

N.B.: (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

(3) Use of log table/ non-programmable calculator is allowed.

- Q1. **Attempt any three of the following.** 15
- A) Define the term quality. Discuss any four points of importance of quality concepts in industry.
 - B) The Mole fraction of I₂ in CCl₄ is 0.05. Calculate the molality and molarity of the solution.
(Given - density of solution = 1.45 g/cm³, M.W. of CCl₄ = 154, M.W. of Iodine = 254)
 - C) What are primary and secondary reference standard? How many grams of copper pyrites CuFeS₂, will give 250 g of copper?
(Given – Atomic weights of Cu = 63, Fe = 55.85, S = 32)
 - D) What is flux? Name the different types of sample size reduction methods used in solid sampling. Explain any one of them.
 - E) List the methods of sampling of gases. With the help of a neat and labelled diagram describe any one of them.
- Q2. **Attempt any three of the following.** 15
- A) Calculate the pH of 25.0 cm³ of 0.2M acetic acid which is to be titrated against 0.2M sodium hydroxide before the beginning of the titration.
(dissociation constant of acetic acid 1.75×10^{-5} at 25°C)
 - B) Give three advantages and two limitations of EDTA as titrant.
 - C) Calculate the potential of the system at equivalence point in the titration of 10.0 cm³ of 0.2M Fe(II) against 0.2M Ce(IV) solutions.
($E^0_{\text{Pt}|\text{Fe}^{2+},\text{Fe}^{3+}} = +0.771\text{V}$, $E^0_{\text{Pt}|\text{Ce}^{3+},\text{Ce}^{4+}} = +1.440\text{V}$)
 - D) Explain the following factors used to increase selectivity of EDTA as titrant:
i) pH control of the solution ii) use of masking and demasking agents.
 - E) Name the metallochromic indicators. Explain any one of them.
- Q3. **Attempt any three of the following.** 15
- A) With the help of a neat labelled diagram, explain the working of hollow cathode lamp.
 - B) Compare FES and AAS
 - C) What is fluorescence? What are the factors affecting fluorescence and phosphorescence?
 - D) What is phosphorescence? Draw a schematic diagram of Phosphorimeter and explain the role of shutter.
 - E) Draw a schematic diagram of turbidimeter and explain its working.

Q4.

Attempt any three of the following.

15

- A) With the help of diagram, explain the working of Craig countercurrent extractor.
- B) In GLC using 25.0 cm column, component 'A' and 'B' are found to have retention times 13.30 min. and 14.60 min. respectively. An unretained species passed through the column in 1.32 minutes. The peak widths at the base for 'A' and 'B' were 1.12 min. and 1.20 min. respectively. Calculate the number of plates in each peak and resolution.
- C) Explain the principle of solid phase extraction. Give any three advantages of it.
- D) Give the comparison between GLC and GSC.
- E) Describe TCD with the help of a diagram used in gas chromatography.

Q.5

- A) **Select whether the following statements are true or false (Any five)**
- a) Analytical Reagent (AR) grade is less pure than Laboratory Reagent (LR).
- b) The primary goal of proper sampling is to ensure that the sample is a true representative of the bulk material.
- c) The products of neutralisation reaction are salt and water.
- d) The magnitude of conditional stability constant is independent of pH.
- e) Hollow cathode lamp is used in AAS.
- f) Flame photometry gives the information of molecular condition of the sample.
- g) Efficiency of a column increases when number of theoretical plate is large and plate height is small.
- h) Craig countercurrent extraction is a single stage extraction.

05

Q.5 B)

Select the correct option and complete the following statements: (any five)

05

- a) Quality control is primarily focused on _____ inspection and testing.
a) product b) facilities c) process
- b) _____ is used for sampling of flowing liquids.
a) Angular sampler b) Hand Scoop c) Multiple tube sampler
- c) Metal - EDTA complex is of _____ type.
a) 1:1 b) 1:2 c) 1:4
- d) Fe(II) against Ce(IV) titration is _____ electron system.
a) one b) two c) five
- e) Molecules having _____ bond are suitable for fluorescence and phosphorescence.
a) Conjugated double b) Sigma c) Pi
- f) In _____ analysis, particle size is not important.
a) Nephelometric b) Turbidimetric c) Fluorometric
- g) In GSC _____ is used as stationary phase.
a) Solid b) Liquid c) Gas
- h) Tributyl phosphate is used for extraction of _____ ions.
a) Uranium b) Sodium c) Titanium

Q.5 C) Match the columns: (any five)

Column A		Column B	
a) Sampling of gases	(i)	Phosphorimetry	
b) Normality	(ii)	Phenolphthalein	
c) Acid base titration	(iii)	LR grade	
d) Ferroin Indicator	(iv)	Liquid	
e) Narcotics detection	(v)	Sampling probe	
f) Decrease in fluorescence	(vi)	No. of gm equivalents per dm^3 of solution	
g) Stationary phase in GLC	(vii)	Demasking	
h) Solid phase extraction	(viii)	Redox titration	
	(ix)	Electron withdrawing groups	
	(x)	Silica	

[Time : 2 ½ Hours]

[Total marks :75

N.B. : (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

(3) Use of logarithmic table/non-programmable calculator is allowed.

1. Attempt **Any Three** of the following:
- A. Discuss the following symmetry elements with suitable example. 5
 - i) Axis of symmetry ii) Identity
 - B. What is point group? Discuss the point group C_{2v} with suitable example. 5
 - C. Draw molecular orbital diagram for CO molecule. Discuss its bond order and magnetic behaviour. 5
 - D. Write a note on correlation diagram for linear and triangular H_3^+ 5
 - E. Discuss bond order and magnetic behaviour of water molecule on the basis of molecular orbital diagram. 5
2. Attempt **Any Three** of the following:
- A. Discuss Meissner effect. 5
 - B. Define atomic packing factor. Prove that packing factor for bcc lattice is 68%. 5
 - C. Give the applications of superconducting materials. 5
 - D. Write a note on Schottky defect in ionic solid. 5
 - E. Give a brief account of fullerenes. 5
3. Attempt **Any Three** of the following:
- A. Explain magnetic properties of lanthanides. 5
 - B. What are inner transition elements? Give the names and observed electronic configuration of lanthanides. 5
 - C. On the basis of lanthanide contraction explain
 - i) decreasing basicity of lanthanides 3
 - ii) similarities between yttrium and lanthanons 2
 - D. Give any two applications of lanthanides. 5
 - E. Write a note on the separation of lanthanides by Tributyl phosphate (TBP) extraction method. 5
4. Attempt **Any Three** of the following:
- A. Discuss ionizing and non-ionizing solvents with suitable examples. 5
 - B. What is non-aqueous solvent? Give any two balance equations for each of the following reactions of liquid ammonia, 5
 - a) Acid-base reactions
 - b) Redox reactions
 - C. Discuss the allotropes of sulphur. 5
 - D. Name elements of group 16. Write any two physical properties. 5
 - E. On the basis of VSEPR theory, explain the bonding and structure of IF_5 interhalogen compound. 5

5. Answer the following:

- A. Select whether the following statements are true or false (Any five) 5
- The molecules having two atoms of the different elements are known as homonuclear diatomic molecules. **F**
 - Improper rotational axis is called rotation reflection axis. **T**
 - The positions occupied by particles in the crystal lattice are called lattice point. **T**
 - Bravais shows that there can only be 14 different ways in which similar point can be arranged in three dimensional space. **T**
 - Magnetic properties of lanthanides are due to the contribution of spin and orbital moment. **T**
 - The order of elution of Ln^{3+} ion from the resin in the column is in the order of their atomic numbers. **F**
 - Oxygen is bad conductor of electricity. **T**
 - Amphiprotic solvents do not show acidic and basic properties. **F**

B. Select the correct option and complete the following statements. (Any five) 5

- The rotational axis C_n for water molecule is _____
a) 2 b) 3 c) 4 d) 5
- BeH_2 molecule is _____
a) linear b) angular c) Tetrahedral d) octahedral
- In cubic crystal system $a = b = c$ and $\alpha = \beta = \gamma = \dots\dots\dots$
a) 90° ✓ b) 180° c) 120° d) 60°
- Number of atoms per unit cell in simple cube structure is
a) 1 b) 2 c) 3 d) 4
- is less reactive because of lanthanide contraction.
a) copper b) zinc c) nickel d) Iridium ✓
- dissolved in selenium oxo-chloride is used as a powerful liquid laser.
a) Lanthanum oxide b) Europium oxide c) Neodymium oxide d) Dysprosium oxide
- General electronic configuration of group 17 is.....
a) ns^2np^5 b) ns^2np^6 c) ns^2np^4 d) ns^2np^3
- CH_3COOH is solvent
a) Aprotic b) Basic c) Acidic d) Neutral

C. Match the column: (Any five) 5


- | | |
|-----------------------------------|--------------------------|
| a. Atomic orbitals | i. No change in density |
| b. Point group for HCl | ii. Radioactive |
| c. Frankel defect | iii. Oxyacid of chlorine |
| d. APF for simple cube structure | iv. Non-ionizing solvent |
| e. Promethium | v. Monocentric |
| f. largest nuclear cross section. | vi. 52 % |
| g. HOCl | vii. $C_{\infty v}$ |
| h. Benzene | viii. Gadolinium |
| | ix. 74% ✓ |
| | x. D_{2h} ✓ |

[Time : 2 ½ Hours]

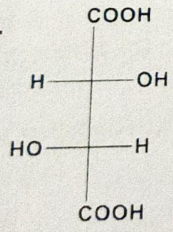
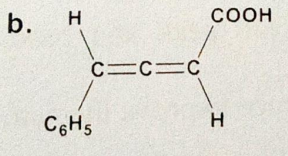
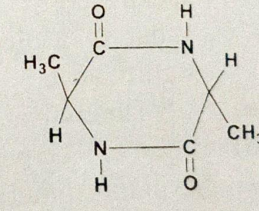
[Total marks: 75]

- N.B. : (1) All questions are compulsory.
 (2) Figures to the right indicate full marks.
 (3) Use of logarithmic table/non-programmable calculator is allowed.

Q.1 Attempt Any Three of the following:

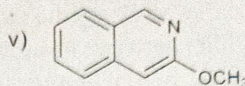
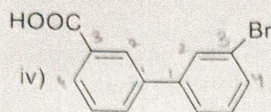
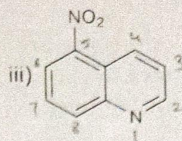
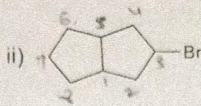
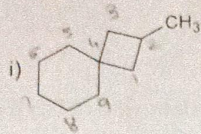
- A. a) Discuss the A_{AC}2 mechanism of acid catalysed esterification of carboxylic acid. 15
 b) Distinguish between basicity and nucleophilicity. 03
- B. a) Discuss the stereochemistry of NGP with a suitable example. 02
 b) Complete the following reaction and name the reaction involved. 02
- 
- C. a) Explain with mechanism pyrolysis of acetates. 03
 b) Complete the following reaction and name the reaction involved. 02
- $\text{CH}_3\text{COOCH}_3 + \text{NaOH} \longrightarrow ?$
- D. Explain the mechanism of photoreduction of benzophenone to benzpinacol. 05
- E. a) Explain the Norrish type-II reaction of pentan-2-one. 03
 b) Write a note on photosensitization reaction. 02

Q.2 Attempt Any Three of the following:

- A. Explain the stereochemistry of unsymmetrically substituted biphenyls using suitable example. 15
- B. State whether following molecules are chiral or achiral 05
- a.  03
- b. 
- c. 
- b) Define rotation reflection symmetry with an example 02
- C. Convert pyridine to pyridine-N-oxide. Draw the resonating structures of pyridine-N-oxide. 03
- a) What is the action of following reagents on pyridine-N-oxide? 02
- b) i) SO₂Cl₂
 ii) Conc.HNO₃ + Conc. H₂SO₄ at 160⁰ C.
- D. Give the Bischler-Napieralski synthesis for the preparation of Isoquinoline. 05
 Write the reaction of isoquinoline with alkaline KMnO₄. 03
- E. a) Write the synthesis of Indole-3-acetic acid. 02
 b) What are Agrochemicals? How are they classified?

Q.3 Attempt Any Three of the following: 15

A. Write IUPAC name of the following compounds. 05



B. How adipic acid is prepared from glucose? Write significance with reaction. 05

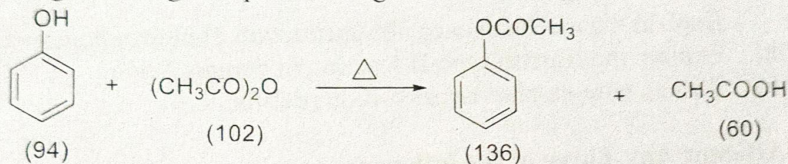
C. State any two principles of green chemistry. Explain with suitable example. 05

D. Write a note on : 05

i) E-Factor

ii) Sonication technique used in organic synthesis.

E. Calculate the % atom economy and theoretical yield of the following reaction if the given weight of phenol is 2g. 05



Q.4 Attempt Any Three of the following: 15

A. Illustrate the electronic transition of organic molecules. Give application of UV spectroscopy. 05

B. What is Molecular ion peak and base peak in mass spectrum? Write the significance. 05

C. a) Give analytical evidence to prove the nature of nitrogen in nicotine. 03

b) What are Terpenoids? 02

D. a) Explain isomerism in Citral. 03

b) Give analytical evidence to prove that Citral has a carbonyl group. 02

E. Write synthesis of Nicotine from Nicotinic acid. 05

Q.5 Answer the following: 15

A. Select whether the following statements are true or false (Any five) 05

a. A transition state has highest energy and least stability.

b. Carbonyl compounds containing α -H atom show Norrish type-I cleavage.

c. Karanjin is the main active ingredient of karanja oil.

d. Compound having centre of symmetry will be optically active.

e. Number of π - bond in the structure of biphenyl is 6.

f. Trichloromethane is a green solvent.

g. Citral is a diterpene.

h. Decrease in absorbance intensity in U.V spectrum is called Hypsochromic shift.

[Time : 2 ½ Hours]

[Total marks :75]

- N.B. : (1) All questions are compulsory.
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Physical Constants:

$$N = 6.022 \times 10^{23}$$

$$R = 8.314 \text{ J/K mol}$$

$$c = 3.0 \times 10^8 \text{ m/s}$$

$$h = 6.626 \times 10^{-34} \text{ Js}$$

1. Attempt **Any Three** of the following: 15
- A. Explain the effect of isotopic substitution on the rotational energy level of a diatomic molecule. 5
 - B. Show that in an anharmonic oscillator the fundamental, first overtone band are in the ratio of 1:2. 5
 - C. Explain the different stretching and bending modes of vibrations in a molecule. 5
 - D. Write a short note on quantum theory of Raman spectra. 5
 - E. A diatomic molecule is irradiated with the radiation of wavelength 437nm. A Raman line appears at 459.5nm. Calculate the Raman Shift. 5
Also comment whether the line is Stokes or Anti Stokes line.
2. Attempt **Any Three** of the following: 15
- A. Show thermodynamically the elevation in boiling point of the solution is a colligative property. 5
 - B. Describe the experimental determination of relative lowering of vapour pressure by static method. 5
 - C. Calculate the osmotic pressure of the solution containing 3.5g of urea (molecular weight 60 g/mole) dissolved in 100 cm³ of water at 293K. 5
 - D. Derive Lindemann's theory of reaction rate of a unimolecular reaction. 5
 - E. Describe how flash photolysis method used to study the kinetics of fast reactions. 5
3. Attempt **Any Three** of the following: 15
- A. With a neat labelled diagram, explain the principle and working of Geiger-Muller counter. 5
 - B. Differentiate between natural and artificial radioactivity. 5
 - C. Explain, how process of carbon dating is used in determination of age of material? 5
 - D. Calculate the nuclear energy value for the following nuclear reaction. 5
$${}_{12}^{24}\text{Mg} + {}_1^2\text{H} \rightarrow {}_{11}^{22}\text{Na} + {}_2^4\text{He}$$

(${}_{12}^{24}\text{N} = 23.9972 \text{ amu}$; ${}_2^4\text{He} = 4.00381 \text{ amu}$; ${}_{11}^{22}\text{Na} = 22.0013 \text{ amu}$; ${}_1^2\text{H} = 2.0147 \text{ amu}$)
 - E. What are essential components of nuclear reactors? Discuss their roles in nuclear reactors. 5

4. Attempt **Any Three** of the following: 15
- A. State the assumptions or postulates on which Langmuir adsorption isotherm is based. 5
- B. Adsorption of a certain gas forms a complete monolayer on charcoal. The volume of gas adsorbed reduced to NTP conditions was found to be 125 cm^3 per gram of adsorbent. Calculate the surface area of the adsorbent. The area occupied by each gas molecule is $14.6 \times 10^{-20} \text{ m}^2$. 5
- C. Describe any two methods by which colloids acquire electric charge. 5
- D. Explain Electrophoresis with a neat labelled diagram, state equation relating electrophoretic mobility and zeta potential. 5
- E. What are surfactants? Discuss the application of surfactants in (i) food industry (ii) detergents. 5
5. Answer the following:
- A. Select whether the following statements are **true** or **false** (Any five) 5
- The dipole moment of trans chloroethane is zero
 - The selection rule for rotational transitions in a diatomic molecule is $\Delta J = +2$
 - The salt of K_2SO_4 in aqueous solution dissociates to give two ions
 - Collision theory considers reacting molecules as rigid spheres.
 - SI unit of radioactivity is 1 curie.
 - Controlled thermonuclear reactions are possible with the heavier isotopes of hydrogen.
 - Physical adsorption is a multimolecular phenomenon.
 - Lyophilic colloids are water hating
- B. Select and write the appropriate answer. (Any five) 5
- _____ line is not a part of Raman lines.
 - Rayleigh
 - Stoke's
 - Antistoke's
 - absorption
 - Rule of mutual exclusion is applicable to those molecules which possess _____ of symmetry
 - Centre
 - axis
 - plane
 - length
 - Relative lowering of vapour pressure for a solution is equal to mole fraction of the _____.
 - ions
 - volatile solvent
 - non volatile solute
 - non volatile solvent
 - Ebullioscopic constant is the elevation in boiling point produced when one mole of solute is dissolved in _____ of solvent
 - 100g
 - 10g
 - 1000g
 - 1g
 - _____ can be used as phosphor in scintillator counter.
 - NaCl
 - Anthracene
 - KCl
 - Ethanol
 - Which of the given is not an application of radiotracer technique _____
 - Photosynthesis
 - Power Generation
 - Carbon dating
 - Determination of reaction mechanism
 - The heat of adsorption in chemical adsorption is in between _____ KJ mol^{-1} .
 - 40-400
 - 4-40
 - 4 - 400
 - 400 - 4000
 - _____ is a system in which liquid is a dispersed phase and solid is the dispersion medium
 - Gel
 - Emulsion
 - Solid foam
 - solution

C.

Match the column: (Any five)

5

- | | |
|-----------------------------------|-----------------------------------------|
| a. Non-linear molecule | i. Adsorbate |
| b. CO ₂ molecule | ii. Van't Hoff factor is greater than 1 |
| c. Solute dissociates in solution | iii. heterogeneous in nature |
| d. Collision frequency | iv. Number of collisions per unit time |
| e. Breeder reactor | v. Van't Hoff factor is less than 1 |
| f. Multiplication factor | vi. $3n-6$ |
| g. SO ₂ | vii. Fertile material |
| h. Colloids | viii. Zero dipole moment |
| | ix. Production factor |
| | x. Adsorbent |
-

R-24

RIZVI COLLEGE OF ARTS, SCIENCE AND COMMERCE

T.Y.B.Sc. (Sem V)

CBCS (2024-25)

Chemistry-Paper V (Applied Component)

Total Marks: 75 Marks

Time: 2 hr.30 min

N.B.: (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

(3) Use of log table/ non-programmable calculator is allowed.

Q.1 Attempt any 3 out of 5

15M

- 1 - What is pharmacopoeia? Explain its importance.
- 2 - What are drugs? What are the requirements of an ideal drug?
- 3 - Explain the terms i) Bioavailability ii) Drug potency iii) Receptor
- 4 - Explain advantages and disadvantages of oral route administration.
- 5 - What is meant by drug dose? What are the factors which affect it?

Q.2 Attempt any 3 out of 5

15M

- 1 - What is diabetes mellitus? Give structure, use and side effect of pioglitazone
- 2 - Give synthesis, use of Ambroxol.
- 3 - What is anti-parkinsonism drug? Give synthesis and uses of levodopa.
- 4 - What are analgesics? What are their types.
- 5 - Give use and synthesis of Acelofenac.

Q.3 Attempt any 3 out of 5

15M

- 1 - What are dye? Explain about various fastness properties of dye.
- 2 - Write note on i) Curcumin ii) Madder
- 3 - Explain structure and properties of wool.
- 4 - Write note on optical brightener,
- 5 - Describe mordant and vat dyeing method.

Q.4 Attempt any 3 out of 5

15M

- 1 - Give brief idea of primaries, intermediates, unit processes.
- 2 - Explain chromophore theory to explain the color of compounds.
- 3 - Give the synthesis of the dye intermediate Naphthol AS
- 4 - Explain relation between color and chemical constitution by Armstrong's theory.
- 5 - Explain nitration, ammonolysis, oxidation as important unit process.

Q.5A Multiple choice question (any 4 out of 7)

4M

- 1 ----- Route of drug administration refers to administration by injection which takes the drug directly into the blood stream.
A) Intravenous B) Anal C) Oral
- 2 A biological active drug which by latention is converted into an inactive carrier form is called.....
A) Pharmacology B) Prodrug C) pharmacon
- 3 Vitamins H
A) Water soluble B) fat soluble C) Insoluble in water and fat
- 4 ----- drugs used to relieve pain.
A) Analgesic B) Antipyretic C) Antidiabetic
- 5are used in treatment diabetes mellitus.
A) Metformin B) Amphetamine C) hormones
- 6 ----- drugs used to relieve pain- fever
A) Anti-analgesic B) Anti- Pyretic C) Both
- 7 ----- are used to enhance intensity of color of compound.
A) Hormones B) Chromophore C) Auxochromes

B True or false (any 4 out of 6)

4M

- 1 Vitamin C is water soluble.
- 2 Bioavailability of drug is 100% when administered orally.
- 3 Antipyretic drug which is responsible for lowering temperature of human being having fever to normal.
- 4 Acelofenac is steroidal anti-histaminic agent.
- 5 Cellulose unit present in the cellulose are five.
- 6 Active component in madder is Lawson.

C Match the column (any 4 out of 6)

4M

- | | | |
|---|---------------------|---------------------------------------|
| 1 | Intravenous | a. Increase in intensity of the color |
| 2 | Trimethadone | b. Responsible for color of compound |
| 3 | Chromophore | c. Increase in wavelength |
| 4 | Antihistamine | d. Analgesic. |
| 5 | Hyper chromic shift | e. Fight against allergic condition. |
| 6 | Bathochromic shift | f. 100% bioavailability |

D Fill in the blanks by choosing correct word given in the bracket (any 3 out of 6)

3M

(Pharmacy, Pharmacology, Calm effect, Anxiety, Analgesic, Antipyretic, Piperzine, Acetyl, Polyester, Polyamide, Synthetic, Natural, Electron withdrawing, electron donating)

- 1 The detailed study of drugs is known as-----
- 2 Sedative is a drug which produces-----.
- 3 ----- Strongly act on central nervous system.
- 4 Cetirizine is a-----derivative.
- 5 Nylon is a-----
- 6 Cotton is -----fibers.