Construct a straight line which approximates the following data : 4
- $x$ : 2 3 5 7 9 10  
 $y$ : 1 3 7 11 15 17
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