



UNIVERSITY OF THE PUNJAB

First Semester 2015
Examination: B.S. 4 Years Programme

Roll No.

PAPER: Chemistry-I (Physical Chemistry)
Course Code: CHEM-101 /

TIME ALLOWED: 2 hrs. & 30 mins.
MAX. MARKS: 50

Attempt this Paper on Separate Answer Sheet provided.

Section II

Q.2 Answer Short questions (2x10=20)

- What is meant by Auto Catalysis?
- Give differences between order and molecularity
- What is meant by lowering of vapour pressure ?
- Define Mean Free Path.
- What is Tyndal Cone Effect ?
- Explain the term "Magnetic susceptibility".
- Write briefly about Macromolecules .
- Describe the effect of temperature on distribution of velocities.
- Give differences between physical and chemical adsorption .
- How will you derive the units of rate constant and half life for third order reaction.

Section III (3 X 10 = 30)

- Q.3
- Explain collision theory of unimolecular reaction . (5)
 - Give mathematical treatment of elevation of boiling point . (5)
- Q.4
- Explain Langmuir adsorption isotherm. (6)
 - The viscosity of hydrogen at 0°C is $8.41 \times 10^{-4} \text{ Kg m}^{-1} \text{ s}^{-1}$. calculate the mean free path of H_2 at STP. (4)
- Q. 5
- What are Colloids? (2)
 - How you distinguish between lyophilic and lyophobic sols? Why the lyophilic sols are called reversible sols? (4)
 - Describe "Second Law of Thermodynamics" (4)



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Attempt this Paper on this Question Sheet only.

Q.1 Multiple Choice Questions (1x10=10)

i- Which of the following has Zero dipole moment.

- (a) BF_3 (b) CHCl_3 (c) SO_2 (d) NH_3

ii- Number of atoms in face centered cubic unit cell are

- (a) 2 (b) 4 (c) 3 (d) 6

iii- The unit of rate constant for second order reaction is

- (a) $\text{dm}^3 \cdot \text{mol}^{-1} \text{sec}^{-1}$ (b) $\text{dm}^5 \text{mol}^{-1} \text{sec}^{-1}$ (c) sec^{-1} (d) $\text{dm}^6 \text{mol} \text{sec}^{-1}$

iv. Units of surface tension are _____.

- a) Nm b) Nm^2 c) Nm^{-2} d) Nm^{-1}

v- Which of the following has the highest value of critical temperature.

- (a) He (b) CO_2 (c) N_2 (d) H_2O

vi- Movement of sol particle under an applied potential is called _____.

- a) electro osmosis b) electrophoresis c) electrolysis d) all

vii. Branch of science which deals with the study of geometric properties and structure of crystals of crystalline substance is called _____.

- (a) crystal spectroscopy b) crystallography c) amorphous spectroscopy d) none

viii- Purification of sols cannot be done by

- (a) Dialysis (b) Electrodialysis (c) Electrophoresis (d) Ultrafiltration

ix- For the adsorption of a gas on a solid, the plot of $\log x/m$ against $\log P$ is linear with slope equal to

- (a) $1/n$ (b) $\log K$ (c) K (d) m

x- Which of the following is purely constitutive property

- (a) Molar refraction (b) Optical rotation (c) both a & b (d) none



UNIVERSITY OF THE PUNJAB

First Semester 2015

Examination: B.S. 4 Years Programme

Roll No.

PAPER: Fundamentals of Chemistry (Basic Chemistry)

TIME ALLOWED: 2 hrs. & 30 mins.

Course Code: CHEM-111 /

MAX. MARKS: 50

Attempt this Paper on Separate Answer Sheet provided.

SECTION-I

Q. No.2 Give answers to the following short questions.

2×10=20

- Justify that Parachor is an additive and Constitutive property?
- Explain delocalized bonding in 1, 3- butadiene.
- Define and illustrate bonding and antibonding molecular orbital.
- What are Cp and Cv value of a gas? Give their mathematical expression.
- Why phenol is acidic and alcohol is neutral?
- Differentiate between Order and molecularity.
- Justify that the viscosity of gases increases with increase in temperature but reverse is true for liquids
- Why the Transition Elements show variable valency?
- Explain the structure of Ethylene on the basis of Hybridization.
- How would you differentiate between Sigma and Pi bond?

SECTION-II

Q. No. 3 Attempt all the following long questions.

5×6=30

- What is meant by Resonance? State the rules of resonance. Explain with examples.
- Derive the equation for First order reaction in which the initial concentrations is 'a' moles dm^{-3} . Also calculate half life and unit of first order reaction
- Define the term surface tension. What are its units? Write a method for measurement of surface tension.
- Derive the Kinetics equation for ideal gasses.
- Write down the main postulates of Molecular Orbital Theory Explain the paramagnetic behavior of O_2 molecule.
- Define the term Orbital Hybridization .Describe various types Hybridization



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Course Code: CHEM-111 /

TIME ALLOWED: 30 mins.
MAX. MARKS: 10

Attempt this Paper on this Question Sheet only.

Q. No. 1 Encircle the most appropriate choice.

i. The contact angle for the rising liquid in a capillary tube is;

- (a) Equal to 90° (b) Less than 90°
(c) Greater than 90° (d) Always 120°

ii. The wave number of the light emitted by a certain source is $2 \times 10^6 \text{ m}^{-1}$ the wave length of this light will be

- a- 500nm b-500m c-200nm d- $5 \times 10^7 \text{ m}$

iii. The molar volume of CO_2 is maximum at

- a-STP b- 127°C and 1atm c- 0°C and 2 atm d- 273°C and 2atm

iv. Which one of the following elements belongs to d-block?

- (a) Sr (b) Ni (c) Al (d) Ga

v. What are the units of rate constant of a second order reaction.

- (a) $\text{dm}^6 \text{ mol}^{-2} \text{ s}^{-1}$ (b) s^{-1} (c) $\text{dm}^3 \text{ mol} \text{ s}^{-1}$ (d) $\text{mol} \text{ s}^{-2}$

vi. Which is more electronegative?

- (a) Sp (b) Sp^2 (c) Sp^3 (d) dSp^3

vii. Election donating groups on phenol increases

- (a) Acidity (b) Basicity (c) Neutral (d) All

viii. Which of the following is a purely constitutive property?

- (a) Molar refraction (b) Optical rotation
(c) Molecular Weight (d) Parachor

ix. How many nucleons are there in an atom of ${}_{92}\text{U}^{238}$?

- (a) 238 (b) 92
(c) 146 (d) 1

x. Covalent radius of Hydrogen is

- a-30.7pm b-32.7pm c-35.7pm d-37.7pm



UNIVERSITY OF THE PUNJAB

Roll No.

Second Semester 2015
Examination: B.S. 4 Years Programme

PAPER: Chemistry-II (Inorganic Chemistry)
Course Code: CHEM-103,

TIME ALLOWED: 30 mins.
MAX. MARKS: 10

Attempt this Paper on this Question Sheet only.

OBJECTIVE

- (i) Electronegativity is a
(a) Relative value (b) directly measurable value
(c) Precise (d) none
- (ii) HClO_4 is a stronger acid than HClO due to
(a) More number of oxygen atoms in conjugate base
(b) More delocalization of the pi bond
(c) More stability of the conjugate base
(d) all
- (iii) Paramagnetic behaviour of O_2 is explained by
(a) VSEPR Theory (b) Molecular Orbital Theory
(c) Valence Bond Theory (d) none
- (iv) Sodium or Potassium salt of fatty acids is known as
(a) soap (b) glass (c) soda ash (d) none
- (v) The colour of transition metal ions is explained by
(a) CFT (b) VBT (c) Werner's coordination theory (d) none
- (vi) Mass Defect is also called as
(a) Binding Energy (b) Ionization Potential (c) Electron Affinity (d) None
- (vii) Beta particles have low ionization power than alpha particles due to
(a) Smaller Mass (b) High speed (c) Low kinetic Energy (d) None
- (viii) Fe^{+2} is larger in size than Fe^{+3} due to
(a) Same Nuclear Charge (b) Different Electrons
(b) Same neutrons (d) None
- (ix) VBT does not explain the
(a) Paramagnetic Behaviour (b) Formation of odd electron molecules
(c) Formation of Coordinate Covalent bond (d) All
- (x) Radioactivity was discovered in 1895
(a) H. Becquerel (b) Newland (c) Dobereiner (d) None



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Second Semester 2015

Examination: B.S. 4 Years Programme

Roll No.

PAPER: Chemistry-II (Inorganic Chemistry)

TIME ALLOWED: 2 hrs. & 30 mins.

Course Code: CHEM-103, C

MAX. MARKS: 50

Attempt this Paper on Separate Answer Sheet provided.

Note: - Attempt all the questions on a separate sheet. No mark on question paper except your Roll Number. Cutting, overwriting or use of remover is not allowed.

SECTION-I

SHORT QUESTIONS

(2x10=20)

- (i) Draw the structure of PCl_5 on the basis of hybridization.
- (ii) Give two limitations of VSEPR.
- (iii) What factors affect Electronegativity?
- (iv) Explain the cause of Periodicity of properties.
- (v) Define inner transition element?
- (vi) How the radioactivity is measured by a Geiger-Muller counter?
- (vii) Why d-block elements show variable oxidation states?
- (viii) Define the term Half life.
- (ix) What are Chelates?
- (x) Draw the structure of phenolphthalein.

SECTION-II

LONG QUESTIONS

(5x6=30)

- (i) Discuss color phenomenon in transition metal complexes on the basis of CFT.
- (ii) Draw the structures of the following molecules on the basis of VSEPR.
(a) NH_3 (b) HCN (c) BeCl_2
- (iii) Define Polarizability and Polarizing Power of ions. Explain the factors affecting the magnitude of polarizing Power of Cations.
- (iv) Write a note on manufacture of Soap.
- (v) Write a note on radioactive disintegration series.



UNIVERSITY OF THE PUNJAB

Third Semester 2015
Examination: B.S. 4 Years Programme

Roll No.

PAPER: Chemistry-III (Organic Chemistry)
Course Code: CHEM-201/

TIME ALLOWED: 2 hrs. & 30 mins.
MAX. MARKS: 50

Attempt this Paper on Separate Answer Sheet provided.

SUBJECTIVE

Part-I

Q.2 Answer the following short questions

20

- (a) What is Reimer-Tiemann reaction?
- (b) Diethylamine is more basic than triethylamine. Is this correct? Justify your answer.
- (c) Hydrolysis of *tert*-butyl chloride is retarded by the addition of sodium chloride. Why?
- (d) How would you convert but-1-ene into butan-1-ol and butan-2-ol?
- (e) Sodium iodide can catalyze the dehalogenation of 1,3-dichloropropane by zinc in ethanol to give cyclopropane. Explain How?
- (f) Tertiary carbocation is more stable than primary carbocation. Explain Why?
- (g) Out line the synthesis of benzyl bromide from toluene with mechanism..
- (h) Explain why nitro group is a Meta directing group in aromatic electrophilic substitution reactions?
- (i) Cyclopentadiene can easily donate a proton to a stronger base. How?
- (j) Why a molecule having a plane of symmetry does not show optical activity?

(P.T.O.)

Part-II

- Q.3 (a) Design a synthesis of 1,3,5-tribromobenzene from benzene. Show all the steps. 3
- (b) Determine the number of double bonds in a cyclic alkene having molecular formula $C_{10}H_{16}$. Two hundred milligram of which reacted with 14.7 mL of 0.1 molar solution of bromine in CCl_4 . 4
- (c) Differentiate between Corey-House and Wurtz reactions with examples and mechanisms. 3
- Q.4 (a) Explain with examples sp^3 , sp^2 and sp hybridization. 5
- (b) Draw the structures of the following compounds. 5
- (i) Amyl alcohol (ii) Hydroquinone (iii) Benzenamine
- (iv) Isopropyl alcohol (v) Anthracene
- Q.5 (a) How would you convert phenol into the following compounds? Give the reaction mechanism in each case.
- (i) Salicylic acid (ii) Salicylaldehyde 4
- (b) Explain the mechanism, kinetics and stereochemistry of SN_1 reactions. 4
- (c) What are crown ethers? Draw the structure of a representative example. 2



Attempt this Paper on this Question Sheet only.

OBJECTIVE

Q.1 Choose the most suitable answer.

- (1) An alcohol form ester by reaction with
(a) aldehyde (b) ketone (c) carboxylic acid (d) ether
- (2) The C-C overlapping for σ -bond in benzene is of the type:
(a) sp^3-sp^3 (b) $p-p$ (c) sp^2-sp^2 (d) $sp-sp$
- (3) Which molecule exhibit intra molecular hydrogen bonding?
(a) ethanol (b) diethyl ether (c) acetone (d) salicylaldehyde
- (4) Anti-Markonikoff's addition of HBr is not observed in:
(a) Pent-2-ene (b) But-2-ene (c) Propene (d) But-1-ene
- (5) Wurtz reaction may be used to prepare higher hydrocarbons. How many products may be formed by the reaction of ethyl iodide and methyl iodide with sodium?
(a) 1 (b) 2 (c) 3 (d) 4
- (6) Which conformation of *n*-butane has least energy:
(a) Staggered form (b) Gouch form (c) Eclipsed form (d) None of these
- (7) What would be the value of "n" if Huckel rule is applied to biphenyl?
(a) 1 (b) 2 (c) 3 (d) 6
- (8) The Lucas test is used to distinguish primary, secondary and tertiary alcohols. The Lucas reagent is
(a) $ZnCl_2 + HNO_3$ (b) $ZnCl_2 + H_2SO_4$ (c) $ZnCl_2 + HCl$ (d) $ZrCl_2 + HCl$
- (9) Grignard's reagent gives alkane when it is reacted with:
(a) Ethanol (b) Water (c) Ethylamine (d) All of above
- (10) Meta directing groups in electrophilic substitution reactions are usually:
(a) Deactivation group (b) Neutral group (c) Activating group (d) None of these



UNIVERSITY OF THE PUNJAB

Fourth Semester 2015

Examination: B.S. 4 Years Programme

Roll No.

PAPER: Chemistry-IV (General Chemistry)

TIME ALLOWED: 2 hrs. & 30 mins.

Course Code: CHEM-203 /

MAX. MARKS: 50

Attempt this Paper on Separate Answer Sheet provided.

Short Questions

Briefly answer following question?

10 × 2 = 20

1. Briefly explain Compton effect?
2. Write down Hittort's rule of migration of ions?
3. What is molar conductivity and give its units.
4. Define standard electrode potential.
5. Define the term law of mass action?
6. Differentiate between precision and accuracy.
7. Briefly explain the concept of pH?
8. What is the principle of flame emission spectroscopy?
9. What are cyanohydrins? Give examples.
10. What are polycarboxylic acid? Give examples.

Subjective Part

10 × 3 = 30

- | | | | |
|------|-----|---|---|
| Q 1. | (a) | Explain Davisson and Germer's experiment for verification of wave-particle duality. | 5 |
| | (b) | What is Faraday's first and second law of electrolysis and its significance? | 5 |
| Q 2. | (a) | What are buffers, explain their working principle with suitable example? | 5 |
| | (b) | Define common ion effect; discuss its application in qualitative analysis. | 5 |
| Q 3. | (a) | Describe preparation of ester from alcohol, also write mechanism in this respect. | 5 |
| | (b) | Explain the nature of different transitions possible in atoms and molecules. | 5 |



UNIVERSITY OF THE PUNJAB

Roll No.

Fourth Semester 2015
Examination: B.S. 4 Years Programme

PAPER: Chemistry-IV (General Chemistry)
Course Code: CHEM-203 /

TIME ALLOWED: 30 mins.
MAX. MARKS: 10

Attempt this Paper on this Question Sheet only.

Objective Part

10 × 1 = 10

1. Which of following give Cannizzaro's Reaction
 - (a) Benzaldehyde
 - (b) Acetaldehyde
 - (c) Acetone
 - (d) Propanal
2. Acetone can be prepared by dry distillation of
 - (a) Calcium acetate
 - (b) Calcium carbonate
 - (c) Calcium chloride
 - (d) Calcium nitrate
3. Heisenberg's uncertainty principle is applicable to?
 - (a) Any microscopic moving object
 - (b) Nucleus only
 - (c) Electron only
 - (d) Atoms only
4. Which is used in artificial flavors
 - (a) Esters
 - (b) Alcohols
 - (c) Ethers
 - (d) Amines
5. The interaction of electromagnetic radiation with matter is called as
 - (a) Fractional distillation
 - (b) Spectroscopy
 - (c) Gravimetry
 - (d) Conductometry
6. UV/Vis spectroscopy is a type of
 - (a) Vibrational spectroscopy
 - (b) Atomic spectroscopy
 - (c) Both a and b
 - (d) Molecular spectroscopy
7. Co-precipitation may be due to
 - (a) Absorption
 - (b) Common ion effect
 - (c) Occlusion or Adsorption
 - (d) High Solubility Product
8. The letters s, p, d and f are used to represent which quantum numbers
 - (a) Principal
 - (b) Magnetic
 - (c) Azimuthal
 - (d) Spin
9. The relationship between energy of a photon of light and its frequency is given by
 - (a) de-Broglie dual nature of matter
 - (b) Bohr's model
 - (c) Planck's Quantum theory
 - (d) Rutherford's atomic model
10. The most widely used flame for atomic absorption is
 - (a) Air-natural Gas
 - (b) Air-propane
 - (c) Air-acetylene
 - (d) Air-Hydrogen