MCHT 2.1

II Semester M.Sc. in Chemistry Examination February 2015

Inorganic Chemistry

Time: 3Hours Max. Marks: 80

Instructions: PART- 1 is compulsory and answers any four of the remaining questions from PART-II

PART- 1

Answer any 8 equestions

i) What is Lanthanide contraction?

ii) What are the characteristics reactions of actinide +3 and +4 ions?

iii) Calculate the EAN for $V(CO)_6$ compound.

iv) Write any three physical properties exhibited by metal carbonyls.

v) Explain the formation of σ-complex in dihydrogen complexes.

vi) Name the following co ordination compound according to IUPAC nomenclature.

$\left[Co(en)_2 Br_2\right]Cl, \left[Cr(en)_5(SCN)\right]F_5$

vii) Identify the optically active compounds from the following complexes.

a) $\left[Co(en)_3\right]^{3+}$

b) $trans-\left[Co(en)_2 Cl_2\right]^{+}$

c) $cis-\left[Co(en)_2 Cl_2\right]^{+}$

d) $\left[Cr(NH_3)_5 Cl\right]$

viii) Octahedral complexes are always high spin complexes. Give reason.

ix) What is Faraday Effect?

x) Why metal t_{2g} orbitals are not overlap with ligand σ-orbitals?

PART-II

1. a) Why do the electronic absorption spectra of Lanthanide ions have sharp bands unlike the broad bands in the 3d-elements?
   b) What are the main principle involved upon separation of N_p, P_u and A_m from U ?
   c) Explain the structure of binucleon metal carbene $Fe_2(CO)_g$.

(4 + 6 + 6)

2. d) What are ligands? With example discuss their classification.
   e) What is Trans effect? Explain its mechanism.
   f) Discuss briefly stepwise and overall stability constant of co ordination compounds

(6 + 4 + 6)

3. g) What is effective atomic number? How the stability of the complex is interpreting using ENA?
   h) Which of the following complexes has more Δ_0 value? Explain why
   i) $\left[Fe(H_2O)_6\right]^{3+}$ ii) $\left[Fe(CN)_6\right]^{3-}$
   i) Discuss molecular orbital diagram of octahedral complexes.

(4 + 6 + 6)

4. k) Compare the CFT and MOT
   l) What are term symbols? Explain their significance
   m) Explain curic temperature (T_c) and Neel temperature (T_N)

(4 + 6 + 6)

5. n) Why scandium and Yttrium are usually considered along with the Lanthanide elements?
   o) What are Nitrosyl complexes? Discuss their structure and bonding with example.
   p) What are di hydrogen complexes? Discuss their structure, bonding and spectroscopic characterization.

(4 + 6 + 6)

6. q) What is Johan Teller distortion? Illustrate with example.
   r) Discuss the octahedral co ordination complexes with π-acceptor ligands
   s) Draw the crystal field splitting diagram for $[CoF_6]^{4-}$ *and* $\left[Co(en)_3\right]^{2+}$ and explain their magnetic properties? **(4 + 6 + 6)**

MCHT 2.2

II Semester M.Sc. in Chemistry Examination February 2015
Organic Chemistry

Time: 3Hours Max. Marks: 80

Instructions: PART- 1 is compulsory and answers any four of the remaining questions from PART-II

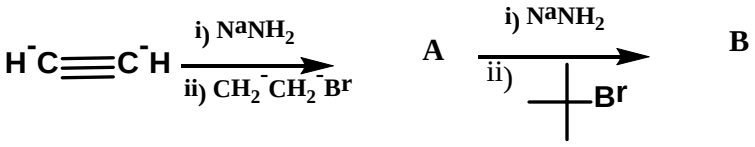
PART-1

Answer any 8 questions **2 x 8=16**

i) What is Luche reduction? Give one example.
ii) Explain chemo selective reaction with example.
iii) Comment on aptitude of migrating group in pinacol-pinocolone rearrangement.
iv) Explain Benzylic acid rearrangement.
v) What is the intermediate involved in Schemidt rearrangement.
vi) What is menat by enantiomeric excess (ee)?
vii) Explain Deals-Alder reaction? Give one example
viii) What is Chichibaby reaction?
ix) What is chiral auxylary? Give one example.
x) Write any two acid labile protecting group used for protection of alcohol group.

PART-II

1. a) Predict the structure of the product formed in the reaction below



b) With example, explain the use of lead teraacetate in organic synthesis. And write the mechanism.

c) With example discuss followings

i) Ring closing mechanism (RCM)
ii) Cross methathesis and
iii) Ring opening methathesis **(4 + 6 + 6)**

2. d) What is Corey-Kim oxidation? Illustrate with example.
e) Explain the radical Mechanism of halogination of alaknes.
f) What is birch reduction? With example explain the stereochemistry of product in reduction of alkyne using birch reduction **(4 + 6 + 6)**

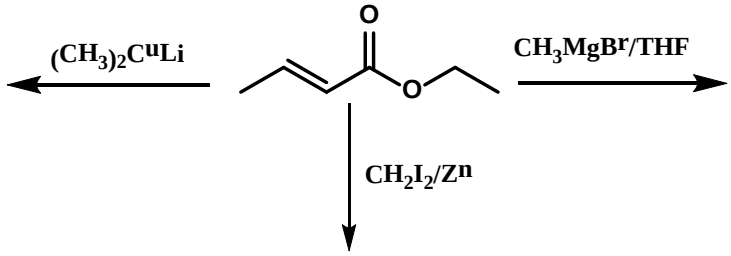
3. g) What is Fries rearrangement? Discuss with mechanism.
   h) What is Beckman rearrangement? Discuss the mechanism and comment on aptitude of migration group.
   i) Illustrate Rabinsion annulations reaction? Explain the mechanism with example.

(4 + 6 + 6)

4. j) Explain the enetioselective and diastereoselective addition to carbon-carbon double bond.
   k) What is conjugate addition reaction? What are the factors influence regeoselectivity in conjugate addition reaction?
   l) With example discuss orthogonal protection strategy.

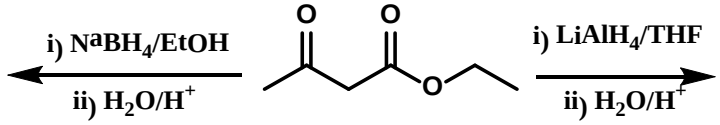
(4 + 6 + 6)

5. m) How phosphorus and sulphur ylids reacts with carbonyl compounds? Write the reaction mechanism in both reactions.
   n) Write the any two major reactions of N-halo succinamides in organic synthesis.
   o) Write the structure of products in the following reaction. **(4 + 6 + 6)**

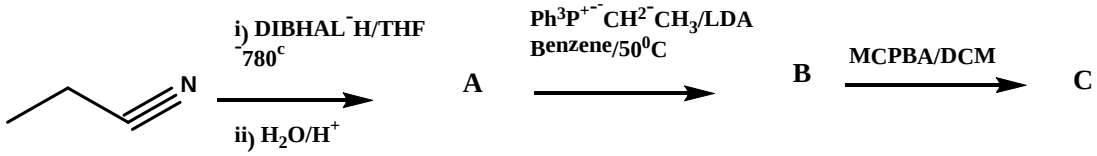


6. Write the structure of products in the following reactions. **(4 + 6 + 6)**

p)



q)



r)

MCHT 2.3

II Semester M.Sc. in Chemistry Examination February 2015

Physical Chemistry

Time: 3Hours Max. Marks: 80

Instructions: PART- 1 is compulsory and answers any four of the remaining questions from PART-II

PART-1

Answer any eight questions

i) What is meant by freezing point depression?
ii) What is activity and activity coefficients?
iii) With example define degree of freedom.
iv) Explain the Faraday law of electrolysis?
v) State the limitation of Debye- Hukel theory?
vi) What are concentration cells? Give two examples.
vii) Define the term liquid junction potential?
viii) Write the statement of variation theorem.
ix) How adsorption is different from absorption phenomenon?
x) What is de- emulsification? Name two de emulsifications.

PART-2

2. a) What are colligative properties? What are the different colligative properties exits?
   b) Discuss the thermodynamics of non ideal solution.
   c) Derive the phase diagram of the water system and explain the term triple point.

(4+ 6+ 6)

3. d) Derive expression of Arrhenius theory of electrolytic dissociation
   e) Explain the HelmHoltz – perrir model of electrical double layer.
   f) How trans port numbers are determined by Hittot's method.

(4+ 6+ 6)

4. g) Derive mathematical expression for application of schrodinger equation for a free particle.
   h) Setup the S equation to polar co ordinates.
   i) Derive the general theory of perturbation method.

(4+ 6+ 6)

5. j) Derive the equation for uni molecular surface reactions.
   k) Derive the Brunauer Emmet Teller-Adsorption isotherm.
   l) Explain electro osmosis phenomenon.

(4+ 6+ 6)

6. m) Explain variation of activity with temperature.
   n) Discuss the phase diagram of the silver lead system.
   o) Derive the expression for Debye-Huckel on sager conductance equation.

(4+ 6+ 6)

7. p) Derive the mathematical expression for particle in a three dimensional Box.

q) Derive the expression for inhibition of unimolecualr surface reaction.

r) How are the colloidal solution are classified on the basis of physical states of the dispersed phase and dispersion medium?

(4+ 6+ 6)

MCHT 2.4

II Semester M.Sc. in Chemistry Examination February 2015

Analytical Chemistry

Time: 3Hours Max. Marks: 80

Instructions: PART- 1 is compulsory and answers any four of the remaining questions from PART-II

PART-I

Answer any eight questions

i) What is error? Mention the difference types of error.
ii) How accuracy can be improved in analysis?
iii) What is gravimetric analysis?
iv) What is redox reaction? Give one example.
v) What are the difference between equivalence point and end point?
vi) What are masking agents? Give two examples.
vii) What is leaving effect or solvent leveling?
viii) What is distribution ratio(D) in solvent extraction?
ix) What is column efficiency?
x) What is diffusion current?

PART-II

1. a) Explain Gaussian distribution and standard deviation(s)?
   b) What is accuracy and precision? Discuss any two methods of expressing accuracy?
   c) Explain the principle of precipitation? What are the difference between post-precipitation and co-precipitation?

(4+ 6+ 6)

2. d) Discuss the isotopic exchange methods?
   e) With example explain visual and adsorption indicator used in precipitation titration.
   f) Explain the inorganic and organic analysis using redox titration.

(4+ 6+ 6)

3. g) Write a note on complexometric titration with EDTA?
   h) Explain the process of determination of Hardness of water?
   i)With example explain direct and back titration methods.

(4+ 6+ 6)

4. j) Explain the basic concept of non- aqueous titrations.
   k) What is separation factor (r)? How it will be calculated?
   l) Discuss column selectivity and column efficiency?

(4+ 6+ 6)

5. m) Discuss methods of minimizing error.
   n) What is meant by seeding? Explain its advantages in precipitation.
   o) Write a note on Quantitative estimation of oxalic acid.

(4+ 6+ 6)

7. p) Write a note on direct and reverse isotopic dilution analysis?

q) Explain the titration of halogen acid salts of bases with perchloric acid.
s) Explain the general theory of column chromatography.

(4+ 6+ 6)