UNIVERSITY OF THE PUNJAB

Part-I A/2016
Examination:- M.A./M.Sc.

Roll No. ....

TIME ALLOWED: 3 hrs.
MAX. MARKS: 100

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

NOTE: *Answer any FOUR questions. All questions carry equal marks.*

Q.1 (a) What is entropy? Discuss the significance of entropy. (12)

(b) Explain the Nernst heat theorem. Give its applications. (13)

Q.2 (a) What do you understand by the concept of degeneracy? Discuss. (10)

(b) Give an account of the experimental methods that are being used to study the kinetics of fast reactions. (15)

Q.3 (a) Prove that $Q = Q_t Q_v Q_r Q_e$ where respective Qs have their usual meanings. (13)

(b) Drive an expression for Azimuthal Quantum number from Schrodinger wave equation. (12)

Q.4 (a) Derive an expression for Deby-Huckle equation for weak electrolytes. (10)

(b) What is activity and activity coefficient? How the activity coefficient is determined by solubility method? (15)

Q.5 (a) What are consecutive reactions? Explain with examples. Derive kinetic expression for consecutive reactions. (15)

(b) Discuss the kinetics of thermal decomposition of Ozone. (10)

Q.6 (a) Derive an expression for average velocity using Maxwell's Law for velocity distribution. (15)

(b) Derive an expression for barometric formula. What is effect of molar mass on distribution? (10)

Q.7 Write short notes on ant two of the followings. (12.5+12.5)

(a) Fuel cell

(b) Tunnel effect

(c) Schrodinger wave equation

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

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

           MOT and CFT.

           $[Fe(CN)_6]^{-}$, $[Fe(H_2O)_6]^{+2}$

       b) Describe the applications of Lanthanides in daily life.   **10**

Q. No.2   a) Explain geometries the following molecules on the bases of VBT.

           i) IF_7 ii) $[PaF_8]^{-3}$ iii) $[PF_6]^{-}$ iv) N_2O v) ICl_2^{-} **15**

       b) Give different methods for the preparation of transition Metal

           complexes giving two examples for each.   **10**

Q. No.3   a)   Discuss the chemistry of $Fe(CO)_5$ **13**

       b)   What is meant by Metallic bonding? Explain the Electron Sea Theory.:   **12**

Q. No.4   a) Explain the bonding in Metal Nitrosyls.

                                          10

       b) What factors are affecting the crystal field splitting?   **10**

       c)   What is the best achievement of CFT?   **5**

Q. No.5   a) Explain the Bridge Bond by giving suitable examples.   **10**

       b) Discuss the chemistry of $Fe(CO)_4I_2$.   **15**

Q. No.6   a)   What is meant by Lanthanide Contraction? Discuss its reasons and

           effects.   **15**

       b)   Give Fajan's rule and its applications.   **10**

Q. No.7   Write note on any **TWO** of the followings:

           i.   N(E) Curves

           ii.   Chemistry of Sod. Nitroprusside

           iii.   Geometrical isomerism in metal complexes.   **2x12.5 =25**

UNIVERSITY OF THE PUNJAB

Part-I   A/2016

Examination:- M.A./M.Sc.
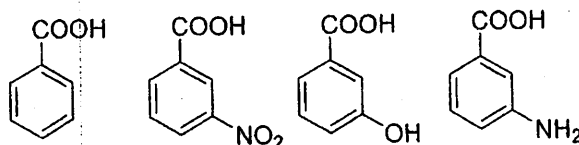
Roll No. ....

Subject: Chemistry   (New Course)

PAPER: III (Organic Chemistry)

TIME ALLOWED: 3 hrs.
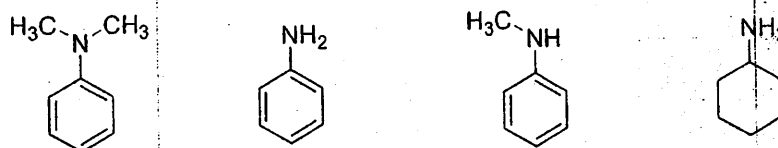
MAX. MARKS: 100

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

Q. No. 1.

A) Arrange the following compounds in the increasing order of their acidity. Give reasons for your order.   [7]
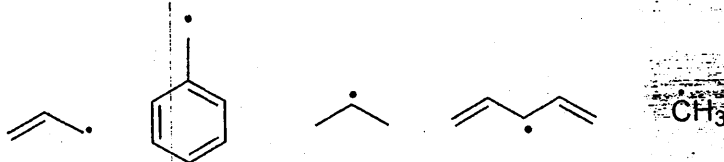

B) Arrange the following compounds in the increasing order of their basicity. Give reasons for your order.   [7]

C) Which is more basic, imidazole or pyrrole? Give reason.   [3]

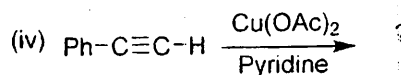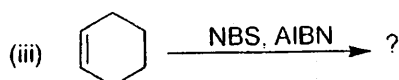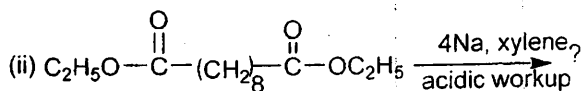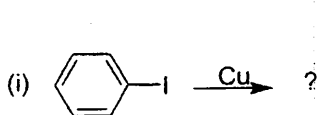D) Which is more acidic, formic acid or benzoic acid? Give reason.   [3]

Q. NO. 2

A) Arrange the following radical according to the increasing order of stability. Provide suitable reasoning for your arrangement.   [5]

B) Describes various methods for generation of free radicals.   [5]

C) Predict the major products of following reaction via free radical mechanism. Draw complete mechanism for all steps.   [10]

(i) Ph-I $\xrightarrow{Cu}$?

(ii) $C_2H_5O-\overset{O}{\underset{||}{C}}-(CH_2)_8-\overset{O}{\underset{||}{C}}-OC_2H_5 \xrightarrow[\text{acidic workup}]{\text{4Na, xylene}}$?

(iii) $\xrightarrow{\text{NBS, AIBN}}$?

(iv) Ph-C≡C-H $\xrightarrow[\text{Pyridine}]{Cu(OAc)_2}$?

Q. NO. 3

How would you carry out oxidation of alkene by the use of following methods? Draw complete mechanisms.   [20]

(i) O_3/Zn (ii) Peroxyacid   (iii) OsO_4

(iv) $I_2/AgOAc$ (Dry method)   (v) $I_2/AgOAc$ (Wet method)

Q. NO.4

Write a note on the following reactions (reaction, mechanisms and synthetic applications).   [6+7+7]
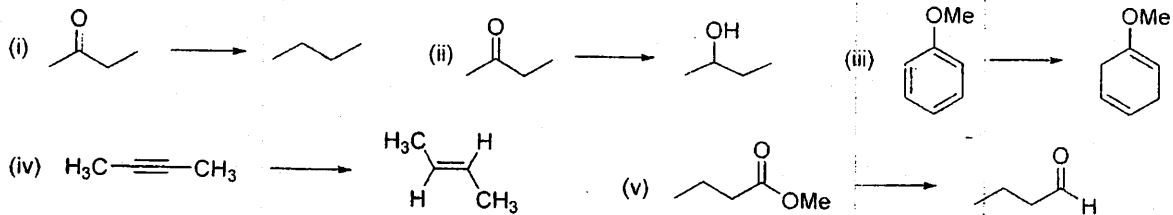
   i.   Knoevenagelcondensation
   ii.   Wittig reaction
   iii.   Claisencondensation

Q. NO. 5

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

Q. NO.6

A)   Differentiate between the following terms.   [10]

   (i) Erythroisomer and threo isomer

   (ii) Diaseterotopic and enantiotopic hydrogen

   (iii) Configurational isomerism and conformational isomerism

   (iv) Enantiomers and diastreoisomers

   (v) Absolute and relative configuration

B)   Draw all the conformers and describe stability order with reason of the following compounds.   [10]
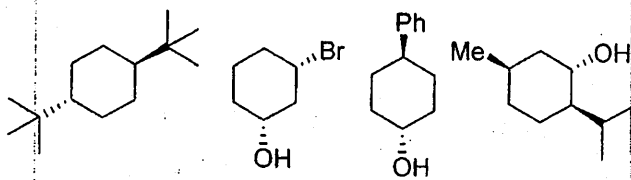
Q. NO. 7

A)   Draw all possible stereoisomers for each of the following compounds.   [12]

   (i)   2-bromo-3-hexanol   (ii)   2, 3-diiodopentane

   (iii)   2-iodo-4-bromohexane   (iv)   1, 3-dichloropentane

   (v)   3-chloro-2-butanol   (iv)   1-bromo-3-methylcyclohexane

B)   Describe the different methods used for the resolution of racemic mixture. Give examples for each method.   [8]
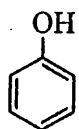
Q. NO. 8

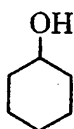A) Explain the following terms used in IR spectroscopy. [8]

    i. Combination band and difference band
    ii. Hooke's Law
    iii. Stretching vibrations and bending vibrations
    iv. Near infrared region and far infrared region

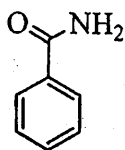B) How will you distinguish between the following pairs of compounds with the help of IR spectroscopy? [12]
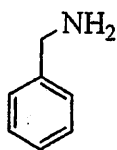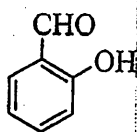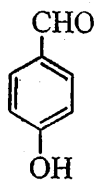

(i)   (ii)   (iii)   (iv)   (v)   (vi)

Q. NO. 9.

A) Explain the difference between [10]

    i. Allowed transition and forbidden transition.

    ii. Transmittance and absorbance

    iii. Chromophore and auxochrome

    iv. λ_{max} and ε_{max}

    v. Bathochromic effect and hyperchromic effect.

B) Why conjugation moves the absorption to longer wavelength in UV / Visible spectroscopy [4]

C) How could you use UV / visible spectroscopy to distinguish between the compounds in each of the following pairs? [6]
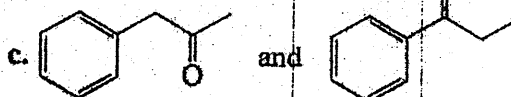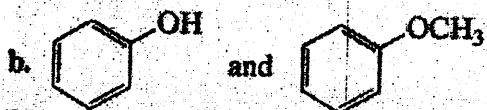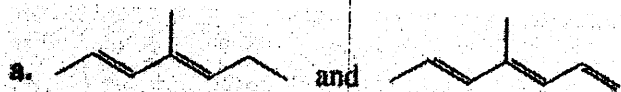
a.   b.   c.

Subject: Chemistry (New Course)   **TIME ALLOWED: 3 hrs.**
PAPER: IV (i) [Biochemistry]   **MAX. MARKS: 100**

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

Q.1 a) Differentiate between plant and animal cells.   (10)
    b) Discuss the Struture and function of plastids andendoplasmic
       reticulum.   (15)

Q.2 a) What are peptides. Discuss their biological importance.   (10)
    b) Explain the α-helix and β pleated sheet structures of protein.   (15)

Q.3 a) What are carbohydrates.   (10)
    b) Discuss the chemistry, structure and properties of glucose.   (15)

Q.4 a) What is enzyme inhibition.   (10)
    b) Discuss different types of inhibitors.   (15)

Q.5   Discuss briefly Watson-Crick model for the structure of DNA.   (25)

Q.6 a) Define and give significance of acid value, saponification value and
       iodine value of oil.   (15)
    b) .Explain regulatory enzymes.   (10)

Q.7   Write short notes on any two of the followings..
       (i) Glygogen
       (ii) Cholesterol
       (iii) mRNA
       (iv) structure of membrane   (25)

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Part-I A/2016
Examination:- M.A./M.Sc.

Roll No. ....

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

TIME ALLOWED: 3 hrs.
MAX. MARKS: 100

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

Q1.

a. Give a detailed account for the classification of errors and how can they be removed from the data. (15, 10)

b. What is meant by student t-test? Give its various forms. Also give its significance.

Q2.

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

b. Why is solid phase extraction preferred over solvent phase extraction?

c. Write the applications of solvent extraction in analytical Chemistry

Q3

a. Define the principle of Chromatography. Explain the factors affecting R_f value. (10, 8, 7)

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

c. Explain the concept of theoretical plates and their role in describing the efficiency of the column.

Q4

a. Compare the Furnace type atomic absorption spectroscopy with Flame type atomic absorption spectroscopy. (9, 8, 8)

b. Explain the principle of Hydride generation AAS with the help of a diagram. What are its specific advantages?

c. Give the possible reactions when a sample is subjected to flame for analysis in flame emission spectroscopy.

Q5

a. How do UV/Vis radiations interact with organic molecules? Explain the effect of conjugation on UV/Vis spectra. (10, 8, 7)

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

c. How UV/Vis spectrophotometer can be used for quantitative analysis?

Q6

a. What is the basic principle of ion exchange chromatography? Write a note on cation and anion exchangers. (10, 7, 8)

b. Give the applications of ion exchange chromatography.

c. Explain the plate theory for the efficiency of column.

Q7

a. Draw the optical layout of flame photometer. Briefly discuss its components. (10, 5, 10)

b. Describe capillary zone electrophoresis.

c. Illustrate the advantages of capillary zone electrophoresis over traditional electrophoresis methods.

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Part-I   A/2016

Examination:- M.A./M.Sc.

Subject: Chemistry (New Course)
PAPER: IV (iii) [Applied Chemistry]

TIME ALLOWED: 3 hrs.
MAX. MARKS: 100

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

Q. No.1	(a)	Discuss the chemistry involved in the setting of cement?	13
	(b)	Describe major raw materials for ordinary Portland cement manufacturing.	12
Q. No.2	(a)	Write down the manufacturing and industrial applications of formic acid.	13
	(b)	Explain the Solvay Process for the Soda ash manufacturing.	12
Q. No.3	(a)	Explain the mechanism of single and multiple-effect evaporators.	12
	(b)	Describes the different procedures by which halogens are introduced in the organic compounds and also describes the industrial applications of halogenation.	13
Q. No.4	(a)	How reverse osmosis helps in drinking water treatment?	12
	(b)	What do you mean by demineralization? Which types of resins are used for this purpose?	13
Q. No. 5	(a)	Describe the annealing process in glass manufacturing also explain its significance.	12
	(b)	Discuss the importance of tank furnace and pot furnace in glass manufacturing.	13
Q. No. 6	(a)	Describe the method for the manufacturing of Linear Alkylbenzenesulfonates (LAS) with the help of flow sheet diagram.	15
	(b)	Discuss different additives and builders used in soap manufacturing.	10

Q. No.7   Write short notes on any three of the following   25

(a)   Colored glass

(b)   Cleansing action of soap

(c)   Distillation

(d)   Phthalic anhydride

(e)   Ion exchange resins

UNIVERSITY OF THE PUNJAB

Part – I   A/2016
Examination:- B.A./B.Sc.

Roll No. ....

Subject: Chemistry-I
PAPER: B (Inorganic Chemistry)

TIME ALLOWED: 3 hrs.
MAX. MARKS: 40

NOTE: *Attempt any TWO questions from Section I and II. Question # 1 is compulsory.*

Q.1: Answer the following: (2x4=8)

(i) Write down IUPAC name of following coordination compounds.
     i. $K_3[Fe(CN)_6]$ ii. $K_4[Fe(CN)_6]$

(ii) Differentiate between Lewis acid and Lewis base. Give one example in each case.

(iii) Draw Lewis dot structures for ClO_4^- and BF_3.

(iv) Define Carbon dating and write down its two uses.

Section I

Q.2: (a) Define Electronegativity. Explain its trend in the Periodic Table with suitable reasons.
     (2,4)

     (b) H_2S is a gas while H_2O is a liquid. Justify the statement.   (2)

Q.3. (a) Predict the shapes of following molecules on the basis of VSEPR theory (2 x 3 = 6)
     (i) SO_4^{2-} (ii) $SnCl_2$ (iii) PCl_5
     (b) Why lone pair occupies more space than a bond pair?   (2)

Q.4 (a) What are major differences between VBT and MOT?   (3)
     (b) Differentiate between Soft and Hard Acid. Discuss applications of HSAB concept.(5)

Q.5 What is Law of Mass action? Describe its application towards the solubility of a sparingly soluble salt with examples.
     (2, 6)

Section II

Q.6: (a) Draw and compare the structures of following coordination compounds on the basis of VBT
     (4)
     i. $[Co(F)_6]^{3-}$ ii. $[Co(NH_3)_6]^{3+}$

     (b) How Nuclear Radiations can be measured? Explain at least one method in detail.
     (4)

Q.7. Define and briefly elaborate the term Crystal Field Splitting. How the color of coordination compounds can be explained on the basis of CFT.   (4 + 4 = 8)

Q.8 (a) What is principle of Column Chromatography. Discuss its applications.   (2, 3)
     (b) Differentiate between double salt and a coordination compound with examples.   (3)

Q.9 (a) What are Radioactive Isotopes. Describe their important applications.   (06)
     (b) What is R_f value? Write down its unit.   (02)