UNIVERSITY OF THE PUNJAB
Part-I : Supplementary Examination 2018
Examination:- M.A./M.Sc.

Subject: Chemistry (New Course)
PAPER: I (Physical Chemistry)

MAX. TIME: 3 Hrs.
MAX. MARKS: 100

NOTE: Attempt any FIVE questions. All questions carry equal marks.

Q.1.   (a) What are consecutive reactions? Explain with examples. Deriver kinetic expression for consecutive reaction.   (10)

(b) What is proposed mechanism for disappearance of N_2O_5? Derive rate expression for the rate of disappearance of it.   (10)

Q.2.   (a) What is sterling's approximation? Explain briefly.   (8)

(b) Derive barometric formula. Discuss effect of altitude and molar mass on it.   (12)

Q.3   (a) Calculate the energy of particle moving in three dimensional boxes with the help of Schrodinger waver equation.   (13)

(b) How would you derive a relationship for azimuthall quantum numbers?   (07)

Q.4   Derive expression for Debye-Hackle Limiting law for strong electrolytes.   (20)

Q.5   (a) Explain third law of thermodynamics. Compare it with Nernst; Heat theorem.   (10)

(b) Explain transition theory of bimolecular reactions.   (10)

Q.6   (a) Explain clausis inequality. Derive expression for it.   (8)

(b) Explain concentration cell without transference.
Derive emf expression for concentration cell without transference.   (12)

Q.7   Explain activity and activity coefficient of an electrolytes give examples.
How activity in determined experimentally   (20)

Q.8   (a) Discuss process of carnot cycle. Also give the efficiency of engine.   (15)

(b) What are Eigen function and Eigen values, explain.   (05)

Q.9   Write note on any two of the followings:-

(i) Rigid Rotators   (10)

(ii) Vibrational and Rotation Partition coefficient..   (10)

(iii) Lindman's mechanism.   (10)

UNIVERSITY OF THE PUNJAB
Part-I : Supplementary Examination 2018
Examination:- M.A./M.Sc.

Roll No. ....

Subject: Chemistry (New Course)
PAPER: II (Inorganic Chemistry)

MAX. TIME: 3 Hrs.
MAX. MARKS: 100

NOTE: Attempt any FOUR questions. All questions carry equal marks.

Q. No.1 a) Explain the bonding in the following molecules on the bases of VBT, MOT and CFT.   **15**

   i) $[CoF_6]^{-3}$ ii) $[Fe(NH_3)_6]^{+2}$

   b) What is meant by Cracking of ores? Describe the cracking of Monazite ore of lanthanides by Conc. H_2SO_4.   **10**

Q. No.2 Explain geometries of the following molecules on the bases of VBT.   **15**

   i) BrF_4^- ii) $XeOF_4$ iii) $[Mo(CN)_8]^{-4}$ iv) SO_2Cl_2 v) ICl_4^-

   b) Discuss the applications of coordination compounds in analytical Chemistry and industry.   **10**

Q. No.3 a) Discuss the chemistry of $Ni(CO)_4$.   **12**

   b) What are N(E) curves? Describe them giving suitable examples.   **13**

Q. No.4 a) What is meant by the stability constant of a metal complex? Discuss the factors which effect the stability constants of metal complexes.   **10**

   b) Explain the applications of Metal Carbonyls.   **10**

   c) What are the limitations of VSEPR theory?   **05**

Q. No.5 a) What are Bridge bonds? What are the factors which support bridge structure? Give suitable examples.   **15**

   b) Discuss the chemistry of Sod. Nitroprusside   **10**

Q. No.6 a) Describe the applications of Lanthanides in daily life.   **13**

   b) What is Trans Effect? Explain it.   **12**

Q. No.7 Write note on any **TWO** of the followings: **2x12.5 =25**

   i)   Geometrical isomerism in metal complexes

   ii) Bonding in Metal carbonyls

   iii) Fajan's rule and its applications.

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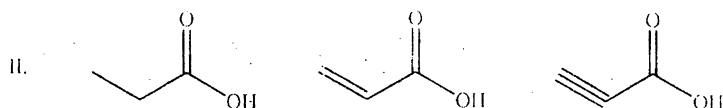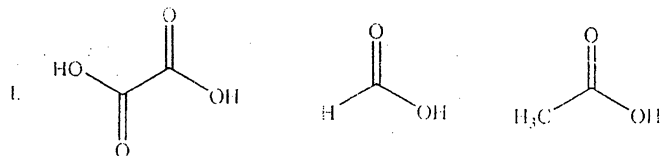## Part-I : Supplementary Examination 2018
Examination:- M.A./M.Sc.

Subject: Chemistry (Old & New Course)
PAPER: III (Organic Chemistry)

MAX. TIME: 3 Hrs.
MAX. MARKS: 100

NOTE: Attempt any FIVE questions. All questions carry equal marks.

Q. NO. 1.

A) Arrange the compounds of each of the following groups in order of increasing acidity, giving explanation for your order. [5 x 2 = 10]

I.

II.

B) Compare the basicity of compounds of following groups. Justify your answer.

[2.5 x 4 = 10]

I. Ammonia and Aniline
II. 2-Nitroaniline and 4-Nitroaniline
III. Benzonitrile and Pyridine
IV. Pyridine and Pyrrole

Q. NO. 2.

A) Predict the major products of following reaction *via* free radical mechanism. Draw complete mechanism for all steps. [5 x 3 = 15]

I)

Peroxide → ?

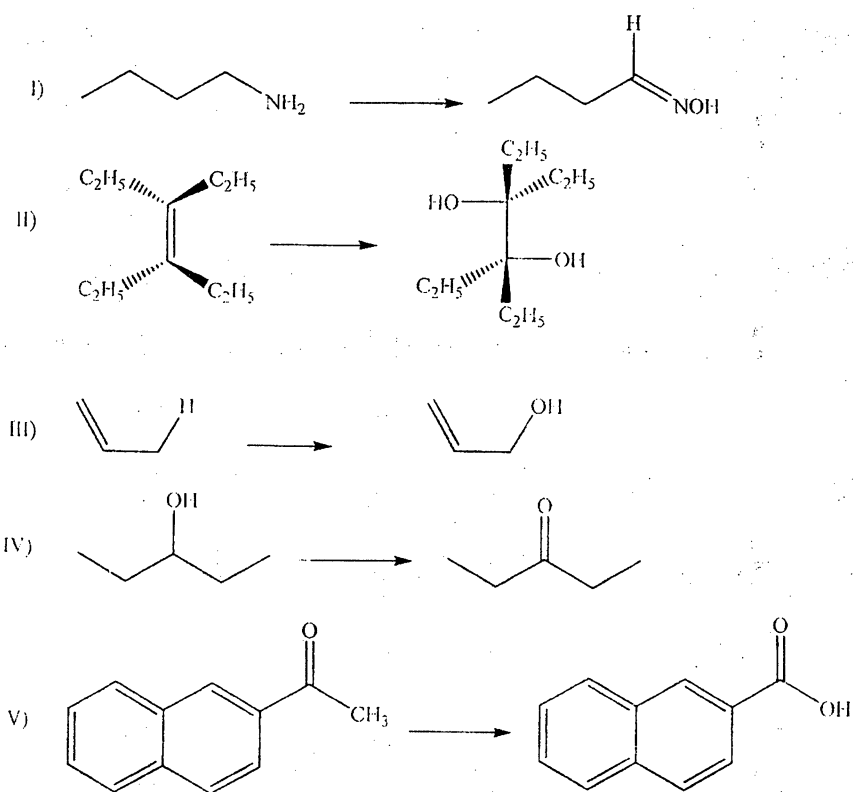II) + EtOOC COOEt Peroxide → ?

III) 2 Cu → ?
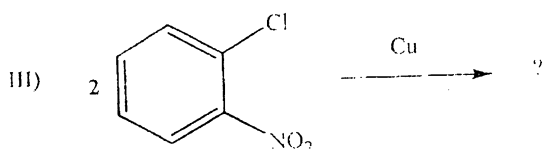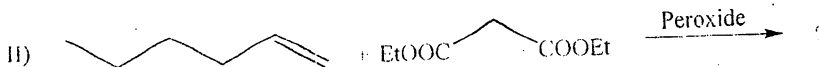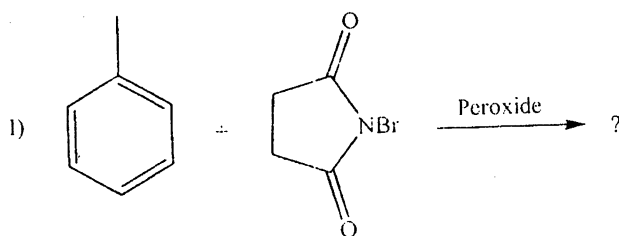
B) Describe Electron spin resonance methods for detection of free radicals. [5]

Q. NO. 3.

How would you bring about the following conversions? Write complete mechanisms for all steps involved.

[4 X 5 = 20]

I)

II)

III)

IV)

V)

Q. NO. 4.
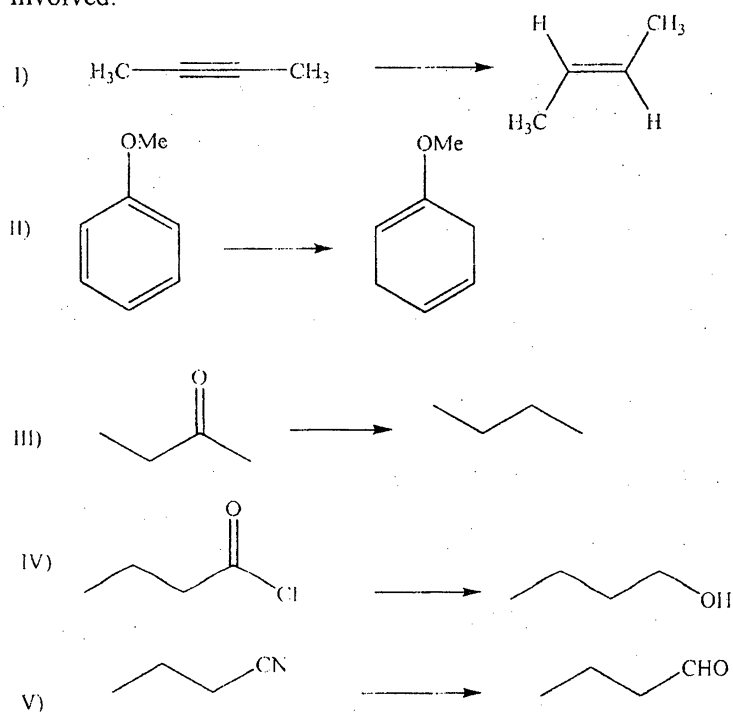
How would you bring about the following conversions? Write complete mechanisms for all steps involved.

[4 X 5 = 20]

I) H_3C ———≡——— CH_3 ⟶

II)

III)

IV)

V)

Q. NO. 5.

Write a note on the following reactions (reaction, mechanisms and synthetic applications).

[10 x 2 = 20]

I) Knoevenagel condensation

II) Perkin reaction

Q. NO. 6.

A) Draw the Fisher projections for all the stereoisomers of 3-bromo-2-butanol and label each chiral carbon atom as *R* or *S*. [4]

B) Describe the different methods used for the resolution of racemic mixture. Give examples for each method. [4]

C) Differentiate the following terms with examples. [2 x 4 = 8]

    I) Enantiomers and Diastereomers

    II) Configurational isomerism and conformational isomerism

    III) Relative configuration and Absolute configuration

    IV) Diasterotopic and enantiotopic hydrogen

D) Draw the perspective formulas of the enantiomers of following compounds and label each enantiomer as R or S. [2 x 2 = 4]

    I) 2-Methyl-1-butanol

    II) 1-Chloro-2-methylbutane

Q. NO. 7.

A) Draw all possible conformations of each of the following molecules and explain which is more stable. [3 x 3 = 9]

    I) *trans*-1-Ethyl-3-phenylcyclohexane

    II) 1, 3, 5-Tribromocyclohexane (all *cis*)

    III) *cis*-4-*tert*-Butylcyclohexanol

B) Draw both the geometrical isomers for the following compounds and assign Z or E designation to each of them. [2 x 3 = 6]

    I) 2-Chloro-3-methyl-2-pentene

    II) 2-Bromo-2-butene

    III) 3-methyl-3-octene

C) Classify the following compounds as optically active or optically inactive. Justify your answer. [1 x 5 = 5]

(I)   (II)   (III)   (IV)   (V)
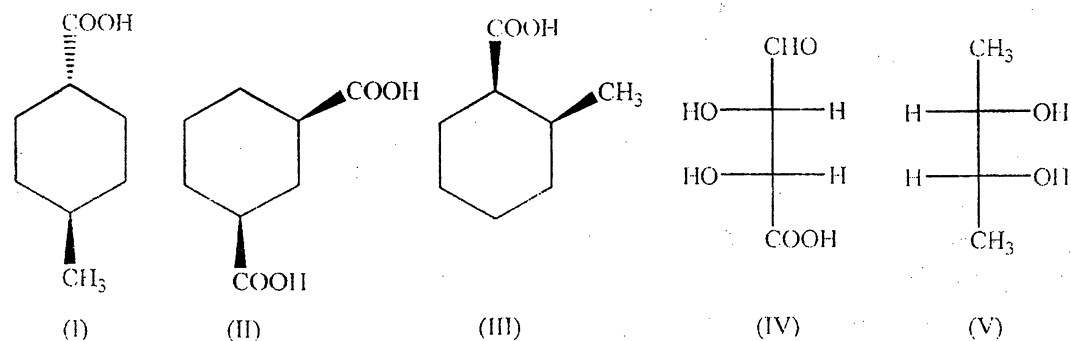
Q. NO. 8.

A) How could you use UV / visible spectroscopy to distinguish between the compounds in each of the following pairs? [4 x 3 = 12]

I)

(a)   (b)

II)

(a)   (b)

III)

(a)   (b)
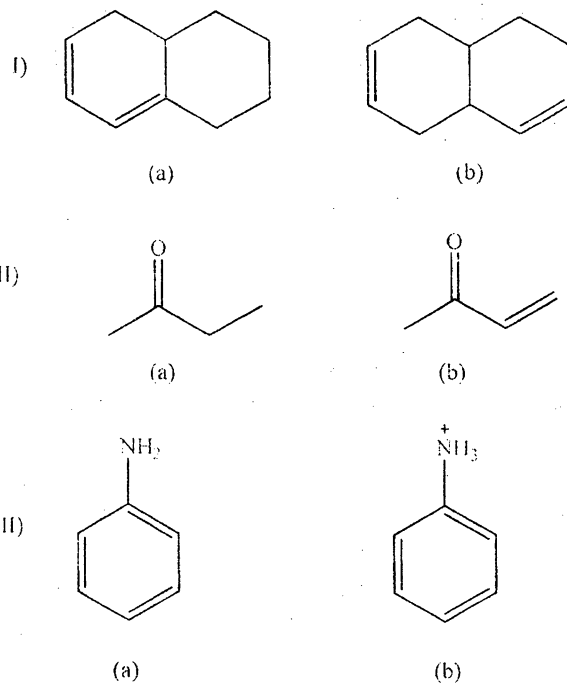
B)   Briefly answer the following questions   [2 x 4 = 8]

    I)   How can we use UV / VIS spectroscopy for the determination of ionization constant of an acid or a base?

    II)   What is difference between transmittance and absorbance?

    III)   What is fine structure in the UV spectrum of benzene?

    IV)   Why saturated hydrocarbons show no absorption in the UV / VIS region (200-800 nm)?

Q. NO. 9.

A)   Briefly answer the following questions   [2 x 5 = 10]

    I)   What is necessary condition for absorption of IR radiation by a molecule?

    II)   Compare the stretching frequency of O — D and O — H bonds.

    III)   What are near infrared region and far infrared region?

    IV)   Determine the total number of possible vibrational modes for carbon dioxide.

    V)   What is difference between fundamental vibrations and overtones?

B) How will you distinguish between the following pairs of compounds with the help of IR spectroscopy?   [2,5 x 4 = 10]

    I)   Acetone and acetic acid

    II)   Ethyl alcohol and diethyl ether

    III)   Methylamine and dimethylamine

    IV)   Cyclohexanol and phenol

UNIVERSITY OF THE PUNJAB
Part-I : Supplementary Examination 2018
Examination:- M.A./M.Sc.

Subject: Chemistry (New Course)
PAPER: IV (i) [Biochemistry]

MAX. TIME: 3 Hrs.
MAX. MARKS: 100

NOTE: Attempt any FOUR questions. All questions carry equal marks.

Q1. i	With the help of examples differentiate between monosaccharides, disaccharides and polysaccharides.	10
ii	Write a short note on invert sugars.	05
iii	Discuss the structure and function of cellulose and starch.	10
Q2. i	When a salt such as sodium chloride is added to water, it dissolves rapidly. Explain this observation with reference to the types of interactions in water.	05
ii	Define calorimetery. Write a note on direct and indirect calorimetery.	08
iii	Differentiate between the following: (a) cofactors and coenzymes (b) apoenzymes and haloenzymes (c) omega 3 and omega 6 fatty acids (d) polar and non-polar amino acids (e) purines and pyrimidines (f) ligases and lyases	12
Q3. i	Alanine has a pl of 6.01 and pK1 and pK2 values of 2.34 and 9.69 respectively. It is placed in a solution of pH 11 and the pH is then lowered to 1.8. With the help of structures, explain the changes in the **charges** on an alanine molecule during the process.	10
ii	Discuss the different types of secondary structures commonly found in proteins.	08
iii	Using collagen and myoglobin as reference, explain the difference in fibrous and globular proteins.	07
Q4. i	Write a note on different types of RNA.	06
ii	Discuss the structure of DNA as explained by the Watson and Crick model.	12
iii	Elucidate the importance of DNA and RNA with respect to their biological functions.	07
Q5. i	Write a note on sphingolipids. Discuss the different types with examples.	12
ii	What are sterols? What is their biological significance?	04
iii	With the help of equations show the formation of triglycerides from fatty acids and glycerol. Differentiate between mixed and simple triglycerides.	04
iv	Briefly discuss the classification of fatty acids.	05
Q6. i	Explain enzyme kinetics using Michealis-Menten equation.	05
ii	Write short notes on the following: (a) Regulatory enzymes (b) Immobilized enzymes (c) Quantitative assay of enzyme activity	4x3
iii	Discuss the different types of specificities exhibited by enzymes.	08
Q7. i	Write equations for the condensation reactions that result in the formation of the following bonds: (a) glycosidic linkage in disaccharides (b) peptide bonds in proteins (c) phophodiester bonds in DNA	06
ii	How are biological systems protected from changes in pH?	05
iii	Write a note on the structure and function of cell membranes.	14

UNIVERSITY OF THE PUNJAB
Part-I : Supplementary Examination 2018
Examination:- M.A./M.Sc.

Roll No. ....

Subject: Chemistry (New Course)
PAPER: IV (ii) [Analytical Chemistry]

MAX. TIME: 3 Hrs.
MAX. MARKS: 100

NOTE: Attempt any FOUR questions. All questions carry equal marks.

Q1.

   a. Discuss various types of errors and how can they be removed from the data.   10, 5, 10

   b. Distinguish between accuracy and precision.

   c. When analyzing the iron content of a well drilled for use in a new housing development, water from the well was analyzed. The following data was obtained as far as iron content (mg/L) is concerned:
1.56, 1.45, 1.51, 142 and 129 mg/L of Fe content
Calculate standard deviation, the relative standard deviation, the percent relative standard deviation and variance.

Q2.

   a. Explain the extraction of metals by solvent extraction. How does pH affect the efficiency of extraction?   13, 6, 6

   b. If you are extracting a substance from water into ether, is it more effective to do one extraction with 150 mL of ether or three extractions with 50 mL?

   c. Write the factors affecting solvent extraction.

Q3

   a. Define band broadening. Describe the factors that effect it.   10, 8, 7

   b. Compare the advantages and disadvantages of paper and thin layer chromatography.

   c. How can you detect colorless spots in paper and thin layer chromatography?

Q4

   a. How direct aspiration type atomic absorption spectroscopy is considered better than Flame type atomic emission spectroscopy?   9, 8, 8

   b. Explain the principle of Hydride generation AAS with the help of a diagram.

   c. What would be the demerit of graphite furnace?

Q5

   a. How do UV/Vis radiations interact with organic molecules? Explain the effect of conjugation on UV/Vis spectra.   12, 9, 4

   b. Discuss the Beer Lambert law with respect to chemical and instrumental deviations.

   c. Describe the working of a photomultiplier tube detector with the help of diagram.

Q6

   a. Write a note on cation and anion exchange resins.   10, 10, 5

   b. Discuss the separation of metal ions by using Anion Exchange resin

   c. Name different adsorbents and solvents used in column chromatography.

Q7

   a. What is electrophoresis? Describe capillary zone electrophoresis. Also, illustrate the advantages of capillary zone electrophoresis over traditional electrophoresis methods.   13, 12

   b. Explain the following terms;
       i- auxochrome
       ii- bathochromic shift
       iii- hyperchromic shift
       iv- λ_{max}