SLR-MM – 116

Seat No.	

M.Sc. (Part – I) (Semester – I) Examination, 2015
CHEMISTRY (Paper – I) (New CBCS Pattern)
Inorganic Chemistry – I

Day and Date : Monday, 16-11-2015 Max. Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

Instructions *: 1) Attempts in **all five** questions.*
*2) Section – **I** (Q. – **1**) 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 **same** answerbook.*
*5) **All** questions carry **equal** marks.*
*6) Figures to the right indicates **full** marks.*
*7) **Neat** and labeled diagrams should be drawn **wherever** possible.*
*8) **Use** of log table and calculators is **allowed**.*

SECTION – I

1. Answer the following : **14**

1) What is the critical mass of uranium ?

2) For which nuclear reaction, Q value is positive ?

3) What is the band gap of silicon ?

4) Why 'In' is preferably used for doping rather than other IIIA group elements ?

5) Give the high energetic nuclear reaction in hydrogen bomb.

6) Why the bond angle in H_2S molecule is smaller than that of H_2O molecule ?

7) What is the geometry of ClO^-_3 ion ?

8) State the Janh-Teller theorem.

9) What is spectrochemical series ?

10) A complex of transition metal ion with d^6 configuration is diamagnetic; is it an octahedral or a tetrahedral one ?

P.T.O.

11) What is the origin of the intense yellow color of CrO_4^{2-} ion ?

12) What is photoelectric effect ?

13) Give the equation of Compton shift.

14) Give a general equation for the wave number in Lyman series.

SECTION – II

2. a) Derive the Schrodinger time independent wave equation. **7**

   b) Give the general characteristic properties of transition elements. **7**

3. a) What is CFSE ? Calculate CFSE for Co(III) complexes in various ligand field with different geometry. **7**

   b) With the help of suitable example, explain Walsh diagram. **7**

4. a) What are the semiconductors ? Discuss the doping of semiconductors and their conduction mechanism. **7**

   b) What are nuclear reactions ? Discuss the nuclear fission reaction with suitable examples. **7**

SECTION – III

5. a) Show from the complete wave function for p orbitals that the distribution of charge in p orbitals is dumb-ball shaped. **5**

   b) Discuss artificial and induced radioactivity. **5**

   c) Give the application of semiconductors. **4**

6. a) What are radial and angular wave functions ? From the complete wave function explain the shape of s orbital. **5**

   b) Explain the charge-transfer spectrum of MnO^-_4. **5**

   c) Calculate the binding energy per nucleon of oxygen atom $^{16}O_8$ which has a mass of 15.994910 a.m.u. **4**

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

   a) Ionization counter

   b) Free radical reaction

   c) Nephelauxetic effect

   d) Black body radiation.

SLR-MM – 117

Seat No.	

M.Sc. – I (Semester – I) (New – CBCS) Examination, 2015
CHEMISTRY
Organic Chemistry – I (Paper – II)

Day and Date : Wednesday, 18-11-2015 Max. Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

N. B. *: 1) Attempt in **all five** questions.*
*2) Question **1** 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 **same 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. A) Select most correct alternative for **each** of the following : **4**

1) Among the following acids, which acid will have lowest pKa ?
   a) Formic acid b) Butanoic acid
   c) Oxalic acid d) Benzoic acid

2) The halogen compound most reactive with water is _____
   a) chloroethane b) chloromethane
   c) isopropyl chloride d) 2-chloro 2-methyl propane

3) Which of the following group is m-directing in aromatic electrophilic substitution reaction ?
   a) methoxy- b) anilide
   c) acetyl d) N, N-dimethylamino-

4) The rearrangement in which the products are temperature dependent is _____
   a) Wittig b) Claisen
   c) Fries d) Beckmann

P.T.O.

B) Predict the product(s) : **7**

1) 2-bromobutane $\xrightarrow{C_2H_5O^{\ominus} / C_2H_5OH}$? + ?

2) trans-but-2-ene $\xrightarrow{Br_2}$?

3) 4-phenylcyclohexanone $\xrightarrow[2)\ H_3O^+]{1)\ NH_2OH \cdot HCl}$?

4) t-butyl benzene $\xrightarrow{SO_3 / H_2SO_4}$?

5) 4-methoxybenzylchloride $\xrightarrow[OH^{\ominus}]{70\%\ aq.\ acetone}$?

6) 4-hydroxy octan-2-one $\xrightarrow{alc.\ KOH}$?

7) 3, 3-dimethyl but-1-ene $\xrightarrow[OH^{\ominus} / H_2O_2 / H_2O]{BH_3}$?

C) Suggest the suitable reagent/catalyst/reaction conditions for the following conversions : **3**

1) Nitrobenzene $\xrightarrow{?}$ m-dinitrobenzene

2) 3-methyl chlorobenzene $\xrightarrow{?}$ O-toluidine + m-toluidine

3) $R - \underset{\underset{O}{\|}}{C} - NH - O - \underset{\underset{O}{\|}}{C} - R' \xrightarrow{?} R - NH_2.$

SECTION – II

2. A) Give an account of strength of acids and arrange the followings in order of increasing acidity giving suitable reason. **7**

P-nitrobenzoic acid, 2, 4-dinitrobenzoic acid, p-t-butylbenzoic acid

I II III

B) Predict the products in the following reactions. Propose mechanism. Discuss the effect of substitution of the reaction. **7**

P-methoxy benzyl chloride $\xrightarrow{OH^{\ominus}}$?

P-nitrobenzyl chloride $\xrightarrow{OH^{\ominus}}$?

3. A) What will happen when benzylic quaternary ammonium salt is treated with Sodamide ? Explain reaction and mechanism by considering suitable example. **7**

B) Draw the conformations of 1, 3-dimethyl cyclohexane. Discuss their stability. **7**

4. A) Predict the products in the following. Give an account of stereochemistry. Discuss its mechanism. **7**

1-methylcyclopentene $\xrightarrow{CF_3COOOH}$?

1-methylcyclopentene $\xrightarrow[KMnO_4/H_2O/OH^{\ominus}]{H_2O/NaOH}$?

B) What is chirality ? Discuss elements of symmetry. **7**

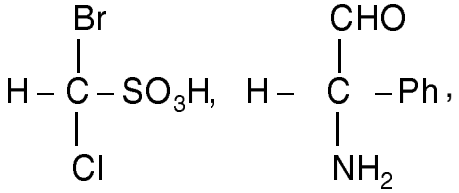
SECTION – III

5. A) Predict the product(s). Discuss mechanism. **5**

$$ph - CH_2 - O - CH_3 \xrightarrow[2)\ H_2O/H^+]{1)\ C_6H_5Li/Et_2O} ?$$

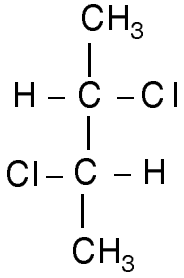
B) Explain E_1 mechanism of elimination reaction with suitable example. Discuss the relative reactivities of the alkyl halides in E_2 reaction. **5**

C) Assign R and S nomenclature to the following isomers. **4**



(I)

(II)



(III)

6. A) What are carbenes ? Discuss their generation, structure and reactions. **5**

   B) What is Michael reaction ? Give its mechanism with suitable example. **5**

   C) Complete the following reaction. Propose mechanism to it. **4**

   but-2-en-1-ol $\xrightarrow{\text{Thionyl chloride}}$?

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

   i) Nucleophilic substitution reactions –Aryne mechanism.

   ii) Pyrolytic elimination reactions.

   iii) Benzillic acid rearrangement.

   iv) Aromatic electrophilic substitutions – IPSO attack.

SLR-MM – 118

Seat No.	

M.Sc. (Part – I) (Semester – I) Examination, 2015
CHEMISTRY (CBCS) (New)
Paper – III : Physical Chemistry – I

Day and Date : Friday, 20-11-2015 Total Marks : 70

Time : 10.30 a.m. to 1.00 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. Answer the following : **14**

i) Define free energy.

ii) What is surfactant ? Mention different types of it.

iii) What do you mean by the term predominant configuration ?

iv) In microcanonical ensemble N, V and _____ remains constant.

v) Which of the following is non-state function ?

a) q b) H c) μ d) S

vi) Give the statement of zeroth law of thermodynamics.

vii) On mixing of gases the entropy _____ (increases/decreases)

viii) Mention different steps involved in chain polymerization.

P.T.O.

ix) What is the principle involved in pressure jump method ?

x) What do you mean by residual entropy ?

xi) Define thermodynamic excess function.

xii) What is Tyndall effect ?

xiii) Give the mathematical statement of Boltzmann-Planck equation.

xiv) What is the ideal source for flash photolysis technique ?

SECTION – II

2. a) Discuss how third law of thermodynamics can be used in the estimation of absolute entropy of a gas at 298 K. **7**

   b) Derive the expression for Maxwell-Boltzmann distribution law. **7**

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

   b) Illustrate the relaxation method for studying fast reaction kinetics. **7**

4. a) Derive Gibb's phase rule. Give its applications. **7**

   b) What is activity coefficient ? Discuss freezing point depression method for its determination. **7**

SECTION – III

5. a) Illustrate the concept of configuration with suitable example. **5**

   b) Discuss grandcanonical ensemble. **5**

   c) The relaxation time for fast reaction is 125 microseconds and equilibrium constant is 1.25×10^{-3}. Evaluate rate constant for forward and backward reactions. **4**

6. a) Discuss magnetic resonance method for studying fast kinetics. **5**

   b) Explain various methods of preparation of colloids. **5**

   c) Estimate Mn and Mw of a protein sample containing equimolar mixture of haemoglobin (35 kg/mol), myoglobin (25 kg/mol) and ribonuclease (15 kg/mol). **4**

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

   a) Entropy change accompanying in phase transformations.

   b) Concept of fugacity.

   c) Thermodynamic probability.

   d) Step growth polymerization.

SLR-MM – 119

Seat No.	

M.Sc. – I (Semester – I) Examination, 2015
CHEMISTRY (C.B.C.S.)
Analytical Chemistry – I (Paper – IV) (New)

Day and Date : Monday, 23-11-2015 Max. Marks : 70

Time : 10.30 a.m. to 1.00 p.m.

Instructions *: 1) Attempt in **all five** questions.*
*2) Q. **1** 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 precision.

b) What is a determinate error ?

c) Define column resolution.

d) What is ascending chromatography ?

e) Define software.

f) The capillary constant in Ilkovic equation is given by

g) Calculate significant figures sin 21.697 – 20.802.

h) Name the softwares used in computer.

i) Define accuracy.

j) The current due to supporting electrolyte is called as

k) Which unit is called as the brain of the computer ?

P.T.O.

l) How the large concentration of electro active species can be removed in polarographic technique ?

m) What is RF factor ?

n) DME can be applied over the range

SECTION – II

2. a) Define half wave potential. Derive the polarographic wave equation. **7**

   b) Discuss in detail various types of errors observed in measurement. **7**

3. a) Discuss the types of detectors used in GC. **7**

   b) Discuss the dead stop end point method. **7**

4. a) Discuss the principle and instrumentation of HPLC. **7**

   b) Discuss in brief average deviation and standard deviation. **7**

SECTION – III

5. a) Explain in brief linear regression. **5**

   b) Give the analytical applications of Amperometry. **5**

   c) Explain in brief methods of sampling. **4**

6. a) Explain in brief classification of chromatographic methods. **5**

   b) Explain input and output devices. **5**

   c) Explain in brief computerized instrument system. **4**

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

   a) Determinate and indeterminate errors.

   b) Application of gas chromatography.

   c) Application of polarography.

   d) Use of internet in computer.

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SLR-MM – 120

Seat No.	

M.Sc. – I (Semester – I) Examination, 2015
CHEMISTRY (Old) (CGPA)
Inorganic Chemistry – I (Paper – I)

Day and Date : Monday, 16-11-2015 Max. Marks : 70

Time : 10.30 a.m. to 1.00 p.m.

***Instructions** : 1) Attempt in **all five** questions.*
*2) Q. **1** 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 artificial radioactivity.

b) What is photoelectric effect ?

c) Germanium doped with indium is an example of _____ type semiconductor.

d) Write two applications of p-n-p junction transistor.

e) Complete the reaction $_{92}U^{235} + {}_{0}n^{1} \longrightarrow {}_{56}Ba^{144} + \_\_\_\_\_ + 2{}_{0}n^{1}$.

f) TiO_2 is colourless, why ?

g) How many bond pairs and lone pairs present in SF_4 molecule ?

h) What are Nuclear reactions ?

i) What is the value of Plank's constant ?

P.T.O.

j) Write the names of four quantum numbers.

k) Define the term inert pair effect.

l) Which wavelength region colours are observed in transition metal compound ?

m) $_{7}N^{14} + _{0}n^{1} \longrightarrow \_\_\_\_\_ + _{1}H^{1}$

n) Define n-type semiconductor.

SECTION – II

2. a) What are the transition elements ? Discuss the electronic configuration and magnetic properties of elements of I and II transition series. **7**

   b) What are nuclear reactions ? Explain in brief Q value of nuclear reactions. **7**

3. a) Give a brief account of black body radiation. **7**

   b) What are semiconductors ? Explain in brief intrinsic semiconductors. **7**

4. a) Explain the Jahn-Teller effect in octahedral complexes with suitable example. **7**

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

SECTION – III

5. a) Describe construction and working of photovoltaic cell. **5**

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

   c) Discuss in brief atomic spectra. **4**

6. a) Explain in brief photoelectric effect. **5**

   b) Write note on Bents rule. **5**

   c) Explain in brief radioactive decay. **4**

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

   a) Origin of quantum theory

   b) Metal carbonyls

   c) Band theory

   d) Nuclear fusion reaction.

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SLR-MM – 121

Seat No.	

M.Sc. – I (Semester – I) (Old) Examination, 2015
(CGPA)
CHEMISTRY
Organic Chemistry – I, Paper No. – II

Day and Date : Wednesday, 18-11-2015 Max. Marks : 70

Time : 10.30 a.m. to 1.00 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 (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. a) Define the terms of the followings : **5**
   i) Acid and base by L.B. Theory
   ii) Carbenes
   iii) Ylides.
   iv) Ambident nucleophile.
   v) Arenium ion.

P.T.O.

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

i)  + $KNH_2 \rightarrow$?

ii) Cyclohexane + $Br_2 \rightarrow$? + ?

iii) t-Butyl alcohol $\xrightarrow{H_2SO_4}$?

iv) Ethyl acetate $\xrightarrow{500°C}$? + ?

v) Benzenediazonium chloride $\xrightarrow{H_2O}$?

c) Assign the E and Z nomenclature of the following compounds : **4**

i) 1-Brome-1-chloropropene

ii) 1-Brome-1, 2-dichloroethene

iii) 2, 4-Hexadienoic acid

iv) 3-Bromo 3, 5-octadiene.

SECTION – II

2. a) What are carbocations ? Explain their structure, generation stability and reactivity of carbocations. **7**

b) Give an account of following factors affecting reactivity in SN^2 reactions : **7**

i) Substrate

ii) Solvent

iii) Leaving group

iv) Attacking nucleophile

3. a) Explain the vilsmeier-Hack reaction and their mechanism. **7**

b) What is sharpless asymmetric epoxidation reaction ? Explain their stereochemistry and applications. **7**

4. a) What is unimolecular elimination reaction ? Explain their orientation and reactivity. **7**

b) What is pyrolytic elimination reaction ? Explain their stereochemistry. **7**

SECTION – III

5. a) Discuss conformational analysis of 1, 2-disubstituted cyclohexane. **5**

   b) Explain addition of bromine to cis and trans-2-butene is stereospecific. **5**

   c) What is Markovnikov's rule ? Explain orientation and reactivity of substituted olefinic compounds. **4**

6. a) What is resolution of racemic modification ? Explain their different resolution methods with suitable examples. **5**

   b) What is prochirality ? Explain with suitable prochiral molecules. **5**

   c) Why chair conformation of cyclohexane is more stable than boat conformation ? **4**

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

   a) SN^i reaction.

   b) Arynes.

   c) Gattermann-Koch reaction.

   d) Elements of symmetry.

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SLR-MM – 122

Seat No.	

M.Sc. (Part– I) (Semester – I) Examination, 2015
CHEMISTRY (Old) (CGPA)
Paper – III : Physical Chemistry – I

Day and Date : Friday, 20-11-2015 Total Marks : 70

Time : 10.30 a.m. to 1.00 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. Answer the following : **14**

a) State zeroth law of thermodynamics.

b) Mention any two non state thermodynamic functions.

c) What do you meant by ideal solution ?

d) Define microstates.

e) Give the relationship between thermodynamic probability and entropy.

f) What is micelle ?

g) Give the principle of relaxation methods.

h) Mathematically define number average molecular mass.

i) State Henry's law.

j) Mention any two methods of studying fast kinetics.

k) What is colloid ?

l) Give the significance of third law of entropy.

m) Mention different types of ensemble.

n) What do you meant by fast reactions ?

SECTION – II

2. a) Derive Maxwell-Boltzman distribution law in terms of α and β. **7**

b) Discuss relaxation methods of studying fast kinetics. **7**

3. a) Derive Maxwell's relations. **7**

b) Explain Osmometric method for determination of molecular weight of a polymer. **7**

4. a) Describe various properties of colloids. **7**

b) Explain freezing point depression method for determination of activity coefficient. **7**

SECTION – III

5. a) Write on flash photolysis technique. **5**

b) What is surfactant ? Give the classification of surfactants. **5**

c) Equal numbers of molecules with $M_1 = 5000$ and $M_2 = 50000$ are mixed. Calculate number average and mass average molecular mass. **4**

6. a) Illustrate step growth polymerization. **5**

b) Derive Boltzmann-Planck equation. **5**

c) The relaxation time for a fast reaction is 100 microseconds and the equilibrium constant is 1×10^{-4}. Calculate the rate constant for both forward and backward reactions. **4**

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

   a) Thermodynamic excess functions.

   b) Thermodynamics of ideal solutions

   c) Concept of fugacity.

   d) Significance of M-B distribution law.

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SLR-MM – 123

Seat No.	

M.Sc. – I (Semester – I) Examination, 2015
CHEMISTRY (Old) (CGPA)
Analytical Chemistry – I (Paper – IV)

Day and Date : Monday, 23-11-2015 Max. Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

Instructions *: 1) Attempt in **all five** questions.*
*2) Q. **1** 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) The current due to supporting electrolyte is called as _____

b) Which unit is called as the brain of the computer ?

c) How the large concentration of electro active species can be removed in polarographic technique ?

d) What is RF factor ?

e) DME can be applied over the range _____

f) Define precision.

g) What is a determinate error ?

h) Define column resolution.

i) What is ascending chromatography ?

j) Define software.

P.T.O.

k) The capillary constant in Ilkovic equation is given by _____

l) Calculate significant figures in 21.697-20.802.

m) Name the softwares used in computer.

n) Define accuracy.

SECTION – II

2. a) Discuss the principle and instrumentation of HPLC. **7**

   b) Define significant figure. Calculate the formula weight of $CaCl_2$, $FeSO_4$ and KNO_3 and give significant figures of each compound. **7**

3. a) Define half wave potential. Derive the polarographic wave equation. **7**

   b) Discuss in detail various types of errors observed in measurement. **7**

4. a) Discuss the types of detectors used in GC. **7**

   b) Discuss the dead stop end point method. **7**

SECTION – III

5. a) Explain in brief linear regression. **5**

   b) Give the analytical applications of Amperometry. **5**

   c) Explain in brief methods of sampling. **4**

6. a) Explain in brief classification of chromatographic methods. **5**

   b) Explain input and output devices. **5**

   c) Explain in brief computerized instrument system. **4**

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

   a) Application of polarography

   b) Use of internet in computer

   c) Determinate and indeterminate errors

   d) Application of Gas chromatography.

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SLR-MM – 124

Seat No.	

M.Sc. – I (Semester – II) Examination, 2015
CHEMISTRY
Inorganic Chemistry – II (Paper – V)
(New C.G.P.A.)

Day and Date : Tuesday, 17-11-2015 Max. Marks : 70

Time : 10.30 a.m. to 1.00 p.m.

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

*2) Q. **1** 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) Write the oxides of sulphur.

b) Write the electronic configuration of Ce^{4+}.

c) Write functions of haemoglobin.

d) Which catalyst is used in hydrogenation of alkenes ?

e) $2PbS + 3O_2 \rightarrow$ ------ $+ 2SO_2$.

f) What is the lanthanide contraction ?

g) What is the hybridization of boron in B_2H_6 ?

h) What is the action of water on diborane ?

P.T.O.

i) What is homogeneous catalysis ?

j) Name the methods used for the separation of lanthanides.

k) Write the names of polymorphism of carbon.

l) Name the trace elements which are used in biological processes.

m) What is the function of ferrodoxin ?

n) Which one shows highest magnetic moment among the tripositive lanthanide ions ?

SECTION – II

2. a) What are silicones ? Give the applications of silicones. **7**

   b) Discuss the factors affecting the stability of metal complexes. **7**

3. a) How is gold extracted ? What are its properties and uses ? **7**

   b) What are the lanthanides ? How are they separated ? **7**

4. a) What are boranes ? Discuss synthesis, structure and properties of diborane. **7**

   b) What is Wackers process ? Discuss the catalytic cycle involved it. **7**

SECTION – III

5. a) Discuss the electronic configuration and oxidation states of actinides. **5**

   b) Discuss the structure and mechanism of hemoglobin. **5**

   c) Write note on pi-metal complexes. **4**

6. a) Discuss a brief account of extraction of Zinc. **5**

   b) Discuss in brief Ziegler and Natta catalysis. **5**

   c) Explain in brief sulphur nitrogen compounds. **4**

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

   a) Monsanto acetic acid process

   b) Polymorphism of carbon

   c) Applications of lanthanides

   d) Nitrogen fixation.

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SLR-MM – 125

Seat No.	

M.Sc. – I (Semester – II) (New) (CGPA) Examination, 2015
CHEMISTRY (Paper – VI)
Organic Chemistry – II

Day and Date : Thursday, 19-11-2015 Max. Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

***Instructions** : 1) Attempt **all five** questions.*
*2) Question 1 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 **same** 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. A) Select most correct alternative for **each** of the following : **4**

i) Direct amination of pyridine with sodamide in liquid ammonia is known as _____ reaction.

a) Dakin b) Stobbe
c) Dieckmann d) Chichibabin

ii) Among the followings which is used as a dehydrating reagent in the synthesis of organic compounds ?

a) DDQ b) DCC
c) PTC d) LDA

iii) Wolf-Kishner reduction reaction is carried out under _____ condition.

a) Basic b) Acidic
c) Neutral d) Above all

iv) Acetophenone on Baeyer-villiger oxidation gives _____

a) Methyl benzoate b) Benzyl acetate
c) Phenyl acetate d) Lactone

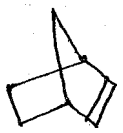
P.T.O.

B) Predict the product (s) : **7**

i) cyclohexanone $\xrightarrow[\text{acetyl chloride}/H_2O,H^+]{\text{piperidine}/p-TsOH}$?

ii) pyrrole $\xrightarrow{\text{alk. chloroform}}$? + ?

iii) cinnamaldehyde $\xrightarrow[H_2O/OH^-]{LiAlH_4}$?

iv)  $\xrightarrow[H_2O_2]{OsO_4}$?

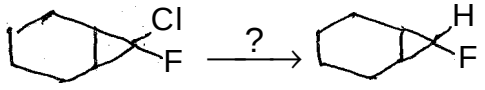
v) 2-pentanone $\xrightarrow[\text{ether}/H_3O^+]{CH_3CH_2MgBr}$?

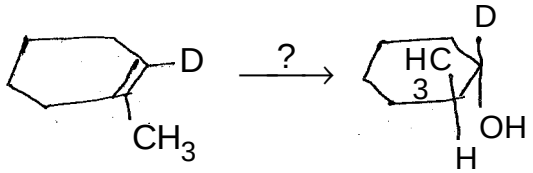
vi) 1-chlorooctane $\xrightarrow[\text{[18] crown–6 acetonitrile}]{KCN}$?

vii) Naphthalene $\xrightarrow[C_2H_5OH]{Li/liq\ NH_3}$?

C) Suggest the suitable reagent/catalyst/conditions for the following transformations. **3**

i) $R_1-\underset{\underset{OH}{|}}{CH}-R_2$ + acetone $\xrightarrow{?}$ $R-\underset{\underset{O}{||}}{C}-R$ + Isopropanol

ii) 

iii) 

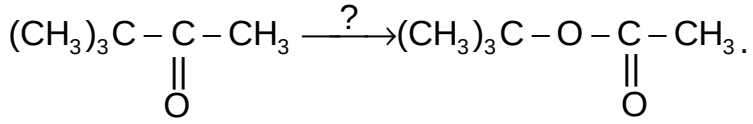
SECTION – II

2. A) Discuss the mechanism involved in the conversion of diethyl adipate to 2-carboethoxycyclopentanone in the presence of sodium ethoxide. **7**

   B) What are phase transfer catalysts ? Give their synthetic application and mechanistic pathway. **7**

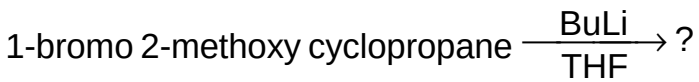
3. A) How the conversion of acetophenone to ethylbenzene takes place in the presence of zinc amalgum and HCl ? Give its mechanism. Give synthetic utility of the reagent. **7**

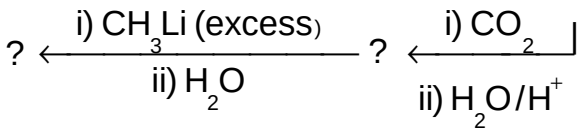
   B) How will you affect the following conversion ? Discuss its mechanism. Give an account of migratory aptitude of groups.



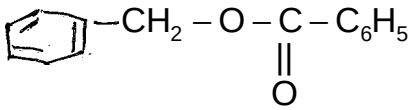
7

4. A) Complete the following reaction. Give the method of preparation and applications of organolithium compounds. **7**





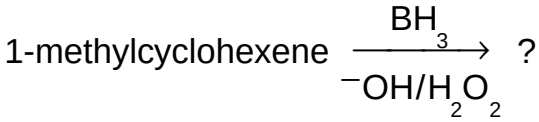
   B) What is retrosynthetic analysis ? Explain various terms involved in it. Outline retrosynthetic analysis and design synthesis of following molecule. **7**



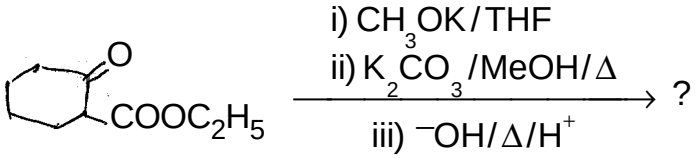
SECTION – III

5. A) Give the synthetic applications of Meerwein Pondorff verley reduction. Discuss mechanism with the help of suitable example. **5**

   B) What is hydroboration ? Discuss its mechanism and stereochemistry with respect to the followings : **5**



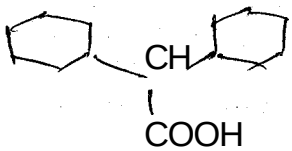
   C) Complete the following reaction. Suggest suitable mechanism. **4**



6. A) Discuss the protection and deprotection with respect to mechanism of alcohols as trimethyl silyl ether. **5**

   B) Give synthetic applications of diazomethane in organic syntheses. **5**

   C) Based on disconnection approach, suggest synthesis for the following : **4**



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

   i) Dakin reaction.

   ii) Prevost-Woodward hydroxylation

   iii) Organo copper compounds – preparation and application

   iv) Clemmensens reduction.

SLR-MM – 126

Seat No.	

M.Sc. (Part – I) (Semester – II) (CGPA) Examination, 2015
CHEMISTRY (Paper – VII) (New)
Physical Chemistry – II

Day and Date : Saturday, 21-11-2015 Total Marks : 70
Time : 10.30 a.m. to 1.00 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 **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. Answer the following : **14**
   a) State Stark-Einstein law.
   b) One Einstein of photon means _____ number of photons.
   c) Draw structure of ADP.
   d) What is temperature coefficient of a chemical reaction ?
   e) Mention different types of delayed fluorescence.
   f) Give Nernst equation.
   g) According to steady state approximation, the concentration of reactive intermediate _____
      a) Decreases b) Increases
      c) Remains constant d) None of these
   h) What do you mean by singlet and triplet states ?
   i) Calculate ionic strength of 0.25 m KI and 0.25 m $K_2S_2O_8$ solution.
   j) Represent one acid storage battery.

P.T.O.

k) Define Rate Determining Step (RDS).

l) State Kasha's rule.

m) For endorgenic biochemical reaction ΔG is _____

n) Define guantum yield.

SECTION – II

2. a) Give an account of fluorescence and structure. **7**

   b) What is quenching ? Deduce Stern Volmer equation. **7**

3. a) Illustrate the influence of ionic strength on the rate of ionic reactions. **7**

   b) Describe electrical double layer and its structure with the help of Helmholtz model. **7**

4. a) Discuss intra and inter molecular Excitation Energy Transfer (EET) processes. **7**

   b) Explain the kinetics of ozone decomposition reaction. **7**

SECTION – III

5. a) Describe the structure of proteins. **5**

   b) Draw Jablonski's diagram. Mention various non-radiative transitions. **5**

   c) Using following mechanism show that – $1/2\ d[NO_2]/dt = k[NO_2]\ [F_2]$

   Given : Mechanism : i) $NO_2 + F_2 \rightarrow NO_2F$ slow step

   ii) $F + NO_2F \rightarrow NO_2$ fast step. **4**

6. a) Discuss green house effect. **5**

   b) Explain the role of ATP in biological systems. **5**

   c) What is storage battery ? Mention one example each of acid and alkali storage battery. **4**

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

   a) Electronic transitions.

   b) Kinetics of gas phase reaction between hydrogen and halogens.

   c) Formation of photodimer species.

   d) Franck-Condon principle and its significance.

_____

SLR-MM – 127

Seat No.	

M.Sc. – I (Semester – II) (CGPA) Examination, 2015
CHEMISTRY (Paper – VIII)
Analytical Chemistry – II (New)

Day and Date : Tuesday, 24-11-2015 Max. Marks : 70

Time : 10.30 a.m. to 1.00 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 five** questions (from Section **I, II** and **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. Solve the following : **14**

a) What is Hookes Law ?

b) Which spin state is higher in NMR spectroscopy ?

c) What is molecular ion peak ?

d) Why fourier transform used in spectroscopy ?

e) Why plasma source is more efficient than flame ?

f) What is meant by plasma ?

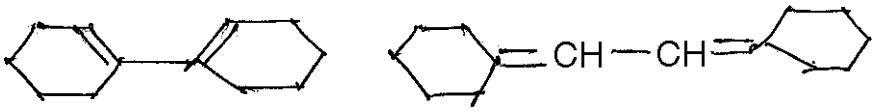
g) Which radiation, infrared on ultraviolet has shorter wavelength and lower energy ?

h) Which is most abundant on base peak in mass spectrum of toluene ?

P.T.O.

i) Increasing ring strain in cyclic compounds x = 0 stretching frequency changes in which extent ?

j) Why the λ_{max} for the diene (I) is observed at lower nm than (II).



(I) (II)

k) What is spin-spin splitting ?

l) What is chemical interference ?

m) Why the source modulation employed in AAS ?

n) What are chromophore and auxochrome ?

SECTION – II

2. a) Discuss the basic principle and instrumentation of UV-visible spectroscopy. **7**

b) Discuss the construction and working of plasma torch. **7**

3. a) What factors responsible for vibrational frequencies in IR spectroscopy. **7**

b) Assign the structure of the compound having following data. **7**

M.F. : C8H7OCl

IR : 1690 cm^{-1}

NMR : 7.4 – 7.9 (5H)

4.75 (2H, S)

4. a) Explain the application of AAS. **7**

b) An organic compound, $C_6 H_8 O$ shows following spectral data. Identify structure of the compound.

UV : λ_{max} 225 nm (ε = 10,000), 318 nm (ε = 40)

MS : Molecular ion at m/z = 96, base peak m/z = 68.

IR : A strong band at 1690 cm^{-1}.

NMR : 5.9 (1H, d)

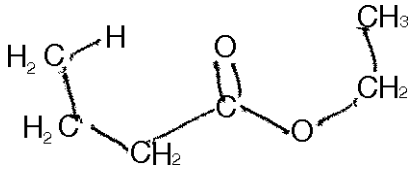
7 (1H, m) **7**

SECTION – III

5. a) Explain Mc Lafferty rearrangement in detail. **5**

   b) How magnetic field affect shielding of nuclei in NMR spectroscopy ? **5**

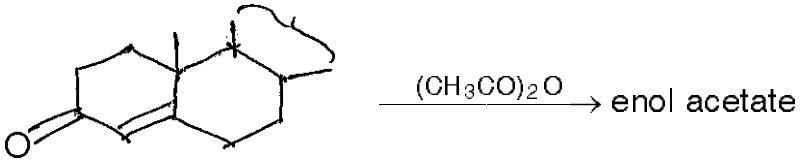
   c) Ethyl butanoate in its mass spectrum show two characteristics peak due to odd electron ion at m/z = 88 and 60 and abundant ion at m/z = 71. Explain fragmentation. **4**



6. a) Explain detection limit and sensitivity in AAS. **5**

   b) Explain disadvantages of AAS. **5**

   c) Cholest-4-en-3one gives an enol acetate, which has λ_{max} at 238 nm. Suggest the structure for the enol ester. **4**



7. Write short note on (**any three**) **14**

   a) Application of ICP

   b) Anisotropy effect

   c) Beer Lambert Law

   d) Nebulizer.

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SLR-MM – 128

Seat No.	

M.Sc. – I (Semester – II) (CGPA) Examination, 2015
CHEMISTRY
Inorganic Chemistry – II (Paper – V) (Old)

Day and Date : Tuesday, 17-11-2015 Max. Marks : 70

Time : 10.30 a.m. to 1.00 p.m.

Instructions : 1) *Attempt in* ***all five*** *questions.*
2) *Q.****1*** *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) Write the electronic configuration of Sm^{2+}.

b) Write functions of haemoglobine.

c) Which catalyst is used in Wackers process ?

d) $2CuS + 3O_2 \rightarrow$ _____ $+ 2SO_2$.

e) What is the lanthanide contraction ?

f) What is the hybridization of boron in B_2H_6 ?

g) What is the action of water on diborane ?

h) Name the methods used for the separation of lanthanides.

i) Write the names of polymorphism of sulphur.

P.T.O.

j) Name the trace elements which are used in biological processes.

k) What is the function of ferrodoxin ?

l) Which one shows highest magnetic moment among the tripositive lanthanide ions ?

m) Give the oxides of Carbon.

n) What is homogeneous catalysis ?

SECTION – II

2. a) How is copper extracted ? What are its properties and uses ? **7**

   b) Discuss the oxidation states and magnetic properties of lanthanides. **7**

3. a) What are boranes ? Discuss synthesis, structure and properties of diborane. **7**

   b) What is Wackers process ? Discuss the catalytic cycle involved it. **7**

4. a) What are silicates ? Give the applications of silicates. **7**

   b) Discuss the factors affecting the stability of metal complexes. **7**

SECTION – III

5. a) Explain in brief oxyacids of sulphur. **5**

   b) Discuss the structure cytochromes. **5**

   c) Write note on pi-metal complexes. **4**

6. a) Discuss a brief account of extraction of silver. **5**

   b) Discuss in brief Ziegler and Natta catalysis. **5**

   c) Explain in brief sulphur nitrogen compounds. **4**

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

   a) Nitrogen fixation

   b) Monsanto acetic acid process

   c) Applications of actinides

   d) Polymorphism of sulphur.

———————

SLR-MM – 129

Seat No.	

M.Sc. – I (Semester – II) Examination, 2015
CHEMISTRY
Organic Chemistry – II (Paper – VI) (Old) (CGPA)

Day and Date : Thursday, 19-11-2015 Max. Marks : 70
Time : 10.30 a.m. to 1.00 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) Answer 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 the most correct alternative for each of the followings : **4**

i) Base catalysed decomposition of arylsulphonyl hydrazones of ketones to give vinyllithium is known as _____ reaction.

a) Barton b) Favorskii
c) Shapiro d) Wolf-Kishner

ii) In MPV reduction intramolecular transfer of _____ takes place to carbonyl carbon.

a) H^+ b) $H^{\ominus}$ c) $H^{\bullet}$ d) H_2

iii) For the cyclopropanation, _____ reagent is used.

a) organzinc b) organo copper
c) crown ethers d) CrO_3

iv) In Baeyer – Villiger oxidation, cyclic ketones are oxidised to _____

a) ester b) aldehyde
c) lactone d) carboxylic acid

P.T.O.

B) Predict the product(s) : **7**

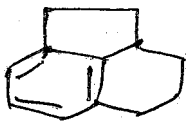
i) butadiene + diethylfumarate $\xrightarrow{\Delta}$?

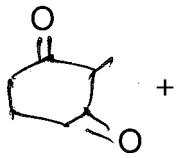
ii) Formaldehyde $\xrightarrow[\text{3) } R - CH_2 - Br]{\text{1) 1,3 – dithiane/Bf}_3,\ \text{2) BuLi/THF}}$? $\xrightarrow{\text{4) } HgCl_2/H_2O/MeOH}$

iii) $Ar - CO - CH_2 - CH_2 - COOH \xrightarrow[H_2O/\text{Toluene, reflux}]{Zn–Hg/HCl}$?

iv) $Ar - O - CH_2 - \underset{\underset{OH}{|}}{CH} - CH_2OH \xrightarrow[\text{benzene, } 25^\circ C]{pb(OCOCH_3)_4}$?

v) Methylmagnesium bromide $\xrightarrow[\text{2) } H_2O]{\text{1) } SO_2}$?

vi)  $\xrightarrow[C_6H_6/\text{reflux}]{DDQ}$?

vii)  +  $\xrightarrow[\text{2) Base}/C_6H_6/\Delta/H^+]{\text{1) KOH/MeOH, } \Delta}$?

C) Suggest the suitable reagent/catalysts for the following : **3**

i) benzaldehyde $\longrightarrow C_6H_5 - \underset{\underset{O}{\|}}{C} - \underset{\underset{OH}{|}}{CH} - C_6H_5$

ii) cyclohexanone $\longrightarrow$ 

iii) crotonaldehyde $\longrightarrow$ but – 2 – en – ol

SECTION – II

2. A) Complete the following reactions and propose the mechanism. **7**

   i) Toluene $\xrightarrow{Na/liq.\ NH_3}$?

   ii) Phenol $\xrightarrow{alk.chloroform}$?

   B) Explain the mechanism of oxidation of Isopropanol to acetone in the presence of aluminium tertiary butaoxide. **7**

3. A) Discuss the preparation of organomagnesium compounds and their synthetic utility. **7**

   B) Suggest the reaction conditions, catalyst for the following conversion. Explain the role of catalyst and mechanism. **7**

   Cyclohexene $\xrightarrow{?}$ 

4. A) Give an account of nucleic acids and nucleoproteins. **7**

   B) How will you affect the following conversion ? Give in detail its mechanism. **7**

   benzaldehyde $\xrightarrow{?}$ styrene.

SECTION – III

5. A) Predict the product in the following. Discuss the mechanism for the reaction. **5**

   α – chlorocycloheptanone $\xrightarrow{\text{alkoxide ion}}$?

   B) Complete the following reaction. Discuss hydride ion mechanism involved in the reduction by $LiAlH_4$. **5**

   cinnamaldehyde $\xrightarrow[2)\ H_2O/H^+]{1)\ LiAlH_4}$.

   C) What are crown ethers ? Discuss their structure, nomenclature and applications. **4**

6. A) Give an account of Prevost-Woodward hydroxylation by silver oxide with respect to mechanism and applications. **5**

   B) Outline the mechanism of enzyme action. **5**

   C) Give the applications of following reagents in organic syntheses. **4**

      i) Merrifield resin

      ii) Diazomethane.

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

   i) Stork-enamine reaction.

   ii) Wolf-Kishner reduction

   iii) Synthetic utility of Osmium tetraoxide.

   iv) Preparation and applications of dicyclohexyl-carbodiimide.

SLR-MM – 130

Seat No.	

M.Sc. (Part – I) (Semester – II) (CGPA) Examination, 2015
CHEMISTRY (OLD)
(Paper – VII) : Physical Chemistry – II

Day and Date : Saturday, 21-11-2015 Max. Marks : 70
Time : 10.30 a.m. to 1.00 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. Answer the following. **14**

i) Mention basic constituents of a biological cell.

ii) Mention different types of nucleic acids.

iii) Write state steady state approximation.

iv) Define rate determining step.

v) What do you mean by quenching ?

vi) Mention typical lifetime for fluorescence emission.

vii) One Einstein of photons = _____.

viii) Represent one acid storage cell.

P.T.O.

ix) Define molar absorption coefficient.

x) Lists different possible electronic transitions.

xi) What is the spin multiplicity for triplet states ?

xii) Mention Nernst equation. Give the significance of the terms involved in it.

xiii) Which of the following is spin forbidden transition ?

a) IC b) Fluorescence

c) phophorescence d) All of these.

xiv) Give the statement of Stark-Einstein law of photochemical equivalence law.

SECTION – II

2. a) Describe the method of evaluation of the mean activity coefficients of ions using emf data. **7**

b) Describe kinetics of bimolecular collisional quenching. **7**

3. a) With the help of Franck-Condon principle, illustrate the shapes of the absorption bands. **7**

b) Discuss inter and intramolecular EET process. **7**

4. a) With the help of single sphere model illustrate the effect of ionic strength on rate of ionic reactions. **7**

b) Illustrate the role of photochemistry in green house effect. **7**

SECTION – III

5. a) Write on hydrolysis of ATP. **5**

b) Diagramatically illustrate photodissociation and predissociation. **5**

c) Comment on bioenergetics of a biochemical reactions. **4**

6. a) Write in brief Debye Huckel theory. **5**

   b) Describe the kinetics of a reaction between NO_2 and F_2. **5**

   c) Distinguish between fluorescence and phosphorescence. **4**

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

   a) Excimer emission

   b) Fractional order reactions

   c) Fluorescence phenomena and structure

   d) Electrical double layer.

SLR-MM – 131

Seat No.	

M.Sc. – I (Semester – II) (CGPA) Examination, 2015
CHEMISTRY
Paper – VIII : Analytical Chemistry – II (Old)

Day and Date : Tuesday, 24-11-2015 Max. Marks : 70

Time : 10.30 a.m. to 1.00 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 five** questions. (From Section **I, II** and **III**) should be written in the **one** and the **same** answerbook.*

*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 : **8**

1) An effect by virtue of which the absorption maximum is shifted towards shorter wavelength is known as

a) Blue shift b) Red shift

c) Hyperchromic effect d) Hypochromic effect

2) The correct order of IR frequency for following acyl-halides is

a) RCOF b) RCOCl c) RCOBr

a) A > B > C b) B > C > A

c) C > A > B d) C > B > A

3) The relative abundance of the molecular ion peak in olefins.

a) Increases with increase in molecular mass

b) Firstly decreases then increases with increase in molecular mass

c) Decreases with increase in molecular mass

d) No effect

P.T.O.

4) The basic theory of mass spectrometry is different from IR, NMR and UV in the respect that in mass spectrometry.
   a) No selective absorption of radiation is involved
   b) The compound undergoes irreversible chemical changes
   c) Mass spectral reactions are more drastic than chemical reactions
   d) All

5) The most widely used flame in the atomic absorption is
   a) Air acetylene
   b) Air propane
   c) Air coal gas
   d) Oxyacetylene

6) The region of the flame in which the maximum emission or absorption occurs, depends on
   a) Droplet size and type of flame used
   b) Ratio of oxidant to fuel
   c) Tendency for the species to enter into oxide formation
   d) All are correct

7) Distance between the centres of the peaks of doublet is called
   a) Spin-spin coupling
   b) Spin constant
   c) Coupling constant
   d) None

8) The PMR spectra of H_2, CH_4, C_6H_6 and O_2H_6 exhibit
   a) Quintet
   b) Triplet
   c) Doublet
   d) Singlet

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

1) Any group which does not itself act as a chromophore but whose presence brings about a shift of the absorption towards red end of the spectrum is known as _____

2) Hydrogen bonding shifts the ultra-voilet absorption to _____ wavelengths.

3) Transfer of energy from the nucleus in its higher energy state to the molecular lattice is known as _____

C) Answer the following : **3**

1) How many spin states are possible for H-nucleus ?
2) Can you distinguish a pair of enantiomers by IR spectroscopy ?
3) How will you distinguish between cis and trans - 1, 3, 5 - hexatriene ?

cis

trans

SECTION – II

2. A) Assign the structure of a compound which exhibits the following data : **7**

M.F. $C_4H_8O_2$, Mol.weight. 88

uv : 206 nm

IR : 3049 - 2924, 1445, 1736 cm^{-1}

^{1}HNMR (δ, PPM) 0.9 (f) 3H

1.2 (Sextet) 2H

3.4 (f) 2H

8.4 (δ) 1H

B) Predict the number of signals in ^{1}HNMR spectroscopy of each of the following : **7**

i) 1.1- Dimethyl cyclopropane
ii) Cis 1, 2 - Dimethyl cyclopropane
iii) Trans 1, 2 - Dimethyl cyclopropane
iv) 1, 2 – Dichloropropane
v) Allyl bromide
vi) 1-chloroethene
vii) Trans 1, 2, dichloroethene.

3. A) Explain the basic principle of IR spectroscopy and factors affecting on IR frequency. **7**

   B) Write down applications of atomic absorption spectroscopy. **7**

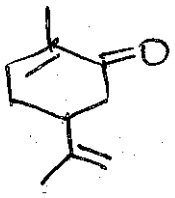
4. A) Describe the construction and working of plasma torch. **7**

   B) How would you distinguish between ethylamine, diethylamine and triethylamine on the basis of mass spectroscopy and describe some special features of amines which help to identify them. **7**

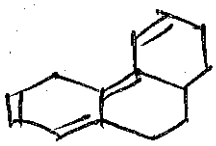
SECTION – III

5. A) An organic compound with molecular formula, $C_3H_3Cl_5$ give the following PMR data. Assign the structure for compound. ^{1}HNMR (δ, PPM) : 4.52 (f) 1H
   6.07 (d) 2H **5**

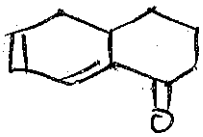
   B) Calculate λ max value of the following compounds using Woodward- Fieser rule. **5**



(I)



(II)



(III)

   C) Describe atomness in AAS. **4**

6. A) Write down different fragmentation modes of diphenyl ether. **5**

   B) Explain shielding and deshielding in ^{1}HNMR spectroscopy. **5**

   C) Assign the structure of compound which exhibits the given data.

   Mf. C_8H_7OCl

   IR : 3300, 1690, 1600, 1500, 830cm^{-1}

   ^{1}HNMR (δ, PPM) : 2.5 (S, 3H)

   7.3 (d, J = 8H_2) 2H

   7.9 (d, J = 8H_2) 2H **4**

7. Write a short note on (**any three**) : **14**
   a) Mclafferty rearrangement.
   b) Chemical shift and coupling constant.
   c) Applications of ICP – AIS.
   d) Fundamental vibrations in IR spectroscopy.

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SLR-MM – 132

Seat No.	

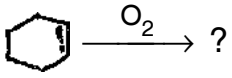
M.Sc. II (Semester – III) (New CGPA) Examination, 2015
ORGANIC CHEMISTRY (Paper – IX)
Advanced Organic Chemistry – I

Day and Date : Monday, 16-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

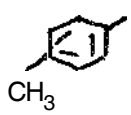
N.B. : *1) Attempt in **all five** questions.*
*2) Section **I** (question **1**) is **compulsory**.*
*3) Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.*
*4) Answer to **all five** questions (from Section **I, II, III**) should be written in the **one**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

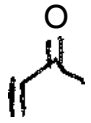
SECTION – I

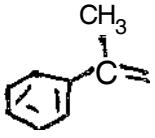
1. A) Predict the product : **11**

i)  $\xrightarrow{O_2}$?

ii) $2\ R - Li - Cu\ I \xrightarrow[N_2]{ether}$? + ?

iii)  $\xrightarrow[165^{\circ}C]{AlCl_3}$?

iv) $C_2H_5 - CHO +$  $\xrightarrow{DABCO}$

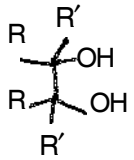
v)  $\xrightarrow[2.\ NaOEt]{1.\ P\text{–}\ CH_3C_6H_4SO_2Cl/Py}$?

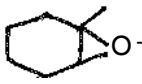
P.T.O.

vi)  $\xrightarrow[\text{ii) } H_2O_2]{\text{i) } O_3,\ MeOH}$?

vii) $R-\overset{O}{\overset{\|}{C}}-CH=\overset{\oplus}{N}=\overset{\ominus}{N} \xrightarrow[Ag^{\oplus}]{\Delta}$? $\xrightarrow{H_2O}$?

viii)  $\xrightarrow{NBS}$?

ix)  $\xrightarrow{Pb(OAc)_4}$?

x)  $\xrightarrow[BF_3.OEt_2]{NaBH_3CN}$?

xi)  $\xrightarrow[\text{2. NaOH}]{\text{1. } NaN_3, H_2SO_4}$?

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

i) Reaction of alkene with an oxidising agent such as peroxy acid leads to formation of _____

ii) Negative ρ value means _____ electrons in the transition state than in the starting material.

iii) Slow atmospheric oxidation of C – H to C – O – O – H is called _____

SECTION – II

2. A) Comment on kinetic isotope effect to determine the reaction mechanism with suitable example. **7**

B) Explain Passerini reaction with suitable example. **7**

3. A) Discuss following reactions : **7**

i) Payne

ii) Brook

B) Explain in brief : **7**

i) Lossen rearrangement

ii) Smiles rearrangement.

4. A) Discuss reactions of diazomethane with : **7**

i) alkene

ii) acid chloride

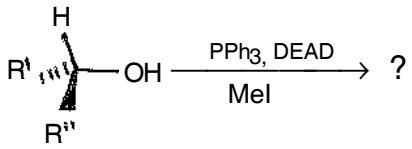
iii) aldehyde and ketones

B) Discuss the applications of polyphosphoric acid in detail. **7**

SECTION – III

5. A) Optically active 1 - bromo-2-methyl butane on free radical bromination gives 1, 2-dibromo-2-methylbutane. Explain with stereochemistry. **5**

B) Predict the product and discuss the mechanism : **5**



C) Explain Hammett equation. **4**

6. A) Discuss synthesis of substituted alkynes using Corey-Fuchs reaction. **5**

B) Discuss reactivity at bridge head position in free radical reaction with suitable example. **5**

C) Give applications of selenium dioxide. **4**

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

A) Complex metal hydrides.

B) Julia olefination

C) Biginelli reaction

D) Semipinacol rearrangement.

———————

SLR-MM – 133

Seat No.	

M.Sc. – II (Semester – III) Examination, 2015
(New CGPA)
ORGANIC CHEMISTRY
Advanced Spectroscopic Methods (Paper – X)

Day and Date : Wednesday, 18-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 p.m.

N.B. *: i) Section **I** is **compulsory**.*
*ii) Attempt **any two** questions from Section **II** and **any two** from Section **III**.*
*iii) Answer to **all** questions (Section **I, II, III**) should be written in **one** answer book.*
*iv) **All** questions carry **equal** marks.*
*v) Figures to **right** indicate **full** marks.*
*vi) Use of log table and calculators is **allowed**.*

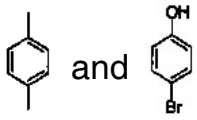
SECTION – I

1. A) Answer the following : **7**

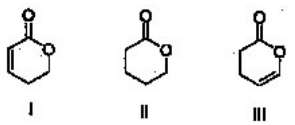
a) What is Nitrogen Rule ?

b) What do you mean by base peak ?

c) How many signals you expect in the proton decoupled ^{13}C NMR spectrum of following compounds ?



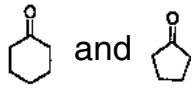
d) Arrange the following compounds in order to their increasing wave number of absorption due to >c=o stretching in the following compounds.



e) Which of the following diatomic molecules don't absorb in the IR region ?
HCl, ClBr, N_2, H_2, O_2

P.T.O.

f) How can IR distinguish between following pair of the compound ?

 and

g) How will you distinguish between cis- and trans- isomers of cinnamic acid by PMR ?

B) Choose the correct alternative : **7**

a) ^{1}H, ^{13}C, ^{19}F, ^{31}P have nuclear spin equal to

i) 1/2 ii) 1 iii) 0 iv) 3/2

b) How many Hertz does 1 ppm correspond to for PMR spectrometer operating at a radiofrequency of 60 MHz and 100 MHz ?

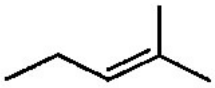
i) 6 Hz, 10 Hz ii) 60 Hz, 100 Hz

iii) 100 Hz, 60 Hz iv) 10 Hz, 6 Hz

c) Which of the following nuclei will have a magnetic moment ?

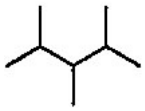
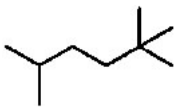
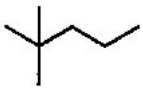
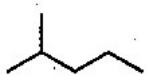
i) ^{2}D ii) ^{16}O iii) ^{12}C iv) ^{32}S

d) How many absorption signals will the following compound have in its carbon NMR spectrum ?

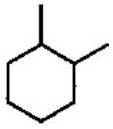
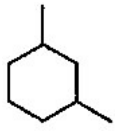
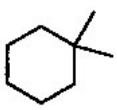


i) 3 ii) 4 iii) 5 iv) 6

e) The CMR spectrum of an unknown compound shows 6 absorptions and the PMR spectrum shows 5 absorptions. Which of the following compounds is the unknown compound ?

i)  ii)  iii)  iv) 

f) The CMR spectrum of an unknown compound shows 4 absorptions and the PMR spectrum shows 4 absorptions. Which of the following compound is the unknown compound ?

i)  ii)  iii)  iv) 

g) Which transition has the smallest molar absorptivity ?

i) $\pi - \pi^*$ ii) $\sigma - \sigma^*$ iii) $n - \pi^*$ iv) $\sigma - \pi^*$

SECTION – II

2. A) Explain the FAB and MALDI ionisation methods of Mass technique. **7**

   B) Deduce the structure of organic compound using given spectral data. **7**

   Molecular Formula : $C_6H_{14}O$

   IR : 2972, 1467, 1378, 1327, 1169, 1111, 1015, 908, 795 cm^{-1}

   ^1H NMR (δ in ppm) : 1.1 (d, J = 6 Hz, 30 mm); 3.6 (septet, J = 6 Hz, 5 mm)

   ^{13}C NMR (δ in ppm) : 22 (st, CH_3), 68 (CH)

   Mass : m/z = 102, 87, 59, 45 (base), 43

3. A) Explain chemical and magnetical equivalence phenomenon in NMR technique. **7**

   B) Explain the following with examples : **7**

   i) McLafferty rearrangement.

   ii) Nuclear Overhauser Effect (NOE).

4. A) Explain AB_2, AX_2 Spin System with examples. **7**

   B) Deduce the structure of organic compound using given spectral data. **7**

   Molecular Formula : $C_5H_{10}O_2$

   IR : 2972, 1741, 1437, 1362, 1248, 1148, 1098, 997, 880 cm^{-1}

   ^1H NMR (δ in ppm) : 0.95 (t, J = 6 Hz, 30 mm), 1.62 (sextet, J = 6 Hz, 20 mm), 2.28 (t, J = 6 Hz, 20 mm), 3.65 (s, 30 mm)

   Mass : m/z = 102 (M^+), 87, 74, 71, 59, 55, 43 (base), 42, 41, 59, 45 (base), 43; M^+ very weak

SECTION – III

5. A) Deduce the structure of the compound using following data **5**

   Molecular Formula : $C_5H_{10}O$

   UV : Featureless above 210 nm

   IR ; 1100, 1020 cm^{-1}

   ^1H NMR (δ in ppm) : 1.22 (d, J = 6 Hz, 12 mm), 2.0 (m, 16 mm), 3.65 (t, J = 6 Hz, 8 mm), 3.80 (m, 4 mm).

B) What is Anisotropy effect ? Explain with suitable examples. **5**

C) The analytical data and the molecular mass determination gave C_8H_8O as a molecular formula of the compound. The compound burns with sooty flame. It shows following absorption band. Find out the structure of the compound.

(IR : 2825, 2717, 3060, 1700, 830 cm^{-1}) **4**

6. A) Explain spin-spin coupling and coupling constant. **5**

B) What is ortho effect ? Explain with suitable examples. **5**

C) Explain hydrogen bonding effect in IR spectroscopy. **4**

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

a) HETCOR and COSY technique.

b) Factors affecting on IR frequency.

c) Detectors in mass spectroscopy.

d) Mass spectral fragmentation of amines.

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SLR-MM – 134

Seat No.	

M.Sc. II (Semester – III) (New CGPA) Examination, 2015
ORGANIC CHEMISTRY (Paper – XI)
Photochemistry and Pericyclic Reactions

Day and Date : Friday, 20-11-2015 Max.Marks : 70

Time : 2.30 p.m. to 5.00 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 (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. A) Fill in the blanks : **7**

i) The photolytic conversion of organic nitrites into nitroalcohols is known as _____ reaction.

ii) The phenomenon in which electron returns to ground state (S_0) from singlet state (S_1) by liberating energy is known as _____

iii) Excited state with same spin and paramagnetic is known as _____

iv) The cycloaddition reaction between an electronically excited carbonyl group and a ground state oletin to yield an oxetane is known as _____ reaction.

v) Rotation of bond in same direction either clockwise or anticlockwise is known as _____ rotatory motion.

vi) For the effective energy transfer energy gap between donor and acceptor should be _____

vii) A process in which bonds are being made or broken on same face (side) of the molecule is known as _____ process.

P.T.O.

B) Define the following terms : **7**

i) Intersystem crossing.

ii) Cheletropic reactions.

iii) Claisen rearrangement.

iv) Phosphorescence.

v) Exciplex.

vi) Excimer.

vii) Oxa-di-π-methane rearrangement.

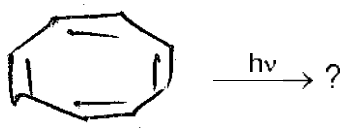
SECTION – II

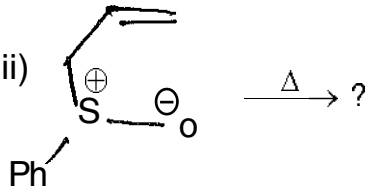
2. A) Explain aromaticity on the basis of perturbation molecular orbital theory. **7**

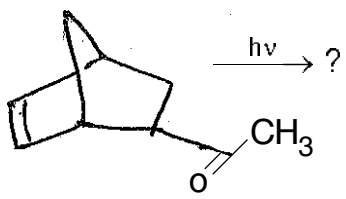
B) Describe Norrish type – I and type – II reactions. **7**

3. A) Explain [1 , 3] sigmatropic rearrangement is photochemically allowed process. **7**

B) Predict the products with mechanism and identify reaction involved. **7**

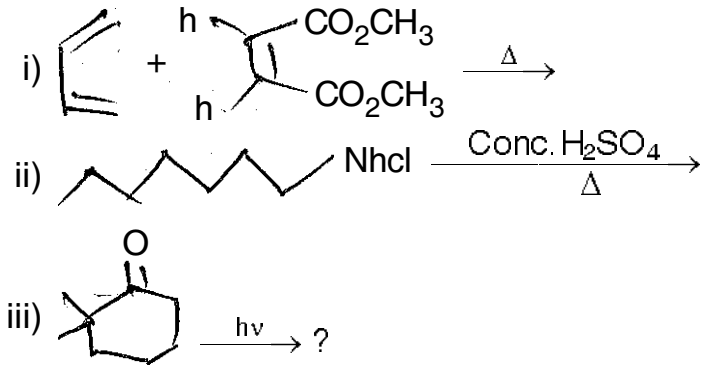
i) 

ii) 

iii) 

4. A) Discuss photochemistry of 1, 3-butadiene. **7**

   B) Predict the products with mechanism. **7**



SECTION – III

5. A) Discuss aromaticity of non-benzonoid aromatic compounds. **5**

   B) Explain cope rearrangement is stereospecific. **5**

   C) Describe photofries rearrangement. **4**

6. A) Butadiene-cyclobutene interconversion under thermal condition con rotatory mode is allowed process. Explain by FMO method. **5**

   B) [4 + 2] cycloaddition is thermally allowed process. Explain by correlation diagram method. **5**

   C) Predict the products with mechanism **4**

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

   a) Photoreduction.

   b) Di-π-Methane arrangement.

   c) Alternant and non-alternant hydrocarbon.

   d) The reaction.

SLR-MM – 135A

Seat No.	

M.Sc. – II (Semester – III) (New CGPA) Examination, 2015
ORGANIC CHEMISTRY (Elective)
Drugs and Heterocycles (Paper – XII)

Day and Date : Monday, 23-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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) Draw the correct structure of following drugs : **7**

i) Cephalosporin

ii) Hydroxy chloroquinine

iii) Isoniozide

vi) Histamine

v) Trimeprazine

vi) 5 – fluorouracil

vii) Reserpine.

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

i) Aziridine + H_2O $\longrightarrow$?

ii)  + perbenzoic acid $\longrightarrow$? + ?

P.T.O.

iii) Oxirane + phenyl Magnesium bromide $\xrightarrow{H_3O^{\oplus}}$? + ?

iv) 2 – Methly Thiirane + HCl $\longrightarrow$?

v) Oxetane $\xrightarrow[ii)\ H^+/H_2O]{i)\ PhMgBr}$? + ?

vi) Thietane + Cl_2 $\longrightarrow$?

viii) 2-Chloro oxazole + $NH_2 - NH_2$ $\longrightarrow$?

SECTION – II

2. a) Give the different synthetic methods of amoxycillin. **7**

   b) What are antimalarials ? Explain the life cycle of plasmodium and give the synthesis of trimethoprim. **7**

3. a) What are anaesthetics ? Give the synthesis and mechanism of action of thiopental. **7**

   b) Discuss the synthesis, mechanism of action and applications of Diazepam and Trimeprazine. **7**

4. a) What are cardiovascular drugs ? Give the synthesis, mechanism of action, applications and drawback of methyldopa. **7**

   b) Give the synthesis and applications of following anti-inflammatory drugs (**any two**) : **7**

   i) Oxyphenbutazone

   ii) Dichlorophenac

   iii) Indomethacin.

SECTION – III

5. a) Suggest the mechanism for the conversion of oxirane to thiiranes. Discuss the ring opening reactions of thiirane by electrophilic and nucleophilic reagents. **5**

   b) Discuss synthesis of indole by using Fischer and Madelung synthetic methods. **5**

   c) Give any two methods of the synthesis of coumarins. **4**

6. a) Discuss different synthetic methods of thiazole with mechanism. **5**

   b) Give the different synthetic methods of quinoline and isoquinolines. **5**

   c) Give any two methods for the synthesis of coumarins and chromones.

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

   a) Pyridines

   b) Diazines

   c) Pyrimidines

   d) Oxazole.

SLR-MM – 136

Seat No.	

M.Sc. (Part – II) (Semester – III) (CGPA) Examination, 2015
ORGANIC CHEMISTRY (Paper – IX) (Old)
Organic Reaction Mechanism

Day and Date : Monday, 16-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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 is Norrish Type – I reaction ?

ii) What is migratory aptitude ?

iii) Which cyclic intermediate formed in Wittig reaction ?

iv) What are enamines ?

v) Define inter system crossing.

vi) Define Taft equation.

vii) Which reagent is used in Baeyer-Villiger oxidation ?

viii) Write a reaction illustrating the term “stereo selectivity”.

P.T.O.

B) State whether **true** or **false** : **3**

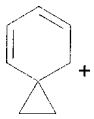
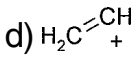
i) At photo stationary state rate of cis to trans and trans to cis isomerization is equals, resulting in no change in composition of products.

ii) Classical carbocations can be stabilized by movement of either lone pair or C-H sigma electrons or Pi-electrons.

iii) Alkylation of enamines can be carried out by secondary alkyl halides.

C) Select the most correct alternative for **each** of the following : **3**

i) Which of the following is non-classical carbocation _____

a)  b)  c)  d) 

ii) In _____ reaction products formation takes place by formation of phosphorous ylide.

a) Smiles rearrangement b) Stevens rearrangement

c) Wittig reaction d) Sommelet rearrangement

iii) In Wolf rearrangement _____ ketones are decomposed thermally or photochemically rearrange to ketene.

a) α – diazo b) β – diazo

c) γ – diazo d) δ – diazo

SECTION – II

2. a) Explain in detail the mechanism of oxygen transport by hemoglobin. **7**

   b) Explain acylation of alcohols by acyl halides. **7**

3. a) Describe rearrangements in the biosynthesis of valine. **7**

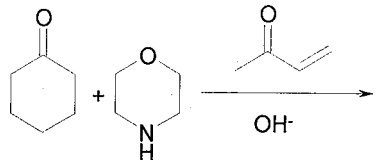
   b) Explain with suitable examples enantioselectivity and stereoselectivity of alkylation. **7**

4. a) Write different reactions of Arynes. **7**

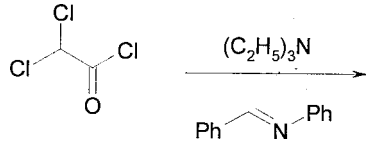
   b) Explain various non-kinetic methods of determining reaction mechanism. **7**

SECTION – III

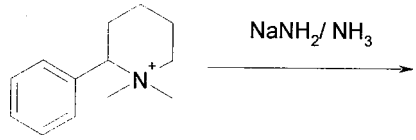
5. Predict the product and justify your predictions.

a) 

5

b) 

5

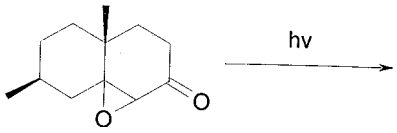
c) 

4

6. a) Explain synthetic applications of sulphur ylides. **5**

   b) Explain in detail Paterno-Buchi reaction. **5**

   c) Predict the products and justify your prediction. **4**



7. Explain the following (**any three**) : **14**

   i) Nature's $NaBH_4$ is a nucleotide

   ii) Barton reaction

   iii) Synthetic utility of enamines

   iv) Non-classical carbocation.

SLR-MM – 137

Seat No.	

M.Sc. Part – II (Semester – III) (Old) (CGPA) Examination, 2015
ORGANIC CHEMISTRY (Paper – X)
Advanced Spectroscopic Methods

Day and Date : Wednesday, 18-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 p.m.

Instructions : *i) Section **I** is **compulsory.***

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

*iii) Answer to **all** questions (Section **I, II** and **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 table and calculators is **allowed**.*

SECTION – I

1. A) Choose the correct answer. **10**

a) Compound C_5H_{10} shows no absorption at 1380 cm^{-1} it is

I) Pentene II) Cyclopentane
III) Pentyne IV) All of these

b) The n-π^* transition shows absorption at longer wavelength

I) It requires higher energy II) It requires minimum energy
III) It is below U.V. region IV) It has very low intensity

c) HETCOR spectra is used to detect directly bonded

I) $^{13}C - {}^{1}H$ II) $^{13}C - {}^{13}C$ III) $^{1}H - {}^{1}H$ IV) All

d) ^{13}C spectra can be simplified by the process of

I) Noise decoupling II) Broad band decoupling
III) Off resonance decoupling IV) All of these

e) The PMR spectra of H_2, CH_4, C_2H_6 and C_6H_6 exhibit

I) Singlet II) Doublet III) Triplet IV) Quintet

f) $^1H - ^{13}C$ COS γ is termed

I) HETCOR II) DEPT
III) Inadequate IV) NOIS γ

g) The actual value of nuclear spin is depends on

I) Mass number II) Atomic number
III) Both I and II IV) Shielding effect

h) The inclusion of any common stable isotope, except O^{18} alters the use of

I) Nitrogen rule II) Ring rule
III) Thermospray IV) Even electron rule

i) β-cleavage of a bond with γ-H rearrangement to form cation and a neutral molecule is called

I) MacLafforty afforty rearrangement
II) Retro Diels-Alder reaction
III) H-transfer rearrangement
IV) Skeletal rearrangement

j) Aniline show blue shift in acidic medium because

I) In acidic medium unshared pair of nitrogen of aniline is not available for delocalization
II) $-NH_2$ group is meta orienting
III) $-NH_2$ group is electron withdrawing
IV) None of these

B) Answer the following. **4**

a) In case of OH and NH resonances broad signals are observed. Explain.

b) What is base peak ?

c) How many different types of protons are present in allyl bromide ?

d) Which is the most abundant or the base peak in the mass spectrum of toluene ?

SECTION – II

2. A) Deduce the structure of the compound for given spectroscopic data. **7**

M^+, m/z = 260, 262 and 264 in the ratio 1 : 1.27 : 0.33

IR – 1687, 1585, 1490, 1397, 1223, 1070, 1010, 985, 811 cm^{-1}

PMR – 2.25, quintet, J = 6Hz, 20 mm

3.15, (t), J = 6Hz, 20 mm

3.65, (t), J = 6Hz, 20 mm

7.62, (d), J = 8Hz, 20 mm

7.84 (d), J = 8Hz, 20 mm

CMR – 27(t), 35(t), 45(t), 128(s), 130(d), 133(d), 137(s), 190(s).

Mass – m/z = 262 (w), 260(w), 185, 183, 157, 155, 143, 116, 115, 76, 75

m/z = 265, 263, 261, 227, 185, 183, 146, 107, 105.

B) Explain chemical and magnetical phenomenon in NMR spectroscopy. **7**

3. A) Deduce the structure of organic compound for given spectroscopic data. **7**

Molecular formula : C_9H_{10}

IR : 3030, 1500, 1550, 740 cm^{-1}

PMR : 2.04, quartet, 2H

2.91, triplet, 4H

7.17, singlet, 4H

B) Explain factors affecting group frequencies in IR. **7**

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

B) Explain shielding and deshielding phenomenon in NMR spectroscopy. **7**

5. A) A compound with molecular formula $C_7H_5OCl_3$ shows a three protone singlet at δ3.9 and two one protone doublets (J = 8Hz) at δ6.76 and 7.3. Identify the compound. **5**

B) A compound C_6H_8O shows the following CMR signals. Deduce its structure. **5**

13_C NMR (δ in ppm) : 199.7(s), 129.8(d), 150.9(d), 38.1(t), 25.7(t), 22.8(t).

C) Predict the number of signals in PMR spectroscopy of each of the following. **4**

i) 1, 1 dimethyl cyclopropane
ii) cis – 1, 2 dimethyl cyclopropane
iii) trans 1, 2 dimethyl cyclopropane
iv) 1, 2 dichloro propane.

6. A) Acetylene protons are more shielded than ethylenic protons. Explain. **5**

B) Explain different modes of fragmentation in mass spectroscopic technique. **5**

C) Explain DEPT technique in ^{13}C – NMR spectroscopy. **4**

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

A) AX, AB and A_2 spin notation with example.

B) First order and second order spectra.

C) NOES γ and HETCOR technique.

D) MacLafforty rearrangement.

SLR-MM – 138

Seat No.	

M.Sc. – II (Semester – III) Examination, 2015
ORGANIC CHEMISTRY (Paper – XI) (Old) (CGPA)
Advanced Synthetic Methods

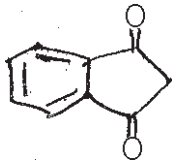
Day and Date : Friday, 20-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

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 (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

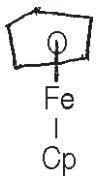
1. Predict the product(s) : **14**

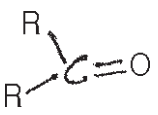
1)  $\xrightarrow{2\ TMSI}$?

2)  $\xrightarrow[Dioxane\ |\ HOH]{SeO_2}$?

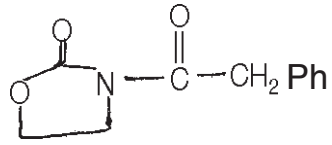
3)  $I + CH_2 = CH - \underset{\underset{O}{\|}}{C} - CH_3 \xrightarrow[AIBN]{TBTH}$?

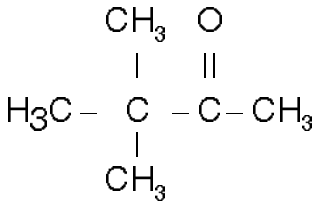
4)  $\xrightarrow[ii)\ H_2O_2|OH]{i)\ IPC_2BH\ (-)}$?

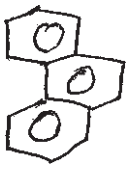
5)  $\xrightarrow[Me_2NH]{HCHO}$?

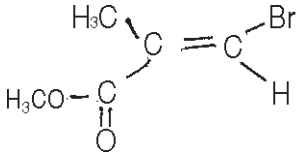
6)  $\xrightarrow[TsOH]{HO-(CH_2)_3-OH}$?

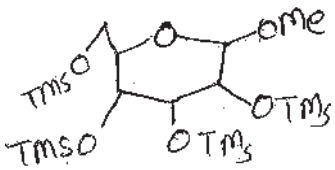
P.T.O.

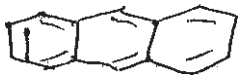
7)  $\xrightarrow[2)\ R-CH_2-X]{1)\ LDA\,|\,THF}$?

8)  $\xrightarrow{CF_3CO_3H}$?

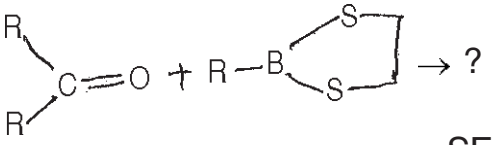
9)  $\xrightarrow{O_3}$?

10)  $\xrightarrow[PPh_3]{Pb(OAC)_2}$?
Et_3N

11)  $\xrightarrow[CH_2Cl_2]{TBAF\,|\,Et_3N}$?
THF

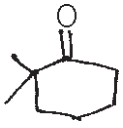
12)  $\xrightarrow[DMF]{H_5IO_6\,|\,H_2O}$?

13)  $\xrightarrow[H_3O^{\oplus}]{(CH_3)_2CuLi}$?

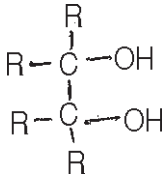
14)  → ?

SECTION – II

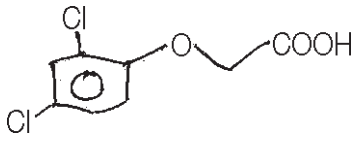
2. a) Predict the products with mechanism. **7**

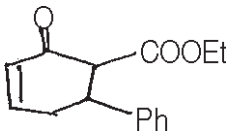
1)  $\xrightarrow[ii)\ Ph-SeBr\ \ iii)\ H_2O_2]{i)\ LDA}$?

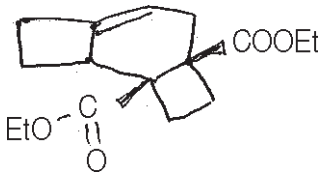
2)  $Br + H_3C-C\equiv C-H \xrightarrow[Et_2NH]{Pd(O)\ CuI}$?

3)  $\xrightarrow{NaIO_4}$?

b) Using disconnection approach outline the synthesis of following T.M. **7**

i) 

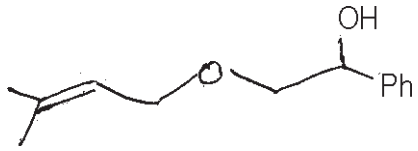
ii) 

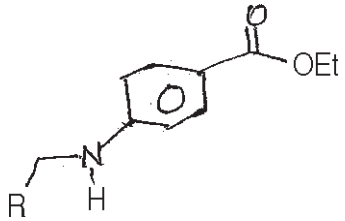
iii) 

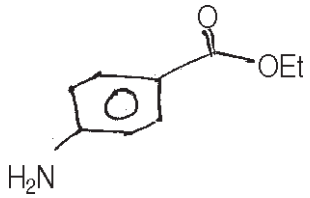
3. a) Discuss the applications of following reagents in organic synthesis. **7**
   i) Organo tin compounds
   ii) Trimethyl silyl iodide.
   iii) Peracids.

   b) Explain hydroboration with respect to mechanism, stereoselectivity and regioselectivity. **7**

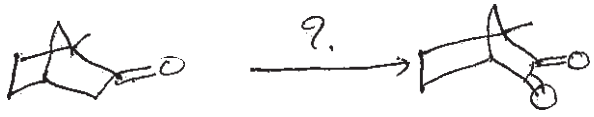
4. a) Give the synthons and synthetic equivalents of following T.M. **7**

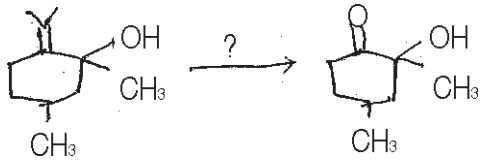
i) 

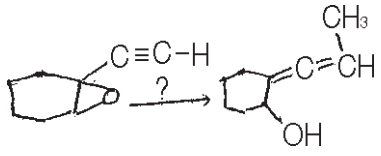
ii) 

iii) 

   b) Suggest the suitable reagent for following transformation and suggest mechanism. **7**

i) 

ii) 

iii) 

SECTION – III

5. a) Discuss the term umpolung with suitable examples. **5**
   b) Give the application and importance of PPA in organic synthesis. **5**
   c) Using suitable protecting group, how would you bring following conversion. **4**

6. a) Explain the synthetic methods of EZ and ZZ dienes with the help of organoboranes. **5**
   b) Explain the function of organo cobalt complexes in organic synthesis. **5**
   c) Define and explain following terms used in organic synthesis. **4**
      i) Regioselectivity
      ii) Chemoselectivity.

7. Write notes on (**any 3**) : **14**
   a) One group C – C disconnections.
   b) Pausal-khand reaction.
   c) Protection of alcohols.
   d) Carbonylation of organoboranes.

———————

SLR-MM – 139

Seat No.	

M.Sc. (Part – II) (Semester – III) (CGPA) Examination, 2015
ORGANIC CHEMISTRY (Paper – XII) (Old)
Drugs and Heterocycles

Day and Date : Monday, 23-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

N.B. : *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 (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** indicates **full** marks.*

SECTION – I

1. a) Define the terms of the following : **7**

i) Bacteriostatic and bactericidal agents

ii) Antineoplastic drugs

iii) Antibiotics

iv) Sulpha drugs

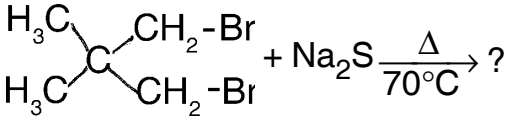
v) Soft drugs

vi) Antipyretics

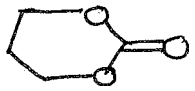
vii) Analgesics.

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

i) $Br - CH_2 - CH_2 - CH_2 - NH_2 \xrightarrow[\Delta]{\overset{\ominus}{O}H} ?$

ii)  $+ Na_2S \xrightarrow[70°C]{\Delta} ?$

P.T.O.

iii)  $+ CNS^{\ominus} \longrightarrow ? \xrightarrow{170 - 210^{\circ}C} ?$

iv) Aniline + α-bromo butane $\xrightarrow{HCl}$?

v) $CH_3 - \overset{O}{\overset{\|}{C}} - \overset{O}{\overset{\|}{C}} - CH_3 + 2NH_3 + CH_3 - CHO \xrightarrow{H^{\oplus}} ?$

vi) $CH_3 - \overset{O}{\overset{\|}{C}} - \underset{CH_3}{\underset{|}{CH}} - O - \overset{O}{\overset{\|}{C}} - CH_3 + NH_3 \xrightarrow{H^{\oplus}} ?$

vii) $CH_3 - \underset{Br}{\underset{|}{CH}} - CHO + CH_3 - \overset{S}{\overset{\|}{\underset{NH_2}{\underset{|}{C}}}} \xrightarrow{H^{\oplus}} ?$

SECTION – II

2. a) Explain the synthetic methods of Amoxycillin and their applications. **7**

   b) Discuss the synthesis of Trimethoprim and mechanism of action. **7**

3. a) Explain the synthesis and mechanism of action of Aminopyrine. **7**

   b) What are anti-inflammatory drugs ? Discuss synthesis and mechanism of action of Ibu-Profen. **7**

4. a) What is anti-leprotic drug ? Explain synthesis, mechanism of action and adverse effect of DDS. **7**

   b) Write notes on **any two** of the following drugs : **7**

      i) Atenolol

      ii) Lignocaine

      iii) Benadryl.

SECTION – III

5. a) Suggest the mechanism for the conversion of oxi-rane to thi-ranes. Discuss the ring opening reactions of thi-rane by electrophilic and nucleophilic reagents. **5**

   b) Explain ring opening reactions of oxetane by nucleophiles is slower than that of oxi-rane. What is the action of following on 2-Methyl oxetane ? **5**

      i) HCl

      ii) CH_3COCl

      iii) $AlCl_3$/benzene.

   c) Discuss the synthesis of Aziridine by using nitrene and ylides. **4**

6. a) Discuss synthesis of Indole by using Fischer and Madelung synthetic methods. Explain Indole is easily react with electrophiles than benzene. **5**

   b) Give the synthesis of oxazole derivatives and explain, why electrophilic substitution should occur in the – 5 and – 4 position. **5**

   c) Give the different synthetic methods of imidazole with mechanism. **4**

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

   i) Coumarins

   ii) Triazines

   iii) Quinolines

   iv) Purines.

SLR-MM – 140

Seat No.	

M.Sc. – II (Semester-IV) (CGPA) Examination, 2015
ORGANIC CHEMISTRY
Theoretical Organic Chemistry (Paper – XIII)

Day and Date : Tuesday, 17-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 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 (Section – **I, II** and **III**) should be written in the **one** answerbook.*

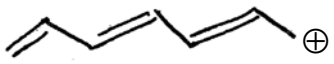
*5) **All** questions carry **equal** marks.*

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

SECTION – I

1. A. Answer the following : **7**

i) Calculate the charge density in the following :



ii) Draw the structure of [14] annulene. Is it aromatic ?

iii) Draw the HOMO and LUMO of 1, 3, 5 hexatriene.

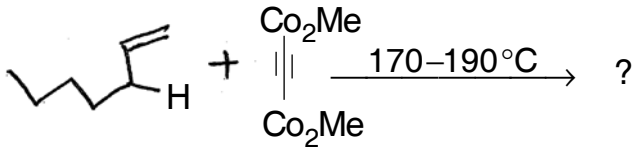
iv) Explain the term Catenane and Rotaxanes.

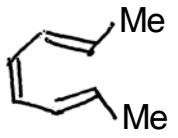
v) Which of the following is most stable ?

vi) What are sigmatropic reactions ?

vii) Define the term reactivity index.

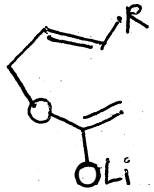
B. Predict the products :

i) 

ii) 

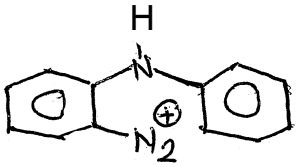
$\xrightarrow[\text{Pentane}]{132^\circ C}$?

iii) 
$\xrightarrow{h\nu}$?

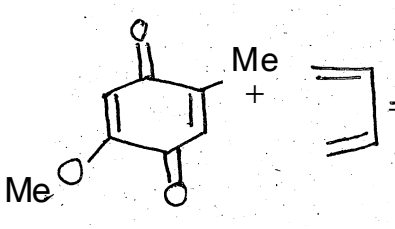
iv) 

$\xrightarrow[\text{ii) } H^{\oplus}]{\text{i) [3,3]}}{}^{\Delta}$?

v) $CH_3 - CH = \underset{\displaystyle Br}{\underset{|}{C}}H - CH_3 \xrightarrow[CCl_4\ /\ \Delta]{NBS}$?

vi) 

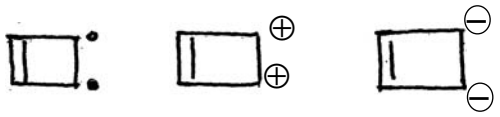
$\xrightarrow[h\nu\ OH]{\ominus}$?

vii) 

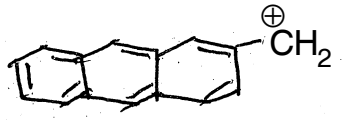
$\xrightarrow{100^\circ C}$?

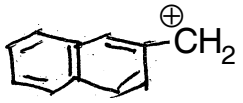
SECTION –II

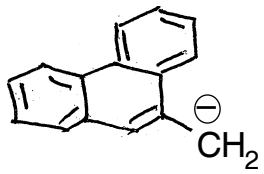
2. a) Calculate Hyckel's Delocalisation energy in the following molecules and write its stability order. **7**



b) Determine the charge density in the following. **7**

i) 

ii) 

iii) 

3. a) Discuss the aromatic nature and reactions of Ferrocene. **7**

b) Explain the Huckel's theory of aromaticity. **7**

4. a) Describe Claisen, Cope and Aza-Cope sigmatropic rearrangements with mechanism. **7**

b) Explain the Kinetic and thermodynamic control in enolization and sulphonation of naphthalene. **7**

SECTION – III

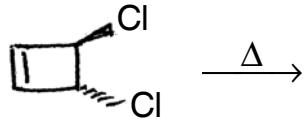
5. a) Explain neighbouring assistance in free radical reactions. **5**

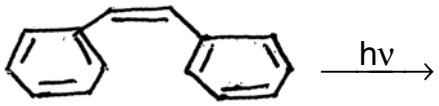
b) What are pericyclic reactions ? Explain conrotatory and – dis-rotatory ring opening with suitable examples. **5**

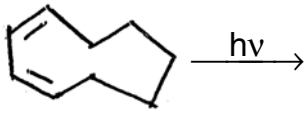
c) Explain [2 + 2] additions of Ketene. **4**

6. a) Explain Woodward-Hoffmann rule for cycloaddition reactions with suitable example. **5**

   b) Write the necessary selection rule and give stereochemistry of the products that you would expect from each of the following pericyclic reactions : **5**

   i) 

   ii) 

   iii) 

   c) Explain the base catalysed hydrolysis of esters with suitable examples. **4**

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

   a) Annulenes and heteroannulenes.

   b) Sandmeyers reaction.

   c) 1, 3 - dipolar additions.

   d) Reactivity index.

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SLR-MM – 141

Seat No.	

M.Sc. – II (Semester – IV) (CGPA) Examination, 2015
ORGANIC CHEMISTRY
Stereochemistry (Paper – XIV)

Day and Date : Thursday, 19-11-2015 Max. Marks : 70

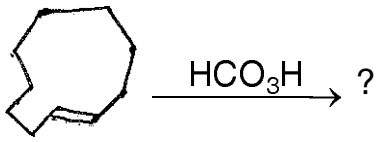
Time : 2.30 p.m. to 5.00 p.m.

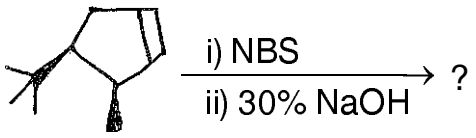
Instructions : *i) Section **I** is **compulsory**.*
*ii) Attempt **any two** questions from Section **II** and **any two** from Section **III**.*
*iii) Answer to **all** questions (Section **I, II, III**) should be written in **one** answer book.*
*iv) **All** questions carry **equal** marks.*
*v) Figures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

SECTION – I

1. Answer the following : **14**

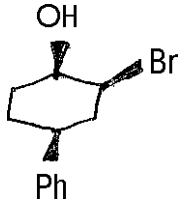
A) Predict the product with appropriate stereochemistry **10**

a) 

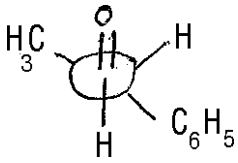
b) 

P.T.O.

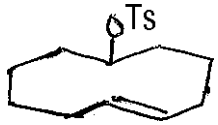
c)  $\xrightarrow[\text{iii) NaOH}]{\text{i) } Br_2 \\ \text{ii) } H_3O^+}$?

d) 

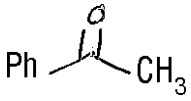
$\xrightarrow{Ag_2O}$?

e) 

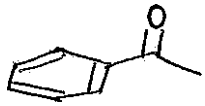
$\xrightarrow{CH_3MgBr}$ Major + Minor

f) 

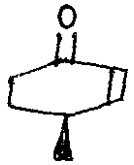
$\xrightarrow{C_6H_5N(Et)_2}$? + ?

g) 

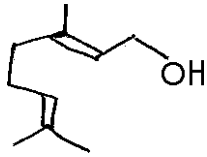
$\xrightarrow{\text{S–BIMAL–H}}$?

h) 

$\xrightarrow{\text{(+) IPC–BBN}}$?

i) 

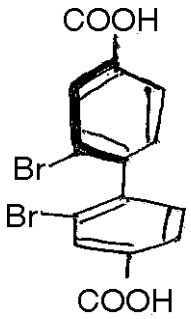
$\xrightarrow[H^+/H_2O]{Me_2CuLi}$?(Major) + ?(Minor)

j) 

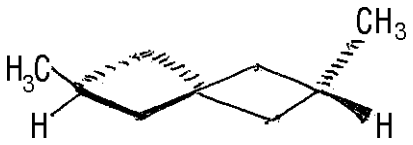
$\xrightarrow{\text{R, R(+) OET}}$?

B) Assign R/S configuration to the following : **4**

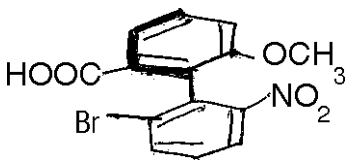
a)



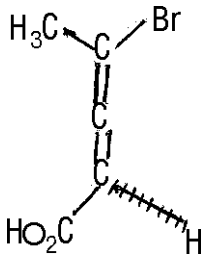
b)



c)



d)



SECTION – II

2. 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.

3. A) Draw the different conformation of perhydrophenanthrene and comment on stability. **7**

   B) Explain the stereochemistry of Diel's-Alder reaction with suitable example. **7**

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

   B) Discuss the effect of conformation on chemical reactivity in cyclohexane derivatives with respect to (i) NGP (ii) Molecular rearrangement reactions. **7**

SECTION – III

5. a) Explain the conformation of 5, 7 and 8 membered ring. **5**

   b) Explain stereochemical restruction in bridged ring system. **5**

   c) Epoxidation of (E) and (Z)-2-butene with peracids is stereospecific reaction. Explain. **4**

6. a) The rate of base induced dehydrohalogenation of threo-1-brom-1, 2,-diphenyl propane is faster than erythro-isomer. Explain. **5**

   b) Explain the terms Homotopic, enantiotopic and distereotopic group and faces with suitable example. **5**

   c) State and explain Curtin-Hammett principle with suitable example. **4**

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

   a) Distereoselectivity of Aldol reactions.

   b) Concept of I-strain.

   c) Felkin-Ann model.

   d) Enantiomeric excess.

SLR-MM – 142

Seat No.	

M.Sc. (Part – II) (Semester – IV) (CGPA) Examination, 2015
ORGANIC CHEMISTRY
Chemistry of Natural Products (Paper – XV)

Day and Date : Saturday, 21-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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.*

SECTION – I

1. a) Answer the followings : **7**
   i) Define biogenesis and biosynthesis.
   ii) What are prostaglandins ?
   iii) What are lignin ?
   iv) What are flavonoids ?
   v) What are alkaloids ?
   vi) Sesquiterpenoid.
   vii) Isoprene rule.

   b) Answer the followings : **7**
   i) Structure of reserpine, strychnine.
   ii) Hardwickiic acid.
   iii) Structure of ojma lactum.
   iv) Classification of steroid.
   v) Shikimate pathway.
   vi) Atropine is _____ type of alkaloid.
   vii) Ergosterol is the provitamin for _____

P.T.O.

SECTION – II

2. a) Write the biosynthesis of cholesterol from isopentyl pyrophosphate. **7**

   b) What are prostaglandins ? Write its biogenesis and functions. **7**

3. a) Explain in detail biological role of riboflavine. **7**

   b) Explain the biosynthesis of strychnine. **7**

4. a) Write the biosynthesis of morphine from tyrosine. **7**

   b) Write synthesis of ring A of Taxol. **7**

SECTION – III

5. a) Elucidate the nature of nitrogen in strychnine. **5**

   b) Describe the position of keto group and angular methyl group in estrone. **5**

   c) Explain the synthesis of isoprene unit from acetic acid. **4**

6. a) Explain the biosynthesis of coumarin. **5**

   b) Explain the biological function and mechanism of thiamine. **5**

   c) Explain biosynthesis of nicotine. **4**

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

   a) Serine-glycine interconversion using folic acid.

   b) Synthesis of estrone.

   c) Role of biotin in carboxylation.

   d) Biosynthesis of ephedrine.

SLR-MM – 143

Seat No.	

M.Sc. (Part – II) (Semester – IV) (CGPA) Examination, 2015
ORGANIC CHEMISTRY
Applied Organic Chemistry (Paper – XVI)

Day and Date : Tuesday, 24-11-2015 Total Marks : 70
Time : 2.30 p.m. to 5.00 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** answerbook.*
*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) Carbohydrates
   ii) Green Chemistry
   iii) Ultrasound
   iv) Epimers
   v) Atom economy
   vi) Ionic liquid
   vii) One pot synthesis
   viii) Anomers.

   b) Draw the structures of the following components.
   i) 1 – Ethyl – 3 – Methyl imidazolium Nitrate
   ii) Calixarene
   iii) α – cyclodextrin

P.T.O.

iv) β – D – glucofuranose
v) D – Mannose
vi) α – D – glucopyranose.

SECTION – II

2. a) What are calixarenes ? Give the types and applications of calixarenes. **7**

   b) What is supramolecular chemistry ? Explain the characteristic of cyclodextrins. **7**

3. a) What are phase transfer catalyst ? Discuss the synthesis and applications of crown ethers. **7**

   b) What are enzyme catalysed reactions ? Enzymatic reduction reactions are highly stereoselective and straight forward reactions. Explain with suitable examples. **7**

4. a) What are merrifield regin ? How it is prepared ? Discuss their applications as a polymer support reagent. **7**

   b) Write note on the following. **7**
      i) Atom economy
      ii) Altrasound energy.

SECTION – III

5. a) What are carbohydrates ? How they are classified ? **5**

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

   c) Why cyclic structure of glucose is favourable than the open chain structure ? **4**

6. a) Discuss the configuration of C – 1(anomeric centre) in glucose using Hudson's and Fischer enzymatic methods. **5**

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

i) Glucose + Phenyl hydrazine (excess) $\rightarrow$ Glucosazone

ii) Fructose + Phenyl hydrazine (excess) $\rightarrow$ Fructosazone

c) D and L configuration of Monosaccharides. **4**

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

a) Mutarotation

b) Multicomponent synthesis

c) Ionic liquids

d) Epimers and Anomers.

SLR-MM – 144

Seat No.	

M.Sc. (Part – II) (Semester – III) (New) Examination, 2015
INDUSTRIAL CHEMISTRY (Paper – IX) (CGPA)
Unit Operation of Chemical Engineering

Day and Date : Monday, 16-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 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 (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) What is Extractive distillation ?

ii) What are the different factors accounted for selection of solvent for extraction ?

iii) On what principle does the Ball mill achieve size reduction of a solid ?

iv) What qualities do a filter aids should possess ?

v) What is meant by Dew point ?

vi) What are the disadvantages of forced circulation evaporator ?

vii) What are the applications of Tunnel dryer ?

viii) What is azeotropic breaker ?

ix) Give an example of a leaching operation.

x) What is the use Tube Sheet in heat exchanger ?

xi) What is Raoult's Law ?

xii) What is nucleation ?

xiii) What are the advantages of tray dryer ?

xiv) What is meant by deliquescence ?

P.T.O.

SECTION – II

2. a) Explain in brief construction and working of multiple effects evaporator. **7**

   b) Describe in detail the working of continuous countercurrent extraction. **7**

3. a) Describe in detail the working of, valve plate and sieve plate column used in distillation. **7**

   b) What are the different propellers agitators used in Agitated Vessel ? **7**

4. a) Explain with neat labelled diagram the construction and working of Kettle Reboiler. **7**

   b) Explain the principle, construction and working of Hammer mill. **7**

SECTION – III

5. a) Explain the long tube vertical evaporator. **5**

   b) Discuss steam distillation process with respect to example. **5**

   c) Explain the term : (1) Caking of crystal (2) Constant pressure filtration. **4**

6. a) What are the differences between Grizzlies and Trammels ? **5**

   b) Discuss in details with respect to flow sheet the sulfolane process. **5**

   c) Explain with neat labelled diagram Batch plant for extraction of oil from seed. **4**

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

   a) Spray drier.

   b) Rotary drum filter.

   c) Mixer settler in liquid-liquid extraction.

   d) Scrubbers.

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SLR-MM – 145

Seat No.	

M.Sc. – II (Semester – III) (New) Examination, 2015
INDUSTRIAL CHEMISTRY (CGPA)
Unit Processes in Chemical Technology (Paper – X)

Day and Date : Wednesday, 18-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 p.m.

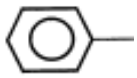
Instructions *: 1) Attempt in **all 5** questions.*
*2) Section **I** is **compulsory**.*
*3) Attempt **any two** questions from Section **II** and **any two** from Section **III**.*
*4) Answers to **all** questions (Section **I**, **II** and **III**) should be written in the **one** answer book.*
*5)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

SECTION – I

1. Answer the following : **14**

a) $(CH_3)_2NH \xrightarrow{CH_3CNO} ? \xrightarrow{HNO_3} ?$

b) $C_3H_5(OH)_3 + HNO_3 \longrightarrow ? + ?$

c)  $+ HNO_3 \longrightarrow ?$

d) Toluene + thionyl chloride $\xrightarrow[\text{Catalyst}]{SbCl_2} ? + ? + ?$

e) β-Chloropropionic acid + Methanol $\xrightarrow{Al_2O_3} ? + ?$

f) $CH_3CHO + 3Cl_2 \longrightarrow ? + ?$

g) What is Strecker reaction ?

h) $(CH_3)_2O + SO_3 \longrightarrow ?$

P.T.O.

i) What are the applications of sulphonates ?

j) $C_6H_5COCl + Na_2O_2 \longrightarrow ? + ?$

k) $CH_3CHOHCH_3 + ½\ O_2 \longrightarrow$

l) $2C_2H_5SH \xrightarrow{\text{oxidation}}$

m) $CH_3OH + CO \longrightarrow$

n) Define polymerization.

SECTION – II

2. a) Give an account of liquid phase oxidation with oxidizing compound. **7**

   b) How is cellulose acetate manufacture ? What are its applications ? **7**

3. a) Explain with flow chart the manufacturing process of vinyl chloride from acetylene. **7**

   b) What are resins ? Give the methods for the manufacture of phenolic resins. **7**

4. a) What is sulphonation ? What are the working up procedures in sulphonation ? **7**

   b) What is nitration ? Explain the manufacturing process of nitrobenzene. **7**

SECTION – III

5. a) Explain with the help of neat diagram Schmidnitrator. **5**

   b) Discuss the mechanism of aromatic sulphonation. **5**

   c) Describe the various methods of polymerization. **4**

6. a) Discuss the relationship between D.V.S. and Stability of Nitrator Charge. **5**

   b) Explain the sulphoxidation. **5**

   c) Describe with help of diagram Ball Mill Sulphonator. **4**

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

   a) Alkyd resins.

   b) Nitrate esters.

   c) Photohalogenation.

   d) Manufacture of ethyl acetate.

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SLR-MM – 146

Seat No.	

M.Sc. (Part – II) (Semester – III) (New) Examination, 2015
INDUSTRIAL CHEMISTRY (Paper – XI) (CGPA)
Instrumental Analysis

Day and Date : Friday, 20-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 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.*

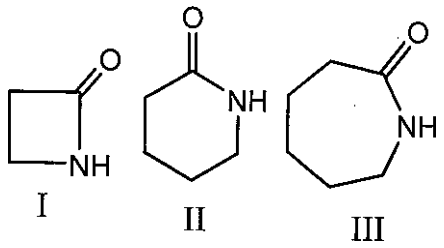
*5) **All** questions carry equal marks.*

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

SECTION – I

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

i) Arrange the following compounds in their decreasing order of wave number of absorption



ii) What is transducer ?

iii) Which ionic conductor is used to detect hydrocarbon gases ?

iv) What is meant by Fermi resonance in IR Spectroscopy ?

v) What accounts for the blue colour of the sky ?

P.T.O.

vi) What is meant by base peak ?

vii) What does happen in the mass spectrum of a compound containing one chlorine atom ?

viii) Define coupling constant.

ix) How many ^{1}HNMR signals are expected for neiopentane $(CH_3)_4C$?

x) Broad signals often observed in the PMR spectra associated with – OH and – NH resonance. Why ?

xi) Which Crystalline membrane is used to detect fluoride in analyte solution ?

xii) HETCOR Experiment correlate ^{13}C nuclei with directly attached

xiii) Which methods are employed to simplify ^{13}C spectra ?

xiv) The IR stretching frequency of Carbonyl group in Cyclopropanone is greater than that of Cyclobutanone. Why ?

SECTION – II

2. a) Explain with example gas sensing membrane electrode. **7**

   b) Draw the Karplus Curve and explain its significance. **7**

3. a) Discuss the principle and instrumentation of Turbidimetry and Nephelometry. **7**

   b) An organic compound of molecular formula C_8H_7OCL shows the following features :

   IR(KBr) : 1690 cm^{-1} ; 1600 cm^{-1}

   ^{1}HNMR : 2.6δ (s, 3H) ; 7.5δ (d, 2H) ; 8.0δ (d, 2H, J = 8Hz)

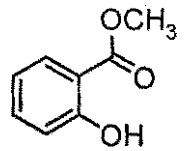
   Make proper assignment of the data. **7**

4. a) How would you distinguish between the reactant and product using DEPT NMR ? Explain with an example. **7**

   b) Discuss in detail FAB and SIMS ionization technique. **7**

SECTION – III

5. a) Describe fragmentation modes of the following compound whose mass spectrum exhibits Peak at m/e 152(M^+), 121, 120, 92, 65, 64. **5**



b) What is Pascal's Triangle ? Explain its use in first order splitting with suitable example. **5**

c) Explain 1, 3, 5-trinitro benzene and 1, 2, 3-trinitro benzene differentiated by ^{13}C NMR. **4**

6. a) Explain the factors affecting the PMR chemical shifts. **5**

b) Explain in detail NOESY spectroscopy. **5**

c) What is the effect of hybridization of carbon on the stretching frequency of C-H bonds ? **4**

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

a) NMR shift reagent

b) Nuclear overhauser effect

c) Classification of metal membrane electrode

d) McLafferty rearrangement.

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SLR-MM – 147 A

Seat No.	

M.Sc. – II (Semester – III) (New) Examination, 2015
INDUSTRIAL CHEMISTRY (CGPA)
Advanced Topics in Industrial Chemistry – I (Elective) (Paper – XII)

Day and Date : Monday, 23-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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 is meant by viscosity ?
   b) Define atom economy.
   c) Define aniline point.
   d) What is the purpose of fertilizers ?
   e) Give the chemical structure of Salbutamol.
   f) What are the different varieties of coal found in the earth crusts ?
   g) Define pharmacodynamics and pharmacokinetics.
   h) What are NSAIDs ?
   i) Give the examples of antipyretic drug.
   j) Give the example of green solvent.
   k) What is meant by syrups ?
   l) Define prodrug.
   m) What is meant by excipients in drugs ?
   n) Mention three factors taken in consideration while selecting coal for different uses.

P.T.O.

SECTION – II

2. a) Describe the Kjeldahl's method of the determination of total nitrogen in fertilizer sample. **7**

   b) Describe in details the working, construction and calorific value of solid fuel is determine using Bomb calorimeter. **7**

3. a) Describe the Pharmacokinetics of drug regarding absorption, distribution, metabolism and excretion of drug. **7**

   b) Discuss the applicability of $NaNO_2$/CAS titration method in pharmaceutical analysis. **7**

4. a) What are antipyreticdrugs ? Describe the synthesis of chloroquine. **7**

   b) What is green chemistry ? Give the principle of Green Chemistry. **7**

SECTION – III

5. a) Explain in detail Redwood method for viscosity measurement. **5**

   b) Discuss in brief the concept of prodrug. **5**

   c) Give the estimation of potassium by sodium tetraphenyl borate method. **4**

6. a) Explain the proximate analysis of coal. How it is carried out ? What is its significance. **5**

   b) Discuss manufacturing process of Tablets. **5**

   c) Explain significance of LD_{50}. **4**

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

   a) Solid dosage forms

   b) Protein receptor

   c) Orsat apparatus

   d) Synthesis of ciprofloxacin.

SLR-MM – 149

Seat No.	

M.Sc. – II (Semester – III) (CGPA) Examination, 2015
INDUSTRIAL CHEMISTRY
Unit Processes in Chemical Technology (Old)
Paper – X

Day and Date : Wednesday, 18-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 p.m.

***Instructions** : 1) Attempt **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) $HC \equiv CH + 6HNO_3 \rightarrow ? + ?$

b) $CH_2ClCH_2COOH + CH_3OH \xrightarrow{Al_2O_3} ? + ? + ?$

c) $NH_2CONH_2 + H_2S_2O_7 \rightarrow ? + ?$

d) $2C_6H_5COCl + Na_2O_2 \rightarrow ? + ?$

e) $(CH_3CO)_2O + C_6H_5ONa \xrightarrow{H_2SO_4} ? + ?$

f) Give two examples of addition polymerization polymers.

g) $C_6H_5NH_2 + HNO_3 \xrightarrow[80\%]{AcOH} ? + ?$

h) $CH_3COOH + C_6H_5CCl_3 \rightarrow ? + ? + ?$

P.T.O.

i) $C_6H_5NO_2 + 3\ NaHSO_3 \rightarrow ? + ?$

j) $C_6H_5.CH_2OH + O_2 \rightarrow ? + ?$

k) $CH_3OH + CO \xrightarrow{C_2H_5ONa} ?$

l) Give any two examples of condensation polymerisation polymers.

m) $C_3H_5(OH)_3 + 3HNO_3 \rightarrow ? + ?$

n) Give the structural formula of RDX and tetryl.

SECTION – II

2. a) What is nitration ? Discuss in brief nitrating agents. **7**
   b) What is meant by polymerization ? What are the methods of polymerization ? **7**

3. a) How is cellulose acetate manufactured ? What are its application ? **7**
   b) Explain in brief the kinetics and mechanism of halogenation. **7**

4. a) Discuss with the help of diagrams. **7**
      i) Batch sulphonation kettle and
      ii) Ball-Mill sulphonator.
   b) Give an account of liquid phase oxidation with oxidizing compounds. **7**

SECTION – III

5. a) How is polyethylene prepared ? What are its properties and applications ? **5**
   b) Discuss in brief the esterification by organic acid. **5**
   c) Write a note on Schmid nitrator. **4**

6. a) Describe the manufacturing process of monochloro acetic acid. **5**
   b) How is ethyl acetate manufactured ? **5**
   c) What is sulfonation ? What are the uses and application of sulfonates ? **4**

7. Write notes on **any three**. **14**
   a) Photo halogenation
   b) Epoxy resins
   c) Oxidation of methanol
   d) Chloral manufacturing process.

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SLR-MM – 151

Seat No.	

M.Sc. (Part – II) (Semester – III) (CGPA) Examination, 2015
INDUSTRIAL CHEMISTRY (Old)
Advanced Topics in Industrial Chemistry (Paper – XII)

Day and Date : Monday, 23-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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 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 internal solution is used to detect NH_3 in analyte solution in gas sensing electrode ?
   ii) What is meant by batch process ?
   iii) How silicon nanoparticles are produced ?
   iv) Define Young's modulus.
   v) Which method is used for the growth of a single crystal from a melt ?
   vi) Which are the various technique used to develop nanocrystal of Cds ?
   vii) What is mineralizer ?
   viii) Which ionic conductor is employed as Hue gas monitoring sensor ?
   ix) What is flow work ?
   x) What are the different types of ion-selective membrane electrode ?
   xi) How is silicon Nitride prepared ?
   xii) What is electrodeposition process ?
   xiii) What is meant by stress and strain ?
   xiv) Complete the reaction :
   a) $2Si_2Cl_6 + \underline{\quad ? \quad} \longrightarrow \underline{\quad ? \quad} + 3LiCl + 3AlCl_3$
   b) $SiO_2 + \underline{\quad ? \quad} \xrightarrow{1850°C} \underline{\quad ? \quad} + CO_2 \uparrow$

P.T.O.

SECTION – II

2. a) Explain in detail the process of spray pyrolysis and hydrothermal synthesis. **7**

   b) Explain in detail molecular selective gas sensing membrane electrode. **7**

3. a) What is CVD ? Explain in details various process involved in CVD. **7**

   b) Discuss the elastic and rupture behaviour of metallic material with the help of strain-stress curve. **7**

4. a) What is electroanalytical sensor ? Explain with respect to saturated calomel and standard hydrogen electrode. **7**

   b) What are extrinsic and intrinsic silicon semiconductor ? **7**

SECTION – III

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

   'A' Liquid water, fed at a rate of 20 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 is analyzed and is found to contain 1.5 mole % water. Draw and label a flow chart of the process and calculate all unknown stream variables. **5**

   b) Explain the growth of semiconductor nanocrystal in organic solution and polymer. **5**

   c) Explain various types of reactor used in chemical industry. **4**

6. a) Explain in details recycle and bypass. **5**

   b) Explain the growth of nanocrystal in inorganic matrices. **5**

   c) Describe in brief the thermal properties of material. **4**

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

   i) Silicon carbide

   ii) Sol-gel method

   iii) Nano sensor

   iv) Application of crystalline and Amorphous silicon.

SLR-MM – 153

Seat No.	

M.Sc. (Part – II) (Semester – IV) (CGPA) Examination, 2015
INDUSTRIAL CHEMISTRY (Paper – XIV)
Inorganic Chemical Industries

Day and Date : Thursday, 19-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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** 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 calculators is **allowed**.*

SECTION – I

1. Answer the following sub questions. **(2×7=14)**
   a) Define the term metallurgy.
   b) Chemical industries in India run under installed capacity. Why ?
   c) Why does froth floatation process is more effective for sulphide ore ?
   d) What are the basic constituents of Portland cement ?
   e) Ceramic whitewares are usually glazed, give the reason.
   f) What are the basic raw materials used for the manufacture of glass ?
   g) Define the term superconductivity.

SECTION – II

2. A) How does aluminum occur in nature ? Give extraction methodology of aluminum from its ore. **7**

   B) What are the characteristics of refractory materials ? Give an account of manufacture, properties and industrial uses of aluminum and silica refractory's. **7**

P.T.O.

3. A) What do you mean by inorganic fine chemical ? Explain the method of preparation of
   i) ferrous sulphate ii) Sodium silicate. **7**

   B) Define the term ferrite. How are the ceramic materials act as insulator ? Give an account of high temperature materials and their industrial applications. **7**

4. A) What is alloy steel ? Why are alloying elements added in steel ? Describe any one commercial methods for manufacture of steel. **7**

   B) Mention the industries which manufacturing the cement. Describe the manufacturing process of Portland cement with respect to raw material, physico-chemical principles and unit operation involved in the process. **7**

SECTION – III

5. A) Explain the following terms : **5**
   i) Magnetic materials
   ii) Luminous paints.

   B) What are the properties and application of zinc oxide and titanium oxide ? **5**

   C) What are the effects of following elements on the properties of pig iron
   i) Sulphur ii) Phosphorus iii) Silica. **4**

6. A) How are ceramics classified ? Which are the basic raw materials used in ceramics ? How are it manufactured ? Write their important properties. **5**

   B) What is alumina ? Give the chief source of alumina ? How is it extracted ? What are the uses of alumina ? **5**

   C) What are the ores of thorium ? Describe the extraction of thorium from its chief ore point out important compounds of thorium. **4**

7. Write short notes on **any three** of the following. **14**
   a) Ellingham diagrams
   b) Position of inorganic industries in India
   c) Manufacture of lime
   d) Whiteware.

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SLR-MM – 154

Seat No.	

M.Sc. (Part – II) (Semester – IV) (CGPA) Examination, 2015
INDUSTRIAL CHEMISTRY
Methods of Analysis in Industries (Paper – XV)

Day and Date : Saturday, 21-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 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 (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) Name the factors which affect thermogravimetric analysis.

b) Classify the different types of coal.

c) What is meant by specific resistance ?

d) Name any two analgesic drug used.

e) What are the methods performed for activation analysis ?

f) What is meant by binding energy ?

g) Which are the different materials used for the making of DTA furnace ?

h) What is meant by GCV ?

i) What is the unit of radioactivity ?

j) What is the purpose of quadrapolar mass analyzer ?

P.T.O.

k) Which physical property is measured by X-rays, UV and IR ?

l) What is meant by NSAID in pharmaceutical chemistry ?

m) How many α and β particles are emitted when $^{238}_{92}U$ changes to $^{206}_{82}Pb$?

n) Name the instrument employed and parameter measured in DSC.

SECTION – II

2. a) Discuss in details the factors which affect the TGA curves. **7**

   b) Explain in detail the ultimate and proximate analysis of coal. **7**

3. a) Explain the Neutron activation analysis method used in radiochemical analysis. **7**

   b) Draw neat and labelled diagram of ESCA and explain the working of its different components. **7**

4. a) Discuss the applicability of CAS/$NaNO_2$ titration method in pharmaceutical analysis. **7**

   b) Discuss the importance of process control at each stage of production and Q.C. department. **7**

SECTION – III

5. a) Explain the working and construction of Zinker gas calorimeter. **5**

   b) Distinguish between TGA and DSC. **5**

   c) Give the importance of electrochemical method of analysis. **4**

6. a) Explain the application of TGA. **5**

   b) Discuss the pharmocopeica chemical assay of any one antipyretic drug. **5**

   c) Give an account of principle and working of ISS. **4**

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

   a) Nuclear reaction

   b) AES

   c) IP/USP

   d) Effluent monitoring and control.

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SLR-MM – 155

Seat No.	

M.Sc. (Part – II) (Semester – IV) (CGPA) Examination, 2015
INDUSTRIAL CHEMISTRY (Paper – XVI)
Industrial Management

Day and Date : Tuesday, 24-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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 question : **14**

i) Which gases are responsible for green house effect ?

ii) What is atom Economy ?

iii) What is ancillary industry ?

iv) What is the purpose of NSIC ?

v) What are the types of technology transfer ?

vi) What is control chart ?

vii) What is meant by incompatible chemical ?

viii) What is the purpose of IDEMI ?

ix) What is meant by Export and Import ?

x) Define incinerator.

xi) Which chemical was responsible for Bhopal gas tragedy ?

xii) What is SIDO ?

xiii) What is FDA ?

xiv) Name any two conventional energy resources.

P.T.O.

SECTION – II

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

   b) What is fuel cell ? How do fuel cell works ? **7**

3. a) Explain the manufacturing process of biodiesel. **7**

   b) What is Patent ? What is the procedure to obtain a patent ? **7**

4. a) Discuss the Indian Factory Act - 1948. **7**

   b) Give brief account of highly reactive and intrinsically explosive chemical. **7**

SECTION – III

5. a) Explain in detail Non-Conventional energy resources. **5**

   b) Discuss in brief pilot plant. **5**

   c) Explain the importance of Q.C. department. **4**

6. a) What is the procedure to start small scale industry ? **5**

   b) Explain the various Government standards for quality of industrial products. **5**

   c) Explain the P-Chart in quality determination. **4**

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

   a) Industry-University Interface.

   b) Concept of safety at work.

   c) Hydrogen as important energy resources.

   d) Incentive given by government to SSI.

SLR-MM – 156

Seat No.	

M.Sc. – II (Semester – III) (New) (CGPA) Examination, 2015
POLYMER CHEMISTRY
Paper – IX : Fundamentals of Feedstocks and Polymers

Day and Date : Monday, 16-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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** answerbook.*
*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) Which fractions are expected on pyrolysis of polystyrene in vacuo at 290-320°C ? **14**

   ii) What are the IUPAC names of PMMA and Nylon – 6, 6 ?

   iii) Define cetane number.

   iv) Why refining of crude oil is necessary ?

   v) High pressure free radical process used for polyethylene is not satisfactory for polypropylene; why ?

   vi) Define fiber. Give its types.

   vii) When polymerisation will occur at interface between monomer droplet and water in emulsion polymerisation method ?

SECTION – II

2. a) Discuss the importance of ethylene as a building block for polymer industry. **7**

   b) Describe the synthesis, properties and applications of PET. **7**

P.T.O.

3. a) Explain the structure, properties of PVC and describe its manufacturing by suspension polymerisation. **7**

   b) Give an account on classification of polymers. **7**

4. a) Discuss bulk polymerisation method in detail. **7**

   b) Explain in brief the catalytic cracking process. **7**

SECTION – III

5. a) Compare addition and condensation polymerisation with suitable example. **5**

   b) Explain the melt polycondensation with suitable example. **5**

   c) Discuss the theories associated with origin of petroleum. **4**

6. a) Discuss the CNSL as building block towards polymer industry. **5**

   b) Describe the synthesis of HDPE. **5**

   c) Explain trade name nomenclature system in polymers. **4**

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

   a) Suspension polymerisation method.

   b) Benzene as a building block for polymer synthesis.

   c) Polyacetals.

   d) Precipitation polymerisation technique.

SLR-MM – 157

Seat No.	

M.Sc. – II (Semester – III) (New) Examination, 2015
POLYMER CHEMISTRY (CGPA)
Paper – X : Morphology and Physical Chemistry of Polymers

Day and Date : Wednesday, 18-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 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 : **14**

i) Draw a MWD curve for polymer having same $\overline{Mn}$ but different polydispersity.

ii) Draw a GPC chromatogram of any hypothetical polymer.

iii) Show the diffraction pattern for amorphous and crystalline polymers separately.

iv) Give the equation for degree of crystallinity and explain the terms involved.

v) Explain theta solvent.

vi) Enlist the factors affecting thermal degradation of polymers.

vii) Give two examples of antioxidants with structure.

SECTION – II

2. a) Write a note on number average molecular weight. Derive an expression. **7**

b) Explain the XRD method of analysis of polymer characterization. **7**

P.T.O.

3. a) Discuss Flory-Huggins theory of polymer solutions. **7**
   b) Write a note on polymer stabilization. **7**

4. a) Discuss light scattering method of molecular weight determination. **7**
   b) Write a note on factors affecting polymer crystallinity. **7**

SECTION – III

5. a) Based on the principles of DSC how will you determine the Tg of polymers ? **5**
   b) Discuss Krigbaum-Flory theory. **5**
   c) Explain degradation due to ultrasonic waves. **4**

6. a) Write a note on molecular weight determination by Membrane Osmometry. **5**
   b) What is the principle of TMA ? How TMA is used in polymer characterization ? **5**
   c) Write a note on photo-stabilizers and its uses. **4**

7. Write short notes on (**any three**) : **14**
   a) Viscosity average molecular weight.
   b) Differentiate between spherulites, crystallites and fibrils.
   c) Viscosity of dilute solutions.
   d) Mechanism of chemical degradation.

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SLR-MM – 158

Seat No.	

M.Sc. (Part – II) (Semester – III) (CGPA) Examination, 2015
POLYMER CHEMISTRY
Paper – XI : Basic Concept of Polymerization (New)

Day and Date : Friday, 20-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

Instructions *: 1) Attempt **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** question (Section – **I, II** and **III**) should be written in the **one** answerbook.*
*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. Answer the following : **(2×7=14)**

a) Give one example of Suzuki coupling reaction for development of new polymers.

b) Which types of monomer undergo anionic chain polymerization ?

c) Name any two initiators and coinitiators in cationic chain polymerization.

d) AIBN cannot used as initiator in cationic polymerization, explain.

e) Explain the use of Pd comlex in C-C bond constructions.

f) Why cationic ring opening polymerization of cyclic amide or lactam is not commercially useful ?

g) Calculate the DP when extent of conversion is 20% for polyesterification reaction, using stoichiometric amounts of diol and diacid.

P.T.O.

SECTION – II

2. A) Define terms inhibitor and retarder. What are the various types of inhibitors and retarders used in radical chain polymerization. **7**

   B) Derive the kinetic expression for polyesterification AA and BB type monomers in presence of mineral acids. **7**

3. A) Define the term hydrolytic polymerization. Discuss the synthesis of ε - caprolactam by hydrolytic polymerization. **7**

   B) Derive the equation showing relation between for copolymerization equation and monomer reactivity ratio. **7**

4. A) Define the term Backbiting. Write down the mechanism for formation of polyethylene showing backbiting phenomenon. **7**

   B) i) Mention reasons for non linearity in third order plot for the polymerization of AA and BB type monomers.

   ii) What are Schrock and Grubbs catalysts ? List their uses in development of new step growth polymers. **7**

SECTION – III

5. A) What is the effect of solvent on the rate of cationic polymerization ? **5**

   B) Polymer having $\overline{Mn} = 24116$ on hydrolysis gives 39.30% p-phenylene diamine, 59.81% terephthalic acid and 0.88% benzoic acid, calculate degree of polymerization (DP) and extent of reaction (P). **5**

   C) Discuss the application of chain transfer agent in radical chain polymerization. **4**

6. A) Explain the various types of initiators used in cationic polymerization of cyclic ether. **5**

   B) Using ^{14}C labelled AIBN as an initiator, a sample of styrene is polymerized to get average degree of polymerization of 3.04×10^4. AIBN had an activity of 19.62×10^7 counts per minute mole in a scintillation counter. If 6.44 g of poly styrene had an activity of 406 counts per minutes, determine the mode of termination by appropriate calculation. **5**

   C) Schematically draw and discuss the different types of copolymers. **4**

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

   I) Gel effect (Auto acceleration)

   II) Types of initiator in anionic polymerization

   III) Mayo Lewis method for monomer reactivity ratio

   IV) Heck Polycondensation

   V) Isomerization polymerization.

SLR-MM – 159 A

Seat No.	

M.Sc. – II (Semester – III) Examination, 2015
POLYMER CHEMISTRY (CGPA)
Paper – XII : Elective – I
Spectral and Instrumental Analysis of Polymers (New)

Day and Date : Monday, 23-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 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** from Section **III**.*

*4) Answers to **all 5** questions (Section **I, II** and **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. Answer the following : **(2×7=14)**

a) Compare and contrast Infra Red Spectroscopy and Raman Spectroscopy.

b) Explain the meaning of T_{50} and IPDT in TGA curve of a polymer.

c) List any four applications of TEM technique.

d) How will you differentiate three isomers of dichloro benzenes using CMR ?

e) Calculate the wave number for IR radiation whose wavelength is 2 μm.

f) List any four advantages of FTIR technique.

g) What is TMS ? Draw its chemical structure and give any four reasons for using TMS as a reference standard in NMR.

P.T.O.

SECTION – II

2. A) With the help of neat diagram explain CMR of different tactic polypropylenes (PP). **7**

   B) Explain the use of IR technique to study polymer blends; poly (vinyl phenol) with poly (ethylene oxide) and poly (vinyl phenol) with poly (vinyl isobutyl ether). **7**

3. A) Discuss the use of the rotating crystal diffraction method to determine dimension of polymer unit cell. **7**

   B) Discuss in brief the applications of DSC and AFM technique. **7**

4. A) How will you determine the % content of styrene in SBR by using UV-Visible spectroscopy technique ? **7**

   B) Explain the determination of Cis and Trans Isomerization in Natural Rubber using CMR. **7**

SECTION – III

5. A) How X-ray scattering data may be used to determine the percentage crystallinity and the size of the crystallites ? **5**

   B) Discuss the basic Principle of DTA and TGA technique and draw the Typical TGA curve for a high performance PET. **5**

   C) Line broadening is observed in solid state CMR. Give reasons and how this problem is solved ? **4**

6. A) Discuss the use of Raman Spectroscopy to study degradation in PEEK polymer. **5**

B) Determine the structure of monomer M1 and the polymer P1, P2 from data below. **5**

Monomer ($C_5H_8O_2$) M1 $\xrightarrow{\text{Polymerization}}$ P1 $\xrightarrow{H/OH}$ P2 + CH_3OH

Monomer ($C_5H_8O_2$)	P1	P2
_____	MW = 10000	MW = 8600
IR = 3070, 3030, 2980, 2910, 1730, 1625 cm^{-1}	IR = 2957, 2910, 1725 cm^{-1}	IR = 2975, 2910, 1760 3300 – 3100 (broad) cm^{-1}

C) Explain the NOE effect observed in CMR. **4**

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

I) Advantages and limitations of Pyrolysis GC-MS.

II) Different characterization technique for polymers.

III) Production of X-ray in laboratory.

IV) Polymer analysis by MALDI-TOF technique.

V) Principle and applications POM technique in polymer analysis.

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SLR-MM – 160

Seat No.	

M.Sc. – II (Semester – III) (Old) Examination, 2015
POLYMER CHEMISTRY (CGPA)
Paper – IX : Fundamentals of Feedstocks and Polymers

Day and Date : Monday, 16-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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) Write the order of antiknocking. **14**
   ii) What is the role of surfactant in emulsion polymerisation ? Give one example of each type of surfactant.
   iii) How LLDPE and VLDPE are synthesized ?
   iv) What is average composition of individuals in B-T-X mixture ?
   v) What is power alcohol ?
   vi) State the various ways to improve the brittleness of PS.
   vii) Why we are getting narrow molecular weight distribution in suspension polymerisation method ?

SECTION – II

2. a) In detail explain the bulk polymerisation technique. **7**
   b) Discuss the IUPAC nomenclature system with suitable example for single strand polymers. **7**

P.T.O.

3. a) Describe the use of benzene as a building block towards polymer industries. **7**

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

4. a) Why it is necessary to improve antiknocking characteristics of fuel ? Explain the various ways of improvements. **7**

   b) Discuss the manufacturing and applications of polystyrene. **7**

SECTION – III

5. a) Explain the refining of crude oil. **5**

   b) Discuss the batch, semibatch and continuous process. **5**

   c) Describe the mechanism of branching in polyethylene synthesis by high pressure method. **4**

6. a) Describe the emulsion polymerisation method. **5**

   b) Compare the chain growth polymerisation with step growth polymerisation. **5**

   c) Discuss the various theories associated with origin of petroleum. **4**

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

   a) CNSL as a raw material for various classes of polymers.

   b) Manufacturing of Nylon-6, 6 with its applications.

   c) Source based nomenclature of polymers.

   d) Solution polycondensation technique.

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SLR-MM – 161

Seat No.	

M.Sc. (Part – II) (Semester – III) (CGPA) Examination, 2015
POLYMER CHEMISTRY (Paper – X) (Old)
Morphology and Physical Chemistry of Polymers

Day and Date : Wednesday, 18-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 p.m.

***Instructions**: 1) Attempt in **all 5** questions.*

*2) Section **I** (question **1**) 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) Define polydispersity.

ii) At Tg polymer shows molecular motions. True of False ? Correct if necessary.

iii) For the same polymer sample the Mw is greater than Mn. True or False ? Correct if necessary.

iv) Define ceiling temperature.

v) Polymers are never 100% crystalline. Why ?

vi) Can DSC be used for determination of polymer degradation ? Explain.

vii) Polymer dissolution is a fast process. True or False ? Explain.

P.T.O.

SECTION – II

2. a) Explain various types of degradations with suitable examples. **7**

   b) Discuss the principle and working of TMA in detail with examples. **7**

3. a) Enlist the factors affecting crystallinity in polymers. How is X-ray utilized to characterize crystallinity in polymers ? **7**

   b) Give the principle of vapor phase osmometry. Explain the method to determine MW by VPO. **7**

4. a) Write a detailed note on thermodynamics of polymer dissolution. **7**

   b) Discuss with suitable diagram (s) GPC in detail. **7**

SECTION – III

5. a) Write a note on Krigbaun-Flory theory. **5**

   b) Differentiate between crystallites and spherulites. **5**

   c) Write a short note on Mv. **4**

6. a) Discuss thermal degradation with suitable examples. **5**

   b) Explain Flory-Huggins theory of polymer dissolution. **5**

   c) Write a short note on photostabilizers. **4**

7. Attempt **any three** : **14**

   a) Explain light scattering technique.

   b) Polymer degradation in presence of chemicals.

   c) Determination of Tg by dialatometry.

   d) Derive an equation to determine Mw.

   e) Write a note on solubility parameter.

SLR-MM – 162

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
POLYMER CHEMISTRY (Old) (CGPA)
Paper – XI : Basic Concept of Polymerization

Day and Date : Friday, 20-11-2015 Total. Marks : 70

Time : 2.30 p.m. to 5.00 p.m.

Instructions *: 1) Attempt in **all five** question.*
*2) Section **I** (question **one**) is **compulsory**.*
*3) Attempt **any two** questions from Section **II** and **any two** 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** 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 questions : **(2×7=14)**

I) Can we use ATRP polymerize all Vinyl monomers ? Give reasons.

II) What is Heck reaction ? How is it applied in polymer chemistry ?

III) Styrene in presence of AIBN was polymerized. State how it will undergo termination of polymerization reaction.

IV) Explain how the reactivity ratios of the two monomers control formation of block/random/alternate copolymers.

V) Define cationic chain polymerizations and what types of monomer undergo cationic chain polymerizations.

VI) Give two examples of Suzuki coupling reaction used for development of new step growth polymers.

VII) Define the term “Living Polymerization”. Bring out significance of this process.

P.T.O.

SECTION – II

2. a) Discuss the cationic polymerization of cyclic ether. **7**

   b) The order of polyesterification reaction is third order in absence of external mineral acid; justify with suitable example. **7**

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

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

4. a) Derive the kinetic expression for radical chain polymerization initiated by UV radiations. **7**

   b) Discuss the RAFT polymerizations. **7**

SECTION – III

5. a) Discuss the effect of solvent on the rate of cationic chain polymerizations. **5**

   b) Calculate degree of polymerization (DP) and proportion of benzoic acid that should be used with equimolar mixture of adipic and ethylene glycol to produce a polyester having $\overline{Mn} = 10000$ at 99.50% conversion. **5**

   c) Describe the advantages of copolymerizations, illustrating with suitable commercial examples. **4**

6. a) Describe the various initiators used to carry out anionic chain polymerizations. **5**

   b) Discuss reasons for nonlinearity in the step growth polymerization plot. **5**

   c) Poly (vinyl acetate) of number average molecular weight 100,000 is hydrolyzed to Poly (vinyl alcohol). Oxidation of latter with periodic acid to cleave 1, 2 diol linkages yields Poly (vinyl alcohol) with number average degree of polymerization 200. Calculate the % of Head-Tail and Head-Head linkages in the Poly (vinyl acetate). **4**

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

   a) Q-e Scheme.

   b) ADMIT polymerization.

   c) Nitroxide-Mediated Polymerization (NMP).

   d) ROP of Cyclosiloxanes.

SLR-MM – 163A

Seat No.	

M.Sc. (Part – II) (Semester – III) (CGPA) Examination, 2015
POLYMER CHEMISTRY (Old)
Paper – XII : Elective – 1
Spectral and Instrumental Analysis of Polymers

Day and Date : Monday, 23-11-2015 Total Marks : 70
Time : 2.30 p.m. to 5.00 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** 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** 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 following : **(2×7=14)**

I) State the Braggs law of diffraction and give meaning of terms involved.

II) List the causes of line broadening in solid state CMR of polymer.

III) How do you differentiate polypropylene from polystyrene by IR spectroscopy ?

IV) Draw TGA curve for Kapton polyimide and explain the meaning of T_{50} in TGA curve of a polymer.

V) Mention any four disadvantages of Pyrolysis MS for polymer analysis.

VI) List any four advantages of SEM technique.

VII) Schematically show $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ transition, for UV spectra and give two examples of compounds showing these transitions.

SECTION – II

2. a) Explain how the powder crystal diffraction method is used to determine structure of polymer. **7**

   b) Discuss the Stereochemistry of polybutadienes by solid state CMR. **7**

3. a) IR technique is useful to study the orientation in polymer. Explain with suitable example. **7**

   b) Compare basic principles of TGA and DSC technique. Discuss their use for polymer analysis. **7**

4. a) Describe applications of SEM and AFM towards polymer analysis. **7**

   b) How % composition of styrene in copolymer styrene-butadiene (SBR) is determined by using UV spectroscopy technique ? **7**

SECTION – III

5. a) Describe the factors affecting DSC and DTA curves. **5**

   b) List advantages and limitations of Pyrolysis GC-MC technique. **5**

   c) Discuss the use of Raman Spectroscopy for identification of Nylon types. **4**

6. a) Describe the principle involved in Polarized Optical Microscopy (POM) analysis of polymer. **5**

   b) Explain the analysis of polymer by MALDI-TOF technique. **5**

   c) Determine the structure of monomer M and the polymer P1, P2 from data below. **4**

$$\text{Monomer}\,(C_5H_8O_2) \xrightarrow{\text{Polymerization}} P1 \xrightarrow{H/OH} P2 + CH_3OH$$

Monomer ($C_5H_8O_2$)	**P1**	**P2**
----------	MW = 10000	MW = 8600
IR = 3070, 3030, 2980, 2910, 1730, 1625 cm^{-1}	IR = 2957, 2910, 1725 cm^{-1}	IR = 2975, 2910, 1760 3300 – 3100 (broad) cm^{-1}

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

   a) Use of TBA in polymer analysis

   b) Determination of crystallinity, size and orientation of crystallites by XRD.

   c) ATR technique in IR spectroscopy.

   d) Thermal characterization technique for polymers.

   e) Applications of FAB-MS technique.

SLR-MM – 164

Seat No.	

M.Sc. II (Part – II) (Semester – IV) (CGPA) Examination, 2015
POLYMER CHEMISTRY
Paper – XIII : Step Growth of Polymers

Day and Date : Tuesday, 17-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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 table and non programmable calculator is **allowed**.*

SECTION – I

1. Answer the following : **(2×7=14)**

a) Illustrate by chemical equation the preparation of Bisphenol-A and Urea.

b) Draw the chemical repeat unit structure of polyester PEN and PEEK polymer.

c) Give method of preparation of HEXA.

d) Draw the chemical repeat unit structures of Kevlar and Nylon –11.

e) By chemical equation only, show the formation of phenol by cumene process.

f) Write four characteristic of good paint.

g) How poly (para phenylene) is obtained from cis-dihydro catechol ?

SECTION – II

2. A) Discuss the synthesis, properties and applications of polyurethanes. **7**

B) Explain briefly the transestrification method for manufacture of Sarona (PTT). **7**

P.T.O.

3. A) Compare and contrast chemistry in prepolymer formation in Resole and Novolac. **7**

   B) Describe preparative methods and important applications for aromatic polyamides. **7**

4. A) Discuss the applications and preparative methods of polysulphones . **7**

   B) Explain are the analysis and testing methods for paints. **7**

SECTION – III

5. A) With suitable examples; explain effect of methylene linkages on melting point of Nylons. **5**

   B) Explain of Azelaic acid and ε -Caprolactam. **5**

   C) Describe the Cross linking of MF resin. **4**

6. A) Cross linking of UF resin proceed with formation of cyclic ring structure, illustrate with suitable reaction. **5**

   B) What are the characteristic of varnishes ? **5**

   C) Discuss the role of catalyst during the formation of various polyesters from DMT. **4**

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

   I) Classification of pigments

   II) Nomenclature system for Nylons

   III) Epoxy resin properties and applications

   IV) Phosgene method for preparation of polycarbonate

   V) Cross linking of unsaturated polyester.

SLR-MM – 165

Seat No.	

M.Sc. – II (Semester – IV) (Old) Examination, 2015
POLYMER CHEMISTRY (CGPA)
Paper – XIV : Stereo Regular Polymers, Elastomers and Polymer Additives

Day and Date : Thursday, 19-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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. i) Cycloheptene and higher cycloalkenes undergo only ROP; Why ? **14**
   ii) Give one example of white pigment and blowing agent used in rubber.
   iii) Why Z-N initiators are practically important ?
   iv) Define optically activity and optical isomerism.
   v) How natural rubber is converted into cyclised rubber ?
   vi) Why coordination polymerisation is also called as insertion polymerisation ?
   vii) Why syndiotactic poly (propylene oxide) is optically inactive ?

SECTION – II

2. a) Explain the kinetics of Z-N polymerisation. **7**
   b) Describe the stereoisomerism of polymerisation acrylamide. **7**

P.T.O.

3. a) Discuss the monometallic mechanism of $AlEt_3 – TiCl_3$ system. **7**

   b) Explain the various additives used in rubber. **7**

4. a) Give an account on various chemical modifications of natural rubber. **7**

   b) Explain the stereoisomerism involved in polymers derived from 4 – substituted-1, 3-butadiene. **7**

SECTION – III

5. a) Describe the manufacturing process of nitrile rubber. **5**

   b) Discuss the analysis of stereoregularity by using NMR. **5**

   c) Explain the evidences towards propagation at carbon – transition metal bond. **4**

6. a) Describe the mechanism of ionic and coordination polymerisation. **5**

   b) Discuss the role of antistatic additives in polymer formulation. **5**

   c) Compare the stereoselective and stereoelective polymerisation in chiral monomer with suitable example. **4**

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

   a) Styrene – Butadiene Rubber

   b) Bernoulli model

   c) Stereoregular polymers from cyclopentene

   d) Geometrical isomerism.

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SLR-MM – 166

Seat No.	

M.Sc. – II (Semester – IV) (CGPA) Examination, 2015
POLYMER CHEMISTRY
Paper – XV : Selected Topics in Polymers

Day and Date : Saturday, 21-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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 : **14**

i) Draw a labeled diagram showing cholesteric phase.

ii) Name any two blowing agents.

iii) Give examples of various agents for vulcanization.

iv) Give various plastic recycling codes and names of corresponding polymers.

v) Give the reaction for sulfonation of polystyrene.

vi) Give the curing reaction of epoxy resin.

vii) How does flame retardant additive works in rubbers ?

SECTION – II

2. a) Write a note on ionic polymers. Explain the concept of reversible crosslinking. **7**

b) Give in detail synthesis of hydrogenated polystyrene. **7**

P.T.O.

3. a) Explain the preparation of acetyl cellulose. **7**

   b) What are thermoplastic elastomers ? Explain with suitable example. **7**

4. a) How will you prepare – $(AB)_n$ - multiblock copolymer ? **7**

   b) Write a note on solid phase peptide synthesis. **7**

SECTION – III

5. a) What is microsortation ? How it is useful ? **5**

   b) Write a note on use of polymers in optical fibers. **5**

   c) Enlist the advantages of polymer reactions. **4**

6. a) Explain the addition mechanism for the preparation of ABA triblock copolymers. **5**

   b) What do you understand by polymer supported reagents ? Discuss its applications. **5**

   c) How and why does polymer recycling affect the initial properties of the polymers ? **4**

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

   a) Suggest three methods to save environment from plastic waste. (The methods can be hypothetical or practical).

   b) Reaction conditions and reagents required for the preparation of hydroxyl ethyl cellulose.

   c) Mechanism of self healing polymers work.

   d) Advantages and disadvantages of polymer incineration.

SLR-MM – 168

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
PHYSICAL CHEMISTRY (New CGPA)
Paper – IX : Quantum Chemistry

Day and Date : Monday, 16-11-2015 Total Marks : 70

Time : 2.30 p.m. to 5.00 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) Define atomic orbital.
   ii) Mention any one conjugate pair of variables.
   iii) Write the wave function for 1s atomic orbital of H atom.
   iv) Put the limits for zenith and azimuthal i.e. θ and Φ angles.
   v) Write Bohr's quantization postulate.
   vi) State the Broglie hypothesis.
   vii) Mention the relationship between Cartesian coordinates and polar coordinates r, θ, Φ.
   viii) Give the expression for kinetic energy operator (T) in three dimension.
   ix) Put the condition for normalization.
   x) The zero point energy of simple harmonic oscillator is
   xi) Sketch the probability curves for particle in a box for n = 1 and n = 2.
   xii) Calculate the degeneracy of the level with energy equal to $26\ h^2/8\ mL^2$.
   xiii) What do you mean by commutator operator ?
   xiv) Mention different quantum numbers.

P.T.O.

SECTION – II

2. a) Describe the variation method for the calculation average energy of molecules. **7**
   b) Discuss restricted and unrestricted HF methods. **7**

3. a) Discuss quantum mechanical treatment of a harmonic oscillator. **7**
   b) Explain in detail Huckel Molecular Orbital Theory of ethylene molecule. **7**

4. a) Explain in detail the classical and quantum mechanical approach of Compton scattering. **7**
   b) Write the expression for Schrodinger wave equation for Hydrogen like atom. Separate the variables and write down the ϕ and R equations. **7**

SECTION – III

5. a) Discuss radial plots. **5**
   b) Derive the expression for total energy operator (H). **5**
   c) For a particle in a three dimensional rectangular box of dimensions $a_x = 3 \times 10^{-15}$ m $a_y = 4 \times 10^{-15}$ m and $a_z = 5 \times 10^{-15}$ m, calculate the ground state energy. **4**

6. a) Illustrate de Broglie hypothesis. **5**
   b) Describe the 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) Heisenberg's uncertainty principle
   b) Basic postulates of quantum mechanics
   c) Semi empirical approximation methods
   d) Spherical co-ordinates.

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SLR-MM – 169

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
PHYSICAL CHEMISTRY (CGPA) (New)
Paper – X : Electrochemistry

Day and Date : Wednesday, 18-11-2015 Total Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

Instructions *: 1) Attempt in* ***all five*** *questions.*
2) ***All*** *questions carry* ***equal*** *marks.*
3) Section ***I*** *is* ***compulsory*** *and answers should be written in the* ***same*** *answer book.* ***Attempt*** *at least* ***two*** *questions from Section* ***II*** *and Section* ***III****.*
4) Figures to ***right*** *indicate marks.*
5) ***Neat*** *and labeled diagrams should be drawn* ***wherever*** *necessary.*
6) ***Use*** *of calculator and log-table is* ***allowed****.*

SECTION – I

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

i) According to Debye-Huckel theory of interionic attraction the ion is considered as a dimensionless point charge. True or false.

ii) The thickness of ionic atmosphere increases as the concentration of electrolyte _____

iii) The mobility of an ion _____ due to relaxation force.

iv) Write the Debye-Huckel limiting law for an electrolyte.

v) Write the relationship between three forms of activity coefficients for dilute solution.

vi) Name the effect due to which the conductance of an electrolyte solution increases at high potential.

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

viii) Give the expression for thickness of ionic atmosphere in water at 25°C.

ix) How do you verify the Debye-Huckel limiting law ?

x) Define corrosion.

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

xii) Write the expression for hydration energy according to Born-Haber method.

xiii) Name the secondary slow step in the theories of overvoltage.

xiv) The mobile phase in electro-osmosis is _____

SECTION – II

2. a) Derive Debye-Huckel limiting law. **7**

   b) Explain how do you verify quantitatively Debye-Huckel equations for activity coefficient of an electrolyte. **7**

3. a) Discuss the Wein effect in detail. **7**

   b) Calculate the thickness of ionic atmosphere for 1 : 1 electrolyte in water (D = 78.6) at 0.1, 0.01 and 0.001 moles at 25°C and comment on the result. **7**

4. a) Derive Butler-Volmer equation for an electrode reaction. **7**

   b) Explain the experimental determination of overvoltage. **7**

SECTION – III

5. a) Discuss the Bernal and Fowler method of determining heats of hydration. **5**

   b) Describe the construction and working of hydrogen-oxygen fuel cell developed by Apollo systems. **5**

   c) In a fuel cell carbon is used as a fuel. The thermodynamic parameters for the cell reaction are $\Delta H^\circ = -67.63$ k cal/mol and $\Delta G^\circ = -61.45$ k cal/mol with an equilibrium potential of 1.333 V. If oxygen is used as the oxidant write the cell reaction and calculate the efficiency of the fuel cell. **4**

6. a) Discuss the electrochemical nature of corrosion. **5**

   b) Discuss the Helmholtz-Perrin theory of electrical double layer with its limitations. **5**

   c) Explain the nature of electrocapillary curve obtained for mercury electrode. **4**

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

   a) Indirect losses due to corrosion

   b) Pourbaix diagrams

   c) Abnormal ionic conductances of H^+ and OH^- ions

   d) Theories of overvoltage.

SLR-MM – 170

Seat No.	

M.Sc. – II (Semester – III) Examination, 2015
PHYSICAL CHEMISTRY (New-CGPA)
(Paper – XI) : Molecular Structure – I

Day and Date : Friday, 20-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 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 table and calculator is **allowed**.*

SECTION – I

1. Answer the following : **14**

i) Write down the point group for the following molecules a) PCl_5 b) PCl_3.

ii) What is σ_h symmetry operation ?

iii) What information about the molecular geometry for N_2O can be determined form knowing that a pure rotational absorption spectrum is observed for this molecule ?

iv) What is a symmetry element ?

v) How many normal modes of vibrational are possible for a benzene molecule ?

P.T.O.

vi) In a given representation (reducible or irreducible) the character of all matrices belonging to operations in the same class are

vii) State Frank-Condon principle.

viii) In the hydrogen molecule, when hydrogen is replaced by deuterium. What will happen to the rotational constant B ?

ix) How many electrons are involved in XPS ?

x) Which kind of spectroscopy could be used to measure the binding energy of an electron in the $^1\pi_u$ M.O. of O_2 ?

xi) A photon in what spectral region induces a π-toπ^* transition of a C = O double bond ?

xii) What is Raman effect ?

xiii) Which of the following vibrational transitions will be observed for a diatomic molecule (treated as a harmonic oscillator) : v = 1 to v = 3; v = 2 to v = 3; v = 5 to v = 4.

xiv) Identify the molecules that will exhibit a pure rotational absorption microwave spectrum: NO_2, $CCIF_3$, NF_3, CH_4, CO_2.

SECTION – II

2. a) What are the symmetry operations in the point group C_{2v} ? Identify a molecule that belongs to the group. By examining the effect of sequential application of the various symmetry operations in the group, construct the group multiplication table. **7**

   b) Explain the rule of mutual exclusion and its converse. Sketch and explain the polarisability ellipsoids of various modes of vibration of CO_2 molecule. Which of these are Raman Active ? **7**

3. a) What is Fortrat parabola ? Obtain the expression for the band head in terms of B' and B". **7**

   b) Illustrate various processes of re-emission of energy by an excited molecule. **7**

4. a) Give an account of microwave spectra of linear molecules. **7**

   b) Discuss vibrational coarse structure i.e. progressions. **7**

SECTION – III

5. a) Explain quantum mechanical approach of Raman effect. **5**

   b) Sketch and explain the polarizability ellipsoids for the H_2O molecule. **5**

   c) Write a note on proper and improper rotations. **4**

6. a) Explain the principle of photoelectron spectroscopy. **5**

   b) Write the differences between Raman spectra and I.R. spectra. **5**

   c) The first line in the rotation spectrum of carbon monoxide has a frequency of 3.8424 cm^{-1}. Calculate the rotational constant and hence the C-O bond length in carbon monoxide.? **4**

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

   a) Point group.

   b) Great orthogonality theorem.

   c) Hydrogen atom spectrum.

   d) Intensity of the spectral lines.

SLR-MM – 171

Seat No.	

M.Sc. (Part – II) (Semester – III) (New) (CGPA) Examination, 2015
PHYSICAL CHEMISTRY
Paper – XII : Solid State and Nuclear Chemistry (Elective)

Day and Date : Monday, 23-11-2015 Total Marks : 70
Time : 2.30 p.m. to 5.00 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) What is tarnish reaction ?
ii) Give the composition of Fricke's solution utilized in Fricke dosimeter.
iii) Define Weiss indices.
iv) What is half life period for radio-isotope ?
v) What is dead time of a detector ?
vi) List the charge particle nuclear radiations.
vii) On an average what amount of energy is required to produce an ion pair ?
viii) What is F centre ? Give one example.
ix) Name one example of inorganic and organic scintillators each.
x) Radioactive decay follows _____ kinetics.
xi) State Bragg's equation for XRD.
xii) What do you mean by anisotropy ?
xiii) Name any two methods of single crystal growth from melt.
xiv) What is Frankel defect ?

P.T.O.

SECTION – II

2. a) Give an outline of high surface area materials. **7**

   b) Define isomorphism. Discuss its applications. **7**

3. a) Mention different types of nuclear reactors. Discuss PHWR. **7**

   b) Describe in detail nuclear fission reaction. **7**

4. a) Describe in detail radiolysis of water. **7**

   b) Illustrate principle of zone refining method. **7**

SECTION – III

5. a) Write on nuclear radiation detector-HPGe detector. **5**

   b) Comment on Wagner's theory of solid state reactions. **5**

   c) Explain different plane defects encountered in solids. **4**

6. a) Explain different modes of interaction of nuclear radiations. **5**

   b) Discuss in brief different factors affecting reactivity of solid state reactions. **5**

   c) Write on India's nuclear power programme. **4**

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

   a) Non-stoichiometric defects

   b) Fricke's dosimetry

   c) Critical size of thermal reactor

   d) Crystal systems.

SLR-MM – 172

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
PHYSICAL CHEMISTRY (Old) (CGPA)
Paper – IX : Quantum Chemistry

Day and Date : Monday, 16-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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) Why is the wave nature of matter not more apparent in our daily observations ?
   ii) Write down the expression for overlap integral.
   iii) What is the principle of variation method ?
   iv) Calculate the de Broglie wavelength of 50 g particle moving with the speed of 120 cm/s.
   v) Put the condition for orthogonalisation.
   vi) Sketch Ψ^2 plots for particle moving in one dimensional box of length 'a' nm.
   vii) Classical frequency of oscillation is given by the expression _____
   viii) Mention any two Bohr's fundamental assumptions.
   ix) What do you mean by threshold frequency of a photoelectric surface ?
   x) Construct the secular determinant for trimethylenemethane molecule.
   xi) Define free valence index.
   xii) What do you mean by eigen value and eigen function ?
   xiii) Give the expression for kinetic energy operator in three dimension.
   xiv) Write recursion formula.

P.T.O.

SECTION – II

2. a) Discuss in detail the radial plots for hydrogen atom. **7**

   b) Using method of separation of variables break up the Schrodinger wave equation for rigid rotator into ordinary angular equations. **7**

3. a) Describe quantum mechanical approach of photoelectric effect. **7**

   b) What is Hermitian type of operator ? Give the properties of it. **7**

4. a) Using HMOT, calculate $E\pi$, $B\pi$ and delocalisation energy of 1, 3-butadiene. **7**

   b) Discuss Slater and Guassian type of orbitals. **7**

SECTION – III

5. a) Evaluate average value for position and momentum for a particle in one dimensional box of length a. **5**

   b) Find out the normalisation constant N of the function $\Psi = N \sin (n\pi/a)x$ where the $0 < x < + a$. **5**

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

6. a) Write on Schmidt orthogonalization process. **5**

   b) Give the physical interpretation of Ψ and ψ^2 for quantum mechanical harmonic oscillator. **5**

   c) If the position of an electron in H atom could be determined with an accuracy of 0.01 nm, what would be the uncertainty in its velocity. Comment on the result. **4**

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

   a) Basic postulates of quantum mechanics

   b) Linear variation functions

   c) de Broglie hypothesis

   d) Perturbation theory.

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SLR-MM – 173

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
(Old) (CGPA)
PHYSICAL CHEMISTRY
Electrochemistry (Paper – X)

Day and Date : Wednesday, 18-11-2015 Total Marks : 70
Time : 2.30 p.m. to 5.00 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 electrokinetic effects.

ii) Give the expression for zeta potential.

iii) Define hydration number.

iv) What is corrosion ?

v) Calculate the wavelength at which Debye-Falkenhagen effect observed for uni-univalent electrolyte having concentration 0.002 m.

vi) When the concentration of electrolyte increases what happens to the thickness of the ionic atmosphere ?

P.T.O.

vii) Define overvoltage.

viii) Give the expression for Onsager constant B.

ix) Which theory gives correct structure of electrical double layer ?

x) Electrocapillary maxima is obtained when current density on the electrode is

a) maximum

b) minimum

c) zero

d) all of these

xi) State Faraday's first law of electrolysis.

xii) Mention any two major objectives of electroplating.

xiii) Give Bjerrum ion pair association constant.

xiv) Name the catalyst used in CO-Air fuel cell.

SECTION – II

2. a) Discuss in detail Bjerrum theory of ion association. **7**

b) What is Pourbaix diagram ? Give its significance in corrosion study. **7**

3. a) Discuss the working of hydrocarbon-air and CO-air fuel cells. **7**

b) Describe abnormal ionic conductance of OH^- and H^+ ions in water media. **7**

4. a) Explain the concept of hydration number with the help of Bernol-Fowler method. **7**

b) Derive Tafel equation for electrode kinetics. Explain the terms involved in it. **7**

SECTION – III

5. a) Explain Helmholtz electrical double layer. **5**

b) Write on Wein effect. **5**

c) Evaluate Debye-Huckel constants A and B for nitrobenzene at 298 K

[Given D = 34.8 and η = 0.018 poise] **4**

6. a) Give the importances of diffusion over potentials. **5**

   b) Discuss influence of ions on zeta potential. **5**

   c) Calculate the thickness of ionic atmosphere for 1 : 1 electrolyte in acetonitrile at 298 K at 0.1 and 0.001 M. [D = 37.5]. **4**

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

   a) Electrotyping

   b) Debye-Falkenhagen effect

   c) Mechanism of corrosion

   d) Activity coefficients.

SLR-MM – 174

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
PHYSICAL CHEMISTRY (Old) (CGPA)
Paper – XI : Molecular Structure – I

Day and Date : Friday, 20-11-2015 Total Marks : 70
Time : 2.30 p.m. to 5.00 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 labeled diagrams should be drawn.*
*6) **Use** of calculator and log table is **allowed**.*

SECTION – I

1. Answer the following : **14**

i) Give the statement of Stark effect.

ii) If a molecule possess n-fold axis of rotation then C_n^n = ?

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

iv) Give the Maxwell-Boltzmann distribution law.

v) Write the selection rule for pure rotational Raman spectrum.

vi) Convert 500 nm to cm^{-1}.

vii) The spectral line obtained due to excitation of molecule from v = 0 to v = 1 vibrational state is called

viii) State the Beer-Lambert's law.

ix) What are the term symbols for a state S = ½ and L = 2 ?

x) The continuum observed well below the true dissociation energy is called _____

xi) What are Anti-Stokes lines ?

xii) Which source generally used in Raman spectroscopy ?

xiii) What is centre of inversion ? Give one example which possesses center of inversion.

xiv) In UPES _____ electrons are ejected while in XPES _____ electrons are ejected.

SECTION – II

2. a) Considering NH_3 as an example, show all the possible symmetry operations. **7**

   b) Construct the multiplication table for C_{2v} point group. **7**

3. a) Discuss the rotational spectrum of a non-rigid diatomic molecule. **7**

   b) Explain band origin and band head in the rotational fine structure of electronic vibrational spectra. **7**

4. a) Describe the principle of photoelectron spectroscopy. **7**

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

SECTION – III

5. a) Derive an expression for vibrational energy of a diatomic molecule. **5**

   b) State and explain Franck-Condon principle. **5**

   c) The moment of inertia of a diatomic molecule is 3.50×10^{-46} kg m^2. Calculate the rotational constant B and frequency of the first line in rotational Raman spectra. **4**

6. a) Write on applications of ESCA technique. **5**

   b) What are term symbols ? How they are represented ? **5**

   c) The separation between lines in the rotational spectrum of HCl molecule was found to be 20.92 cm^{-1}. Calculate the bond length. **4**

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

   a) Types of planes of symmetry

   b) The intensity of the spectral lines

   c) Zeeman effect

   d) Modes of re-emission of energy by excited molecule.

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SLR-MM – 176

Seat No.	

M.Sc. (Part – II) (Semester – IV) Examination, 2015
PHYSICAL CHEMISTRY (CGPA)
Paper – XIII : Statistical Mechanics and Thermodynamics

Day and Date : Tuesday, 17-11-2015 Total Marks : 70
Time : 2.30 p.m. to 5.00 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** answerbook.*
*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**

a) The zero point energy of simple harmonic oscillator having angular frequency ω is

b) Give the expression for Debye T-cubed law.

c) The electronic partition function of an atom whose ground state $^2D_{3/2}$ is

d) Mention any two bosons.

e) What is the probability of receiving a card of King from a standard deck of 52 cards ?

f) State the principle of conservation of mass in an open system.

g) The total partition function is given by the expression _____

h) What is symmetry number for methane molecule ?

i) How Boltzman constant and gas constant relates with each other ?

j) What is statistical weight ?

P.T.O.

k) The ensemble in which μ, T and V are constant is referred as _____ ensemble.

l) Define predominant configuration.

m) What is the ratio of ortho to para hydrogen at very high temperature ?

n) Define flux.

SECTION – II

2. a) Discuss entropy production due to heat flow. **7**

   b) Explain Debye theory of heat capacity for monoatomic solids. **7**

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

   b) Name various electrokinetic effects. Write on Saxen's relations. **7**

4. a) Derive the expression for translational partition function. **7**

   b) Deduce the expression ni/gi = exp $(-\alpha + \beta\varepsilon i) - 1$. **7**

SECTION – III

5. a) Discuss permutation and cominationary rules. **5**

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

   c) Evaluate vibrational partition function for N_2 molecule at 3000K. (Given fundamental vibrational frequency = 1.621×10^{13} Hz). **4**

6. a) If H = f(T, P) and dH is an exact differential then prove that $(dH/dP)_T = V - T(dV/dT)_P$. **5**

   b) Write on thermodynamic probability. Derive Stefan-Boltzmann law. **5**

   c) Prove the cyclic rule $(dp/dT)_V (dT/dV)_P (dV/dP)_T + 1 = 0$. **4**

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

   a) Legendre transformations

   b) Electronic partition function

   c) Saxens relations

   d) Conservation of mass in open and closed systems.

SLR-MM – 177

Seat No.	

M.Sc. (Part – II) (Semester – IV) Examination, 2015
PHYSICAL CHEMISTRY (CGPA)
(Paper – XIV) : Chemical Kinetics

Day and Date : Thursday, 19-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 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**

a) The collision theory is satisfactory for _____ order reactions.

a) zero b) first c) second d) third

b) What do you mean by acidity functions ?

c) Mention various types of complex reactions.

d) Give steady state approximation.

e) Molecularity and order of a chemical reaction is always same. True/False.

f) In elastic collision, energy _____

i) transfers ii) no transfer

iii) remains constant iv) none of these

g) Mention trajectory in potential energy surfaces.

h) Define catalyst.

i) Give one example of autocatalytic reaction.

j) Mention different steps involved in chain reaction.

k) What is saddle point ?

l) Define activation energy.

m) Give the expression for Arrhenius equation.

n) Put the rate law for the reaction $2A + B \rightarrow P$.

SECTION – II

2. a) Give an account of the theory of absolute reaction rates. **7**

b) Discuss the kinetics of consecutive reaction $A \rightarrow B \rightarrow C$. Calculate the time when the concentration of B will be maximum and also find out that concentration. **7**

3. a) Describe in brief the kinetics of branching chain reactions and explosion limits. **7**

b) Illustrate enzyme catalysed reactions. **7**

4. a) Give the salient features of the collision theory and transition state theory. **7**

b) Discuss critically the effect of temperature on the reaction rates with particular mention of the significance of activation energy. **7**

SECTION – III

5. a) Describe the methods of determining the order of a reaction. **5**

   b) Write on general characteristics of acid-base catalytic reactions. **5**

   c) The gaseous decomposition of ozone takes place as $2O_3 \rightarrow 3O_2$.

   The rate is $-d[O_3]/dt = k[O_3]^2/[O_2]$. Show that this rate law follows from the proposed mechanism

   i) $O_3 \rightleftharpoons O_2 + O$ fast equilibrium.

   ii) $O + O_3 \rightarrow 2O_2$ slow. **4**

6. a) Explain graphically how catalyst provides alternative path for the reaction. **5**

   b) Illustrate kinetics of parallel reactions with suitable example. **5**

   c) The half life for a given reaction was halved as the initial concentration of the reactant was doubled. What is the order of the reaction ? **4**

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

   a) Autocatalysis.

   b) Steady state treatment.

   c) Lindemann's unimolecular theory.

   d) Potential energy surfaces.

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SLR-MM – 178

Seat No.	

M.Sc. (Part – II) (Semester – IV) Examination, 2015
PHYSICAL CHEMISTRY
(CGPA)
Paper No. – XV : Molecular Structure – II

Day and Date : Saturday, 21-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

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

SECTION – I

1. Compulsory. **14**

i) Express the total polarizibility of a molecule in terms of electronic, atomic and orientation polarization.

ii) What is the value of one Debye unit in terms of esu ?

iii) Orientation polarization is observed in polar molecules only. True or false.

iv) From Lorentz-Lorentz equation _____ polarization can be calculated.

v) Paramagnetic substance are _____ by magnets.

vi) Write the relationship between volume and mass susceptibility.

vii) According to Curie-Weiss law susceptibility varies _____ with temperature.

viii) Write the equation for nuclear magneton.

ix) _____ can be used as the reference standard for both proton and ^{13}C NMR.

P.T.O.

x) The ^{13}C NMR is much simpler to interpret than proton NMR. Why ?

xi) Which is the free radical used in the calibration of ESR spectra ?

xii) Predict the number of ESR lines for the p-semibenzoquinone radical, $[O.C_6H_4O^-]$, Which contain four equivalent protons.

xiii) Mossbauer spectroscopy involves nuclear transitions as a result of _____ absorption.

xiv) Name the standard absorber adopted for Mossbauer spectroscopy.

SECTION – II

2. a) Derive Debye equation for molar polarization of a molecule. **7**

   b) The dipole moment of a polar molecule is 1.21 D at 25°C. Calculate its orientation polarization contribution. **7**

   (Given $k = 1.38 \times 10^{-16}$ erg K^{-1} mol^{-1} and $1.0\ D = 1.0 \times 10^{-18}$ esu cm)

3. a) Derive Van-Vleck general equation for magnetic susceptibility. **7**

   b) Explain the use of Pascal constants for calculation of magnetic susceptibility. **7**

4. a) What is coupling constant ? Explain with suitable diagram effect of coupling between two neighboring nuclei on the splitting pattern of their NMR signals. **7**

   b) With suitable example explain the shielding and deshielding effects on resonance energy of a proton. **7**

SECTION – III

5. a) Describe how the ESR spectrum help to study of free radicals and unstable paramagnetic substances. **5**

   b) What important information is provided by an ESR spectrum ? Explain with examples. **5**

   c) The ESR frequency of an electron is 9.8 GHz. Calculate the strength of the magnetic field applied. ($g = 2.0$, $\beta = 9.2732 \times 10^{-24}$ 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) Write a brief note on Mossbauer Sources. **5**

   c) The energy of emitted γ-rays from first excited state of ^{67}Zn nucleus is 93.0 keV. Calculate its recoil energy ($N = 6.023 \times 10^{23}$, $1keV = 1.6 \times 10^{-19}$ J, $c = 3.0 \times 10^{8} ms^{-1}$). **4**

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

   a) Limitation of Debye theory

   b) Verification Curie-Weiss law

   c) Factors affecting chemical shift

   d) Applications of ESR.

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SLR-MM – 179

Seat No.	

M.Sc. (Part – II) (Semester – IV) Examination, 2015
PHYSICAL CHEMISTRY (CGPA)
Surface Chemistry (Paper – XVI) (Elective)

Day and Date : Tuesday, 24-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 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) "Formation of micelle increases the surface tension of surfactant solution". State whether this statement is true or false.

ii) What is surface activity ?

iii) "A liquid wets complete the surface of solid when contact angle is 180°. State whether the statement is true or false.

iv) Write down equation for Langmuir adsorption isotherm.

v) What is contact angle hysteresis ?

vi) If an emulsion feels creamy, what will be emulsion type ?

vii) Compute the value of ΔP for spherical interfaces using Young and Laplaces equation.

viii) List the factors on which rate of chemisorptions depends.

ix) How aqueous solution of water insoluble organic substance is prepared ?

P.T.O.

x) State role of wetting agents in prevention of redeposition of dirt on clean solid surface.

xi) Give the equation of contact angle in terms of surface tension when a drop of liquid is placed on the surface of solid.

xii) State whether adsorption of acetic acid on surface of charcoal powder is physical adsorption or chemical adsorption.

xiii) What is catalytic poison ?

xiv) Define Kraft temperature.

SECTION – II

2. a) What is emulsion ? Discuss methods of identification of emulsion types. **7**

   b) Derive an equation for spreading coefficient for spreading of liquid B on the surface of liquid A. Give the meaning of positive and negative values of spreading coefficient. **7**

3. a) Describe sintering process and mechanism of sintering. **7**

   b) $\Gamma = -\frac{C}{RT}\left(\frac{d\gamma}{dC}\right)$ name and derive this equation with usual notation. **7**

4. a) Derive Kelvin equation for vapour pressure inside and outside the droplet. **7**

   b) Give a detailed account of gravimetric method of gas adsorption. **7**

SECTION – III

5. a) Discuss factors affecting adsorption. **5**

   b) What is critical micelle concentration ? Explain energetic of micellization using Arrehenius equation. **5**

   c) Calculate spreading coefficient of hexane on the surface of water if the interfacial tension at 20°C is 51.0 dynes cm^{-1}. The surface tension of water and hexane are 72.75 and 18.40 dynes cm^{-1}. **4**

6. a) What are insoluble monomolecular films ? How is the physical states of these films distinguished ? **5**

   b) Describe concept of condensed film adsorption and Herkin-Jura equation. **5**

   c) Calculate the height to which benzene having surface tension 22.6 dynes cm^{-1} and density 0.86 gm per cc has risen into in to a capillary of diameter 0.029 meter at 20° C. **4**

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

   a) Langmuir surface pressure balance.

   b) Drop number method.

   c) Detergency.

   d) Kinetics of chemisorptions.

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SLR-MM – 180

Seat No.	

M.Sc. – II (Semester – III) Examination, 2015
ANALYTICAL CHEMISTRY (New CGPA)
Advance Separation Techniques (Paper – IX)

Day and Date : Monday, 16-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

N. B. *: 1) Attempt in **all five** questions.*
*2) Section **one** 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 **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) Explain the term concentrate in ultrafiltration.
   ii) Define the term Rx-value.
   iii) Explain the term ionic strength elution.
   iv) Explain current efficiency in electrodialysis.
   v) What is isotachophoresis ?
   vi) Define the term capillary electrophoresis.
   vii) Give the names of the solvents used in paper chromatography.
   viii) Mention the two types of membranes used in dialysis.
   ix) Give the long form of MALDI.
   x) Define distribution coefficient.

P.T.O.

xi) Explain the term electro-osmotic flow.

xii) Give two important criteria for choice of filter paper in paper chromatography.

xiii) Give two examples of rigid gels.

xiv) Define concentration polarization.

SECTION – II

2. a) Derive the relationship between the distribution coefficient and distribution ratio by taking suitable example. **7**

   b) Explain the principle of dialysis. Give information of membranes used in hemodialysis. **7**

3. a) Explain the principle, sedimentation constant and sedimentation equilibrium of ultracentrifugation. **7**

   b) What is the principle of zone refining ? Explain the process of zone refining. **7**

4. a) Describe the ascending and descending paper chromatography. **7**

   b) Discuss the principle involved in gel permeation chromatography. Explain the rigid gels used in gel permeation chromatography. **7**

SECTION – III

5. a) Describe components involved in affinity media. **5**

   b) Explain the working technique in electrodialysis. **5**

   c) Write note on two dimensional paper chromatography. **4**

6. a) Explain in brief the solid phase extraction. **5**

   b) Give applications of electrophoresis in inorganic and organic separations. **5**

   c) Which gels are commonly used in gel permeation chromatography and why ? **4**

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

   a) Role of spacer arms and ligand in gel permeation chromatography.

   b) Peritonial dialysis.

   c) Applications of electrodialysis.

   d) Capillary electrochromatography.

SLR-MM – 181

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
ANALYTICAL CHEMISTRY (New) (CGPA)
Paper – X : Instrumental Methods of Analysis – I

Day and Date : Wednesday, 18-11-2015 Total Marks :70
Time : 2.30 p.m. to 5.00 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) What is the function of supporting electrolyte ?
ii) Mention the dead time of GM counter.
iii) The penetrating power of _____ is highest among the nuclear radiations.
iv) Mention any two microelectrodes used in amperometric technique.
v) The range of frequency that can be used in high frequency titrations is _____
vi) Mention typical band gap of Germanium semiconductor.
vii) Define dielectric constant.
viii) What is the basis of thermo gravimetric analysis ?
ix) Sketch typical TGA curve.
x) Diagrammatically represent diffusion current region and limiting current.
xi) Which electrolytes are used in construction of salt bridge ?
xii) Mention different types of DSC technique.
xiii) Give any two examples of organic scintillation detectors.
xiv) What do you mean by the term electrodes of first kind ?

P.T.O.

SECTION – II

2. a) What are different types of ion selective electrodes ? Explain liquid-liquid membrane electrode. **7**

   b) Explain how isotope dilution analysis is used in various biomedical investigations. **7**

3. a) What do you mean by tracer technique ? Describe how this technique is useful in physico-chemical investigations. **7**

   b) Discuss principle and technique of electro-gravimetry. **7**

4. a) Describe in detail the glass electrode used for pH measurement. **7**

   b) Describe various applications of DTA. **7**

SECTION – III

5. a) Explain radiochromatographic technique. **5**

   b) Write on advantages of amperometric titrations. **5**

   c) With the help of thermogravimetric curves, explain how copper sulphate pentahydrate decomposes. **4**

6. a) Explain the conditions under which steady state voltammogram is obtained. **5**

   b) With schematic diagram explain power compressed DSC. **5**

   c) What is the concentration of Cd solution if in polarographic analysis, the diffusion coefficient is 0.72×10^{-5} cm^2/sec., with rate of flow is 2mg/sec. with drop time 4.4 sec. and magnitude of average diffusion current is $10\mu A$. **4**

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

   a) Types of cells used in High Frequency Titrations

   b) Stripping voltammetry

   c) Comparison between TGA and DTA

   d) Microelectrodes.

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SLR-MM – 182

Seat No.	

M.Sc. – II (Semester – III) (CGPA) Examination, 2015
ANALYTICAL CHEMISTRY (New)
Paper – XI : Applied Analytical Chemistry

Day and Date : Friday, 20-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

N.B. : *1) Section – **I** is **compulsory**.*
*2) Attempt **any two** questions **each** from Section – **II** and Section – **III**.*
*3) Attempt in **all five** questions.*
*4) Answers to **all** the **three** Sections are to be written in the **same** answerbook.*
*5) Figures to the **right** indicate **full** marks.*
*6) **Draw** neat, labeled diagrams **wherever** necessary.*
*7) **Use** of log table provided by university is **allowed**.*

SECTION – I

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

a) Give the major composition of creams.

b) Name the constituents on which the fertility of the soil depends.

c) Write the principle of determination of Ziram.

d) Which ore is used to estimate Fe ? Write its chemical formula.

e) Name the acid created at armpit which has bad odour.

f) Write the principle of estimation of Tin (Sn) from brass.

g) Write major element present in bauxite ore.

h) What is the role of calcium and magnesium in the face powder ?

i) Give the classification of plant nutrients.

j) What are minerals ? Give examples.

k) What are the constituents of feeding stuffs ?

l) The calcium from the plant constituents come under the macro element. (True/False)

m) Aluminium alloy is resistant to atmospheric corrosion. (True/False)

n) Humus is a colloidal substance and increases the soil's cation exchange capacity. (True/False)

SECTION – II

2. A) Write the various procedures used for decomposition of fertilizer and experimental procedure for total phosphorus. **7**

   B) Give in detail analysis of steel alloy. **7**

3. A) What are the major and minor constituents of soil ? Explain the analytical procedure for the determination of nitrogen and potassium. **7**

   B) Give a short account on the determination of soil properties w.r.t.

      i) Soil fertility

      ii) Exchange capacity

      iii) Soil reaction. **7**

4. A) What are the various mineral constituents in plants ? Write the procedure for determination of calcium and magnesium. **7**

   B) Give in detail analysis of Cu-Ni alloy and solder. **7**

SECTION – III

5. A) What is ore ? Give the detail analysis of pyrolusite ore. **5**

   B) What is fertile soil ? Give soil testing methods for the fertile soil. **5**

   C) Explain determination of water, non-volatile matter and ash content in cosmetic analysis. **4**

6. A) What is the composition of dolomite ore ? Describe the experimental procedure for the determination of desired constituents in it. **5**

   B) How moisture is determined from plant sample by method of ashing ? **5**

   C) What is the role of boric acid in the deodorant and how it can be analyzed ? **4**

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

   i) Physical properties of soil

   ii) Determination of Ziram

   iii) Kjeldahl nitrogen method

   iv) Analysis of sugar and starch in plant.

SLR-MM – 183 A

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
ANALYTICAL CHEMISTRY (CGPA) (New)
Paper – XII : Analytical Spectroscopy (Elective)

Day and Date : Monday, 23-11-2015 Total Marks : 70

Time : 2.30 p.m. to 5.00 p.m.

Instructions *: 1) Attempt **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) Mention any two Mössbauer nuclei.
   ii) What is binding energy ?
   iii) Put any two nuclei having zero spins.
   iv) The ideal source for Raman spectroscopy is
   v) Mention the source used in PAS spectroscopy.
   vi) Why antistokes lines are weaker than Stokes lines in Raman spectra ?
   vii) What is quadruple splitting ?
   viii) Mention different probes preferred in SPM techniques.
   ix) What do you mean by polarizability ?
   x) What do you mean by elastic collision ?

xi) Write theoretical value of Linde's splitting factor (g) for an electron.

xii) For NQR spectra the sample should be in _____ state.

i) Liquid ii) Solid

iii) Gas iv) All of these

xiii) ESR spectrum of naphthalene radical gives _____ number of lines.

xiv) Define Rayleigh scattering.

SECTION – II

2. a) Explain the principle and technique of ultraviolet photoelectron spectroscopy. **7**

b) Describe the applications of Raman spectroscopy in structure elucidation. **7**

3. a) Discuss isomer shift and effect of magnetic field in case of Mössbauer spectroscopy. **7**

b) Mention chemical and surface applications of photoacoustic spectroscopy. **7**

4. a) Explain with suitable examples the applications of ESR spectroscopy in quantitative analysis. **7**

b) Explain the theory of Nuclear Quadrapole Resonance Spectroscopy. **7**

SECTION – III

5. a) Give a quantum mechanical theory of Raman Effect. **5**

b) Explain why homonuclear diatomic molecules can give Raman effect ? **5**

c) A particular Mössbauer nucleus has spin 5/2 and 3/2 in excited and ground state respectively. Into how many lines will the spectrum split if both electric and magnetic field are present ? **4**

6. a) Explain the role of electric field gradient in NQR spectroscopy. **5**

b) Lists applications of Scanning Tunneling Microscopy. **5**

c) Write on PAS gases and condensed system. **4**

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

a) Scope and limitations of ESCA.

b) ESR spectroscopy for qualitative analysis.

c) Atomic force microscopy.

d) Resonance Raman effect.

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SLR-MM – 184

Seat No.	

M.Sc. – II (Semester – III) Examination, 2015
ANALYTICAL CHEMISTRY (Paper – IX) (Old) (CGPA)
Advance Separation Techniques

Day and Date : Monday, 16-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 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 the **right** indicate **full** marks.*
*7) **Use** of log table and non-programmable calculator is **allowed**.*

SECTION – I

1. A) Attempt the following : **10**

1) Give one important criteria for choice of the paper in paper chromatography.

2) Define the term mashing agent.

3) Define the term electro-osmotic flow.

4) Explain the term ionic-strength elusion.

5) Give one important difference between ultrafilter and conventional filter.

6) Give meaning of automated device.

7) Give two applications of DLS.

8) Define Mie-scattering.

9) Explain meaning of spacer arms.

10) Define Rx-value.

P.T.O.

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

1) The migration velocity in electrophoresis depends upon _____
2) The plate count (N) in capillary electrophoresis is given by the equation _____
3) Substances having nearly same Rf-values can be distinguished by _____ paper chromatography.
4) Determination of uranium by using _____

SECTION – II

2. A) What is the principle of zone refining technique ? Explain process of zone refining. **7**

   B) Explain principle of electrophoresis. Give applications of capillary electrophoresis. **7**

3. A) Explain principle and working of dialysis with the help of diagram. **7**

   B) Which gels are commonly used in gel permeation chromatography ? Why ? Explain the role of ligands in gel permeation chromatography. **7**

4. A) Explain factors affecting solvent extraction. **7**

   B) Describe working technique of electrodialysis with the help of diagram. **7**

SECTION – III

5. a) Explain sedimentation constant and sedimentation equilibrium. **5**

   b) Describe radial paper chromatography. **5**

   c) Give applications of dialysis. **4**

6. a) Explain solid phase extraction. **5**

   b) Give applications of electrophoresis in inorganic and organic separation. **5**

   c) Describe components involved in affinity chromatography. **4**

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

   i) Applications of ultrafiltration.
   ii) Hemodialysis
   iii) Isoelectric focussing
   iv) Capillary electro-Chromatography.

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SLR-MM – 185

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
ANALYTICAL CHEMISTRY (Old) (CGPA)
Paper – X : Instrumental Methods of Analysis – I

Day and Date : Wednesday, 18-11-2015 Total Marks : 70
Time : 2.30 p.m. to 5.00 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** answerbook.*
*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) Which gas is filled in gas fill detectors ?

ii) What is secondary ionization ?

iii) Name the device that is used to determine the temperature in DSC apparatus.

iv) In amperometry the preferred reference electrode is _____

v) What do you mean by working electrode ?

vi) State Faraday's first law of electrolysis.

vii) Mention the nuclear radiations.

viii) What is the function of potentiostat ?

ix) Draw a typical DTA curve and mention endotherms and exotherms.

x) Define diffusion current.

xi) Who introduced high frequency titration method ?

xii) Neutrons were discovered by _____ .

xiii) What is dilatometry ?

xiv) Represent glass electrode.

P.T.O.

SECTION – II

2. a) With the help of suitable example explain liquid-liquid membrane electrode. **7**

   b) Explain in detail how DSC technique can be used in studies of thermal transition and isothermal crystallization. **7**

3. a) Describe how electrolytic separation of metals can be studied with the help of electro gravimetric analysis. **7**

   b) Write on applications of neutron activation analysis. **7**

4. a) What do you mean by ion selective electrodes ? Discuss solid state electrodes. **7**

   b) Discuss instrumentation for Differential Thermal Analysis (DTA) technique. **7**

SECTION – III

5. a) Lists advantages and disadvantages of amperometric titrations. **5**

   b) Draw typical TGA curve. What information you can get from it ? **5**

   c) Explain in detail isotopic dilution analysis. **4**

6. a) Discuss technique of radiochromatography. **5**

   b) Describe characteristics of nuclear radiations. **5**

   c) Write on rotating platinum electrode. **4**

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

   a) Types of thermo gravimetric analysis.

   b) Advantages of high frequency titrations

   c) Radioimmunoassay

   d) Coulometric technique.

SLR-MM – 186

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
ANALYTICAL CHEMISTRY (Old) (CGPA)
Paper – XI : Applied Analytical Chemistry

Day and Date : Friday, 20-11-2015 Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

N.B. : *1) Question 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 the ***right*** *indicate* ***full*** *marks.*

SECTION – I

Answer the following : **(14×1=14)**

1. a) What are ores ?
   b) What is use of D.D.T. ?
   c) Kjaldhal method is used for estimation of _____ element.
   d) Give the composition of feed stock in oil cake.
   e) Which component is more helpful for soil fertility ?
   f) Give composition of solder alloy.
   g) What are types of steel alloy ?
   h) Dehydrated gypsum is known as plaster of Paris (True/False).
   i) Give classification of plant nutrients.
   j) Copper-Nickel alloy is highly resistance to corrosion in sea water (True/False).
   k) What is composition of brass ?
   l) The calcium from plant comes under the macro nutrient (True/False).
   m) Give composition of face powder.
   n) What are antiperspirants ?

P.T.O.

SECTION – II

2. A) Explain chemical analysis as measure of soil fertility. **7**

   B) How mineral constituents Ca, Mg is analyzed from plant ? **7**

3. A) Explain analysis of phosphorus by alkali metric ammonium molybdo phosphate method. **7**

   B) Explain analysis of insecticides thiometon and chloridane. **7**

4. A) Explain the following : **7**
   a) Method of ashing
   b) Determination of moisture
   c) Determination of sulphur.

   B) Describe determination of endosulphan and thorium from food grain. **7**

SECTION – III

5. A) Explain method of analysis of Pyrrolusite ores. **5**

   B) What are different major and minor constituents of soil ? **5**

   C) Explain in short determination of borate and sulphate from cosmetics. **4**

6. A) How will you determine the mineral constituents Fe and Mn from the soil samples ? **5**

   B) Explain composition of soldering material. Describe analysis of solder alloy. **5**

   C) How sampling of soil can be done for soil analysis ? **4**

7. Write short notes on **any three** : **14**
   a) Aluminium alloy.
   b) Estimation of potassium by tetraphenyl borate method.
   c) Analysis of thorium.
   d) Deodorants and antiperspirants.

SLR-MM – 187 A

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
ANALYTICAL CHEMISTRY (Old) (CGPA)
Paper – XII : Analytical Spectroscopy

Day and Date : Monday, 23-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 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) Which radiation source is commonly used in microwave spectroscopy ?
   ii) Give the selection rule for rotational Raman spectra.
   iii) What is the selection rule in ESR spectroscopy ?
   iv) Name the substance which is used as a standard in Mossbauer spectroscopy.
   v) Draw the prolate charge distribution of a nucleus in NQR.
   vi) List the techniques of SPM.
   vii) What is meant by X-ray fluorescence ?
   viii) How many ESR lines would be possible for methyl radical ?
   ix) "NQR is only applicable in solid state material". Why ?
   x) Write the equation for recoil energy in Mossbauer spectroscopy.
   xi) Mention any two nuclei having half integer spin.
   xii) Which type of electron beam is used for image formation in TEM ?
   xiii) What is zero field splitting ?
   xiv) Calculate ESR frequency of unpaired electrons in a magnetic field at 3000 G.

P.T.O.

SECTION – II

2. A) What is Mossbauer spectroscopy ? Explain the importance of Mossbauer effect. **7**

   B) Discuss classical theory of Raman spectroscopy. **7**

3. A) What is ESCA spectroscopy ? Discuss its instrumentation in detail. **7**

   B) What are applications of NQR spectroscopy ? **7**

4. A) What is the basic principle of ESR spectroscopy ? Discuss hyperfine splitting phenomenon with illustrative examples. **7**

   B) Compare electron microscopy and electron spectroscopy. **7**

SECTION – III

5. A) Draw neat labelled diagram of SEM. Explain its various components in detail. **5**

   B) Calculate the number of ESR peaks in $^{13}CH_3$ radical and interpret their intensity ratios. **5**

   C) Explain scanning probe microscopy. **4**

6. A) Explain principle of NQR spectroscopy. Discuss the NQR spectrum for a nucleus with I = 2. **5**

   B) What is resonance Raman effect ? **5**

   C) What are the applications of photoacoustic spectroscopy ? **4**

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

   A) Instrumentation of Raman spectroscopy.

   B) Isomer shift in Mossbauer spectroscopy.

   C) g-value and factors affecting it.

   D) Scanning tunneling microscopy.

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SLR-MM – 192

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
INORGANIC CHEMISTRY (Paper – IX) (New CGPA)
Inorganic Chemical Spectroscopy

Day and Date : Monday, 16-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 p.m.

Instructions *: 1) Attempt in **all five** questions.*
*2) Section – **I** (Q. **1**) 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 **same** answer book.*
*5) **All** questions carry **equal** marks.*
*6) Figures to the **right** indicate **full** marks.*
*7) **Neat** and labeled diagrams should be drawn **wherever** possible.*
*8) Use of log table and calculators is **allowed**.*

SECTION – I

1. Answer the following : **14**

a) What is chemical shift ?

b) Why the ^{1}H, ^{15}N, ^{19}F, ^{31}P, etc. shows NMR spectra ?

c) What is the basic principle of ESCA ?

d) Which elements does not produce auger electron spectra ?

e) How the centrifugal distribution constant (D) is calculated ?

f) Which type of substances can be studied by microwave spectra ?

g) When will the Raman spectrum results ?

h) Which equation is used to calculate the quantized rotational energy of molecule ?

i) What is the equation of force constant (f) ?

j) In IR spectrophotometer which material is used for fabrication of detector ?

k) State Orgel diagram.

P.T.O.

l) Give the term symbol for an atom with the configuration s^1p^1.

m) How many vibrational modes are present in CO_2 molecule ?

n) What is the point group of trans N_2F_2 ?

SECTION – II

2. a) The BCl_3 molecule belongs to D_{3h} point group. Obtain the matrices of the irreducible representation by considering the B-Cl bonds of the molecules. **7**

   b) Discuss the principle and instrumentation of photo electron spectroscopy. **7**

3. a) What are the Racah parameters ? How they can be calculated ? On the basis of Racah parameter, interpret the octahedral complexes of CO^{2+} ion. **7**

   b) Discuss the applications of microwave spectroscopy. **7**

4. a) Discuss about the basic principle and instrumentation used in NMR technique. **7**

   b) Describe about the Raman spectrometer. **7**

SECTION – III

5. a) What is characteristic table ? Prepare characteristic table for C_{3v} point group. **5**

   b) Discuss the selection rule for possible transitions in electron absorption spectra. **5**

   c) On the basis of IR spectra, explain hydrogen bonding. **4**

6. a) Discuss the charge transfer spectra in metal complexes. **5**

   b) Distinguish between proper and improper rotations. **5**

   c) Give the applications of NMR spectroscopy. **4**

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

   a) Photo-ionization process.

   b) Stark effect.

   c) Morse potential energy diagram.

   d) Great Orthogonality Theorem.

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SLR-MM – 193

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
INORGANIC CHEMISTRY
Paper – X : (New CGPA)
Co-ordination Chemistry – I

Day and Date : Wednesday, 18-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 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 meant by ternary complexes ?

b) "Intensity of d-d transition is usually weak" Why ?

c) Draw TGA thermogram of $CaC_2O_4 . 2H_2O$.

d) What do you mean by paramagnetic substance ?

e) Using spin only formula, calculate magnetic moment (B.M.) for d^5 case.

f) What is weak field ligand ?

g) What is meant by second order Zeeman effect ?

h) Write the formula for Curie-law.

i) What are the factors affecting DTA curve ?

P.T.O.

j) What is meant by volume susceptibility ?

k) What is strong field ligand ?

l) Write the term symbol for ground state of d^4 configuration.

m) What are the different types of catalyst used in the chemical reaction ?

n) Which is the oxidation product of the ethylene in water solvent ?

SECTION – II

2. a) Explain the catalytic cycle of Monsanto acetic acid process. **7**

   b) Draw the DTA curve for $CuSO_4 . 5H_2O$ and explain the mechanism of decomposition. **7**

3. a) Set up MO energy level diagram for octahedral structure involving sigma bonding. **7**

   b) Distinguish between paramagnetism, diamagnetism and ferromagnetism. **7**

4. a) What are mixed ligand complexes ? Discus the factors affecting stability of ternary complexes. **7**

   b) Explain the structure of $[Cu(CN)_4]^{-2}$ on the basis of VBT. **7**

SECTION – III

5. a) Explain the difference between CFT and MOT. **5**

   b) Explain the synthesis of peptide with suitable example. **5**

   c) Write a brief note on current and feature trends in catalysis. **4**

6. a) Explain the Wackers process. **5**

   b) Explain the origin of paramagnetism. **5**

   c) Explain the factors affecting TGA curve. **4**

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

   a) Charge transfer spectra.

   b) Factors affecting DTA curve.

   c) Diamagnetic correction.

   d) Synthesis of peptide.

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SLR-MM – 194

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
INORGANIC CHEMISTRY
Paper No. XI : Nuclear Chemistry (New CGPA)

Day and Date : Friday, 20-11-2015 Total Marks : 70

Time : 2.30 p.m. to 5.00 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) What is radioactive decay ?

b) What is the difference between chemical equilibrium and radioactive equilibrium ?

c) Why the particle emitted in the following nuclear reaction is called neutron

$${}_4Be^9 + {}_2He^4 \rightarrow {}_6C^{12} + {}_0n^1$$

d) Why cadmium and boron is used as control rods in fission reaction ?

e) Which fertile element is extracted from monazite sand ?

f) What is the purpose of construction of nuclear reactors ?

g) On which factor does the stability of atomic nucleus depend ?

h) What are the specialities of spallation type of nuclear reaction ?

i) What is the difference between prompt and delayed neutrons ?

j) Why binding energy calculated by semi-empirical mass equation is precise and accurate ?

P.T.O.

k) Write the nuclear shell configuration for first 40 nucleons.

l) What is nuclear fuel ?

m) What is the difference between chemical equilibrium and radioactive equilibrium ?

n) The separation of H_2 and D_2 by the electrolysis of alkaline water is based on the fact that

SECTION – II

2. a) What is binding energy ? Give the experimental evidence for nuclear magic numbers. Find the binding energy and binding energy per nucleon for $_{26}Fe^{56}$ whose atomic mass is 55.934932 amu. (Given that, masses of proton = 1.007825 amu, $_0n^1$ (neutron) = 1.008665 amu, 1 amu = 931.5 MeV). **7**

b) Why the moderator is not used in fast breeder reactor ? Draw the schematic diagram of fast Breeder reactor and explain the function of each component. **7**

3. a) What are the characteristic features of nuclear fission ? Discuss the mechanism of nuclear fission with special reference to the energetics of the process involved. **7**

b) How does a projectile particle are produced ? Discuss the classification of nuclear reactions on the basis of nature of projectile particles and over all energy change during nuclear reaction with suitable example. **7**

4. a) Discuss the essential features of liquid drop model. How does liquid drop model useful in explaining in the mechanism of nuclear fission ? **7**

b) What are different types of nuclear reactions ? Give Bohr's hypothesis of compound nucleus for nuclear reactions and explain direct nuclear reactions. **7**

SECTION – III

5. a) What is the difference between photochemistry and radiation chemistry ? Define the G-value in radiation chemistry. Discuss the different types of interactions between the charged particles having medium energy with matter. **5**

b) Differentiate nuclear model on the basis of Fermi gas model and collective nuclear model. **5**

c) Discuss thermonuclear reactors as future source of nuclear energy. **4**

6. a) Discuss the essential features of single particle shell model. How does this model explain the enhanced stability at the magic numbers ? **5**

   b) Discuss the present status of nuclear power in India. **5**

   c) What are the prospects of nuclear fusion as a source of future energy ? What are the technical problems that would be arise during harnessing energy from fusion reactions ? **4**

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

   a) Heavy water manufacturing in India.

   b) Fermi Gas model.

   c) Photonuclear reactions.

   d) Radiolysis of water.

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SLR-MM – 195 A

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
INORGANIC CHEMISTRY (New CGPA)
Paper – XII : Environmental Chemistry (Elective)

Day and Date : Monday, 23-11-2015 Max. Marks : 70

Time : 2.30 p.m. to 5.00 p.m.

***Instructions** : 1) Attempt in **all five** questions.*
*2) Section **I** (Q – **1**) 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 **same** answer book.*
*5) **All** questions carry **equal** marks.*
*6) Figures to the **right** indicate **full** marks.*
*7) **Neat** and **labelled** diagrams should be drawn **wherever** possible.*
*8) **Use** of log table and calculators is **allowed**.*

SECTION – I

1. Answer the following : **14**
   a) Define secondary pollutants.
   b) Define COD.
   c) What are the sources of heavy toxic metals in the aquatic environment ?
   d) Name the method used for monitoring of gaseous air pollutants.
   e) Name the acids present in the acid rain.
   f) What is toxicology ?
   g) Write the full forms of TLV and VOC.
   h) What is the range of pH value for most fertile soil ?
   i) What is disinfection of water ?
   j) Major sources of air pollution.
   k) What is smog ?
   l) What are the types of radioactive wastes ?
   m) What are the end products of aerobic oxidation of organic waste ?
   n) Which toxic chemical responsible for Minamata disease ?

P.T.O.

SECTION – II

2. a) What are the principle sources of air pollutants in the atmosphere ? Discuss their effects on living and non-living things. **7**

   b) Discuss the coagulation and flocculation with respect to principle reactions involved and process which controls the water pollution. **7**

3. a) Mention the mechanisms affecting the collections of particulate pollutants in the cyclonic separators and fabric filters. **7**

   b) Give the types, sources and classification of water pollutants. **7**

4. a) Explain monitoring and analysis of carbon monoxide (CO) and carbon dioxide (CO_2) from atmosphere. **7**

   b) Define radiation pollution. What are effects on ionizing radiations on human ? **7**

SECTION – III

5. a) Explain disinfection and demineralization of water. **5**

   b) What is pesticide ? Give the classification of pesticides in details. **5**

   c) Explain in brief ozone depletion. **4**

6. a) What are effects of pesticide residue on life ? **5**

   b) Explain Chernobyl accident. **5**

   c) Explain in brief chemical methods of sterilization. **4**

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

   a) Types of sampling of gases

   b) Ionizing and non-ionizing radiations

   c) Dry and wet scrubber

   d) Analysis of toxic heavy metals.

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SLR-MM – 202

Seat No.	

M.Sc. (Part – II) (Semester – IV) Examination, 2015
INORGANIC CHEMISTRY (Paper – XV) (CGPA)
Chemistry of Inorganic Materials

Day and Date : Saturday, 21-11-2015 Total Marks : 70

Time : 2.30 p.m. to 5.00 p.m.

Instructions *: 1) Attempt in **all five** questions.*
*2) Section **I** is **compulsory.***
*3) **All** questions carry **equal** marks.*
*4) Answer to the **three** Sections should be written in the **same** answer book and attempt at least **two** questions from Section **II** and **III**.*
*5) Figures to the **right** indicate marks.*
*6) Neat labeled diagrams should be drawn **wherever** necessary.*
*7) **Use** of log table and calculator is **allowed**.*

SECTION – I

1. Answer the following. **14**

a) What type of crystal structure is observed in MnO and Mn_3O_4 ?

b) What are the applications of magneto-plumbites ?

c) What is the difference between semiconductor and ionic conductor ?

d) Write the full forms of LASER and MASER and give one example of each.

e) What is Meissner effect ?

f) Define the term ionic conductivity.

g) What is ferroelectric material ?

h) The dislocations in real crystals are of two types i) _____ ii) _____.

P.T.O.

i) The temperature at which the transition of antiferromagnetic to paramagnetic takes place is called

j) Is glass a molecular or nonmolecular solid and how it differ from ionic crystal ?

k) Which method is used for the synthesis of $ZnFe_2O_4$ and $NiFe_2O_4$ spinals ? What precursor reactants are used for the synthesis of spinals ?

l) Show diagrammatically variation of susceptibility with temperature for paramagnetic materials.

m) What are fullerenes ? Who discovered it ?

n) What are the applications of thin films ?

SECTION – II

2. a) Differentiate between electric conductivity and ionic conductivity. Give the classification of superionic conductors with suitable examples. Explain the ionic conductivity in β-alumina. **7**

   b) Explain the synthesis of inorganic materials using ceramic technique. What are its merits and demerits ? **7**

3. a) Discuss the 'BCS' theory of superconductivity. **7**

   b) Explain hard and soft superconductors with suitable examples. **7**

4. a) Discuss different types of stoichometric defects in ionic solids. Calculate the number of Frenkel defects at a particular temperature in a AB type ionic crystal. What are the effects of stoichiometric defects on electronic properties of the ionic solids ? **7**

   b) Why the glass is called supercooled liquid ? Explain glass formers and glass modifiers. **7**

SECTION – III

5. a) Explain clearly the differences between hard and soft magnetic materials. What is the concept of ferromagnetic domains and explain how it is experimentally established ? **7**

   b) Discuss important applications of superconductors and ionic conductors. **7**

6. a) Discuss commercial applications of nanotechnology. Explain manufacturing techniques of nanomaterials. **7**

   b) What are different types of spinels ? Explain structure of perovskite spinels. **7**

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

   a) Hard and soft magnetic materials

   b) Fullerene as superconductor

   c) Organic semiconductors

   d) Piezoelectricity and Ferroelectricity.