UNIVERSITY OF THE PUNJAB

M.A./M.Sc. Part – I Annual Examination – 2020

Roll No. .....

Subject: Chemistry (New Course) Paper: I (Physical Chemistry) Time: 3 Hrs. Marks: 100

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

Q1. a Explain Harmonic Oscillators obey Hook's Law. Calculate energy levels of a Quantum mechanical Harmonic Oscillator. 17

b. Discuss the significance of principle quantum number. 03

Q2. a. What are concentration cells? Give its Classification. 05

b. Derive an expression for EMF of electrolyte concentration cells without transference. 15

Q3. a. Derive rate equation for Chain reaction:

$H_2 + Br_2 \rightleftarrows 2HBr$ 10

b. Briefly discuss the factors affecting rate of reaction in solutions. 10

Q4. a. Using Max well's equation for velocities distribution derive an expression for most probable velocity. 10

b. How Barometric formula could be used to calculate the effect of altitude. 10

Q5. a. Explain the Third Law of thermodynamics? Compare it with Nernst's heat theorem. 12

b. Discuss the determination of entropy by using Third Law of thermodynamics. 08

Q6. a. What is Sterling's approximation? Explain briefly. 06

b. Derive a relationship between absolute entropy and partition function. 14

Q7. a. Calculte energy of a particle moving in three dimensional box applying Schrodinger wave equation. 08

b. What is activity coefficient? Determine the activity coefficient for sparingly soluble salt by solubility method. 12

Q8. a. Discuss the postulates of Quantum theory 06

b. What is normalized wave function? ~~Give examples.~~ 04

c. What is proposed mechanism for the disappearance of N_2O_5. Derive a rate expression for the rate of diappearance of it. 10

Q9. Write notes on any two of the following: (10+10)

(i) Transition state theory.

(ii) Fuel cells

(iii) Adiabatic magenatization

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M.A./M.Sc. Part – I Annual Examination – 2020

Roll No. .....

Subject: Chemistry (New Course) Paper: II (Inorganic Chemistry) Time: 3 Hrs. Marks: 100

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

Q. No.1 a) What are labile and inert complexes? Discuss various factors which affect lability. **15**

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

Q. No.2 a) Define Resonance and discuss the resonance contributing structures of following species: **15**

i) CO_3^{2-} ii) NH_3 iii) NO_3^- iv) SO_4^{2-} v) N_3^-.

b) Discuss the chemistry of $Fe_3(CO)_{12}$. **10**

Q. No.3 a) Discuss the structure of followings on the basis of MOT. **10**

i) $[Fe(CN)_6]^{4-}$ ii) $[Fe(H_2O)_6]^{2+}$

b) Explain the Bridge Bond by giving suitable examples. **15**

Q. No.4 a) Explain the bonding in Metal carbonyls. **15**

b) Discuss the applications of coordination compounds in various fields of life. **10**

Q. No.5 a) Discuss geometrical isomerism in coordination compounds. **15**

b) What is meant by Lanthanide Contraction? Discuss its reasons and effects. **10**

Q. No.6 a) Discuss the colour and magnetic properties of lanthanides and actinides. **15**

b) Describe the N(E) curves for metals, semi metals and non-metals **10**

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

i. Trans Effect

ii. Fajan's rule and its applications.

iii. Jahn Teller Distortion Theorem

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M.A./M.Sc. Part – I Annual Examination – 2020

Roll No. .....

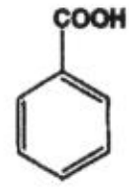
Subject: Chemistry (Old & New Course) Paper: III (Organic Chemistry) Time: 3 Hrs. Marks: 100

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. [4 x 2 = 8]

I) 

II) HCOOH 

B) What is effect of ortho substituent on the acidity of benzoic acid? [2]

C) Compare the basicity of compounds of following groups. Justify your answer. [2.5 x 4 =10]

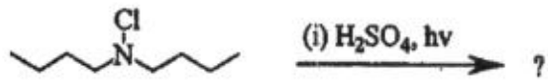
I. Ethylamine and acetonitrile
II. *o*-Nitroaniline and *p*-nitroaniline
III. C_2H_5OK and C_2H_5SK
IV. Aniline and ammonia

Q. NO. 2

A) Describe two different methods for the detection of free radicals. [8]

B) Predict the major products of following reaction via free radical mechanism. Draw complete mechanism for all steps. [4 + 4]

(i) $CH_3CH_2CH_2COOH \xrightarrow{Pb(CH_3COO)_4,\ I_2} ?$

(ii) 

C) Explain Captodative effect for stability of free radicals with examples. [4]

Q. NO.3

Write a note on the following reactions (reaction, mechanisms and synthetic applications). [10 + 10]

I. Knoevenagel condensation
II. Darzen's glycosidic ester synthesis

Q. NO. 4.

A) Write complete reaction of cyclohexanone with the following reagents. Draw complete mechanisms for both. (10)

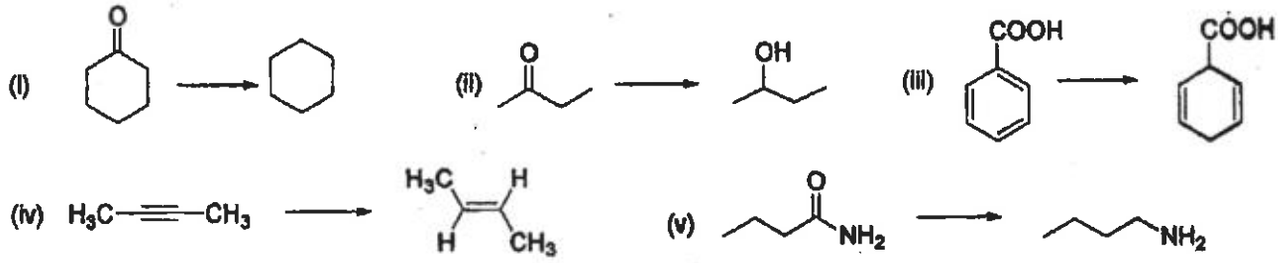
(i) Na in liq. NH3, EtOH
(ii) *m*-Chloroperbenzoic acid

B) Draw complete mechanisms for the following reactions.

I. Swern's oxidation of primary alcohols [4]
II. Hydroxylation of alkene by using iodine and silver acetate (both wet and dry methods). [6]

Q. NO. 5

How would you bring about the following conversions? Write complete mechanisms for all steps involved. [5 X 4 = 20]



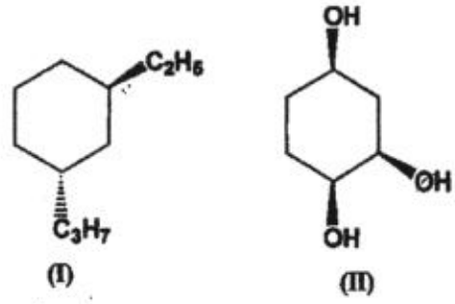
Q. NO. 6

A) Explain the following terms and give examples for each. [10]

I. Epimers
II. Geometrical isomers
III. Dihedral angle
IV. Meso isomer
V. Diastereomers

B) Give two examples of organic compounds which show optical isomerism without a chiral carbon atom. Explain why these compounds are optically active. [4]

C) Draw all the conformers and describe stability order with reason of the following compounds. [6]



Q. NO. 7

A) Draw both the geometrical isomers for the following compounds and assign Z or E designation to each of them. [6]

I. 1-Iodo-1, 2- dichloroethylene
II. 3-Propyl-2-pentene
III. 3-methyl-3-octene

B) Draw the perspective formulas of the enantiomers of following compounds and label each enantiomer as R or S. [9]

I. 2-butanol
II. 2-Methyl-1-butanol
III. 2-hydroxypropanoic acid

C) Draw the fisher projection of following compounds. [5]

I. (2R,3R)-2,3-dibromohexane
II. (2R,3R)-3-Chloro-2-butanol

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Roll No. .....

Subject: Chemistry Paper: IV (i) [Biochemistry] (New Course) Time: 3 Hrs. Marks: 100

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

Q.1:

a) What do you mean by GAGS? Explain Proteoglycans in detail **(15)**

b) What are disaccharides? Discuss the chemistry, structure and functions of Maltose and Trehalose. **(10)**

Q.2:

a) Write different methods for the measurement of energy expenditure. **(15)**

b) Discuss the cell wall composition. **(10)**

Q.3:

a) Explain enzyme inhibition. Differentiate between competitive and non-competitive inhibition with examples. **(13)**

b) Explain Regulatory enzymes, Allosteric enzymes and Multienzyme systems with examples **(12)**

Q.4:

a) Write a note on secondary structure of proteins. **(10)**

b) What is the difference between fibrous proteins and globular proteins? Explain with examples **(15)**

Q.5:

a) Write in detailed the Chargaff's Rules, and Watson and Crick's about the deoxyribonucleic acid. Briefly write what are basis of Chargaff rules which might be helpful in Watson and Crick's model. **(15)**

b) Write a note on pH and buffer systems **(10)**

Q.6:

a) What are sphingolipids? Give a brief account. **(13)**

b) Explain the properties of lipid aggregates: Micelles and Bilayers. **(12)**

Q.7: Write short notes on any two of the followings. **(25)**

a) Classification of enzymes

b) Purines, Pyrimidines and nucleotides

c) Glycolipids

d) Isoezymes

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Roll No. .....

Subject: Chemistry Paper: IV (ii) [Analytical Chemistry] (New Course) Time: 3 Hrs. Marks: 100

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

Q1. a) Distinguish between error and deviation. 3, 10, 12
b) Discuss different types of determinate errors. How they can be minimized?
c) The percentage of a constituent 'A' in a compound AX was found to be 58.41, 58.32, 58.36, 58.23, 58.11 and 53.38 percent. Calculate the standard deviation, variance and the relative deviation in parts per thousand.

Q2. a) Explain the extraction of metals by solvent extraction. How does pH affect the efficiency of extraction? 8, 8, 9
b) Write about different forms of solvent extraction.
c) Write a detailed note on solid phase extraction.

Q3. a) Define chromatography. Give the classification of chromatographic methods. 8, 12, 5
b) What is efficiency of the column? Explain the factors affecting efficiency of column.
c) What is gradient elution?

Q4. a) How flame is used as atomizer? Explain its event 9, 9, 7

b) Explain the principle of hydride generation AAS with the help of a diagram. What are its specific advantages?
c) Draw the optical layout of flame photometer. Briefly discuss its components

Q5. a) Define the term spectroscopy. Give brief description of radiation source, filter and detector in UV/Vis spectrophotometer. 10, 7, 8
b) What is the effect of conjugation on UV/Vis spectra?
c) Compare the single beam spectrophotometer with double beam spectrophotometer.

Q6. a) What is the principle of ion-exchange chromatography? Write a note on cation and anion exchange resins. 10, 7, 8
b) What is the basis of separation in electrophoresis? Give different types of capillary electrophoresis
c) Differentiate between paper and thin layer chromatography.

Q7. a) Briefly discuss sample injection system in flame photometry 10,15

b)What are the flameless techniques in AAS spectroscopy. Explain them in detail

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Roll No. .....

Subject: Chemistry Paper: IV (iii) [Applied Chemistry] (New Course) Time: 3 Hrs. Marks: 100

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

Q. No.1	(a)	Explain the design and working of heat regenerative furnaces in glass manufacturing.	12
	(b)	What do you understand by tempered glass, discuss its manufacturing and applications?	13
Q. No.2	(a)	Discuss production of oxalic acid from sodium formate, also describe its important applications.	12
	(b)	Explain ammonia Solvay process of soda ash manufacturing with the help of flow sheet diagram.	13
Q. No.3	(a)	Discuss all the chemical reactions in rotary kiln during cement formation.	12
	(b)	What are setting agents and why they are used, describe cement setting mechanism.	13
Q. No.4	(a)	How fractional distillation is different from simple distillation, explain the importance of former method in different industrial purification processes.	12
	(b)	What do you understand about chlorination process, write down some important chlorinating agents and their applications as well.	13
Q. No. 5	(a)	What is boiler scale and sludge, what are different chemical methods for their treatment?	12
	(b)	Explain the principle of using ion exchange resins for water softening.	13
Q. No.6	(a)	Discuss continuous method of soap manufacturing and its advantages over batch process.	13
	(b)	Differentiate between cationic and anionic detergents, give examples and applications of each type of detergent.	12
Q. No.7	Write short notes on any three of the following		25
	(a)	Multiple effect evaporators	
	(b)	Reverse Osmosis	
	(c)	Phthalic anhydride	
	(d)	Soap builders	
	(e)	Sodium hydroxide	