CENTRAL UNIVERSITY OF HARYANA
Jant-Pali, Mahendergarh, Haryana
Term End Examination May 2018

Name of Programme	**: Elective Course in Chemistry**
Year & Semester	**: May 2018, Second Semester**
Course Name	**: Organic Chemistry of Polymers**
Course Code	**: SCS CH 1205 DCEC 4004**
Maximum Marks	**: 70**
Duration	**: 3 Hrs**

Q1. Answer any four out of seven of the following, each of 3.5 marks (14 marks)

i) Synthesis of polyethylene terephthalate
ii) Synthesis of urea-formadehyde resins
iii) Synthesis of carbonates
(iv) Synthesis of epoxy resins
v) Synthesis of polyphosphazenes
vi) Synthesis of silicone polymers
vii) Synthesis of unsaturated polyesters

Q2. Write short notes on any two out of three topics, each of 7 marks (14 marks)

i) Cationic polymerization
ii) Emulsion Polymerization
iii) Fischer Tropsch synthesis of polymers

Q3. Answer any two of the following three topics, each of 7 marks (14 marks)

i) write a note on natural and synthetic biodegradable plastics and polymers
ii) Write a short note on free radical polymerization
iii) List out some free radical initiators and their mechanism and temperature ranges of action

Q4. Answer any two of the following three topics, each of 7 marks (14 marks)

i) Compare polycondensation and chain polymerization reactions
ii) Compare synthesis of novolac and resole phenolics
iii) Compare suspension and emulsion polymerizations

Q5. Answer any two of the following three topics, each of 7 marks (14 marks)

i) Write a note on Termination reactions in radical reactions.
ii) Write a note on stereoisomerism in polymers, with special reference to geometric isomers of butadiene and isoprene
iii) List out some redox initiators and their mechanism

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations May /June 2018

Programme: M.Sc. (Chemistry) | **Session: 2017-18**

Semester: II | **Max. Time: 3 Hours**

Course Title: Inorganic Chemistry –II | **Max. Marks: 70**

Course Code: SCS CH 1201 C 4004

Question No. 1. Attempt any four. **(4 × 3.5 = 14)**

a) Water binds K^+ ion in the gas phase with $\Delta H° = -18$kcal/mol while benzene binds K^+ ion with $\Delta H° = -19$kcal/mol. Justify.

b) Describe various types of mixed – valence compounds. Explain which one of them would be useful in the activation of small molecules.

c) Identify the guest and describe the mode of interaction for a crown–ether versus a cryptand host.

d) Explain the terms Kinetic *versus* Thermodynamic selectivity in supramolecular host – guest interactions.

e) Which one is expected to be more labile and why? (i) $[Ni(bpy)_3]^{2+}$
(ii) $[Ni(bpy)_2(H_2O)_2]^{2+}$ [bpy: 2,2'-bipyridine]

f) In the Orgel diagram of the d^2 tetrahedral system, the energy of $^3T_{1g}(F)$ is lowered and that of $^3T_{1g}(P)$ is raised. Explain.

g) Transition metal complexes with **A** and **E** ground states have magnetic moments that differ from the spin-only values. Explain.

Question No. 2. Attempt any two. **(2 × 7 = 14)**

a) $[Cr(H_2O)_6]^{3+}$ shows three absorption bands at 17.4, 24.6 and 37.9 kK. Assign these bands and calculate **Dq**, **c** (parameter related to increase or decrease of energy of T_{1g} states), **B'**. **B** for Cr(III) is 1.06 kK for the free ion. Also calculate and comment on the nephelauxetic ratio (β). 1 kK = 1000 cm^{-1}.

b) Describe the importance of $[Ru(bpy)_3]^{2+}$ complex as photo-sensitizer in the photo-cleavage of water and explain the role of bpy ligand in this complex. What would happen to the photo-sensitization ability of the $[Ru(bpy)_3]^{2+}$ complex if bpy is replaced by NH_3?

c) i) The absorption spectrum of $[Ti(H_2O)_6]^{3+}$ is attributed to a single electronic transition $t_{2g} \rightarrow e_g$. The band, however, is not symmetrical and suggests that more than one state is involved. Explain (4 marks)

ii) Given that the maximum absorption in the d-d- band for $[Ti(H_2O)_6]^{3+}$ occurs at 20300 cm^{-1}; predict where the bands will occur for $[Ti(CN)_6]^{3-}$ and $[Ti(Cl)_6]^{3-}$ complexes? (3 marks)

Question No. 3. Attempt any two. **(2 × 7 = 14)**

a) i) Discuss the differences between inner and outer sphere mechanisms in octahedral complexes (4.5 marks)

ii) The reduction of $[Co(NH_3)_5Cl]^{2+}$ by $[Cr(H_2O)_6]^{2+}$ occurs through inner sphere electron transfer mechanism and is much faster than the reduction of $[Co(NH_3)_6]^{2+}$. Explain (2.5 marks)

b) $[NiCl_4]^{2-}$ and $[Ni(CO)_4]$ both are tetrahedral but differ in their magnetic moment. Explain with the help of a d-orbital splitting diagram.

c) Both FeF_2 and $K_3[CoF_6]$ contain six–coordinate high – spin metal ions. The electronic spectrum of the former shows absorption features at 6990 and 10,660 cm^{-1}, while the latter has absorption features at 10,200 and 14,500 cm^{-1}. For which complex is Δ_o largest? Why? How many multiplicity allowed transitions would you expect for these complexes? How can you account for the presence of two bands in each spectrum?

Question No. 4. Attempt any two. **(2 × 7 = 14)**

a) Discuss molecular orbitals formed in octahedral transition metal complexes with σ - only; π - only; and mixed donor ligands.

b) In the solid state, $[Co(pyridine)_2Cl_2]$ is violet and has a magnetic moment of 5.5 BM, but a CH_2Cl_2 solution of this compound is blue and has a magnetic moment of 4.42 BM. In contrast, $[Co(pyridine)_2Br_2]$ is blue in both the solid state and in CH_2Cl_2 solution and has a magnetic moment of 4.6 BM in both forms. Explain these observations and deduce the structure for all complexes. Predict the color and magnetic moment of $[Co(pyridine)_2I_2]$ complex.

c) What is Born-Landé equation and what does it predict about the variation of lattice energy as we go from left to right in a period?

Question No. 5. Attempt any two. **(2 × 7 = 14)**

a) i) What is molecular recognition? Explain its importance in supramolecular chemistry. (4 marks)

ii) Why is hydrogen bonding considered a "masterkey interaction" in supramolecular chemistry? Draw the geometries of the following hydrogen bonds: bent; donating bifurcated and trifurcated. (3 marks)

b) What is a molecular device? Discuss the process of photo- and electrochemical switching by taking example of a 1,2-dithienylethene unit in a molecular switch. (4 marks)

ii) Explain Dexter and Forster mechanisms of electron transfer in molecular devices (3 marks)

c) Explain Pre-organization and Complementarity with suitable examples.

CENTRAL UNIVERSITY OF HARYANA

Programme: MSc (Chemistry) **Session: 2017-18**

Semester: II **Max. Time: 3 Hours**

Course Title: Physical Chemistry-II **Max. Marks: 70**

Course Code: SCS CH 1203 C 4004

Instructions:

1. Question no. 1 has seven sub-parts and students need to answer any four. Each sub-part carries three and a half Marks.

2. Question nos. 2 to 5 have three sub-parts and students need to answer any two sub-parts of each question. Each sub-part carries seven marks.

Physical constants

($c = 3\times10^{8}$ m s^{-1}, $h = 6.63\times10^{-34}$ J s^{-1}; $k_B = 1.38\times10^{-23}$ J K^{-1}; $\pi = 3.14$; $N_A = 6.02\times10^{23}$)

Question No. 1. (4X3.5=14)

a) The energy of a particle in a cubic box of edge a is given by the expression,

$$\epsilon_n = (n_x^2 + n_y^2 + n_z^2)\frac{h^2}{8ma^2}.$$

Using this expression, find out the translational partition function.

b) Define partition function. Give three examples, with their respective constraints.

c) Derive the expression for the mean activity coefficient of $Al_2(SO_4)_3$ in terms of molality (m).

d) Which of the following molecules will show a microwave rotational spectrum?

H_2, HCl, C_6H_6, CH_3Cl, CH_2Cl_2, H_2O, SF_6

e) What are symmetric and asymmetric top molecules? Explain, with suitable examples.

f) Explain the effect of isotope substitution in rotational spectroscopy.

g) What do you mean by overtone and combination frequencies? How can the intensity of hot bands be enhanced?

Question No. 2. (2X7=14)

a) (i) What are the assumptions made in the Debye–Hückel Theory? (2 marks)

(ii) Write the expression of the law and explain the terms involved. (1.5 marks)

(iii) Explain why the law is called a limiting law and elaborate its limitations. (3.5 marks)

b) (i) Why do deviations from ideal behaviour begin to occur at much lower concentrations of solute for electrolytic solutions than for non-electrolytic solution? (2 marks)

(ii) Benzene and toluene form a solution which is very nearly ideal. Consider a mixture of benzene (Bz) and toluene (Tol) at 60 °C. At 60 °C, the vapor pressures of pure benzene and pure toluene are 385 Torr and 139 Torr, respectively. What are the vapor pressures of benzene and toluene in a mixture with x_{Bz} = 0.400, and x_{Tol} = 0.600, and what is the composition of the vapor in equilibrium with this solution? Use Raoult's law to find the vapor pressures of the two species. (5 marks)

c) (i) What is chemical potential? What does it signify? (2 marks)

(ii) Derive the general form of the Gibbs-Duhem Equation. What does it transform into at constant temperature and pressure conditions? (5 marks)

Question No. 3. (2X7=14)

a) Define the molar heat capacity of a gas. Sketch the temperature variation of the molar heat capacity of a diatomic gas. Explain the plot. (1,3,3 marks)

b) (i) The vibrational heat capacity of a diatomic molecule is given by $C_V = R\left(\frac{\vartheta_V}{T}\right)^2 \frac{e^{\vartheta_V/T}}{(e^{\vartheta_V/T}-1)^2}$. Obtain the expression at low and high temperatures. (3 marks)

(ii) The frequencies of the three normal modes of vibration (in wave number) of water molecule are 3656.7, 1594.8 and 3755.8 cm $^{-1}$. Calculate the vibrational partition function at 300 K. (4 marks)

c) Using the translational partition function, derive the expression for the molar the entropy of an indistinguishable gas (the Sackur-Tetrode Equation). (7 marks)

Question No. 4. (2X7=14)

a) The rotational spectrum of $^{79}Br^{19}F$ shows a series of equidistant lines 0.71433 cm^{-1} apart. Calculate the rotational constant, $\tilde{B}$, and hence the moment of inertia and bond length of the molecule. Determine the wave number of the J = 9 to J = 10 transition, and find which transition gives rise to the most intense spectral line at room temperature (say 300 K). (7 marks)

b) (i) The rotational constant for $H^{35}Cl$ is observed to be 10.5909 cm^{-1}. What are the values of $\tilde{B}$ for $H^{37}Cl$ and for $D^{35}Cl$? (5 marks)

(ii) Write a short note on the Stark effect. (2 marks)

c) (i) HCl has a $\tilde{B}$ value of 10.5909 cm^{-1} and a centrifugal distortion constant $\tilde{D}$ of 5.3 X 10^{-4} cm^{-1}. Calculate the vibrational frequency and force constant of the molecule. (4marks)

(ii) Explain the unusual trend in the intensity of spectral lines in rotational spectroscopy. (3 marks)

Question No. 5. (2X7=14)

(a) (i) Discuss the simple harmonic oscillator model for a vibrating diatomic molecule. What do you mean by zero point energy? [3+1 marks]

(ii) Write down the selection rule for a simple harmonic oscillator undergoing vibrational changes. Derive the expression for calculating $\Delta\varepsilon$ for a $v = 0$ to $v = 1$ transition. [1+2 marks]

(b) (i) Write down the empirical expression of the Morse function and draw the Morse curve. What is D_{eq}? [3 marks]

(ii) Derive the expression for *fundamental*, *first overtone* and *second overtone* transitions possible in a vibrating diatomic molecule undergoing anharmonic oscillation. The values of these transitions for HCl are 2886, 5668 and 8347 cm^{-1}, respectively. Calculate the equilibrium oscillation frequency and corresponding anharmonicity constant for HCl. [2+2 marks]

(c) (i) What are the selection rules for a diatomic vibrating rotator? Describe the P, Q and R branches of spectra for a diatomic vibrating rotator. [1+3 marks]

(ii) Write down the equations for calculating the number of fundamental vibrational modes in linear and non-linear molecules. How many vibrational modes are possible for the SO_2 molecule? Depict the modes of SO_2 with a proper drawing (3 marks)

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, May/June 2018

Programme: MSc Chemistry | **Session: 2017-18**
Semester: II | **Max. Time: 3 Hours**
Course Title: Organic Chemistry II | **Max. Marks: 70**
Course Code: SCS CH 1202 C 4004

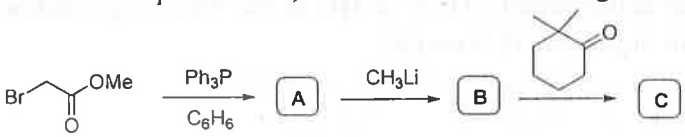
Instructions:

1. Question no. 1 has seven sub parts and students need to answer any four. Each sub part carries three and half Marks.
2. Question no. 2 to 5 have three sub parts and students need to answer any two sub parts of each question. Each sub part carries seven marks.

Question No. 1. **(4X3.5=14)**

a) Why are halobenzenes called deactivators even though they are *o*- and *p*- directors?

b) Find out the products **A**, **B** and **C** in the following reaction.



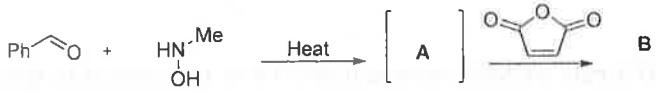
c) Describe *von* Ritcher reaction with stepwise mechanism.

d) What is autooxidation? Explain the steps involved in the autooxidation of benzaldehyde.

e) Illustrate Norrish type II reaction with a suitable example.

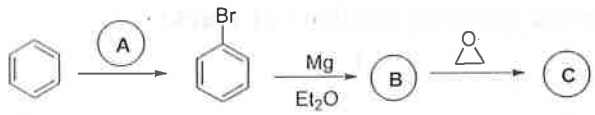
f) What is Nazarov reaction? Explain the reaction with Frontier Molecular Orbital diagram.

g) What is the structure of the reactive intermediate A. Explain its formation and further reaction with maleic anhydride.

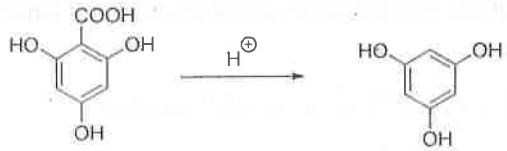


Question No. 2. **(2X7=14)**

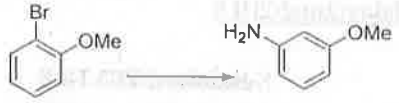
a) (i) Why is aniline more reactive towards electrophiles than phenol? **(2 marks)**
(ii) Find out reagents/products **A**, **B**, and **C** in the following transformations **(3 marks)**.



(iii) Identify the type of reaction and explain the mechanism of the following transformations. **(2 marks)**



b) (i) The reaction of *ortho*-bromoanisole(1) gives only *meta*-aminoanisole (2) on treatment with potassium amide in liquid ammonia. Explain the regioselectivity with the help of mechanism. **(2.5 marks)**

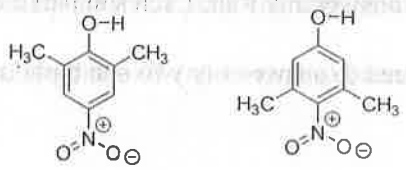


(1) (2)

(ii) How will you obtain *m*-bromophenol from benzene? Describe only the steps. **(2.5 marks)**

(iii) Explain the following statement **(2 marks)**

Compound 1 is more acidic than compound 2.

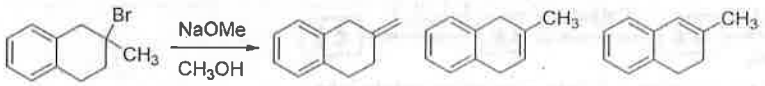


(1) More acidic pka = 7.22

(2) Less acidic pka = 8.25

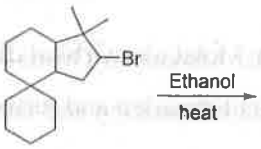
c) (i) Describe E1CB reaction with a suitable example. **(2.5 marks)**

(ii)Which one will be the major product (**I, II** or **III**) in the following reaction? Give your comments to support your argument. **(2.5 marks)**



(I) (II) (III)

(iii) Identify the reaction and predict the major product in the following transformation. **(2 marks)**



Question No. 3. **(2X7=14)**

a) i) What is the Markovnikoff's rule of addition reactions? How it is useful in determining the regioselectivity of products during addition of unsymmetrical reagents to unsymmetrical C-C double bonds? **(3 marks)**

(ii) Describe the Sharpless asymmetric epoxidation reaction. How will you predict the stereochemistry of the product using SAE model? **(3 marks)**

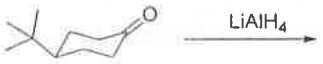
(iii) What is the major product in the following reaction?. **(1 mark)**

b) (i) Discuss the Michael addition reaction taking an appropriate example. **(2.5 marks)**

(ii) Why does addition of H_2 to C-C multiple bond require a transition metal catalyst? Explain with mechanism. **(2 marks)**

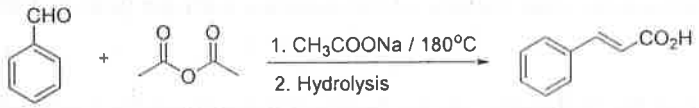
(iii) Describe hydroboration reaction of any terminal olefin. **(2.5 marks)**

c) (i) Predict the major product in the following reaction. Give your comments. **(2.5 marks)**



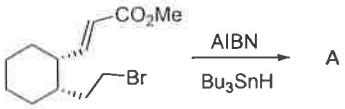
(ii) What is the Eschenmoser salt in Mannich reaction? Discuss the Mannich reaction taking an appropriate example. **(2.5 marks)**

(iii) Identify the following reaction and discuss its reaction mechanism. **(2 marks)**



Question No. 4. **(2X7=14)**

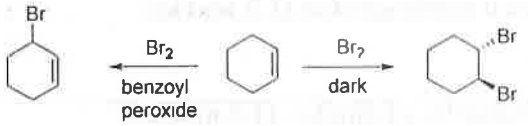
a) (i) Predict the product **A** of the following reaction; explain with detailed mechanism **(3.5 marks)**



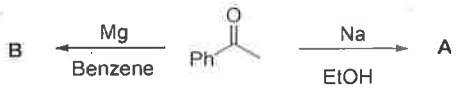
(ii) What are persistent radicals? Draw the structure of any one example **(1.5 marks)**

(iii) Illustrate Paterno-Buchi reaction with a suitable example. **(2 marks)**

b) (i) Explain the difference in reactivity of cyclohexene towards bromine under the following conditions. **(3 marks)**

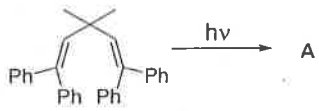


(ii) Predict the products **A** and **B** in the following reactions. Explain with mechanism. **(3 marks)**

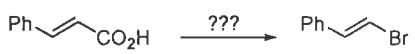


(iii) Explain a method for reduction of benzyl bromide to toluene that proceeds via a free radical. **(1 mark)**

c) (i) Predict the product A with detailed mechanism. **(2.5 marks)**



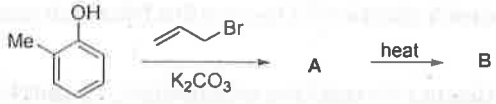
(ii) How will you do the following conversion? **(2.5 marks)**



(iii) Illustrate Sandmeyer reaction with a suitable example. **(2 marks)**

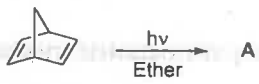
Question No. 5. **(2X7=14)**

a) (i) What are the products A and B and how are they formed? **(2.5 marks)**

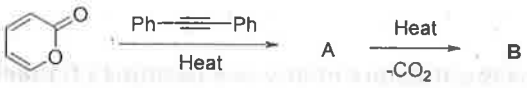


(ii) Explain thermal electrocyclic ring closure of hexatrienes with the help of FMO diagram. **(3 marks)**

(iii) What is the product of the following photochemical intramolecular cycloaddition? **(1.5 marks)**



b) (i) Describe with mechanism the formation of products **A** and **B** in the following reaction. **(2.5 marks)**



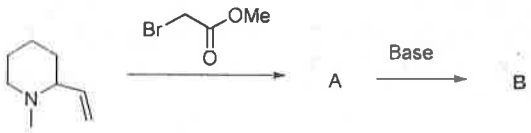
(ii) What is inverse electron demand Diels-Alder reaction? Give an example. **(1 mark)**

(iii) Describe an example of an intramolecular carbonyl ene reaction. How can such reactions be made faster? **(2 marks)**

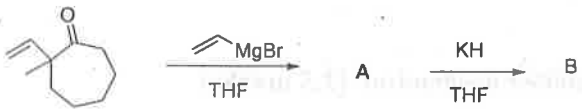
(iv) Give an example of Johnson-Claisen rearrangement **(1.5 marks)**

c) (i) What are 1,3-dipoles? Give three examples of dipoles. **(1.5 marks)**

(ii) What are the products **A** and **B**? Describe the mechanism. **(3 marks)**



(iii) Explain with mechanism the formation of **A** and **B**. **(2.5 marks)**



CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, May/June 2018

Programme: MSc Chemistry
Semester: II
Course Title: Organic Chemistry II (reappear)
Course Code: SCS CH 1202 C 4004

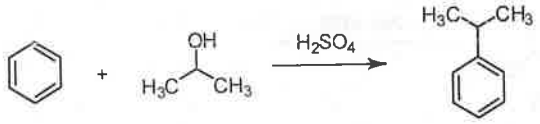
Session: 2017-18
Max. Time: 3 Hours
Max. Marks: 70

Instructions:

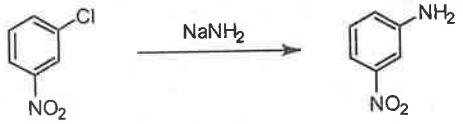
1. Question no. 1 has seven sub parts and students need to answer any four. Each sub part carries three and half Marks.
2. Question no. 2 to 5 have three sub parts and students need to answer any two sub parts of each question. Each sub part carries seven marks.

Question No. 1. **(4X3.5=14)**

a) a) Propose a suitable stepwise mechanism of following transformation.



b) Identify the following reaction and propose its stepwise mechanism.



c) Write a note on E1CB reactions.

d) Discuss the Sharpless Asymmetric epoxidation reaction.

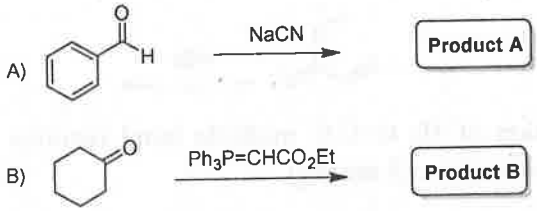
e) Draw the π-molecular orbitals of butadiene and mark the HOMO and LUMO.

f) Write a note on the stability of free radicals.

g) Illustrate any photochemical reaction of carbonyl compounds.

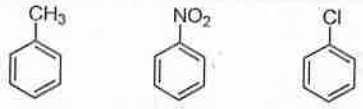
Question No. 2. **(2X7=14)**

a) (i) Predict the product in following reaction. **(4 marks)**



(ii) Describe Vilsmeier-Haack Reaction. **(3 marks)**

b) (i) Describe the orientation and reactivity of following substituted benzene towards the electrophilic substitution reactions. **(4 marks)**

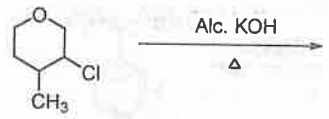


(1) (2) (3)

(ii) Discuss hydroboration reaction using a suitable terminal olefin as a reactant. **(3 marks)**

(c) (i) What is oragnolithium reagents? Describe some of its application in organic synthesis. **(3 marks)**

(ii) Find out products in the following reactions and predict the major product wherever is necessary. **(4 marks)**

A) 

B) 

Question No. 3. **(2X7=14)**

a) (i) What is major difference between aldol reaction and Knoevenagel reaction. Describe with the help of suitable examples. **(5 marks)**

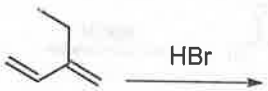
(ii) Discuss metal hydride reduction of carbonyl compounds. **(2 marks)**

b) (i) Why the reaction of hindered ketone with Grignard reaction does not take place. Explain with an example. **(3.5 marks)**

(ii) Describe Reformatsky reaction. **(3.5 marks)**

c) (i) Describe the Markovnikoff's rule of addition reaction. **(2 marks)**

(ii) What the major product in the following reaction. **(2 mark)**



(iii) Why addition of H_2 to C-C multiple bond requires transition metal catalyst? Explain with mechanism. **(3 marks)**

Question No. 4. **(2X7=14)**

a) (i) Write a note on structure and stability of free radicals. **(3 marks)**

(ii) What are radical chain reactions? What are the steps involved in them? Illustrate with an example **(3 marks)**

(iii) What is the spectroscopic method for the detection of free radicals **(1 mark)**

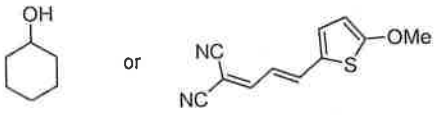
b) (i) Illustrate Hunsdiecker reaction of benzoic acid. **(3 marks)**

(ii) Describe a photochemical cycloaddition reaction **(2 marks)**

(iii) What is meant by one electron reduction? Give an example. **(2 marks)**

c) (i) Illustrate di-pi-methane rearrangement. **(3 marks)**

(ii) Which of the following compound will absorb light more effectively and why? **(2 marks)**



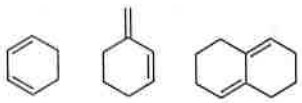
(iii) What is autooxidation? Illustrate with an example. **(2 marks)**

Question No. 5. **(2X7=14)**

a) (i) Briefly describe the features of Diels-Alder reaction. **(3 marks)**

(ii) Illustrate Claisen rearrangement. **(2 marks)**

(iii) Which of the following compounds ***cannot*** participate as dienes in Diels-Alder reactions? Explain why? **(2 marks)**



b) (i) Write a note on sigmatropic rearrangements **(3 marks)**

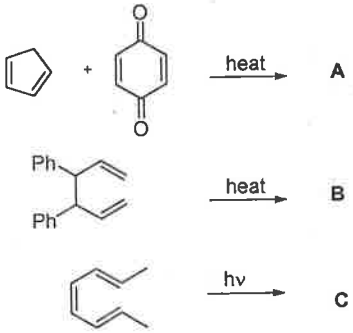
(ii) What is carbonyl ene reaction? Give an example **(2 marks)**

(iii) What are conrotation and disrotation in electrocyclisation reactions? **(2 mark)**

c) (i) Write a brief account on 1,3-dipolar cycloaddition reactions. **(3 marks)**

(ii) Describe antarafacial and suprafacial modes of migrations **(1 marks)**

(iii) Predict the products in the following reactions. **(3marks)**



CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, May/June 2018

Programme: M.Sc. (Chemistry) **Session: 2017-18**

Semester: IV **Max. Time: 3 Hours**

Course Title: Medicinal and Pharmaceutical Chemistry **Max. Marks: 70**

Course Code: SCS CH 1403 DCEC 4004

Instructions:

1. Question no. 1 has seven sub parts and students need to answer any four. Each sub part carries three and half Marks.

2. Question no. 2 to 5 have three sub parts and students need to answer any two sub parts of each question. Each sub part carries seven marks.

Question No. 1. (4 x 3.5=14)

a) Describe the role of hydrogen bonding in drug-target interactions.

b) State Lipinski's rule of five.

c) Explain the differences between lock and key model and induced fit model.

d) What do you mean by antipsychotic drugs? Discuss the synthesis of diazepam.

e) Describe the term local anesthesia. Discuss its mechanism of action.

f) Describe the bacterial cell and point out the different classes of antibiotics which target various parts/pathways of bacterial cell.

g) Discuss the synthesis of ciprofloxacin.

Question No. 2. (2X7=14)

a) (i) What is meant by allosteric binding? (2 marks)

(ii) Explain the differences between agonists and antagonists. (3 marks)

(iii) Define IC_{50} and explain its relevance in medicinal chemistry. (2 marks)

b) (i) What is a topoisomerase poison? Explain with an example. (2 marks)

(ii) What is in-silico screening? How is it useful in drug discovery? (2 marks)

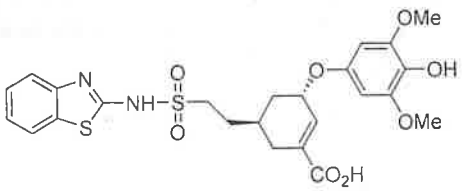
(iii) Draw the structure of any DNA intercalator. (1 mark)

(iv) What are the common sources of lead compounds? (2 marks)

c) (i) How do you establish structure-activity relationship for a series of newly developed lead compounds? (2.5 marks)

(ii) What is a pharmacophore? (1 mark)

(iii) The following compound inhibits an enzyme strongly. Identify the functional groups in it that are capable of engaging in hydrogen bonding, electrostatic bonding and van der Waals interactions. (2 marks)



(iv) What is meant by pharmacodynamics? (1.5 marks)

Question No. 3. (2X7=14)

a) (i) Describe a synthesis of cisplatin. How does it act on DNA? (3 marks)

(ii) What are three major classes of anticancer drugs? Give one example of each. (2 marks)

(iii) Explain the difference between apoptosis and necrosis. (2 marks)

b) (i) Draw the structure of anticancer drug SAHA and what is its cellular target? Describe its synthesis. (3 marks)

(ii) Explain metastasis and its significance in cancer. (2 marks)

(ii) Give an example of a nitrogen mustard. (1 mark)

(iii) Why do anticancer drugs show more side effects than antibacterial agents? (1 marks)

c) (i) Draw the structure of combretastatin A-4 and describe its synthesis. What is its cellular target? (3 marks)

(ii) What is the difference between a malignant tumor and neoplasm? (2 marks)

(iii) What is angiogenesis? How is it relevant in cancer chemotherapy? (2 marks)

Question No. 4. (2X7=14)

a) (i) Describe the biosynthesis of a bacterial cell wall. Which class of antibiotic inhibits the bacterial cell wall formation? Discuss in detail with the help of mechanism. (5 marks)

(ii) What is the meaning of prodrug? Illustrate it taking an appropriate example. (2 marks)

b) (i) What is 6-APA? Does it have any relation with Penicillin synthesis? Discuss in short. (2 marks)

(ii) Describe the synthesis of 7-ACA and demonstrate one general method for the preparation cephalosporin. (3 marks)

(iii) Name and draw the structure of one antibiotic which is used to inhibit bacterial protein synthesis. (2 marks)

c) (i) What do you mean by cardiovascular drugs? Describe the classification of cardiovascular drugs. (3 marks)

(ii) Name and draw the structure of any two drug molecules which are used as cardiovascular drugs. (2 marks)

(iii) Discuss the synthesis of methyldopa. (2 marks)

Question No. 5. (2X7=14)

a) (i) Discuss the various classes of anti-infective drugs. (3 marks)

(ii) Describe the various classes of anti-viral drugs which inhibit the virus life cycle at different stages in the host cell. (2½ marks)

(iii) Name and draw the structure of one antimalarial drug (1½ marks)

b) (i) Discuss the laboratory synthesis of fluconazole (3 marks)

(ii) Mention two air-borne viral diseases. (1 mark)

(iii) Write down the structure of dapsone. Mention its activity and describe it synthesis. (3 marks)

c) (i) What are psychoactive drugs? Describe the terms stimulants, depressants and hallucinogens taking suitable examples. (3½ marks)

(ii) Describe the various types of neurotransmitters. Draw their structures and mention their functions wherever necessary. (3½ marks)

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, May/June 2018

Programme : M.Sc. (Chemistry)
Semester : II
Course Title : Inorganic Chemistry – II (Reappear)
Course Code : SCS CH 1201 C 4004

Session: 2017-18
Max. Time: 3 Hours
Max.Marks : 70

Note: *There are **total five questions** in this question paper and all are **compulsory**. Each Question carries **Fourteen Marks**. Total number of printed pages is 3.*

Question No. 1 ***has seven sub parts and students need to answer all. Each sub part carries two Marks.***

Question No. 1 **(7 x 2 = 14)**

(a) The ligand-to-metal charge transfer bands increase in energy in the series: $[CoI_4]^{2-}$<$[CoBr_4]^{2-}$ <$[CoCl_4]^{2-}$. Explain.

(b) Explain spin-crossover in coordination compounds by taking one example.

(c) What is positive and negative cotton effect?

(d) Draw plots showing the variation of magnetic susceptibility with temperature in *dia-*, *para-*, *ferro-* and *antiferromagnetic* substances.

(e) What is crystal field activation energy? Discuss with an example.

(f) Discuss stereochemistry of a dissociation reaction in an octahedral complex.

(g) What do you mean by polarization theory in square planar complexes?

Question numbers 2 to 5 have three sub parts and students need to answer any two sub part of each question. Each sub part carries seven marks.

Question No. 2 **(2 X 7 = 14)**

(a) (i) What are spectroscopic terms? Write down the components of *S*, *P*, *D* and *F* terms in an octahedral ligand field. **(4 marks)**

(ii) What are charge-transfer complexes? Give two examples. **(3 marks)**

(b) (i) Discuss the selection rules with regard to the electronic transitions in coordination complexes. **(3 marks)**

(ii) The electronic spectrum of $[Ti(H_2O)_6]^{3+}$ shows only one peak. Which transition is responsible for this peak? Explain the observation by drawing an *Orgel* diagram for Ti^{3+}. **(4 marks)**

(c) (i) What are paramagnetic and diamagnetic substances? Why diamagnetism is considered a universal property of matter? **(3 marks)**

(ii) What is Curie's law? Write down the spin only formula for calculating magnetic moment. Calculate the value of magnetic moment for high spin d^6 electron configuration using the same formula. **(4 marks)**

Question No. 3 **(2 X 7 = 14)**

(a) (i)The stepwise stability constants (log *K*) for successive bindings of NH_3 to $[Ni(H_2O)_6]^{3+}$ are: 2.79, 2.26, 1.69, 1.25, 0.74 and 0.03 in 2M NH_4NO_3 at 30 °C. Explain the observation with proper explanation. **(3 marks)**

(ii)Discuss the ring types (e.g. 3,4,5,6,7-membered) that give rise to highly stable coordination complexes. Explain chelate effect by taking suitable example. **(4 marks)**

(b) (i) Elaborate thermodynamic and kinetic stability with examples of metal cyanide compounds. What do you mean by a *labile* complex? **(4 marks)**

(ii) Draw the structures of the metal complexes that contain the following ligands: en, ox^{2-} and phen. **(3 marks)**

(c) (i) The formation constants for the following reactions is as follows:

$[Fe(OH_2)_6]^{2+}(aq) + bpy(aq) \Leftrightarrow [Fe(bpy)(OH_2)_4]^{2+}(aq) + 2H_2O(l)$ $\log K_1 = 4.2$

$[Fe(bpy)(OH_2)_4]^{2+}(aq) + bpy(aq) \Leftrightarrow [Fe(bpy)_2(OH_2)_2]^{2+}(aq) + 2H_2O(l)$ $\log K_2 = 3.7$

$[Fe(bpy)_2(OH_2)_2]^{2+}(aq) + bpy(aq) \Leftrightarrow [Fe(bpy)_3]^{2+}(aq) + 2H_2O(l)$ $\log K_3 = 9.3$

Explain why log K_3 is much higher than log K_1 and log K_2. **(3 marks)**

(ii) Explain macrocyclic effect in coordination complexes with suitable examples. **(4 marks)**

Question No. 4 **(2 X 7 = 14)**

(a) (i) What do you mean by substitution reactions in octahedral complexes? Discuss the mechanism of associative and dissociative reactions. **(5 marks)**

(ii) Write a note on role of π-acceptor ligand in octahedral substitution reactions. **(2 mark)**

(b) (i) Explain the substitution reaction without breaking metal-ligand bond in an octahedral complex with suitable example. **(2 marks)**

(ii) How will you distinguish the terms hydrolysis, acid hydrolysis and base hydrolysis of coordination compounds? Using examples, explain the mechanism of base hydrolysis in an octahedral complex. **(5 Marks)**

(c) (i) What is *trans-effect*? What would be the sequence of substitutions required to get [Pt(Cl)(Br)(NH_3)(Py)] (with Br *trans* to Cl) from $[Pt\ Cl_4]^{2-}$? **(3 marks)**

(ii) How do we distinguish an inner sphere from an outer sphere mechanism? Discuss with suitable examples. **(4 marks)**

Question No. 5 **(2 X 7 = 14)**

(a) (i) What is stretching frequency? How does it relate with bond order of carbonyl compounds? **(2 marks)**

(ii) What are metal carbonyls? Give their classification briefly with suitable examples. **(2 marks)**

(iii) Discuss the formation of σ and π-bond in metal carbonyls with neat orbital diagrams. Also discuss the role of π-acceptor and donor ligands in metal carbonyls. **(3 marks)**

(b) (i) What is 18- electron rule? Write a short note on EAN rule? Prove with an example. **(2 marks)**

(ii) Write down preparation, properties and structures of $Ni(CO)_4$ and $Cr(CO)_6$. **(5 marks)**

(c) (i) Discuss structures of metal nitrosyls. **(2 marks)**

(ii) Write down the reaction for preparation of dinuclear metal cluster. Discuss bonding in dirhenium complex $[Re_2Cl_8]^{2-}$ ion. **(5 marks)**

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, May/June 2018

Programme : M.Sc. (Chemistry)
Semester : I
Course Title : Inorganic Chemistry – I (Reappear)
Course Code : SCS CH 1101 C 4004

Session: 2017-18
Max. Time: 3 Hours
Max.Marks : 70

Note: *There are **total five questions** in this question paper and all are **compulsory**. Each Question carries **Fourteen Marks**. Total number of printed pages is 2.*

Question No. 1 ***has seven sub parts and students need to answer all. Each sub part carries two Marks.***

Question No. 1 **(7 x 2 = 14)**

(a) Write down two differences between crystal field theory (CFT) and valence bond theory (VBT).

(b) "*Square planar d^8 paramagnetic complexes are rare*" – Elucidate the statement.

(c) What is electroneutrality principle?

(d) Why f^0, f^7 and f^{14} lanthanide complexes are colourless? Explain.

(e) Write a note on "*electrolysis in Liquid HF*".

(f) Discuss the structure of borazine. Why it is more reactive than benzene?

(g) What do you mean by relative permittivity? How does it correlate with solvent?

Question numbers 2 to 5 have three sub parts and students need to answer any two sub part of each question. Each sub part carries seven marks.

Question No. 2 **(2 X 7 = 14)**

(a) (i) Draw the molecular orbital diagram of an ML_6 octahedral complex (M is metal ion and L is ligand coordinated to the metal ion). **[5 marks]**

(ii) What do you mean by static and dynamic Jahn-Teller effect? **[2 marks]**

(b) (i) Explain the variation of lattice energy of first row divalent transition elements with the help of crystal field theory. **[4 marks]**

(ii) How many electronic transitions are possible for $[Ti(H_2O)_6]^{3+}$ complex? Explain by showing distribution of electrons in the *d* orbitals. **[3 marks]**

(c) (i) What are spinels? Explain the differences between a normal and an inverse spinel. **[4 marks]**

(ii) What do you mean by synergistic bonding in metal carbonyl complexes? Discuss the bonding of CO with transition metal ions. **[3 marks]**

Question No. 3 **(2 X 7 = 14)**

(a) (i) What is the most common oxidation state of lanthanides? Explain lanthanide contraction. **[4 marks]**

(ii) Write a short note on lanthanide shift reagents. **[3 marks]**

(b) (i) Discuss the separation and purification process of lanthanides by ion exchange process. **[4 marks]**

(ii) Explain the origin of magnetism in lanthanide complexes. Write down the formula for calculating magnetic moment of lanthanides. **[3 marks]**

(c) (i) Why the actinides have more tendency of forming complexes than lanthanides? Give an example of uranium cyclopentadienyl complex and draw its structure. **[3 marks]**

(ii) Which actinide elements are found in earth's crust and what is their value in ppm? What are control rods? Give two examples. **[4 marks]**

Question No. 4 **(2 X 7 = 14)**

(a) (i) How many skeletal electrons are present in B_5H_9 and $B_4H_4^{2-}$? **[3 marks]**

(ii) What do you mean by pseudohalides and carboranes? Discuss with examples. **[4 marks]**

(b) (i) How chlorofluorocarbons help in ozone layer depletion? **[3 marks]**

(ii) What is hybridization? Write down hybridization of the XeF_6, NO_3^- and BrF_5. **[4 marks]**

(c) (i) What is phosphazene? Write down its preparations with balanced equations. **[3 marks]**

(ii) Draw the structure and determine the charge on the cyclic anion $[Si_4O_{12}]^{n-}$. **[4 marks]**

Question No. 5 **(2 X 7 = 14)**

(a) (i) What do you mean by leveling and differentiating effects? **[4 marks]**

(ii) Discuss the behavior of bromine trifluoride in non-aqueous medium. **[3 marks]**

(b) (i) Discuss the mechanism of coordination reactions in non-aqueous media with suitable example. **[3 marks]**

(ii) Write down two methods of preparation for thionyl chloride and phosphoryl chloride. **[4 marks]**

(c) (i) What is superacid? Why it is more powerful than normal acid? **[3 marks]**

(ii) What is non-aqueous solvent? How you can differentiate between protic and aprotic solvent? Discuss with suitable examples. **[4 marks]**