

Total No. of Questions : 3]

SEAT No. :

**P1381**

[Total No. of Pages : 12

**[5123]-204**

**M.Sc. - I (Semester - II)**

**ANALYTICAL CHEMISTRY**

**CHA - 290 : General Chemistry - II**

**(2013 Pattern) (5 Credits)**

Part A - Modern Separation Methods and Hyphenated Techniques (2.5 Credits/25 Marks)

Part B - Basic Biochemistry (5.0 Credits / 50 Marks)

Part C - Concept of Analytical Chemistry (2.5 Credits / 25 Marks)

Part D - Industrial Methods of Analysis (2.5 Credits / 25 Marks)

Part E - Organometallic and Inorganic Reaction Mechanism (2.5 Credits / 25 Marks)

Part F - Mathematics for Chemists (2.5 Credits / 25 Marks)

Part G - Pericyclic, Photochemistry and Free Radical Reactions (2.5 Credits / 25 Marks)

### **Modern Separation Methods and Hyphenated Techniques**

***Time : 3 Hours]***

***[Max. Marks : 25***

***Instructions to the candidates:***

- 1) All questions of respective section / part are compulsory.***
- 2) Figures to right hand side indicate full marks.***
- 3) Neat labelled diagrams must be drawn wherever necessary.***
- 4) Use of log table / non programmable calculator is allowed.***
- 5) Students should attempt any two parts from Part A, B, C, D, E, F and G or full paper of biochemistry (Part - B).***
- 6) Write the answers of two parts on separate answer books.***

***Q1) Answer the following***

***[10]***

- a) State and explain principle of gas chromatography.
- b) What is gradient elution? Explain with example.
- c) How is the resolving power of HPLC column increased.
- d) What is metastable ion in Mass Spectrometry?
- e) What are the characteristics of an ideal detector in HPLC?

***P.T.O.***

**Q2)** Attempt any two of the following : **[10]**

- a) Explain the process of photoionization and thermal ionization in MS.
- b) With a suitable schematic diagram explain the function of the components of a gas chromatography setup.
- c) Distinguish between Normal phase HPLC and reverse phase HPLC.
- d) What is chromatography? Classify the different chromatographic techniques and give suitable explanation.

**Q3)** Attempt any one of the following : **[5]**

- a) What is meant by hyphenated technique? Explain the technique of GC - MS giving suitable examples.
- b) A mixture of substances A, B, C and D were analysed using T.C.D. Determine the weight percentage of each component if areas were  $5.2\text{cm}^2$ ,  $9.1\text{cm}^2$ ,  $4.6\text{cm}^2$  and  $6.9\text{cm}^2$ .

respectively

Given :    Compound    Weight factor

A	0.56
B	0.73
C	0.81
D	0.85



Total No. of Questions : 6]

SEAT No. :

**P1381**

**[5123]-204**

**M.Sc. - I (Semester - II)**  
**ANALYTICAL CHEMISTRY**  
**Basic Biochemistry**  
**(2013 Pattern) (5 Credits)**

*Time : 3 Hours]*

*[Max. Marks : 50*

**SECTION - I**

**Q1)** Answer any three of the following : **[9]**

- a) How is the end group of a protein determined?
- b) Give the structure of Glycogen and starch.
- c) Classify proteins with suitable examples.
- d) Differentiate between active and passive transport of ions.

**Q2)** Attempt any two of the following : **[8]**

- a) Describe the structure and function of mitochondria and endoplasmic reticulum.
- b) What are the components of cell membrane? Give the function of each.
- c) Short note on Eucaryotic cell metabolism.

**Q3)** Attempt any two of the following : **[8]**

- a) Classify types of fatty acids.
- b) Comment on :
  - i) Lysosomes
  - ii) Sickle cell anaemia.
- c) Discuss the reactions of TCA cycle. Give it's energetics.

## **SECTIONS - II**

**Q4)** Answer any three of the following : **[9]**

- a) Classify enzymes with suitable examples.
- b) What are double reciprocal plots? Give their importance.
- c) Discuss different types of inhibition.
- d) Give a brief account of post translational modification of protein.

**Q5)** Attempt any two of the following : **[8]**

- a) What are coenzymes? Name the coenzyme derived from B complex vitamins. Discuss their biochemical role.
- b) Discuss the major structural differences between A, B and Z forms of DNA.
- c) Discuss characteristics of genetic code and give a note on wobble hypothesis.

**Q6)** Attempt any two of the following : **[8]**

- a) Comment on :
  - i) Nutritional disorders (any 2)
  - ii) Night blindness
- b) Give experimental proofs to support DNA replication and whether it is semiconservative.
- c) Give therapeutic uses of enzymes.



Total No. of Questions : 3]

SEAT No. :

**P1381**

**[5123]-204**

**M.Sc. - I (Semester - II)**  
**ANALYTICAL CHEMISTRY**  
**Concept of Analytical Chemistry**  
**(2013 Pattern) (5 Credits)**

***Time : 3 Hours]***

***[Max. Marks : 25***

***Q1)*** Answer the following :

**[10]**

- a) What is determinate error? Give an example.
- b) Differentiate between batch extraction and continuous extraction.
- c) Explain the test of significance.
- d) Calculate the proper number of significant figures in each of the following:
  - i) 0.00256
  - ii) 22.0092
- e) Give any two properties of nano materials.

***Q2)*** Attempt any two of the following :

**[10]**

- a) Draw a neat labelled diagram of fractionating column and explain it's principle and working.
- b) Write a note on rejection of result : The Q test.
- c) Explain the factors affecting solvent extraction.
- d) Describe the steps involved in the sampling process.

***Q3)*** Attempt any one of the following :

**[5]**

- a) Write a note on salt induced precipitation of proteins.
- b) The following results were obtained in the replicate determination of lead content of a blood sample : 0.613, 0.615, 0.614, 0.615 and 0.617 ppm. Calculate the mean and standard deviation of this set of data.



Total No. of Questions : 3]

SEAT No. :

**P1381**

**[5123]-204**

**M.Sc. - I (Semester - II)  
ANALYTICAL CHEMISTRY  
Industrial Methods of Analysis  
(2013 Pattern) (5 Credits)**

***Time : 3 Hours]***

***[Max. Marks : 25***

***Q1)*** Answer of the following :

**[10]**

- a) Enlist different types of process analysers.
- b) Explain the concept of stepwise formation constants.
- c) Give two types of quality standards for laboratory.
- d) Define : Chromatography.
- e) 0.02 g NaOH is dissolved in 100 ml water. What is the concentration of solution in ppm.

***Q2)*** Attempt any two of the following :

**[10]**

- a) Write a note on automatic elemental analyzer.
- b) Describe stability and instability constants giving suitable examples.
- c) What is an acidic buffer? Explain it's action giving suitable example.
- d) Give a brief account of cost and benefits of a quality system.

***Q3)*** Answer any one of the following :

**[5]**

- a) Define :
  - i) Quality audits.
  - ii) Limiting reactants.
  - iii) Gram mole.
- b) Write a note on Industrial process analyser.



Total No. of Questions : 3]

SEAT No. :

P1381

[5123]-204

M.Sc. - I (Semester - II)

ANALYTICAL CHEMISTRY

Organometallic and Inorganic Reaction Mechanism  
(2013 Pattern) (5 Credits)

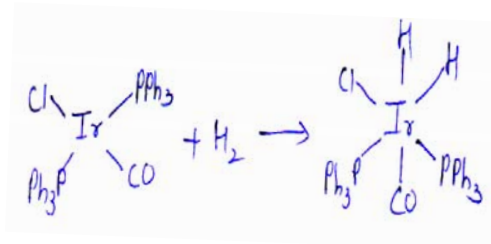
Time : 3 Hours]

[Max. Marks : 25

Q1) Answer the following :

[10]

- a) Determine the valence electron counts for the transition metals in the following complexes
- i)  $[\text{Fe}(\text{CO})_4]^{2-}$
  - ii)  $\text{CO}_2 (\text{CO})_8$
- b) Define and explain :
- i) Oxidative addition.
  - ii) Reductive elimination.
- c) What do you understand by inert and labile complexes?
- d) Which of the following obey the  $18e^-$  rule
- i)  $[\text{Ni}(\text{CN})_4]^{2-}$
  - ii)  $\text{Fe} (\text{CO})_5$
- e) Predict the type of reaction.



**Q2)** Attempt any two of the following : **[10]**

- a) Differentiate between associative and dissociative mechanisms in substitution reactions.
- b) Write a note on hydroformylation reaction.
- c) Explain the methods of synthesis of metal carbonyls.
- d) Explain in detail the electron transfer reactions.

**Q3)** Attempt any one of the following : **[5]**

- a)  $^{13}\text{C}$  NMR is a powerful technique to characterize carbonyl compounds. Explain with suitable examples.
- b) Write a note on : Trans effect.





Total No. of Questions : 3]

SEAT No. :

**P1381**

**[5123]-204**

**M.Sc. - I (Semester - II)**  
**ANALYTICAL CHEMISTRY**  
**Mathematics For Chemists**  
**(2013 Pattern) (5 Credits)**

**Time : 3 Hours]**

**[Max. Marks : 25**

**Q1)** Answer the following :

**[10]**

a) Give the transpose of the following matrices.

i) 
$$\begin{bmatrix} 6 & 3 & 8 \\ 2 & 9 & 4 \end{bmatrix}$$

ii) 
$$\begin{bmatrix} 7 & 2 & 4 \\ 8 & 7 & 2 \\ 7 & 3 & 6 \end{bmatrix}$$

b) Give the quotient rule for differentiation.

c) State whether the following differential equations are exact or inexact.

i)  $(x^2y+x) dy + (xy^2 - y) dx = 0$

ii)  $x^2dy - y^2 dx - xy dx = 0$

d) Define unit and diagonal matrices. Give examples.

e) Differentiate the equation w.r.t.x.  $y = \frac{2+x}{2-x}$

**Q2)** Attempt any two of the following :

**[10]**

a) Using Falk's scheme evaluate

i)  $A = \begin{bmatrix} 2 & 4 & 6 \\ 1 & 2 & 3 \end{bmatrix}$

$x = \begin{bmatrix} 1 \\ 4 \\ 8 \end{bmatrix} \quad Ax = ?$

$$\text{ii) } B = \begin{bmatrix} 7 & 1 & 5 \\ 2 & 4 & 6 \end{bmatrix}$$

$$y = \begin{bmatrix} 1 \\ 5 \\ 9 \end{bmatrix} \text{ By } = ?$$

- b) Enlist rules of partial differentiation and give suitable examples.
- c) One card is drawn from a well shuffled deck of 52 cards. Calculate the probability that the card will be :
- a black card
  - not a diamond
  - a diamond
  - not a black card

d) i) Find the determinant of :-  $\begin{bmatrix} 4 & 8 & 2 \\ 9 & 2 & 2 \\ 6 & 3 & 4 \end{bmatrix}$

ii) Find the cofactor of :-  $\begin{bmatrix} 7 & 6 & 3 \\ 5 & 1 & 2 \\ 6 & 5 & 6 \end{bmatrix}$

**Q3)** Answer any one of the following :

**[5]**

- a) Solve the following :
- Integrate  $\int_0^2 (x+1)(x^3-3) dx$
  - Find the derivative of  $x^2 - y^2 + 5x = 9y$
- b) Write a short note on Taylor and McLaurin theorem.



Total No. of Questions : 3]

SEAT No. :

**P1381**

**[5123]-204**

**M.Sc. - I (Semester - II)**

**GENERAL CHEMISTRY**

**Pericyclic, Photochemistry and Free Radical Reactions  
(2013 Pattern) (5 Credits)**

**Time : 3 Hours]**

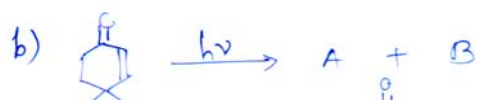
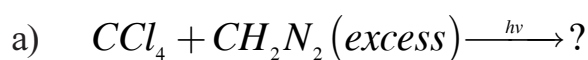
**[Max. Marks : 25**

**Q1) Answer the following :**

**[10]**

- a) What do you mean by quantum yield, explain it's significance in photochemical reactions.
- b) Irradiation of o-xylene yields a mixture of m-and p-xylenes.
- c) Discuss step-wise mechanism of Antimarkownikoff's addition with suitable example.
- d) In allylic bromination NBS is used as a brominating reagent instead of Bromine.
- e) Write the mechanism of claisen rearrangement with suitable examples.

**Q2) Predict the product indicating mechanism in any two of the following : [10]**



**Q3)** Attempt any two of the following :

**[5]**

- a) Explain free radical axylation of aromatic rings.
- b) Write a short note on Di - IT methane rearrangement.
- c) Give a brief account of Norvish Type - I process.

