

Subject: Chemistry

Time: 3 Hours

Paper: A

Marks: 40

Question No. 1 is compulsory. Attempt any two questions from each section in addition to Q. No 1. Five questions should be attempted in total. All questions carry equal marks.

Section-I

Q 1. (a) Solve the following set of simultaneous equations: 02

(i) $2y = 3x + 4$

(ii) $y = 2x + 1$

(b) Differentiate the followings: 03

(i) $y = x^6(1 - e^x) \sin 4x$

(ii) $y = \frac{x^3}{\sqrt{1-3x}}$

(c) Solve the following differential equations: 03

(i) $\frac{dx}{dt} = \frac{ka}{x_e}(x_e - x)$, if $x=0$, when $t=0$

(ii) $\frac{dy}{dx} = \frac{3}{4}x^2 + x - 3$, if $y=0$, when $x=2$

Q 2. (a) Derive expression for P_c , V_c and T_c in term of Vander-Waal constants using Vander-Waal equation. 04

(b) Prove that $C_p - C_v = R$ 02

(c) The molar heat capacity of an ideal gas at constant volume is $12.47 \text{ J K}^{-1} \text{ mol}^{-1}$. Calculate the molar heat capacity of the same gas at constant pressure. 02

Q 3. (a) Derive kinetic equation for 2^{nd} order reaction when initial concentration of both reactants is same. 04

(b) Prove that half-life period for 2^{nd} order reaction is inversely proportional to the initial concentration of reactants. 02

(c) What is Eigen function? Show that the function $\phi = e^{-ar}$ is an Eigen function of the operator $\frac{\partial^2}{\partial r^2}$. What is the Eigen value? 02

Q 4. (a) What is Free energy? Discuss its temperature and pressure dependence. 04

(b) Give postulates of collision theory. 02

(c) A 0.590-mol sample of an ideal gas initially at 300 K and 1.5 bar is compressed isothermally to a final pressure of 6.90 bar. Calculate the change in Gibbs energy for this process. 02

- Q 5. (a) Derive Clausius-Clapeyron equation for thermodynamics of vapor pressure. 04
 (b) How can you determine the Arrhenius parameters using Arrhenius equation? 02
 (c) Benzene has a normal boiling point at 760 Torr of 353.25 K and $\Delta_{\text{vap}}H_m = 30.76 \text{ kJ mol}^{-1}$. If benzene is to be boiled at 30.00°C in a vacuum distillation, to what value of P must the pressure be lowered? 02

Section-II

- Q6. (a) Derive Schrodinger wave equation for motion of a particle in one dimension. 04
 (b) State Faraday's first law of electrolysis. Give its significance. 02
 (c) For a solution of 45.20 g of sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) in 316.0 g of water. Calculate the freezing point while $K_f = 1.86 \text{ K mol}^{-1} \text{ kg}$. 02
- Q 7. (a) What is Kohlrausch's law? Give its applications. 04
 (b) What is osmotic pressure? Give method of its determination. 02
 (c) Calculate the pressure of a gas for which adsorption coefficient is unity and fractional surface coverage is 0.8 using Langmuir adsorption. 02
- Q 8. (a) Derive Langmuir adsorption Isotherm for adsorption of a gas on solid surface. 04
 (b) Write a note on quantum mechanical tunneling. 02
 (c) Calculate Arrhenius parameters for a chemical reaction for which the values of rate constant are given below: 02
 (i) 2.5×10^{-5} at 20°C
 (ii) 1.6×10^{-6} at 30°C
- Q 9. (a) Discuss thermodynamics of electrochemical cells. 04
 (b) Write a note on autocatalysis. 02
 (c) The emf of a standard cell is 1.02 V at 298K. The temperature co-efficient of the cell is $-0.5 \times 10^{-5} \text{ V K}^{-1}$. Calculate ΔG . 02

Model Paper

**UNIVERSITY OF THE PUNJAB,
LAHORE**

B.A/B.Sc 1st Annual examination 2016

Subject: Chemistry

Total marks: 40

Paper: B (Inorganic Chemistry)

Time Allowed: 03 hours

Note: Q. No. 1 is compulsory. Attempt any Two questions from each section.

Q.1: Answer the following:

(2x4=8)

- (i) What is the structure of I_3^- ion according to VSEPR theory?
- (ii) Why lighter elements undergo fusion and heavier elements show nuclear fission reaction?
- (iii) What is the formula to calculate pH of a solution?
- (iv) What is the difference between Effective Nuclear Charge and proton number?

Section I

Q.2: (a) What is modern Periodic law? How elements are classified in modern periodic table?

(2, 4)

(b) What is chelate? Give example.

(2)

Q.3. Predict the structure of following molecules on the basis of VSEPR theory

(2x4=8)

(i) NH_3

(ii) SO_2

(iii) XeF_2

(iv) SeF_4

Q.4 (a) What are transition elements? Describe their general properties?

(2, 3)

(b) How MOT explain the paramagnetic nature of O_2 ?

(3)

Q.5 (a) Explain the colour of compounds on the basis of CFT?

(4)

(b) What are inner and outer d-orbital complexes? Explain with reference to VBT

(4)

Section II

Q.6: (a) What is SHAB concept? Give its application

(2, 4)

(b) What is meant by half life? Give formula to calculate its value using decay constant.

(2)

Q.7. How nuclear radiations can be detected and measured by Wilson Cloud Chamber and Geiger Muller counter?

(4x2=8)

Q.8 (a) What are indicators? Give examples of acid base, redox and precipitation Indicators?

(2, 3)

(b) Define a Buffer solution. Give an example of acidic and a basic buffer?

(3)

Q.9 (a) Give classification of chromatographic techniques on the basis of mobile and stationary phases?

(5)

(b) Define Solubility and Solubility Product.

(3)

Model paper

BSC Part II organic chemistry

All question carry equal marks.

Question 1 is Compulsory.

Q. No 1. Answer the following questions.

(1x8)

- The degenerate orbitals are filled according to the
- The mean distance between the nuclei of the two bonded atoms is called the
- In S_N1 mechanism the order of stability of the carbocations is
a. Tertiary secondary primary methyl
b. Methyl secondary tertiary primary
c. Primary secondary tertiary methyl
- Such systems that contains one or more sp^3 hybridized carbon atoms in an otherwise conjugate ring, is known as
a. Homoaromatic system b. homotropylium cation c. nonbenzoid system.
- Clemmensen reduction can be brought about by
a. Zinc amalgam and 25% HCl b. hydrazine and base KOH. c. $LiAlH_4$
- Acetoacetic ester, a β -keto ester, is synthesized by the self-condensation of ethyl acetate which takes place in the presence of sodium ethoxide. The reaction is known ascondensation.
- Aryl nitriles can be prepared by the reaction of arenediazonium salts with cuprous cyanide. This reaction is also known as thereaction.
- Amino acids behave both acidic and basic properties. This property is known as
a. amphoteric b. isoelectric c. Predominant isoelectric.

Q. No 2. Answer the following questions.

(2x4)

- Write condensed and bond-line formulas for the five isomeric C_6H_{14} alkanes.
- cyclo-octatetraene is not planar, where as its dianion is a planar molecule. Why?
- Direct esterification is restricted to reactions of carboxylic acids and primary alcohols. Why?
- Chloral reacts rapidly with methanol to form the hemiacetal, but only slowly to give the corresponding acetal. Why?

Q. No 3. Briefly explain the following Reactions with mechanism.

(4x2)

- Cannizzaro's Reaction.
- Reimer –Tiemann Reaction.

Q. No 4. Write the structural formula for each of the following substance.

(1x8)

- | | | | |
|------------------|------------|---------------|-------------|
| a. Aspirin | b. Chloral | c. benzamide | d. Phthalic |
| anhydride | e. Cumene | f. Mesitylene | formamide |
| h. Glutaric acid | | | |

Q. No 5. Explain with mechanism the synthesis of following conversions.

(2x4)

- p-nitobenzaldehyde from toluene
- Butanenitrile from n-propyl alcohol
- n-butyl bromide from n-butyl alcohol
- Benzoic Acid from Acetophenone



UNIVERSITY OF THE PUNJAB

A/2015

Examination:-B.A./B.Sc.

Roll No.

Subject: Chemistry

TIME ALLOWED: 3 hrs.

PAPER: D [Applied Chemistry]

MAX. MARKS: 40

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

FIRST question is compulsory. Attempt at least two questions from each section.

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|---------|-----|---|---|
| Q. No.1 | (a) | Differentiate between allowed and forbidden transitions. | 2 |
| | (b) | How methane acts as green house gas? | 2 |
| | (c) | Discuss the significance of annealing during glass manufacturing. | 2 |
| | (d) | Give the structural difference between starch and cellulose. | 2 |

Section-I

- | | | | |
|----------|-----|--|---|
| Q. No.2 | (a) | Classify spectroscopic techniques on the basis of type of electromagnetic radiations. | 4 |
| | (b) | What is green house effect, discuss its importance. | 4 |
| Q. No.3 | (a) | Describe acid rain and its impact on environment. | 4 |
| | (b) | In view of solvent extraction, explain distribution law and distribution co-efficient. | 4 |
| Q. No.4 | (a) | Discuss the applications of rounding off significant figures in Chemistry. | 4 |
| | (b) | What is the principle of IR spectroscopy? | 4 |
| Q. No. 5 | (a) | What are determinate and indeterminate errors? | 4 |
| | (b) | Discuss the role of metal pollution in water bodies. | 4 |

Section-II

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|----------|-----|---|---|
| Q. No. 6 | (a) | Describe the continuous process of soap manufacturing. | 4 |
| | (b) | Enlist all the important raw materials for glass manufacturing process. | 4 |
| Q. No. 7 | (a) | Explain biological function and importance of cellulose. | 4 |
| | (b) | With the help of flow sheet diagram explain soda ash manufacturing process. | 4 |
| Q. No. 8 | (a) | Discuss the significance of lipids in biological membranes. | 4 |
| | (b) | Write a brief note on Iron metallurgy. | 4 |
| Q. No. 9 | | Explain detailed process of Urea manufacturing on industrial scale along with flow sheet diagram. | 8 |