Total No. of Questions : 3]

SEAT No. :

P2035

[Total No. of Pages : 14

[4923]-2004
M.Sc.-I (Semester-II)
ANALYTICAL CHEMISTRY
CHA - 290 : General Chemistry - II (2013 Pattern) (New 4 Credits)
New Course Based on Credit & Semester System

PART - A : Modern Seperation Methods and Hyphenated Techniques (2.0 Credit / 25 marks)

PART - B : Basic Biochemistry (4.0 Credit / 50 marks)

PART - C : Concept of Analytical Chemistry (2.0 Credit / 25 marks)

PART - D : Industrial Methods of Analysis (2.0 Credit / 25 marks)

PART - E : Organometallic and Inorganic Reaction Mechanism (2.0 Credit / 25 marks)

PART - F : Mathematics for Chemists (2.0 Credit / 25 marks)

PART - G : Pericyclic, Photochemistry and Free Radical Reactions (2.0 Credit / 25 marks)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***All questions of respective section / part are compulsory.***
2) ***Figures to right hand side indicates full marks.***
3) ***Neat labelled diagram 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, C, D, E, F and G or full paper of biochemistry (Part-B).***
6) ***Write the answers of <u>two parts</u> on seperate answer books.***

PART-A

Modern Separation Methods and Hyphenated Techniques

Q1) Answer the following: **[10]**

a) Give the characteristics of detectors in HPLC.

Explain Refractometer detector.

b) Differentiate between isocratic and gradient elutions in HPLC.

c) Give the application of Gas chromatography.

d) What are metastable ion in Mass Spectrometry?

e) State and explain the principle of gas chromatography.

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

a) Explain GE-MS Techniques.

b) Enlist the pressure pump in HPLC. Explain any one of them.

c) Explain the inductively coupled plasma in Mass spectrometry?

d) Compared the Normal phase and Reverse Phase Chromatography.

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

a) A mixture of ethanol-heptane-benzene and ethyl acetate were analysed using T.C.D. Determine the weight percentage of each component if areas were 5.0 cm^2, 9.0 cm^2, 4.0 cm^2 and 7.0 cm^2 respectively.

(Given - compound ——— weight factor
Ethanol ——— 0.64
Heptane ——— 0.70
Benzene ——— 0.78
Ethyl Acetate ——— 0.79)

b) Compare the GC and HPLC with respect to the following points.

i) Principle .

ii) Sample injection system.

iii) Column.

iv) Detector.

v) Application.

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M.Sc.-I (Semester-II)
ANALYTICAL CHEMISTRY
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(2013 Pattern) (2.0 Credit)
PART-C
Concept of Analytical Chemistry

Q1) Answer the following: **[10]**

a) Distinguish between Accuracy & Precision.

b) What is difference between batch extraction and continuous extraction?

c) Calculate the proper number of significant figures in each of the following

i) 0.00512 ii) 20.0041

d) Explain in brief student 'T' test.

e) What is determinate error?

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

a) Write a note on rejection of result in the 'Q' - test.

b) Explain in detail the factors affecting the solvent extraction.

c) Describe various steps involved in sampling operations.

d) Draw a neat labelled diagram of fractionating column and explain its principle and working.

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

a) The following results were obtained in the replicate determination of the lead content of a blood sample: 0.752, 0.756, 0.752, 0.751 and 0.760 ppm pb. Calculate the mean and standard deviation of this set of data.

b) What are the advantages of fused silica capillary column compared with glass or metal columns?

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ANALYTICAL CHEMISTRY
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PART-D
Industrial Methods of Analysis

Q1) Answer the following: **[10]**

a) Mention the various bulk properties used in process analyzer.

b) How will you prepare 10ppm sodium solution from sodium chloride (Given : Molecular wt of sodium chloride - 58).

c) Give any two types of quality standard for laboratory.

d) Enlist the different types of process analysers.

e) What is common ion effect. Give one example.

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

a) Write note on Industrial process analyser.

b) Explain different quality systems in chemical laboratory.

c) Describe stability and instability constant with suitable example.

d) Explain the terms:
   i) PPM
   ii) PPb
   iii) gram mole.

Q3) Attempt <u>any one</u> of the following: **[5]**

a) Explain the term automatic chemical analyser. Explain any one automatic chemical analyser in detail.

b) What will be the analytical molar Na_2CO_3 concentration in the solution produced when 25.0 ml 0.200 M $AgNO_3$ are mixed with 0.0800 M Na_2CO_3?

(Given Formation of 5.00×10^{-3} mole of $AgNO_3$ will required 2.50×10^{-3} mole of Na_2CO_3 and $n_{Na_2CO_3} = 4.00 \times 10^{-3}$ mole).

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[4923]-2004
M.Sc.-I (Semester-II)
CHEMISTRY
CHA - 290 : Drug Chemistry
(2013 Pattern) (4.0 Credit)
PART-B
Basic Biochemistry

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1. ***All questions are compulsory.***
2. ***Answers to the two sections to be written is separates answer books.***
3. ***Draw diagrams wherever necessary.***
4. ***Figures to the right indicate full marks.***

SECTION - I

Q1) Answer any four of the following: **[12]**

a) Classify proteins with suitable examples.

b) What do you mean by primary active transport? Explain with example.

c) How will you determine end groups of a protein?

d) What are homopolysaccharides? Explain the structure anf functios of Glycogen.

e) Write the following in brief:

i) Different types of fatty acids with example.

ii) Amino acid therapy.

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

a) Discuss the reactions of TCA cycle. Give energetics.

b) Describe the structure and function of mitochondria and Endoplasmic Reticulum.

c) What are the different structural levels of proteins? Give details of forces involved in stabilizing the structure of Globular protein.

Q3) Comment on any five of the following: **[5]**

a) Role of phosolipids in cell membrance.

b) Sickle cell anemia.

c) Super secondary motifs.

d) Aromatic amino acids.

e) Non essential amino acids.

f) Sphingolipids.

g) Lysosomes.

SECTION-II

Q4) Answer any four of the following: **[12]**

a) Discuss the major structural differences between A, B and Z forms of DNA.

b) Explain the flow of genetic information.

c) Classify Enzymes with suitable examples.

d) Comment on post translational modification of protein.

e) Give the important features of Genetic Code. Add a note on wobble hypothesis.

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

a) Give experimental proofs to substantiate DNA replication is semiconservative.

b) What are the factors affecting enzyme activity? Describe the effect of substrate concentration on enzyme activity.

c) What are coenzymes? Name the coenzyme derived from B complex vitamins. Discuss their biochemical role.

Q6) Comment on any five of the following: **[5]**

a) Transcriptional bubble.

b) Introns.

c) Night blindness.

d) Lagging strand synthesis.

e) Enzymes as therapeutic agents.

f) Nutritional disorders, (any two).

g) Enzyme inhibition.

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PART-E
Organometallic and Inorganic Reaction Mechanism

Q1) Answer the following: **[10]**

a) Determine valence shell electronic count for the following:

i) $[Fe(CO)_5]$

ii) $[Ni(CN)_4]^{2-}$

iii) $\left(\eta^5 - C_5H_5\right)_2 Co$

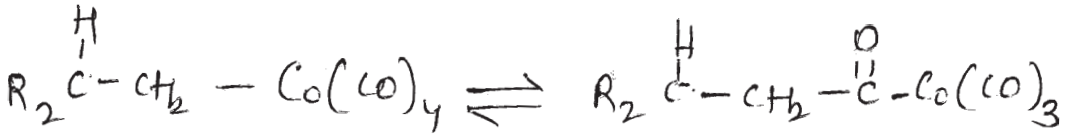
iv) $Fe_2\ (CO)_9$

b) On the basis of 18 e^- rule find the charge on the following:

i) $\left[\eta^5 - C_5H_5Co\right]^x$

ii) $[Co(CO)_3Pph_3]^x$.

c) Predict the type of reaction:



d) Give the rate law for the following reaction

$ML_5X + Y \rightleftharpoons ML_5Y.$

e) Pick out the inert complexes.

$$\left[Cr(CN)_6\right]^{3-} ; \left[Co(NH_3)_6\right]^{3+} ; Fe(H_2O)_6^{3+}$$

Q2) Answer any two: **[10]**

a) Explain with the help of suitable examples "Insertion Reactions".

b) Explain bonding in Ferrocene.

c) Discuss how infrared spectroscopy is useful to predict structure of organometallic compounds.

d) Discuss the stereochemistry of substitution in transoctahedrae complexes.

Q3) Write note on any one **[5]**

a) Reactions of ferrocene.

b) Isomerization in octahedral chelate rings.

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(2013 Pattern) (2.0 Credit)

PART-F
Mathematics for Chemists

Q1) Answer the following: **[10]**

a) Define:

i) Square matrix.

ii) Diagonal matrix.

b) i) If $A = \begin{bmatrix} 6 & 1 & 7 \\ 2 & 2 & 5 \end{bmatrix}$ $4A = ?$

ii) Add the following matrices: $\begin{bmatrix} 3 & 5 \\ 7 & 6 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix}$.

c) Give the quotient rule for differentiation.

d) List two points of differences between maxima and minima.

e) i) If $y = \frac{x^4}{4}$, $\frac{dy}{dx} = ?$

ii) Define independent variable.

Q2) Attempt <u>any two</u> of the following: **[10]**

a) Differentiate with respect to x:-

i) $y = x^3\left(x^2 - 2\right)$

ii) $y = \frac{3+x}{3-x}$

b) Give equations and graphical representation for the following with suitable illustrations:

i) Straight lines.

ii) Slope and intercept.

c) Discuss any two differential equations in physical chemistry.

d) i) What is the equation for the following data?

x	1	2	3	4	5	6	7
y.....	1	4	9	16	25	36	49

ii) Give two applications OF taylor's theorem.

Q3) Attempt <u>any one</u> of the following: **[5]**

a) Evaluate:

i) $\int x \sin x dx = ?$

ii) $\int (3x^3 + 5x^2) dx = ?$

iii) Give the transpose of $A = \begin{pmatrix} 3 & 2 & 6 \\ 1 & 4 & 7 \end{pmatrix}$.

b) Using Falk's scheme evaluate the following:

i) $A = \begin{pmatrix} 4 & 1 & 1 \\ 3 & 7 & 6 \end{pmatrix}$ $x = \begin{pmatrix} 2 \\ 4 \\ 2 \end{pmatrix}$ $Ax = ?$

ii) $B = \begin{pmatrix} 9 & 8 & 1 \\ 2 & 2 & 2 \end{pmatrix}$ $y = \begin{pmatrix} 6 \\ 1 \\ 3 \end{pmatrix}$ $By = ?$

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ANALYTICAL CHEMISTRY
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(2013 Pattern) (2.0 Credit)
PART-G
Pericyclic, Photochemistry and Free Radicals
(2013 Patten)

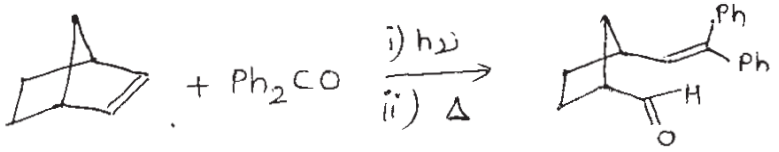
Q1) Attempt any two of the following: **[8]**

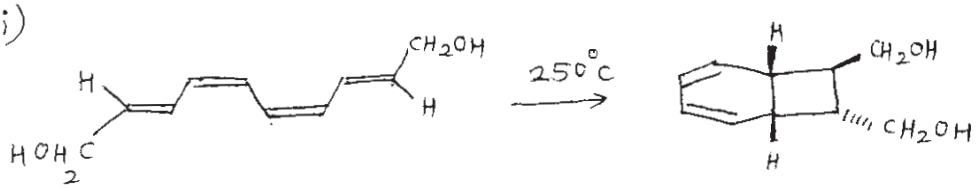
a) Draw the correlation diagram for disrotatory opening of cyclobutene to butadiene and predict whether it will be thermally or photochemically allowed.

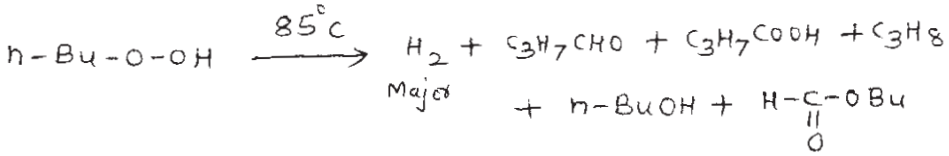
b) Explain the photoenolisation reaction with suitable examples.

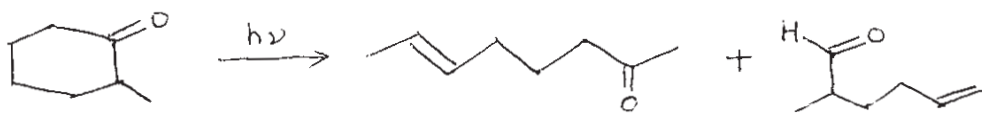
c) Explain free radical arylation of aromatic rings.

Q2) Explain the mechanism for Any Three of the following: **[9]**

i) 

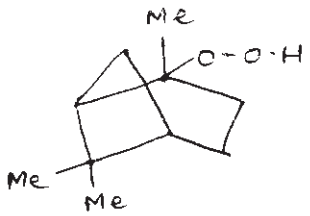
ii) 

iii) 

iv) 

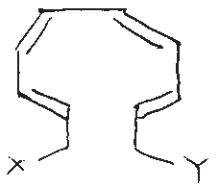
Q3) Predict the products for <u>any four</u> of the following indicating the mechanism involved. **[8]**

i)



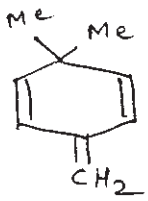
$\xrightarrow[R-H]{130^{\circ}C}$? + ?

ii)



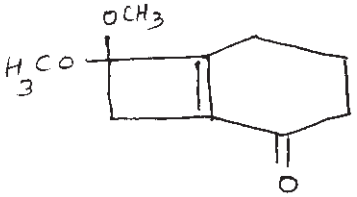
$\xrightarrow{\Delta}$? $\xrightarrow{h\nu}$?

iii)



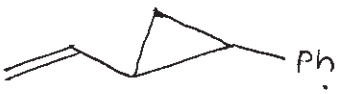
$\xrightarrow{h\nu}$?

iv)



+ $H_3COC-C\equiv C-CO_2CH_3 \xrightarrow{\Delta}$?

v)



$\xrightarrow[AIBN]{PhSH}$?