

[Time : 3Hours]

[Total marks :100]

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.

Physical Constant:

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

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

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

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

$$\text{Mass of electron} = 9.109 \times 10^{-31} \text{ Kg}$$

$$1 \text{ amu} = 931 \text{ MeV} = 1.66 \times 10^{-27} \text{ Kg}$$

1. Attempt any four of the following:

- A. A material is irradiated with a wavelength of 435.8 nm and the first Raman line appears at 440.1 nm. Calculate the Raman shift and identify the type of line. 5
- B. Derive the expression for the moment of inertia (I) of a rigid rotor. 5
- C. Explain different types of stretching and bending modes of vibration in molecule 5
- D. Define dipole moment. Explain the structure of CO₂ and SO₂ on the basis of dipole moment. 5
- E. Derive an expression for frequency of P and R branch lines in IR spectra of diatomic molecule 5
- F. Calculate the wave number of the first four lines in the rotational spectrum of diatomic molecule ¹²C¹⁶O. (I = 1.457 × 10⁻⁴⁶ kgm²). 5

2. Attempt any four of the following.

- A. Describe the dynamic method for determination of relative lowering of vapour pressure when a nonvolatile solute is added to solvent. 5
- B. Define ebullioscopic constant. Aqueous solution of urea boils at 374.15 K. What is its molality? (k_b = 0.512 Kmol⁻¹kg) 5
- C. Derive VantHoff's equation for osmotic pressure. 5
- D. Derive Lindemann's Unimolecular theory of reaction rates. 5
- E. Describe the stop flow method to study the kinetics of fast reaction 5
- F. 2.50 g of naphthalene (m.wt :128) is dissolved in 25.0 g of benzene. The freezing point of pure benzene is 278.5K, and the freezing point of the solution is 275.8K. What is the molal freezing point depression constant, K_f of benzene? 5

3. Attempt any four of the following:

- A. With a neat labeled diagram, explain the principle and working of Geiger-Muller counter. 5
- B. The ¹⁴C activity of a sample of wood from the sample is 5.6 dpm/gm. If in living plants the equilibrium value of ¹⁴C activity is 24.4 dpm/gm, calculate the age of sample of wood. (Half-life of ¹⁴C is 5720 years) 5
- C. Derive an equation for the Q value of a nuclear reaction. 5
- D. Write a note on artificial transmutation. Give any two artificial nuclear reactions. 5

- E. With the help of diagram, describe different components of a nuclear power reactor 5
- F. Write thermonuclear fusion reactions involved in the carbon Nitrogen cycle which occur in stellar bodies. 5
4. Attempt any four of the following:
- A. State BET equation, identify terms involved in it. Test the validity of the equation. 5
- B. Explain the different types of adsorption isotherm with one example of each. 5
- C. What is electro-osmosis? How is it studied experimentally? 5
- D. What is meant by electric double layer? Explain it with a diagram. 5
- E. Adsorption of hydrogen gas forms a complete monolayer on the surface of charcoal, the volume of hydrogen reduced to S. T. P was found to be 1.79 per g of charcoal. Calculate the surface area of adsorbent, if the area occupied by one hydrogen molecule is $15.0 \times 10^{-20} \text{ m}^2$. 5
- F. Write a note on surfactants. 5
5. Answer the following:
- A. Choose the correct option and fill in the blank (Any five) 5
 [Wagging, Simple harmonic, Isotopes, Negative, Microwave, μ^2 , Zero, Centre of symmetry]
- a. Dipole moment of CO_2 molecule is -----
- b. Equation of moment of inertia $I =$ -----
- c. Rotational spectra are obtained in ----- region.
- d. Vibrational motion of a single particle is ----- motion.
- e. In Anti stokes line Raman shift is -----
- f. Mutual exclusion rule is applicable for those molecules that possess----
- g. ----- is out of plane vibration.
- h. ----- is the same atomic number but different mass number.
- B. Select whether the following statements are true or false (Any five) 5
- a. A property which depends upon the number of particles of solute and independent of its nature is called additive property.
- b. If a solution boils at a temperature T_1 and solvent at temperature T_2 , then the elevation in boiling point is $T_2 - T_1$.
- c. The depression in freezing point in a one molal solution is called as cryoscopic constant
- d. Ostwald and Walker method is used to determine the osmotic pressure of the solution.
- e. The probability factor in the rate equation considers the orientation of the molecules.
- f. The collision frequency is inversely proportional to the concentration of the reacting molecule.
- g. Flash photolysis technique is used to determine the rate of a slow reaction.

- C. Select and write the appropriate answer. (Any five) 5
- a. _____ can be used as phosphor in a scintillator counter.
 a) NaCl c) Anthracene
 b) KCl d) Ethanol
- b. The average life of a radioactive element is _____ times the half-time.
 a) 0.693 c) 0.44
 b) 0.963 d) 1.44
- c. The process of converting the stable nucleus of one element into unstable nucleus of another element by bombarding it with fast moving particle is called _____.
 a) Artificial radioactivity c) Natural disintegration
 b) Natural transmutation d) Artificial redox reaction
- d. _____ can be used as moderator in nuclear power reactor.
 a) D₂O b) Boron c) Ferrous d) Cadmium
- e. Q value of nuclear reaction is related to mass defect by relation, Q =
 a) 931 / m Mev c) Δm x 931 Mev
 b) Δm / 931 Mev d) Δm x 0.931 Mev
- f. In Geiger-Muller counter can not detect _____ radiation efficiently.
 a) α b) γ c) β d) ⁴He₂
- g. Which of the following is fertile material?
 a) ²³³U b) ²³⁵U c) ²³⁹Pu d) ²³²Th
- h. Predict the projectile in the following reaction.
¹⁰B₅ + _____ → ⁷Si₅ + ⁴He₂
 a) ²H₁ b) ¹n₀ c) ¹D₂ d) ¹H₁

- D. Match the column: (Any five) 5
- | | |
|--------------------------|--|
| a. Lyophobic sol | i. Alumina |
| b. Gum Arabic | ii. Cold cream |
| c. W/O emulsion | iii. Gel |
| d. SO ₂ | iv. Silica gel |
| e. Zeta potential | v. Adsorbate |
| f. Adsorbent | vi. $\zeta = \frac{4\pi\epsilon\sigma}{D}$ |
| g. Diffused double layer | vii. Dorn effect |
| | viii. Proposed by Guoy model |
| | ix. Electrophoresis |
| | x. Micelles |

Time: 3Hours

Marks: 100

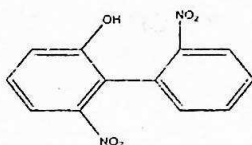
- N.B.: (1) All questions are compulsory.
 (2) Figures to the right indicate full marks.
 (3) Use of log table/ non-programmable calculator is allowed.

Q.1 Attempt ANY FOUR of the following:

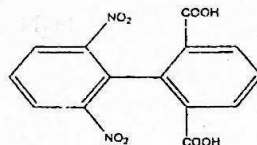
- A) Write short notes on the following: 3
 i) Chelotropic reactions 2
 ii) Electrophilicity
- B) Complete the following reaction and name the product. Explain the mechanism of the reaction. 5
- $$\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \xrightleftharpoons{\text{dry HCl gas}} ?$$
- C) Explain the following terms: 5
 i) ligand ii) B_{AC2} iii) pericyclic reaction iv) nucleophile
 v) synartetic acceleration
- D) Using suitable examples explain sigmatropic and group transfer reactions. 5
- E) Distinguish between the following: 3
 i) Fluorescence and Phosphorescence 2
 ii) Singlet and Triplet state
- F) What is photosensitisation? Explain the photochemical reduction of benzophenone. 5

Q.2 Attempt ANY FOUR of the following:

- A) a) State whether following compounds are optically active or optically inactive. Justify your answer. 3



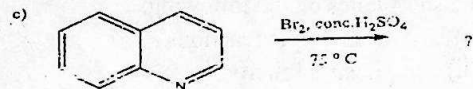
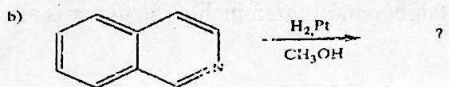
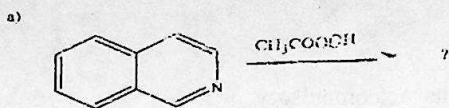
i)



ii)

- b) Define centre of symmetry with an example. 2
- B) Write a note on stereochemistry of allenes. 5
- C) a) Give synthesis of indole-3-acetic acid. 3
 b) Give preparation of pyridine-N-oxide from pyridine. 2

D) Complete the following reactions.



E) What are Agrochemicals? Give advantages of using agrochemicals. Write the synthesis of Endosulfan.

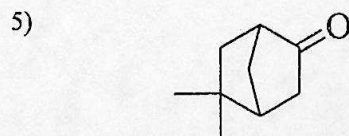
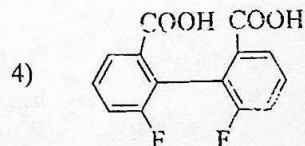
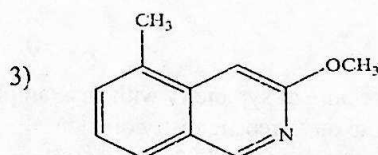
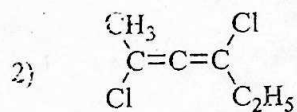
F) Give the Bischler-Napieralski synthesis for the preparation of Isoquinoline. Write the reaction of isoquinoline with alkaline $KMnO_4$

Q.3.

Attempt ANY FOUR of the following:

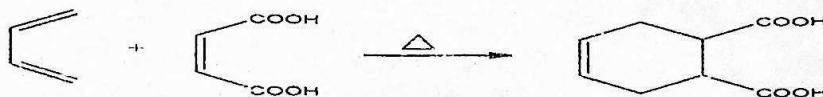
A)

Give the IUPAC names of the following:



- B) Write the structural formula for each of the following compounds: 5
1. 1-chloro-6-methoxyspiro [3.4] octane
 2. Bicyclo [3.3.0] octan-3-carboxylic acid
 3. 2,2'-difluoro-6,6'-dinitrodiphenyl
 4. 2-methoxy quinoline
 5. Penta-2,3-diene-1-oic acid
- C) a) Explain convergent synthesis with a suitable reaction? 3
 b) Define chemoselectivity with a suitable example? 2
- D) a) Explain multicomponent synthesis with a suitable example? 3
 b) What is E-factor? Give its significance? 2
- E) Give the synthesis of the following from a suitable starting compound. 5
- 1) 1-phenyl ethanol using a suitable Grignard reagent.
 - 2) n-pentane using a suitable Organolithium compound

- F) a) Define atom economy? Calculate the percentage atom economy of the following reaction? 3

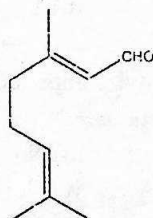


[Given Atomic Weights: C=12, H=1, O=16]

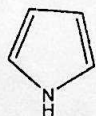
- b) Give any two applications of biocatalyst in green chemistry? 2

Q.4 Attempt ANY FOUR of the following.

- A) a) Explain the following terms used in spectroscopy with suitable example 3
- i) Chromophore
 - ii) Auxochrome
- b) Give the shifts in absorption bands in UV- visible spectroscopy. 2
- B) a) Explain the fragmentation of the 2-Methyl pentane 3
 b) Define Base peak and Isotopic peak 2
- C) a) What are terpenoids? Give products of ozonolysis of the following terpenoid? 3



- b) State Special isoprene rule with suitable example. 2
- D) Give the reaction for Hofmann exhaustive methylation and degradation of 3



- b) What are harmful effects of nicotine? 2

Q.5 B) State whether the following statements are TRUE or FALSE: (ANY FIVE) 5

- Trans-1,3-dimethyl cyclobutane is chiral.
- Cumulene having odd number of double bonds shows geometrical isomerism.
- Alternating axis of symmetry is also known as rotation reflection axis.
- Electrophilic substitution reactions on isoquinoline takes place preferably at positions 5 and 8.
- Isoquinoline is also known as 2-azanaphthalene.
- Gibberellins belong to the class of Plant Growth Regulators.
- Endosulfan is a plant growth regulating hormone.

Q.5 C) Fill in the blanks with correct alternatives given in the bracket : (ANY FIVE) 5

[quinoline, chemoselective, LiAlH_4 , dimethylsulphate, larger, bridged head, smaller, isoquinoline, renewable, dimethylcarbonate, supercritical CO_2 , regioselective, tert.butyl hydroperoxide]

- Addition of halogen acid to an unsymmetrical alkene is an example of ----- reaction.
- Methane is an example of ----- raw material
- causes selective methylation of active methylene compounds
- Oxidation of aldehydes can be carried out with benign reagents like -----
- Dry cleaning of the clothes can be done using ----- instead of carbon tetrachloride.
- benzo[c]pyridine is also called -----
- For the nomenclature of spirans the ----- ring is given preference
- To name the fused and the bridged ring systems the numbering starts from one of the ----- carbon atoms.

Q.5 D) Match the columns: (ANY FIVE) 5

Column A	Column B
a) Citral-b	(i) Odd mass number
b) >N-CH_3	(ii) Nicotine
c) Epinephrine	(iii) Hypochromic shift
d) Pinner	(iv) Geraniol
e) Odd number of nitrogen atom	(v) Laevorotatory
f) β -carotene	(vi) Neral
g) Citral-a	(vii) $\lambda_{\text{max}} = 452\text{nm}$
	(viii) Protein hormone
	(ix) Herzog Meyer method

(Time: 3 hours)

Total Marks: 100

- 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 four of the following. 20
- A) Explain the term quality control and quality assurance.
- B) Calculate mass percent composition of each element in potassium ferrocyanide, $K_4Fe(CN)_6$
 (Given: atomic weight of K = 39, Fe = 55.85, C = 12, N = 14)
- C) Concentrated H_2SO_4 has specific gravity of 1.71 g.cm^{-3} and it contains 80% w/w of H_2SO_4 . Calculate 1) Molar concentration 2) Normal concentration
 (Given atomic weight of H = 1, S = 32, O = 16)
- D) Explain the importance of quality concept in industry.
- E) Describe the sampling of immiscible and flowing liquid.
- F) Discuss different equipment used for sampling of compact solid.
- Q.2** Attempt any four of the following. 20
- A) Calculate the potential of the system in the titration when equal volumes of equimolar Fe(II) and Ce(IV) solutions are mixed.
 ($E^0_{Ptl, Fe^{2+}, Fe^{3+}} = +0.771 \text{ V}$, $E^0_{Ptl, Ce^{3+}, Ce^{4+}} = +1.440 \text{ V}$)
- B) 10.0 cm^3 0.1 M Fe (II) solution is titrated with 0.02 M $KMnO_4$ at pH = 1. Calculate the potential when
 i) 9.9 cm^3 of 0.02 M $KMnO_4$ added
 ii) 10.1 cm^3 of 0.02 M $KMnO_4$ added
 Given: $E^0_{Ptl, Fe^{3+}, Fe^{2+}} = +0.771 \text{ V}$, $E^0_{Ptl, MnO_4^-, Mn^{2+}} = +1.510 \text{ V}$
- C) What are redox indicators? Explain the use of any one redox indicator.
- D) What are the factors which increase the selectivity of EDTA as titrant. Explain any two.
- E) Explain the following types of EDTA titrations:
 i) Back titration ii) Substitution titration.
- F) Discuss the theory of metallochromic indicators. What are the requirements of metallochromic indicators?
- Q.3.** Attempt any four of the following. 20
- A) With the help of a diagram explain the working of hollow cathode lamp.
- B) Discuss the principle of Atomic Absorption Spectroscopy. Explain the role of rotating chopper in AAS.
- C) Explain phosphorescence. Give two applications of phosphorimetry.
- D) Explain Jablonski diagram of energy levels in a molecule.
- E) Discuss the working of nephelometry with the help a labelled diagram.
- F) Explain: - 1) Turbidimetric titrations 2) Phase titrations

- Q.4 **Attempt any four of the following.** 20
- A) Explain the principle of solid phase extraction. Give its advantages.
 B) Discuss any two factors affecting solvent extractions.
 C) Explain the terms used in HPLC i) isocratic elution ii) gradient elution. Give any three applications of HPLC.
 D) Explain the principle of HPLC. Discuss UV detector used in HPLC.
 E) Give applications and limitations of HPTLC.
 F) Name the steps involved in HPTLC. Write a note on fluorimetric detector used in HPTLC.

- Q.5 A) **Select the correct option and complete the following statements: (any five)** 05
- a) _____ cannot be used for validation of analytical method.
 i) Reference material ii) Certified reference material iii) LR grade
 b) The reagent of highest grade of purity is _____ grade.
 i) AR ii) GR iii) LR
 c) 30ppm means _____.
 i) 30 mg ii) 30 mg/cm³ iii) 30mg/dm³
 d) 1M Al(OH)₃ solution is equivalent to _____ N Al(OH)₃ solution.
 i) 1 ii) 3 iii) 0.1
 e) _____ method is mostly used to draw sample from a cylinder filled with gas at high temperature.
 i) Flushing ii) Static iii) Displacement
 f) The process of rolling and quartering is used for decreasing _____.
 i) particle size ii) sample size iii) Bulk ratio
 g) _____ is used for sampling of particulate solid.
 i) Auger sampler ii) Concentric tube thief iii) Gee sampler
 h) _____ acid is excellent solvent for dissolution of many metal oxides and metals above hydrogen.
 i) Hydrochloric ii) Sulphuric iii) Perchloric

- Q.5 B) **State whether true or false: (any five)** 05
- a) Sulphuric acid is added to reduce $E_{\text{Pv/Fe}^{3+}/\text{Fe}^{2+}}^0$ in the titration between Fe(II) and potassium dichromate.
 b) Nernst's equation is applicable only at equivalence point in redox titrations.
 c) Equivalent point potential is independent of concentrations of reactants and products in titration of Fe(II) against MnO_4^- .
 d) Ferroin contains 1,10-phenanthroline.
 e) EDTA does not form 1:1 complex with most of the metal ions.
 f) $K_{MY} = K'_{MY}$ when $\alpha_4 = 0$
 g) In the titration of Ca^{+2} against EDTA, concentration of Ca^{+2} is zero at equivalence point.

Q.5 C) Fill in the blanks with correct alternatives given in the bracket : 05
(any five)

(alkali & alkali earth metals, phosphorescence, turbidimeter, turbidance, toxic metals, hollow cathode lamp, low, conjugated double)

- AAS is used to detect _____ like Cu, Ni, Zn and Hg in food products.
- Flame photometry is extensively used for the estimation of _____.
- In AAS the source of radiation is _____.
- Delayed re-emission of absorbed radiation is called _____.
- Phosphorimetric experiments are normally carried out at _____ temperature.
- The instrument used to measure turbidance is known as _____.
- Molecules having _____ bond are suitable for fluorescence and Phosphorescence.
- A turbidimeter measures _____ as a function of concentration of suspension.

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

05

- | Column A | Column B |
|--------------------------|--|
| a) Neutral chelate | (i) Detection of separated component using scanning instrument |
| b) Powder silica | (ii) Extraction of uranyl nitrate |
| c) HPLC | (iii) Remove impurities from solvent |
| d) Multistage separation | (iv) $pH_{1/2}$ |
| e) HPTLC | (v) Reciprocating pump |
| f) TBP solvent | (vi) Countercurrent extraction |
| g) Precolumn | (vii) Solid phase extraction |
| | (viii) Easily extracted in water |
| | (ix) Easily extracted in organic solvent |

RIZVI COLLEGE OF ARTS, SCIENCE AND COMMERCE

T.Y.B.Sc. CHOICE BASED (REGULAR 2023-24) SEMESTER-V CHEMISTRY: PAPER V

is called.....

A) Pharmacology B) prodrug C) pharmacon

3 Vitamins vit. C and vitamins of group B are vitamins.

A) Water soluble B) fat soluble C) water insoluble

4 is the drug that binds to receptor and blocks biological response.

A) agonist B) Antagonist C) both

5 are used in treatment of infectious diseases.

A) Functional agent B) chemotherapeutic agent C) hormones

6 Medicinal term used for drug is

A) Pharmacology B) prodrug C) pharmacon

7 are suspensions of the solid or liquid particles in gas.

A) Tablet B) Aerosols C) Drops

8 is a book of direction and requirement of the preparation of medicine.

A) Pharmacophore B) pharmacology C) pharmacopia

True or false (any 5 out of 7)

5M

1 Antipyretic drug which is responsible for lowering temperature of human being having fever to normal.

2 Aceclofenac is steroidal anti-inflammatory agent.

3 Cetrizine is an anti-histaminic drug

4 Type I diabetes also known as maturity onset diabetes.

5 Diuretics are used in the treatment of edema.

6 Levodopa is an example of anti parkinsonism drug

7 The Latin word 'expectrare' means to drive out from the chest.

Match the column (any 5 out of 8)

5M

1 1. chromophore

a. wool

2 2. natural dye

b. Intensify the colour

3 3. auxochrome

c. Requirement of good dye

4 4. fastness

d. natural dye

5 5. chlorophyll

e. Derived from plant and animal

6 6. Washing fastness

f. Responsible for colour

7 7. Natural fibre

g. Fastness property

8 8. Economic viability

h. Ability of substance to retain

True and false (any 5 out of 7)

5M

2 visible radiation having wavelength in the range 180nm to 380nm is used.

3 Introduction of nitro group is called Nitration process.

4 According to witt's theory quinonoid structure are coloured compound.

5 The intensity of colour decreased then it is called hypochromic shift.

6 The colour of compound is caused due to presence of unsaturated group called chromophore.

7 Chromophores are directly converted into dyes.

8 Nitration process is a single step chemical conversion.

RIZVI COLLEGE OF ARTS, SCIENCE AND COMMERCE

T.Y.B.Sc. CHOICE BASED (REGULAR 2023-24) SEMESTER-V CHEMISTRY: PAPER V

(Time: 3 Hours)

Total Marks: 100

- 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 4 out of 6

20M

- 1 Give the synthesis, use and side effects of amphetamine.
- 2 Give a brief note on classification of drugs on the basis of therapeutic action.
- 3 What are CNS drugs? Give the structure and use of levetiracetam and phenytoin.
- 4 Explain advantages and disadvantages of oral route administration.
- 5 Explain different form of formulations.
- 6 What is pharmacopoeia? Explain its importance.

Q.2 Attempt any 4 out of 6

20M

- 1 Give the structure, use and side effect of prednisolone and aceclofenac.
- 2 Give synthesis, use and side effect of diclofenac.
- 3 Give synthesis, use and side effect of atenolol.
- 4 What is diabetes mellitus? Give structure, use and side effect of pioglitazone
- 5 Classify drug for respiratory system on the basis of physiological function.
- 6 What is anti-perkinsonism drug? Give synthesis and uses of levodopa.

Q.3 Attempt any 4 out of 6

20M

- 1 What are dye? Explain about various fastness properties of dye.
- 2 Classify the dyes based on the applicability on substrates.
- 3 What are the limitations of natural dyes?
- 4 What is optical brightener? Also give essential properties of optical brightener.
- 5 Describe mordant dyeing and disperse dyeing method of dyeing cotton fiber.
- 6 Define natural dye? Give a brief note on indigo and henna as natural dye.

Q.4 Attempt any 4 out of 6

20M

- 1 Give brief idea of primaries, intermediates, unit processes.
- 2 What is diazotisation reaction? Explain its different method.
- 3 How will you convert
 - 1) Benzene Sulphonic Acid To Benzene - 1,3 - disulphonic acid.
 - 2) Aniline To o, & p - Nitroaniline
 - 3) 2- Naphthol To Tobias Acid
- 4 Explain relation between colour and chemical constitution by Armstrong's theory.
- 5 Explain nitration, ammonolysis, and oxidation as important unit process.
- 6 What are the various types of shift in the absorption of visible light due to change in structure

Q.5A Multiple choice question (any 5 out of 8)

5M

- 1 The ideal drug should have..... toxicity.
A) Maximum B) Moderate C) Minimum
- 2 A biological active drug which by latention is converted into an inactive carrier form