Seat No.

M.Sc. (Part – I) (Semester – I) Examination, 2016
CHEMISTRY (Paper – I) (New) (CBCS Pattern)
Inorganic Chemistry – I

Day and Date : Tuesday, 29-3-2016　　　　　　　　　　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)　Answers 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.

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

SECTION – I

1.　Answer the following :　　　　　　　　　　　　　　　　　　　　**14**

1)　What is the energy of electron in hydrogen atom in ground state ?

2)　Give the Schrodinger wave equation.

3)　Give the equation for calculation of energy of an electron in n^{th} orbital.

4)　The substance $CoBr_3 \cdot 4NH_3 \cdot 2H_2O$ behaves like a (3 + : 1 –) electrolyte in solution; write its correct formula.

P.T.O.

5) Why the solution of MnO_4 is intense colored ?

6) The magnetic moment of $[MnBr_4]^{2-}$ is 5.9 BM. Is it a tetrahedral or square planar complex ?

7) What is the CFSE for high spin octahedral complex with d^6 central metal ion ?

8) What is Walsh diagram ?

9) What is Bent's rule ?

10) What is the band gap of germanium ?

11) Which type of semiconductor will be produced after doping of 'As' in 'Si' ?

12) What is the unit of Radioactivity ?

13) Which reaction can takes place in atomic bomb ?

14) What is half-life period of ^{14}C ?

SECTION – II

2. a) Derive the expression for the energy of particle in a one dimensional box. **7**

   b) What is crystal field splitting ? With a suitable example explain the crystal field splitting for square planar complex. **7**

3. a) What is Jahn-Teller effect ? Explain the distortion of geometry in $[Co(NH_3)_6]^{2+}$ complex. **7**

   b) Write the postulates of VSEPR theory. Explain the structure of ClF_3 molecule. **7**

4. a) What is transistor ? Explain their construction and working. **7**

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

SECTION – III

5. a) What are nuclear Coulombic barriers ? What is its significance ? **5**

   b) Explain the construction and working of photovoltaic cell. **5**

   c) Write down the complete wave functions of s orbital. Explain its shape. **4**

6. a) Explain the transformation of coordinates of wave equation. **5**

   b) Discuss Racah parameters and Slater Condon parameters. **5**

   c) Calculate the packing fraction, mass defect and energy released in the formation of argon atom $^{40}Ar_{18}$. Isotopic mass of Ar = 39.96238 a.m.u. **4**

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

   a) G. M. Counter

   b) $d\pi$-pπ bonding

   c) Spectrochemical series

   d) Atomic spectra.

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SLR-MD – 136

M.Sc. – I/Semester – I (New-CBCS) Examination, 2016
CHEMISTRY
Organic Chemistry – I (Paper – II)

Day and Date : Thursday, 31-3-2016

Time : 10.30 a.m. to 1.00 p.m. Max. Marks : 70

Instructions : 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**.
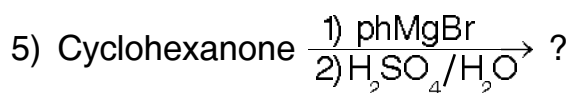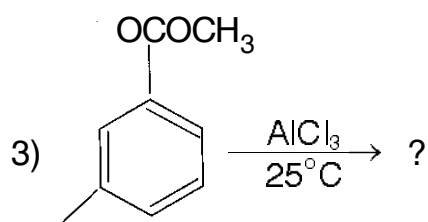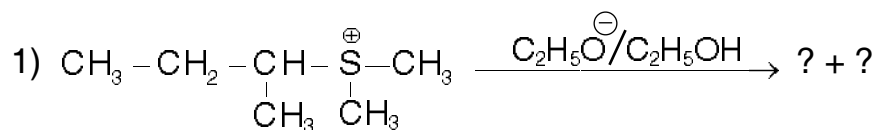
SECTION – I

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

   1) Among the following which is a stronger base ?
      a) N, N - dimethyl O-toluidine   b) Aniline
      c) N, N- dimethyl aniline   d) Aminocyclohexane

   2) Which halide will react with the same nucleophile under the same set of conditions with higher rate of reaction ?
      a) Alkyl iodide   b) Alkyl bromide
      c) Alkyl chloride   d) Alkyl fluoride

   3) Which of the following compounds will undergo nucleophilic substitution reaction most readily ?
      a) chlorobenzene   b) 3-chloroacetophenone
      c) p-nitrochlorobenzene   d) p-chlorotoluene

   4) Succinimide on treatment with bromine and aq.KOH, yields β-alanine, is an example of _____ rearrangement.
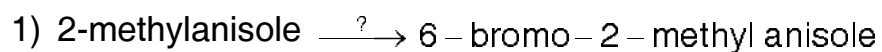   a) Hofmann   b) Curtius
      c) Schmidt   d) Beckmann   **P.T.O.**

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

1) $CH_3-CH_2-CH-\overset{\oplus}{\underset{CH_3\ \ CH_3}{S}}-CH_3$ $\xrightarrow{C_2H_5\overset{\ominus}{O}/C_2H_5OH}$? + ?

2) Cis – 2 – butene $\xrightarrow{Br_2}$?

3)

OCOCH$_3$

$\xrightarrow[25°C]{AlCl_3}$?

4) Methyl benzene $\xrightarrow{HNO_3+H_2SO_4}$? + ?

5) Cyclohexanone $\xrightarrow[2) H_2SO_4/H_2O]{1)\ phMgBr}$?

6) 2, 4-dinitrochlorobenzene $\xrightarrow{CH_3\overset{\ominus}{O}}$?
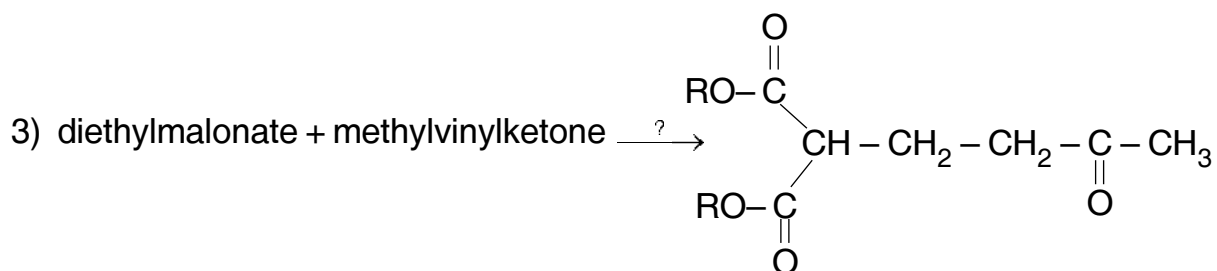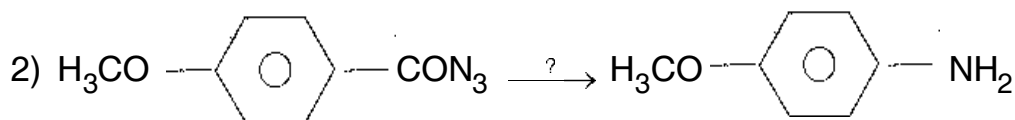
7) 3-bromobenzamide $\xrightarrow{Br_2+NaOH}$?

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

1) 2-methylanisole $\xrightarrow{?}$ 6 – bromo – 2 – methyl anisole

+

4 – bromo – 2 – methyl anisole

2) H_3CO —⬡— CON_3 $\xrightarrow{?}$ H_3CO —⬡— NH_2

3) diethylmalonate + methylvinylketone $\xrightarrow{?}$

$\underset{RO-\underset{\parallel}{\underset{O}{C}}}{\overset{RO-\overset{\parallel}{\overset{O}{C}}}{CH}}-CH_2-CH_2-\underset{\parallel}{\underset{O}{C}}-CH_3$
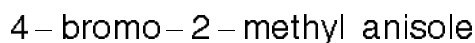
SECTION – II

2. A) Explain the effects of following factors on E_1 and E_2 reactions.   **7**
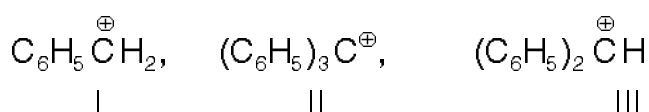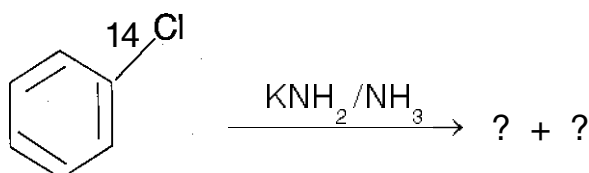
   a) Structure of alkylhalide.

   b) Concentration of the base.

   B) What are carbanions ? Discuss their generation and structure. Arrange the following carbanions with respect to increasing stability and explain stability order.   **7**

   $$C_6H_5 \overset{\oplus}{C}H_2, \qquad (C_6H_5)_3 C^{\oplus}, \qquad (C_6H_5)_2 \overset{\oplus}{C}H$$
   $$\text{I} \qquad\qquad\quad \text{II} \qquad\qquad\qquad \text{III}$$

3. A) Complete the reaction and discuss its mechanism.   **7**

   $$\xrightarrow{\text{KNH}_2/\text{NH}_3} \quad ? + ?$$

   B) What are racemic modifications ? Give an account of chemical methods for resolution of racemic modification.   **7**

4. A) Predict the product(s). Discuss reactivity and orientation involved in the reaction.   **7**

   $$\text{acetanilide} \xrightarrow[\text{AlCl}_3]{\text{ClCH}_2\text{COCl}} \quad ?$$

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

   $$\text{1-methylcyclopentene} \xrightarrow{\text{KMnO}_4/\text{H}_2\text{O}/\overset{\ominus}{\text{OH}}} \quad ?$$
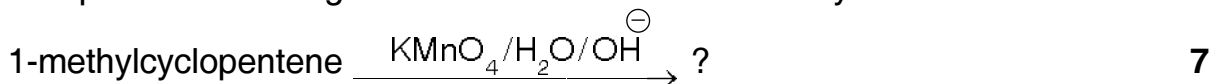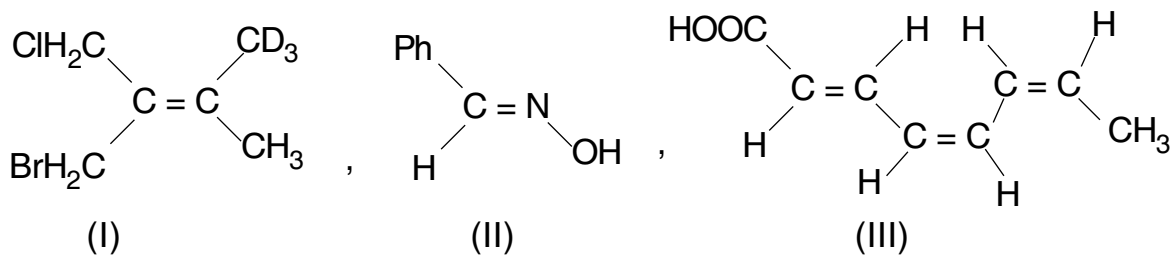
SECTION – III

5. A) Give an account of E, cb reaction with suitable example. Discuss mechanism.   **5**

   B) What is Beckmann rearrangement ? Discuss its mechanism and stereochemistry. Prove that it is intramolecular as well as intermolecular rearrangement.   **5**

C) Assign E and Z nomenclature to the following isomers. **4**
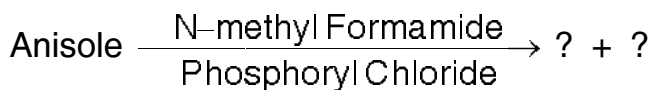

(I)   (II)   (III)

6. A) Discuss the effect of following factors on reactivity in aliphatic nucleophilic substitution reactions. **5**

a) Substrate structure.

b) Solvent.

c) Leaving group.

B) What are ylides ? Discuss their formation and reactions by considering suitable example. **5**

C) Complete the reaction and propose mechanism. **4**

Anisole $\xrightarrow[\text{Phosphoryl Chloride}]{\text{N–methyl Formamide}}$? + ?

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

1) Neighbouring group participation in aliphatic nucleophilic substitution.

2) Sharpless asymmetric epoxidation.

3) Claisen rearrangement.

4) Aromatic nucleophilic substitution – SN^1 and SN^2.

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Seat No.	

M.Sc. (Part – I) (Semester – I) Examination, 2016
CHEMISTRY (CBCS) (New)
(Paper – III) : Physical Chemistry – I

Day and Date : Saturday, 2-4-2016   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. Answers the following :   **14**

   i) Name the best source used in flash photolysis technique.

   ii) The heat absorbed by the system can't completely converted into work. [true/false]

   iii) Write the mathematical expression for third law of thermodynamics.

   iv) What do you mean by configuration ?

   v) State Boltzmann-Planck equation.

   vi) Complete the equation $(dS/dV)_T = (-----/dT)_V$.

   vii) Define macromolecule.

   viii) Give the expression for Gibb's phase rule. Mention the significance of terms involved.

   ix) Give the expression for relaxation time.

   x) What is critical micelle concentration ?

   xi) Mention different types of ensembles.

P.T.O.

xii) What is Sol ?

xiii) Define thermodynamic probability.

xiv) Give the characteristics of irreversible process.

SECTION – II

2. a) With the help of suitable example illustrate the concept of configuration and microstates. **7**

   b) What are relaxation methods ? Discuss temperature jump method used in the investigation of kinetics of fast reactions in solution. **7**

3. a) Show that $P = T\,(\partial P/\partial T)_V - (\partial E/\partial V)_T$. **7**

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

4. a) Describe the viscosity method for the determination of molecular weight of the polymer. **7**

   b) Explain how absolute entropy of a gas can be evaluated at room temprature using third law of thermodynamics. **7**

SECTION – III

5. a) Explain entropy change accompanying in various phase transformations. **5**

   b) Write on chain polymerization process. **5**

   c) The relaxation time for a fast reaction is 250 microseconds and the equilibrium constant is 2.5×10^{-4}. Calculate the rate constant for both forward and backward reactions. **4**

6. a) Discuss the concept of ensemble taking an example of grandcanonical ensemble. **5**

   b) Write a note on thermodynamic excess functions. **5**

   c) Equal numbers of monomers having masses $M_1 = 3500$ and $M_2 = 25000$ are mixed. Calculate number average and mass average molecular mass. **4**

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

   a) Study of fast kinetics by stop-flow technique

   b) Properties of colloids

   c) Predominant configuration

   d) Henry's law.

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Seat
No.

M.Sc. – I (Semester – I) Examination, 2016
(C.B.C.S.) (New)
CHEMISTRY
Analytical Chemistry – I (Paper – IV)

Day and Date : Tuesday, 5-4-2016　　　　　　　　　　　　　Total 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) Name the detectors used in gas chromatography.

   b) Do the addition of 168.11 + 7.045 + 0.6832 by using rules of computation.

   c) Name the reference electrode used in polarography.

   d) Round the number 1.00727, 28755 to two significant figures.

   e) Name the various types of detectors used in HPLC.

   f) What is indeterminate error ?

   g) Define the software.

   h) Write the long form of C.P.U.

   i) Name the electrode used in amperometric titration.

   j) What are the methods employed to develop a chromatogram ?

P.T.O.

k) What is the principle of amperometric titration ?

l) The current due to supporting electrolyte is called _____

m) Mention the types of errors.

n) Column chromatography separates the molecules according to their _____

SECTION – II

2. a) Explain the nature of titration curves obtained in Amperometric titration. Give their advantages. **7**

   b) Define precision and accuracy. Explain the analytical methods used for determination of the accuracy. **7**

3. a) Discuss briefly various types of detectors in HPLC. **7**

   b) Discuss the qualitative and quantitative application of polarography. **7**

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

   b) Discuss the instrumentation of gas chromatography. **7**

SECTION – III

5. a) Discuss the input and output devices. **5**

   b) Give the classification of errors. **5**

   c) Give an account on half wave potential. **4**

6. a) Discuss the use of power point and excel in chemistry. **5**

   b) Give a general idea of different types of chromatography. **5**

   c) Explain in brief use of internet in computer. **4**

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

   a) Advantages and disadvantages of DME

   b) Minimization of error.

   c) Linear regression and X-Y plots.

   d) Detectors in gas chromatography.

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Seat
No.

M.Sc. (Part – I) (Semester – I) (Old) Examination, 2016
CHEMISTRY (Paper – I)
Inorganic Chemistry – I

Day and Date : Tuesday, 29-3-2016　　　　　　　　　　　　　Max. Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

Instructions : i) Attempt **all five** questions.

ii) Section **I** (Q. **1**) is **compulsory**.

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

iv) Answer to **all** questions should be written in **same** answer book.

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

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

vii) **Neat** and **labeled** diagrams should be drawn **wherever** possible.

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

SECTION – I

1. Answer the following :　　　　　　　　　　　　　　　　　　　　　　　**14**

1) What is the unit of Radioactivity ?

2) What is the critical mass of plutonium ?

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

4) What is transistor ?

5) Which type of semiconductor will be produced after doping of 'Al' in 'Si' ?

6) What is Walsh diagram ?

7) What is the geometry of ClO_3^- ion ?

8) Why the solution of $Cr_2C_7^-$ is intense colored ?

9) What is the CFSE for low spin octahedral complex with d^6 central metal ion ?

P.T.O.

10) What is nephelauxetic parameter (β) ?

11) Draw the structure of $Fe_2(CO)_9$.

12) What is the solution of Schrodinger equation in terms of polar co-ordinates ?

13) What is photoelectric effect ?

14) Give the Schrodinger wave equation.

SECTION – II

2. a) Discuss the separation of variables of wave equation. **7**

   b) Write the postulates of VSEPR theory. Explain the structure of NH_3 molecule. **7**

3. a) What is Jahn-Teller effect ? Explain the distortion of geometry in $[Co\,(NH_3)_6]^{2+}$ complex. **7**

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

4. a) On the basis of band theory, explain various types of metallic solids. **7**

   b) What is tracer technique ? Discuss their applications. **7**

SECTION – III

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

   b) Explain the construction and working of photoconductive cell. **5**

   c) Write down the complete wave functions of s orbital. Explain its shape. **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 bonding in metal carbonyl compounds. **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) G.M. counter
   b) $d\pi$-$p\pi$ bonding
   c) Spectrochemical series
   d) Black body radiation.

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SLR-MD – 140

M.Sc. – I (Semester – I) (Old) Examination, 2016
CHEMISTRY
Organic Chemistry – I (Paper No. – II)

Day and Date : Thursday, 31-3-2016   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 Lewis theory
   ii) Carbocations
   iii) Arynes
   iv) SN^i
   v) Prochirality.

   b) Predict the product(s) :   **5**
   i) Chloroform $\xrightarrow{\text{NaOH}}$?

   ii) Thiophenol $\xrightarrow[\text{ii) 1-bromobutane}]{\text{i) NaOH}}$?

   iii) 2-Butanol + Thionyl chloride $\longrightarrow$?

   iv) Pyridine + Acetylchloride $\longrightarrow$?

   v) Norbornene + Perbenzoic acid $\longrightarrow$? + ?

P.T.O.

c) Assign the R and S nomenclature of the following compounds : **4**
   i) 2-Bromobutane
   ii) 3-Bromo-2-butanol
   iii) Lactic acid
   iv) 4-chloro-2-Methyloctane.

SECTION – II

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

   b) Give an account of following factors affecting reactivity in SN^1 reactions.
      i) Substrate   ii) Solvent
      iii) Leaving group   iv) Attacking nucleophile

3. a) Explain the Aromatic nucleophilic substitution reactions with suitable examples. **7**

   b) Discuss the reaction, mechanism and stereochemical aspects of addition of electrophile to the alkenes. **7**

4. a) What is Hofmann and Saytzeff rule ? Explain with suitable examples. **7**

   b) What is bimolecular elimination reaction ? E2 elimination is an anti-elimination reaction, explain with suitable example. **7**

SECTION – III

5. a) What is Markovnikov's rule ? Explain their orientation and reactivity. **5**

   b) What is reduction reaction ? Explain reduction of alkynes with metal and liquid ammonia with mechanism. **5**

   c) Explain orientation and reactivity of electrophilic substitution of monosubstituted benzene based on charge distribution. **4**

6. a) What is racemic modification ? Explain different racemic modification methods. **5**

   b) What is threo and erythro nomenclature ? Explain with suitable examples. **5**

   c) Discuss conformational analysis of 1, 3-disubstituted cyclohexane. **4**

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

   a) Nucleophilic substitution at an allylic carbon.

   b) Nitrenes

   c) Michael reaction

   d) Ambident nucleophile.

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Seat No.

M.Sc. (Part – I) (Semester – I) Examination, 2016
CHEMISTRY (Old)
Paper – III : Physical Chemistry – I

Day and Date : Saturday, 2-4-2016　　　　　　　　　　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. Answers the following.　　　　　　　　　　　　　　　　　　**14**

　 i) Give the expression for Gibb's phase rule. Mention the significance of terms involved.

　 ii) In adiabatic process

　　　 a) $q = 0$　　　　 b) $S = 0$　　　　 c) $V = 0$　　　　 d) $H = 0$

　 iii) Write the mathematical expression for combined form of first and second law of thermodynamics.

　 iv) What is polydispersity ?

　 v) State Boltzmann-Planck equation.

　 vi) Complete the equation $(dS/dV)_T = (\underline{\qquad} /dT)_V$.

　 vii) Give the statement of third law of thermodynamics.

　 viii) Name the best source used in flash photolysis technique.

　 ix) Give the expression for relaxation time.

　 x) What is degree of polymerization ?

P.T.O.

xi) What is ensemble ?

xii) Give the significance of the term entropy.

xiii) Define thermodynamic probability.

xiv) Mention any two thermodynamic state functions.

SECTION – II

2. a) Discuss the freezing point depression method of determination of activity coefficient. **7**

   b) Describe the viscosity method for the determination of molecular weight of the polymer. **7**

3. a) Illustrate the different steps involved in determination of absolute entropy of a gas at room temperature. **7**

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

4. a) Discuss in detail the study of kinetics by stop-flow technique. **7**

   b) Show that $P = T \left(\partial P/\partial T\right)_V - \left(\partial E/\partial V\right)_T$. **7**

SECTION – III

5. a) Explain entropy change during phase transformations. **5**

   b) What is sol. ? Discuss different types of sols. **5**

   c) What is configuration and microstates ? Explain with suitable example. **4**

6. a) Discuss the concept of ensemble taking an example of canonical ensemble. **5**

   b) Write a note on Henry's law. **5**

   c) Evaluate entropy change when 3 moles of gas is heated from 27°C to 327°C at constant pressure of 1 atm. The heat capacity of the gas is 37.5 J/K. **4**

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

   a) Magnetic resonance method for fast reaction study

   b) Critical micelle concentration

   c) Most probable configuration

   d) Chain polymerization.

Seat No.

M.Sc. – I (Semester – I) Examination, 2016
CHEMISTRY (Old)
Analytical Chemistry – I (Paper – IV)

Day and Date : Tuesday, 5-4-2016　　　　　　　　　　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) What is RF factor ?

   b) DME can be applied over the range.

   c) Define precision .

   d) What is a determinate error ?

   e) Define column resolution.

   f) What is ascending chromatography ?

   g) Define software.

   h) The capillary constant in Ilkovic equation is given by_____

   i) Calculate significant figures in 21.697 – 20.802.

   j) Name the softwares used in computer.

P.T.O.

k) Define accuracy.

l) The current due to supporting electrolyte is called as _____

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

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

SECTION – II

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

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

3. 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**

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

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

   b) Use of internet in computer.

   c) Determinate error.

   d) Application of polarography.

_____

Seat
No.

M.Sc. (Part – I) (Semester – II) Examination, 2016
CHEMISTRY (Paper – V) (New CBCS Pattern)
Inorganic Chemistry – II

Day and Date : Wednesday, 30-3-2016 Max. Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

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

ii) Section **I** (Q. **1**) is **compulsory**.

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

iv) Answer to **all** questions should be written in **same** answer book.

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

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

vii) **Neat** and labeled diagrams should be drawn **wherever** possible.

viii) **Use** of log table and calculators is **allowed**.

SECTION – I

1. Answer the following : **14**

   1) $2XeF_6 + SiO_2 \rightarrow ?$

   2) Which catalyst is used for alkene hydrogenation ?

   3) Give the relation between stepwise and overall stability constants.

   4) What is lanthanide contraction ?

   5) What is the specific gravity of tinstone mineral ?

   6) How many copper ions are present in heamocynine molecule ?

   7) How the sodium salt of nitroxylic acid is prepared ?

   8) For which reaction, Ziegler and Natta catalyst is used ?

   9) What is chelate effect ?

   10) Which tri-positive actinide ion has lowest magnetic moment ? **P.T.O.**

11) What is the boiling point of Silver ?

12) What is the name of electron transport protein in bacteria ?

13) How many B-B bonds are present in $B_{10}H_{14}$ molecule ?

14) What are the ylides ?

SECTION – II

2. a) What are the carboranes ? How are boranes and carboranes classified ? Discuss how carboranes are prepared. **7**

   b) Give the physical and chemical properties of ferrocence. **7**

3. a) Explain factors affecting stability constant referring to the properties of metal ion. **7**

   b) Discuss the electronic configuration and magnetic properties of actinides. **7**

4. a) Explain the process of extraction of tin from tinstone ore. **7**

   b) What is photosynthesis ? Explain the working of photosystems. **7**

SECTION – III

5. a) Explain the synthesis and structure of sulphur nitrogen compounds. **5**

   b) Discuss Monsanto acetic acid process. **5**

   c) Explain ion exchange method for separation of lanthanides. **4**

6. a) What are the carbides ? How do we classify them ? **5**

   b) Comment on role of organometallic compounds of transition metals as catalyst. **5**

   c) Give the different properties of copper. **4**

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

   a) Pseudohalides

   b) Hydroformylation

   c) Mole ratio method

   d) Nitrogen fixation.

_____

SLR-MD – 144

M.Sc. – I (Semester – II) (New) (CBCS) Examination, 2016
CHEMISTRY (Paper – VI)
Organic Chemistry – II

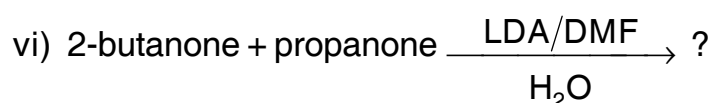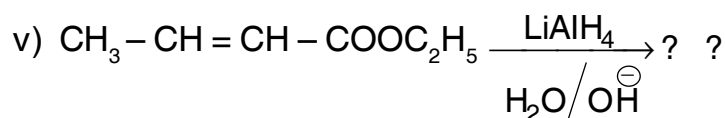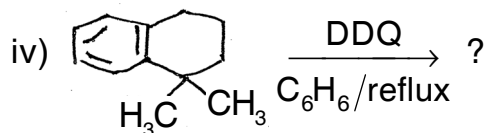Day and Date : Friday, 1-4-2016   Max. Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

Instructions : 1) Attempt in **all five** questions.
2) Question **1** is **compulsory**.
3) Attempt **any two** questions from Section **II** and **any two** question from Section **III**.
4) Answer to **all** questions should be written in **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) Diaryl compounds can be prepared by _____ reaction.
      a) Ullmann   b) Stobbe   c) Dakin   d) Mc- Murry
   ii) For the synthesis of less substituted enolates _____, reagent is used.
      a) LDA   b) DCC   c) DDQ   d) 1, 3- dithiane
   iii) O-Nitrobenzaldehyde on MPV reduction gives _____
      a) O- aminobenzaldehyde   b) O-nitrobenzyl alcohol
      c) O-aminobenzyl alcohol   d) O-aminomethyl benzene
   iv) Cyclic ketone on reaction with per-acid gives _____
      a) ester   b) acid   c) alcohol   d) lactone

   B) Predict the product(s).   **10**

   i) Cyclohexanone $\xrightarrow{\quad Ph_3P = CH - COOC_2H_5 \quad}$?

   ii) Tripropylborane $\xrightarrow{\quad CH_3COOH \quad}$?

iii) Pyrrole $\xrightarrow{\text{alk.chloroform}}$? + ?

iv) $\xrightarrow[\text{C}_6\text{H}_6/\text{reflux}]{\text{DDQ}}$?

v) $CH_3 - CH = CH - COOC_2H_5 \xrightarrow[H_2O/O\overset{\ominus}{H}]{LiAlH_4}$? ?

vi) 2-butanone + propanone $\xrightarrow[H_2O]{LDA/DMF}$?

vii) l- phenyl ethanol $\xrightarrow{MnO_2/CCl_4}$?

viii) Pent-3-en-2-one $\xrightarrow[H_2O/H^+]{\text{Methyl Lithium}}$?

ix) P- methoxystyrene $\xrightarrow{BH_3}$?

x) $CH_3 - \underset{\underset{Br}{|}}{CH} - \overset{\overset{O}{||}}{C} - \underset{\underset{Br}{|}}{CH} - CH_3 \xrightarrow[H_2O/H^+]{C_2H_5ONa}$
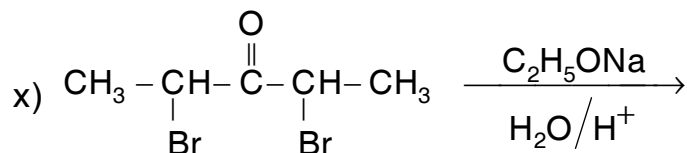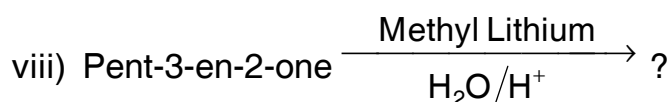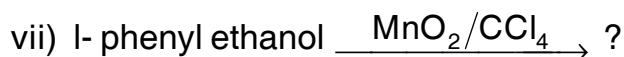
SECTION – II

2. A) What happens when diethylpimelate is subjected to reaction with sodium ethoxide ? Explain reaction and mechanism. **7**

   B) What are crown ethers ? Give the synthesis of [18] crown-6. Discuss characteristics of crown ethers. Outline their synthetic applications. **7**

3. A) Predict the product in the following reaction. Discuss migratory aptitude of the groups and mechanism of the reaction. **7**

   P-methoxyacetophenone $\xrightarrow{\text{m}-\text{bromo perbenzoic acid}}$?
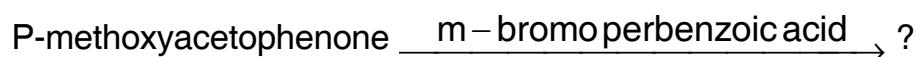
   B) Complete the following reaction and propose its mechanism. **7**

   $R - \overset{\overset{}{\underset{\underset{O}{||}}{C}}}{} - O - R' \xrightarrow{LiAlH_4}$? + ?
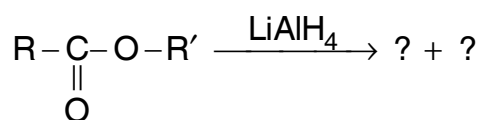
4. A) Discuss synthesis and reactivity of organomagnesium halides. Give an account of preparation of primary, secondary and tertiary alcohols using organomagnesium halide. **7**

   B) Define the following terms used in the synthesis **7**
   i) Target molecule (TM)
   ii) Disconnection
   iii) Functional Group Interconversion (FGI)
   iv) Retrosynthetic approach
   v) Synthon.

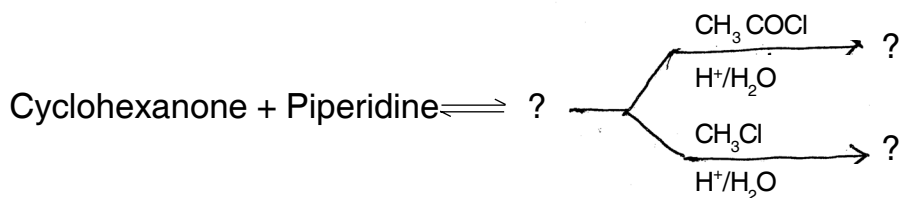   Outline the retrosynthetic analysis of the following molecule and suggest synthesis.
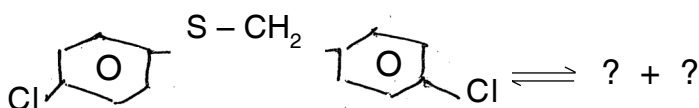
SECTION – III

5. A) Complete the following reaction. Discuss stereochemistry and mechanism. **5**

   $$1-\text{methylcyclohexene} \xrightarrow[\text{ii) O}\overset{\ominus}{\text{H}}/\text{H}_2\text{O}_2]{\text{i) BH}_3} \text{?}$$
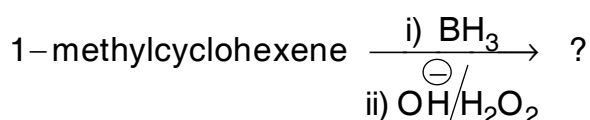
   B) Predict the product(s) in the following reaction. Discuss mechanism of the reaction. **5**

   Cyclohexanone + Piperidine $\rightleftharpoons$?

   $\xrightarrow[\text{H}^+/\text{H}_2\text{O}]{\text{CH}_3\text{COCl}}$?

 $\xrightarrow[\text{H}^+/\text{H}_2\text{O}]{\text{CH}_3\text{Cl}}$?

   C) Outline the principle of protection of an amino group. Discuss in detail carbamates as protecting groups for amines. **4**

6. A) Complete the following reaction and propose mechanism. **5**

   $$\text{O}-\text{hydroxybenzaldehyde} \xrightarrow{\text{alk. H}_2\text{O}_2} \text{?}$$

B) What are phase transfer catalysts ? Give an account of various factors influencing phase transfer reactions. Discuss applications of phase transfer catalysts in organic synthesis. **5**

C) Predict the product in the following reaction. Suggest suitable mechanism. **4**

$$CH_2 = CH - \underset{\underset{OH}{|}}{C}H - CH_3 \xrightarrow[\text{acetone}/\Delta]{\text{Al.t-butoxide}} ?$$
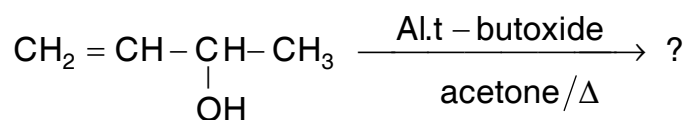
7. Write notes on **(any three)** : **14**

   i) Stobbe reaction.

   ii) Use of Merrifield resin- in polypeptide synthesis.

   iii) Birch reduction.

   iv) Synthetic applications of organo-copper compounds.

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SLR-MD – 145

M.Sc. (Part – I) (Semester – II) Examination, 2016
CHEMISTRY (Paper – VII) (CBCS New)
Physical Chemistry – II

Day and Date : Monday, 4-4-2016　　　　　　　　　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) Which type of transitions causes fluorescence emission ?

   ii) What do you mean by steady state approximation ?

   iii) Define fluorescence. Mention its lifetime.

   iv) Order of a reaction may be zero, integer and half integer. True/False.

   v) Estimate ionic strength of 0.25 m solution of sulphuric acid.

   vi) Define quantum yield.

   vii) What is zeta potential ?

   viii) Mention basic constituents of a cell.

   ix) Represent lead storage battery.

   x) What is exergonic biochemical reaction ?

P.T.O.

xi) Give mathematical expression for Stern-Volmer equation.

xii) Mention radiationless phophysical pathways.

xiii) Define quenching process.

xiv) What do you mean by electrical double layer ?

SECTION – II

2. a) Illustrate kinetics of bimolecular quenching process. **7**

   b) Discuss the method of determination of dissociation constant of monobasic acid by e.m.f. method. **7**

3. a) Describe the method for evaluation of mean ionic activity coefficients from e.m.f. data. **7**

   b) Discuss in detail green house effect. **7**

4. a) Applying steady state approximation, discuss the kinetics of thermal decomposition of acetaldehyde. **7**

   b) Explain excitation energy transfer mechanism by giving suitable examples. **7**

SECTION – III

5. a) Explain Franck - Condon principle. **5**

   b) Write on Stern's electrical double layer model. **5**

   c) Discuss kinetics of reaction between NO_2 and F_2. **4**

6. a) Describe ozone decomposition reactions. **5**

   b) Explain how ionic strength affects the rate of ionic reactions. **5**

   c) Distinguish between eukaryotic and prokaryotic cell. **4**

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

   a) Jablonski's diagram

   b) Higher order kinetics

   c) Fuel cells

   d) Nucleic acid : DNA.

_____

Seat No.

M.Sc. – I (Semester – II) Examination, 2016
CHEMISTRY (C.B.C.S.)
Analytical Chemistry – II (Paper – VIII) (New)

Day and Date : Wednesday, 6-4-2016　　　　　　　　　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** questions (Section **I, II** and **III**) should be written in **one** answer book.
　　　　　　　　 5) **All** questions carry **equal** marks.
　　　　　　　　 6) Figures to the **right** indicate **full** marks.
　　　　　　　　 7) **Use** of log tables and calculators is **allowed**.

SECTION – I

1. Answer the following :　　　　　　　　　　　　　　　　　　　　　　**14**

   a) What is the function of nebulizer in ICP ?

   b) Define spin-spin relaxation.

   c) Which is most abundant peak in alkyl aniline ?

   d) Predict the transition involved in methyl chloride.

   e) The n-propyl cyclohexene shows the base peak _____

   f) Write the wavelength range of finger print region in IR.

   g) Predict the modes of vibration in ethane molecule.

   h) 1-Phenyl ethanol shows the base peak at m/z 107 due to _____ ion.

   i) Name the factors affecting chemical shift.

   j) What is the nuclear spin value for C^{12} and O^{16} nuclei ?

   k) Define absorbance.

   l) The most intense peak in the mass is known as _____ peak.

   m) Define coupling constant.

   n) Name the different types of atomizers used in AAS.

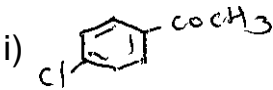**P.T.O.**

SECTION – II

2. a) Define the term chemical shift. Explain the shielding and deshielding effect. **7**

   b) What is the basic principle of AAS ? Explain the different types of interference in AAS. **7**

3. a) Explain the effect of following factors on vibrational frequencies in IR spectroscopy. **7**

   b) Explain the fragmentation pattern in n-propyl cycloalkane and 1-butanol. **7**

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

   b) Deduce the structure of an organic compound on the basis of following data : **7**

   Molecular Formula C_8H_7N

   IR-2220, 1600, 1595, 745, 690 cm^{-1}

   PMR (δ) : 3.6, 2H, S ; 7.25, 5H, S

   Mass (m/z) : 77, 90, 91, 117 (m$^+$)

SECTION – III

5. a) With the help of Woodward and Fieser's rules. Calculate the λ max values for following compounds. **5**

   i)   ii)

   b) Discuss in brief spin-spin coupling. **5**

   c) Explain in brief Chemical shift. **4**

6. a) Explain TMS is used as internal standard in PMR spectroscopy. **5**

   b) Give applications of ICP-AES. **5**

   c) Describe fragmentation pattern of ethyl benzene. **4**

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

   a) Quantitative applications of UV-Visible Spectrophotometer

   b) Anisotropic effect

   c) McLafferty rearrangements

   d) Sample handling in IR Spectroscopy.

Seat No.

M.Sc. – I (Semester – II) Examination, 2016
INORGANIC CHEMISTRY – II (Paper – V)
(Old CGPA)

Day and Date : Wednesday, 30-3-2016　　　　　　　　Total Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

Instructions : 1) Attempt in **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.

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

P.T.O.

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

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

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

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

_____

Seat No.	

M.Sc. – I (Semester – II) (Old CGPA) Examination, 2016
CHEMISTRY (Paper – VI)
Organic Chemistry – II

Day and Date : Friday, 1-4-2016   Max. Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

Instructions : 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.
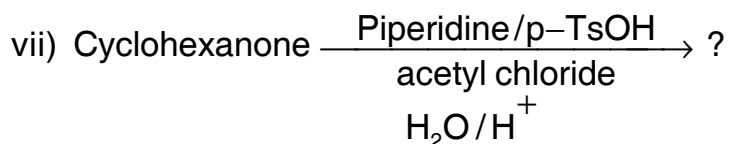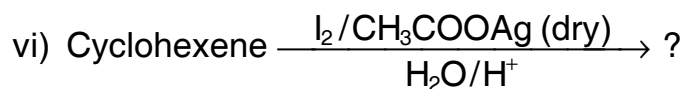7) **Use** of logtable and calculator is **allowed**.

SECTION – I

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

 i) Ullmann reaction is useful for the preparation of _____
  a) hydroxy aldehyde   b) biphenyl
  c) catechol   d) 2-amino pyridine

 ii) Among the following reactions which is useful for making terminal or exocyclic double bond ?
  a) Peterson   b) Simmon-Smith
  c) Dakin   d) McMurry

 iii) One mole of $LiAlH_4$, reduces _____ moles of an ester.
  a) 2   b) 4   c) 1   d) 3

 iv) Witting reaction proceeds via the formation of _____ intermediate.
  a) cyclopropanone   b) betaine
  c) ylide   d) dichloro carbene

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

i) Propyne $\xrightarrow[\text{ii) CH}_3\text{Br}]{\text{i) CH}_3\text{MgI}}$?

ii) + 1-butenone $\xrightarrow[\text{2) K}_2\text{CO}_3/\text{MeOH}/\Delta]{\text{1) CH}_3\text{OK}/\text{THF}}$?

iii) Propiophenone $\xrightarrow{\text{Zn(Hg)/HCl}}$?

iv) Isopropyl alcohol $\xrightarrow[\text{CH}_3\text{COCH}_3]{\text{Al(OCMe}_3)_3}$?

v) $CH_3 - CH = CH - \underset{\underset{O}{\|}}{C} - CH_3$ $\xrightarrow[\text{H}_2\text{O/H}^+]{\text{CH}_3\text{Li}}$?

vi) Cyclohexene $\xrightarrow[\text{H}_2\text{O/H}^+]{\text{I}_2/\text{CH}_3\text{COOAg (dry)}}$?

vii) Cyclohexanone $\xrightarrow[\substack{\text{acetyl chloride} \\ \text{H}_2\text{O/H}^+}]{\text{Piperidine/p–TsOH}}$?
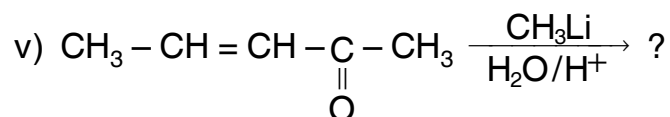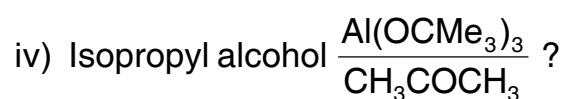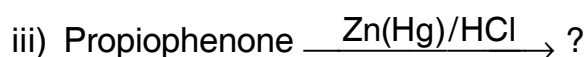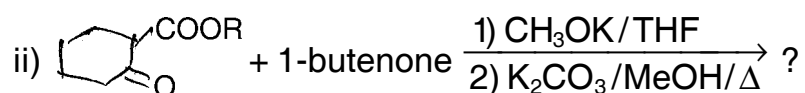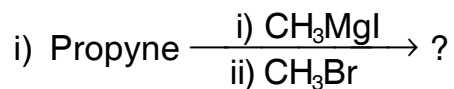
C) Suggest the suitable reagent/catalyst/conditions for the following transformations : **3**

i) $\xrightarrow{?}$

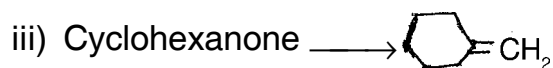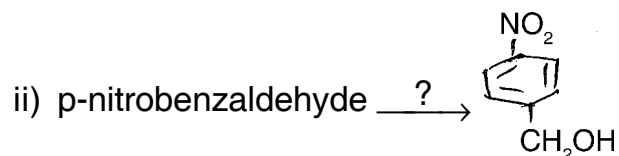ii) p-nitrobenzaldehyde $\xrightarrow{?}$
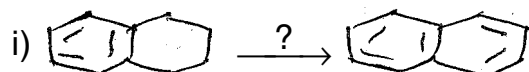
iii) Cyclohexanone $\longrightarrow$

SECTION – II

2. A) Give synthetic applications of dicyclohexyl-carbodiimide. **7**

   B) Predict the products in the following reaction. **7**

   Pyrrole $\xrightarrow{\text{alk.chloroform}}$? + ?

3. A) How will you convert cyclohexanone to cyclohexane by using hydrazine under basic conditions ? **7**

   B) What are synthans and synthetic equivalents ? Explain with the help of suitable example. Using disconnection approach, outline the synthesis for the following : **7**

   $H_5C_2O - \underset{\underset{O}{\|}}{C} - \langle \rangle - NH_2$
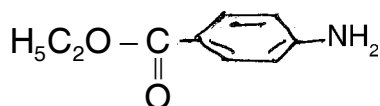
4. A) Give the method for the preparation of organozinc compounds. Complete the following reactions. Give applications of organozinc compounds. **7**

   i) Cyclohexene $\xrightarrow{CH_2I_2/(CH_3)_2Zn}$?

   ii) $\xrightarrow[(C_2H_5)_2Zn]{CH_2I_2}$?
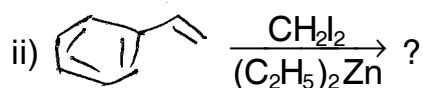
   B) Discuss the mechanism involved in the conversion of alcohol to ketone in the presence of aluminium t-butoxide in benzene. Give applications of the reaction. **7**

SECTION – III

5. A) What are enamines ? Give their formation. Complete the following reaction. Discuss its mechanism **5**

   $CH_3 - \underset{\underset{CH_3}{|}}{CH} - \underset{\underset{O}{\|}}{C} - CH_3 \xrightarrow[\underset{H_2O/H^+}{C_2H_5Cl}]{\text{piperidine}/p-TsOH}$?
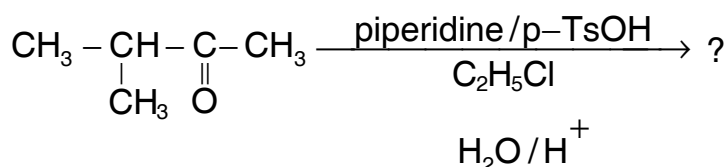
   B) Predict the product and propose mechanism for the following : **5**

   Benzoic acid $\xrightarrow{Na/liq.NH_3}$?

C) What are crown ethers ? Discuss applications of crown ethers in organic synthesis. **4**

6. A) Discuss the principle of protection of carbonyl group. Describe the use of cyclic acetals as protecting groups for carbonyl compounds. **5**

B) Complete the following reaction. Suggest mechanism. Discuss its stereochemistry **5**

1-methyl cyclopentene $\xrightarrow[\overline{OH}/H_2O_2]{BH_3/THF}$?
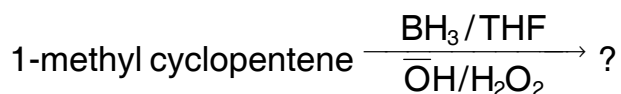
C) Based on disconnection approach, give the convenient synthesis of the following alkene via Wittig reaction. Predict mechanism. **4**
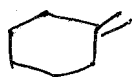
7. Write notes on **(any three)** : **14**

   i) Stobbe reaction.

   ii) Catalytic hydrogenation using homogeneous catalysts.

   iii) Protection and deprotection of amino group.

   iv) Wittig reaction.

_____

Seat
No.

M.Sc. (Part – I) (Semester – II) (Old CGPA) Examination, 2016
CHEMISTRY (Paper – VII)
Physical Chemistry – II

Day and Date : Monday, 4-4-2016　　　　　　　　　　　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) What do you mean by rate determining step ?

   b) Mention basic units (bases) of DNA.

   c) Draw structure of ADP.

   d) The order of an elementary step is always equal to its molecularity. True/False.

   e) Mention different types of delayed fluorescence.

   f) Define excimer.

   g) Mention different green house gases.

   h) What do you mean by Zeta potential ?

   i) Give the mathematical formula for ionic strength. State the significance of the terms involved in it.

   j) Represent one alkaline storage battery.

P.T.O.

k) Internal conversion is _____ process.
   a) radiative
   b) Radiationless
   c) Photonic
   d) all of these

l) Give the expression for Beer-Lambert's law.

m) Put the mathematical expression for Debye-Huckel Limiting law.

n) What is quenching process ?

SECTION – II

2. a) With the help of suitable diagram explain various photophysical pathways. **7**

   b) Explain the method of determination of dissociation constant of monobasic acid by e.m.f. measurement. **7**

3. a) Using double sphere model, illustrate the influence of solvent on the rate of ionic reaction in solution state. **7**

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

4. a) Give an account of bimolecular collisional quenching. **7**

   b) State Franck-Condon principle. Discuss the shapes of absorption bands using this principle. **7**

SECTION – III

5. a) Describe folding and unfolding phenomena of the proteins. **5**

   b) With the help of Jablonski's diagram mention various radiative and non-radiative transitions. **5**

   c) Write on fractional order kinetics. **4**

6. a) State and explain the laws of photochemistry. **5**

   b) Discuss exergonic and endorgenic biochemical reactions. **5**

   c) Calculate ionic strength of a solution which is made by mixing 20 ml of 0.1 m KI and 20 ml of 0.1 m $K_2S_2O_8$. **4**

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

   a) Franck-Condon principle.

   b) Steady state approximation.

   c) Characteristics of exciplex species.

   d) Photodissociation and predissociation.

_____

Seat No.

M.Sc. – I (Semester – II) Examination, 2016
CHEMISTRY (Old CGPA)
Analytical Chemistry – II (Paper – VIII)

Day and Date : Wednesday, 6-4-2016

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** 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 wavelength range of finger print region in IR.

   b) Predict the modes of vibration in ethane molecule.

   c) 1-Phenyl ethanol shows the base peak at m/z 107 due to _____ ion.

   d) Name the factors affecting chemical shift.

   e) What is the nuclear spin value for C^{12} and O^{16} nuclei ?

   f) Name the detectors used in UV-visible spectrophotometer.
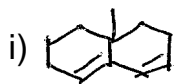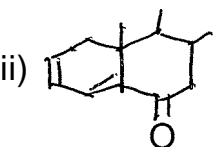
   g) What do you mean by base peak ?

P.T.O.

h) Define absorbance.

i) How will you distinguish between cis and trans 1, 3, 5 Hexatrene by UV ?

j) Define coupling constant.

k) Name the different types of atomizers used in AAS.

l) What is the function of nebulizer in ICP ?

m) Define spin-spin relaxation.

n) Which is most abundant peak in benzene ?

SECTION – II

2. a) Explain the effect of following factors on vibrational frequencies in IR spectroscopy. **7**

   b) Explain the fragmentation pattern in t-butyl alcohol and 1-butanol. **7**

3. a) Deduce the structure of an organic compound on the basis of following data : **7**

   Molecular Formula : C_7H_7OCl

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

   PMR (ppm) : 2.5 (S, 3H)

              7.3 (d, J = 8 Hz, 2H)

              7.9 (d, J = 8 Hz, 2H)

   Mass (M/z) : 154/156 (3 : 1)

             139/141 (3 : 1)

             111/113 (3 : 1)

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

4. a) Define the term chemical shift. Explain the shielding and deshielding effect. **7**

   b) What is the basic principle of AAS ? Explain the difference types of interference in AAS. **7**

SECTION – III

5. a) With the help of Woodward and Fieser's rules calculate the λ_{max} values for following compounds. **5**

   i)

   ii)

   b) Discuss in brief spin-spin coupling. **5**

   c) Explain in brief anisotropic effect. **4**

6. a) Explain TMS is used as internal standard in PMR spectroscopy. **5**

   b) Give applications of ICP-AES. **5**

   c) Describe fragmentation pattern of ethyl benzene. **4**

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

   a) Applications of IR Spectroscopy

   b) FT-NMR

   c) McLafferty rearrangements

   d) Photomultiplier.

_____

Seat No.

M.Sc. – II (Semester – III) (New CGPA) Examination, 2016
ORGANIC CHEMISTRY (Paper – XI)
Photochemistry and Pericyclic Reactions

Day and Date : Saturday, 2-4-2016   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 homolysis of protonated N-haloamines either thermally or photochemically to form amine salts with halogenated alkyl substituents is known as _____ reaction.

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

    iii) The thermal reaction of alkene having an allylic hydrogen with a compound having multiple bond is known as _____ reaction.

    iv) Rotation of bond in same direction either clockwise or anticlockwise is known as _____ rotation.

    v) The thermally induced rearrangement of an allyphenyl ether to an o-allylphenol is known as _____ rearrangement.

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

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

P.T.O.

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

i) Intersystem crossing.

ii) Cope rearrangement.

iii) Suprafacial and antarafacial process.

iv) Chelotropic reactions.

v) Singlet state (S$_1$)

vi) Photo Fries reaction

vii) Photoreduction.

SECTION – II

2. A) Discuss aromaticity of non-benzonoid aromatic compounds. **7**

B) [4 + 2] cycloaddition is thermally allowed process. Explain by correlation diagram method. **7**
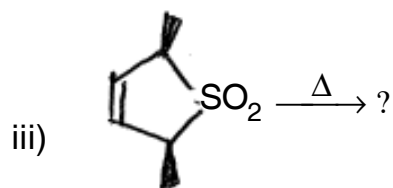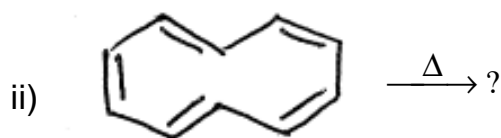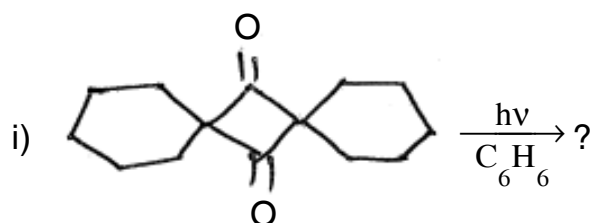
3. A) With the help of symmetry properties of molecular orbitals of cyclohexadiene, show why its con. rotatory conversion to hexatriene is thermally forbidden process. **7**
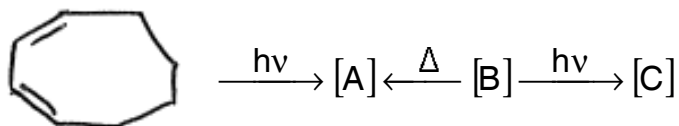
B) Predict the products with mechanism and identify the reaction involved. **7**

i)

$\xrightarrow[C_6H_6]{h\nu}$?

ii)

$\xrightarrow{\Delta}$?

iii)

$SO_2 \xrightarrow{\Delta}$?

4. A) 1, 3 – sigmatropic rearrangement is photochemically allowed process. Explain. **7**

   B) Find A, B, and C. Write selection rules. **7**

$$\xrightarrow{h\nu} [A] \xleftarrow{\Delta} [B] \xrightarrow{h\nu} [C]$$

SECTION – III

5. A) Show the electron distribution in the MO's of the cyclopentadienyl cation and anion. **5**

   B) Explain, why cyclopentadiene is much more acidic than 1, 3-cyclohexadiene. **5**

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

   i)

   ii)
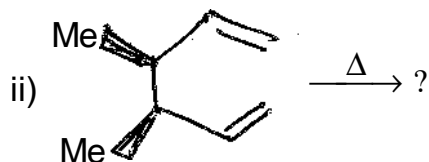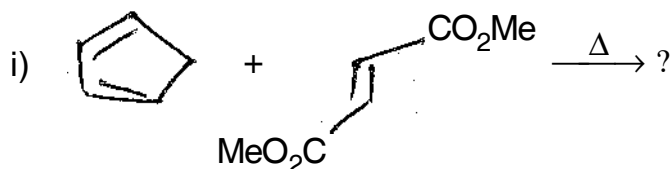
6. A) Describe Norrish type I and II reactions with suitable examples. **5**

   B) Explain Diels- Alder reaction is stereospecific with suitable examples. **5**

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

   i) $2 \, Ph_2 \, C = O \; \dfrac{h\nu}{(CH_3)_2 \, CHOH} \, ?$

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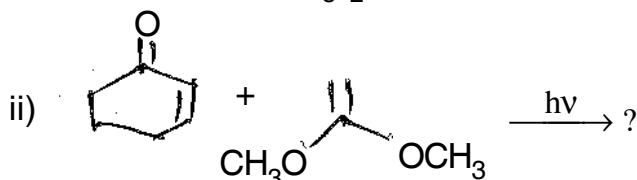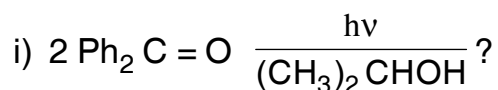
7. Write short notes on (**any three**). **14**

   a) Alternant and Non-alternant hydrocarbons.
   b) Barton reaction.
   c) Photochemistry of 1,3 - butadiene.

   d) Excimers and exiplexes.

Seat No.

M.Sc. – II (Semester – III) (Old-CGPA) Examination, 2016
ORGANIC CHEMISTRY (Paper – IX)
Organic Reaction Mechanism

Day and Date : Tuesday, 29-3-2016   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. Predict the product of following :   **14**

a) $\xrightarrow{\text{KNH}_2}$?

b) + $\xrightarrow{\text{AlCl}_3}$?

c) $\xrightarrow{\text{H}^+}$?

d) —COOH $\xrightarrow[\text{ii) CH}_2\text{N}_2]{\text{i) SOCl}_2}$?
   iii) Ag$_2$O aq.

P.T.O.

e) $\xrightarrow{\text{mCPBA}}$?

f) + $\|$ $\xrightarrow{h\nu}$?

g) $\xrightarrow{\text{AlCl}_3}$?

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

i) + $\overset{\ominus}{C}H_2 - \overset{+}{S}$ $\xrightarrow{\text{DCE}}$?

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

k) $\xrightarrow[\text{ii) H}_2\text{O}]{\text{i) KNH}_2}$?

l) $\xrightarrow[\text{ii) CH}_3\text{ - I}]{\text{i)} \quad / \text{ H}^+}$?

m) + + $\xrightarrow{\text{HCl}}$?

n) $\xrightarrow[\text{ii)}]{\text{i) LDA / ether - 78}^\circ\text{C}}$?
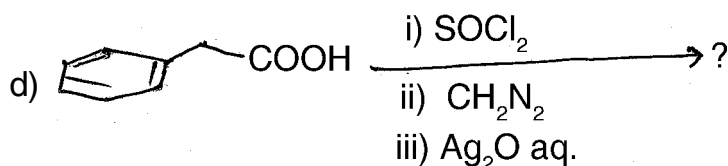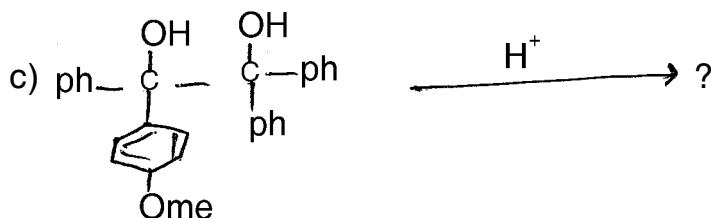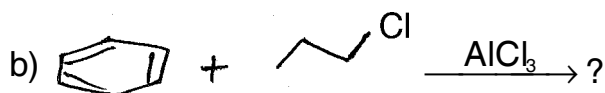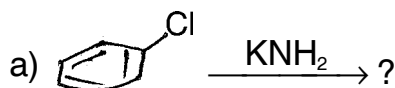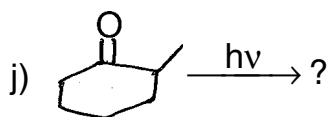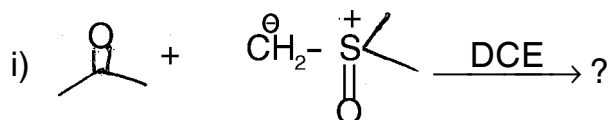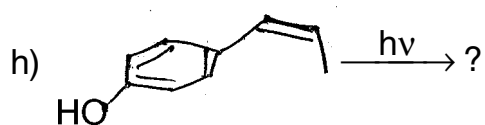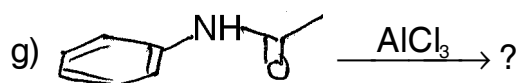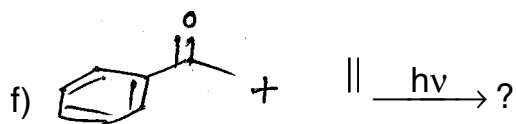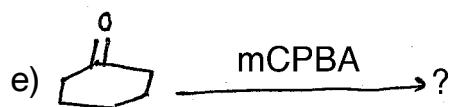
SECTION – II

2. A) What is Smile's reaction ? Explain with suitable examples. **7**

   B) Explain Barton reaction with suitable examples. **7**

3. A) What is enantioselectivity and stereoselectivity of alkylation ? Explain. **7**

   B) Describe Nature's $NaBH_4$ is a nucleotide and explain reductive animation in nature. **7**

4. A) Explain Hammett equation and its modification with suitable examples. **7**

   B) Explain in details of non-classical carbocations. **7**

SECTION – III

5. A) Write any two methods to synthesis of Arynes and explain its chemical properties. **5**

   B) Explain the structure of hemoglobin and its importance in oxygen transport. **5**

   C) Explain Baeyer-Rilliger reaction with suitable examples. **4**

6. A) Explain what is Norrish type-I and Norrish type-II in photochemical reactions. **5**

   B) Write any two methods for generation of sulfur ylides and explain its applications. **5**

   C) Explain paterno-Buchi reaction with suitable examples. **4**

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

   A) Photochemistry of carbonyl compounds

   B) Phosphorus ylides preparation and applications

   C) Mannich reaction

   D) Acylation of alcohols by acyl halides, imidazolides.

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Seat
No.

M.Sc. – II (Semester – III) (Old/C.G.P.A.) Examination, 2016
ORGANIC CHEMISTRY
Paper – X : Advanced Spectroscopic Methods

Day and Date : Thursday, 31-3-2016　　　　　　　　　　　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 the **one** answer book.*
　　　　　　　　iv) ***All** questions carry **equal** marks.*
　　　　　　　　v) *Figures to the **right** indicate **full** marks.*
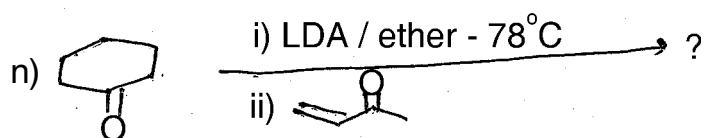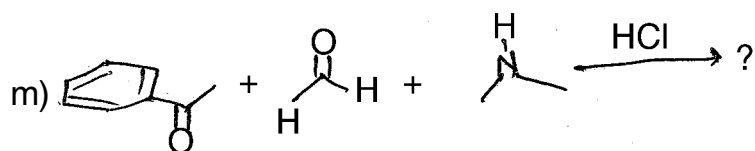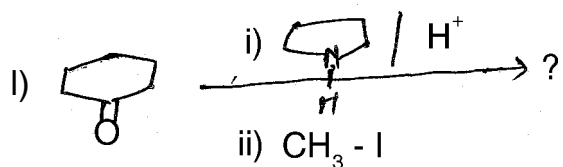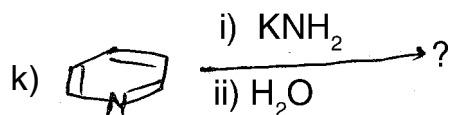　　　　　　　　vi) ***Use** of log table and calculators is **allowed**.*

SECTION – I

1. Answer the following :　　　　　　　　　　　　　　　　　　　　**10**

   A) Choose the correct answer.

   a) The shift of an absorption maximum towards longer wavelength is known as

   　　I) Hypsochromic effect　　　　　II) Bathochromic effect

   　　III) Hyperchromic effect　　　　　IV) Hypochromic effect

   b) The $n - \pi^*$ transition shows absorption at longer wavelength

   　　I) It requires higher energy　　　II) It requires minimum energy

   　　III) It is below V.U. region　　　　IV) It has very low intensity

   c) Compound C_5H_{10} shows no absorption at 1380 cm^{-1}. It is

   　　I) Pentene　　　　　　　　　　II) Cyclopentane

   　　III) Pentyne　　　　　　　　　IV) All

   d) The increasing order of streching frequencies for $c \equiv c$, $c = c$ and $c - c$ is

   　　I) $c - c > c = c > c \equiv c$　　　　II) $c \equiv c > c = c > c - c$

   　　III) $c = c < c - c > c \equiv c$　　　IV) None of the above

P.T.O.

e) Ring strain in lactone or a lactam

   I) Increases carbonyl streching frequency

   II) Decreases carbonyl streching frequency

   III) Increases c = c frequency

   IV) Decreases c = c frequency

f) HETCOR spectra is used to detect directly bonded

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

g) When a carbon is bonded to two hydrogens and to two different groups, the two Hs are

   I) Distereotopic protons   II) Enantiotopic protons

   III) Heterotopic protons   IV) All

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

   I) Noise decoupling   II) Broad band decoupling

   III) Off-resonance decoupling   IV) All

i) In proton decoupled CMR spectra, o, m and P-xylenes exhibit signals respectively.

   I) 3, 4, 5   II) 4, 5, 3   III) 5, 4, 3   IV) 3, 5, 4

j) Alkyl anilines exhibit the base peak at m/e = 106. The ion responsible for it is

   I) Azatropylium ion   II) Anilinium ion

   III) Tropylium ion   IV) All of the above

B) Answer the following :   **4**

a) Why ^1H, ^{15}N, ^{19}F, ^{31}P etc. show NMR spectra ?

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

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

and
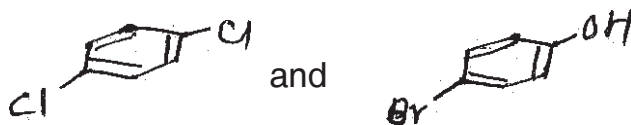
d) How can IR distinguish between following pair of the compounds ?

   I)   and   II)

SECTION – II

2. A) Explain chemical and magnetical equivalence phenomenon in NMR spectroscopy. **7**

B) How will you distinguish following using spectroscopic methods ? **7**

i) and

ii) and

iii) and
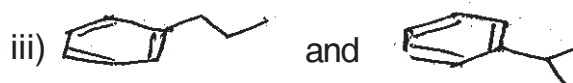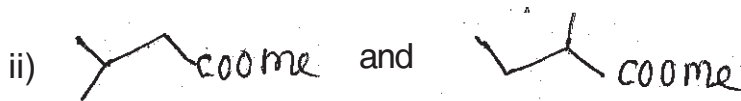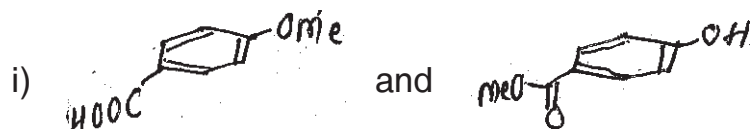
3. A) Deduce the structure of compound using given spectral data **7**

Molecular formula : $C_7H_4O_3NCl$

UV : 255 nm (ε, 12000)

IR : 1770, 1530, 850, 1350 cm^{-1}

PMR (δ) : 8.03 (d, J = 8 Hz, 12 mm)

in

PPM   8.13(d, J = 8 Hz, 12 mm)

B) A compound with molecular formula, $C_7H_5OCl_3$ shows a three proton singlet at δ 3.9 and two one proton doublets.(J = 8Hz) at δ 6.76 and 7.3. Identify the compound. **7**

4. A) Explain the following with suitable example. **7**

i) Mclafferty rearrangement

ii) Nitrogen rule.

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

SECTION – III

5. A) What is ortho effect in mass spectroscopy ? Explain how it is reflected in the mass spectral fragmentation of ortho and para-toluenes. **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 Dichloropropane.

6. A) Explain desorption ionisation techniques (FAB and MALDI). **5**

   B) A compound C_8H_7N shows following CMR signals. Deduce its structure. **5**

   IR – 2200, 1510, 1620 cm^{-1}

   ^{1}H–NMR – 7.2(d), 2H

   (δPPM)   2.4(s), 3H

   7.5(d), $_8H_2$, 2H

   C) What is chemical shift ? Explain factors affecting on chemical shift. **4**

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

   a) AB, AX and A_2 spin system in NMR technique.

   b) HETCOR technique in 2D-NMR spectroscopy.

   c) Mass spectral fragmentation of amines.

   d) Anisotropic effect in NMR spectroscopy.

———————————

Seat No.

M.Sc. – II (Semester – III) (CGPA Old) Examination, 2016
ORGANIC CHEMISTRY (Paper – XI)
Advanced Synthetic Methods

Day and Date : Saturday, 2-4-2016   Maxs. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

Instructions : 1) Attempt in **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) Predict the products of followings :   **7**

i)

$\xrightarrow{Bu_3SnH}$?

ii)

$\xrightarrow[\text{THF, } 0^\circ C]{EtMeCu(CN)Li_2}$?

iii)

+ $Ph - CH_2 - Br$ $\xrightarrow{LDA/DMF}$?

iv)

$\xrightarrow[\text{ii) } Na_2Cr_2O_7/H_2SO_4]{\text{i) } BH_3}$?

v) $Ar - x + R - C \equiv C - H \xrightarrow{\quad \text{pd (o) CuI} \quad}{Et_2NH}$?

vi) $Ar \underset{S}{\overset{S}{\diagdown}} \!\!\!\!\!\!\! \xrightarrow{\quad Hg\,(ClO_4)_2/MeOH - CHCl_3 \quad}$?

vii) [pyridine with Br] $+$ [CH₂=CH-ph] $\xrightarrow[p\,(O-Me\,C_6H_4)_3/100°C]{\quad pd\,(OAC)_2 \quad}$?
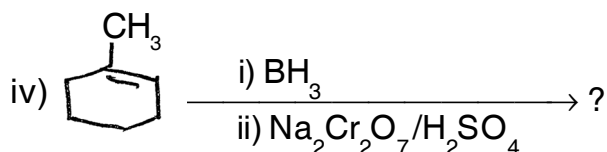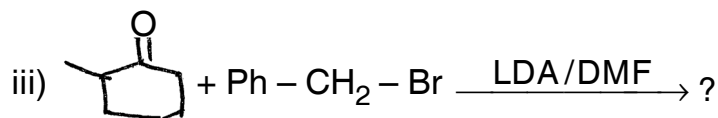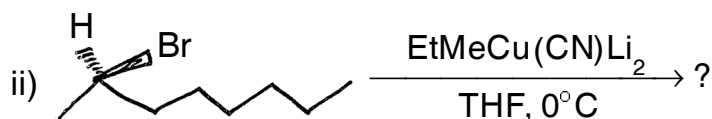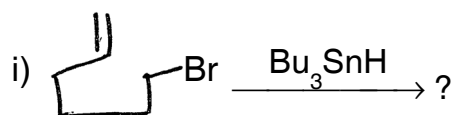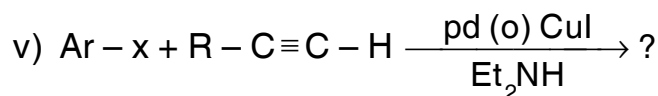
B) Define the following terms :   **7**

    i) Functional group interconversion

    ii) Deprotection

    iii) Umpolung

    iv) Transmetalation

    v) Chemoselectivity

    vi) Hydroboration

    vii) Hydroformylation.

SECTION – II

2. a) Explain the role of LDA in organic synthesis.   **7**

   b) Discuss the importance of the order of events in organic synthesis.   **7**

3. a) Discuss the principle of protection of carbonyl group and describe the use of cyclic acetals/ketals as protecting groups for carbonyl compounds.   **7**

   b) Explain synthetic applications of organoboranes in organic synthesis.   **7**

4. a) Give mechanism and synthetic applications of Suzuki coupling reaction.   **7**

   b) Write the reagents and suggest the mechanism for following conversions. (**any three**) :   **7**

i) $\underset{H_3C}{\overset{CH_3}{\diagup}} \!\!\! CH - COOH \xrightarrow{\quad ? \quad} \underset{H_3C}{\overset{H_3C}{\diagdown}} \!\!\! \underset{R}{\overset{}{C}} - COOH$

ii)

Minor + Major

iii) $CH_2 = CH_2 \xrightarrow{\quad ? \quad} CH_3CHO$

iv)
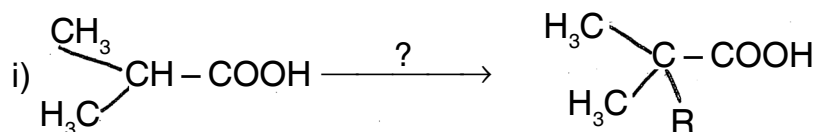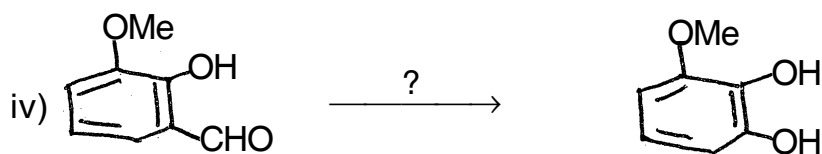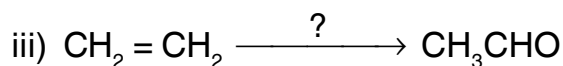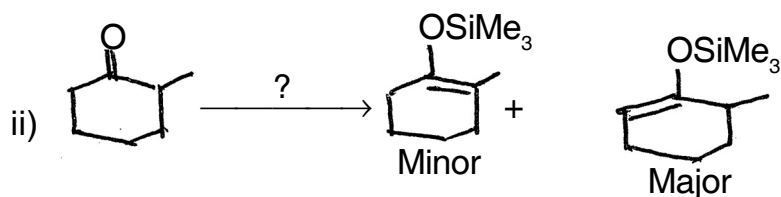
SECTION – III

5. a) Give a retrosynthetic analysis and the corresponding synthesis of following compounds : **5**

   i)

   ii)

   iii)
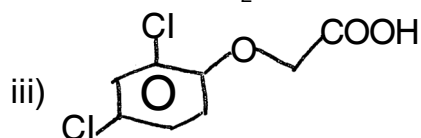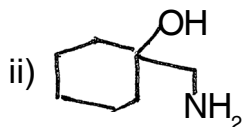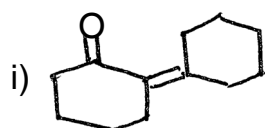
   b) Discuss the synthesis of amine by using disconnection approach. **5**

   c) Explain the role of O_3 in organic synthesis. **4**

6. a) Describe the reactions of Iron Carbonyls and Ferrocenes. **5**

   b) Discuss the synthesis and uses of organosilane. **5**

   c) Give the names of various protecting groups for amines with suitable examples. **4**

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

   a) Selenium dioxide

   b) Suzuki coupling reaction

   c) Reversal of polarity

   d) Organo Tin compounds.

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Seat
No.

M.Sc. II (Semester – IV) (New CGPA) Examination, 2016
ORGANIC CHEMISTRY (Paper – XIII)
Advanced Organic Chemistry – II

Day and Date : Wednesday, 30-3-2016   Max. Marks : 70
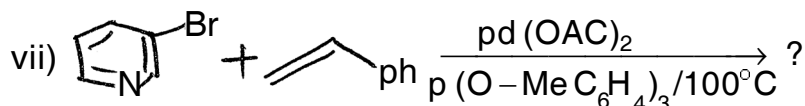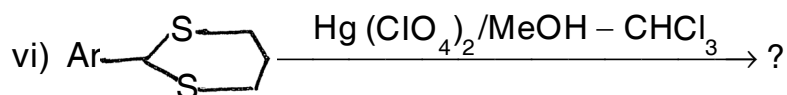Time : 2.30 p.m. to 5.00 p.m.

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) Define the terms of following.   **7**

   i) Protecting groups

   ii) Retrosynthetic analysis

   iii) Carboxylations

   iv) Hydroboration

   v) Functional group interconversion

   vi) Stereoselectivity

   vii) Synthetic equivalents.

   B) Predict the product(s) in the following reaction.   **7**

   i) [benzene-OTF] + Bu_3Sn —CH=CH—CH$_2$—CH(NHAc)—COOEt $\xrightarrow[\text{Asph}_3,\text{THF,heat}]{8\,\text{mol\% pd}_2(\text{dba})_3}$?

   ii) R – COOH + [cyclohexene-O] $\xrightarrow{\text{TsOH,CH}_2\text{Cl}_2}$?

iii)

$$\xrightarrow{\text{HCHO/Me}_2\text{NH}} \ ?$$

iv)

 + CO$_2$Me $\xrightarrow[\text{Et}_3\text{N}, 100°\text{C}]{\text{pd(OAC)}_2}$?

v) R$_3$B $\xrightarrow[\text{NaOH}]{\text{H}_2\text{O}_2}$? + ?

vi) Me OBn $\xrightarrow[\text{O}_2, \text{CuCl}, \text{DMF.H}_2\text{O}]{\text{Cat.pdCl}_2}$?

vii) R – CH $=$ CH$_2$ + CO + R^1– OH $\xrightarrow{\text{CO}_2(\text{CO})_8}$?
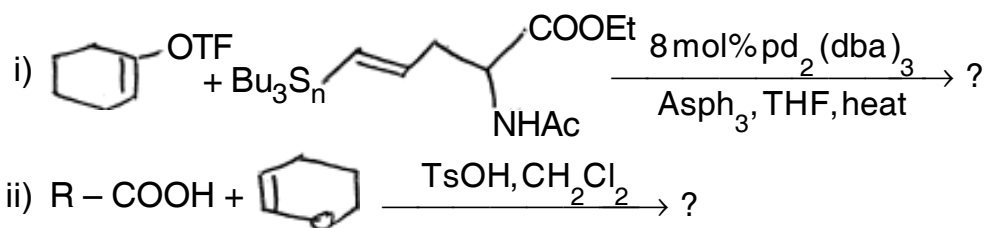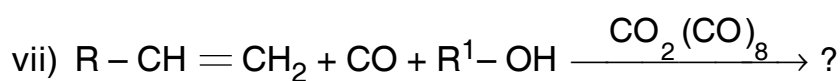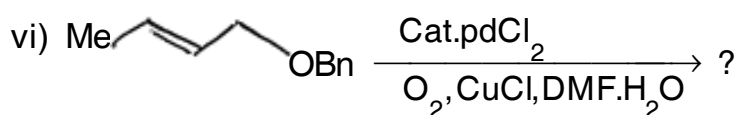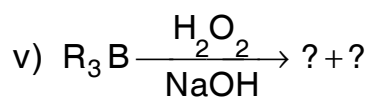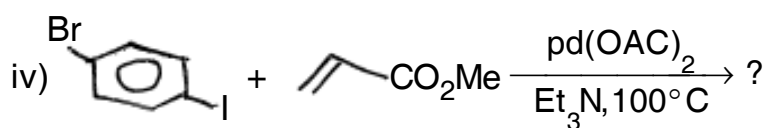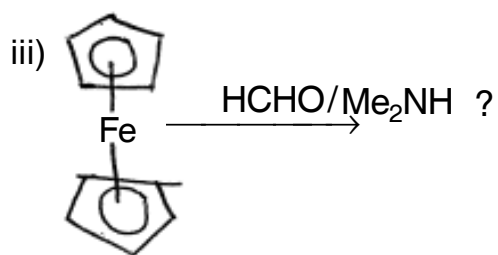
SECTION – II

2. a) Explain synthetic utility of organoboranes.   **7**

   b) Give the applications of silane complexes in organic synthesis.   **7**

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

i)

ii)

COOEt

iii)

NH$_2$
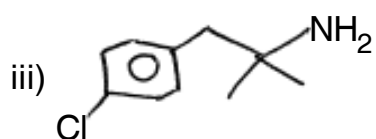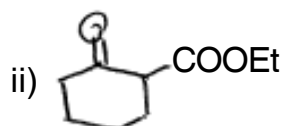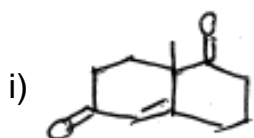
b) Propose the suitable reagents for following transformation and suggest the mechanism. **7**
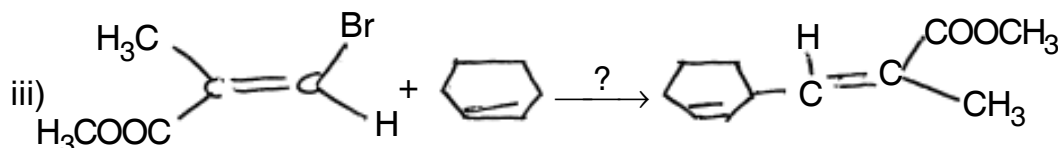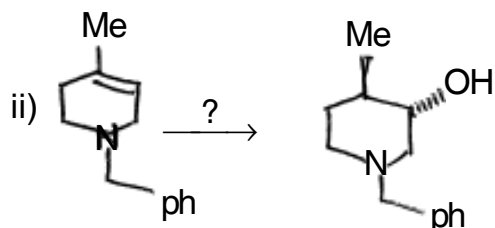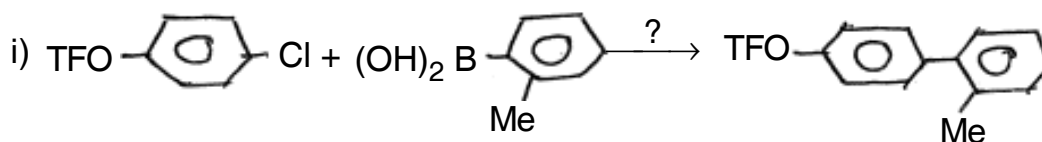
4. a) Give the synthon and synthetic equivalent for the following T.M. **7**
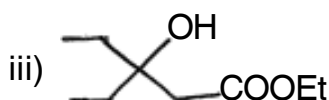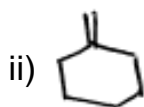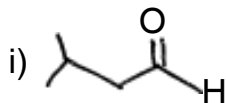
b) Discuss the principle of protection of alchols with suitable examples. **7**

SECTION – III

5. a) Using a suitable protecting group how would you bring about the following conversion ? **5**
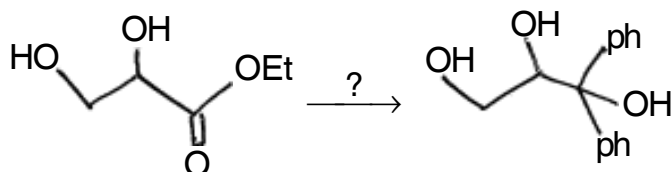
b) Discuss the term regioselectivity with suitable examples. **5**

c) Explain the role of cobalt in organic synthesis. **4**

6. a) Discuss the functional group interconversion with suitable example. **5**

 b) Discuss two group C-C disconnections with suitable examples. **5**

 c) Explain the role of palladium catalyst in coupling reactions. **4**

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

 a) Cyclization reaction

 b) Umpolung reagents

 c) Carbonylation reactions in organoboranes

 d) Cross coupling reactions.

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Seat
No.

M.Sc. – II (Semester – IV) (New CGPA) Examination, 2016
ORGANIC CHEMISTRY (Paper – XIV)
Stereochemistry

Day and Date : Friday, 1-4-2016   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 **right** indicate **full** marks.

SECTION – I

1. Answer the following :

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

a)
i) NBS
ii) 30% NaOH

b)
CH_3
$\overset{\ominus}{O}Et$
Cl

c) ph
(+) IPC – BBM

d)
$\overset{\ominus}{O}AC$
OBS

e)
baker's yeast
CO_2Et allyl alcohol

f)
$$\xrightarrow[\text{ii) } H^+ / H_2O]{\text{i) } Me_2CuLi}$$

g)
$$\xrightarrow[\text{t} - BuOOH , CH_2Cl_2 , -20^\circ C]{Ti(O-i-Pr)_4 , (+) DET}$$

h)
$$\xrightarrow{LiAlH_4}$$

i)
$$\xrightarrow{\triangle}$$

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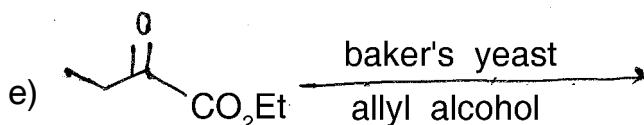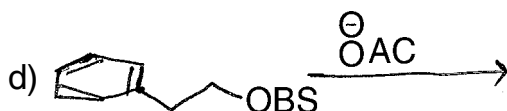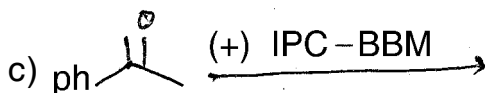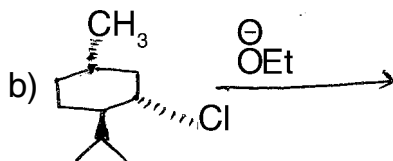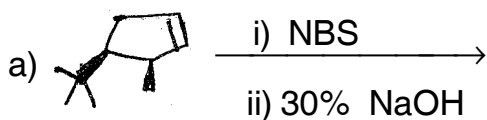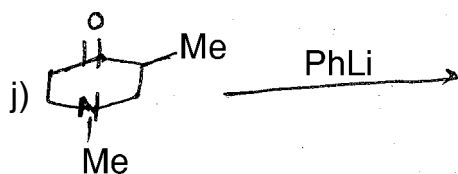
B) Assign R/S configuration to the following : **4**

a)

b)

c)

d)
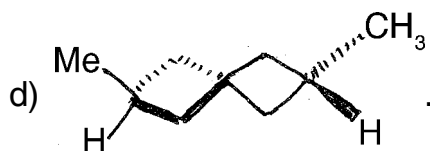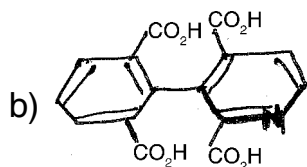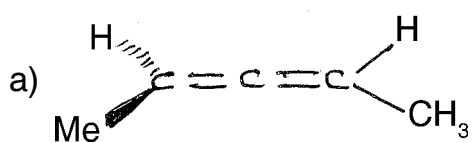
SECTION – II

2. A) Define enantioselective synthesis. Explain enantioselective synthesis with chiral hydrazones. **7**

   B) Discuss the effect of conformation on chemical reactivity in cyclohexane derivatives with respect to

      i) Substitution reaction

      ii) NGP. **7**

3. A) Discuss the structures of different distereomeric forms of perhydro phenanthrene. **7**

   B) Draw the conformation of cis and trans g-methyl decalins and comment on their stability, optical activity, boiling points. **7**

4. A) Explain enantioselective synthesis reactions via chiral hydrazones. **7**

   B) Explain Curtin-Hammett principle with suitable example. **7**

SECTION – III

5. A) What is chiral reagent and chiral catalyst ? Explain it by using CBS reagent and NADH. **5**

   B) What are enantiotopic and distereotopic atoms, groups and faces ? **5**

   C) Explain conformations of the 5, 7 and 8 membered ring. **4**

6. A) Explain why thermodynamically less stable endo product is more preferred over exo product in Diels-Alder reaction. **5**

   B) Explain base induced halogenation of threo/erythro 1-bromo-1,2-diphenyl propane. **5**

   C) Explain the use of calculations of optical purity and enantiomeric excess. **4**

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

   a) Sharpless epoxidation

   b) Felkin-Ahn model

   c) Concept of I-strain

   d) Asymmetric dihydroxylation.

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Seat No.

M.Sc. – II (Semester – IV) (New CGPA) Examination, 2016
ORGANIC CHEMISTRY (Paper – XV)
Chemistry of Natural Products

Day and Date : Monday, 4-4-2016
Time : 2.30 p.m. to 5.00 p.m.   Max. Marks : 70

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**
    a) Squalene is having _____ number of isoprene units.
    b) _____ is the sulphur containing vitamin.
    c) Vitamin B1 deficiency disease is _____
    d) RDA is known as _____
    e) The number of chiral centres in cholesterols are _____
    f) Podophyllotoxin is synthesize by _____ pathway.
    g) _____ is the precursor for biogenesis of thromboxanes.

   B) Answer the following : **7**
    a) What is structure of Vitamin B1 ?
    b) Write the structure of testosterone.
    c) What is the structure of Adermin ?
    d) Give the structure of Ecqonine.
    e) What is SAM ?
    f) Draw the structure of ψ-pelletierine.
    g) What is structure of codeine ?

P.T.O.

SECTION – II

2. Complete the following conversions.

    A) Tyrosine → → →   **7**

    B) Squalene → → →   **7**
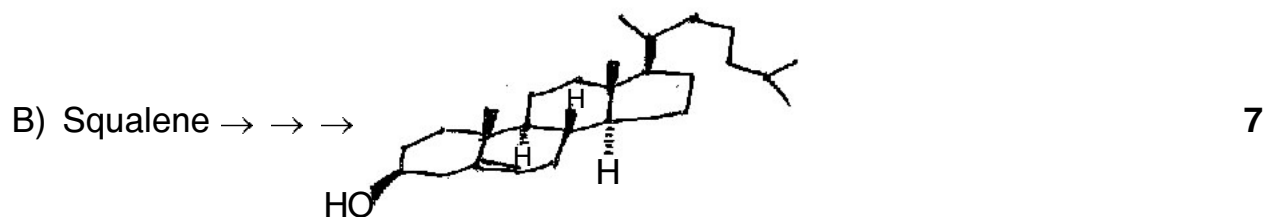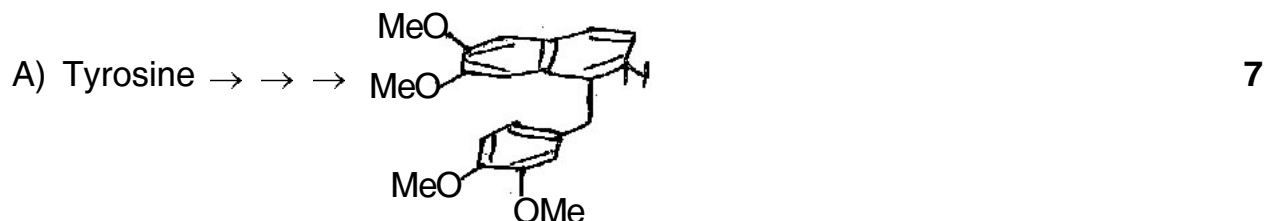
3. A) Explain total synthesis of reserpine by woodward method.   **7**

    B) Explain isolation, structure determination and synthesis of testosterone.   **7**

4. A) Describe the synthesis of Vitamin-H and explain its biological functions.   **7**

    B) Explain biogenesis of flavonoids, isoflavonoids and stilbers by shikimate
    pathway.   **7**

SECTION – III

5. A) Biogenesis of Nicotin – Explain its in detail.   **5**

    B) Explain chemical synthesis of camptothecine.   **5**

    C) Describe structure determination of androsteron.   **4**

6. A) Explain chemical synthesis of folic acid and its biochemical functions.   **5**

    B) Describe the biogenesis of triterpenoids.   **5**

    C) Explain the synthesis of lithocholic acid from cholesterol.   **4**

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

    a) Terpenoid quinones.

    b) Biogenesis of hardwickiic acid.

    c) Stereochemical aspect of podophyllotoxin.

    d) Structure determination in Taxol.

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Seat
No.

M.Sc. II (Semester – IV) (New CGPA) Examination, 2016
Organic Chemistry
APPLIED ORGANIC CHEMISTRY (Paper – XVI)

Day and Date : Wednesday, 6-4-2016   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) Define the terms of the followings :   **7**
　　 i) Green Chemistry
　　 ii) Ionic liquid
　　 iii) Epimers
　　 iv) Disaccharides
　　 v) Tropolone
　　 vi) Annulene
　　 vii) Fulvene.

　 b) Draw the correct structure of following compounds :   **7**
　　 i) [18] Annulene
　　 ii) D – Arabinose
　　 iii) L – Psicose
　　 iv) α – D (+) – Glucopyranose
　　 v) Methyl β – D – glucoside
　　 vi) β – D – GlucoFuranose
　　 vii) 1 – Butyl – 3 – methyl Ionidazoliumhexafluoro phosphate.

P.T.O.

SECTION – II

2. a) What is solid phase synthesis ? Explain the Merrifield resin is used in solid phase synthesis of polypeptide. **7**

   b) What are enzymes ? Explain their enzymatic oxidation and reduction reactions. **7**

3. a) What are green reactions ? Explain the various green reactions in basic principles of green Chemistry. **7**

   b) What are non-benzenoid aromatic compounds ? Explain their different rules for aromaticity. **7**

4. a) Explain the synthesis and applications of following compounds in perfumes. **7**

      i) 2 – phenylethanol   ii) vanillin

   b) Write notes on the followings : **7**
      i) Cyclodextrins   ii) Multicomponent reactions

SECTION – III

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

   b) What are azulene ? Explain the synthesis and their mechanism. **5**

   c) Discuss the D and L– configurations of monosaccharides. **4**

6. a) What is tropane ? Explain their synthesis and chemical reactions. **5**

   b) Discuss the chemical reactions of glucose with following reagents : **5**
      i) Phenyl hydrazine   ii) Fehling's solution

   c) Why β – form of glucose is more stable than the α – form ? **4**

7. Write notes on (**any three**) : **14**
   a) Killani-Fischer's synthesis
   b) Ultrasonication
   c) Calixerins
   d) Synthetic Musk.

_____

Seat No.

M.Sc. II (Semester – IV) (Old CGPA) Examination, 2016
ORGANIC CHEMISTRY
Stereochemistry (Paper – XIV)

Day and Date : Friday, 1-4-2016   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** questions 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.
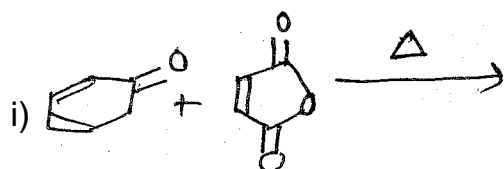   v) Figures to the **right** indicate **full** marks.
   vi) **Use** of log tables and calculators is **allowed**.

SECTION – I

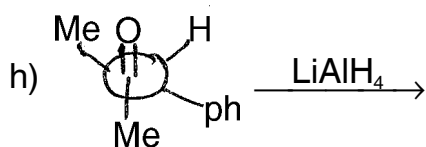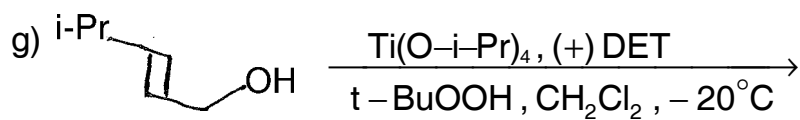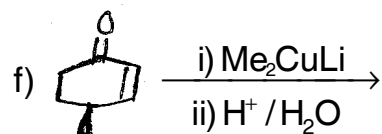1. Answer the following.   **14**

   Predict the product with appropriate stereochemistry.

   a) $\dfrac{\text{i) Me}_2\text{CuLi}}{\text{ii) H}^+ / \text{H}_2\text{O}}$? + ?

   b) $\dfrac{\text{baker's yeast}}{\text{allyl alcohol}}$?

   c) $\dfrac{\text{NaNO}_2 / \text{HCl}}{0.5°\text{C}}$?

   d) $\xrightarrow{\text{NaOH}}$?

e)

$$\xrightarrow{Ag_2O} ?$$

f)

$$\xrightarrow{O\overset{\ominus}{AC}} ?$$

g)

$$\xrightarrow{S-BINAL-H} ?$$

h)

$$\xrightarrow{\overset{\ominus}{OEt}} ?$$

i)

$$\xrightarrow{HNO_2} ?$$

j)

$$\xrightarrow{m-CPBA} ?$$

k) +

$$\xrightarrow{\Delta} ?$$

l)

$$\xrightarrow[ii) H_3O^+]{i) CH_3MgBr} (major) + (minor)$$
$$\qquad\qquad\quad ? \qquad\quad ?$$

m)

$$\xrightarrow{LiAlH_4} ?$$

n)

$$\longrightarrow ? + ?$$
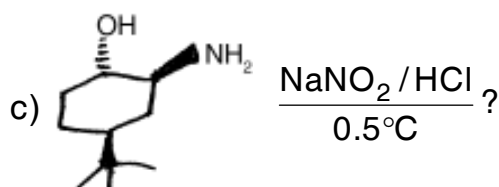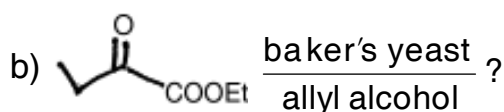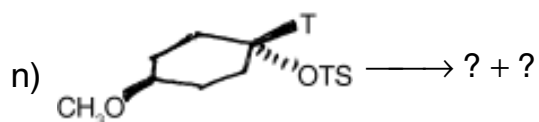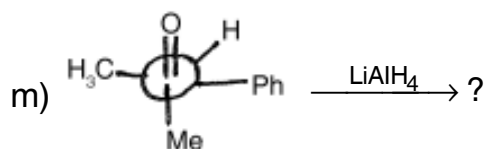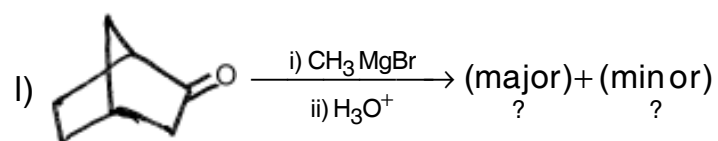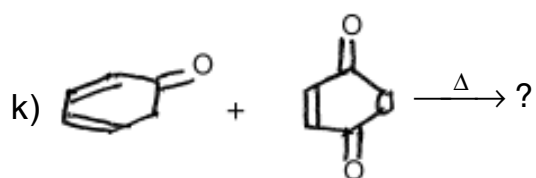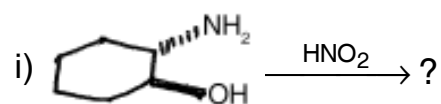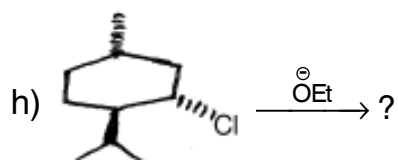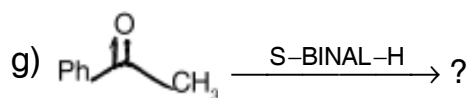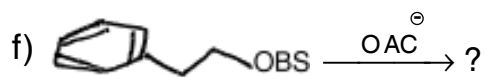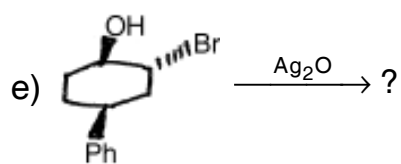
SECTION – II

2. A) Draw the structure of different distereomeric forms of perhydroanthracene and explain its stability. **7**

   B) Draw the conformations of cis/trans g-methyldecalins and comment on their stability and optical activity. **7**

3. A) What is stereospecific reaction ? Explain why addition of bromine to Z or E-butene is stereospecific reaction ? **7**

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

4. A) Discuss the effect of conformation on chemical reactivity in cyclohexane derivative with respect to

   i) Elimination reaction

   ii) NGP. **7**

   B) What is stereoselective reaction ? Explain distereoselectivity of the Aldol reactions. **7**

SECTION – III

5. A) Explain optical activity in Biphenyl compounds. **5**

   B) Explain the stability of the ring as a function of ring size and as a function of nature of ring. **5**

   C) Explain why thermodynamically less stable endo product is more preferred over exo in Diel's Alder reaction. **4**

6. A) What are the applications of Cram's rule ? **5**

   B) Explain the terms homotopic, enantiotopic and distereotopic groups and faces. **5**

   C) Explain the conformations of 5, 7 and 8 membered ring. **4**

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

   A) Sharpless epoxidation

   B) Felkin-Ahn model

   C) Concept of I-strain

   D) Curtin-Hammet principle.

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Seat No.

M.Sc. – II (Semester – IV) (Old CGPA) Examination, 2016
ORGANIC CHEMISTRY
Chemistry of Natural Products (Paper – XV)

Day and Date : Monday, 4-4-2016   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** 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 and calculator is **allowed**.

SECTION – I

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

    i) Elucidate furan ring in hardwickiic acid.

    ii) What is biogenesis ?

    iii) What are vitamins and provitamins ?

    iv) What is the chemical nature of prostaglandin ?

    v) Name the precursor involved in biosynthesis of cholesterol.

    vi) What is the medicinal use of camptothecin.

    vii) Phenylalanine is biosynthesised through which pathway ?

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

    i) Hardwickiic acid has _____ chiral centres.

    ii) Morphine has _____ hydroxyl functional groups.

    iii) _____ is derived from phenylalanine and tyrosine.

    iv) _____ is isolated from oil of ginger.

C) Match the pairs : **3**

   i) Strychnine   a) Antagonist of muscarinic acetylcholine receptor

   ii) Atropine   b) Nonalkaloid toxic lignan

   iii) Podophyllotoxin   c) Agonist of the glycine receptor

SECTION – II

2. A) Justify the position of tertiary methyl at C-5 and C-9 in Hardwickiic acid. **7**

   B) Explain the nature and size of sulphur containing ring in biotin. **7**

3. A) Explain the position of methyl groups in santonin. **7**

   B) Write down the Karrer et.al synthesis of Riboflavin. **7**

4. A) Discuss the Corey's approach for the synthesis of $PGE_{2\alpha}$. **7**

   B) Write a note on analytical evidence for lumi-lactoflavin. **7**

SECTION – III

5. A) Give the analytical evidences to prove the structure of pyridoxine. **5**

   B) Identify A, B, C, D and E in following. **5**

$$\xrightarrow{\text{HCN}} [A] \xrightarrow{H_3O^+} [B] \xrightarrow{\Delta} [C] \xrightarrow{\text{HCl}} [D] \xrightarrow[H^+]{\text{aq.KsCo}_3} [E]$$

reduced
dress
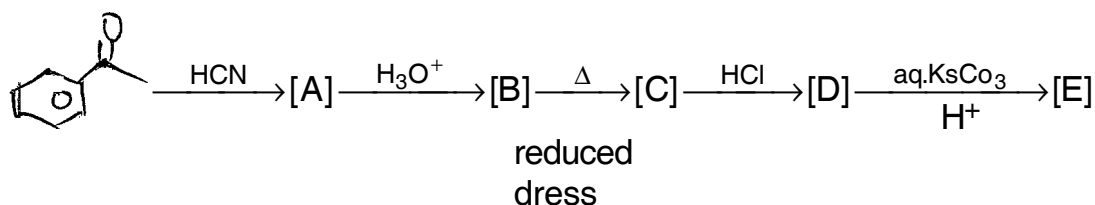
   C) Write down synthesis of progesterone from diosgenin. **4**

6. A) What are prostaglandins ? Explain their nomenclature. **5**

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

   C) Describe mode of action of camptathecin. **4**

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

   a) Biosynthesis of methionine from folic acid

   b) Biological role of vitamin B_6 in transamination

   c) Biogenetic route for coumarin

   d) Lanosterol to cholesterol.

Seat No.

M.Sc. – II (Semester – III) (New) (CGPA) Examination, 2016
INDUSTRIAL CHEMISTRY
(Paper – X) Unit Processes in Chemical Technology

Day and Date : Thursday, 31-3-2016   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) $\xrightarrow{H_2SO_4, 165°C}$?

b) $\xrightarrow[145°C]{22\% \text{ Oleum,}}$

c) $CCl_3CHO + 2C_6H_5Cl \longrightarrow$?

d) $2CHClF_2 \xrightarrow{\Delta, 700°C}$?

e) $4CH_3NO_2 + 6NaHS + H_2O \longrightarrow$

f) Benzene $+ 2HNO_3 \longrightarrow ?$

g) $CH_3COOC_2H_5 + C_{15}H_{31}COOH \longrightarrow ? + ?$

h) Bisphenol A + Epichlorohydrin ? $\longrightarrow ?$

i) $CS_2 + NaOC_2H_5 \longrightarrow ?$

j) $2CH_3CH_2SH \xrightarrow{\text{oxidation}} ?$

k) $2C_6H_6 + 2HCl + O_2 \xrightarrow{\text{CuCl}_2 \text{ on Al}_2O_3}$

l) What is meant by nitric ratio ?

m) $(CH_3)_2O + SO_3 \longrightarrow$

n) $\overset{O}{\underset{CH_2-CH_2}{\triangle}} \xrightarrow{HCN} ? \xrightarrow{-H_2O}$

SECTION – II

2. a) What is nitration ? Discuss the process equipment for technical nitration. **7**

   b) How is ethyl acetate manufacture ? Explain its properties and applications. **7**

3. a) Describe the manufacturing process of monochloroacetic acid. **7**

   b) Define polymerization. Describe the manufacture of polyethylene by high pressure process. **7**

4. a) What is sulphonation ? Describe the manufacture of monosulfonation of benzene. **7**

   b) Explain the liquid phase oxidation of acetaldehyde to acetic acid. **7**

SECTION – III

5. a) Discuss the esterification of carboxylic acid derivatives.   **5**

   b) Give the manufacturing process of chlorobenzene.   **5**

   c) Explain in brief the DVS calculation.   **4**

6. a) Explain with the help of neat diagram Biazzi nitrator.   **5**

   b) Explain the desulphonation.   **5**

   c) What are the techniques of polymerization ?   **4**

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

   a) Nitrating agents.

   b) Manufacture of vinyl acetate.

   c) Isoeugenol to vanillin.

   d) Oxidation of methanol.

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SLR-MD – 172

Seat No.	

M.Sc. – II (Semester – III) (New) (CGPA) Examination, 2016
INDUSTRIAL CHEMISTRY
Paper – XII : Advanced Topics in Industrial Chemistry – I
(Elective)

Day and Date : Tuesday, 5-4-2016   Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.
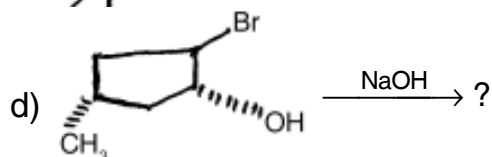
Instructions : 1) Attempt in **all 5** questions.
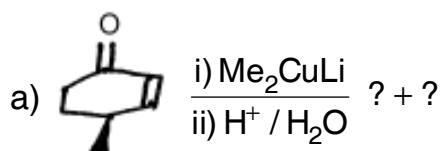   2) Section **I** is **compulsory**.
           3) Attempt **any two** questions from Section **II** and **any two**
              from Section **III**.
           4) Answers to **all** questions (Section **I**, **II** and **III**) should be
              written in the **one** answer book.
           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 drug ?

   b) What is meant by knocking ?

   c) In a bomb calorimeter does the reaction take place under conditions of constant pressure or constant volume.

   d) Which energy conversion takes place when a fuel is burnt ?

   e) Name the biocatalysis used for chemical reaction.

   f) Define atom economy.

   g) Give the examples of green solvent.

   h) What are the natural sources of fertilizer ?

   i) Give the examples of analgesic drug.

   j) What is meant by octane volume number of gasoline ?

P.T.O.

k) What is meant by pharmacokinetics ?

l) Define prodrug.

m) Define pharmacophore.

n) What is antipyretic drug ?

SECTION – II

2. a) Explain in detail the analysis of nitrogen and potassium in the given sample of fertilizer.   **7**

   b) Discuss the working and construction of Bomb calorimeter.   **7**

3. a) What is green chemistry ? Give its principle.   **7**

   b) Explain the CAS method used for pharmaceutical analysis.   **7**

4. a) What are anti-inflammatory drugs ? Describe the synthesis and mechanism of action Salbutamol.   **7**

   b) Define Pharmaceutics. Why do we convert drugs into medicine ?   **7**

SECTION – III

5. a) Explain in detail the determination of moisture content in pharmaceutical drug using K. F. titrator.   **5**

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

   c) Explain significance of LD_{50}.   **4**

6. a) Explain the ultimate analysis of coal. How it is carried out ? Give its significance.   **5**

   b) Give the classification of drugs on the basis of its chemotherapy properties. **5**

   c) Explain Route-wise dosage forms.   **4**

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

   a) Potassium by sodium tetraphenyl borate method

   b) DNA as receptor

   c) IP/USP

   d) Colorimetric method of estimation of sulpha drug.

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M.Sc. – II (Semester – III) (Old CGPA) Examination, 2016
INDUSTRIAL CHEMISTRY
Unit Processes in Chemical Technology (Paper X)

Day and Date : Thursday, 31-3-2016   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) $CH_3COONa + Cl\,CH_2C_6H_5 \rightarrow\, ?\, +\, ?$

   b) $CH_3(CH_2)_7CH = CH(CH_2)_7COOH \xrightarrow[H_2SO_4]{Na_2Cr_2O_7} ? + ?$

   c) $(CH_3)_2O + SO_3 \rightarrow\, ?$

   d) $6CH_2Cl_2 + 2\,Al + 3\,Br_2 \rightarrow\, ?$

   e) 2, 2-Dimethylpropane $\xrightarrow[410°C]{HNO_3} ? + ? + ?$

   f) Naphthalene $\xrightarrow{HNO_3} ? \xrightarrow{HNO_3} ?$

   g) Anthraquinone $\xrightarrow[\substack{Hg\ Catalyst \\ 125°C}]{36\%\,oleum}$

   h) $CCl_3CHO + 2C_6H_5Cl \xrightarrow{H_2SO_4} ?$

   i) $CH_3COOC_2H_5 + C_{15}H_{31}\,COOH \underset{}{\overset{BF_3}{\rightleftharpoons}} ?$

j) What are the properties of polyesters resins ?

k) Furfural $\xrightarrow[\text{dil}]{\text{KMnO}_4}$?

l) $2\,CH_3CH_2SH \xrightarrow{\text{Oxidation}}$?

m) $C_6H_6 \xrightarrow[\text{gamma rays}]{Cl_2}$?

n) $C_6H_6 + 2HNO_3 \xrightarrow{H_2SO_4}$?

SECTION – II

2. a) Describe the manufacture of nitrobenzene by continuous nitration with fortified spent acid. **7**

   b) Discuss the methods of polymerization. **7**

3. a) What is sulfonation ? What are uses and applications of sulfonates ? **7**

   b) Discuss in brief the chlorination in presence of catalyst. **7**

4. a) What is esterification ? How is ethyl acetate manufactured ? **7**

   b) Explain in brief manufacturing process, properties and uses of polystyrene. **7**

SECTION – III

5. a) Discuss with diagram Ball-mill sulphonator. **5**

   b) How is chlorobenzene manufactured ? **5**

   c) What are n-nitro compounds ? **4**

6. a) How is polyethylene manufactured ? **5**

   b) Discuss in brief liquid phase oxidation with oxygen. **5**

   c) What is photohalogenation ? **4**

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

   a) Formation of vanillin from eugenol.
   b) Epoxy resins.
   c) Biazzi nitrator.
   d) Nitrating agents.

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Seat No.

M.Sc. (Part – II) (Semester – III) (Old CGPA) Examination, 2016
INDUSTRIAL CHEMISTRY (Paper – XII)
Advanced Topics in Industrial Chemistry
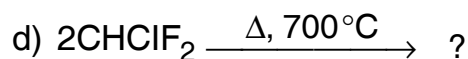
Day and Date :Tuesday, 5-4-2016   Total Marks : 70
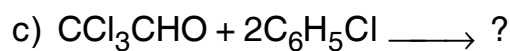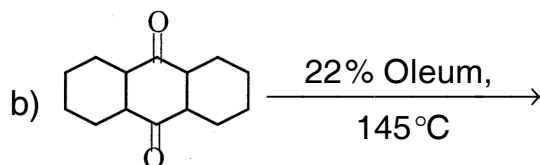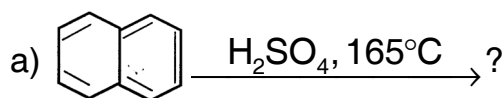Time :2.30 p.m. to 5.00 p.m.

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. Answers the following :   **14**

   i) Where do differential balances usually apply ?

   ii) What techniques are used to develop nanocrystal of Germanium ?

   iii) What type of semiconductor is obtained by doping silicon with boran ?

   iv) What is sensor ?

   v) Define limiting reactant.

   vi) What is shear strain ?

   vii) Which ionic conductor is used to detect mercury and carbon monoxide ?

   viii) What techniques are used to develop nanocrystal of CuCl ?

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

   x) What is the sequence of events that occur at a surface in a CVD process ?

   xi) What do you understand from ultimate strength of material ?

P.T.O.

xii) Write the expression for nucleation rate.

xiii) Which ionic conductor is used to detect fuel gases ?

xiv) What is flow work in energy balances ?

SECTION – II

2. a) Explain in detail classification of metal membrane electrode. **7**

   b) Explain electrical, optical, thermal properties of material. **7**

3. a) Two methanol-water mixtures are contained in separate flasks. The first mixture contains 40 wt% methonal, and the second contains 70 wt% methonal. If 200 gm of the first mixture are combined with 150 gm of the second, what are the mass and consumption of the product ? **7**

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

4. a) Explain in detail Nanocrystals on crystal substrate. **7**

   b) What is balanced process ? Give the general procedure for a single unit process for material balances calculation. **7**

SECTION – III

5. a) Explain with example gas sensing membrane electrode. **5**

   b) Explain in details various reactors used in a chemical industry. **5**

   c) Explain the growth of nanocrystals in organic solution and in polymer. **4**

6. a) Explain in detail Sol-gel method. **5**

   b) Explain in brief ionic conductor with respect to zirconia. **5**

   c) Discuss the corrosion resistance material used in equipment design. **4**

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

   a) Storage vessels for liquids

   b) Silanes

   c) Thick film sensors

   d) Spray pyrolysis.

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SLR-MD – 178

M.Sc. (Part – II) (Semester – IV) Examination, 2016
INDUSTRIAL CHEMISTRY (New CGPA)
Chemical Industries – I (Paper – XIII)

Day and Date : Wednesday, 30-3-2016　　　　　　　　　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) Give the important ores of iron.

   b) What are the different processes used for the manufacturing of steel ?

   c) Give the important constituents of Portland cement.

   d) What are the raw materials required for the production of one ton of Type I cement ?

   e) What is the chemical composition of soft glass and hard glass ?

   f) Give the structure of Rosaniline.

   g) Give important application of pyrex glass.

   h) Give two functions of pigments in paints.

   i) What are the main constituents of oil varnishes ?

   j) Give the structure of Phenolphthalein.

   k) Define insecticides. Give two example of its.

P.T.O.

l) Give some important petrochemicals derived from ethylene.

m) Define catalytic cracking.

n) How much percentage of carbon is present in Mild steel and Tool steel ?

SECTION – II

2. a) Discuss in detail the extraction of iron from its ore. **7**

   b) Explain in detail the manufacture of cement. **7**

3. a) Discuss with the help of a diagram the manufacture of ordinary glass. Give the reaction involved in it. **7**

   b) Give an account of the following organochlorine pesticides w.r.t. synthesis and application (i) Aldrin and (ii) Endrin. **7**

4. a) Outline the petrochemicals derived from Toluene. **7**

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

SECTION – III

5. a) Describe in brief the manufacturing processes of zinc oxide. **5**

   b) Give the synthesis of N, N Diethyl-3-methyl benzamide and N, N, Diethylene benzamide. **5**

   c) Give in the detail the purification methods for the Bauxite ore. **4**

6. a) What is meant by whitewares ? Give the manufacturing process of it. **5**

   b) Explain the setting and hardening of cement. **5**

   c) What is paint ? Give its important functions. **4**

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

   i) Manufacturing processes of titanium dioxide.

   ii) Luminous paint.

   iii) Fluorescent brightening agents.

   iv) Synthesis and applications of Endosulphan.

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Seat
No.

M.Sc. (Part – II) (Semester – IV) (New CGPA) Examination, 2016
INDUSTRIAL CHEMISTRY
Pollution Monitoring and Control (Paper XIV)

Day and Date : Friday, 1-4-2016　　　　　　　　　　　　Max.Marks : 70

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

Instructions : *1) Attempt **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** question (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 the main advantage of reverse osmosis process over ion exchange process ?

　b) State two harmful effects of silica presents in water.

　c) What is the effect of using unleaded petrol in automobiles ?

　d) What is the importance of dissolved oxygen in water ?

　e) Name five particulate matters present in air.

　f) What is smog ?

　g) What is average residence life of NO in the atmosphere ?

　h) Reduction – precipitation technique is particularly used for the removal of

　i) Which organomercurical compounds of mercury are highly toxic ?

　j) Which particle capture mechanisms operated in the removal of particulate matter by fabric filters ?

　k) Name the method which is ideally suited for recovery of phenols from petroleum refinery waste.

P.T.O.

l) What are the two chief pollution problems associated with thermal power plants ?

m) Give the full form of VOC, IP, BP and USP.

n) What is trickling filter ?

SECTION – II

2. a) Discuss briefly the salient features of the Water (prevention and control of pollution) Act 1974.   **7**

   b) What are the effects of phenols and phenolic residues on human beings ? Give an account of treatment and recovery of phenols using stream gas stripping method from liquid effluents.   **7**

3. a) Give the sampling and monitoring methods for SO_2. How it is removed from gaseous effluents using absorption and adsorption processes ?   **7**

   b) Explain the MINAS and plan of action for synthetic fiber industries and oil refineries.   **7**

4. a) Discuss the methods used for the recycling of plastic polymers. What are the important products obtained from recycled plastic polymeric materials ?   **7**

   b) Discuss the recovery and removal of chromium from industrial effluents.   **7**

SECTION – III

5. a) Explain in short removal of nitrogen from the waste water treatment.   **5**

   b) Describe in brief the measurement of silica, and lime during the soil analysis.   **5**

   c) Discuss briefly the method used for analysis of residual chlorine in the waste water treatment.   **4**

6. a) Discuss the end use of recycled polymer.   **5**

   b) What is the general criterion employed in setting minimum national standard ?   **5**

   c) Discuss in brief the reverse osmosis for waste water treatment.   **4**

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

   i) Analysis of particulate matter.

   ii) IS – 2296.

   iii) Solvent extraction process for removal of phenolic residues.

   iv) Removal of suspended solids from waste water treatment.

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Seat
No.

M.Sc. (Part – II) (Semester – IV) (New CGPA) Examination, 2016
INDUSTRIAL CHEMISTRY (Paper – XV)
Nanotechnology and Instrumental Analysis

Day and Date : Monday, 4-4-2016   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**

    i) What is meant by Morphology of an object ?

    ii) What does a horizontal portion in TG curve indicate ?

    iii) What are Miller indices of a plane making intercept 2a, 4b, 3c ?

    iv) What is transmission electron microscopy ?

    v) $SiO_2 + 2C \xrightarrow{\;?\;}$?

    vi) What is Electrodeposition ?

    vii) What is effect of heating rate on TG curve ?

    viii) Which inert reference material is mostly used in DTA ?

    ix) Which type of material is analyzed by WAXS ?

    x) What is the sequence of events that occur at a surface in a CVD process ?

    xi) How does percentage crystallinity of polymer determine by X-ray method ?

    xii) How does resolution get improve in Electron Microscopy ?

    xiii) State the formula for Broadening of Diffraction of light.

    xiv) What is xerogel ?

SECTION – II

2. a) Discuss with Principle Atomic Force Microscope. **7**

   b) Deduce Bragg's equation and discuss its use in X-ray Spectroscopy. **7**

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

   b) Discuss with Principle Transmission electron Microscope. **7**

4. a) Explain in details the Magnetic sputtering process. **7**

   b) Discuss with Principle the Instrumentation for Thermogravimetry. **7**

SECTION – III

5. a) Explain in details Powder Crystal method. **5**

   b) What are the basic chemical reactions involved in CVD process ? Give some examples. **5**

   c) Explain in brief Amorphous and Crystalline Sillicon. **4**

6. a) A grating with 3500 lines/cm^{-1} is illuminated with mercury green line having a wavelength equal to 646 nm. At what angle will the first and second order diffraction maxima occur ? **5**

   b) Explain spray pyrolysis process. **5**

   c) What are the factor affecting DTA curve. **4**

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

   a) Chemical Bath Deposition (CBD).

   b) Application of SEM.

   c) X-ray Production.

   d) Application of TGA.

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Seat
No.

M.Sc. (Part – II) (Semester – IV) (New CGPA) Examination, 2016
INDUSTRIAL CHEMISTRY (Paper – XVI)
Industrial Management and Material Balance

Day and Date : Wednesday, 6-4-2016　　　　　　　　　　　　Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

Instruction :　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) What is Pilot Plant ?

　　ii) Define ancillary industry.

　　iii) What is the purpose of NSIC ?

　　iv) Name the chemical manufacture from molasses.

　　v) What are the types of technology transfer ?

　　vi) What is meant by Patent ?

　　vii) What is control chart ?

　　viii) What is meant by incompatible chemical ?

　　ix) What is the purpose of IDEMI ?

　　x) Where do integral balances usually apply ?

　　xi) What is meant by modulus of rigidity ?

　　xii) Which metals are used as material of construction to design food and
　　　　pharmaceutical equipments ?

　　xiii) What is an integral balance ?

　　xiv) What is shaft work in energy balances ?

SECTION – II

2. a) Explain in detail stress-strain curve manifesting elastic and rupture behaviour of metallic material.   **7**

   b) Explain the Export-Import rules and regulations.   **7**

3. a) Explain the manufacturing process of biodiesel.   **7**

   b) What is meant by incineration ? Explain the advantages and disadvantages of incineration.   **7**

4. a) What is balanced process ? How do you scale a flow chart ? What is the basis of calculation.   **7**

   b) A mixture containing 45% benzene (B) and 55% toluene (T) by mass is fed to a distillation column. An overhead stream of 95 wt% B is produced, and 8% of the benzene fed to the column leaves in the bottom stream. The feed rate is 2000 kg/hr. Determine the overhead flow rate and the mass flow rates of benzene and toluene in the bottom stream.   **7**

SECTION – III

5. a) Explain in detail wind energy and solar energy.   **5**

   b) Discuss the role of R and D department in the economical growth of an industry.   **5**

   c) Explain the importance of Q.C. department.   **4**

6. a) What is the procedure to obtain the registration and license for SSI ?   **5**

   b) Explain the P chart in quality determination.   **5**

   c) Explain the concept of safety at work.   **4**

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

   a) I.P,B.P. and USP.

   b) Prevention of corrosion for reactor.

   c) Classification of chemical reactor

   d) Industry-University Interface.

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Seat No.

M.Sc. (Part – II) (Semester – IV) (Old CGPA) Examination, 2016
INDUSTRIAL CHEMISTRY (Paper – XIV)
Inorganic Chemical Industries

Day and Date : Friday, 1-4-2016   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**
   i) What is Thomas Slag ?
   ii) What are the important ores of zinc ?
   iii) What is meant by Hardening of steel ?
   iv) What is meant by mortar ?
   v) Why does cerium oxide is added to optical glass ?
   vi) Define ore and mineral.
   vii) What is meant by Dielectrics ?
   viii) What is meant by pigment ?
   ix) How does potassium permanganate prepare ?
   x) What is the purpose of Glazing ?
   xi) What is meant by Fat lime ?
   xii) How is Kaolinite obtained ?
   xiii) Which methods are employed to purify Bauxite ore ?
   xiv) How does silicon affect on the properties of cast iron ?

P.T.O.

SECTION – II

2. a) What do you mean by Pig Iron ? Explain the Bessemer process for manufacturing of steel. **7**

   b) Describe in detail the extraction process of thorium with respect to filament growth method from monazite sand. **7**

3. a) Describe in detail with respect to the raw material the manufacturing process of glass. **7**

   b) Describe the manufacturing process of Portland cement. **7**

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

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

SECTION – III

5. a) Explain the various alloys used in electrical and electronic industry. **5**

   b) Explain the setting and hardening of cement. **5**

   c) Explain the American process for manufacturing of Zinc oxide pigment. **4**

6. a) How does sodium dichromate prepare ? Discuss the industrial manufacturing process of sodium dichromate. **5**

   b) What are ceramic ? Explain the manufacturing process of whiteware. **5**

   c) Discuss ceramic for insulator. **4**

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

   a) Position of Inorganic chemical industries in India

   b) Refractories

   c) Properties of lime

   d) Properties and uses of ferrous sulphate.

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Seat No.

M.Sc. (Part – II) (Semester – IV) (Old) (CGPA) Examination, 2016
INDUSTRIAL CHEMISTRY
Methods of Analysis in Industries
(Paper – XV)

Day and Date : Monday, 4-4-2016   Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

Instructions : 1) Attempt in **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) Define quasistatic thermogravimetry.

   b) What is meant of NCV ?

   c) Name any two NSAIDs.

   d) Give the equation formula for the calculation of higher calorific value by bomb calorimeter.

   e) Give the names of the analytical instrument used for the analysis of materials.

   f) What is meant by half life of the radioactive element ?

   g) Name the different types of deflection balance used in TGA.

   h) Classify the different types of coal.

   i) Give the names of non-instrumental method of analysis used in chemical industries.

   j) In β emission from a nucleus the atomic number of the daughter element decreases by one. Is it true or false ?

   k) Name the different types of analyzers used in electron spectroscopy.

l) What is the reference material used in DSC ?

m) Which are the sources used in ESCA and AES ?

n) In orsat appartus which chemicals are used for the absorption of CO_2, CO, O_2 ?

SECTION – II

2. a) With the help of neat diagram explain the working and construction of bomb calorimeter for the determination of calorific value of solid fuel. **7**

   b) Discuss the principle, working and application of ESCA. **7**

3. a) Give the principle of TGA and discuss the function of different components of TGA with the help of neat diagram. **7**

   b) Explain with the suitable example Schnoiger oxygen flask method in analysis of pharmaceutical drugs. **7**

4. a) What is Neutron Activation Analysis (NAA) ? Discuss some important application of this technique. **7**

   b) Discuss the importance of Q.C department in a chemical industries. **7**

SECTION – III

5. a) Explain DSC analysis method of determination of purity of material. **5**

   b) Explain in detail the ultimate analysis of coal. **5**

   c) Give the importance of electrochemical method of analysis. **4**

6. a) Explain the principle and working of ISS. **5**

   b) Explain in detail the working of quadrapolar mass analyzer. **5**

   c) Discuss the pharmocopeica chemical assay of any one analgesic drug. **4**

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

   a) Ionisation chamber and G.M. counter.

   b) K.F. titration method.

   c) Factors affecting DSC curves.

   d) Effluent monitoring and controlling.

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Seat No.

M.Sc. – II (Semester – III) (Old) (CGPA) Examination, 2016
POLYMER CHEMISTRY
Paper – IX : Fundamentals of Feedstocks and Polymers

Day and Date : Tuesday, 29-3-2016
Time : 2.30 p.m. to 5.00 p.m.

Max. Marks : 70

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) What are the IUPAC names of PMMA and Nylon-6, 6 ? **14**

   ii) Give the order of Knocking.

   iii) Why commercial production of PVC was delayed by 50 years; after its development ?

   iv) What is autoacceleration in bulk polymerisation ?

   v) Define the fire point.

   vi) State the various ways to improve the brittleness of PS.

   vii) How LLDPE and VLDPE are synthesized ?

SECTION – II

2. a) What is crude oil ? Explain with their types and sources of crude oil. **7**

   b) Describe the manufacturing process of poly(vinyl chloride) with their properties and application. **7**

P.T.O.

3. a) Discuss in detail bulk polymerisation method. **7**

   b) Discuss the classification of polymers with suitable examples. **7**

4. a) Discuss the catalytic cracking method in detail. **7**

   b) Describe the use of toluene as a building block towards polymer industries. **7**

SECTION – III

5. a) Compare addition and condensation polymerisation with suitable example. **5**

   b) Give an account on any one renewable resource as building block for polymer industry. **5**

   c) Explain the synthesis, properties and application of poly (ethylene terephthalate). **4**

6. a) Discuss the systematic structure based (IUPAC) nomenclature with suitable examples. **5**

   b) Explain the manufacturing and properties of PP. **5**

   c) Explain the use of acetylene as building block towards polymer industry. **4**

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

   a) Batch and continuous method

   b) Polyacetals

   c) Refining of crude oil

   d) Power alcohol.

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Seat No.

M.Sc. – II (Semester – IV) Examination, 2016
POLYMER CHEMISTRY
(Paper – XIII) Step Growth of Polymers (CGPA) (New)

Day and Date : Wednesday, 30-3-2016   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** mark.
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)

   I) Draw the chemical structure of DGEBA.

   II) Write down any four properties of PEEK.

   III) Illustrate by chemical equation the synthesis of Melamine by dicyandiamide route.

   IV) Phosgene method is not commercially useful for synthesis of polycarbonate. Why ?

   V) Draw the chemical structure of HEXA. Describe its synthesis.

   VI) Write down important properties of polyester PEN and compare these properties with those of the PET.

   VII) By chemical equation only show the synthesis of ε-caprolactam from Cyclohexane.

P.T.O.

SECTION – II

2. A) Describe synthesis of Nylon-6, 10 and Kevlar. Illustrate how their properties depend on chemical structure. **7**

   B) What are Network polyesters ? Describe cross linking of unsaturated network polyester by MMA and Styrene monomers. **7**

3. A) Describe preparation, properties and cross linking reactions of Epoxy resin. **7**

   B) Describe three different methods for preparations of phenol. **7**

4. A) Describe preparation, properties and applications of Polysulphone. **7**

   B) Explain briefly the alcoholysis method for manufacture of poly butylene terephthalate (PBT). Describe its important properties and applications. **7**

SECTION – III

5. A) Discuss the various side reactions occurring during manufacture of polyester PBT. **5**

   B) Protonic acid catalyzed Novolacs are less reactive towards cross linking compared to similar Novolac prepared by metal oxide catalyst. Give reasons. **5**

   C) Discuss preparation of Kapton film and illustrate its significant properties for aerospace applications. **4**

6. A) With the help of suitable examples explain the effect of number of methylene linkages on the properties of nylons. **5**

   B) Calculate the extent of reaction at which gelation will occur for the mixture of 1.50 mole of phthalic anhydride 0.98 mole of glycerol and 0.003 mole of ethylene glycol for formation of glyptal resin. **5**

   C) Explain various cross linking reactions involved during curing of MF. **4**

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

   I) Polybenzimidazole

   II) Chemistry of Polyurethane

   III) Cross linking of UF resin

   IV) Non Phosgene method for preparation of polycarbonate

   V) Commercial epoxy resin.

Seat
No.

M.Sc. – II (Semester – IV) Examination, 2016
POLYMER CHEMISTRY
Stereoregular Polymers and Modern Polymerization Methods
(CGPA) (New) (Paper – XIV)

Day and Date : Friday, 1-4-2016   Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

Instructions : i) Attempt in **all 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 five** 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) Why β-TiCl$_3$ has low stereospecificity ?

    II) What is the difference between melt viscosity of polymer blends and that of
       copolymers ?

    III) How cellulose and amylose are different in terms of stereochemistry ?

    IV) What are the components of Z-N initiators ?

    V) How one can polymerise the polar monomer containing electron donar atoms
       by Z-N initiators ?

    VI) Which letter are used in denoting absolute and relative configuration ?

    VII) Co-ordination polymerisation is also called an insertion polymerization;
        why ?

P.T.O.

SECTION – II

2. a) Discuss the Co-ordination polymerisation of olefins and dienes. **7**

   b) Discuss the stereoisomerism in polymerisation of 1, 3-butadiene monomer. **7**

3. a) Explain the Bimetallic mechanism of Z-N initiators for polymerisation of propylene monomer. **7**

   b) Discuss the various properties of block co-polymers. **7**

4. a) Discuss the stereoisomerism in polymerisation of acrylamide. **7**

   b) Explain the stereospecific polymerisation of MMA. **7**

SECTION – III

5. a) Describe the stereoregular polymers from cyclopentene. **5**

   b) Discuss the mechanism of syndiotactic polymerisation with suitable example. **5**

   c) Explain the evidences towards propagation at carbon-transition metal bond. **4**

6. a) Discuss the synthesis, properties and applications of styrene-butadiene diblock co-polymer. **5**

   b) Describe the tactic structures obtained in polyactaldehyde polymer. **5**

   c) Explain the observed rate behavior in Z-N polymerisation. **4**

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

   a) Thermoplastic elastomers

   b) Stereoregular polymers from chloroprene

   c) Stereoselective and stereoelective polymerisation

   d) Atom Transfer Radical Polymerisation (ATRP).

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SLR-MD – 199

Seat No.	

M.Sc. – II (Semester – IV) Examination, 2016
POLYMER CHEMISTRY
Paper – XV : Selected Topics in Polymers (CGPA) (New)

Day and Date : Monday, 4-4-2016   Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

Instructions : i) Attempt in **all 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) Answer 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. Answer the following :   **(2×7=14)**

   I) Write down the structure of polythiophene as conducting polymer.

   II) Give two examples of accelerators used in vulcanization of rubber and draw its chemical structure.

   III) Draw the structure of polystyrene cross linked with Divinyl benzene.

   IV) Define the term incineration and write down the product obtained in incineration.

   V) How LC Polymers are characterized ? Name any two methods of characterization.

   VI) What are the functions of antioxidant and give two examples of antioxidant ?

   VII) What is the role of DCC in polypeptide synthesis and draw its structure ?

SECTION – II

2. A) Define the term compounding of rubber and explain the functions of Fillers, Plasticizers, UV-stabilizers and biocides. Give examples of each.   **7**

   B) What is lithography ? Explain, briefly the negative mode of working of a photo resist with suitable diagram.   **7**

P.T.O.

3. A) What is Merrifield Resin ? Discuss its use for synthesis of polypeptide. **7**

   B) Discuss the manufacturing process of CMC and list the uses of cellulose ether derivatives. **7**

4. A) What is doping ? Give two examples of each of P-type and N-type dopant and explain why conductivity increases on doping ? **7**

   B) What is neoprene ? Discuss the synthesis, properties and application of neoprene rubber. **7**

SECTION – III

5. A) Explain the manufacturing process of paint with the help of flow diagram. **5**

   B) Discuss the classification of polymer recycling process. **5**

   C) Describe the synthesis, properties and applications of Silicon Elastomers. **4**

6. A) Discuss the chlorination process of polyethylene with their properties and application. **5**

   B) Explain Flory Rehner Equation to determine cross linked density of vulcanized rubber. **5**

   C) Recently it has been claimed that fuel may be recovered from plastic waste. Discuss in detail. **4**

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

   I) Hydrogenation of Polystyrene.

   II) Epoxidation of Natural Rubber.

   III) Microsortation Process in Polymer Waste.

   IV) Classification of Pigments.

   V) Liquid Crystal Polymers.

Seat No.

M.Sc. (Part – II) (Semester – IV) (New-CGPA) Examination, 2016
POLYMER CHEMISTRY (Paper – XVI) (Elective Paper)
Processing Technology and Polymer Properties

Day and Date : Wednesday, 6-4-2016   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) Answers to **all 5** questions (from Section **I, II, III**) should be written in **one** and the **same** answer book.
5) **All** the questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.
7) **Use** of log tables and calculators is **allowed**.

SECTION – I

1. I) By what processing method, plastic pipes and rods are made ?   **14**

   II) Define Yellowness Index.

   III) By what method high strength polyethylene fibers are made ?

   IV) Viscosity is the resistance of flow. True or False ?

   V) Twin screw extruder is a negative pump. True or False ?

   VI) What is Haze ?

   VII) By what processing method, plastic bottles are made ?

   VIII) SPANDEX fibers are made by what method ?

   IX) Compression moulding is widely used for making thermosetting articles. True or False ?

   X) Define Iodine number.

   XI) Refractive index is a measure of bending of light. True or False ?

   XII)

   XIII) Polyacrylonitrile fibers are made by what method ?

   XIV) What is HDT ?

P.T.O.

SECTION – II

2. a) Describe the melt spinning process. What type of fibers are made by this method ?   **7**

   b) Explain Maxwell model. How it is useful to explain stress relaxation ?   **7**

3. a) Describe with the help of a neat diagram, the Calendaring process. What type of articles are made by this process ?   **7**

   b) Explain Voigt model. What is its importance ?   **7**

4. a) Describe the injection moulding technique. What type of articles are made by it ?   **7**

   b) Describe the testing procedures for pipes and tubes.   **7**

SECTION – III

5. a) Describe the Reaction Injection Moulding. What type of articles are made by it ?   **5**

   b) Describe the Izod impact tester and the specimen preparation.   **5**

   c) Describe thermoforming method. What type of articles are made by this method ?   **4**

6. a) Describe the method for the determination of bulk density of polymers.   **5**

   b) Describe the transfer moulding technique. What are its advantages ?   **5**

   c) Explain the factors controlling dielectric loss and volume resistivity.   **4**

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

   a) Tests for tyres and containers.

   b) Photo elastic properties of polymers.

   c) Cone and plate Rheometer.

   d) Post spinning processes.

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SLR-MD – 207

M.Sc. (Part – II) (Semester – III) Examination, 2016
PHYSICAL CHEMISTRY (New CGPA)
Paper – IX : Quantum Chemistry

Day and Date : Tuesday, 29-3-2016   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** questions from Section **III**.
            4) Answers to **all** Sections (**I, II** and **III**) should be written in the **one** answer book.
            5) **All** questions carry **equal** marks.
            6) Figures to the **right** indicate **full** marks.
            7) Use of log table and calculator is **allowed**.

SECTION – I

1. Answers the following :   **14**

   i) The normalized wave function for a particle in one dimensional box is _____

   ii) What do you mean by overlap integral ?

   iii) Give the expression of zero point energy for harmonic oscillator.

   iv) Mention the factors on which the Compton shift depends.

   v) What is Stefan-Boltzmann law ?

   vi) Put the condition for orthogonalization.

   vii) Mention the value for R (Raydberg constant).

   viii) Give the set of spherical coordinators.

   ix) Photoelectric effect shows _____ nature of light. (corpuscular/wave)

   x) The number of nodes possible in radial wavefunction of 4p orbital is _____

   xi) Give mathematical expression for free valence index.

P.T.O.

   xii) What do you understand by the term degeneracy ?

   xiii) What is the expression for kinetic energy operator in one dimension ?

   xiv) Construct the secular determinant for allyl molecule.

SECTION – II

2. a) Write in detail the radial eigen functions of Hydrogen atom.   **7**

   b) Derive the expression for time independent Schrodinger wave equation.   **7**

3. a) Using Hukel Molecular Orbital Theory, evaluate the MO coefficients for wave functions of allyl molecular.   **7**

   b) State and explain Planck's distribution law. How it is experimentally verified ?   **7**

4. a) Give an account of variation method utilized for evaluation of energy.   **7**

   b) Derive the expression for Schrodinger equation for particle in three dimensional cubical box.   **7**

SECTION – III

5. a) Estimate the value of average energy of a particle in one dimensional box having length L $\overset{\circ}{A}$.   **5**

   b) Explain Slater and Guassion type orbitals.   **5**

   c) Derive the expression for Hamiltonian operator.   **4**

6. a) Discuss Stern-Gerlach experiment.   **5**

   b) Show that $\psi = (2/a)^{1/2} \sin (n\pi/a)$ x is an eigen function of kinetic energy operator. Find out the value of eigen value.   **5**

   c) If the position of the electron in an atom could be determined with an accuracy of 0.1 $\overset{\circ}{A}$, what would be the uncertainty in its velocity ?   **4**

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

   a) Compton scattering

   b) Hermitian operators

   c) Assumptions of HMO Theory

   d) Self Consistent Field Theory.

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Seat
No.

M.Sc. (Part – II) (Semester – III) Examination, 2016
PHYSICAL CHEMISTRY (New CGPA)
Paper – X : Electrochemistry

Day and Date : Thursday, 31-3-2016   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 atleast **two** questions from Section **II** and Section **III**.
4) Figures to **right** indicate marks.
5) **Neat** and **labelled** diagrams should be drawn **wherever** necessary.
6) **Use** of calculator and log-table is **allowed**.

SECTION – I

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

   i) According to Debye-Huckel theory each ion is surrounded by an ionic atmosphere of _____ charge.

   ii) The thickness of ionic atmosphere increases as the concentration of electrolyte

   iii) The mobility of an ion decreases due to electrophoretic force. (true or false)

   iv) Write the Debye-Huckel Limiting law for an electrolyte.

   v) Write the relationship between three forms of activity coefficients for an electrolyte solution.

   vi) At high frequency the conductance of an electrolyte solution increases due to _____ effect.

   vii) Name the mechanism with which the abnormal conductance of hydroxyl ion is explained.

   viii) Give the expression for thickness of ionic atmosphere.

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

P.T.O.

   x) How do you verify the Debye-Huckel limiting law ?

   xi) Define a fuel cell.

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

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

   xiv) The stationary phase in electrosmosis is

SECTION – II

2. a) Derive Debye-Huckel Limiting law. **7**

   b) Derive Debye-Huckel-Onsager equation. **7**

3. a) Discuss the Debye-Falkenhagen effect in detail. **7**

   b) Explain the mechanism of abnormal ionic conductances of hydrogen and hydroxyl ions. **7**

4. a) Describe various steps involved in the mechanism of overvoltage and explain which of them is a slow step and why ? **7**

   b) Calculate reversible decomposition potential of 0.5 n $AgNO_3$ {Given a $(Ag^+) = 0.396$, $E°(Ag/Ag^+) = 0.799$ V and $E° (OH^-/O^2) = -0.403$ V} **7**

SECTION – III

5. a) Discuss the Bernal and Fowler method of determining heats of hydration. **5**

   b) Describe the construction and working of natural gas and CO-Air fuel cell. **5**

   c) In a fuel cell carbon is used as a fuel. The thermodynamic parameters for the cell reaction are $\Delta H^0 = -67.63$ k cal/mol and $\Delta G^0 = -61.45$ 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) Explain the nature of electrocapillary curve obtained for mercury electrode. **5**

   b) Discuss the Stern theory of electrical double layer. **5**

   c) Explain the effects of electrolytes on the zeta potential. **4**

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

   a) Significance of fuel cells.

   b) Pourbaix diagrams.

   c) Electrotyping technique.

   d) Tafel equation.

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Seat No.

M.Sc. – II (Semester – III) Examination, 2016
PHYSICAL CHEMISTRY (New CGPA)
Paper – XI : Molecular Structure – I

Day and Date : Saturday, 2-4-2016   Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

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

SECTION – I

1. Answer the following :   **14**

   i) Write down the point group for the molecules (a) SF_6 (b) CCl_4.

   ii) What is the degeneracy of the rotational energy level with J = 4 for a heteronuclear diatomic molecule ?

   iii) What are the normal modes of vibration of CO_2 and how many of that are IR active ?

   iv) What is the ideal source for Raman spectroscopy ?

   v) What is the difference between a singlet and a triplet state ?

   vi) For spherical top molecule CH_4, the principal moments of inertia will be
       a) $I_y = I_z$ and $I_x = 0$ b) $I_y = I_z$ and $I_x \neq 0$
       c) $I_x = I_y = I_z$ d) $I_x \neq I_y \neq I_z$

   vii) The fingerprint region (in terms of wave number) of an infrared spectrum, which is characteristic for each individual compound is between _____

   viii) Why is XPS a more qualitative than quantitative technique ?

   ix) What is the binding energy of an electron in XPS ?

   x) Define predissociation phenomena.

P.T.O.

xi) State Stark effect.

xii) Mention the factors which contribute to the width of the spectral lines.

xiii) State Beer-Lambert's law.

xiv) The term symbol for the particular atomic state is written as _____

SECTION – II

2. a) Identify the various symmetry elements in water molecule. Work out the character table for the group C2v. **7**

   b) Explain the Birge-Sponer extrapolation method used to determine the dissociation of I_2 molecule. **7**

3. a) Give the quantum theory of Raman Effect. How rotational energy changes in molecules can be studied using Raman effect ? **7**

   b) State Franck-Condon principle. Explain why electronic spectra are very complex ? **7**

4. a) What are overtone and hot bands ? What is the distance between atoms in a $^1H^{35}Cl$ molecule if the lines in rotation-vibration bands are separated by $2060 \, m^{-1}$? **7**

   b) Explain the application of photoelectron spectroscopy in structure elucidation by taking any two examples. **7**

SECTION – III

5. a) How many IR active vibrational modes does CS_2 possess, and why ? **5**

   b) What are σ_v, σ_d and σ_h symmetry operations. **5**

   c) Calculate the frequency of the J = 3 to J = 4 transition in pure rotational absorption spectrum of $^{14}N^{16}O$. The equilibrium bond length is 115 pm. Assume no centrifugal distortion. **4**

6. a) What do you understand by group frequencies ? Explain their use in molecular structure determination. **5**

   b) Explain rotational spectra of symmetric top molecules. **5**

   c) Estimate the ground state term for equivalent electron system p^2. **4**

7. Write short notes on (**any three**) : **14**
   a) Symmetry elements and operations
   b) Great orthogonality theorem
   c) Group frequencies
   d) Isotope effect in rotational spectroscopy.

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SLR-MD – 210

Seat
No.

M.Sc. (Part – II) (Semester – III) Examination, 2016
PHYSICAL CHEMISTRY (New CGPA)
(Paper – XII) : Solid State and Nuclear Chemistry (Elective)

Day and Date : Tuesday, 5-04-2016   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. Answers the following :   **14**

    i) Define fission barrier.

   ii) What do you mean by anisotropy ?

  iii) Define Miller indices.

   iv) Give one example of isotone.

    v) Mention typical dead time of a detector.

   vi) Penetration power of _____ particle is more.

       a) γ b) α c) β d) None of these

  vii) What is scavenging of free radicals ?

 viii) Lists different types of solid state reactions.

   ix) Name one example each of inorganic and organic scintillator.

    x) Alpha particle is _____ nucleus.

       a) H   b) He   c) Both   d) None of these

xi) What is Frankel defect ?

xii) Give the composition of Fricke's solution utilized in Fricke dosimeter.

xiii) Name any two methods of single crystal growth from melt.

xiv) Give Bragg's equation for XRD.

SECTION – II

2. a) What is single crystal ? Explain single crystal growth from melt. **7**

   b) Describe in detail radiolysis of water. **7**

3. a) Mention different types of nuclear reactors. Discuss GM counter in detail. **7**

   b) Discuss in detail different modes of gamma ray interaction with the matter. **7**

4. a) Define isomorphism. Discuss its applications. **7**

   b) Illustrate the principle of zone refining method. **7**

SECTION – III

5. a) Explain Geiger-Muller counter. **5**

   b) Comment on Wagner's theory of solid state reactions. **5**

   c) Write on India's nuclear power programme. **4**

6. a) Discuss in brief different factors affecting reactivity of solid state reactions. **5**

   b) Explain different plane defects encountered in solids. **5**

   c) With the help of a graph of fission yield against mass number, describe mass distribution involved in nuclear fission reaction. **4**

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

   a) Non-stoichiometric defects

   b) Types of nuclides

   c) The four factor formula

   d) Crystal systems.

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SLR-MD – 213

M.Sc. (Part – II) (Semester – III) Examination, 2016
PHYSICAL CHEMISTRY (Old CGPA)
(Paper – IX) : Quantum Chemistry

Day and Date : Tuesday, 29-3-2016   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) The zero point energy of simple harmonic oscillator is

   ii) Mention the different quantum numbers.

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

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

   v) Put the condition for orthogonalization.

   vi) State de Broglie hypothesis.

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

   viii) Define atomic orbital.

   ix) Write Bohr's quantization postulate.

   x) Put the limits for θ and Φ angles.

P.T.O.

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

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

xiii) Define mathematically charge density.

xiv) Mention any one conjugate pair of variables.

SECTION – II

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

   b) Explain in detail the Bohr model for an atom. **7**

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

   b) Explain in detail Huckel MOT approach for ethylene molecule. **7**

4. a) Explain SCF theory. **7**

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

SECTION – III

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

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

   c) For a particle in a three dimensional rectangular box of dimensions $a_x = 1 \times 10^{-15}$ m $a_y = 1.5 \times 10^{-15}$ m and $a_z = 2 \times 10^{-15}$m, calculate the ground state energy. **4**

6. a) Write down the consequences of Heisenberg's uncertainty principle. **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) Planck's distribution law

   b) HMO approximations

   c) Semi empirical approximation methods

   d) Spherical co-ordinates.

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Seat No.

M.Sc. (Part – II) (Semester – III) (Old – CGPA) Examination, 2016
PHYSICAL CHEMISTRY
Paper – X : Electrochemistry

Day and Date : Thursday, 31-3-2016   Total Marks : 70

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

Instructions :   1) Attempts in **all five** questions.
              2) Attempt **any two** questions from Section **I** and **any two** from Section **II**.
              3) Figures to the **right** indicate **full** marks.
              4) **Neat** and **labeled** diagram should be drawn.
              5) **Use** of calculator and log table is **allowed**.

SECTION – I

1. Answer the following :   **14**
   a) Which catalyst is used in natural gas and Co-Air fuel cell ?
   b) The activation energy for overvoltage is _____ k cal.
   c) Define streaming potential.
   d) The electrocapillary curve is obtained by plotting _____ against _____.
   e) Write expression for velocity of electrophoresis of small spherical particles.
   f) Write an expression for thickness of ionic atmosphere.
   g) According to Debye-Huckel theory of interionic attraction each ion is surrounded by an _____ opposite charge.
   h) Write the expression for the constant B in Debye-Huckel-Onsager equation.
   i) As the concentration of electrolyte increases the thickness of ionic atmosphere decreases. True or False
   j) Write the expression for hydration energy according to Born-Habber method.
   k) Define decomposition voltage.
   l) Define hydration number.
   m) How do you obtain Pourbaix diagrams ?
   n) What is fuel cell ?

SECTION – II

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

   b) Discuss in brief the Debye-Falkenhagen and Wein effect.　**7**

3. a) State various forms of activity coefficient and explain their interrelationship.　**7**

   b) The activity coefficient of an ion and ion pairs are 0.827 and 0.88 respectively for 0.5 m KCl. If the fraction of association is 0.021, Calculate association constant.　**7**

4. a) What is the difference between overvoltage and polarization ? Explain types of polarization.　**7**

   b) Calculate zeta potential of a quartz particle moving with a velocity of 3×10^{-3} cm/sec in aqueous suspension under potential gradient of 10 V/cm. (Given $\eta = 8.903 \times 10^{-3}$ poise and D = 78.30 at 25°C)　**7**

SECTION – III

5. a) Explain in detail the thermodynamic parameters for the ion solvent interactions.　**5**

   b) Discuss the Gemini and Appolo hydrogen oxygen fuel cell.　**5**

   c) The efficiency of fuel cell is 92% and the standard enthalpy change of two electron reaction is 68 Kcal/mole. Calculate the equilibrium potential of the fuel cell.　**4**

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

   b) What is electrokinetic potential ? Explain in detail electro-osmosis.　**5**

   c) How do you determine the zeta potential experimentally ?　**4**

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

   a) Significance of fuel cell

   b) Concept of hydration number

   c) Influence of ions on zeta potential

   d) Bjerrum theory.

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Seat
No.

M.Sc. (Part – II) (Semester – III) (Old-CGPA) Examination, 2016
PHYSICAL CHEMISTRY
Paper – XI : Molecular Structure – I

Day and Date : Saturday, 2-4-2016   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) What do you mean by improper axis of symmetry (Sn) ?

   ii) What technological advances have enabled the routine use of Raman spectroscopy ?

  iii) The symmetric top molecules have all the three moment of inertia equal. True or False.

   iv) Find the point group of the benzene molecule.

    v) Why antistokes lines are less intense than stokes lines ?

   vi) What are hot bands ?

  vii) Can we get vibrational spectra of a homonuclear diatomic molecule ?

 viii) Give the unit of force constant.

   ix) The term symbol is $^4D_{5/2}$. What are the values of L, S and J ?

    x) State Franck-Condon principle.

   xi) Name the lines arising from $\Delta J = -1, 0, +1$.

xii) No rotational Raman spectrum is observed for spherical top molecules. True or False.

xiii) Evaluate number of vibrational degrees of freedom for water molecule.

xiv) What do you mean by binding energy ?

SECTION – II

2. a) Identify symmetry elements of water molecule and construct the multiplication table. **7**

   b) Outline the effect of isotopic substitution on the rotational spectra of molecules. **7**

3. a) Discuss the rotational spectrum of a rigid diatomic molecule. **7**

   b) With the help of energy level diagram explain various possible transitions for the single electron of hydrogen atom. **7**

4. a) Discuss vibrational coarse structure i.e. progression. **7**

   b) Give the outline of photoelectron spectroscopy. **7**

SECTION – III

5. a) Describe in detail the instrumentation of a Raman spectrometer. **5**

   b) Explain mutual exclusion principle with example. **5**

   c) The HCl molecule gives the vibrational absorption line of wavelength 3.456×10^{-6} m. Calculate force constant of H-Cl bond. **4**

6. a) Explain the ionization process occurring in Photoelectron Spectroscopy. **5**

   b) Write about the atomic quantum numbers. **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) Great Orthogonality theorem

   b) Fortrat diagrams

   c) Symmetry elements

   d) Born-Oppenheimer approximation.

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Seat No.

M.Sc. (Part – II) (Semester – IV) Examination, 2016
PHYSICAL CHEMISTRY (New CGPA)
Paper – XIII : Statistical Mechanics and Thermodynamics

Day and Date : Wednesday, 30-3-2016
Time : 2.30 p.m. to 5.00 p.m.

Total Marks : 70

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) Why electron obeys F-D statistics ?

   b) Give symmetry number for H_2 and O_2 molecule.

   c) Mention any two Saxen's relations.

   d) Entropy is a path independent thermodynamic function. True/False.

   e) Evaluate Qele of an atom whose atomic state is $^2P_{3/2}$.

   f) Mention Euler's theorem of exactness.

   g) Give any two pair of conjugate variables.

   h) State third law of thermodynamics.

   i) State Boltzmann-Planck equation.

   j) Evaluate 6.023×10^{23} ! (Use Stirling's approximation)

   k) What do you mean by flux and force ?

   l) Give the expression for vibrational partition function.

P.T.O.

m) What is the probability of selecting a card of heart of square from a standard deck of 52 cards ?

n) The para state of hydrogen is associated with _____ values of rotational quantum number.

   i) odd   ii) even   iii) both   iv) none of these

SECTION – II

2. a) Explain the entropy production due to heat flow.   **7**

   b) Discuss in brief Debye theory for heat capacity of solid.   **7**

3. a) What do you mean by an ensemble ? Describe in detail canonical ensemble.   **7**

   b) Show that $Q_{trans} = (2\pi mkT)^{3/2}/h^3 \times V$. Write down the equation for S_{trans}.   **7**

4. a) Give the expression for classical M-B distribution law. Evaluate the M-B constants α and β.   **7**

   b) Name various electrokinetic effects. Explain how they relate with each other.   **7**

SECTION – III

5. a) Discuss permutation and cominationary rules.   **5**

   b) Compare M-B, F-D and B-E statistics.   **5**

   c) Using Sackur-Tetrode equation, estimate the translational entropy of the Ne gas at 298 K and 1 atm. pressure.   **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.   **5**

   c) Calculate characteristic rotational temperature and rotational partition function of H_2 at 750°C (Given $I_{H2} = 4.603 \times 10^{-48}$ Kg-m^2).   **4**

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

   a) Significance of Helmholtz free energy

   b) Electronic partition function

   c) Conservation of mass in open and closed system

   d) Electronic gas in metals.

M.Sc. (Part – II) (Semester – IV) (New CGPA) Examination, 2016
PHYSICAL CHEMISTRY
Paper – XIV : Chemical Kinetics

Day and Date : Friday, 1-4-2016   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) 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) According to transition state theory write an equation for an equilibrium constant between two reactant molecules A and B.

   b) The collision number between two reactants depends on _____ power to the temperature.

   c) For a unimolecular reaction write a relationship between Ea and $\Delta H^{\#}$.

   d) Define energy factor.

   e) In a consecutive reaction the concentration intermediate reaches maximum and decreases during the reaction. True or False.

   f) Aldehydic form of D-glucose gives β and α D-glucose simultaneously. If k_{β} and k_{α} are 10 and 20 s^{-1} respectively what is the ratio of the two forms of glucose at the end of the reaction ?

g) Give an example of first order opposed first order reaction.

h) What is meant by rate determining step in a consecutive reaction ?

i) What is a branched chain reaction ?

j) Write the chain termination step in thermal decomposition of acetaldehyde.

k) Define explosion limit of a chain reaction.

l) In general catalytic mechanism write the condition for Arrhenius intermediate.

m) Activation energy of a catalysed reaction is generally more than the uncatalyzed reaction. True or False.

n) What is an optimum temperature in an enzyme catalysed reaction ?

SECTION – II

2. a) Using Lindemann's unimolecular reaction mechanism derive a rate expression and explain its limiting cases. **7**

   b) Explain how the activation energy, enthalpy of activation and entropy of activation of a reaction are calculated. **7**

3. a) A reactant M gives simultaneously the products N and O with rate constants k_n and k_o respectively. Derive an expression for the overall rate constant of the reaction. **7**

   b) Obtain an expression for the maximum concentration of an intermediate in a consecutive reaction. **7**

4. a) Derive a rate expression for the reaction between H_2 and Br_2. **7**

   b) Define what is meant by a saddle point, reaction coordinate and explain the tunnelling effect. **7**

SECTION – III

5. a) In an acid catalysed reaction derive a rate equation for a protolytic mechanism. **5**

   b) Write a general mechanism of an exzyme catalysed reaction and obtain an expression for Michaelis-Menten constant. **5**

   c) What is an autocatalyzed reaction ? Explain its kinetics with a suitable example. **4**

6. a) Explain the assumptions of conventional transition state theory. **5**

   b) For a consecutive reaction

   $$A \xrightarrow{k_1} B \xrightarrow{k_2} C$$
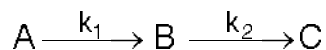
   The values of k_1 and k_2 are 45 and 15 h^{-1} respectively. If the reaction is carried out with 1.0 mol dm^{-3} of pure A, calculate the maximum concentration of B. **5**

   c) What are acidity functions ? Explain their significance. **4**

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

   a) Orientation and energy factor.

   b) Kinetics of second order opposed first order equilibrium reaction.

   c) Examples of tunnelling effect.

   d) Oscillatory reactions.

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Seat
No.

M.Sc. (Part – II) (Semester – IV) Examination, 2016
PHYSICAL CHEMISTRY (New CGPA)
Paper – XV – Molecular Structure – II

Day and Date : Monday, 4-4-2016   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. **Compulsory** :   **14**

    a) Dielectric materials are insulating/conducting materials.

    b) The relative permeability of a paramagnetic substance is

    c) The ratio of the intensity of magnetization I to the magnetizing field H is called magnetic

    d) The material which exhibits hysteresis is _____ in nature.

    e) Domains are present in diamagnetic materials. True or False.

    f) Explain why all protons in a molecule do not absorb radiofrequency energy at the same frequency.

    g) Which requirements a good NMR solvent has to satisfy ?

    h) Which interactions NOE is based on ?

    i) ESR spectroscopy is applicable to the study of chemical, photochemical and electrochemical reactions which proceed via free radical mechanisms. True or False.

    j) The Doppler effect is characteristic of

       a) water waves   b) sound waves   c) light waves   d) all of these

    k) What are point charges ?

P.T.O.

l) Define dipole moment.

m) What are the units of magnetic moment, magnetic induction and magnetic field ?

n) At what frequency would the chemical shift of chloroform ($CHCl_3$, $\delta = 7.28$ ppm) occur relative to TMS on a spectrum recorded on a 300 MHz spectrometer ?

SECTION – II

2. a) Derive the Debye equation for molar polarization in terms of relative permittivity of the medium, distortion polarization and dipole moment of a molecule. **7**

   b) Discuss the applications of Mössbauer spectroscopy. **7**

3. a) Estimate the refractive index of steam at 100° C and 1 atm pressure, given that its polarizability volume is 1.50×10^{-24} cm^3. **7**

   b) What is the experimental set up used in the nuclear magnetic resonance spectroscopy ? Explain with a suitable diagram. **7**

4. a) Calculate the recoil velocity and energy of the Mössbauer nucleus ^{119}Sn when emitting a γ-ray of frequency 5.76×10^{18} Hz. What is the Doppler shift of the γ-ray frequency to an outside observer ? ($N_A = 6.02 \times 10^{23}$ mol^{-1}). **7**

   b) Show how Van-Vleck's expression for molar magnetic susceptibility reduces to Langevin's equation. **7**

SECTION – III

5. a) Explain the use of dipole moment study intramolecular rotations in di-substituted benzene derivatives with an example. **5**

   b) Explain the significance of 'g-factor'. **5**

   c) Calculate the NMR frequency (in MHz) of the proton in a magnetic field of intensity 1.4092 tesla, given that $g_N = 5.585$ and $\mu_N = 8.05 \times 10^{-27}$ JT^{-1}. **4**

6. a) Explain magnetically dilute and magnetically concentrated species. **5**

   b) What is isomer shift ? Explain with examples. **5**

   c) The Gouy balance results showed that a sample of a complex ion in a tube of 1.75×10^{-5} m^2 cross-section that was partly in a magnetic flux density of 0.4 T was pushed into the field by a force equal to 2.50×10^{-4} N. Calculate the magnetic susceptibility χ. (Given : $\mu_0 = 4\pi \times 10^{-7}$ J C^{-2} m^{-1} s^2). **4**

7. Write short notes on (**any three**) : **14**
   a) Determination of magnetic susceptibility
   b) Lennard-Jones potential
   c) ELDOR
   d) Hyperfine structure in Mössbauer spectroscopy.

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SLR-MD – 222

M.Sc. (Part – II) (Semester – IV) (New) (CGPA) Examination, 2016
PHYSICAL CHEMISTRY
Elective (A) : Surface Chemistry (Paper – XVI)

Day and Date : Wednesday, 6-4-2016   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) What is the effect of length of hydrophobic chain on the critical micelle concentration of surfactant ?

   ii) "Acetic acid does not forms monomolecular film on the surface of water", Give the reason.

   iii) Which one selectively wets the surface of glass when in contact with mixture of benzene and water ?

   iv) By which of the following forces, the gas molecules are held on solid surface in physical adsorption.

   a) Chemical   b) Gravitational   c) Electrostatic   d) Van der Waal's

   v) What is emulsion ?

   vi) Which of the following kinds of catalysis can be explained by the adsorption theory ?

   a) homogeneous catalysis   b) heterogeneous catalysis
   c) enzyme catalysis   d) acid-base catalysis

vii) In liquid-vapor, the curved interface is a part of circle of radius R_1, then according to Young and Laplaces' equation other principle radius of curvature R_2 is equal to

    a) Zero   b) Infinity   c) Same as R_1 d) $\dfrac{1}{R_1}$

viii) Give the names of some solid lubricants.

ix) A given liquid completely wets the surface solid. Predict the angle made by the liquid with surface of solid.

x) Why entropy of micellization is high ?

xi) Which of the following is the role played by an emulsifier ?

    a) Accelerates the dispersion   b) Stabilizes the emulsion

    c) Homogenizes the emulsion   d) Aids the flocculation of emulsion

xii) Does the ratio of surface area to volume affects the shape of the particles in sintering ? Indicate yes or no.

xiii) According to the Langmuir adsorption isotherm, the amount of gas adsorbed at very high pressure

    a) reaches a constant limiting value   b) goes on decreasing with pressure

    c) goes on increasing with pressure   d) increases first and then decreases

xiv) What is micro emulsion ?

SECTION – II

2. a) Give an account of volumetric method of measuring gas adsorption.   **7**

   b) Explain heterogeneous catalysis with suitable examples.   **7**

3. a) Mention emulsion types and methods of identification of emulsion types.   **7**

   b) Derive Kelvin equation for the vapour pressure inside and outside the liquid.   **7**

4. a) Derive an equation for the spreading coefficient for the spreading of liquid B on the surface of liquid A.

   At 20°C surface tension of water mercury are 72.8×10^{-3} N/m and 483×10^{-3} N/m respectively while interfacial tension between them is 375×10^{-3} N/m. Calculate spreading coefficient of mercury on the surface of water. State whether mercury spreads on the surface of water.   **7**

   b) Derive an equation for Langmuir adsorption isotherm. Discuss experimental verification this equation for the given system of adsorbate and adsorbent.   **7**

SECTION – III

5. a) What is critical micelle concentration ? Discuss surface tension method of determination of cmc of given surfactant. **5**

   b) Discuss reprecipitation method of preparation of aqueous suspension of organic nanoparticles. **5**

   c) Discuss the terms selectivity and activity of a catalyst. **4**

6. a) Discuss theory and energetic of micellization. **5**

   b) Describe maximum bubble pressure method of determination of surface tension of liquids. **5**

   c) State and explain Trube's rule. **4**

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

   a) Types of adsorption isotherms.

   b) Mechanism of sintering.

   c) Gaseous monomolecular film.

   d) Tilting plate method of determination of contact angle.

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SLR-MD – 225

Seat No.	

M.Sc. (Part – II) (Semester – IV) Examination, 2016
PHYSICAL CHEMISTRY (Old CGPA)
Paper – XIII : Statistical Mechanics and Thermodynamics

Day and Date : Wednesday, 30-3-2016   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) Give combinationary rule.

    ii) Mention different types of ensembles.

    iii) State Dulong-Petit law.

    iv) Give the expression for vibrational partition function for diatomic molecule.

    v) What do you mean by an integrating factor ?

    vi) Give any two electrokinetic effects.

    vii) How does one calculate the number of microstates associated with a given configuration ?

    viii) Using Stirling's approximation estimate $\ln N_A!$ (N_A is Avogadro's number).

    ix) Give any two examples of bosons.

    x) The symmetry number of heteronuclear diatomic molecules is _____

       a) 0   b) 1   c) 2   d) 6

    xi) What is degeneracy ?

    xii) Calculate the vibrational degrees of freedom for NH_3 molecule.

    xiii) Mention any two Saxen's relation.

    xiv) Define Fermi energy.

P.T.O.

SECTION – II

2. a) On the basis of Onsagar's theory of microscopic reversibility, prove that
   $$\overline{\alpha_i(t)\,\alpha_j(t+\tau)} = \overline{\alpha_j(t)\,\alpha_i(t+\tau)}\ .$$ **7**

   b) Discuss salient features of the Debye theory of heat capacity of solids. **7**

3. a) Deduce the expression for vibrational partition function. Give the expression for characteristic vibrational temperature. **7**

   b) Derive the expression for B-E statistics. Mention various approximations made during the derivation. **7**

4. a) Derive an expression for translational partition functions for an ideal gas. Use this expression to show that
   S_{trans} = 4.576 (3/2 log M + 5/2 log T – log P – 0.5053) cal/K/mole. **7**

   b) Write in detail on the entropy production in closed and open systems. **7**

SECTION – III

5. a) Define ensemble. Explain Grand canonical ensemble. **5**

   b) If H = f(T, P) and dH is an exact differential then prove that
   $(dH/dP)_T = V - T(dV/dT)_P$. Given dq = dH – VdP and 1/T is an integrating factor. **5**

   c) Give permutation rule. Estimate how many ways can 8 persons occupy 4 seats ? **4**

6. a) Write on entropy changes during various physical transformations. **5**

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

   c) The first excited state of Cl atom, $^2P_{1/2}$, lies at 2 eV above the ground state $^2P_{3/2}$. Calculate the electronic partition function of Cl atom at 427°C. **4**

7. Write short notes on **any three** : **14**
   a) Free energy concept
   b) Legendre transformations
   c) Ortho and para hydrogen
   d) Generalized forces and fluxes.

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Seat No.	

M.Sc. (Part – II) (Semester – IV) (Old CGPA) Examination, 2016
PHYSICAL CHEMISTRY
Paper No. – XV – Molecular Structure – II

Day and Date : Monday, 4-4-2016   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 Section **III**.
4) **All** questions carry **equal** marks. Figures to **right** indicate marks.
5) **Neat** and labelled diagrams should be drawn.
6) Use of calculator and logtable is allowed.

SECTION – I

1. Compulsory.   **14**

   i) Express total polarizibility of a molecule in terms of distortion and orientation polarization.

   ii) What is the value of one Debye unit in terms of Coulomb meter ?

   iii) Orientation polarization is observed in both polar and non-polar molecules. True or false.

   iv) Write the Maxwell relation.

   v) Write the expression for magnetic susceptibility according to Curie law.

   vi) What is the advantage of Curie Balance ?

   vii) Complete the equation $C/(T-\theta) = ?$

   viii) What is the spin of ^{14}N nucleus ?

   ix) The resonance frequency in MHz for a proton in the field of 2.3487 T is

   x) The proton decoupled ^{13}C NMR consists of unsplit signals. Why ?

xi) Why alcohol is not a suitable solvent for ESR studies ?

xii) Predict the number of lines in an ESR spectrum an electron interacting with ^{10}B nucleus.

xiii) The distribution of energies resulting from the transition motion of the source nuclei in several directions in Mossbauer spectroscopy is known as

xiv) Mention the main factor on which chemical shift in Mossbauer spectroscopy depends.

SECTION – II

2. a) For polar molecules show that the contribution form orientation polarization is equal to $(4\pi N\mu^2 / 9kT)$. **7**

   b) Show that dipole moment of p-dichlorobenzene is zero and those of o– and m– dichlorobenzenes are nonzero. **7**

3. a) An electron in an atom revolves in an orbit of radius r which in presence of a magnetic field undergo precession of radius r_1. Derive an expression for atomic susceptibility of an atom containing the electron. **7**

   b) Explain the use of Pascal Constants for calculation of magnetic susceptibility. **7**

4. a) For an AX molecule explain the splitting of resonance energy levels (NMR signals) due to spin-spin coupling. **7**

   b) Sample and reference nuclei experience magnetic fields B_s and B_{ref} respectively at applied field strength of Bo. If σ_s and σ_{ref} are the respective shielding constants derive a relation between chemical shift and B_s & B_{ref}. **7**

SECTION – III

5. a) Derive conditions for resonance of an unpaired electron for its ESR spectrum. **5**

   b) Explain the nature of ESR spectrum obtained for benzene anion. **5**

   c) Calculate the frequency of methyl radical at 330 mT. (g = 2.0, β = 9.2732×10^{-24} JT^{-1}. **4**

6. a) Describe the working of a Mossbauer spectrometer with a neat sketch . **5**

   b) What is isomer shift in Mossbauer spectroscopy ? Explain with examples. **5**

   c) The half life of first excited state of ^{67}Zn 9.4 $\times 10^{-6}$ s. Calculate its line width. **4**

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

   a) Refraction method of dipole moment determination

   b) Pascal constants

   c) ^{13}C NMR Spectroscopy

   d) Quadrupole splitting in Mossbauer spectroscopy.

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SLR-MD – 228

Seat No.	

M.Sc. (Part – II) (Semester – IV) Examination, 2016
PHYSICAL CHEMISTRY (Old CGPA)
Surface Chemistry (Paper – XVI)

Day and Date : Wednesday, 6-4-2016
Time : 2.30 p.m. to 5.00 p.m.

Max. Marks : 70

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. Solve the following : **14**

   i) What is the effect of temperature on the critical micelle concentration of surfactant ?

   ii) "Stearic acid forms condensed monomolecular film while film of oleic acid is liquid expanded type", give the reason.

   iii) 'Mercury does not spread on water', why ?

   iv) In physical adsorption, the gas molecules are held on solid surface by _____ forces.

       a) Chemical   b) Gravitational

       c) Electrostatic   d) Van der Waal's

   v) An emulsion is a colloidal dispersion of liquid in liquid. State true or false.

   vi) Which of the following kinds of catalysis can be explained by the adsorption theory ?

       a) Homogeneous catalysis   b) Heterogeneous catalysis

       c) Enzyme catalysis   d) Acid-base catalysis

P.T.O.

vii) Compute the value of ΔP for plane interfaces using Young and Laplaces equation.

viii) Give the names of some solid lubricants.

ix) Complete the following equation : $\gamma = \dfrac{?}{\Delta A}$.

x) Define surface excess concentration.

xi) Which of the following is the role played by an emulsifier ?

    a) Accelerates the dispersion   b) Stabilizes the emulsion

    c) Homogenizes the emulsion   d) Aids the flocculation of emulsion

xii) What is sintering ?

xiii) According to the Langmuir adsorption isotherm, the amount of gas adsorbed at very high pressure _____

    a) Reaches a constant limiting value

    b) Goes on decreasing with pressure

    c) Goes on increasing with pressure

    d) Increases first and then decreases

xiv) What are catalytic poisons ?

SECTION – II

2. a) Describe Point B method of determination surface area of an adsorbent.

    The adsorption of nitrogen on silica studied at 77 K by Point B method has given the volume of gas corresponding to Point B, reduced to standard condition of P = 1 atm and T = 273 K as 40 cc. Calculate surface area of silica if area of nitrogen molecule is 16.2 A°. **7**

  b) Why falling drop of liquid is spherical ? Describe drop number method of determination of surface tension of liquid. **7**

3. a) What are emulsions ? Discuss theories of emulsion stabilization. **7**

  b) Derive Gibb's adsorption equation. **7**

4. a) Show that for the spherical interferences $\Delta P = \dfrac{2\gamma}{r}$ using the concept of surface free energy change in droplet. **7**

b) Compare the equation describing physical states of monomolecular films with the three dimensional ideal gas equation. Discuss on molecular gaseous film using this equation. **7**

SECTION – III

5. a) Define heat of wetting and discuss in brief the following : **5**
   i) Wetting agents
   ii) Selective wetting with examples.

b) Explain the mechanism of catalytic synthesis of ammonia on iron oxide catalyst. **5**

c) Derive following equation for the spreading coefficient of liquid B on the surface of liquid A. $S_{B/A} = \gamma_A - \gamma_B - \gamma_{AB}$ where γ_A, γ_B and γ_{AB} are the surface tension of liquid A, liquid B and interfacial tension between liquid A and B. **4**

6. a) What is critical micelle concentration ? How it is determined using surface tension measurements ? **5**

b) Discuss spreading of benzene on the surface of water. **5**

c) At 25°C and a surface pressure of 0.10 dynes per cm lauric acid occupies an area of 31 nm^2 per molecule in a water surface. Assuming the film to be a two dimensional ideal gas, calculate the gas constant in ergs per degree per mole and compare the results with the accepted value. **4**

7. Write notes on **any three** of the following : **14**
   a) Sintering
   b) Langmuir-Adam surface pressure balance
   c) Tilting plate method of determination of contact angle
   d) Classification of surfactants.

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Seat
No.

M.Sc. – II (Semester – III) Examination, 2016
ANALYTICAL CHEMISTRY (New) (CGPA)
Advance Separation Techniques (Paper – IX)

Day and Date : Tuesday, 29-3-2016   Max. Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

N.B. : 1) Attempt in **all five** questions.
     2) Section – **I** is **compulsory**.
     3) Attempt **any two** questions from Section – **II** and **any two** questions from Section – **III**.
     4) Answer to **all** questions should be written in **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. Attempt the following questions :   **14**

   i) Define concentration polarization.

   ii) Give two important criteria for choice of filter paper in paper chromatography.

   iii) Define distribution coefficient.

   iv) Mention the two types of membranes used in dialysis.

   v) Define the term isotachophoresis.

   vi) Explain current efficiency in electrodialysis.

   vii) Define the term Rx-value.

   viii) Explain the term permeate in ultrafiltration.

   ix) Explain the term ionic strength elution.

   x) Define the term spacer arms.

xi) Define the term ᴍᴀsʜɪɴɢ agent.

xii) Mention the two types of rigid gels.

xiii) Define exclusion limit.

xiv) Diethyl ether is better extractant than $\beta - \beta'$-dichlorodiethyl ether. Explain.

SECTION – II

2. a) Explain the working technique of electrodialysis with the help of diagram. **7**

   b) Explain in brief the technique of solvent extraction. **7**

3. a) Discuss the principle involved in gel permeation chromatography. Explain the rigid gels used in gel permeation chromatography. **7**

   b) What is the principle of paper chromatography ? How are the components of a mixture identified by paper chromatography ? **7**

4. a) Explain the working technique of electrodialysis with the help of diagram. **7**

   b) Explain the principle, sedimentation constant and sedimentation equilibrium of ultracentrifugation. **7**

SECTION – III

5. a) Which gels are commonly used in gel permeation chromatography and why ? **5**

   b) Write note on radial paper chromatography. **5**

   c) Explain in brief the extraction by chelation. **4**

6. a) Describe components involved in affinity media. **5**

   b) What is isoelectric focusing ? Explain with suitable examples. **5**

   c) Explain the technique of ultrafiltration. **4**

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

   a) Steps involved in affinity chromatography.

   b) Factors affecting solvent extraction.

   c) Role of spacer arms and ligand in gel permeation chromatography.

   d) Capillary electrochromatography.

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Seat No.

M.Sc. (Part – II) (Semester – III) Examination, 2016
ANALYTICAL CHEMISTRY
(Paper – X) : Instrumental Methods of Analysis – I (New CGPA)

Day and Date : Thursday, 31-3-2016   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) What are microelectrodes ?

    ii) What is dead time of a Giger-Muller counter ?

    iii) How liquid-liquid junction potential can be minimized ?

    iv) Radioactive disintegration follows _____ order kinetics.

    v) What do you mean by the term secondary ionization ?

    vi) Give Ilkovic equation.

    vii) The scientist _____ introduced the technique of high frequency titrations.

    viii) Which parameter is measured in the technique TGA ?

    ix) What is the effect of radio frequency on the molecules ?

    x) Define isomer. Give an example of it.

P.T.O.

xi) Mention the typical band gap of semiconductors.

xii) Sketch typical polarogram and mention half wave potential $E_{1/2}$.

xiii) Mention different microelectrodes used in amperometry.

xiv) Give the principle of DTA.

SECTION – II

2. a) Describe neutron activation analysis. Mention various applications of it. **7**

   b) Discuss various factors that affect the results of thermo gravimetric analysis. **7**

3. a) Describe instrumentation of Electrogravimetry. **7**

   b) What are the main material components needed in the design of a polymer based ion selective membrane ? What is the role of each of these components in the membrane ? **7**

4. a) Give an account of Differential Thermal Analysis (DTA). **7**

   b) Write on cyclic voltametry. **7**

SECTION – III

5. a) Lists advantages of dropping mercury electrode. **5**

   b) Write on gas sensing electrodes. **5**

   c) Explain how α, β and γ radiations differs from each other. **4**

6. a) Write on special analytical applications of radiometric titrations. **5**

   b) With schematic diagram describe heat flux DSC. **5**

   c) Describe the cells used in high frequency titrations. **4**

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

   a) Stripping voltammetry

   b) Radioimmunoassay

   c) Electrolytic separation of metals

   d) Applications of TGA technique.

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SLR-MD – 231

M.Sc. – II (Sem. – III) (New CGPA) Examination, 2016
ANALYTICAL CHEMISTRY
Paper – XI : Applied Analytical Chemistry

Day and Date : Saturday, 2-4-2016   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** answer book.*
      5) *Figures to the right indicate **full** marks.*
      6) *Draw **neat**, labelled diagrams **wherever** necessary.*
      7) *Use of log table provided by University is **allowed**.*

SECTION – I

1. Answer the following questions :   **14**
   a) Which chief components are present in brass ore ?
   b) Write major contents present in solder alloy.
   c) What are the various steps involved in sampling of soil ?
   d) Why fertilizer sample is subjected to digestion in Kjeldahl nitrogen method ?
   e) What are the constituents of feeding stuffs ?
   f) Potassium in the sample reacts with sodium tetraphenylborate to form potassium tetraphenylborate. (True/False)
   g) The percentage of Cu present in bronze is 60-90%. (True/False)
   h) What is mixed fertilizer ?
   i) What is the role of 8-hydroxy quinoline (oxime) in estimation of aluminium from bauxite ?
   j) Give the major composition of creams.
   k) Write formula to calculate % Ni from aluminium alloy.

P.T.O.

 l) Silica is estimated by acid and HF treatment in bauxite ore. (True/False)

 m) Why zinc oxide is used in cosmetics ?

 n) Give the classification of plant nutrients.

SECTION – II

2. A) Give in detail analysis of Cu-Ni alloy and solder.   **7**

 B) What is sample and how sample of fertilizer collected ? Write the experimental procedure for urea nitrogen.   **7**

3. A) Explain the analysis of dolomite and bauxite ore.   **7**

 B) Write the various procedure used for decomposition of fertilizer and experimental procedure for total phosphorus.   **7**

4. A) How will you determine pH of soil sample ?   **7**

 B) How will you analyse the following pesticides from their samples ?

  i) Thiometon   ii) Ziram   iii) Chlordane   **7**

SECTION – III

5. A) Give in detail methods of analysis of starch and sugars in plants.   **5**

 B) Explain determination of water, non-volatile matter and ash content in cosmetic analysis.   **5**

 C) Give in detail classification of pesticides and analysis of DDT in pesticides.   **4**

6. A) Write definition of alloy. Give in details analysis of steel.   **5**

 B) Explain analysis of face powder with respect to Ca, Zn, Mg and boric acid.   **5**

 C) What is composition of antiperspirant ? Mention briefly the methods of determination of its major contents.   **4**

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

 i) Cleansing lotion.

 ii) Soil fertility.

 iii) Gypsum.

 iv) Analysis of fatty acids and aluminium from deodorants.

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Seat
No.

M.Sc. (Part – II) (Semester – III) (New CGPA) Examination, 2016
ANALYTICAL CHEMISTRY
Paper – XII : Analytical Spectroscopy (Elective)

Day and Date : Tuesday, 5-4-2016   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 the source used in Mössbauer spectroscopy.

   ii) Mention the detector used in photoacoustic spectroscopy.

   iii) Define inelastic collision.

   iv) Homonuclear diatomic molecules show Raman spectra. (True or False)

   v) Name the source preferred in SEM technique.

   vi) State mutual exclusion principle.

   vii) Why antistokes lines are weaker than Stokes lines in Raman spectra ?

   viii) Define chemical shift.

   ix) What is binding energy ?

   x) Put any two nuclei having half integer spins.

   xi) Give the fundamental energy equation used in spectroscopy.

   xii) ESR spectrum of benzene radical gives _____ number of lines.

P.T.O.

xiii) For NQR spectra the sample should be in _____ state.

    i) Liquid   ii) Solid   iii) Gas   iv) All of these

xiv) g factor for electron is _____

SECTION – II

2. a) Describe the applications of Raman spectroscopy in structure elucidation.   **7**

   b) Explain the theory of nuclear quadrapole resonance spectroscopy.   **7**

3. a) Discuss the technique of photoacuostic spectroscopy.   **7**

   b) Explain the principle and technique of photoelectron spectroscopy.   **7**

4. a) Schematically illustrate the hyperfine structure of benzene radical.   **7**

   b) Discuss in detail applications of Mössbauer spectroscopy with respect to iron and tin containing compounds.   **7**

SECTION – III

5. a) List applications of Scanning Tunneling Microscopy.   **5**

   b) Explain quadruple splitting with an example of $[Fe(CN)_5NO]^{--}$ ion.   **5**

   c) Distinguish between Raman and IR spectra.   **4**

6. a) Describe Rayleigh and Raman scattering.   **5**

   b) Give an account of Chemical applications of photoacoustic spectroscopy.   **5**

   c) Write on PAS gases and condensed system.   **4**

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

   a) Resonance Raman Spectroscopy.

   b) Surface applications of PAS.

   c) Working of SEM instrument.

   d) ESR spectroscopy for qualitative analysis.

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Seat
No.

M.Sc. – II (Semester – IV) (New CGPA) Examination, 2016
ANALYTICAL CHEMISTRY
Advance Analytical Techniques (Paper – XIII)

Day and Date : Wednesday, 30-3-2016   Max. Marks : 70

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

N.B. : 1) Attempt in **all five** questions.
2) Section **I** is **compulsory**.
3) Attempt **any two** questions from Section **II** and **any two** questions from Section **III**.
4) Answer to **all** questions should be written in **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) Answer the following :   **10**
   i) Give the names of non-discrete methods.
   ii) Define the critical temperature.
   iii) Explain nitrogen rule.
   iv) Explain in short the term super-critical fluid.
   v) Give long form of FIA.
   vi) Give two examples of detectors used in ion chromatography.
   vii) Define critical pressure.
   viii) Explain the meaning of magnetic nucleus.
   ix) Give two important advantages of ion chromatography.
   x) Write principle of electrophoresis with equation.

   B) Fill in the blanks :   **4**
   i) With increase in pressure the density of supercritical fluid _____
   ii) Electrostatic Process (ESP) is used for controlling _____
   iii) The number of _____ taking part in the chemical reaction is known as molecularity of a reaction.
   iv) Function of PMT in dynamic light scattering is _____

SECTION – II

2. A) Explain the principle of flow injection analysis.   **7**

   B) Derive the mathematical expression for first order reaction.   **7**

3. A) Explain photo sedimentation with the help of diagram.   **7**

   B) Describe the GC-MS technique of separation of mixture.   **7**

4. A) What are the advantages of supercritical fluid chromatography over the GLC
      and HPLC.   **7**

   B) Explain the detectors used in ion chromatography. Give their applications.   **7**

SECTION – III

5. A) Explain in detail flow injection titration.   **5**

   B) What is the principle of gas chromatography ?   **5**

   C) Write note on stopped flow methods of analysis.   **4**

6. A) Give applications of DLS.   **5**

   B) Describe the instrumentation of FIA with the help of flow-sheet diagram.   **5**

   C) Derive expression for steady state approximation.   **4**

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

    i) Applications of kinetic methods.

   ii) Properties of supercritical fluids.

  iii) Analytical applications of ion chromatography.

   iv) Centrifugal fast scan analyzer.

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SLR-MD – 240

Seat No.

M.Sc. (Part – II) (Semester – IV) Examination, 2016
ANALYTICAL CHEMISTRY (New CGPA)
(Paper – XIV) : Instrumental Methods of Analysis – II

Day and Date : Friday, 1-4-2016   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. Answers the following :   **14**

   i) The Bragg's equation is written as $n\lambda$ = _____

   ii) Give the X-ray wavelength range in nm.

   iii) What is critical angle principle ?

   iv) The highest flame temperature is obtained in oxygen with _____

      a) Acetylene   b) Hydrogen

      c) Butane   d) Cyanogen

P.T.O.

v) What is the basis of turbidimetric analysis ?

vi) Who discovered X-ray radiation ?

vii) Fluorescence emission is observed mainly due to the _____ transition.

    a) $\pi \rightarrow \pi^*$ b) $\sigma \rightarrow \sigma^*$

    c) $n \rightarrow \sigma^*$ d) None of these

viii) Give the mathematical equation for Beer-Lambert's law.

ix) Define atomization process.

x) X-ray's removes inner core electrons True/False.

xi) Mention typical life time of phosphorescence emission.

xii) What do you meant by the term delayed fluorescence ?

xiii) Define chemiluminescence.

xiv) The R. I. of benzene is 1.42 at 298 K. Calculate R_M. (density = 0.91 g/cm^3).

SECTION – II

2. a) Illustrate X-ray absorption phenomenon.   **7**

   b) Discuss in detail spectrofluorometer.   **7**

3. a) Discuss the general techniques utilized in surface spectroscopy.   **7**

   b) Mention different types of emission spectra. Briefly explain them.   **7**

4. a) With the help of block diagram, explain the equipment used in flame

     photometry.   **7**

   b) Write on applications of turbidimetry.   **7**

SECTION – III

5. a) Illustrate different factors which contributes to atomic spectral line widths. **5**

   b) Comment on advantages and disadvantages of XRF technique. **5**

   c) Explain various applications of interferometry. **4**

6. a) Deduce Bragg's equation and discuss its use in X-ray spectroscopy. **5**

   b) Give advantages of emission spectrometry over absorption methods. **5**

   c) With the help of Joblonski's diagram, show various photophysical pathways with their typical lifetimes. **4**

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

   a) Sampling of surfaces

   b) Fluorescence and structure

   c) Spectroscopic surface methods

   d) X-ray generation techniques.

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Seat No.

M.Sc. II (Semester – IV) (New – CGPA) Examination, 2016
ANALYTICAL CHEMISTRY
Paper – XV : Biochemical and Food Analysis

Day and Date : Monday, 4-4-2016   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** answer book.
    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. A) Answer the following :   **10**

   1) What is sap value ?

   2) Write the principle of limit test for arsenic.

   3) What are the sources of Vitamin C and name the diseases caused by deficiency of Vit. C ?

   4) Explain pasteurization.

   5) Write classification of food preservatives.

   6) What are proteins ?

   7) Define lethal dose.

   8) Name the carbohydrates present in honey.

   9) Which vitamins are present in butter ?

   10) Write the role of K_2SO_4 in Kjeldahl's method.

P.T.O.

B) Fill in the blanks :   **4**
   1) _____ apparatus is used in limit test for arsenic.
   2) Beriberi is caused due to deficiency of _____
   3) Mineral oils are obtained from _____ by distillation.
   4) _____ and _____ are the water soluble vitamins.

SECTION – II

2. A) Give classification of poisons. Write the significance of LD 50 and LC 50.   **7**

   B) What are good and bad cholesterol ? Write estimation of blood cholesterol.   **7**

3. A) What are the constituents of milk ? How lactose is estimated from milk ?   **7**

   B) How do the impurities get incorporated in pharmaceutical substances ?   **7**

4. A) What is Limit test ? Write limit test for iron.   **7**

   B) What is acid value ? How it is estimated from oil sample ?   **7**

SECTION – III

5. A) Write the mode of action of snake venom.   **5**

   B) Estimation of chloride and ash from milk.   **5**

   C) What is bilirubin ? How it is estimated ?   **4**

6. A) What is oxytocin ? Write an essay of analysis of oxytocin.   **5**

   B) Give classification of vitamins. Write an essay of analysis of Vit. A.   **5**

   C) What are the major constituents of Honey ? Give estimation of HMF.   **4**

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

   I) Analysis of oil by sap value.

   II) Classification of food colour.

   III) Mode of action of organophosphate.

   IV) Preservation of blood.

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Seat
No.

M.Sc. (Part – II) (Semester – IV) Examination, 2016
ANALYTICAL CHEMISTRY (Paper – XVI) (New CGPA)
Environmental Chemical Analysis

Day and Date : Wednesday, 6-4-2016

Time : 2.30 p.m. to 5.00 p.m.   Total Marks : 70

Instructions : 1) Attempt in **all five** questions.
2) Question No. **1** is **compulsory**. Attempt **any two** questions **each** from Section **II** and Section **III**.
3) Answer to **all** questions are to be written in **one** answer book **only**.
4) **All** questions carry **equal** marks.
5) Figures to the **right** indicate **full** marks.
6) Draw neat labelled diagram **wherever** necessary.
7) **Use** of calculator and log table is **allowed**.

SECTION – I

1. Attempt the following questions.   **14**

   a) What is the purpose of primary treatment of waste water ?

   b) Mention the components of biosphere.

   c) Bhopal tragedy is the case of what type of pollution ?

   d) State origin of waste water.

   e) State measures to control plastic pollution.

   f) Explain the term persistent organic compound.

   g) State the formula of alum.

   h) Define the terms aerobic digestion and anaerobic digestion.

   i) Explain aerobic lagooning.

   j) State types and sources of water pollution.

k) What is alkalinity ?

l) Explain hydrosphere.

m) Mention different types of air pollution.

n) Define effluents and influents.

SECTION – II

2. a) What are particulate matter ? Explain their effect on human life. **7**

   b) How the alkalinity and hardness of water sample are measured ? **7**

3. a) Explain the biogeochemical cycle of carbon. **7**

   b) Discuss adsorption method for waste water treatment. **7**

4. a) Discuss sedimentation of waste water. **7**

   b) What is waste water and explain domestic waste water treatment ? **7**

SECTION – III

5. a) Describe the dithiozone method for determination of Cd in potable water. **5**

   b) Which pollutants are generated in sugar industry ? How these pollutants can be converted into useful products ? **5**

   c) What is BOD ? Explain briefly the experimental procedure of BOD determination. **4**

6. a) What do you mean by reverse osmosis ? Explain its role in waste water treatment. **5**

   b) Explain ion exchange method for waste water treatment. **5**

   c) Explain public health significance of Pb and Cd from water. **4**

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

   a) Nitrogen cycle.

   b) Biological treatment of hazardous waste.

   c) Three mile island tragedy.

   d) Types and sources of soil pollution.

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SLR-MD – 249

M.Sc. (Part – II) (Semester – III) Examination, 2016
INORGANIC CHEMISTRY (Paper – IX) (New CGPA)
Inorganic Chemical Spectroscopy

Day and Date : Tuesday, 29-3-2016   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) Answers 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) Which symbols are used to denote the point group for crystals ?

   b) In which point group staggered form of ferrocene belongs ?

   c) What is the ground state term of chromium ?

   d) State Laporte selection rule.

   e) How many fundamental bands are observed in the IR spectrum of benzene ?

   f) What is zero point energy ?

   g) Which type of molecules give rise to pure rotational Raman lines ?

   h) In Raman spectroscopy, what is scattering coefficient ?

   i) How will you obtain a photoelectron spectrum ?

   j) Who invented PAS ?

P.T.O.

k) What is Stark effect ?

l) How does a microwave spectrum differ from IR spectrum ?

m) State the splitting pattern in case of ethyl bromide.

n) What is shift reagent ?

SECTION – II

2. a) What is Orgel diagram ? On the basis of Orgel diagram explain the spectra of d2 and d8 ions. **7**

   b) What are the symmetry operations ? Discuss about them with illustrations. **7**

3. a) Describe vibrational-rotational spectra of polyatomic molecule. **7**

   b) Discuss the effect of isotopic substitution on transition frequencies and intensities. **7**

4. a) What is chemical shift ? Explain the factors affecting chemical shift. **7**

   b) Discuss the principle and instrumentation of photo acoustic spectroscopy. **7**

SECTION – III

5. a) Obtain the multiplication table for ammonia (NH_3). **5**

   b) Discuss the Rules for the determination of term symbol. **5**

   c) In the IR spectrum of the polymeric complex $Na_2 [Co (CN)_5]_x$, two $C \equiv N$ stretching frequencies occurs, explain. **4**

6. a) Explain the energies of atomic and molecular transitions. **5**

   b) What are the reducible and irreducible representations ? **5**

   c) Explain the contact shift. **4**

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

   a) Rigid rotor model.

   b) Application of ESCA.

   c) Charge transfer spectra.

   d) Algebra of symmetry operations.

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SLR-MD – 250

M.Sc. (Part – II) (Semester – III) Examination, 2016
INORGANIC CHEMISTRY
(Paper – X) (New C.G.P.A.)
Co-ordination Chemistry – I

Day and Date : Thursday, 31-3-2016   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 mean by volume susceptibility ?

   b) Which calibrant is used in DTA ?

   c) Write the term symbol for ground state of d^4 configuration.

   d) What are the different types of catalyst used in the chemical reaction ?

   e) Which is the oxidation product of the ethylene in water solvent ?

   f) What is strong field ligand ?

   g) Define the term catalyst.

   h) What is mean by ternary complex ?

   i) Write the formula for Curie-Weiss law.

   j) Write the chemical formula for Wilkinson's catalyst used for hydrogenations of olefins.

   k) Draw the Orgel energy level diagram for d^2 case in octahedral system.

P.T.O.

l) Write the equation for μ_{eff} magnetic moment.

m) Using TGA technique how do you identify water molecule in coordination sphere.

n) What do you mean by paramagnetic substance ?

SECTION – II

2. a) What is magnetic susceptibility ? Explain the determination of magnetic susceptibility by Gouy method. **7**

   b) What are mixed ligand complexes ? Discuss the factors affecting stability of ternary complexes. **7**

3. a) Explain the structure of $[Cu(Cl)_4]^{2-}$ on the basis of VBT. **7**

   b) Draw the DTA curve for $CaC_2O_4 \cdot 2H_2O$ and explain the mechanism of decomposition. **7**

4. a) Discuss the catalytic cycle of Monsanto acetic acid process. **7**

   b) Set up MO energy level diagram for octahedral structure involving sigma bonding. **7**

SECTION – III

5. a) Explain the different between CFT and MOT. **5**

   b) What is diamagnetism and paramagnetism ? Discuss with suitable examples. **5**

   c) Write a brief note on current and future trends in catalysis. **4**

6. a) Calculate CFSE values of the following : **5**

   $[Fe(CN)_6]^{3-}$, $[CoF_6]^{3-}$

   b) Outline the decarboxylation reaction of β -keto acid. **5**

   c) Explain the factors affecting TGA curve. **4**

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

   a) Ziegler-Natta polymerization.

   b) Diamagnetic correction.

   c) Factors affecting DTA curve.

   d) Spectrochemical series.

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Seat
No.

M.Sc. (Part – II) (Semester – III) (New CGPA) Examination, 2016
INORGANIC CHEMISTRY
Paper – XII : Environmental Chemistry (Elective)

Day and Date : Tuesday, 5-4-2016   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) Name the devices that use the liquid spray to remove pollutants from gas stream.

    b) Define primary pollutants.

    c) Define BOD.

    d) Write the classification of water pollutants.

    e) What is the range of pH value for most fertile soil ?

    f) Name the instrumental techniques used for air pollutants analysis.

    g) What are methods used for the collection of gaseous air pollutant from atmosphere ?

    h) Which primary nutrients are present in soil ?

    i) Mention some common ionizing radiations.

    j) What is radioactive fallout ?

k) What is chemical toxicology ?

l) Which toxic chemical responsible for Minamata disease ?

m) What are the types of radioactive wastes ?

n) Why hardness of water is expressed in terms of $CaCO_3$ equivalent ?

SECTION – II

2. a) Classify air pollution in details. Discuss the reactions of SO_2 and NO_x in the atmosphere.   **7**

    b) Discuss the coagulation and flocculation with respect to principle reactions involved and process which controls the water pollution.   **7**

3. a) Explain in details of adsorption, absorption and condensation of gaseous effluent of air pollutant.   **7**

    b) What are effect of water pollutants on life and environment ?   **7**

4. a) How will you draw the gaseous samples for the analysis of CO_2 and H_2S air pollutants from atmosphere ?   **7**

    b) Define radiation pollution. What do you mean by ionizing and non-ionizing radiations ?   **7**

SECTION – III

5. a) What are effects of pesticide residue on life ?   **5**

    b) Explain the determination of dissolved oxygen in water.   **5**

    c) Write brief account on air pollution problems in industrial area.   **4**

6. a) Explain ion exchanger method as water softener.   **5**

    b) Explain Bhopal gas tragedy.   **5**

    c) What are impacts of water pollutant on life ?   **4**

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

    a) Disposal methods for the radioactive wastes.

    b) Types of collections particulate pollutants.

    c) Acid rain.

    d) Ozone depletion.

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SLR-MD – 259

Seat No.

M.Sc. (Part – II) (Semester – IV) Examination, 2016
INORGANIC CHEMISTRY (Paper – XIII) (New CGPA)
Instrumental Techniques

Day and Date : Wednesday, 30-3-2016   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) Answer to **all** questions (Section **I, II** and **III**) should be written in **one** answer book.
5) **All** questions carry **equal** marks.
6) Figures to the **right** indicate **full** marks.
7) Use of log tables and calculators is **allowed**.

SECTION – I

1. Answer the following :   **14**

   a) What are the peaks observed in DTA curve ?

   b) What is the source of radiations generally used in Mössbauer spectroscopy ?

   c) In which region of electromagnetic spectrum, transition between NQR levels observed ?

   d) Name the main components in instrumentation of X-ray spectroscopy.

   e) What is the main factor on which chemical shift depends ?

   f) Name the factors which affect the thermogravimetric curves ?

   g) Why water and alcohol are not suitable solvents for ESR studies ?

   h) Name the best known standard free radical used in calibrating ESR spectra.

   i) What is Doppler broadening ?

P.T.O.

j) How X-rays are generated ?

k) What are thermometric titrations ?

l) Name the main hyperfine interactions in Mössbauer spectroscopy.

m) Why molecules do not exhibit ESR spectra ?

n) Name X-ray diffraction methods used for investigating the internal structure of compounds.

SECTION – II

2. a) Explain the principle and applications of neutron diffraction technique. **7**

   b) Describe the principle and working of DTA. **7**

3. a) Explain quadrupole splitting and hyperfine interaction in Mössbauer spectroscopy with suitable example. **7**

   b) What is prolate and oblate nucleus in NQR ? Enumerate NQR frequencies for nucleus with I = 3/2 in an axially symmetric EFG $(\eta = 0)$. **7**

4. a) Discuss the theory of X-ray diffraction, giving a schematic diagram of instrumentation involved. **7**

   b) Explain the factors affecting the magnitude of g value in ESR spectrum. **7**

SECTION – III

5. a) What is meant by thermomechanical analysis (TMA) ? Give a schematic representation of thermomechanical analyser. **5**

   b) A powder diffraction pattern of lead was obtained with Cu-Kα radiation $(\lambda = 1.539 \overset{o}{A})$. Calculate the *d* value of the interplaner distance which gives rise to a first order line at $\sin \theta = 0.9210$. **4**

   c) What are the essential characteristics which a nuclide should have for exhibiting Mössbauer effect ? **4**

6. a) The compound $K_4[Fe(CN)_6].3H_2O$ gives single line Mössbauer spectrum with no quadrupole splitting. Explain. **5**

   b) Predict the ESR spectrum of $.NH_2$ radical and explain the behavior. **5**

   c) What are the differences between DTA and DSC ? **4**

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

   a) Applications of X-ray diffraction.

   b) Isomer shift in Mössbauer spectroscopy.

   c) Applications of thermometric titrations.

   d) Use of NQR spectroscopy in structural information of group III halides.

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Seat No.

M.Sc. (Part – II) (Semester – IV) Examination, 2016
INORGANIC CHEMISTRY (Paper – XIV) (New CGPA)
Co-ordination Chemistry – II

Day and Date : Friday, 1-4-2016   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 **one** answer book.*
5) ***All** questions carry **equal** marks.*
6) *Figures to the **right** indicate **full** marks.*
7) *Use of log tables and calculator is **allowed**.*

SECTION – I

1. Answer the following :   **14**

   a) Write the kinetics of SN^1CB reaction ?

   b) What do you mean by intermediate complex ?

   c) If $n_L > n_R$, then plane of plane polarized light is rotated to which side ?

   d) Define ORD.

   e) Recemic mixture is optically active. State true or false.

   f) Define photochemical reaction.

   g) Define the term activation energy.

P.T.O.

h) Define Grothus-Drafers law.

i) Substitution reaction of square planar complex is stereo specific or stereo selective.

j) Write the two names of techniques used to study kinetics of inorganic reactions.

k) Define Tran's effect.

l) Define base hydrolysis.

m) Write the two types of photochemical reactions.

n) Which of the following is labile complex ? $[Fe(H_2O)_6]^{2+}$ (high spin) and $[Fe(CN)_6]^{3+}$.

SECTION – II

2. a) Describe the inner sphere electron transfer mechanism. Explain two electron transfer process. **7**

   b) Explain the term photochemistry of metallocence. **7**

3. a) What are acid hydrolysis reaction ? Explain acid hydrolysis of Co (III) complexes by considering effect of substitution of ligand and steric factors. **7**

   b) Discuss the relationship between Optically Rotatory Dispersion (ORD) and Circular Dichroism (CD) curves. **7**

4. a) Explain kinetic inertness and lability of metal complexes on the basis of crystal field theory. **7**

   b) State the silent features of SN^1 and SN^2 mechanism of octahedral metal complexes. **7**

SECTION – III

5. a) Discuss the SN1 (CB) mechanism. **5**

   b) Write an account on pi-bonding theory of trans effect. **5**

   c) Why does molecule show optical activity ? Illustrate your answer by using complex compound. **4**

6. a) Metal – ligand bond cleavage is not required to explain rapid conversion of $[Co(NH_3)_5 CO_3]^+$ to $[Co(NH_3)_5 H_2O]^+$. **5**

   b) Discuss how ORD study can be used to establish the configuration of the metal complex ? **5**

   c) State the laws of photochemistry. Explain the photochemistry of chromium (III) complexes. **4**

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

   a) Base hydrolysis

   b) Polarization theory of Tran's effect

   c) Cis effect

   d) Isomerization reaction in octahedral complexes.

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SLR-MD – 261

Seat No.	

M.Sc. (Part – II) (Semester – IV) (New-CGPA) Examination, 2016
INORGANIC CHEMISTRY (Paper – XV)
Chemistry of Inorganic Materials

Day and Date : Monday, 4-4-2016   Max. Marks : 70
Time : 2.30 p.m. to 5.00 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** 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** necessary.
8) **Use** of log table and calculators is **allowed**.

SECTION – I

1. Answer the following :   **14**

   a) According to band theory difference between metals, semiconductors and insulators depend on which factors ?

   b) Give the equation of Curie-Weiss laws.

   c) Write any two types of solids.

   d) How the strength of refractory material increases ?

   e) Write general formula of spinels.

   f) In which factor conductivity of semiconductor depends ?

   g) Write any two applications of ionic conductors.

   h) Who discovered superconductivity ?

   i) Why $BaTiO_3$ is used in capacitor ?

   j) What is the full form of LASER ?

P.T.O.

   k) What is the range of Nanomaterials ?

   l) Give the classification of superconductors.

   m) Write any two methods of preparation of nanomaterials.

   n) Give the formula of magneto plumbite.

SECTION – II

2. a) Explain the synthesis of solid state materials with high temperature and high pressure techniques. **7**

   b) Explain the theory of diamagnetism. **7**

3. a) What are organic semiconductors and explain its properties in details ? **7**

   b) Explain the different types of defects that occur in the crystalline solids and give an example of each. **7**

4. a) Discuss the applications of nanomaterials. **7**

   b) Discuss the type I and II superconductors. **7**

SECTION – III

5. a) Discuss structure and properties of Spinels and Ilmenites. **5**

   b) Explain fullerenes as superconductors. **5**

   c) Explain thermodynamics of Schottky and Frenkel defect formation. **4**

6. a) What are different types of nanomaterial explain in brief ? **5**

   b) What are processes occurs during formation and modification of glassy materials ? **5**

   c) Explain in brief synthesis of solid state material with ceramic techniques. **4**

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

   a) Ionic conductors

   b) Magnetic properties of materials

   c) Manufacturing of nanomaterials

   d) Refractory materials.

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Seat
No.

M.Sc. (Part – II) (Semester – IV) (New CGPA) Examination, 2016
INORGANIC CHEMISTRY (Paper – XVI)
Applied Inorganic Chemistry

Day and Date : Wednesday, 6-4-2016   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) 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 table and calculator is **allowed**.

SECTION – I

1. Answer the following :   **14**

   a) What are the types of inorganic polymers ?

   b) What are the types of solar cells ?

   c) What is biomass ?

   d) Write allotropes of carbon.

   e) Define hapticity of ligand.

   f) What are the sources of geothermal energy ?

   g) What is co-ordination polymer ?

   h) Name the minerals of zeolite.

   i) Name the sandwitch compounds.

   j) What is the size of nonmaterial ?

   k) Write the component of photo electrochemical cell.

   l) What are inorganic polymers ?

   m) Write the sources of non conventional energy.

   n) What are silicones ?

P.T.O.

SECTION – II

2. a) What are the various types of method for making nanomaterials ? Explain in brief sol-gel method. **7**

   b) Explain the energy conversion from fission and fusion reactions. **7**

3. a) Outline the various characterization techniques for nanomaterials. Explain in detail X-ray diffraction technique. **7**

   b) Give a brief account of phosphorous based polymers. **7**

4. a) What are organosilicones ? Discuss various types of silicones. **7**

   b) What are organometallic compounds ? How they are classified ? **7**

SECTION – III

5. a) Explain the ion exchange method for making nanomaterials. **5**

   b) Give the advantages of geothermal energy. **5**

   c) What is 18-electron rule ? Explain it with suitable example. **4**

6. a) Discuss the theories of catalysis. **5**

   b) Write the applications nonmaterials. **5**

   c) Write the general properties of inorganic polymers. **4**

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

   a) Inert gas rule

   b) Homogeneous catalysis

   c) Types of inorganic polymers

   d) Photovoltaic cell.