SLR-VD – 1

M.Sc. (Part – I) (Semester – I) Examination, 2014
CHEMISTRY (Paper – I)
Inorganic Chemistry – I

Day and Date : Monday, 21-4-2014   Max. Marks : 70
Time : 11.00 a.m. to 2.00 p.m.

Instructions : 1) Attempt in **all 5** questions.
2) Section **I** is **compulsory**.
3) Attempt **any two** questions from Section **II** and **any two** from Section **III**.
4) Answers to **all** questions (Section **I**, **II** and **III**) should be written in the **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.

SECTION – I

1. Answer the following :   **14**

   a) What are Slater Condon Parameters ?

   b) Define the term absorptivity.

   c) What is nephelauxetic ratio β ?

   d) What is the abundance of silver (ppm) in the earth's crust by weight ?

   e) What is Pauling's electronegativity of silver ?

   f) Why is cesium used in photoelectric cells ?

   g) How does silver react with H_2S ?

   h) What is the value of Racah Parameter B (cm^{-1}) for Co^{2+} ?

   i) What are the factors upon which magnitude of Δ_0 depends ?

   j) What is the value of Δ_0 (in KJ mol^{-1}) for $[Ti(H_2O)_6]^{3+}$ ion ?
      Complete the following reactions.

   k) $3\,Cu + 8\,HNO_3$ (dil) $\longrightarrow$?

P.T.O.

l) $Cu + 4\ HNO_3$ (conc.) $\longrightarrow$?

m) $4\ Au + 8\ NaCN + 2H_2O + O_2 \longrightarrow$?

n) $Cu_2S + 2\ Cu_2O \longrightarrow$?

SECTION – II

2. a) How is lead extracted from its principal ore ? What are its properties and uses ? **7**

   b) Derive Schroedinger time independent wave equation. **7**

3. a) Explain the chemistry of I^{st}, IInd and IIIrd transition series in connection with electronic configuration, oxidation states and magnetic properties. **7**

   b) Discuss the effect of lone pairs and effect of electronegativity on the shapes of molecules, according to VSEPR theory. **7**

4. a) What are semiconductors ? Discuss in brief rectifiers and transistors. **7**

   b) Derive an equation for complete normalized wave function $\psi_{(x)}$ for the particle in one dimentional box. **7**

SECTION – III

5. a) State and explain photoelectric effect. **5**

   b) What are Racah Parameters B and C ? **5**

   c) What is atomic inversion ? **4**

6. a) Discuss in brief free radical mechanisms. **5**

   b) How is gold extracted ? What are its properties and uses ? **5**

   c) Explain construction and working of photovoltaic cell. **4**

7. Write notes on **any three** of the following : **14**

   a) Metal clusters

   b) Black body radiation

   c) Nephelauxetic series

   d) Bent's rule.

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Seat No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
ORGANIC CHEMISTRY
Advanced Spectroscopic Methods (Paper – X)

Day and Date : Wednesday, 23-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
2) Section **I** is **compulsory**.
3) Attempt **any two** questions from Section **II** and **any two** from Section **III**.
4) Answers to **all** questions (Sections **I, II** and **III**) should be written in the **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.
7) **Use** of log table and calculators is **allowed**.

SECTION – I

1. A) Select the correct answer for **each** of the following :   **4**

   i) Which of the following compound would be expected to absorb light of longest wave length ?

   a)   b)

   c)   d)
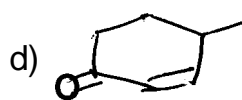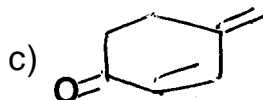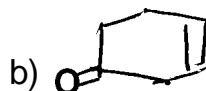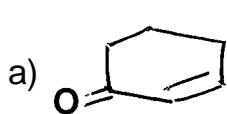
   ii) How many ^{1}HNMR signals would you expect for $H_2C = C = CH_2$?
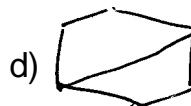   a) 1   b) 2
   c) 3   d) 0

iii) A cyclic compound of molecular formula C_6H_{10} shows only two signals in the broad-band decoupled ^{13}C NMR spectrum. The off resonance decoupled spectrum showed a triplet and doublet. The compound is

a)

b)

c)

d)

iv) An aromatic hydrocarbon (M = 134) has an intense ion at m/e 91. Which of the following is consistent with the data ?

a) 1, 4-Diethylbenzene

b) n-Butylbenzene

c) 1, 2, 4, 5- Tetramethylbenzene

d) 1-Isopropyl-4-methylbenzene

B) Fill in the blanks : **4**

i) Each alkyl group produces a bathochromic shift of _____ when present on a diene.

ii) The long range coupling constants are usually _____

iii) The carbonyl carbon of cyclohexanone appears at δ 210 relative to other carbons due to _____ in its $^{13}CNMR$ spectrum.

iv) According to the nitrogen rule if M^+ is even, then the compound will contain an _____ number of nitrogen atoms.

C) Solve the followings : **6**

i) How are (E) and (Z)-2-butene differentiated by proton NMR spectroscopy ?

ii) What are the functional group and finger print region in IR spectrum ?

iii) The UV band of ethylene at λ_{max} 175 nm is shifted to λ_{max} 217 in 1, 3-butadiene but remains unchanged in 1, 5-hexadiene. Explain.

iv) What are Lanthanide shift reagents ?

v) Suggest the structure for a hydrocarbon C_5H_{12} with one ^1HNMR and two $^{13}CNMR$ peaks.

vi) In 1-propanol the base peak is at $m/2$ = 31, in allyl alcohol, however it is at $m/2$ = 57. Explain.

SECTION – II

2. A) An organic compound with the molecular formula $C_8H_8N_2O_3$ shows the following spectral data. Assign the values and deduce the structure of the compound

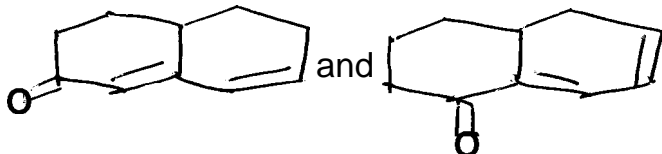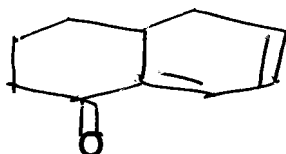 | | | |
   |---|---|---|
   | UV (λ_{max}) nm | : | 225, 335 |
   | IR (cm^{-1}) | : | 3279, 2920, 1683, 1508 and 1462 |
   | ^{1}HNMR (δ) ppm | : | 2.1(s, 3H); 7.85 (d, 2H; J = 7.5Jz) |
   | | | 8.25 (d, 2H, J = 7.5 Hz) and 10.6 (brs, 1H) |
   | ^{13}CNMR (δ) ppm | : | 24 (q), 115(d), 122 (d), 123 (s), 171 (s) and 194 (s). **7** |

   B) Draw the Karplus curve and explain its significance. **7**

3. A) What is ortho effect in mass spectroscopy ? Explain how it is reflected in the mass spectral fragmentation of ortho and p-nitro toluenes. **7**

   B) How are the following pairs of compounds differentiated by the suggested methods ?

   i) 1, 3, 5- Trinitrobenzene and 1, 2, 3-trinitrobonzene by ^{13}CNMR spectroscopy.

   ii) Acetanilide and N-methylbenzamide by IR.

   iii) and by UV spectroscopy. **7**

4. A) How can the following reaction monitored with the assistance of IR spectra of the compounds ? Justify your answer. **7**
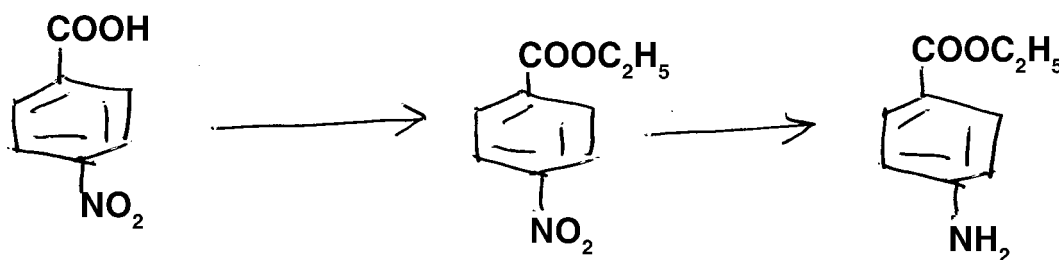
   B) Discuss the principle and applications of FT-^{13}CNMR spectroscopy. **7**

SECTION – III

5. A) Describe the shielding and deshielding mechanisms in NMR. **5**

   B) How would you distinguish between the reactant and product using DEPT NMR ? Explain taking proper example. **5**

   C) Two isometric compounds I and II having molecular formula C_3H_6O display IR absorption at (I) ~ 1710 cm^{-1} (II) 3300 and 1640 cm^{-1}. Predict the structure of I and II based on the above data. **4**

6. A) Explain the mechanism of spin-spin splitting and the rules for first order splitting in ^{1}HNMR. **5**

   B) An organic compound ($C_9H_{10}O_2$) has a strong band in the IR spectrum at 1690 cm^{-1}. Its PMR spectrum shows the following signals. Identify the compound and interpret the spectral data $\delta 2.5$ (Sδ 3H); 3.9 (S, 3H); 7.0 (d, 2H, J = 12 Hz); 8.1 (d, 2H, J = 12 Hz.) **5**

   C) Taking appropriate example explain the utility of HRMS in determining the exact molecular formulae. **4**

7. Write a note on (**any three**) : **14**

   A) Nuclear Overhauser effect

   B) Study of H-bonding by IR spectroscopy

   C) Cosy spectroscopy

   D) McLafferty rearrangement.

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Seat No.

M.Sc. – II (Semester – III) Examination, 2014
ORGANIC CHEMISTRY (Paper – XI)
Advanced Synthetic Methods

Day and Date : Friday, 25-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

N.B. : 1) Attempt in **all 5** questions.
     2) Section **I** (question **one**) is **compulsory**.
     3) Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.
     4) Answers to **all 5** questions (from **I, II, III**) should be written in the **one** and **same** answer book.
     5) **All** questions carry **equal** marks.
     6) Figures to the **right** indicate **full** marks.
     7) **Use** of log tables and calculators is **allowed**.

SECTION – I

1. a) Predict the product(s) in the following reactions :   **7**

vi) $\xrightarrow[\text{ii) } H_3O^+]{\text{i) } g-BBN}$?

vii) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-\overset{\overset{O}{||}}{C}-Ph \xrightarrow[H^+]{MCPBA}$?
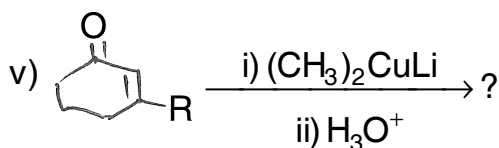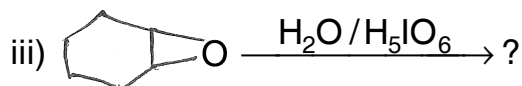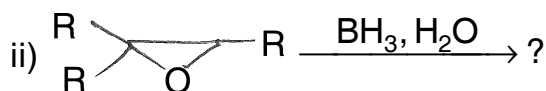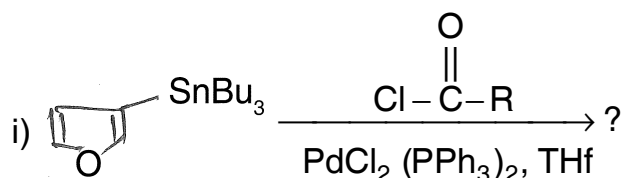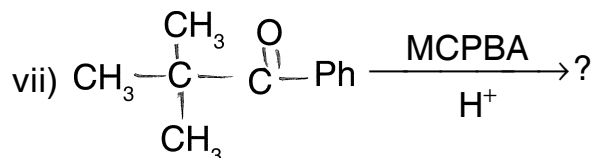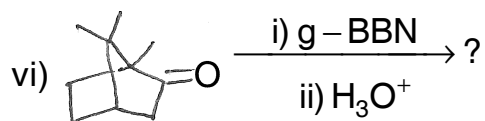
b) Choose the correct option for followings :   **4**

   i) A group whose use makes possible to react a less reactive functional group selectivity in the presence of a more reactive group is known as _____

   a) Umploungh   b) Synthon

   c) Synthetic equivalent   d) Protecting group

   ii) The coupling of terminal alkynes with aryl or vinyl halides in the presence of Pd(O) is known as _____ reaction.

   a) Stille coupling   b) Sonogishira

   c) Suzuki   d) Wittig

   iii) Which of the following compounds act as protecting group for alcohols ?

   a) Ethers   b) Acetals

   c) Ketals   d) All of these

   iv) Ketone can be converted directly into ester by the use of _____

   a) $(C_2H_5O)_3$ Al   b) O_3

   c) Peracids   d) All of these

c) Write the synthetic equivalents for the following TM :   **3**

   i)

   ii) $CH_3O - CH_2 - CH_2 - CH_2 - CHO$

   iii)
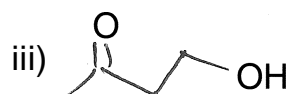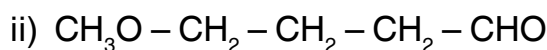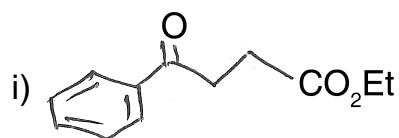
SECTION – II

2. a) Discuss the synthetic methods of EE, EZ and ZZ dienes with the help of organo boranes.   **7**

   b) Describe Pauson-Khand reaction for the synthesis of cyclopentenones in detail.   **7**

3. a) Find A and B in the following :   **7**

   i) $\xrightarrow{Fe_2(CO)g}$ [A] $\xrightarrow{RCOCl/AlCl_3}$ [B]

   ii) $\xrightarrow[\text{ii) Me}_3\text{SiCl}]{\text{i) LDA}}$ [A] $\xrightarrow{Ph-CH_2Br}$ [B]

   iii) $\xrightarrow{Sn\ Sn\ Bf_3}$ [A] $\xrightarrow[\text{Ni}]{\text{Raney}}$ [B].
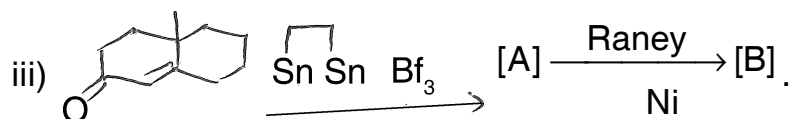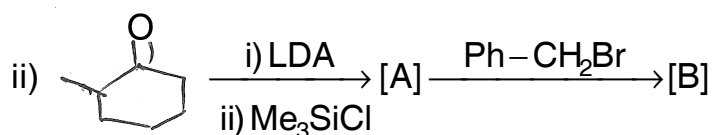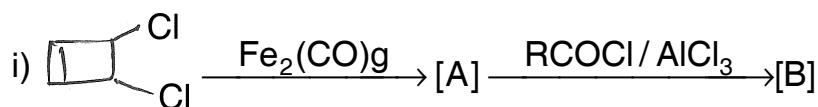
   b) Define regio selectivity. Discuss regioselective alkylation of ketones and regio selectivity in Michael reaction.   **7**

4. a) Predict the product(s) with mechanism.   **7**

   i) $\xrightarrow[\text{AIBN, Toluene}]{Bu_3SnH}$?

   ii) $\xrightarrow[\text{CH}_2\text{Cl}_2,\ 0°C]{\text{IBx}}$?

   iii) $\xrightarrow[\text{dioxane, HCl, } \Delta]{pd(pph_3)_4}$?
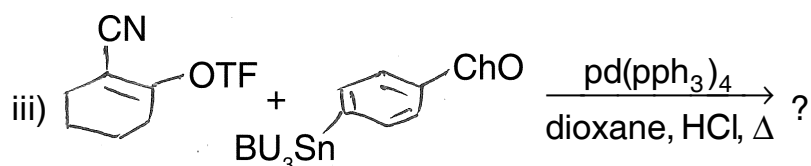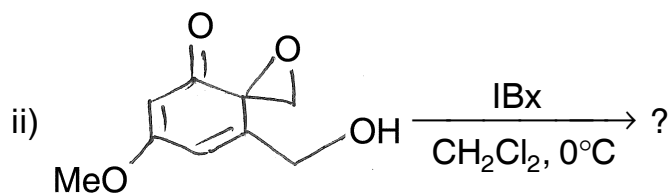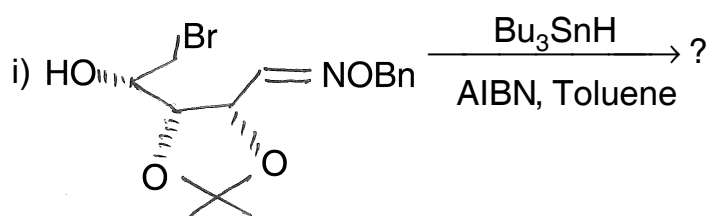
   b) Write down methods of preparation of ferrocene. Discuss its structure and bonding.   **7**

SECTION – III

5. a) Define and explain the terms : **5**

     i) Functional Group Interconversion (FGI)

     ii) Retro synthetic analysis.

   b) Describe Wacker oxidation. **5**

   c) Describe functions of organo cobalt complexes in organic synthesis. **4**

6. a) Predict the product(s) with mechanism and identify reaction involved in it. **5**

     i) $\overset{Cl}{\diagup} + CH_3 - C \equiv C - H \xrightarrow[\text{CuI, BuNH}_3]{\text{Pd (PPh}_3)_4}$?

     ii) $\underset{N}{\diagup}{-Br} + \underset{N}{\diagup}{-B(OH)_2} \xrightarrow[\text{Et}_4\text{NBr KOH}]{\text{Pd (PPh}_3)_4}$?
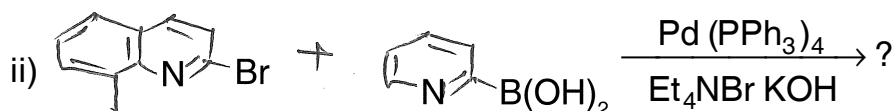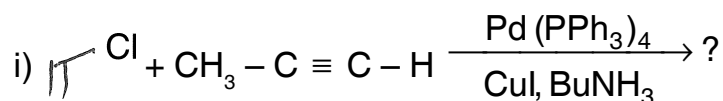
   b) Describe Heck reaction with suitable examples. **5**

   c) Find A, B, C and D in the following : **4**

$$CH_3-\overset{O}{\overset{||}{C}}-H \xrightarrow{\text{Sn Sn , H}^+} [A] \xrightarrow{\text{NaOEt}} [B] \xrightarrow{\underset{O}{CH_2-CH-Ph}} [C]$$

$$[C] \xrightarrow{\text{HgCl}_2, H_2O} [D]$$
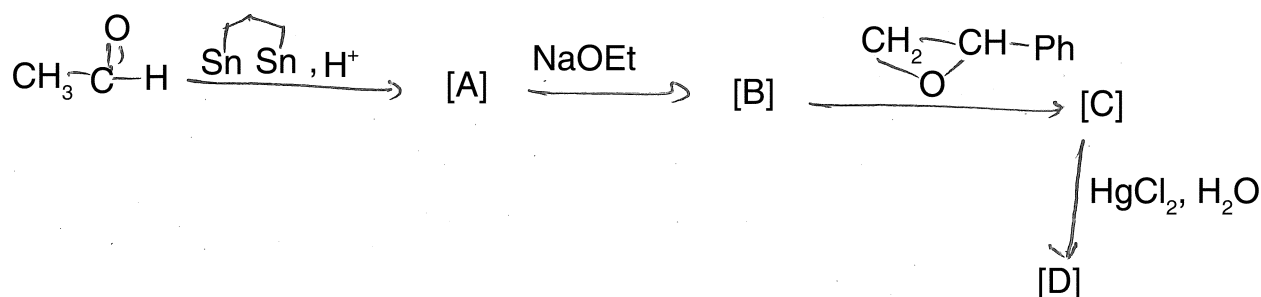
7. Write note on (**any three**) : **14**

   a) Ozonolysis

   b) Amine synthesis

   c) Umploung concept

   d) Protection of carboxylic group.

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Seat
No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
ORGANIC CHEMISTRY (Paper – XII)
Drugs and Heterocycles

Day and Date : Monday, 28-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

N.B. : 1) Attempt in **all five** questions.
2) Section – **I** (question **one**) is **compulsory**.
3) Attempt **any two** questions from Section – **II** and **any two** questions from Section – **III**.
4) Answer to **all 5** questions (from Section – **I, II, III**) should be written in the **one** and the **same** answer book.
5) **All** the questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.

SECTION – I

1. a) Draw the correct structure of the following drugs   **7**

    i) Amoxicillin   ii) Tetracyclines

    iii) Trimethoprim   iv) Methadone

    v) Oxyphenbutazone   vi) Reserpine

    vii) Zidovudine.

   b) Predict the product(s) of the following reactions   **7**

    i) Acetyl acetone + Phenyl Hydrazine $\longrightarrow$?

    ii) O – Toluidine $\xrightarrow[\text{HNO}_2,\, 5°C]{\text{HCL}}$? $\xrightarrow{\text{base}}$?

    iii) 1, 2 - Diaminobenzene + Acetic Acid $\xrightarrow[100°C]{\Delta}$?

P.T.O.

iv) Aniline + $CH_3 - CH = CH - C \overset{O}{\underset{H}{\diagdown}} \xrightarrow{H^{\oplus}}$?

v) Coumarin + $Br_2 \longrightarrow$?

vi) Oxirane + Phenyl Magnesium bromide $\xrightarrow[\text{ii) } H^+/H_2O]{\text{i) ether}}$?

vii) Thiirane + Sodium Metaperiodate $\xrightarrow[20-25°C]{}$?
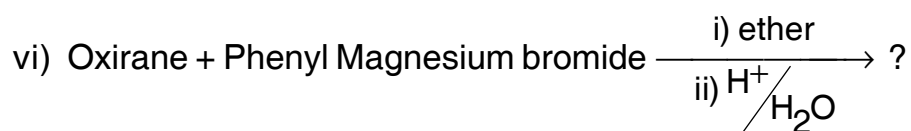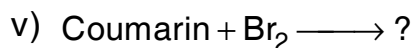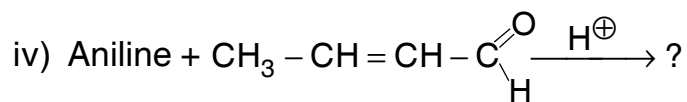
SECTION – II

2. a) What are Antibiotics ? Discuss the synthesis and uses of Ampicillin.   **7**

   b) What are antimalarials ? Explain the synthesis and mechanism of action of Trimethoprim.   **7**

3. a) What are analgesic and antipyretics ? Discuss the synthesis and mechanism of action of Meperidine.   **7**

   b) What are anti-inflammatory drugs ? Describe the synthesis and mechanism of action of Indomethacin.   **7**

4. a) Why tuberculosis is a infectious disease ? Explain the synthesis, mechanism of action and applications of Ethambutol.   **7**

   b) Write notes on **any two** of the following drugs :   **7**
      i) Dapsone
      ii) Thiopental sodium
      iii) Methyldopa.

SECTION – III

5. a) Describe the cyclization reaction of open chain to aziridine ring is stereospecific. What is the action of following on aziridine ?   **5**
      i) HCl
      ii) CH_3COCl
      iii) Vinyl cyanide.

b) Discuss Fisher-Indole synthesis by using suitable examples and suggest the mechanism. What is the action of following on Indole ? **5**

   i) CH_3I (excess)

   ii) Phenyl Magnesium bromide

   iii) n-BuLi

c) Explain ring closure methods of α – halohydroxy compounds to oxirane derivatives with the help of stereochemistry. **4**

6. a) Give the synthesis of oxazoles from α – acylamino ketones, esters and amides and suggest the mechanism of reaction. **5**

b) Synthesis of thiazole derivatives by different methods with mechanism. **5**

c) How will you synthesis benzofuran from coumarin and aryl-2-chloropropene ethers and suggest the mechanism of reaction. **4**

7. Write notes on **any three** of the following : **14**

   i) Purins

   ii) Isoquinolines

   iii) Pyrimidines

   iv) Triazines.

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Seat No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
ORGANIC CHEMISTRY (Paper – XIII)
Theoretical Organic Chemistry

Day and Date : Tuesday, 22-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all 5** questions.
2) Section – **I** is **compulsory**.
3) Attempt **any two** questions from Section – **II** and **any two** from Section – **III**.
4) Answer to **all** questions should be written in the **same** answer book.
5) **All** questions carry **equal** marks.
6) **Use** of log-table and calculator is **allowed**.

SECTION – I

1. A) Answer the following :   **14**

    i) Which molecular orbitals are involved in FMO theory ?

    ii) Name the two factors that decide the stereochemistry of electrocyclic reactions.

    iii) Explain the aromaticity of [10] annulenes.

    iv) How many signals are observed in the CNMR spectrum of Buckminster fullerene ?

    v) Write the structure of AIBN.

    vi) What are catenanes ?

    vii) Which technique is used to confirm the actual cleavage during ester hydrolysis ?

    viii) Write the product(s) in the following :
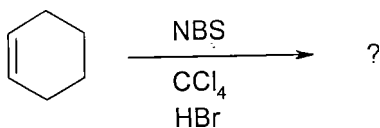
B) State whether **true** or **false** :

   ix) Sulphonation of naphthalene is thermodynamically controlled process at low temperature.

   x) Azulene undergoes Diels-Alder reaction efficiently at room temperature.

C) Fill in the blanks :

   xi) The charge density in the following molecule is _____
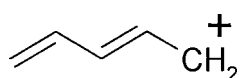
   xii) β-Cyclodextrin contains _____ glucose units.

D) Select the most correct alternative for **each** of the following :

   xiii) Tropylium cation is _____
      a) aromatic   b) anti-aromatic
      c) non aromatic   d) heteroaromatic

   xiv) The metal used for coupling of alkynes is _____
      a) Cu   b) Fe   c) Pd   d) Ni

SECTION – II

2. a) Applying perturbational molecular orbital theory, calculate the reactivity index (NE) when naphthalene undergoes SE reaction at position 1 and 2. **7**

   b) With the help of correlation diagram and FMO approach show that Diels-Alder reaction is thermally allowed process. **7**

3. a) Calculate the delocalization energy in the following and on that basis explain the stability. **7**
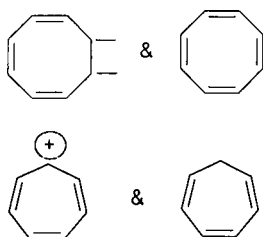
b) Write the necessary selection rule and give stereochemistry of the product that you would expect from each of the following pericyclic reactions. **7**

i) $\xrightarrow{\Delta}$?

ii) + $\xrightarrow{hv}$? + ?

iii) + $\xrightarrow{\Delta}$?

iv) + $\xrightarrow{\Delta}$?
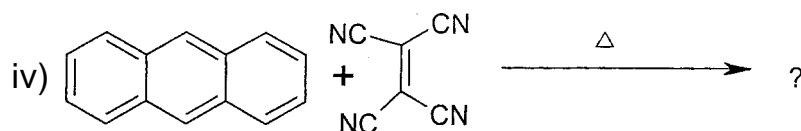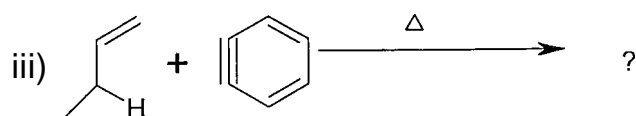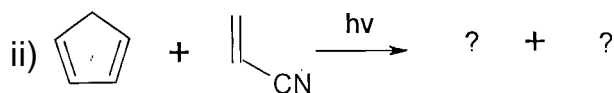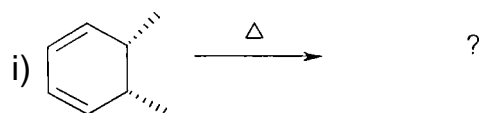
4. a) What are free radicals ? How are they detected ? Explain the mechanism of Sandmeyers reaction and Hunsdiecker reaction. **7**

b) Predict the products giving suitable mechanism. **7**

i) $\xrightarrow[\text{AIBN}]{\text{TBTH}}$? + ?

ii) $\xrightarrow[\text{OH}^-]{\overset{+}{\text{H}}, hv}$?

iii) MeO—⟨ ⟩—OH + $\xrightarrow[\text{K}_2\text{CO}_3]{\text{Cu}}$?

iv) $\xrightarrow[\text{OH}^-]{\text{NaNO}_2}$?
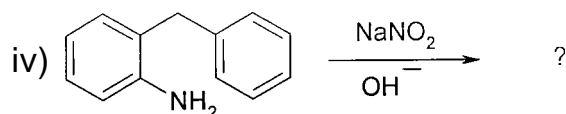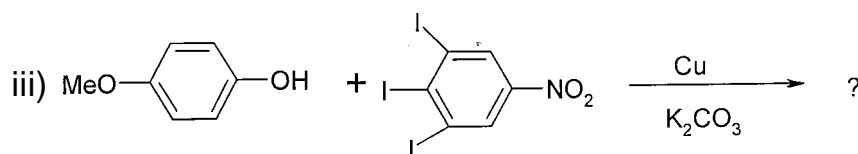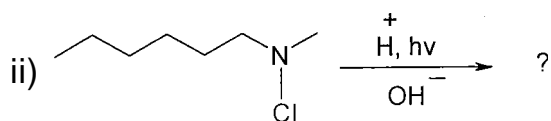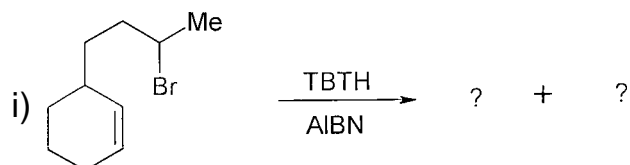
SECTION – III

5. a) Write explanatory note on the mechanisms of different types of base catalyzed hydrolysis of esters. **5**

   b) Give the explanation for the following : **5**

   i) The configuration of product olefin in the Wittig reaction depends on the nature of ylide used in the reaction.

   ii) The Diels-Alder reaction of cyclopentadiene with maleic anhydride results in endo product at room temperature while exo product at elevated temperature.

   c) Explain Claisen rearrangements with suitable examples. **4**

6. a) Explain various methods to prepare tropylium salts. **5**

   b) What are crown ethers ? Who discovered them ? Write the preparation, structures and applications of 12-crown-4 and 18-crown-6. **5**

   c) Explain various electrophilic substitution reactions of ferrocene. **4**

7. Write notes on **(any three)** : **14**

   a) Huckels rule of aromaticity

   b) Hunsdiecker reaction

   c) Cope rearrangements

   d) Alternant and non alternant hydrocarbons.

_____

Seat No.

M.Sc. – II (Semester – IV) Examination, 2014
ORGANIC CHEMISTRY
Stereochemistry (Paper – XIV)

Day and Date : Thursday, 24-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

N.B. : i) *Section I is* **compulsory**.

ii) *Attempt* **any two** *questions from Section II and* **any two** *from Section* **III**.

iii) *Answers to* **all** *questions (Section I, II, III) should be written in* **one** *answer book.*

iv) **All** *questions carry* **equal** *marks.*

v) *Figures to the* **right** *indicate* **full** *marks.*

vi) **Use** *of log tables and calculators is* **allowed**.

SECTION – I

1. Answer the following :

A) Predict the product with appropriate stereochemistry.   **10**

a) [structure] $\xrightarrow{\text{1) NBS}}{\text{2) 30\% NaOH}}$

b) [structure] $\xrightarrow{\text{NaBH}_4}$? (major) + ? (minor)

c) [structure] $\xrightarrow[\text{EtOH}]{\text{NaBH}_4}$?

d) $\xrightarrow[\substack{Ti(0.i-Pr)_4 \\ L(+)DET}]{t-BuOOH}$?

e) $\xrightarrow{CH_3MgBr}$ A(major) + B (minor)

f) Ph $\xrightarrow{S-BINAL-H}$?

g) $\xrightarrow{H_2/Ni}$ A + B

h) $\xrightarrow[\Delta]{C_6H_5N(Et)_2}$ A + B

i) $\xrightarrow[H^+/H_2O]{I_2/CH_3COOAg}$?

j) $\xrightarrow{Ag_2O}$?
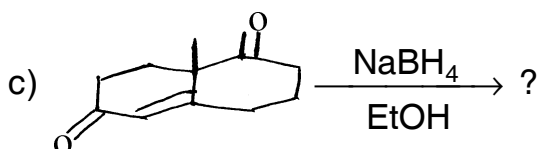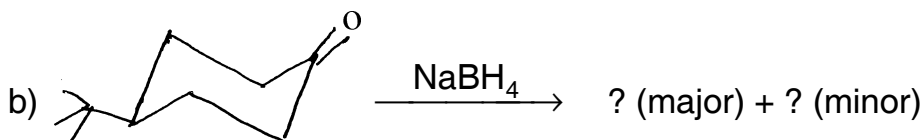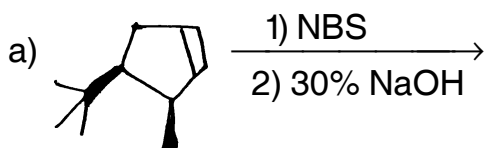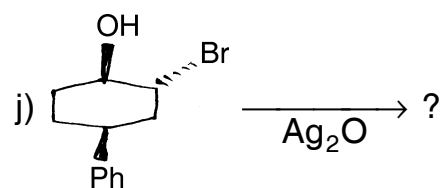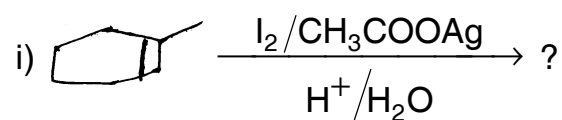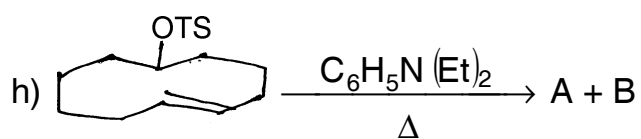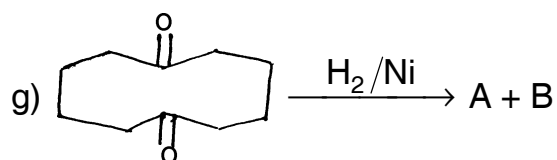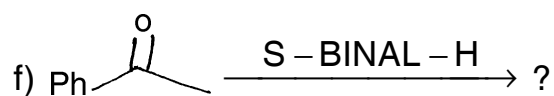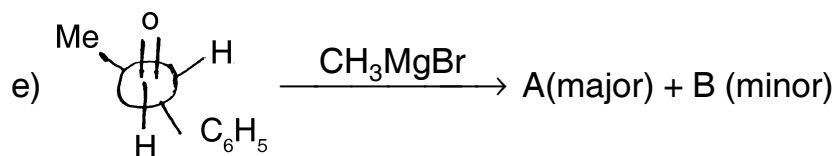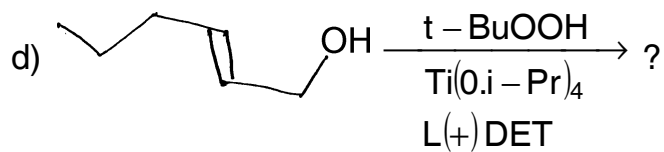
B) Assign R/S configuration to the following : **4**

k)

l)

m)

n)
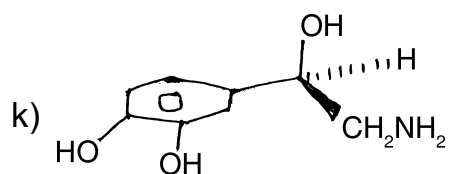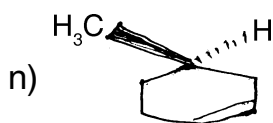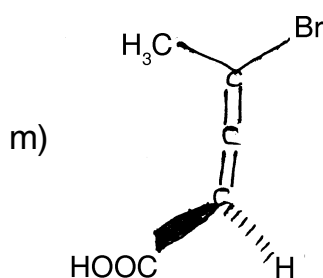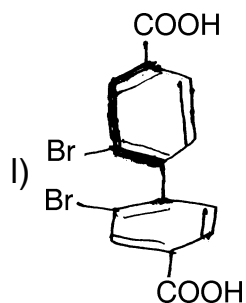
SECTION – II

2. A) Define enantioselective synthesis. Explain enantioselective synthesis via chiral oxazolines.   **7**

   B) State and explain Curtin-Hammett principle with suitable examples.   **7**

3. A) Describe the methods for the determination of configuration in ring system.   **7**

   B) Discuss the effects of conformations on reactivity of diastereomers with respect to   **7**

   i) Ionic elimination reactions

   ii) Intramolecular rearrangement.

4. A) Explain the case of ring closure as a function of ring size, nature and degree of substitution of the ring.   **7**

   B) What is stereoselective synthesis ? Describe with suitable examples.   **7**

   i) Stereoselective synthesis via chiral reagent

   ii) Stereoselective synthesis via chiral substrate.

SECTION – III

5. A) Draw the conformations of cis/trans g-methyl decalins and comment on their stability and optical activity.   **5**

   B) Explain the stereochemical restriction in bridged ring systems with the help of Bredl rule.   **5**

   C) Draw conformations of cis and trans 1, 4 dimethyl cyclohexane. Explain which is more stable. Why ?   **4**

6. A) Explain enantiomeric excess (ee) with example.   **5**

   B) Draw different conformation of perhydrophenanthrene and explain stability.   **5**

   C) Explain why cis-decalin shows a single sharp peak in its ^{1}H-NMR spectrum while transdecalin shows a resolved broad band.   **4**

7. Write short notes on (**any three**) :   **14**

   i) Concept of I-strain

   ii) Felkin-Ahn model

   iii) Distereoselectivity in Aldol reactions

   iv) Conformations of 5, 7 and 8 membered ring and stability.

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Seat
No.

M.Sc. II (Semester – IV) Examination, 2014
ORGANIC CHEMISTRY
Chemistry of Natural Products (Paper – XV)

Day and Date : Saturday, 26-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

N.B. : 1) Attempt in **all 5** questions.

2) Section **I** is **compulsory**.

3) Attempt **any two** questions from Section – **II** and **any two** from Section – **III**.

4) Answers to **all** questions (Section **I, II** and **III**) should be written in the **one** answer book.

5) **All** questions carry **equal** marks.

6) Figures to the **right** indicate **full** marks.

7) **Use** of log tables and calculators is **allowed**.

SECTION – I

1. A) Fill in the blanks :   **6**

   1) Podophyllotoxin bears _____ chiral centres.

   2) Camptothecin is having _____ ring structure.

   3) Strychnine is an _____ of the glycine receptor.

   4) Reserpine is the main constituent of _____ species.

   5) Atropine is _____ type of alkaloid.

   6) Zingiberine is _____ terpenoid.

   B) Answer the following questions :   **4**

   1) Phenyl alanine is biosynthesised through which pathway ?

P.T.O.

2) Elucidate Furan ring in Hardwickiic acid.

3) Citral belongs to which class of terpenoid ?

4) Which compound is used for biosynthesis of ephedrine ?

C) Predict the products. **4**

1) Reserpine $\xrightarrow{\text{LiAlH}_4}$? + ?

2) Yobyrine $\xrightarrow{\text{CrO}_3}$?

3) Strychnine $\xrightarrow[\text{distillati on}]{\text{soda lime}}$? + ? + ?

4) $\xrightarrow[\text{ii) R–C–H}]{\text{i) NaH}}$?
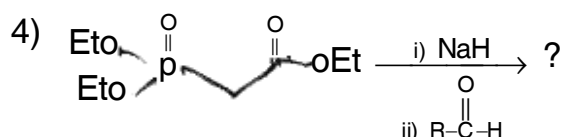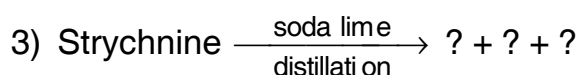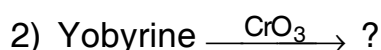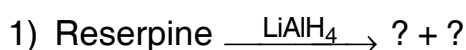
SECTION – II

2. A) What is steroid ? Give the synthesis of mifepristone starting from oestrone. **7**

   B) Explain the stereochemistry of following in reserpine : **7**

   i) D/E ring junction

   ii) Configuration at C_3 and C_{17}.

3. A) Explain the biosynthesis of strychnine using tryptophan as precursor. **7**

   B) Justify the position of tertiary methyl at C-5 and C-9 in Harduickiic acid. **7**

4. A) Describe the Shikimate pathway for the biosynthesis of cinnamic acid. **7**

   B) Write down biosynthesis of coumarins from cinnamic acid. **7**

SECTION – III

5. A) Write down the biosynthesis of isoprene unit from acetic acid. **5**

   B) Describe mode of action of camptothecin. **5**

   C) Write down biosynthesis of isoflavonoide from cinnamic acid. **4**

6. A) What is isoprene unit ? Give the classification of terpenoids with suitable examples. **5**

   B) Define lignins. Show its biosynthesis from coniferyl alcohol. **5**

   C) Write down biosynthesis of morphine from tyrosine. **4**

7. Write short notes on **(any three) :** **14**

   a) Structure of Yobyrine.

   b) Biosynthesis of Methionine from folic acid.

   c) Biological role of vitamin B_6 in transamination

   d) Role of biotin in carboxylation Rx.

Seat No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
ORGANIC CHEMISTRY
Applied Organic Chemistry (Paper – XVI)

Day and Date: Tuesday, 29-4-2014　　　　　　　　　　　　　Total Marks: 70
Time: 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
　　　　　　　　2) Section – **I** (question **one**) is **compulsory**.
　　　　　　　　3) Attempt **any two** questions from Section – **II** and **any two**
　　　　　　　　　 questions from Section – **III**.
　　　　　　　　4) Answer to **all five** questions (from Section **I, II, III**) should be
　　　　　　　　　 written in the **one** and the **same** answer book.
　　　　　　　　5) **All** the questions carry **equal** marks.
　　　　　　　　6) Figures to the **right** indicate **full** marks.

SECTION – I

1. a) Define the terms of the following :　　　　　　　　　　　　　**14**
　　　 i) Merrifield resin
　　　 ii) Green chemistry
　　 iii) Enzymes
　　 iv) Atom economy
　　　 v) Ultrasound
　　 vi) Ionic liquid
　　 vii) Multicomponent synthesis
　 viii) Epimers
　　 ix) Anomers
　　　 x) Disaccharides
　　 xi) Monosaccharides
　　 xii) Tollen's reagent
　 xiii) Mutarotation
　 xiv) Carbohydrates.

P.T.O.

SECTION – II

2. a) What are enzymatic reduction reactions ? Explain with suitable examples with stereochemistry. **7**

   b) What are effects of additives on stereoselectivity in reduction reactions by using Baker's yeast enzyme ? **7**

3. a) Why water is used for organic reactions in green chemistry ? Describe the different aqueous phase reactions with suitable examples. **7**

   b) What is atom economy in green chemistry ? Explain the concept of atom economy with different green reactions. **7**

4. a) Explain : Green chemistry principles; design for energy efficiency, use of renewable feed stocks, reduce derivatives, catalysis. **7**

   b) Write notes on the following : **7**

      i) Crown ethers ii) One pot synthesis

SECTION – III

5. a) Discuss the D and L configuration with suitable examples. **5**

   b) Why was the open chain structure of glucose discarded in favour of cyclic structure ? **5**

   c) Describe the chain lengthening method of aldose. **4**

6. a) Describe the preparation of glucosazone based on osazone formation. **5**

   b) Explain the following conversions : **5**

      i) D-Glycopyranose $\xrightarrow[\text{Reflux}]{\text{CH}_3\text{OH/HCl}}$ xylotrimethoxy glutaric acid.

      ii) D-Glycofuranose $\xrightarrow[0°\text{C}]{\text{Methanol/HCl}}$ dimethoxy succinic acid.

   c) How the D-glucose and D-mannose are C_2-epimers ? Explain based on epimerisation **4**

7. Write notes on (**any three**) : **14**

   i) Kiliani-Fischer's synthesis

   ii) Glycoside

   iii) Anomeric effect

   iv) Size of the oxide ring in glucose.

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Seat No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
INDUSTRIAL CHEMISTRY (Paper – IX)
Unit Operations of Chemical Engineering

Day and Date : Monday, 21-4-2014

Total Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all 05** questions.
2) Section **I** is **compulsory**.
3) Attempt **any two** questions from Section **II** and **any two** from Section **III**.
4) Answers to **all** questions (Section **I, II** and **III**) should be written in the **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.
7) **Use** of log tables and calculators is **allowed**.

SECTION – I

1. **Compulsory** (**One** mark **each**) : **14**

   i) Suggest an evaporator for viscous solutions with scale formation.

   ii) What is a counter current condenser ?

   iii) A constant boiling mixture is known as _____

   iv) The distillation method in which the liquid and vapour are allowed to attain equilibrium is called _____

   v) Give an example of extraction with reflux.

   vi) Mention the use of Dorr agitator.

   vii) Plate and frame press are advantageous over chamber press. Why ?

   viii) For what purpose Grizzles are used ?

   ix) What is the use of cyclones ?

   x) How does the Cottrell precipitator works ?

P.T.O.

xi) Define fractional void age used in filtration theory.

xii) Mention the two stages of crystallization.

xiii) Mention any one significance of drying.

xiv) The Blake and Dodge crushers belong to which type of crushers ?

SECTION – II

2. a) Describe with a neat diagram working of horizontal tube evaporator. **7**

   b) Discuss the working of Valve and Sieve plate columns in distillation with neat sketch. **7**

3. a) Describe the working of Dorr agitator extractor with a neat sketch. **7**

   b) Describe the fractional distillation with a neat process flow diagram. **7**

4. a) Discuss the classification of filters and explain the working of sand fitter. **5**

   b) Describe the advantages of packed towers in gas absorption. **5**

   c) Explain with neat diagrams what are parallel and counter current condensers. **4**

SECTION – III

5. a) Discuss the construction and working of upturned and deflector type entrainment separators. **5**

   b) Explain the working of Compartment tray dryer. **5**

   c) Discuss the significance of filter aids. **4**

6. a) Describe the working of Swenson Walker crystallizer with a neat sketch. **5**

   b) Explain the construction and working of a Cyclone for separation of solids from fluids. **5**

   c) Discuss the advantages and disadvantages of filter press. **4**

7. Write notes on **any three** : **14**

   a) Effect of scale formation on evaporation

   b) Classification of crystallizers

   c) Counter current extraction

   d) Membrane separations.

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Seat No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
INDUSTRIAL CHEMISTRY (Paper – X)
Unit Processes in Chemical Technology

Day and Date : Wednesday, 23-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all 05** questions.
2) Section **I** is **compulsory**.
3) Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.
4) Answers to **all** questions (Section **I**, **II** and **III**) should be written in the **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.
7) **Use** of log tables or calculator is **allowed**.

SECTION – I

1. Answer the following : **14**
   a) What are the uses of sulphonates ?
   b) What is sulphoxidation ?
   c) What is hydrogenation ?
   d) What is calcination ?
   e) What is double decomposition ?
   f) What is amination by reduction ?
   g) What is nitric ratio ?
   h) What is the boiling point ($^\circ$C) of chloral ?
   i) What are the uses of ethyl acetate ?
   j) What is hydrolysis ?
   k) Complete the following reactions.

    $+ NO_2OH \rightarrow$?

l) $+ HO.NO_2 \rightarrow ?$

m) $+ HNO_3 \rightarrow ?$

n) $+ COCl_2 \rightarrow ?$
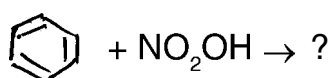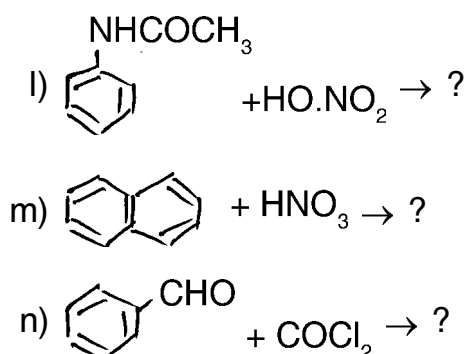
SECTION – II

2. a) What are unit processes ? Discuss nitration of benzene with HNO_3 – fortified spent acid. **7**

   b) What is sulphonation ? Discuss industrial equipment and techniques. **7**

3. a) How is monochloroacetic acid manufactured ? What are its properties and uses ? **7**

   b) Explain in brief manufacturing process, properties and applications of vinyl acetate. **7**

4. a) What is polymerization ? Discuss with suitable examples addition polymerization and condensation polymerization. **7**

   b) Give a brief account of chlorination, bromination and fluorination reactions. **7**

SECTION – III

5. a) What are nitrating agents ? **5**

   b) What are sulphonating agents ? **5**

   c) Discuss preparation, properties and uses of polypropylene. **4**

6. a) Discuss the types of oxidative reactions. **5**

   b) Discuss nitration of acetylene. **5**

   c) What is photohalogenation ? **4**

7. Write notes on **any three** of the following : **14**

   a) Chlorobenzene

   b) Alkyd resins

   c) Nitrate esters

   d) Esterification by organic acid.

_____

Seat No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
INDUSTRIAL CHEMISTRY (Paper – XI)
Pollution Monitoring and Control

Day and Date : Friday, 25-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
                2) Section – **I** is **compulsory**.
                3) **All** questions carry **equal** marks.
                4) Answer to the **all** questions (Section – **I, II, III**) should be written in the **same** answer book.
                5) Figure to the **right** indicate **marks**.
                6) Attempt at least **two** questions from Section – **II** and **any** **two** questions from Section – **III**.
                7) **Use** of log table and calculator is **allowed**.

SECTION – I

1. Answer the following :   **14**

    a) National Ambient Air Quality Standards (NAAQS) are based on the effect of air pollutant on _____ and _____

    b) What are Environmental legislation ?

    c) Write the full form of VOC's, POC's and PCB's.

    d) What are BOD and COD ?

    e) Name the currently practiced waste water treatment methods used in oil refineries.

    f) What is monitoring ?

    g) Name the Spectrophotometric method used for the analysis of H_2S gas.

h) Draw the structure of 'Pb-Dithiozone' and Cd-Dithizone complexes.

i) Non-Dispersive Infrared Analyses (NDIR) is used for monitoring and analysis of _____ pollutant.

j) What is the purpose of legal standards ?

k) Absorption, adsorption, condensation and incineration are the process used for the removal of _____ pollutant.

l) Coal based thermal power plants are responsible for the emission of pollutants like _____

m) What is aim of air quality monitoring ?

n) The 'CPCB' of India has evolved the certain minimum industry specific effluent standard at the national level which are designation _____

SECTION – II

2. a) Explain the nature of industrial effluents. What is the composition of liquid effluents of Petrochemicals and oil refineries ? How does organic chemicals are recovered from liquid effluents generated by oil refineries ? **7**

b) Discuss Indian Standards for effluents discharge on land and explain in brief legal provisions made under water (Prevention and Control of Pollution) Act – 1974. **7**

3. a) Discuss the methods used for the removed and recovery of trace heavy metals from industrial effluents. **7**

b) How industries are responsible for air pollution ? What are effects of air pollutants on living and nonliving things ? **7**

4. a) What are the objectives of Air (Prevention and Control Board) Act – 1981 ? Discuss the statutory functions of Central Pollution Board. (CPCB). **7**

b) Which ingredients are covered under statutory definition of air pollutants ? Give the constitution of Central and State pollution control boards. Discuss emission standards for Sugar and Explosive industries. **7**

SECTION – III

5. a) How does Mercury and Cadmium determined ? What are their effects on human beings ? **5**

   b) Describe the recovery of trace organic chemicals from Liquid effluents. **5**

   c) Explain removal of particulate matter using electrostatic precipitation technique. **4**

6. a) Describe the monitoring and analysis of Sulphur dioxide (SO2) using West Gaeke spectrophotometric technique. **5**

   b) Discuss the methods used for the removal of Phenolic residue petroleum residue from petroleum waste effluents. **5**

   c) Discuss activated sludge process. **4**

7. Write short note on **any three** of the following : **14**

   a) MINAS for Distilleries and pesticide industries

   b) Analysis of Copper and its recovery

   c) Recycling of polymer waste

   d) NDIR technique.

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SLR-VD – 2

Seat No.	

M.Sc. – I (Semester – I) Examination, 2014
CHEMISTRY (Paper – II)
Organic Chemistry – I

Day and Date : Wednesday, 23-4-2014　　　　　　　　　　　Max. Marks : 70
Time : 11.00 a.m. to 2.00 p.m.

Instructions : 1) Attempt in **all five** questions.
　　　　　　　2) Q. **1** is **compulsory**. Attempt **any two** questions from question numbers **2-4** and **any two** questions from question numbers **5-7**.
　　　　　　　3) Answers to **all** questions should be written in the **same** answer book.
　　　　　　　4) **All** questions carry **equal** marks.
　　　　　　　5) Figures to **right** indicate **full** marks.
　　　　　　　6) **Neat** labeled diagrams should be drawn **wherever** necessary.
　　　　　　　7) **Use** of log-table and calculator is **allowed**.

SECTION – I

1. A) Select most correct alternative for **each** of the following :　　　　　**3**

　　i) Among the following which is a soft acid ?

　　　a) BF_3　　　　　b) BH_3　　　　c) AlH_3　　　　d) $C_6H_5^+$

　　ii) The relative reactivity order of alkyl halide in SN^1 reaction is _____
　　　a) 3° alkyl halide > 2° alkyl halide > 1° alkyl halide
　　　b) 3° alkyl halide > 1° alkyl halide > 2° alkyl halide
　　　c) 3° alkyl halide < 2° alkyl halide < 1° alkyl halide
　　　d) all alkyl halides are equally reactive

　　iii) Curtius rearrangement involves the pyrolysis of an _____
　　　a) phenyl acetate　　　　　　　b) acyl halide
　　　c) acyl azide　　　　　　　　　d) ester of hydroxamic acid

P.T.O.

B) Fill in the blanks : **3**

   i) In a compound, which can eliminate to give different alkenes, the move highly substituted alkene is the major product. This generalisation is known as _____

   ii) Oxime of _____ compound on Beckmann rearrangement gives $\in$ caprolactum.

   iii) 10 –30% SO_3 in conc.H_2SO_4 used in sulphonation of benzene is known as _____

C) State whether the statement is **correct** or **false** : **3**

   i) The ease with which an acid-base reaction takes place depends on the hardness or softness of the acid or base.

   ii) Halogens are ortho/para-directing activating groups.

   iii) In erythro isomer, the similar groups at the two adjacent non equivalent chiral centres are on the opposite side of the Fischer projection.

D) Predict the product (s) : **5**

i)

$$\xrightarrow{\quad Br_2 \quad} ?$$

ii)

$$\xrightarrow[\text{Ti}\left(OP_r^i\right)_4 / TBH_4]{(-)\, DET} ?$$

iii) $Ar - CH_2 - CH - CH(CH_3)_2 \xrightarrow{\quad base \quad} ? + ?$
                    |
                   Br

iv)

$$\xrightarrow[H_2SO_4]{SO_3} ?$$

v)

$$\xrightarrow[\text{ii)}\ H_2O]{\text{i)}\ \Delta} ?$$
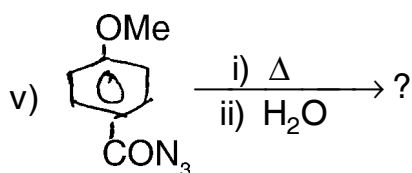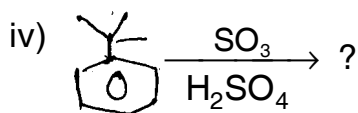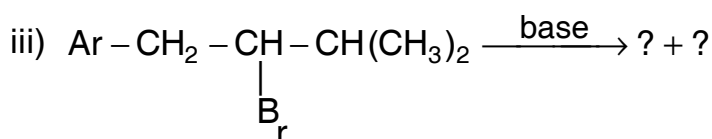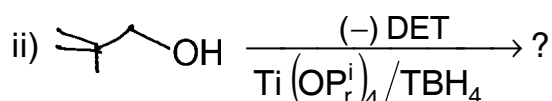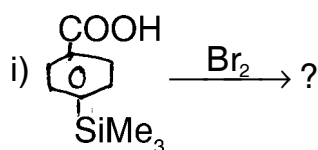
SECTION – II

2. A) Outline the mechanism for the following conversion :
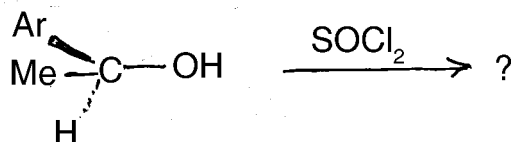
   $$\underset{\substack{Me \\ H}}{\overset{Ar}{\underset{|}{C}}} \text{—OH} \xrightarrow{SOCl_2} ? \qquad 7$$

   B) Discuss the generation, structure and reactions at nitrene. **7**

3. A) Give in details the account of the sharpless epoxidation. **7**

   B) Complete the following reaction. Discuss its mechanism. **7**

   $$\xrightarrow{KNH_2/NH_3} ?$$
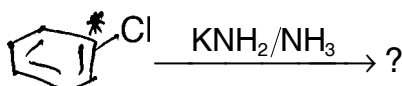
4. A) Discuss the effect of structure of substrate, strength of base, leaving group and solvent on the rate of E1 reaction. **7**

   B) Assign the product and mechanism of the following reaction. **7**

   $$\xrightarrow{NaOBr} ? + ?$$
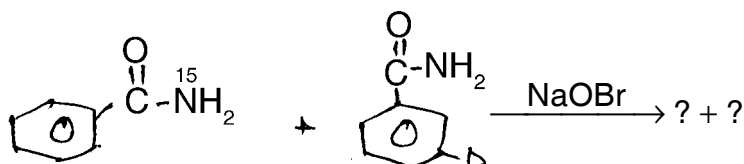
SECTION – III

5. A) Discuss conformational analysis of 1,4-dissubstituted cyclonexanes. **5**

   B) What are different types of reaction intermediate ? Give one example of each type with respect to reaction involving their formation. **5**

   C) Outline the mechanism involved in addition of borane to carbon-carbon double bond. Discuss its stereochemistry. **4**

6. A) Give an account of nucleophilic substitution at a vinylic carbon. **5**

   B) Complete the following reaction and give its mechanism. **5**

   $$\text{Phenyl acetate} \xrightarrow{AlCl_3} \begin{cases} \xrightarrow{60°C} ? \\ \xrightarrow{160°C} ? \end{cases}$$
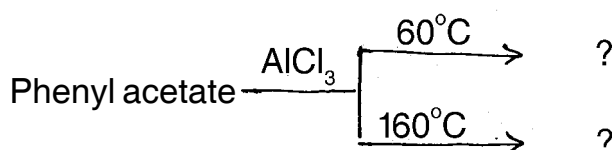
C) Assign E and Z nomenclature for the following isomers :   **4**

i)
$$\underset{Br}{\overset{H_3C}{\diagdown}}C=C\underset{Cl}{\overset{H}{\diagup}}$$

ii)
$$\underset{H}{\overset{H_5C_6}{\diagdown}}C=N{\diagdown}OH$$

iii)
$$\underset{}{\overset{Ph}{\diagdown}}N=N{\diagdown}Ph$$

iv)
$$H_3C{\overset{H}{\diagdown}}C=C\underset{H}{\overset{H}{\diagup}}C=C\underset{COOH}{\overset{H}{\diagup}}$$
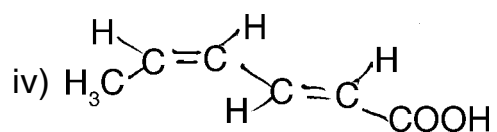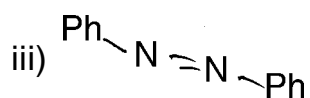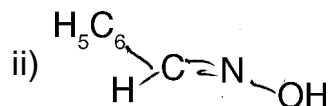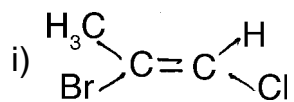
7. Write short notes on (**any three**) :   **14**

    i) Diazo coupling reaction

    ii) Stereochemistry of biphenyls

    iii) Michael reaction

    iv) Gatterman-Koch reaction

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Seat No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
INDUSTRIAL CHEMISTRY
Advanced Topics in Industrial Chemistry
(Paper – XII)

Day and Date : Monday, 28-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all 5** questions.
2) Section – **I** is **compulsory**.
3) Attempt **any two** questions from Section – **II** and **any two** from Section – **III**.
4) Answers to **all** questions (Section **I, II** and **III**) should be written in the **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.

SECTION – I

1. Answer the following :   **14**

   1) What is meant by yield ?

   2) Define sensors.

   3) Which are the various technique used to develop nanocrystal of CdS ?

   4) Write the expression for nucleation rate.

   5) Which are the process used for CVD ?

   6) What are the uses of silica gel ?

   7) Give the methods used to purify the silicon materials.

   8) What type of semiconductor is obtained by doping silicon with boron ?

P.T.O.

9) What is a diode ?

10) Give the reaction of preparation of silicon from silica.

11) Give the different types of stirrer used in the reactor.

12) What is meant by doping ?

13) What is shaft work ?

14) Difference between batch process and continuous process.

SECTION – II

2. a) Give the general procedures for a single unit process for material balances calculation. **7**

   b) An experiment on the growth rate of certain organism requires an environment of humid air enriched in oxygen. Three input streams are fed into air evaporation chamber to produce an output stream with the desired composition.

   A – Liquid water - fed at a rate of 20.0 cm^3/min

   B – Air (21 mole % O_2 , the balance N_2)

   C – Pure oxygen with a molar flow rate one fifth of the molar flow rate of stream B.

   The output gas analyzed and is found to contain 1.5 mole % water. Draw and label of flow chart of the process, and calculate all unknown stream variable. **7**

3. a) Explain the crystal growth from vapor, melt and solution. **7**

   b) Explain in detail the process, involve in the Chemical Vapor Deposition (CVD). **7**

4. a) Discuss in brief the electrical and optical properties of material. **7**

   b) What is nanosensor ? Discuss applications of sensors in industries. **7**

SECTION – III

5. a) Explain pH sensing glass membrane electrode.   **5**

   b) Explain in brief recycle and bypass.   **5**

   c) Explain in detail the sol-gel technique.   **4**

6. a) What are the special properties of nanocrystalline solid ?   **5**

   b) Describe the manufacture process of ultrapure germanium.   **5**

   c) Give the uses of silicon carbide and silanes.   **4**

7. Write notes on **any three** :   **14**

   a) Storage vessels for liquids

   b) Thick film sensors.

   c) Nanocrystals in zeolite.

   d) Batch and continuous process.

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Seat
No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
INDUSTRIAL CHEMISTRY (Paper – XIII)
Organic Chemical Industries

Day and Date :Tuesday, 22-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all 05** questions.
2) Section – **I** is **compulsory**.
3) Attempt **any two** questions from Section — **II**
and **any two** from Section – **III**.
4) Answer to **all** questions (Section – **I, II** and **III**)
should be written in the **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.

SECTION – I

1. Answer the following :   **14**

   a) Give two examples of nitro dyes.

   b) What are the common auxochromes present in azo dyes ?

   c) How are azo dyes classified ?

   d) What are the geometrical isomers possible for indigotin ?

   e) Draw the structure of indican.

   f) Which is the parent substance present in xanthin dyes ?

   g) What are the raw materials required to produce one tonne of oxalic acid ?

   h) What is the melting point of anhydrous oxalic acid ?

   i) $C_{12} H_{22} O_{11} + 18 (O) \xrightarrow[V_2O_5]{HNO_3}$?
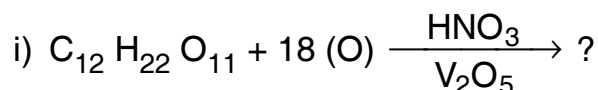
   j) What are the uses of ethyl benzene ?

   k) What are the applications of Zineb ?

   l) What are the applications of Rosaniline ?

   m) What are the properties of Dimetholate ?

   n) Define the term Chemotherapy.

                                                                                    P.T.O.

SECTION – II

2. a) What are agrochemicals ? Discuss manufacturing process, properties and
   uses of BHC. **7**

   b) What are dyes ? Explain in brief the classification of dyes according to
   the mode of applications. **7**

3. a) Explain with chart the petrochemicals derived from ethylene and discuss
   their uses. **7**

   b) Describe the manufacturing process of anhydrous alcohol. **7**

4. a) What are paints ? Explain the constituents of paints. **7**

   b) How is furfural manufactured from bagasse ? **7**

SECTION – III

5. a) How is Rhodamine B manufactured ? **5**

   b) Discuss manufacturing process, properties and applications of aspirin. **5**

   c) How is malathion prepared ? What are its properties and uses ? **4**

6. a) Describe the preparation and applications of crystal violet. **5**

   b) How is citric acid manufactured ? **5**

   c) How is Baygon prepared ? What are its uses ? **4**

7. Write notes on **any three** of the following : **14**

   a) Drug and pharmaceutical industries in India

   b) Vitamins

   c) Endosulphan

   d) Fluorescent brightening agents.

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Seat No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
INDUSTRIAL CHEMISTRY (Paper – XIV)
Inorganic Chemical Industries

Day and Date : Thursday, 24-4-2014   Max Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all 5** questions.
2) Section – **I** is **compulsory.**
3) Attempt **any two** questions from Section – **II** and **any two** from Section – **III**.
4) Answers to **all** questions (Section – **I, II** and **III**) should be written in the **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.

SECTION – I

1. Answer the following :   **14**

    i) Which are the acidic fluxes used in extraction Metallurgy ?

    ii) What are the important ore of Zinc ?

    iii) What is meant by Refractoriness ?

    iv) Which constituent of cement retard the setting action of cement ?

    v) What is the application of Crooks Glass ?

    vi) Define mineral.

    vii) What is meant by Ferrites ?

    viii) What is meant by pigment ?

    ix) How is sodium silicate prepared ?

    x) What are the different alloy of Nickel ?

    xi) Define setting and hardening of cement.

    xii) What is the chemical composition of Feldspar ?

    xiii) Which ore of Thorium is mostly found in India ?

    xiv) What is Thomas Slag ?

SECTION – II

2. a) What do you mean by Ellingham diagram ? Explain the oxide metallurgy on the basis of Ellingham diagram. **7**

   b) Which raw materials are used in manufacture of Portland cement ? Draw a labeled diagram of rotary Kiln used for manufacture of Portland cement by wet process. **7**

3. a) Describe the manufacturing process of glass. **7**

   b) Describe the manufacturing process of Iron by Blast Furnace. **7**

4. a) Explain the mechanism of Phosphorescence and mention its important uses. **7**

   b) What are the important ore of Aluminium ? Describe the various steps involved in the extraction of it from its ore. **7**

SECTION – III

5. a) Explain the role of high temperature material and ceramic superconductors in industries. **5**

   b) Explain the manufacturing process of lime. **5**

   c) What are the properties and application of titanium oxide ? **4**

6. a) How is aluminium chloride prepared ? Discuss the industrial application of manganese dioxide ? **5**

   b) What is meant by White Wares ? Explain the manufacturing process. **5**

   c) Explain the industrial application of various alloy. **4**

7. Write short on **any three** of the following : **14**

   a) Position of inorganic chemical industries in India

   b) Classification of glasses

   c) Setting and hardening of cement

   d) Properties and application of potassium permanganate.

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Seat
No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
INDUSTRIAL CHEMISTRY
Methods of Analysis in Industries (Paper – XV)

Day and Date : Saturday, 26-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all 5** questions.
     2) Section – **I** is **compulsory**.
     3) Attempt **any two** questions from Section – **II** and **any two** from Section – **III**.
     4) Answers to **all** questions (Section **I, II** and **III**) should be written in the **one** answer book.
     5) **All** questions carry **equal** marks.
     6) Figures to the **right** indicate **full** marks.

SECTION – I

1. Solve the following :   **14**

   i) Why analysis of raw materials in chemical industries is necessary ?

   ii) State any one reagent used in colorimetric estimation of vitamin -C.

   iii) Name any two solvents more basic than water.

   iv) Why disodium salt of EDTA is used in complexometric titrations ?

   v) Suggest some chromatographic methods those commonly used in R and D laboratories of industries.

   vi) Define the term therapeutic index of the drug.

   vii) What is radioactivity ?

   viii) Name the indicator used in Volhard's method of titration between $AgNO_3$ and KCNS.

P.T.O.

ix) A process of emission of glow of visible light from material on exposure to high energy radiation is
   a) photoelectric process
   b) Tyndall effect
   c) scintillation process
   d) Raman effect

x) Name the ions used as probe in Ion Scattering Spectrometer.

xi) Give the characteristics of a good thermo balance.

xii) State whether beam of energetic electrons or beam of X-ray photon is used in ESCA Technique.

xiii) Define the term water equivalence of Bomb Calorimeter.

xiv) What is Curie temperature ?

SECTION – II

2. a) What is radioactive disintegration ? Derive equation of radioactive decay law. Radioactive carbon in wood sample decays with a half life of 5770 years. What is the rate constant for the decay process ? **7**

   b) What is isotopic dilution method ? Describe application of this technique. **7**

3. a) Explain with suitable schematic diagram TGA apparatus. **7**

   b) Give the distinguishing features of DTA and DSC. **7**

   Discuss with suitable examples applications of DSC technique.

4. a) Outline principle underlying Secondary Ion Mass Spectrometer. Mention some applications of this technique. **7**

   b) Describe principle and instrumentation of ESCA. **7**

SECTION – III

5. a) Discuss importance of analysis in Chemical Industries. **5**

b) Give a detailed procedure of the method of analysis of mixture of carbonate and hydroxide. **5**

c) Explain colorimetric method of estimation of vitamin-B6. **4**

6. a) Discuss estimation of Fe by gravimetry. **5**

b) Describe use of Orsat apparatus in gas analysis. **5**

c) What is calorific value ? How it is determined by Bomb Calorimeter ? **4**

7. Write notes on **any three** of the following : **14**

a) Ultimate and proximate analysis of coal.

b) Chemical shift in ESCA.

c) GM Counter.

d) Post precipitation and co-precipitation.

e) Theory of acid-base titrations.

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SLR-VD – 24

M.Sc. (Part – II) (Semester – IV) Examination, 2014
INDUSTRIAL CHEMISTRY (New)
Industrial Management (Paper – XVI)

Day and Date : Tuesday, 29-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions :   1) Attempt in **all five** questions.
2) Section **I** is **compulsory**.
3) Attempt **any two** questions from Section **– II** and **any two** questions from Section **III**.
4) Answers to **all** questions (Section **I, II** and **III**) should be written in the **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.

SECTION – I

1. Answers the following questions :   **14**

   i) What is SIDO ?

   ii) What are raw materials used for the manufacturing of bioethanol ?

   iii) What are renewable resources of energy ?

   iv) What is meant by ancillary industries ?

   v) What are the sources responsible for acid rain ?

   vi) What is atom economy ?

   vii) What is pilot plant ?

   viii) What is FDA ?

   ix) Define incinerator.

   x) What is meant by export ?

   xi) What is the composition of gobar gas ?

P.T.O.

xii) What is meant by control chart ?

xiii) Which Nitro compounds are commonly called as explosive ?

xiv) What is meant by ignition temperature ?

SECTION – II

2. a) Discuss in detail, the purpose, planning, design and operation of pilot plant. **7**

   b) Explain the role, need and principle of green chemistry. **7**

3. a) Explain the role and importance of QC department. **7**

   b) Explain solar energy system and wind energy system as a energy source. **7**

4. a) Explain p-chart and c-chart in quality determination. **7**

   b) What are the conventional and non-conventional energy sources ? **7**

SECTION – III

5. a) Explain in brief the manufacturing process of bioethanol. **5**

   b) Discuss in detail the Indian Factory Act – 1948. **5**

   c) What are various tax benefits given by the government to SSI ?. **4**

6. a) Explain in brief the manufacturing process of biodiesal. **5**

   b) Explain the importance of R and D department in the economical of growth of an Industry. **5**

   c) Describe the adverse effect of hazardous chemical emitted by the chemical industry. **4**

7. Write short note on **any three** : **14**
   a) Safety concept in Industry
   b) Technology transfer
   c) Export – Import rules and regulations.
   d) Transportation of Hazardous chemicals.

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Seat
No.

M.Sc. – II (Semester – III) Examination, 2014
POLYMER CHEMISTRY
Paper – IX : Fundamentals of Feedstocks and Polymers

Day and Date : Monday, 21-4-2014　　　　　　　　　　　　Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions :　i) Attempt **five** questions.
　　　　　　　ii) Section **I** (question **1**) is **compulsory**.
　　　　　　　iii) Attempt **any two** questions from Section **II** and **any two**
　　　　　　　　　questions from Section **III**.
　　　　　　　iv) Answers to **all 05** questions (from Section **I, II, III**) should
　　　　　　　　　be written in the **one** and the **same** answer book.
　　　　　　　v) **All** questions carry **equal** marks.
　　　　　　　vi) Figures to the **right** indicate **full** marks.
　　　　　　　vii) **Use** of log tables and calculators is **allowed**.

SECTION – I

1. i) List the drawbacks associated with solid state polymerization.　　　**14**

　 ii) Solubility of branched polymers is more than that of linear polymers; why ?

　iii) What does mean by stabilization and blending of gasoline ?

　iv) When polymerization will occur in hydrocarbon phase of micelle in emulsion
　　　polymerization ?

　 v) What is the experimental evidence for H-T arrangement in PS backbone ?

　vi) Define the flash point of fuel.

　vii) What is the significance of numbers added onto the word "nylon" in trade
　　　name nomenclature ?

SECTION – II

2. a) Explain the melt polycondensation and compare the advantages of solution
　　 polycondensation over melt polycondensation.　　　　　　　　　　　**7**

　 b) Discuss the ladder and semiladder polymers with suitable examples.　　　**7**

P.T.O.

3. a) Give an account on any one renewable resource as building block for polymer industries. **7**

   b) How is vinyl chloride prepared ? Describe the manufacturing of PVC by suspension polymerization. **7**

4. a) Compare the chain growth and step growth polymerization with suitable examples. **7**

   b) What is cracking ? Why cracking is necessary ? Explain catalytic cracking process. **7**

SECTION – III

5. a) Describe the use of C_4 stream as chemicals and polymers. **5**

   b) Discuss the classification of polymers with one example of each. **5**

   c) Give an account on synthesis of HDPE by Ziegler process. **4**

6. a) Explain the solid state polymerization with suitable example. **5**

   b) Discuss the use of ethylene as resource for monomer and polymers. **5**

   c) Describe the important properties and applications of PMMA. **4**

7. Write short notes of **(any three)** : **14**

   a) Solution polymerization

   b) Refining of crude oil

   c) Poly (ethylene terephthalate)

   d) Toluene as resource for chemicals and polymers.

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Seat
No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
POLYMER CHEMISTRY
Morphology and Physical Chemistry of Polymers (Paper – X)

Day and Date : Wednesday, 23-4-2014　　　　　　　　　　Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
　　　　　　　　2) Section **I** (question **one**) is **compulsory**.
　　　　　　　　3) Attempt **any two** questions from Section **II** and **any two**
　　　　　　　　　　questions from Section **III**.
　　　　　　　　4) Answer to **all 5** questions (Section **I, II** and **III**) should be
　　　　　　　　　　written in the **one** and the **same** answer book.
　　　　　　　　5) **All** the questions carry **equal** marks.
　　　　　　　　6) Figure to the **right** indicates **full** marks.
　　　　　　　　7) **Use** of the log tables and calculators is **allowed**.

SECTION – I

1. Answer **all** questions : 　　　　　　　　　　　　　　　　　　　　**(7×2=14)**

　　I) Name the methods by which M_w and M_z are determined.

　II) Write the expressions for M_n and M_w.

　III) What are spherulites ?

　IV) Below the glass transition temperature, the polymer will be
　　　a) Flexible　　　　　　　　　　b) Opaque
　　　c) Glassy　　　　　　　　　　　d) None of the above

　V) Define solubility parameter.

　VI) The molecular weight decreases rapidly for
　　　a) Random degradation　　　　b) Chain end degradation
　　　c) Polymerisation　　　　　　　d) None of the above

　VII) TMA works on the principle of
　　　a) Electrical changes　　　　　b) Expansion of polymers
　　　c) Chemical reactions　　　　　d) None of the above

P.T.O.

SECTION – II

Answer **any two** of the following :

2. a) How are polymer single crystals prepared ? What is their composition ?　**7**

    b) What is end group analysis ? How the molecular weight of a polymer is determined using this ?　**7**

3. a) Define Tg. Write the factors affecting the Tg of a polymer. What is its importance ?　**7**

    b) Explain the Flory-Huggins theory of polymer solutions.　**7**

4. a) Explain the oxidative degradation of polymers. Give two examples for anti oxidants.　**7**

    b) Describe a method for the structural determination of polymers using X-ray analysis.　**7**

SECTION – III

Answer **any two** of the following :

5. a) Describe TMA method for the determination of Tg.　**5**

    b) Explain the high energy degradation of polymers.　**5**

    c) Describe a typical molecular mass distribution curve. What is its importance ? **4**

6. a) Explain the viscosity of dilute polymer solutions.　**5**

    b) Explain the theta (θ) conditions for polymer solutions.　**5**

    c) Write the relationships between Tg and Tm of different category of polymers.　**4**

7. Write short notes on **any three** of the following :　**14**

    a) Vapour phase osmometry

    b) Photodegradation of polymers

    c) Dilatometry

    d) Unperturbed dimensions.

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SLR-VD – 27

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No.**</td><td></td></tr>
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M.Sc. (Part – II) (Semester – III) Examination, 2014
POLYMER CHEMISTRY
Paper – XI : Basic Concept of Polymerization

Day and Date : Friday, 25-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.

2) Section – **I** (question **1**) is **compulsory.**

3) Attempt **any two** questions from Section – **II** and **any two**
   questions from Section – **III.**

4) Answer to **all 5** questions (Section **I, II, III**) should be
   written in the **one** and the **same** answer book.

5) **All** the questions carry **equal** marks.

6) Figures to the **right** indicate **full** marks.

7) **Use** of the log tables and calculators is **allowed.**

SECTION – I

1. Indicate **True** or **False** :   **14**

   I) Polymerization of Vinyl monomers is favoured from the enthalpy point of
      view. T/F

   II) AIBN cannot be used as an initiator for the polymerization of acrylonitrile. T/F

   III) LRP is a very convenient method to prepare block copolymers. T/F

   IV) ATRP can be used to polymerize all vinyl monomers. T/F

   V) In radical chain polymerization, higher concentration of initiator will yield high
      MW polymer. T/F

   VI) Increasing the polarity of the reaction medium results in decrease in the rate
       of cationic chain polymerization. T/F

P.T.O.

VII) ROP of cyclic amides by cationic initiators yields only low MW polymers.T/F

VIII) When the reactivity ratio of the two monomers are such that $r_1 = r_2 = 1$, it gives alternating copolymers. T/F

Answer the following questions.

IX) Give one example of Suzuki reaction.

X) Find out the DP of a polyester derived from ethylene glycol and adipic acid with MW = 15000.

XI) Cite one example of Heck reaction.

XII) What is the requirement of a pair of monomers in terms of reactivity ratios to display ideal copolymerization behaviour.

XIII) What is isomerization polymerization ?

XIV) What is the reason that polymerization of allyl acetate yields only oligomers ?

SECTION – II

2. a) What is ATRP ? Depict the mechanism of ATRP. Discuss the effect of reaction components on ATRP.   **7**

   b) Derive the kinetics expression for self-condensation polyesterification and explain the terms involved.   **7**

3. a) What are the different types of initiator systems that can be used to initiate cationic chain polymerization ?   **7**

   b) What are the different types of copolymerization behaviours ? Explain in terms of monomer reactivity ratios.   **7**

4. a) What are the possible termination reactions in anionic chain polymerization ? Derive the rate expression for anionic chain polymerization that proceed with termination.   **7**

   b) Show schematically the RAFT polymerization. What are its advantages and limitations.   **7**

SECTION – III

5. a) How can you use copolymerization to improve properties and the range of applications of polystyrene, polyethylene, and PVC ? **5**

   b) Describe one method each for the determination of rate of radical chain and step-growth polymerization. **5**

   c) Quenching is not the correct method to control the molecular weight in polyesterification. Explain in details. **4**

6. a) Derive the kinetic expression for radical chain polymerization initiated by UV radiations. **5**

   b) A polyesterification of AA and BB type monomers is performed using 1 mole % excess of BB monomer. Calculate the DP assuming 100% conversion. **5**

   c) Styrene (0.3 mol) was solution polymerized in THF at – 70°C using n-Buli $(1.5 \times 10^{-3}$ mol) as the initiator. Calculate the $\overline{M}_n$ of the polymer. **4**

7. Write notes on **any three** : **14**

   a) Control of MW in step-growth polymerization

   b) NMP

   c) Hydrolytic ROP of E-caprolactam

   d) Q-e Scheme.

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Seat
No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
POLYMER CHEMISTRY
Paper – XII : Elective – 1
Spectral and Instrumental Analysis of Polymers

Day and Date : Monday, 28-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.

2) Section **I** (question **one**) is **compulsory**.

3) Attempt **any two** questions from Section – **II** and **any two** questions from Section **III**.

4) Answer to **all 5** questions (Section **I, II** and **III**) should be written in the **one** and the **same** answer book.

5) **All** the questions carry **equal** marks.

6) Figures to the **right** indicate **full** marks.

7) **Use** of the log tables and calculators is **allowed**.

SECTION – I

1. Answer the following questions :   **14**

   I) Which spectroscopy is complementary to IR spectroscopy ?

   II) Calculate the number of non-equivalent sets of carbon in the following compounds.

and
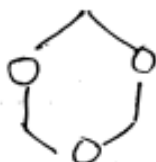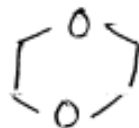
III) How will you differentiate three xylene isomers by CMR ?
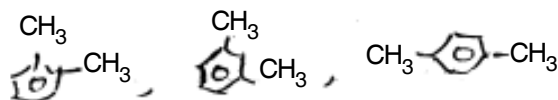
IV) State the Bragg's law of diffraction.

V) Explain the meaning of T_{50} in TGA.

VI) Mention the advantages of pyrolysis – MS.

VII) List the advantages of TEM in polymer analysis.

VIII) Define the terms chromophore and Auxochrome in UV spectroscopy.

IX) For IR radiations of 2 μ m, what is the wave number ?

X) Draw off resonance coupled ^{13}C spectrum of $CH_3CH_2CH_2OH$ in $CDCl_3$.

XI) What is P-GC-MS technique ?

XII) Teflon is thermally more stable than polyethylene. Why ?

XIII) Write equation used for the determination of particle size by XRD technique.

XIV) Which source is used for the production of X-rays ?

SECTION – II

2. a) With the help of neat diagrams explain CMR spectra of different tactic polypropylene. **7**

   b) How is the percentage composition of styrene in SBR determined using UV- visible spectroscopy technique ? **7**

3. a) Describe the factors affecting DSC and DTA curves. **7**

   b) Explain the use of pyrolysis GC-MS technique for determination of monomer composition in copolymers. **7**

4. a) Describe the applications of SEM and TEM in polymer analysis. **7**

   b) Explain production of X-rays in laboratory and discuss application of XRD in polymer analysis. **7**

SECTION – III

5. a) Describe the rotating crystal method for polymer analysis. **5**

   b) How is the percentage monomer composition in copolymers determined by H –1 NMR ? **5**

   c) How is hydrogen bonding in nylon – 6 studied by IR technique ? **4**

6. a) Explain the meaning of T_0, T_{10}, T_{max}, dpdt and ipdt in TGA. **5**

   b) Explain the solid state CMR of PEEK. **5**

   c) Give a brief account of MALDI-TOF mass spectroscopy in polymer analysis. **4**

7. Write notes on **any three** : **14**

   a) DEPT technique in CMR.

   b) Applications of TGA in polymer analysis.

   c) Advantages and disadvantages of pyrolysis mass spectroscopy.

   d) A survey of characterization techniques for polymers.

   e) Molecular vibration in IR spectroscopy.

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Seat No.

M.Sc. (Part – I) (Semester – I) Examination, 2014
CHEMISTRY (Paper – III)
Physical Chemistry – I

Day and Date : Friday, 25-4-2014 — Total Marks : 70
Time : 11.00 a.m. to 2.00 p.m.

**Instructions** : 1) Attempt in **all five** questions.
2) Section **I** is **compulsory**.
3) Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.
4) Answers to **all** questions (Section I, II and III) should be written in the **same** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.
7) **Use** of log table and calculator is **allowed**.

SECTION – I

1. Answers the following : **14**

   a) What is osmosis ?

   b) Give any two statements of second law of thermodynamics.

   c) Put the expression for relaxation time.

   d) Fill in the blank $(dE/dV)_T =$ _____

   e) At mechanical equilibrium _____ remains constant.

       i) P   ii) V   iii) T   iv) S

   f) Define mean free path of a gas molecule.

   g) Give the expression for most probable velocity.

   h) Mention different steps involved in chain polymerization.

   i) Name any two non-state thermodynamic functions.

   j) What do you mean by residual entropy ?

   k) Estimate number of degrees of freedom at triple point of water.

P.T.O.

l) What is a copolymer ?

m) Write the monomer unit for polystyrene.

n) Mention relaxation techniques used in the study of fast reactions.

SECTION – II

2. a) Derive Gibb's phase rule. **7**

   b) Discuss how third law of thermodynamics can be used for the estimation of absolute entropy. **7**

3. a) Explain viscosity method for determination of molar masses of polymer. **7**

   b) Illustrate the freezing point depression method for activity coefficient determination. **7**

4. a) Write on stopped flow method for studying kinetics of fast reactions. **7**

   b) Derive the thermodynamic equation of state. **7**

SECTION – III

5. a) Mention various postulates of kinetic theory of gases. **5**

   b) Derive the expressions for root mean square and average velocity of a gas molecules. **5**

   c) Estimate Mn and Mw of a protein sample containing equimolar mixture of haemoglobin (20 kg/mol), myoglobin (15 kg/mol) and ribonuclease (12 kg/mol). **4**

6. a) Discuss magnetic resonance method used for study of fast reactions. **5**

   b) Write on different properties of sols. **5**

   c) The relaxation time for fast reaction is 25 microseconds and equilibrium constant is 2×10^{-3}. Evaluate rate constant for forward and backward reactions. **4**

7. Write short notes on **any three** : **14**

   a) Thermodynamic excess functions

   b) Relaxation techniques for fast reaction study

   c) Concept of fugacity

   d) Various ideal gas laws.

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Seat No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
POLYMER CHEMISTRY
(Paper – XIII) Step Growth of Polymers

Day and Date : Tuesday, 22-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
2) Section **I** is **compulsory**.
3) Attempt **any two** questions from Section **II** and **any two** from Section **III**.
4) Answer to **all** questions (Section **I**, **II** and **III**) should be written in the **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to **right** indicate **full** marks.
7) **Use** of log tables and non-programmable calculator is **allowed**.

SECTION – I

1. Answer the following :   (2×7=14)

   a) Give components of PEN polyester. Draw its structure.

   b) What are properties of MF resin for its use in high quality dinnerware ?

   c) What is difference between glossy and flat paints ? Define Mar test.

   d) What is lyotropic LCP ? Give one example and draw its repeat unit.

   e) Give the reactions involved in preparation of urea and Hexa.

   f) What are addition type polyamides ? Why were they developed ?

   g) What are important properties of polycarbonate-Lexan ?

SECTION – II

2. A) What are catalyst used in resole preparation ? What is mole ratio of Phenol :
      Formaldehyde in this case ? Why ?   **7**

   B) What is PET ? Give the method used for its manufacture.   **7**

3. A) Explain mode of action of Hexa in crosslinking of PF resin, taking different
moles of Hexa and different temperatures. **7**

B) Explain properties and applications of saturated and unsaturated polyesters. **7**

4. A) Outline mechanism of crosslinking process in UF prepolymer. **7**

B) Discuss flow diagram of paint manufacture. How varnish and coating are
classified ? **7**

SECTION – III

5. A) Explain "Nomenclature method for aliphatic polyamides". **5**

B) What are polycarbonates ? Give non-phosgene method for its preparation. **5**

C) Explain methods of analysis and testing of paints. **4**

6. A) Explain importance of epoxy resin – DGEBA describing its curing reaction. **5**

B) What are different types of oils used in paint ? Explain their significance. **5**

C) Describe manufacture of Nylon-6. **4**

7. Write note on **any three :** **14**

I) Two step solution polycondensation process for polyamide synthesis

II) Modified MF resins

III) Polyurethanes

IV) Synthesis of phenol by any two methods

V) Factors affecting pre-polymer structure in Novolac.

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Seat
No.

M.Sc. – II (Semester – IV) Examination, 2014
POLYMER CHEMISTRY
Paper – XIV : Stereoregular Polymers, Elastomers and Polymer Additives

Day and Date : Thursday, 24-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions :   i) Attempt **five** questions.
   ii) Section **I** (question **1**) is **compulsory**.
   iii) Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.
   iv) Answers to **all 5** questions (from Section **I, II** and **III**) should be written in the **one** and the **same** answer book.
   v) **All** questions carry **equal** marks.
   vi) Figures to the **right** indicate **full** marks.
   vii) **Use** of log tables and calculators is **allowed**.

SECTION – I

1. i) What is practical importance of Z-N initiators ?   **14**

   ii) Why syndiotactic poly (propylene oxide) is optically inactive ?

   iii) How natural rubber is converted into cyclized rubber ?

   iv) What is the basic assumption of Bernoulli model ?

   v) Give two examples of Heat stabilizers used in rubber.

   vi) What are the examples of different conformations in polymers ?

   vii) Why co-ordination polymerization is also called as a insertion polymerization ?

SECTION – II

2. a) Discuss the stereoisomerism in polymerization of acrylonitrile.   **7**

   b) What is compounding of rubber ? List various types of rubber additives and their function giving one example of each additive class.   **7**

P.T.O.

3. a) Discuss the comparison of metal oxide supported initiators and Z-N initiators. **7**

   b) From practical point of view there is only one disyndiotactic polymer, but two diisotactic polymer. Explain. **7**

4. a) Compare the properties of NR, butyl rubber and nitrile rubber. List their applications. **7**

   b) Describe the stereospecific polymerization of 1, 3 dienes. **7**

SECTION – III

5. a) Give an account on the mechanism of ionic and co-ordination polymerization. **5**

   b) Describe stereospecific polymerization of MMA. **5**

   c) Discuss the various blowing agents. **4**

6. a) Explain the process of vulcanization. Give a typical recipe for the same with the role of each ingredient in tire manufacture. **5**

   b) Discuss the stereoisomerism in the polymerization of 1, 1-dissubstituted ethylene monomer with suitable example. **5**

   c) Describe the stereoselection and stereoelection in chiral monomer such as 3 methy-1-pentene. **4**

7. Write short notes of (**any three**) : **14**

   a) Epoxidation of natural rubber

   b) Absolute configuration

   c) Monometallic mechanism of $AlEt_3 – TiCl_3$ system

   d) Component of Ziegler-Natta initiators.

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Seat No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
POLYMER CHEMISTRY
Paper – XV : Selected Topics in Polymers

Day and Date : Saturday, 26-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
2) Section **I** (question **one**) is **compulsory**.
3) Attempt **any two** questions from Section – **II** and **any two** questions from Section – **III**.
4) Answers to **all 5** questions (Section **I, II, III**) should be written in the **one** and the **same** answer book.
5) **All** the questions carry **equal** marks.
6) Figure to the **right** indicates **full** marks.
7) **Use** of the log tables and calculators is **allowed**.

SECTION – I

1. Answer the following :   **14**

   I) What does mean by lyotropic LCPs ?

   II) Which polymerization technique is used to prepare PS for use as polymer support in organic synthesis ?

   III) Complete the reaction

   $$-(OCH_2CH_2OOC-\langle\bigcirc\rangle-CO)_n \xrightarrow[100^\circ - 140^\circ C]{NH_3}$$

   IV) Write the structure of PS-DVB crosslinked resin.

   V) What reagent is used for the preparation of CMC ?

   VI) Name water soluble polymer adhesive.

   VII) What are spandex fibres ?

P.T.O.

SECTION – II

2. a) Discuss the various methods for the synthesis of conducting polymers.   **7**

   b) Discuss in details synthesis and characterization of cellulose acetate.   **7**

3. a) A triblock copolymer can be synthesized by "polymer growth from oligomeric end groups" approach. Explain with suitable examples.   **7**

   b) Classify the polymer recycling process. Discuss the tertiary recycling process with suitable examples.   **7**

4. a) Discuss in details the process of chlorination of PE.   **7**

   b) Discuss the synthesis of styrene-MMA diblock copolymer.   **7**

SECTION – III

5. a) What is doping ? What are the different types of dopants ? Explain with suitable examples.   **5**

   b) How will you convert PE, a thermoplastic into an elastomer by chemical modification ?   **5**

   c) Discuss the synthesis of polysiloxane-polysulphone multiblock copolymer.   **4**

6. a) Discuss the RPI process for microsortation using solvent separation technique.   **5**

   b) Give brief account of polymer adhesives.   **5**

   c) How will you synthesize a polyurethane multiblock copolymer from hydroxyl terminated PBT, butane diol and MDI ? Write the reactions involved.   **4**

7. Write notes on **any three** :   **14**
   a) Hydrogels
   b) Polymers in controlled release applications
   c) HPC
   d) Kevlar
   e) PS-DVB crosslinked resin.

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Seat No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
POLYMER CHEMISTRY (Paper – XVI) (Elective Paper)
Processing Technology and Polymer Properties

Day and Date : Tuesday, 29-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
2) Section **I** (question **one**) is **compulsory**.
3) Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.
4) Answers to **all 5** questions (from Section **I, II, III**) should be written in **one** and the **same** answer book.
5) **All** the questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.
7) **Use** of log tables and calculators is **allowed**.

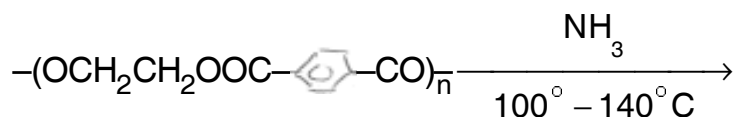## SECTION – I

1. I) Iodine numbers are used to determine the amount of unsaturation. Indicate True or False.   **14**

   II) Give the ASTM number for Yellowness Index of Plastics.

   III) Expand RIM.

   IV) Calendaring is used to make sheets. Indicate True or False.

   V) What is the name of extra polymer material coming out of a polymer processing Machine ?

   VI) Name the method by which completely closed hollow articles are made.

   VII) Extrusion of polymer and solvent at high temperature into a cooling zone is known as _____ spinning.

   VIII) What is Haze ?

   IX) Name at least four post spinning processes.

   X) Write the equation for the stress in a Flexural test.

   XI) What type of fillers are used to increase the impact strength of a polymer ?

P.T.O.

  XII) Name the spinning method by which SPANDEX fibres are made.

 XIII) Define Heat Distortion Temperature.

 XIV) Name the model to describe the elastic behavior of polymer.

SECTION – II

2. a) How do you identify polymers by heating and burning ? **7**

   b) Describe the testing procedure for elastomers and films. **7**

3. a) Define stress, strain and % elongation at break. Draw a typical stress-strain curve and show the different mechanical parameters on it. **7**

   b) Explain the sample preparation and procedure for measuring dielectric constant and dielectric strength. **7**

4. a) With a neat sketch describe a screw and identify different parts in it. What are the advantages of twin screw over a single screw ? **7**

   b) Describe the injection moulding machine and explain the process. What are its advantages and limitations ? **7**

SECTION – III

5. a) How do you determine the bulk density and hardness of polymers ? **5**

   b) Explain the Vogt model for polymers. **5**

   c) Discuss the factors governing dielectric loss and volume resistivity. **4**

6. a) Describe the Thermoforming and vacuum Thermoforming methods. What are their advantages and limitations ? **5**

   b) Describe the Gel spinning and phase separation spinning methods. **5**

   c) Discuss the generalised maxwell model. **4**

7. Write notes on **any three** of the following. **14**

   a) Tests for tyres and containers.

   b) Izod and Charpy impact tests.

   c) Rotational moulding.

   d) Sandwitch moulding and Foaming.

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Seat No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
PHYSICAL CHEMISTRY
Paper – IX : Quantum Chemistry

Day and Date : Monday, 21-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
2) Section – **I** is **compulsory**.
3) Attempt **any two** questions from Section – **II** and **any two** questions from Section – **III**.
4) Answers to **all** questions (Section – **I, II** and **III**) should be written in the **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.
7) **Use** of log table and calculator is **allowed**.

SECTION – I

1. Answer the following :   **14**

   i) The zero point energy of simple harmonic oscillator is _____

   ii) The atomic orbital not allowed in quantum theory is

      a) 4p   b) 5g   c) 3f   d) 4d

   iii) Calculate the degeneracy of the level with energy equal to $12h^2/8ma^2$.

   iv) Give the expression for linear momentum operator (p).

   v) Put the condition for orthogonalization.

   vi) State de Broglie hypothesis.

   vii) Mention the relationship between Cartesian coordinate x and polar coordinates r, θ, Φ .

   viii) Define atomic orbital.

   ix) Write Bohr's quantization postulate.

   x) Put the limits for θ and Φ angles.

xi) Sketch the probability curves for particle in a box for n = 1 and n = 2.

xii) Write the wave function for 1s atomic orbital of H atom.

xiii) Define mathematically charge density.

xiv) Mention any one conjugate pair of variables.

SECTION – II

2. a) Describe the variation method for the calculation of energy of molecules. **7**

   b) Explain the various observations of Compton effect. Derive the expression for it. **7**

3. a) Discuss quantum mechanical treatment of a harmonic oscillator. **7**

   b) Explain in detail various assumptions of Huckel MOT. **7**

4. a) What do you mean by Slater determinant ? Write on STO's. **7**

   b) Derive the expression for Schrodinger wave equation of a particle in two dimensional box. **7**

SECTION – III

5. a) Discuss radial plots. **5**

   b) Derive the expressions for Hamiltonian operator. **5**

   c) Write down the expression for $(x\, d/dx)^2$. **4**

6. a) Write down the consequences of Heisenberg's uncertainty principle. **5**

   b) Explain Stern-Gerlach experiment. **5**

   c) X-ray having wavelength 0.85 nm are scattered by block of carbon. The wavelength of scattered radiation is 0.9 nm. Estimate the angle of scattering. **4**

7. Write short notes on **any three** : **14**

   a) Linear variation functions

   b) Tunneling effect

   c) First order perturbation

   d) Spherical co-ordinates.

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Seat No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
PHYSICAL CHEMISTRY
Paper – X : Electrochemistry

Day and Date : Wednesday, 23-4-2014　　　　　　　　　　Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions :　i) Attempt **five** questions.
　　　　　　　　ii) Section **I** (Question **1**) is **compulsory**.
　　　　　　　　iii) Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.
　　　　　　　　iv) Answers to **all 5** questions (from Section **I, II, III**) should be written in the **one** and the **same** answer book.
　　　　　　　　v) **All** questions carry **equal** marks.
　　　　　　　　vi) Figures to the **right** indicate **full** marks.
　　　　　　　　vii) **Use** of log tables and calculators is **allowed**.

SECTION – I

1. Answer the following (**one** mark **each**) :

    1) A solution of sodium sulphate in water is electrolyzed using platinum electrodes. The product at anode and cathode respectively are _____

    2) Which electrolyte is used in natural gas and CO-Air fuel cell ?

    3) What is biochemical corrosion ?

    4) The mobile phase in electroosmosis is _____

    5) Name the mechanism with which the abnormal conductance of hydrogen ion is explained.

    6) Give the expression for thickness of ionic atmosphere.

    7) How do you verify the Debye-Huckel-Onsager equation ?

    8) What is first postulate of Debye-Huckel theory of interionic attraction ?

    9) As the concentration of electrolyte increases the thickness of ionic atmosphere decreases. True or False.

    10) Write the expression for the constant A in Debye-Huckel-Onsager equation.

    11) The mobility of ion _____ due to electrophoretic force. (Decreases/ Increases)

    12) Name the primary slow step in the theories of overvoltage.

    13) Write the expression for hydration energy of a negative ion according to Bernal and Fowler method.

    14) In Gemini and Appolo fuel cell what is the electrolyte used ?

P.T.O.

SECTION – II

2. a) Obtain an expression for the potential ψ_i on the ion due to ionic atmosphere for dilute solution. **7**

   b) Explain in detail the electrophoretic and relaxation effects with corresponding expressions. Discuss how they affect the conductance of an electrolyte solution. **7**

3. a) Give an account of qualitative verification of Debye-Huckel equations for activity coefficients. **7**

   b) Calculate the Debye-Huckel constants A and B for water at 25°C. (D=78.6 and $\eta = 8.95 \times 10^{-3}$ poise). **7**

4. a) Explain briefly the experimental determination of heat of hydration of hydrogen ion. **7**

   b) What is decomposition potential ? Give experimental method for the determination of decomposition potential. **7**

SECTION – III

5. a) Define corrosion. Explain its mechanism with Pourbaix diagram. **5**

   b) What is difference in between overvoltage and polarization ? Explain types polarization. **5**

   c) Calculate the ratio of activity coefficient f_x, f_c and f_m for 0.1 N KI (MW = 166) in ethyl alcohol at 25°C. The densities of pure solvent and solution are 0.7919 and 0.8014 respectively. **4**

6. a) Describe Guoy-Chapmann theory of electrical double layer with its limitations. **5**

   b) Calculate zeta potential of a quartz particle moving with a velocity of 3×10^{-3} cm/sec in aqueous suspension under potential gradient of 10 V/cm (Given $\eta = 8.903 \times 10^{-3}$ poise and D=78.30 at 25°C). **5**

   c) Describe the Eley-Evans model for calculating the hydration energy. **4**

7. Write note on **any three** : **14**
   i) Relationship between three forms of activity coefficient
   ii) Hydrogen-oxygen fuel cell
   iii) Types of polarization
   iv) Bjerrum ion association pair.

M.Sc. (Part – II) (Semester – III) Examination, 2014
PHYSICAL CHEMISTRY
Paper – XI : Molecular Structure – I

Day and Date : Friday, 25-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
            2) Question **one** is **compulsory**.
            3) Attempt **any two** questions from Section — **II** and
               any two from Section – **III**.
            4) **All** questions carry **equal** marks.
               Figures to **right** indicate marks.
            5) **Neat** and labelled **diagrams** should be drawn.
            6) **Use** of calculator and logtable is **allowed**.

SECTION – I

1. Answer the following :   **14**

    i) An operation involving an n-fold rotation about the principle axis followed by a reflection in a plane perpendicular to the axis of rotation is called _____

    ii) Planar BCl_3 has C_3 axis as the principle axis of rotation, then $C_3^3 = ?$

    iii) When $I_B = I_C > I_A$ the molecule belongs to which type of symmetric top molecule ?

    iv) When an atom in a diatomic molecule is replaced by its heavier isotope the B value increases. **True** or **true**.

    v) The rotational frequency of a diatomic molecule is 3.14×10^{11} radians s^{-1}. What will be its period of rotation ?

    vi) The frequency of OD stretching vibration of CH_3OD is _____ than that of OH in CH_3OH (Greater or smaller).

    vii) At what conditions hot bands are obtained ?

    viii) The spacing between P and R branches of $^{16}O – C – ^{16}O$ is 4B. What would be the corresponding spacing of $^{18}O – C – ^{18}O$?

ix) What are the term symbols for a state S = 1 and L = 2 ?

x) In which region of spectrum the n to π^* transitions of an organic molecule are generally observed ?

xi) What are Anti-strokes lines ?

xii) No rotational Raman effect is observed for asymmetric top molecules. True or false.

xiii) In photo electron spectroscopy _____ energies are measured when electrons are ejected from different orbitals.

xiv) The binding energies of _____ electrons increase with atomic number due to increased positive charge on the nucleus.

SECTION – II

2. a) Discuss the classification of molecules into various point groups. **7**

   b) What are reducible and irreducible representations ? Explain by considering C2V point group. **7**

3. a) For a linear triatomic molecule explain the method of determining bond lengths by isotopic substitution of any one atom. **7**

   b) The average spacing between the successive rotational lines of HCl is 10.593 cm^{-1}. Calculate the moment of inertia and the transition which gives most intense spectral line at 300K. (Given h = 6.626×10^{-34} Js, k = 1.381×10^{-23} JK^{-1}, c = 3.0×10^8 ms^{-1}) **7**

4. a) Discuss the vibration-rotation spectra of a diatomic molecule assuming vibration and rotation are independent of each other. **7**

   b) One of the fundamental vibration mode of H^{35}Cl occurs at 2990 cm^{-1}. What would be the frequency of corresponding mode in D^{35}Cl and H^{37}Cl ? **7**

SECTION – III

5. a) Derive expressions for frequencies of stokes and antistokes lines in Raman spectrum of linear molecules. **5**

   b) A molecule XY$_2$ has three fundamental vibrations which are IR active and only two of them are Raman active. Predict its structure. **5**

c) The first three rotational Raman lines of a homonuclear diatomic molecule are at 65.04, 108.23 and 151.26cm^{-1} from the exciting Raman line. Estimate the rotational constant B and moment of inertia. (h = 6.625 × 10^{-34} Js, c = 3.0 × 10^8 ms^{-1}). **4**

6. a) Sketch electron optics diagram of ESCA and explain its working. **5**

   b) Explain the terms predissociation and dissociation energy. **5**

   c) The values of v_e and x_e for lower and upper states of C_2 molecule are 1641.4 cm^{-1} and 0.00711 and 1788.2 cm^{-1}, 0.00919 respectively. The (0, 0) transition is observed at 19,378 (64,746.55) cm^{-1}. Calculate the energy difference of the two electronic states. **4**

7. Write notes on **any three** : **14**

   a) Orthogonality theorem.

   b) Classification of molecules based on their moment of inertia

   c) Fundamental vibrations and their symmetry

   d) Russell-Saunders coupling.

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Seat No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
PHYSICAL CHEMISTRY (Elective Paper)
Paper – XII : Solid State and Nuclear Chemistry

Day and Date: Monday, 28-4-2014   Total Marks : 70

Time: 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
2) **All** questions carry **equal** marks.
3) Question No. **1**, Section **I** is **compulsory**. Attempt at least **two** questions from **each** Section **II** and **III**.
4) Figures to **right** indicate marks.
5) **Neat** and labelled diagrams should be drawn **wherever** necessary.
6) **Use** of calculator and log-table is **allowed**.

SECTION – I

1. **Compulsory** (**one** mark **each**) :   **14**

   a) In a face centered cubic lattice how many units are containing in unit cell.

   b) Crystal defects are detected by density method.

   c) What is isotropy ?

   d) For simple cube, distance between successive planes are $1 : 1/\sqrt{2} : 1/\sqrt{3}$. True/False

   e) Draw the cube and show the [100] plane.

   f) In a crystal, lattice parameters and angles are $a = b = c$ and the angles 90 are alpha = beta = gamma from this data identify the crystal structure.

   g) The cadmium is used for absorbing neutrons in a nuclear reactor. True/False

   h) In a nuclear reactor, the speed of neutrons is slowed down by

i) Why seed is used for the preparation of single crystal ?

j) One Curie of radioactivity is equal to 3.7×10^{10} disint/sec. True/False

k) Give one example of commercial zeolite.

l) In a breeder reactor _____ alloy is used as a coolant.

m) Which of the following is detected in an electric field ?

    1) Alpha particles

    2) Positrons.

n) What is free radical ?

SECTION – II

2. a) CsBr crystallizes in BCC lattice with the side of the unit cell 4.29A. Calculate the angles at which II order reflection maxima may be expected from the planes (100) (110) and (111) when X rays of wavelength 0.5 A are used. **7**

   b) Draw the schematic diagram of growth from solution to grow single crystals and mention its advantage over the other. **7**

3. a) What is Radiolysis of water ? How it is useful to determine the short lived intermediates from aqueous solution ? **7**

   b) Discuss the formation of compound nucleus and compound nucleus theory to explain the nuclear reaction mechanism. **7**

4. a) Compare the breeder and nuclear reactor of other types. **7**

   b) Discuss the types decomposition reactions with reference to mechanism quoting with suitable example. **7**

SECTION – III

5. a) Give an overview of single crystal rotation method for the determination of crystal structure. **5**

   b) Give the importance of addition reactions. **5**

   c) Define the term structure factor and electron density. **4**

6. a) What is heterogeneous nucleation ? How this nucleation affects on the single crystal growth ? **5**

   b) Give a explanatory note on the four factor formula of nuclear reactor. **5**

   c) Give the mechanism of neutron detector used in the nuclear radiation. **4**

7. Write notes on (**any three**) : **14**

   a) Frenkel defect

   b) Scintilation detector

   c) Bridgeman method for single crystal growth

   d) Zeolite.

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SLR-VD – 38

M.Sc. (Part – II) (Semester – IV) Examination, 2014
PHYSICAL   CHEMISTRY
Statistical Mechanics and Thermodynamics (Paper – XIII)

Day and Date : Tuesday, 22-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
2) Section **I** is **compulsory**.
3) Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.
4) Answers to **all** questions (Section **I**, **II** and **III**) should be written in the **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.
7) **Use** of log table and calculator is **allowed**.

SECTION – I

1. Answers the following :   **14**

   i) State Debye T-cubed law.

   ii) Give the symmetry number for HCl and HBr molecule.

   iii) μ, T and V parameters remain same in the _____ ensemble.
      a) Canonical   b) Microcanonical
      c) Grand canonical   d) All of these

   iv) Give the statement of third law of thermodynamics.

   v) Evaluate in N_A ! where N_A is Avagadro's number.

   vi) Define degeneracy.

   vii) Light photons follow _____ statistics.
      a) M – B   b) F – D   c) B – E   d) None of these

   viii) Put the expression for θ_{rot} .

P.T.O.

ix) Entropy is state/non state function. Choose correct alternative.

x) Mention any two examples of a phenomenological laws.

xi) State the importance of statistical weight.

xii) Name any two inexact differentials.

xiii) What do you meant by partition function ?

xiv) The specific heat is highest for _____ element.
a) Si   b) C   c) Cu   d) Au

SECTION – II

2. a) Derive an expression for Sackur-Tetrode equation.   **7**

   b) Discuss entropy production due to heat flow.   **7**

3. a) Relate partition function and the thermodynamic functions like S, G and A.   **7**

   b) Illustrate Onsagar's theory for microscopic reversibility.   **7**

4. a) Discuss in brief Debye heat capacity theory for solids.   **7**

   b) How entropy change can be estimated during various phase transformations ? **7**

SECTION – III

5. a) What are phenomenological laws ?   **5**

   b) What is integrating factor ? Illustrate this with suitable example.   **5**

   c) Using the equations $PV = RT$ and $(P + a/V^2) V = RT$. Show that dP is an exact differential.   **4**

6. a) Write on conservation of mass in closed and open system.   **5**

   b) Give comparison of MB, BE and FD statistics.   **5**

   c) Estimate the Qrot for O-H radical at 300 K. (Given $r_{O-H} = 0.097$ nm).   **4**

7. Write short notes on **any three** :   **14**

   a) Concept of electron gas in metals

   b) Second law of thermodynamics

   c) Oscillatory reactions

   d) Thermodynamic potentials.

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Seat
No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
PHYSICAL CHEMISTRY
Chemical Kinetics (Paper – XIV)

Day and Date : Thursday, 24-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.

               2) Section **I** is **compulsory**.

               3) Attempt **any two** questions from Section **II** and **any two**

                   questions from Section **III**.

               4) Answers to **all** questions (Section **I, II** and **III**) should be

                   written in the **one** answer book.

               5) **All** questions carry **equal** marks.

               6) Figures to the **right** indicate **full** marks.

               7) **Use** of log table and calculator is **allowed**.

SECTION – I

1. Answers the following :   **14**

   i) Sketch the plots showing the concentration change of reactants and products with time during any chemical reaction.

   ii) What are enzymes ?

   iii) Express Arrhenius equation.

   iv) Define catalyst.

   v) Put one example of pseudo-unimolecular reaction.

   vi) Nuclear disintegration follows _____ order kinetics.

P.T.O.

vii) Mention different steps involved in chain reactions.

viii) What do you mean by rate determining step ?

ix) Define collision number.

x) Give one example of parallel reaction.

xi) What is partition function ?

xii) In elastic collision energy is _____

a) Remains constant

b) Transferred

c) Absorbed

d) All of these

xiii) What do you meant by chain length ?

xiv) When does an acid catalyzed reaction will have a limiting rate ?

SECTION – II

2. a) Mention different complex reactions. Discuss equilibrium reactions and their characteristics. **7**

   b) Discuss the factors which affect the enzyme catalysis. **7**

3. a) Explain how activated complex theory helps in evaluating the activation parameters like enthalpy and entropy. **7**

   b) Describe the kinetics of branched chain reactions. **7**

4. a) Construct multidimensional potential energy surfaces. Explain saddle point and reaction coordinate. **7**

   b) What are the different factors that determine the effectiveness of collision ? **7**

SECTION – III

5. a) Explain how energy of activation is determined by using Arrhenius equation. **5**

   b) Discuss postulates of transition state theory. **5**

   c) Can the activation energy of a reaction be zero or negative ? Explain. **4**

6. a) Sketch Lineweaver-Burk plot. Discuss the significance of it. **5**

   b) Compare transition state theory with collision theory. **5**

   c) For the first order isomerization of an organic compound at 150°C, activation energy is 110 kJ/mole and the rate constant is 9×10^{-4} s^{-1}. Calculate $\Delta S^{\#}$. **4**

7. Write short notes on (**any three**) : **14**

   a) Autocatalysis

   b) General characteristics of catalytic reactions

   c) Temperature coefficient

   d) Kinetics of parallel reactions.

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SLR-VD – 4

M.Sc. (Part – I) (Semester – I) Examination, 2014
CHEMISTRY
Paper – IV : Analytical Chemistry – I

Day and Date : Monday, 28-4-2014   Total Marks : 70
Time : 11.00 a.m. to 2.00 p.m.

Instructions : 1) Attempt in **all five** questions.

     2) Section **one** is **compulsory** and is to be written in **same** answer book.

     3) Attempt **any two** questions from Section **II** and **any two** from Section **III**.

     4) **All** question carry **equal** marks.

     5) Figures to **right** indicate marks.

     6) **Neat** and labelled diagrams should be **drawn**.

     7) **Use** of calculator and log table is **allowed**.

SECTION – I

1. Solve the following (**one** mark **each**) :   **14**

   1) Define a compiler.

   2) Multiply the binary numbers 1010 and 1001.

   3) When the technique of dead stop end point is applicable ?

   4) Define the term coefficient of variance.

   5) Give the relation between diffusion current and concentration in polarography.

   6) Define ion exchange capacity.

P.T.O.

7) What is the main function of binder ?

8) What problems may arise from using a poorly packed HPLC column ?

9) Why the adsorbents should be pure ?

10) What is long form of COBOL ?

11) What is meant by an interpreter ?

12) Why nitrogen or hydrogen gas is passed through test solution in polarography experiment ?

13) How the large concentration of electro active species can be removed in polarographic technique ?

14) DME can be applied over the range _____

SECTION – II

2. a) Define half wave potential. Derive the polarographic wave equation. **7**

   b) Explain the nature of titration curves obtained in amperometric titrations. Give their advantages. **7**

3. a) Discuss in detail various types of errors observed in measurement. **7**

   b) Analysis of a sample of a hematite gave the following percentage values for the iron content :

   7.08, 7.21, 7.12, 7.09, 7.16, 7.14, 7.07, 7.14, 7.18, 7.11

   Find out the mean, standard deviations and coefficient of variation for the values. **7**

4. a) Explain the adsorption and partition methods in column chromatorgraphy. **7**

   b) What is correlation coefficient ? Calculate the correlation coefficient of the following colorimetric analysis of $KMnO_4$. **7**

Concentration of $KMnO_4$ μgml^{-1}	0.00	0.10	0.20	0.30	0.40
Absorbance	0.00	5.20	9.90	15.30	19.10

SECTION – III

5. a) Draw a flow chart illustrating the recompilation of a source program until it is free from all sources of errors. **5**

   b) Explain in brief RAM and ROM. **5**

   c) Explain in brief the WINMOPAC software. **4**

6. a) Discuss in detail various types of errors observed in measurement. **5**

   b) Define accuracy. Describe analytical methods used for determining the accuracy. **5**

   c) The Diffusion current for 10 ml unknown solution of zinc was 5μA, when 10ml of 0.001 M zinc solution was added to above solution test solution, the diffusion current was found 8μA. From these results estimate the concentration of the test solution by using slandered addition method. **4**

7. Write short notes on **any three** of the following : **14**
   a) Amperometric indicators
   b) Types of detectors in gas chromatography
   c) Computerized instrumentation system
   d) Application of polarography.

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Seat
No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
PHYSICAL CHEMISTRY
Paper – XV : Molecular Structure – II

Day and Date : Saturday, 26-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions: i) Attempt **five** questions.

ii) Section – **I** (question **I**) is **compulsory**.

iii) Attempt **any two** questions from Section – **II** and **any two** questions from Section – **III**.

iv) Answers to **all 5** questions (from Section **I, II, III**) should be written in the **one** and the **same** answer book.

v) **All** questions carry **equal** marks.

vi) Figures to the **right** indicate **full** marks.

vii) **Use** of log tables and calculators is **allowed**.

SECTION – I

1. Compulsory :   **14**

   a) Define polarizability of a molecule.

   b) Dielectric relaxation occurs in the visible region of electromagnetic spectrum. True or false.

   c) Among CCl_4 and $CHCl_3$, which is a polar the molecule ?

   d) For a paramagnetic molecule magnetic moment is more than unity($\mu > 1$). True or false.

   e) Write the relationship between volume and mass susceptibility.

   f) What is the advantage of Quinck's method of determining magnetic susceptibility ?

P.T.O.

g) What is the spin value of ^{12}C nucleus ?

h) Write the equation for nuclear magneton.

i) Define spin-lattice relaxation.

j) The shielding constant of a proton depends on the _____ of the atom to which it is attached.

k) The number of lines in the e.s.r signal of an electron interacting with three equivalent protons are _____

l) The ESR transitions are observed in which region of electromagnetic spectrum ?

m) Mossbauer spectroscopy is related to resonance fluorescence of γ-rays. True or false.

n) Does the chemical shift in Mossbauer spectroscopy depends on the radius of the nucleus in the ground state ?

SECTION – II

2. a) Derive Clausius-Mossotti equation for molar polarization of a molecule. **7**

   b) Describe the refraction method of determining dipole moment of a molecule. **7**

3. a) Derive an expression for magnetic moment, I, according to Langevin theory of paramagnetism. **7**

   b) Explain the Gouy method of determining magnetic susceptibility. **7**

4. a) In NMR spectroscopy for a nucleus with I = 1/2, obtain expression for allowed energy levels and frequency of transition in presence of magnetic field. **7**

   b) What are the advantages of using tetramethylsilane as a standard for NMR spectroscopy ? An NMR instruments operates a 300 MHz. Find the value of strength of magnetic field.

   $(h = 6.625 \times 10^{-34}$ Js, $g_N = 5.585$ and $\beta_N = 5.05 \times 10^{-27} JT^{-1})$. **7**

SECTION – III

5. a) Describe the components of an ESR spectrophotometer with a schematic diagram. **5**

   b) Explain the nature of ESR spectrum obtained for benzene anion. **5**

   c) An unpaired electron absorbs at 9.8 GHz in a magnetic field strength of 0.35 T.

   Calculate the g value ($\beta = 9.2732 \times 10^{-24} JT^{-1}, h = 6.626 \times 10^{-34} Js$). **4**

6. a) Describe the working of a Mossbauer spectrometer with a neat sketch. **5**

   b) What is isomer shift in Mossbauer spectroscopy ? Explain with examples. **5**

   c) The energy of emitted γ-rays from first excited state of ^{57} Fe nucleus is 14.4 keV. Calculate its recoil energy ($N = 6.023 \times 10^{23}$, $1keV = 1.6 \times 0^{-19}$ J, $c = 3.0 \times 10^8$ ms^{-1} **4**

7. Write notes on **any three** : **14**

   a) Verification of Curie's law.

   b) Pascal constants.

   c) Limitations of Langevin's theory.

   d) Significance of shielding constants.

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SLR-VD – 41

Seat No.	

M.Sc. (Part – II) (Semester – IV) Examination, 2014
PHYSICAL CHEMISTRY (Elective Paper)
Paper – XVI : Surface Chemistry

Day and Date : Tuesday, 29-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : i) Attempt **five** questions.
       ii) Section **I** (question **1**) is **compulsory**.
      iii) Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.
      iv) Answers to **all 05** questions (from Section, **I, II, III**) should be written in the **one** and the **same** answer book.
       v) **All** questions carry **equal** marks.
      vi) Figures to the **right** indicate **full** marks.
     vii) Use of log tables and calculators is **allowed**.

SECTION – I

1. Answer the following :   **(14×1=14)**

   a) Write BET equation with usual notations.

   b) What is isostatic pressing ?

   c) How emulsion types are predicted if it feels greasy and nongreasy ?

   d) What is positive adsorption ?

   e) Distinguish between adsorption isotherm and adsorption isobar.

   f) Why simple fatty acids do not spread on the surface of water to form monolayer ?

   g) What is Tamman temperature ?

P.T.O.

h) Define the term heat of wetting.

i) Indicate naturally tendency of liquids due to their surface tension property.

j) State the effect of temperature on the rate of physical adsorption.

k) Gas mask containing activated charcoal removes poisonous gases from atmosphere. This process is based on _____ phenomenon.

   (Fill in the blank by choosing correct term from the following)

   v) Adsorption

   vi) Absorption

   vii) Sorption

   viii) Emission

l) What is contact angle hysteresis ?

m) Point out the effect of temperature on detergent efficiency.

n) Define critical micelle concentration.

SECTION – II

2. a) Describe physical states of insoluble monomolecular films. **7**

   b) What is the meaning of emulsion stability ? Describe theories of emulsion stability. **7**

3. a) Give an account of volumetric method of measuring gas adsorption. **7**

   3.72 cm^3 of H$_2$ gas when adsorbed over 2 gm of charcoal at STP form monolayer. If area occupied per hydrogen molecule is 13 A°, calculate the specific surface area of the solid.

   b) Describe differential capillary rise method of determination of surface tension of liquids. A film of pyridine filled in a rectangular wire loop in which one side could be moved. Given that the wire loop is 8.53 cm wide and that a force of 6.48×10^{-3} N is needed to move the side. Determine the value of the surface tension. **7**

4. a) Derive Gibb's Adsorption equation with usual notations for dilute solution. **7**

   b) Discuss various types of adsorption isotherms. Give advantages and disadvantages of Langmuir adsorption isotherm. **7**

SECTION – III

5. a) What is heterogeneous catalysis ? Explain the mechanism of catalytic synthesis of ammonia on iron oxide catalyst. **5**

   b) A spherical drop of water of radius 2 mm is broken down to droplets of radius of 0.1 mm. What is the increase in surface energy ? Surface tension of water is 72.5 dynes per cm. **5**

   c) State and explain Trube's rule. **4**

6. a) Discuss BET method of determination of surface area of an adsorbent. **5**

   b) Derive the equation $\pi A = kT$ with usual notation used to study the physical states of monomolecular film. **5**

   c) What are solid lubricants ? Discuss the mechanism of hydrodynamic and boundary lubrication. **4**

7. Write notes on **(any three) :** **14**

   a) Detergency

   b) Micelle and reverse micelle

   c) Selective wetting

   d) Langmuir-Adam surface pressure balance

   e) Sintering.

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Seat
No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
ANALYTICAL CHEMISTRY (Paper – X) (Old)
Instrumental Methods of Chemical Analysis – I

Day and Date : Wednesday, 23-4-2014   Total Marks : 70

Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.

2) Section **I** is **compulsory**.

3) Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.

4) Answers to **all** questions (Section **I**, **II** and **III**) should be written in the **one** answer book.

5) **All** questions carry **equal** marks.

6) Figures to the **right** indicate **full** marks.

7) **Use** of log table and calculator is **allowed**.

SECTION – I

1. Answers the following.   **14**

   a) Name the scientist who discovered neutron.

   b) What do you mean by indicator electrode ?

   c) In conductometric measurements DC current is used. Why ?

   d) Why neutrons are the best projectile for nuclear fission ?

   e) Mention the function of supporting electrolyte in voltmmetry.

   f) State a function of potentiostat.

   g) Mention magic numbers in nuclear chemistry.

   h) Schematically show exotherm and endotherm in DTA curve.

   i) Define residual current.

P.T.O.

j) Name the reference material used in DSC technique.

k) Represent glass electrode.

l) In amperometric titrations, the reference electrode used is

m) The principle of TGA is

n) State Faraday's second law of electrolysis.

SECTION – II

2. a) What is the principle of isotope dilution analysis ? Write on applications of this method.　**7**

   b) Discuss general principle and instrumentation of DTA.　**7**

3. a) Explain how cyclic voltammetry is a tool for fundamental and diagnostic studies.　**7**

   b) How liquid membrane electrodes are formed ? Explain schematically one such electrode.　**7**

4. a) Write on amperometric titrations.　**7**

   b) Discuss commercial instrument for TGA.　**7**

SECTION – III

5. a) What is tracer technique ? Mention its agricultural applications.　**5**

   b) Illustrate glass electrode.　**5**

   c) Mention advantages and disadvantages of high frequency titrations.　**4**

6. a) Write on electrolytic separation of metals.　**5**

   b) Discuss Radioimmunoassay.　**5**

   c) Lists differences between TGA and DTA.　**4**

7. Write short notes on **any three**.　**14**
   a) Heat flux DSC
   b) Kinetic parameters of thermal degradation
   c) Neutron activation analysis
   d) Enzyme sensing electrodes.

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Seat No.

M.Sc. Part – II (Semester – III) Examination, 2014
ANALYTICAL CHEMISTRY (Paper – XI) (Old)
Applied Analytical Chemistry

Day and Date : Friday, 25-4-2014　　　　　　　　　　　　　　Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions: 1) Q. No. **1** is **compulsory**.
　　　　　　　2) Attempt **any two** questions each from Section – **II** and Section – **III**.
　　　　　　　3) **All** questions should be written in the same answer book.
　　　　　　　4) Figures in **right** indicate **full** marks.

SECTION – I

1. Answer the following : 　　　　　　　　　　　　　　　　　　　**(7×2=14)**

   a) Give the composition of dolomite and bauxite ore.

   b) What is use of bordeaux mixture and which is the metal ion present in it ?

   c) What do you mean by gammexane ?

   d) Name the constituents present in bronze and brass alloy.

   e) What are the constituents of feeding stuffs ?

   f) Why is only nitric acid used for the dissolution of the solder alloy ?

   g) What are the various involved during samping of the soil ?

SECTION – II

2. A) How will you determine the available and non-available phosphorus in fertilizer sample ? Give the detailed experimental procedure of it. 　　　**7**

   B) Discuss the determination of endosulphan and thiram residues in food grain and vegetables with respect to reagents required for the analysis and experimental details. 　　　**7**

P.T.O.

3. A) How will you determine the following elements in glass sample ?　　**7**
    i) Zinc　　　　　ii) Chlorine　　　iii) Titanium

   B) What do you mean by pyrolusite ore ? How is it analyzed ? Give the experimental details for the analysis of pyrolusite ore.　　**7**

4. A) Describe the Kjeldahl's method of the determination of total nitrogen in fertilizer sample.　　**7**

   B) Discuss the detailed dissolution procedure of stainless steel. What is the role of perchloric acid in it ? How are Chromium and Nickel determined ? Write the reactions that took place during the analysis.　　**7**

SECTION – III

5. A) Give a short account on the determination of soil properties.　　**5**
    i) Exchange capacity　　　　ii) Soil reaction

   B) Outline the analytical procedure for the determination of following meatls.　　**5**
    i) Titanium from ferroalloys　　ii) Boron from glass

   C) Give the analysis of uranium ore with chemical reactions.　　**4**

6. A) What are major constituents of soil ? Explain analytical procedure for the determination of any two constituents of soil.　　**5**

   B) Explain the method of determination of Zinab in plant material.　　**5**

   C) Explain in brief, how is starch analyzed from plant samples.　　**4**

7. Write short notes on **(any three) :**　　**14**

   a) Physical analysis of soil.

   b) Air and dust pollution from cement plants.

   c) Moisture determination in plant.

   d) Preliminary testing which respect to glass and glass ceramics.

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SLR-VD – 47

| Seat |
| No. |

M.Sc. – II (Semester – III) Examination, 2014
ANALYTICAL CHEMISTRY (Paper – IX) (New)
Advance Separation Techniques

Day and Date : Monday, 21-4-2014   Max Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

N.B. :   1) Attempt in **all five** questions.
        2) Section – I is **compulsory.**
        3) Attempt **any two** questions from Section – **II** and **any two** questions from Section – **III**.
        4) Answer to **all** questions should be written in the **one** answer book.
        5) **All** questions carry **equal** marks.
        6) Figures to **right** indicate **full** marks.
        7) **Use** of log table and non-programmable calculator is **allowed**.

SECTION – I

1. Attempt the following questions :   **14**

   i) Define the term MECC.

   ii) Give two examples of rigid gel.

   iii) Give meaning of masking agent.

   iv) Explain the term electro osmotic flow.

   v) What is synergic extraction ?

   vi) Give important features of solvent extraction.

   vii) Why ligand is used in gel-permeation chromatography ?

   viii) Give two important criteria for choice of filter paper for paper chromatography.

   ix) Give two applications of electrodialysis.

   x) What is the use of enzyme in affinity chromatography ?

   xi) Conventional filters such as media filters are used to remove _____ solids.

P.T.O.

xii) What is MALDI ?

xiii) Give two examples of modified papers for paper chromatography.

xiv) Give two advantages of hallow fiber dialyser.

SECTION – II

2. A) Explain the technique of solvent extraction. **7**

   B) Explain the principle of dialysis. Give information of membranes used in hemodialysis. **7**

3. A) What is the principle of zone refining technique ? Explain process of zone refining. **7**

   B) Explain the principle, sedimentation constant and sedimentation equilibrium of ultracentrifugation. **7**

4. A) Describe the principle, preparation of gel, visualization and applications of gel chromatography. **7**

   B) Explain principle of electrophoresis. Give applications of capillary electrophoresis. **7**

SECTION – III

5. A) Discuss the principle involved in : **5**

   i) Ascending chromatography

   ii) Descending chromatography.

   B) Derive the relationship between distribution coefficient and distribution ratio by taking suitable example. **5**

   C) Describe the components involved in affinity medium. **4**

6. A) Explain working of dialyser with the help of diagram. **5**

   B) Give applications of electrodialysis. **5**

   C) What is isoelectric focussing ? Explain with suitable examples. **4**

7. Write notes on **(any three)** : **14**

   i) Extraction by solvation

   ii) Capillary electrochromatography

   iii) Gels used in gel-permeation chromatography

   iv) Radial paper chromatography.

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Seat No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
ANALYTICAL CHEMISTRY
Paper – X : Instrumental Methods of Analysis – I (New)

Day and Date : Wednesday, 23-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.

2) Section – **I** is **compulsory.**

3) Attempt **any two** questions from Section **II** and **any two** questions from Section **III.**

4) Answer to **all** questions (Section **I, II** and **III**) should be written in the **one** answer book.

5) **All** questions carry **equal** marks.

6) Figures to the **right** indicate **full** marks.

7) **Use** of table and calculator is **allowed.**

SECTION – I

1. Answer the following :   14

   i) Draw typical polarogram and mention diffusion current region.

   ii) Mention the working voltage range of GM counter.

   iii) Give the function of salt bridge.

   iv) Write Ilkovic equation and give the significance of the terms involved in it.

   v) Name any two inorganic scintillation detectors.

   vi) What do you mean by extrinsic semiconductor ?

   vii) Define dielectric constant.

   viii) Which parameter is measured in DTA ?

   ix) Sketch typical TGA curve.

   x) Which gases are filled in gas filled detectors ?

P.T.O.

xi) Lists various nuclear radiations.

xii) What is pH ?

xiii) The range of frequency that can be used in high frequency titrations is _____

xiv) Write Nernst equation and give the significance of the terms involved in it.

SECTION – II

2. a) Discuss various applications of DTA. **7**

   b) What do you mean by tracer technique ? Describe applications of this in agriculture and industry. **7**

3. a) What are different types of ion selective electrodes ? Explain solid membranae electrodes. **7**

   b) Give the principle of isotope dilution analysis. Explain how it is used in biomedical investigations. **7**

4. a) Discuss principle and technique of electrogravimetry. **7**

   b) What is theoretical basis of DSC ? **7**

SECTION – III

5. a) Explain radiometric titrations. **5**

   b) Draw the thermogram of calcium oxalate and discuss the features of the curve. **5**

   c) Explain dead stop end point method. **4**

6. a) Describe principle of stripping voltametry. **5**

   b) Mention advantages of high frequency titrations. **5**

   c) With the help of DTA curve for mangenes carbonate, explain various reactions involved in it. **4**

7. Write short notes on **any three** : **14**
   a) Solid state ion selective electrodes
   b) Thermobalance
   c) Typical amperometric titration curves
   d) Types of cells used in high frequency titrations.

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Seat
No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
ANALYTICAL CHEMISTRY (New)
Paper – XI : Applied Analytical Chemistry

Day and Date : Friday, 25-4-2014
Time : 3.00 p.m. to 6.00 p.m.

Total Marks : 70

Instructions : 1) Q. No. **1** is **compulsory**.
2) Attempt **any two** questions **each** from Section – **II** and Section – **III**.
3) **All** questions should be written in **same** answer book.
4) Figures to **right** indicate **full** marks.

SECTION – I

1. Answer the following : **(14×1=14)**

   1) What are important alloying elements of Bronze ?

   2) Give the list of major components of soil.

   3) Give the major composition of face powder.

   4) Why zinc oxide is used in cosmetic ?

   5) Give the composition of feed stock. Oil, protein.

   6) What is the use of BHC powder ?

   7) Name the acid created at armpit which has bad odor.

   8) The calcium from the plant comes under the macro element. True/False.

   9) Humus is a colloidal substance, and increases the soil's cation exchange capacity. True/False.

   10) Green vegetables are the good sources of minerals. True/False.

   11) Give the long form of ICP-AES and its use.

   12) Give the chemical formula of gypsum.

   13) A silver coloured coins contains 75% copper, 25% nickel, and a trace amount of manganese. True/False.

   14) Mercury containing skin-lightening cream (fair and lovely) affect the kidney, liver and brain. True/False.

P.T.O.

SECTION – II

2. A) Give the colorimetric and alkalimetric method to determine the boric acid from face powder. **7**

   B) What is the composition of hematite ore ? How the constituents of hematite Ore are determined ? Write the chemical reactions involved in it. **7**

3. A) Give the classification of pesticides. Describe the experimental procedure for thiomenton and chloridane from the soil and plant samples. **7**

   B) Discuss in brief analysis of steel with respect to chemical composition and experimental details. **7**

4. A) What do you mean by bauxite ore ? Give the details of analysis of bauxite ore. **7**

   B) What are the major constituents of soil ? Explain the analytical procedure for the determination of mineral matter and organic matter. **7**

SECTION – III

5. A) What is fertile soil ? Give soil testing methods for the fertile soil. **5**

   B) Describe function of anhydrous aluminium zirconium tetrachlorohydrex glycene as a antiasperant and its analysis. **5**

   C) How will you determine pH of soil sample ? **4**

6. A) What is the role of methenamine in deodorant and how it can be analyzed ? **5**

   B) How will you determine the starch and sugar from the plant samples ? **5**

   C) What is composition of electrical soldering material ? How will you determine the Pb content from solder material ? **4**

7. Write the short notes on (**any three**) : **14**

   a) Cleansing lotion

   b) Stock feed

   c) Soil sampling

   d) Kjeldahl nitrogen method.

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**Seat
No.**

M.Sc. (Part – I) (Semester – II) Examination, 2014
CHEMISTRY
Inorganic Chemistry – II (Paper – V)

Day and Date : Tuesday, 22-4-2014   Max Marks : 70
Time : 11.00 a.m. to 2.00 p.m.

Instructions : 1) Attempt in **all 5** questions.
  2) Section – **I** is **compulsory.**
  3) Attempt **any two** questions from Section – **II** and **any two**
    from Section **III.**
  4) Answers to **all** questions (Section – **I** , **II** and **III**) should be
    written in the **one** answer book.
  5) **All** questions carry **equal** marks.
  6) Figures to the **right** indicate **full** marks.
  7) **Use** of log table or calculators is **allowed**.

SECTION – I

1. Answer the following :   **14**

   a) What is the boiling point (°C) of B_5H_9 ?

   b) How does B_2H_6 react with $(Me)_3 N$?

   c) What are the physical conditions required for nuclear fusion to occur ?

   d) Write the electronic configuration of californium.

   e) What is the concentration of K^+ in animal cells ?

   f) Work out the number of 4f electrons in ce^{3+} ion.

   g) What is the color of Pm^{3+} ion in aqueous solution ?

   h) 1 a.m.u. = _____ MeV.

   i) Mass of hydrogen atom $_1^1H$ = _____ a.m.u.

   j) Draw the structure of Ify.

   k) $_{92}^{238}U + _7^{14}N \rightarrow ? + ?$

   l) $_{92}^{238}U + _8^{16}O \rightarrow ? + ?$

m) $^{246}_{96}C_m + ^{12}_{6}C \rightarrow ? + ?$

n) $^{252}_{98}Cf + ^{11}_{5}B \rightarrow ? + ?$
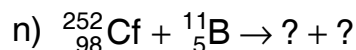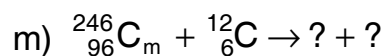
SECTION – II

2. a) What is homogeneous catalysis ? Discuss the catalytic cycle involved in Monsanto acetic acid process. **7**

   b) Why is separation of lanthanides difficult ? Discuss. **7**

      i) Valency change method and

      ii) Ion exchange method for the separation of lanthanides.

3. a) What are boranes ? Discuss synthesis, structure and properties of B_2H_6 and B_4H_{10}. **7**

   b) What is dissociation constant ? What is stability constant ? Discuss chelate effect and its thermodynamic origin. **7**

4. a) What are nuclear reactions ? Discuss in brief the process of nuclear fusion as the source of energy. **7**

   b) What is nitrogen fixation ? Explain the chemical two processes involving the fixation of atmospheric dinitrogen. **7**

SECTION – III

5. a) Describe polymorphism of carbon. **5**

   b) Discuss in brief Ziegler and Natta catalysis. **5**

   c) What is the role of iron in biological processes ? **4**

6. a) Explain in brief synthesis, structure and properties of borazine. **5**

   b) Discuss electronic configuration and oxidation states of actinides. **5**

   c) What are ferredoxins ? **4**

7. Write notes on **any three** of the following : **14**

   a) Isomerization

   b) Compounds of sulphur and nitrogen

   c) Applications of lanthanides

   d) Cytochromes.

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Seat No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
ANALYTICAL CHEMISTRY (Paper – XII) (New)
Analytical Spectroscopy

Day and Date: Monday, 28-4-2014   Total Marks : 70

Time: 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
              2) Section – **I** is **compulsory**.
              3) Attempt **any two** questions from Section – **II** and **any two** questions from Section – **III**.
              4) Answers to **all** questions (Section **I, II, III**) should be written in the **one** answer book.
              5) **All** questions carry **equal** marks.
              6) Figures to **right** indicate **full** marks.
              7) Use of log-table and calculator is **allowed**.

SECTION – I

1. Answer the followings :   **14**

    i) What is Rayleigh scattering ?

    ii) Name the source used in scanning electron microscopy.

    iii) _____ and _____ are the two important Mossbauer nuclei.

    iv) What be the net field gradient if a nucleus is located in a site of tetrahedral or higher symmetry ?

    v) Define chemical shift.

    vi) Define magnetic nucleus.

    vii) Define inelastic collision.

    viii) Write the name of standard material used in ESR spectroscopy.

    ix) Mention the names of gamma ray detectors.

    x) Mention the source used in Mossbauer spectroscopy.

P.T.O.

xi) State cotton effect.

xii) What do you mean by binding energy ?

xiii) 600 nm = _____ joules.

xiv) What do you mean by polarizability ?

SECTION – II

2. a) Explain the principle and techniques of photoelectron spectroscopy. **7**

   b) Explain hyperfine splitting phenomenon. Schematically draw the hyperfine splitting diagram for interaction of two proton nucleus with unpaired electron. **7**

3. a) Write principle and applications of atomic force microscopy. **7**

   b) Write principle of Mossbauer spectroscopy. Explain isomer shift phenomenon with illustrative examples. **7**

4. a) How many spectral lines accepted from methyl radicals in ESR spectroscopy ? Draw its ESR spectrum with intensities ratio. **7**

   b) Explain the theory and applications of NQR. **7**

SECTION – III

5. a) Write chemical and surface applications of photoacoustic spectroscopy. **5**

   b) Explain instrumentation of scanning electron microscopy. **5**

   c) Explain octant rule with illustrations. **4**

6. a) Discuss instrumentation of ESCA. **5**

   b) "$FeCl_3$ consists of quardrupole singlet while $FeSO_4$ consists quardrupole doublet". Explain. **5**

   c) What do you mean by Rayleigh and Raman scattering ? **4**

7. Write short notes on **any three** of the followings : **14**

   a) Raman spectrometer

   b) Zero field splitting

   c) Mossbauer spectrophotometer

   d) Optical rotary dispersion.

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Seat No.

M.Sc. – II (Semester – IV) Examination, 2014
ANALYTICAL CHEMISTRY (Paper – XIII)
Advanced Analytical Techniques (Old)

Day and Date : Tuesday, 22-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
2) Section – **I** is **compulsory.**
3) Attempt **any two** questions from Section – **II** and **any two** questions from Section – **III.**
4) Answer to **all** questions should be written in the **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to **right** indicate **full** marks.
7) **Use** of log table and non-programmable calculator is **allowed**.

SECTION – I

1. Attempt the following questions :   **(14×1=14)**

   i) Define critical temperature and pressure of gas.

   ii) Give two names of detectors used in ion chromatography.

   iii) Give meaning of base peak.

   iv) Mention two advantages of segmented flow method.

   v) Define automated device.

   vi) Give two names of resins used in ion chromatography.

   vii) Why TMS is used in proton NMR ?

   viii) Which eluents are used in ion chromatography ?

   ix) Mention two applications of FIA.

P.T.O.

x) Define chromophore and give one example.

xi) What do you understand by pseudo-first order reaction ?

xii) What is nitrogen rule ?

xiii) What is difference between automated and automatic system ?

xiv) Give the types of non-discrete methods.

SECTION – II

2. A) Explain the principle of ion chromatography and give structure and characteristics of resins. **7**

   B) Give mathematical expression for first order reactions. **7**

3. A) Explain GS-MS technique of separation of mixture with suitable examples. **7**

   B) Give advantages of super critical fluid chromatography over GLC and HPLC. **7**

4. A) Describe instrumentation of FIA with flow sheet diagram. What are its advantages ? **7**

   B) Describe principle and instrumentation of centrifugal fast scan analyser. **7**

SECTION – III

5. A) Give important uses and advantages of ion chromatography. **5**

   B) Write note on differential method. **5**

   C) Explain principle of Mass-spectroscopy. **4**

6. A) What is array pattern ? How does it arise in diffraction ? **5**

   B) What are stopped flow methods ? Explain. **5**

   C) What is pressional motion ? Explain. **4**

7. Write short note on **any three** of the following : **14**

   a) Applications of particle size analysis

   b) Determination of organic species by kinetic methods

   c) Suppressor column in ion chromatography

   d) Hyphenated technique in ion chromatography.

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Seat
No.

M.Sc. II (Semester – IV) Examination, 2014
ANALYTICAL CHEMISTRY (Old)
Environmental Chemical Analysis (Paper – XVI)

Day and Date : Tuesday, 29-4-2014　　　　　　　　　　Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

N.B. : 1) Attempt in **all five** questions.
2) Question No. **1** is **compulsory**. Attempt **any two** questions **each** from Section – **II** and Section – **III**.
3) Answers to **all** questions are to be written in **one** answer book only.
4) **All** questions carry **equal** marks.
5) Figures to the **right** indicate **full** marks.
6) Draw **neat** labeled diagrams **wherever** necessary.
7) **Use** of calculator and University log table is **allowed**.

SECTION – I

1. Answer the following questions in **one** or **two** sentences.　　　**14**

   i) Write the reaction between the gas responsible for Bhopal gas tragedy and primary amine.

   ii) Give parameters to check quality of water.

   iii) State different types of air pollutants.

   iv) Enlist the types of water pollutants with their sources.

   v) State chemical classes of hazardous waste.

   vi) What is ISCO in waste water treatment ?

   vii) Define the terms-bioremediation and grey water.

   viii) State the principle of API oil separator.

   ix) Give the significance of DO.

   x) What do you mean by soil pollution ?

xi) 'Sludge' and 'sewage' are not same materials comment on this statement.

xii) BOD of effluent from paper industry is high. Why ?

xiii) What is eutrophication ?

xiv) What do you mean by exogenic cycle ?

SECTION – II

2. a) Explain the method used to determine amount of arsenic in the water. **7**

   b) What is soil erosion ? State different types of soil erosion. Explain measures to prevent soil erosion. **7**

3. a) Describe the generation of CO_x and explain hazardous effects of CO_x. **7**

   b) Explain the terms-atmosphere, lithosphere, biosphere and hydrosphere. **7**

4. a) Describe the pollution due to sugar industry. **7**

   b) Explain tertiary waste water treatment. **7**

SECTION – III

5. a) Explain the bio-geochemical cycle of nitrogen. **5**

   b) Comment on air pollution caused by suspended particulate matter. **5**

   c) Explain in brief estimation of DO. **4**

6. a) Comment on treatment of polluted soil. **5**

   b) Describe principle and methods of sampling of SO_x. **5**

   c) Hazardous waste should be disposed properly. In view of this, describe disposal of hazardous waste. **4**

7. Write short notes on **any three** of the following : **14**
   a) Minamata disease
   b) Public health significance of lead
   c) Bio-geochemical cycle of sulphur
   d) Persulphate in treatment of industrial waste water.

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Seat No.

M.Sc. – II (Semester – IV) Examination, 2014
ANALYTICAL CHEMISTRY (Paper – XIII) (New)
Advance Analytical Techniques

Day and Date : Tuesday, 22-4-2014　　　　　　　　　　　　Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

N.B. :　1) Attempt in **all five** questions.
　　　　　2) Section – **I** is **compulsory**.
　　　　　3) Attempt **any two** questions from Section – **II** and **two** questions from Section – **III.**
　　　　　4) Answer to **all** questions should be written in **one** answer book.
　　　　　5) **All** questions carry **equal** marks.
　　　　　6) Figures to **right** indicate **full** marks.
　　　　　7) **Use** of log-table and non-programmable calculator is **allowed**.

SECTION – I

1. a) Attempt the following :　　　　　　　　　　　　　　　　　　　　7

　　　i) Give two names of eluents used in ion chromatography.

　　　ii) Name the two methods used to collect analytes after extraction.

　　　iii) Mention the different ion sources for mass spectroscopy.

　　　iv) Give two important advantages of automatic analysis.

　　　v) Mention two types of non-discrete methods.

　　　vi) Define critical pressure of a gas.

　　　vii) Define pseudo unimolecular reactions.

　b) Fill in the blanks :　　　　　　　　　　　　　　　　　　　　　　7

　　　i) The no. of molecules or atoms whose concentration changes during the chemical reaction is known as _____ of reaction.

　　　ii) Super critical fluid extraction system can be operated by _____ and _____ ways.

P.T.O.

iii) The rate of second order reaction is directly proportional to _____ reactants.

iv) Mobile phase used in supercritical fluid analysis is _____

v) The relation between wavelength and diameter in Mie theory is _____

vi) Airy pattern is showed in _____ theory.

vii) Critical point density of CO_2 fluid is _____ gm/ml.

SECTION – II

2. a) Explain the principle of ion chromatography. Give the structure of resins used in ion chromatography. **7**

   b) Explain the terms rate law, order of reaction and derive mathematical expression for second order reaction. **7**

3. a) Describe supercritical fluid chromatography with flow diagram. **7**

   b) Explain GC-MS technique of separation of mixture with suitable examples. **7**

4. a) Give advantages and disadvantages of automated analysis. **7**

   b) Describe principle and instrumentation of dynamic light scattering. **7**

SECTION – III

5. a) Give applications of photosedimentation. **5**

   b) Compare super critical fluid chromatography with other column chromatographic methods. **5**

   c) Explain principle of Mass-spectroscopy. **4**

6. a) Explain characteristics of first order reaction. **5**

   b) Explain instrumentation in ion chromatography. **5**

   c) Describe low angle laser light scattering instrumentation with diagram. **4**

7. Write notes on **any three** : **14**

   i) Principle of Gas chromatography

   ii) Advantages of super critical fluid chromatography

   iii) Graphical representation of second order reactions

   iv) Eluents used in ion chromatography.

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Seat No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
ANALYTICAL CHEMISTRY (New)
Instrumental Methods of Analysis – II (Paper – XIV)

Day and Date : Thursday, 24-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
           2) Section **I** is **compulsory**.
           3) Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.
           4) Answers to **all** questions (Section **I, II** and **III**) should be written in the **one** answer book.
           5) **All** questions carry **equal** marks.
           6) Figures to the **right** indicate **full** marks.
           7) **Use** of log table and calculator is **allowed**.

SECTION – I

1. Answers the following :   **14**

    i) Mention any two fluorescence standards.

    ii) Define atomization.

    iii) What is refractive index ?

    iv) The Bragg's equation is written as $n\lambda = $ _____

    v) What is the basis of nephelometric analysis ?

    vi) What do you mean by self quenching ?

    vii) List any two chiroptical techniques.

    viii) Give the mathematical equation for Beer-Lambert's law.

    ix) The R.I. of benzene is 1.42 at 298 K. Calculate R_M. (density = 0.91 g/cm^3)

    x) Mention typical life time of phosphorescence emission.

   xi) Define elastic scattering.

  xii) Mention any two nonradioactive transitions.

 xiii) The highest flame temperature is obtained in oxygen with _____
      a) Acetylene   b) Hydrogen
      c) Butane   d) Cyanogen

  xiv) Who discovered X-ray radiation ?

SECTION – II

2. a) Discuss instrumentation involved in emission spectroscopy. **7**

   b) Discuss various components encountered in spectrofluorometer. **7**

3. a) Write on applications of turbidimetry and nephelometry. **7**

   b) Mention different types of emission spectra. Briefly explain them. **7**

4. a) With the help of block diagram explain the equipment used in flame photometry. **7**

   b) Illustrate X-ray absorption phenomenon. **7**

SECTION – III

5. a) Write on flame infrared emission. **5**

   b) Illustrate different factors which contributes to atomic spectral line widths. **5**

   c) Comment on advantages and disadvantages of XRF technique. **4**

6. a) Deduce Bragg's equation and discuss its use in X-ray spectroscopy. **5**

   b) Explain various applications of interferometry. **5**

   c) With the help of Joblonski's diagram, show various photophysical pathways with their typical life times. **4**

7. Write short notes on **any three** : **14**
   a) Surface contamination
   b) ORD technique
   c) Chemiluminescence phenomena
   d) X-ray generation techniques.

_____

SLR-VD – 59

| Seat |
| No. |

M.Sc. (Part – II) (Semester – IV) Examination, 2014
ANALYTICAL CHEMISTRY (New)
Paper – XV : Bio-Chemical and Food Analysis

Day and Date : Saturday, 26-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
2) Section **I** is **compulsory**.
3) Attempt **any two** questions from Section **II** and **any two** from Section **III**.
4) Answer to **all** questions (Section **I, II** and **III**) should be written in the **one** answer book.
5) **All** question carry **equal** marks.
6) Figures to the **right** indicate **full** marks.

SECTION – I

1. Answer the following :   **(1×14=14)**

   a) What are food preservatives ?

   b) Define iodine value.

   c) Define oils and fat.

   d) What is bad cholesterol ?

   e) Define softening paint.

   f) What are hormones ?

   g) Define narcotics.

   h) What is LD. 50 ?

   i) Define lethal dose.

   j) Roll of Vitamin A.

   k) Disease caused by deficiency of thiamine.

l) What do you mean by oxytocin ?

m) How anemia is detected ?

n) Which reagent is used for estimation of glucose ?

SECTION – II

2. A) Define acid value. How it is estimated by R-m method.   **7**

   B) Explain significance of monamine.   **7**

3. A) What is bilirubin ? What is its metabolism ? How it is estimated ?   **7**

   B) Explain, how uric acid is formed in body, How it is estimated ?   **7**

4. A) What are major components of Jam and Honey ? How are they estimated.   **7**

   B) Explain estimation of drug phenobarbital.   **7**

SECTION – III

5. a) Explain significance of L.C. 50.   **5**

   b) Explain biological significance of Vitamin C.   **5**

   c) Describe estimation of drug morphine sulphate.   **4**

6. a) Explain biological significance of insulin in diabetics disease.   **5**

   b) Describe procedure for estimation of poisonous material mercury in biological
      sample.   **5**

   c) Describe assay of progesterone.   **4**

7. Write notes on **any three** :   **14**

   a) Explain mode of action of snake renome.

   b) Analysis of milk and milky product.

   c) Estimation of drug aspirin.

   d) Estimation of cholesterol in blood.

Seat No.	

M.Sc. – I (Semester – II) Examination, 2014
CHEMISTRY
Organic Chemistry – II (Paper – VI)

Day and Date : Thursday, 24-4-2014   Max. Marks : 70
Time : 11.00 a.m. to 2.00 p.m.
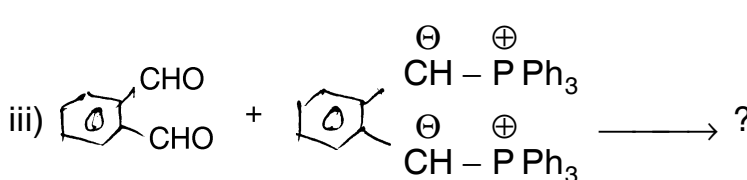
Instructions : 1) Attempt in **all five** questions.
2) Section **I** is **compulsory**. Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.
3) Answers to **all** questions should be written in the **same** answer book.
4) **All** questions carry **equal** marks.
5) Figures to **right** indicate **full** marks.
6) **Neat** labeled diagrams should be drawn **wherever** necessary.
7) **Use** of log tables and calculator is **allowed**.

SECTION – I

1. a) Select most correct alternative for **each** of the followings :   4

   i) In the Diels-Alder reaction, the diene must be in the _____ conformation.

      a) transoid   b) anti   c) staggered   d) cisoid

   ii) In the Birch reduction, the function of the alcohol is to supply _____

      a) electron   b) hydride ion

      c) proton   d) hydrogen free radical

   iii) Alcohols with a hydrogen in the _____ position in the presence of lead tetra acetate gives cyclic ether THF.

      a) β b) γ c) α d) δ

   iv) Clemmensen reduction fails for _____ substrates.

      a) Volatile   b) acid sensitive

      c) base sensitive   d) α-hydroxy ketone

P.T.O.

b) Fill in the blanks : **4**

  i) Diisopropylamine on reaction with butyllithium in the presence of THF at 0°C gives _____

  ii) The catalyst which is soluble in water as well as organic solvent are known as _____

  iii) Nucleic acids containing D-ribose as the sugar unit are called _____

  iv) In the ene reaction, when metal moves from ene to enophile, then the reaction is known as _____ reaction.

c) State whether the statement is **correct** or **false** : **3**

  i) In Baeyer-Villiger oxidation of ketones, the retention of carbonyl oxygen, doesnot takes place in the product as carbonyl oxygen of the product ester.

  ii) Huang-Minlon modification of Wolff-Kishner reduction, the reaction is carried out by refluxing in solvent diethylene glycol.

  iii) 2, 3-Dichloro-5, 6-dicyano-benzoquinone in dehydrogenation reaction is reduced to dichloro-dicyanohydroquinone.

d) Predict the product(s). **3**

  i) $HCN \xrightarrow[2H_2O]{RLi}$?

  ii) Cyclopentanone $\xrightarrow{CH_2N_2}$?

  iii) ⟶ ?

SECTION – II

2. A) Predict the product(s) and suggest suitable mechanism for the following conversions. **7**

  i) α-chlorocyclohexanone $\xrightarrow{\text{alkoxide ion}}$?

  ii) β-acetylnaphthalene + diethylsuccinate $\xrightarrow{(CH_3)_3 \overline{C}\overline{O}k^+}$? + ?
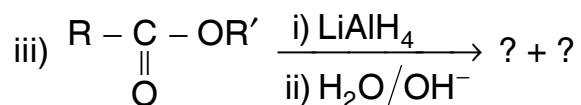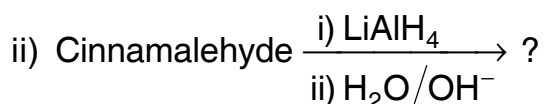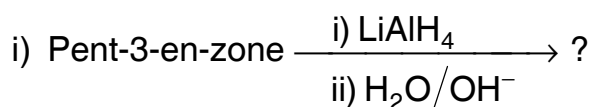
B) Give the applications of following reagents in organic syntheses. **7**

   i) DDQ

   ii) LDA.

3. A) Discuss the hydride ion transfer mechanism in reduction by $LiAlH_4$. Give products of following reactions. **7**

   i) Pent-3-en-zone $\xrightarrow[\text{ii) } H_2O/OH^-]{\text{i) } LiAlH_4}$?

   ii) Cinnamalehyde $\xrightarrow[\text{ii) } H_2O/OH^-]{\text{i) } LiAlH_4}$?

   iii) $R - \underset{\underset{O}{\|}}{C} - OR'$ $\xrightarrow[\text{ii) } H_2O/OH^-]{\text{i) } LiAlH_4}$? + ?

B) Complete the following conversions and suggest mechanism for the conversion. **7**

   i) O-hydroxybenzaldehyde $\xrightarrow{H_2O_2/O\overset{\ominus}{H}}$?

   ii) P-hydroxyacetophenone $\xrightarrow{H_2O_2/O\overset{\ominus}{H}}$?

4. A) Explain : 1-Methylcyclopentene gives syn addition to BH_3. Discuss mechanism, regioselectivity and stereochemistry of the reaction. **7**

B) How can the given conversion be performed under basic conditions ? Suggest reagent/catalyst and mechanism. Discuss applications of the reaction. **7**

   propiophenone $\longrightarrow$ n-propylbenzene
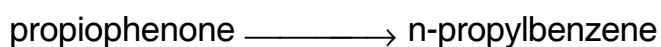
SECTION – III

5. A) Give the method for the preparation of lithium dimethylcuprate (R_2CuLi), its structure. Complete the following reactions. **5**

   i) $Ph - \underset{\underset{O}{\|}}{C} - CH_2 - CH_2 - OTS \xrightarrow{(CH_3)_2 \ CuLi} ?$

   ii) [structure] $\xrightarrow[\text{ii) } H_2O/H^+]{\text{i) } (CH_3)_2 \ CuLi} ? + ?$
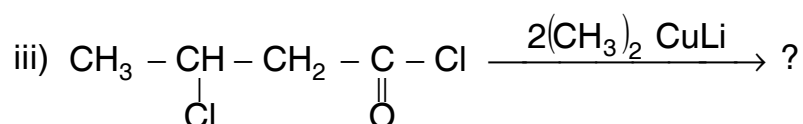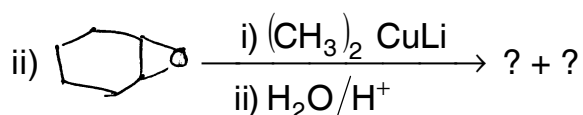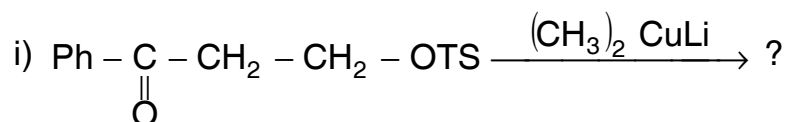
   iii) $CH_3 - \underset{\underset{Cl}{|}}{CH} - CH_2 - \underset{\underset{O}{\|}}{C} - Cl \xrightarrow{2(CH_3)_2 \ CuLi} ?$

   B) Give an account of nucleoproteins and nucleic acids. **5**

   C) What are crown ethers ? Discuss their structure and applications. **4**

6. A) Discuss the Baeyer-Villiger oxidation reaction with respect to mechanism, migratory aptitude of various groups and its applications. **5**

   B) How will you affect following conversion ? Suggest suitable reagent, its synthesis and mechanism involved in conversion. **5**

   benzaldehyde $\xrightarrow{\quad ? \quad}$ styrene.
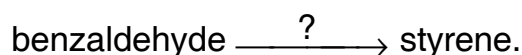
   C) Outline the important features of different types of structures of protein. **4**

7. Write notes on (**any three**) : **14**

   i) Robinson annulation reaction.

   ii) Use of sodium in alcohol in reduction reactions.

   iii) Prevost-Woodward hydroxylation by silver oxide.

   iv) Use of dicyclohexylcarbodiimide in organic syntheses.

Seat No.

M.Sc. – II (Semester – IV) Examination, 2014
ANALYTICAL CHEMISTRY (Paper – XVI)
Environmental Chemical Analysis (New)

Day and Date : Tuesday, 29-4-2014　　　　　　　Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m

Instructions : 1) Attempt in **all five** questions.
　　　　　　　2) Question No. **1** is **compulsory**. Attempt **any two** questions **each** from Section – **II** and Section – **III**.
　　　　　　　3) Answer to **all** questions are to be solved in **one** and the **same** answer book.
　　　　　　　4) **All** questions carry **equal** marks.
　　　　　　　5) Figures to the **right** indicate **full** marks.
　　　　　　　6) Draw **neat** labeled diagrams **wherever** necessary.

SECTION – I

1. Attempt the following questions :　　　　　　　　　　　　　　**14**
　　i) Which pollutant was responsible for Mina-Mata disaster ?
　　ii) Explain the term aerobic digestion.
　　iii) What is eutrophication ?
　　iv) What do you mean by bio-geochemical cycle ?
　　v) State the sinks for cox.
　　vi) State different types of soil pollutants.
　　vii) What is black water ?
　　viii) State origin of waste water ?
　　ix) Enlist the monitoring instruments for air pollution.
　　x) State the objectives of water analysis.
　　xi) Define the terms TQS and DO.
　　xii) What is activated sludge ?
　　xiii) What is sedimentation of waste water ?
　　xiv) What is hardness of water ?

SECTION – II

2. a) What are particulate matter ? Explain their effect on human life. **7**

   b) State different steps involved in treatment of waste water. Explain electrodialysis for treatment of waste water in tertiary treatment. **7**

3. a) Explain methods of sampling of air. What are consequences of air pollution on human health ? **7**

   b) Explain the bio-geochemical cycle of carbon. **7**

4. a) How the alkalinity and hardness of water sample are measured ? **7**

   b) Explain different components of biosphere. **7**

SECTION – III

5. a) Give a brief account of BOD. **5**

   b) Describe the principle and method of sampling of sulphur oxides. **5**

   c) Comment on disposal of hazardous waste. **4**

6. a) Discuss oil and grease removal from industrial waste water. **5**

   b) What is soil erosion ? Give different types of soil erosion. **5**

   c) Give brief account of method for determination of particulates in air. **4**

7. Write short notes on **any 3** : **14**

   a) Public health significance of pb.

   b) Disinfection of waste water.

   c) Sources of soil pollution.

   d) Trickling filters.

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Seat No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
INORGANIC CHEMISTRY (Paper – X)
Co-ordination Chemistry – I

Day and Date : Wednesday, 23-4-2014　　　　　　　　　　　Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt i**n all five** questions.

2) Section **I** is **compulsory.**

3) Attempt **any two** questions from Section – **II** and **any two** from Section – **III.**

4) **Use** only **one** answer book.

5) **All** questions carry **equal** marks.

6) Figures to the **right** indicate **full** marks.

7) **Use** of log tables and calculators is **allowed.**

SECTION – I

1. Answer the following :　　　　　　　　　　　　　　　　　　　**14**

a) What do you meant by Zeeman effect ?

b) Calculate CFSE for the d^6 case in octahedral geometry for weak ligand environment.

c) Which are catalysts used for monsanto acetic acid process ?

d) 'Intensity of d – d transition is usually weak', why ?

e) Draw TGA thermogram of $CuSO_4 \cdot 5 H_2O$.

f) Calculate the magnetic moment of the complex $[Cr(H_2O)_6]^{2+}$ ion.

g) Write the formula for Curie – Weiss law.

h) Which calibrant is used in DTA ?

P.T.O.

i) What do you mean by strong field ligand ?

j) Name the different couplings that are take place in the magnetic substances.

k) Draw the CFT diagram for the d^4 case in strong field in octahedral diagram.

l) What do you mean by Neel point ?

m) Name the calibrant that used in Gouy's method.

n) What are the factors that affect results of TGA ?

SECTION – II

2. a) Explain the mechanism for oxidation of pyrocatechol by oxygen catalyzed using Mn(II) chelate. **7**

   b) Discuss the Mimicking reaction in biological system. **7**

3. a) What do you mean by amino acids ? Discuss amino acid ester hydrolysis with examples. **7**

   b) What are mixed ligand complexes ? Discuss the factors affecting stability of ternary complexes. **7**

4. a) Show how can the magnetic and electric spectral data be used to distinguish the tetrahedral and octahedral Ni(II) complexes ? **7**

   b) What are the assumptions of VBT ? The magnetic moment of $[MnBr_4]^{2-}$ and $[Mn(CN)_6]^{3-}$ are 5.9 and 2.8 B.M., respectively, from this give geometry of each of the complex ion on the basis of VBT. **7**

SECTION – III

5. a) Which of the following pair of complexes have high Δ_0 value and why ? **5**

   I) $[Fe(C_2O_4)_3]^{4-}$ or $[Fe(C_2O_4)_3]^{3-}$

   II) $[Cr(en)_3]^{3+}$ or $[Cr(C_2O_4)_3]^{3+}$

b) $CaC_2O_4 2H_2O$ decomposes to CaO in three steps. Calculate percentage weight losses for each step and predict the decomposition reactions. **5**

Given wt Ca = 40.08 amu C = 12.00 amu O = 16.00 amu H = 1.00 amu

c) In what way Tanabe-Sugano diagrams are more useful than orgel diagram. **4**

6. a) Draw the MO diagram for $[Co(SCN)_6]^{3-}$ complex ion with π bonding. **5**

b) Which of the following ions exhibits Jahn-Teller distortion ? Give the reason Co^{2+}, V^{4+}, Ni^{2+} and Fe^{3+} (high spin.) **5**

c) Give the account for the antiferromagnetic behaviour of $ZnFe_2O_4$. **4**

7. Write short notes on **any three** of the following : **14**

a) Ziegler-Natta polymerization.

b) Synthesis of peptide

c) Spectrochemical series

d) Multielectron system to calculate magnetic momentum.

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SLR-VD – 64

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2014
INORGANIC CHEMISTRY (Paper – XI)
Nuclear Chemistry

Day and Date : Friday, 25-4-2014　　　　　　　　　　Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions :　1)　Attempt in **all five** questions.
　　　　　　　　2)　Section – **I** is **compulsory**.
　　　　　　　　3)　Attempt **any two** questions from Section — **II**
　　　　　　　　　　and **any two** from Section – **III**.
　　　　　　　　4)　**Use** only **one answer book.**
　　　　　　　　5)　**All** questions carry **equal** marks.
　　　　　　　　6)　Figures to the **right** indicate **full** marks.
　　　　　　　　7)　**Use** of log tables and calculators is **allowed**.

SECTION – I

1. Answer the following :　　　　　　　　　　　　　　　　　　　　　**14**

　　a)　What is the function of moderator in nuclear reactor ?

　　b)　Define the term magic number.

　　c)　What is elastic scattering ?

　　d)　Write the principle types of photo nuclear reactions.

　　e)　What is nuclear cross section ?

　　f)　Which atomic nuclides become more radioactive ?

　　g)　What are the types of α-particle spectra ?

　　h)　What is the difference between prompt and delayed neutrons ?

　　i)　Define the packing fraction.

　　j)　Name the nuclear models.

　　k)　On which factors does the stability of nucleus depends ?

　　l)　Name the element which has 12 isotopes.

　　m)　What is fission yield curve ?

　　n)　What do you mean by photonuclear disintegration ?

P.T.O.

SECTION – II

2. a) Explain salient features of liquid drop model and give various assumptions made for this model. **7**

   b) Define packing fraction and mass effect. How does binding energy per nucleon for light, medium and heavy nuclei vary with mass numbers of nuclei ? **7**

3. a) What are the different types of nuclear reactions ? Explain Bohr's hypothesis of compound nucleus formation. **7**

   b) What are the types of β-particles ? Explain energetic of β-decay. **7**

4. a) What are the types of gamma interactions ? Discuss the health effects of gamma radiations. **7**

   b) Explain heavy water manufacturing in India. **7**

SECTION – III

5. a) What are the different types of α-particle spectra observed for radio isotopes ? Explain the α-particle spectra of $^{212}Bi_{83}$ (Th C). **5**

   b) Write a schematic representation thermonuclear reactor. **5**

   c) Derive the equation $B = \Delta m \times 931 Mev$. **4**

6. a) Explain fermi gas model. **5**

   b) Explain nuclear fission cross section. **5**

   c) Explain brief account on research reactor. **4**

7. Write a notes **(any three)** : **14**

   a) Chain reactions

   b) Heavy ion induced nuclear reactions

   c) Fast breeder reactor

   d) Thorium and uranium resources in India.

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Seat No.

M.Sc. (Part – II) (Semester – III) Examination, 2014
INORGANIC CHEMISTRY
Paper – XII : Environmental Chemistry

Day and Date : Monday, 28-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions: 1) Attempts in **all five** questions.
     2) Section **I** is **compulsory**.
     3) Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.
     4) Answers to **all five** questions (from Section **I, II, III**) should be written in the **one** and the **same** answer book.
     5) **All** questions carry **equal** marks.
     6) Figures to the **right** indicate **full** marks.
     7) **Use** of log tables and calculators is **allowed**.

SECTION – I

1. Answer the followings :   **14**

   a) The maximum concentration of ozone layer is found in _____ sphere of atmosphere.

   b) Define smog.

   c) Classify the processes of waste water treatment.

   d) What are the effects of ionising radiations on man ?

   e) Which gas is responsible for Bhopal gas disaster ?

   f) What are pesticides ?

   g) What are the different types of water pollutants according to their origin ?

   h) Name atleast two methods used for monitoring of gaseous air pollutants.

   i) Define the term 'toxicology'.

   j) What is BOD ?

   k) What is ionizing radiation ?

P.T.O.

l) Enlist the methods for disposable of high level radiation waste.

m) Mention some industries which are responsible for water pollution in India.

n) What are the end products of aerobic oxidation of organic waste ?

SECTION – II

2. a) What is acid rain ? Explain its consequence on the environment. **7**

   b) Discuss sampling and analysis of CO and NO_2 pollutants from atmosphere. **7**

3. a) What are the effects of pesticides on human health ? **7**

   b) Describe the principle and working of cyclonic separation to control air pollution. **7**

4. a) What is nuclear fall out ? What are the hazards associated with it ? **7**

   b) Explain minamata disasters. **7**

SECTION – III

5. a) Outline the sources, sinks and control of NO_x pollutant. **5**

   b) What are cammon unit operations of sludge treatment and disposal ? **5**

   c) What are the sources of heavy toxic metals in the environment ? Explain spectrophotometric analysis of copper and chromium. **4**

6. a) Discuss the water pollution caused by various chemical industries. **5**

   b) Explain the determination of dissolved oxygen in water. **5**

   c) Write brief account on air pollution problems in industrial area. **4**

7. Write short notes on (**any three**) : **14**

   a) Ozone depletion.

   b) Degradation of pesticides.

   c) Spectrophotometric analysis of SO_2 air pollutants.

   d) Chernobyl disaster.

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SLR-VD – 66

Seat
No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
INORGANIC CHEMISTRY (Paper – XIII)
Instrumental Techniques

Day and Date : Tuesday, 22-4-2014　　　　　　　　　　Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
　　　　　　　　2) Section **I** is **compulsory**.
　　　　　　　　3) Attempt **any two** questions from Section **II** and **any two** from Section **III**.
　　　　　　　　4) Answer to **all** questions (Section **I, II** and **III** should be written in **one** answer book.)
　　　　　　　　5) **All** questions carry **equal** marks.
　　　　　　　　6) Figures to the **right** indicate **full** marks.
　　　　　　　　7) **Use** of log tables and calculators is **allowed**.

SECTION – I

1. Answer the following : 　　　　　　　　　　　　　　　　　　　　**14**

   a) What is the wavelength of X-ray when produced by using Cr target ?

   b) What is the cause of diffraction of neutron by crystals ?

   c) What is the expression for recoil energy ?

   d) What is the necessary condition for observing ESR spectra ?

   e) What is meant by Doppler broadening ?

   f) Mention the factors affecting DSC curve.

   g) What is the short wavelength region of 62 KV X-ray tube ?

   h) Give the steps in which calcium oxalate monohydrate undergoes thermal decomposition.

   i) Define quadrupole coupling constant.

   j) What is the nuclear spin for nuclei ^{79}Br and ^{85}Rb ?

   k) What would be the net field gradient if a nucleus is located in a site of tetrahedral symmetry ?

   l) Mention the thermal methods of analysis.

   m) Name the nuclei in which Mossbauer resonance have been observed.

   n) Predicts the number of lines in ESR spectra of $(SO_3)_2 NO^-$ anion.

P.T.O.

SECTION – II

2. a) State the resonance condition in electron spin resonance and explain the significance of g-value. What are the general rules governing the no. of lines observed in ESR spectra ? **7**

   b) Explain the principal and applications of neutron diffraction analysis. **7**

3. a) What is Mossbauer spectroscopy ? Explain the importance of recoilless emission and absorption in Mossbauer spectroscopy. **7**

   b) What is NQR spectroscopy ? Discuss the nature of NQR spectra of molecules with axially symmetric field and calculate the transition energy. **7**

4. a) What is TGA ? Explain the factors affecting TGA with suitable examples. **7**

   b) Explain the principals and applications of X-ray diffractions techniques. **7**

SECTION – III

5. a) How the NQR is used to study the charge transfer compounds and structure of compound (II) halides ? **5**

   b) Predict the ESR spectrum of :

   a) $\left[(\beta\, C_6H_2Me_3)_3\right]^{\mp}$ ion,　　　　b) $\left[Fe(CN)_5NO\right]^{3-}$ ion . **5**

   c) Which of the two, cis Fe $(CO)_4 Cl_2$ or trans Fe $(CO)_4 Cl_2$ would have the larger qudrupole splitting for iron ? **4**

6. a) Discuss the applications of Mossbauer spectroscopy in iron compounds. **5**

   b) How is DTA used in the following measurements :

   i) Heat of reactions　　　　　　ii) Specific Heat. **5**

   c) Calculate the Doppler Velocity in mm/sec. corresponding to the natural line width of the X-ray emission from the 23.8 KeV excited state of ^{119}Sn nucleus having a half life of 1.85×10^{-8} Sec. **4**

7. Write a notes (**any three**) : **14**

   a) Instrumentation of ESR spectroscopy

   b) Applications of thermometric titrations

   c) Factors affecting 'g' value

   d) Isomer shift in Mossbauer spectroscopy.

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Seat No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
INORGANIC CHEMISTRY (Paper – XIV)
Co-ordination Chemistry – II

Day and Date : Thursday, 24-4-2014 Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
2) Section – **I** is compulsory.
3) Attempt **any two** questions from Section – **II** and **any two** from Section – **III**.
4) Answer to **all** questions (Section – **I, II** and **III**) should be written in **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.
7) **Use** of log tables and calculators is **allowed.**

SECTION – I

1. Answer the following : **14**

   a) Define cis effect.

   b) Write names of symmetry elements which must not be possessed by optically active compound ?

   c) Define plane polarized light.

   d) Arrange the following isoelectronic species with increase in liability :

   SF_6, AlF_6^{3-}, SiF_6^{2-}, PF_6^- .

   e) Out of which one is optically active. $cis-[Co(NH_3)_4Cl_2]$ and $trans-[Co(NH_3)_4Cl_2]$?

   f) Define inner sphere mechanism.

P.T.O.

g) Predict whether given reaction proceeds via ISM or OSM ?

$$Cr^{2+} + Co - Cl^{2+} \rightarrow Cr - Cl^{2+} + Co^{2+}$$
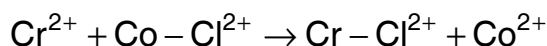
h) Define Quantum yield.

i) Define acid hydrolysis ?

j) Polarization theory of trans effect is based on which concept.

k) What is role of nicol prism in the polarimetry ?

l) Write two metallocenes which give photochemical reaction.

m) What is full form of CTTS ?

n) Predict the rate of dissociative mechanism when increase the negative charge of entering group ?

SECTION – II

2. a) Discuss the mechanism of outer sphere electron transfer. Illustrate your answer with examples. **7**

   b) In SN^1 path via tetragonal pyramid intermediate the attack of Y on cis-MA4BX complexes gives exclusively hundred percent cis – product, explain. **7**

3. a) What are acid hydrolysis reaction ? Explain acid hydrolysis of Co(III) complexes by considering : **7**

   i) effect of chelation

   ii) effect of substitution of ligand

   iii) steric factors.

   b) Discuss the types of nucleophilic substitution reactions in octahedral complexes with suitable examples. **7**

4. a) Discuss the photochemistry of Cr(III) complexes. **7**

   b) Explain the polarization theory of trans effect. **7**

SECTION – III

5. a) Write the evidences to support SN^2 reaction mechanism of square planner complex. **5**

   b) What is anation reaction ? Explain the mechanism with an example. **5**

   c) Explain the mechanism involved in isomerisation reaction in octahedral complexes. **4**

6. a) What is the role of bridging ligand in inner sphere electron transfer mechanism ? **5**

   b) Define the photochemistry. Explain the concept of quantum yield in photochemistry. **5**

   c) What do you understand by activated complex, activated energy and transition state ? Explain with graphical representation. **4**

7. Write a notes (**any three**) : **14**

   a) Investigation of optical active compounds

   b) Photo oxidation-reduction reaction in complexes

   c) Base hydrolysis

   d) Cis effect.

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Seat No.	

M.Sc. (Part – II) (Semester – IV) Examination, 2014
INORGANIC CHEMISTRY (Paper – XV)
Chemistry of Inorganic Materials

Day and Date : Saturday, 26-4-2014   Total Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions : 1) Attempt in **all five** questions.
                  2) Section **I** is **compulsory**.
                  3) Attempt **any two** questions from Section **II** and **any two** from Section **III**.
                  4) Answers to **all** questions (Section **I, II** and **III**) should be written in **one** answer book.
                  5) **All** questions carry **equal** marks.
                  6) Figures to the **right** indicate **full** marks.
                  7) **Use** of log tables and calculators is **allowed**.

SECTION – I

1. Answer the following :   **14**

    a) Write classification of superconductors.

    b) What is the difference between hard and soft magnetic materials ?

    c) Write any two methods of preparation of nanomaterials.

    d) What type of the binding force exists in ionic solids ?

    e) What is F-centre colour centre ?

    f) What is the characteristic of the crystalline solids ?

    g) Give the formula of magneto plumbite.

    h) Define thin films.

    i) Write any two important properties of ceramics.

    j) What is the formula of Kaolin ?

k) Who discovered superconductivity ?

l) Write the equation for determination of conductivity of an intrinsic semiconductor.

m) Why $BaTiO_3$ is used as capacitor ?

n) Define Ferroelectric material.

SECTION – II

2. a) What are type-I and type-II superconductors ? What are applications of superconductors ? **7**

   b) Discuss the structure of Ilmenites and magneto-plumbite. **7**

3. a) What is Meissner effect ? **7**

   b) Explain the mechanism of formation of Schottky and Frenkel defect. **7**

4. a) Discuss co-precipitation method for the synthesis of inorganic materials. **7**

   b) Give classification of conductors, insulators and semiconductor material on the basis of electronic properties of solids. **7**

SECTION – III

5. a) Discuss the magnetic behaviour of NiO. **5**

   b) Explain fullerenes as superconductors.. **5**

   c) Distinguish between perfect and imperfect crystals. **4**

6. a) Discuss laser action in detail. **5**

   b) Give applications of nanotechnology. **5**

   c) Discuss the applications of magnetic materials. **4**

7. Write short note on (**any three**) : **14**

   a) Co-precipitation techniques.

   b) Refractory materials.

   c) Thin Films.

   d) Organic semiconductor.

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Seat No.

M.Sc. (Part – II) (Semester – IV) Examination, 2014
INORGANIC CHEMISTRY (Paper – XVI)
Applied Inorganic Chemistry

Day and Date : Tuesday, 29-4-2014 Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

Instructions: 1) Attempt in **all five** questions.
2) Section **I** is **compulsory**.
3) Attempt **any two** questions from Section **II** and **any two** from Section **III**.
4) Answer to **all** questions (Section **I, II** and **III**) should be written in **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.
7) **Use** of log tables and calculators is **allowed**.

SECTION – I

1. Answer the following. **14**

   a) What is the size of nonmaterial ?

   b) Write the component of photo electrochemical cell.

   c) What are inorganic polymers ?

   d) Write the sources of non conventional energy.

   e) What are silicones ?

   f) What are the types of inorganic polymers ?

   g) What are the types of solar cells ?

   h) What is biomass ?

   i) Write allotropes of carbon.

   j) Define hapticity of ligand.

k) What are the sources of geothermal energy ?

l) What is co-ordination polymer ?

m) Name the minerals of zeolite.

n) Name the sandwitch compounds.

SECTION – II

2. a) What are organosilicones ? Discuss various types of silicones. **7**

   b) What are organometallic compounds ? How they are classified ? **7**

3. a) What are the various types of method for making nanomaterials ? Explain in brief sol-gel method. **7**

   b) Explain the energy conversion from fission and fusion reactions. **7**

4. a) Outline the various characterization techniques for nanomaterials. Explain in detail X-ray diffraction technique. **7**

   b) Give a brief account of phosphorous based polymers. **7**

SECTION – III

5. a) Discuss the theories of catalysis. **5**

   b) Write the applications nonmaterial's. **5**

   c) Write the general properties of inorganic polymers. **4**

6. a) Explain the Ion exchange method for making nanomaterials. **5**

   b) Give the advantages of geothermal energy. **5**

   c) What is 18-electron rule ? Explain it with suitable example. **4**

7. Write a notes **(any three)** : **14**

   a) Photovoltaic cell

   b) Homogeneous catalysis

   c) Types of Inorganic polymers

   d) Inert gas rule.

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Seat No.

M.Sc. (Part – I) (Semester – II) Examination, 2014
CHEMISTRY
(Paper – VII) : Physical Chemistry – II

Day and Date : Saturday, 26-4-2014   Total Marks : 70
Time : 11.00 a.m. to 2.00 p.m.

Instructions : 1) Attempt in **all five** questions.
2) Section **I** is **compulsory**.
3) Attempt **any two** questions from Section – **II** and **any two** questions from Section **III**.
4) Answers to **all** questions (Section **I, II** and **III**) should be written in the **same** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.
7) **Use** of log table and calculator is **allowed**.

SECTION – I

1. Answers the following :   **14**

   i) Represent one alkali storage cell.

   ii) Mention different types of RNA.

   iii) State steady state approximation.

   iv) Define rate determining step.

   v) Which of the following is spin allowed transition ?

      a) IC   b) ISC

      c) RISC   d) All of these

   vi) Mention typical lifetime for phosphorescence emission.

   vii) Estimate the energy in joule of a radiation having wavelength 420 nm.

P.T.O.

viii) State Beer-Lambert's law.

ix) List any two standard materials used for quantum efficiency determination.

x) Define zeta potential.

xi) Mention basic constituents of a biological cell.

xii) Put Nernst equation.

xiii) What is self quenching ?

xiv) Define battery.

SECTION – II

2. a) Utilizing SSA describe the kinetics of hydrogen-bromine reaction. Give final rate law. **7**

   b) With the help of single sphere model illustrate the effect of ionic strength on rate of ionic reactions. **7**

3. a) What do you mean by delayed emission ? Explain E-type delayed fluorescence. **7**

   b) Illustrate the role of photochemistry in air pollution. **7**

4. a) Explain the concept of electrical double layer taking Stern's model. **7**

   b) Derive Stern-Volmer equation. Give the significance of the terms involved in it. **7**

SECTION – III

5. a) Write on structural aspects of proteins. **5**

   b) Comment on bioenergetics of a biochemical reactions. **5**

   c) Diagrammatically illustrate photodissociation and predissociation. **4**

6. a) Write in brief Debye Huckel theory. **5**

   b) Draw neat labeled Jablonki's diagram and point out various photophysical pathways. **5**

   c) Derive the rate expression for third order reaction where initial concentrations of the reactants are equal. **4**

7. Write short notes on **any three** : **14**

   a) Green house effect.

   b) Single electrode potential

   c) Decomposition of ozone

   d) Fuel cells.

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SLR-VD – 8

M.Sc. I (Semester – II) Examination, 2014
CHEMISTRY
Analytical Chemistry – II (Paper – VIII)

Day and Date : Tuesday, 29-4-2014   Total Marks : 70
Time : 11.00 a.m. to 2.00 p.m.

N.B. : 1) Attempt in **all five** questions.

2) Section **I** is **compulsory**.

3) Attempt to **any two** questions from Section **II** and **any two** from Section **III**.

4) Answer to **all five** questions (from Section **I, II & III**) should be written in the **one** and the **same** answer book.

5) **All** questions carry **equal** marks.

6) Figures to the **right** indicate **full** marks.

7) **Use** of log table and calculator is **allowed**.

SECTION – I

1. A) Choose the correct options.   **7**

   1) Equatorial protons in cyclohexane rings come to resonance at about 0.5 δ higher value than the axial protons due to

      a) Sterric effect   b) Anisotropic effect

      c) Inductive effect   d) H-bonding

   2) The function of nebuliser burner system is to

      a) Convert test solution to gaseous atoms

      b) Produce mist or aerosol of the test solution

      c) Bath a and b

      d) Convert liquid to solid state

P.T.O.

3) The most commonly used device for the formation of an atomic vapor in atomic absorption is
   a) Electric arcs
   b) Flame atomization
   c) Sputtering devices
   d) Ovens

4) An effect due to which the intensity of absorption maximum increases is called as
   a) Bathochromic effect
   b) Hypsochromic effect
   c) Hyperchromic effect
   d) Hypochromic effect

5) The frequency of vibration of a bond is a function of
   a) Bond order
   b) Force constant
   c) Masses of atoms
   d) Both b and c

6) H^1, C^{13}, f^{19}, p^{BL} have nuclear spin equal to
   a) $\dfrac{1}{2}$
   b) 1
   c) 0
   d) $\dfrac{3}{2}$

7) Allyl anilines exhibit the base peak at m/c 106. The ton responsible for it is
   a) Tropylium ion
   b) Aratropilium ion
   c) Anilinium ion
   d) None

B) Fill in the blanks.   **4**

   1) IR frequency of equatorial hydroxy group is _____ than that of axial.

   2) The most intense peak in the mass is _____ peak.

   3) Abundance of molecular ion increases as electronegativity of halogen

   4) The difference in the absorption position of the proton with respect to TMS signal is called

C) Answer the following questions.   **3**

   1) Which is the most abundant or base peak in the mass spectrum of toluene ?

   2) Define spin-spin relaxation.

   3) Calculate the chemical shift in (8) ppm for a proton that has resonance at 126 Hz downfield from TMS on spectrophotometer that operates at 60 MHz.

SECTION – II

2. A) The following triene on partial hydrogenation gives three products. How uv spectroscopy and wood-ward fieser rules will help to identify the products ? **7**
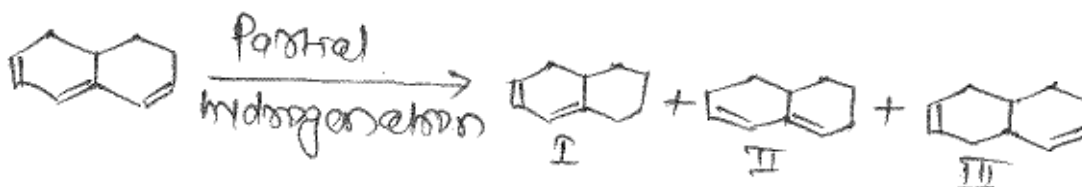
B) Assign the structure for a compound having following data : **7**

M.f. $G_2H_{16}O_2$

IR : 1666, 2900 cm^{-1}

^{1}HNMR (δ, PPM) : 1.4 (s) 9H

3.8 (s) 3H

6.9 (d) 2H

7.8 (d) 2H.

3. A) Describe the applications of plasma emission spectroscopy. **7**

B) An organic compound with molecular formula gave the following data. **7**

M.F. $C_6H_{10}O_3$

uv : no significant uv absorption above 200 nm

IR : 1751, 1818 CM^{-1}.

^{1}HNMR (δ, PPM) : 1.2 (1) 1.4 cm

2.5 (9) 0.8 cm.

4. A) Describe the construction and working of plasma torch. **7**

B) Explain the effect of following factors on vibrational frequencies in IR spectroscopy. **7**

SECTION – III

5. A) Explain TMS is used as internal standard in PMR spectroscopy. **5**

   B) Write down applications of atomic absorption spectroscopy. **5**

   C) Describe fragmentation pattern of benzyl alcohol. **4**

6. A) Distinguish between ICP-AE and AAS. **5**

   B) Define molecular (parent) ion peak. Explain its important features. **5**

   C) An organic compound dissolves in sodium hydroxide to form a yellow coloured solution. It gives brisk effervescence with sodium bicarbonate solution. Its infra-red spectrum exhibits the following absorption bands :

   i) $3060 - 3110$ cm   ii) $3000 - 2520$ cm^{-1}

   iii) $1602, 1510, 1450$ cm^{-1} iv) $1620, 1375, 830$ cm^{-1} **4**

7. Write a short notes on (**any three**) : **14**

   a) Mclafferly rearrangement

   b) Radiation source in AAS

   c) Chemical shift and coupling constant

   d) Sample handling in IR spectroscopy.

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Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2014
ORGANIC CHEMISTRY (Paper – IX)
Organic Reaction Mechanism

Day and Date : Monday, 21-4-2014   Max. Marks : 70
Time : 3.00 p.m. to 6.00 p.m.

N. B. : 1) Attempt in **all 5** questions.
      2) Section – **I** is **compulsory**.
      3) Attempt **any two** questions from Section – **II** and **any two** from Section – **III**.
      4) Answer to **all** questions should be written in the **same** answer book.
      5) **All** questions carry **equal** marks.
      6) **Use** of log-table and calculator is **allowed**.

SECTION – I

1. A) Answer the following :   **8**

     i) What are arynes ?

     ii) Define the term "enantioselectivity".

     iii) Why benzophenone is a good photosensitizer ?

     iv) What is Paterno-Buchi reaction ?

     v) What is Primary Kinetic Isotope Effect (KIE) ?

     vi) Name the reaction which involves generation of ketenes from α-diazoketones.

     vii) Which reagent is used for chemoselective reductive animation ?

     viii) What product will obtain when Ketones undergo Baeyer Villiger reaction ?

   B) State whether **true** or **false** :   **3**

     i) The product δ-halogenated amines is generally isolated in Hoffman-Loeffler Freytag reaction.

     ii) Norrish Type I process is commonly encountered in solution state.

     iii) Alkylation of enamines can be carried out by secondary alkyl halides.

P.T.O.

C) Select the most correct alternative for **each** of the following : **3**

   i) The heme group found in hemoglobin _____

   a) coordinates the iron atom in the plane of the heme only when oxygen is bound.

   b) contains a centrally bound Fe (III) atom.

   c) is covalently bound to the molecule.

   d) is held within the central cavity formed between the four hemoglobin subunits.

   ii) Reaction of benzyne and iodine gives _____

   a) iodobenzene   b) phenol

   c) 1,2-di-iodo benzene   d) dimer

   iii) Reaction of acetone with sulphur ylide $[(CH_3)2S = CH_2]$ gives _____

   a) 1,1-dimethyl ethene   b) 2-methyl-1-propene

   c) 2-methyl-1,2-epoxy propene d) both a) and b)

SECTION – II

2. a) Explain with suitable examples stereoselectivity of alkylation. **7**

   b) Explain the mechanism, stereochemistry, migratory aptitude and applications of following reactions : **7**

   i) Dienone-Phenol.

   ii) Pinacol-Pinacolone.

3. a) Describe the following methods used to determine reaction mechanism. **7**

   i) Identification of the reaction product.

   ii) Cross-over experiment

   iii) Isotopic labeling.

   b) Elaborate the participation to triplet excited in ketones in Paterno-Buchi reaction. **7**

4. a) Write different reactions of Arynes. **7**

   b) Predict the products and justify your prediction. **7**
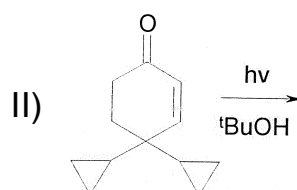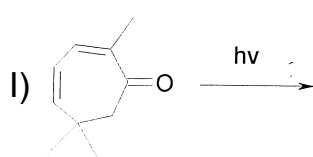
SECTION – III

5. Provide mechanism for the following transformations :

a)   5

b)   5

c)   4
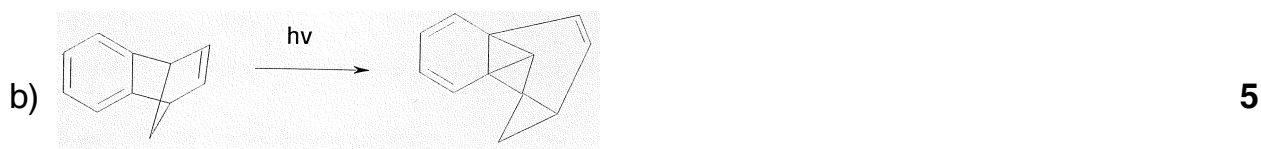
6. Predict the products and justify your prediction.

a)   5

b)   5

c)   4

7. Explain the following (**any three**) :   14
   i) Photo Fries rearrangement.
   ii) Hofmann Lofer Fretage reaction.
   iii) Synthetic utility of Nitrogen ylides.
   iv) Taft equation.