

Program Name: M.Sc. Chemistry

III Semester / 2nd Year Examination

Subject Code: MSC-Chem-305

Subject Name: BIOORGANIC CHEMISTRY

[Time : 03:00 Hours]

[Max. Marks : 70]

Note: Attempt all the questions as per given instructions.

1. Multiple Choice Questions (MCQs)

[01×15=15]

- I In feedback regulation, the end product binds at:
(a) Active site (b) Allosteric site (c) E-S complex (d) None of these
- II The coenzyme not involved in hydrogen transfer:
(a) FMN (b) FAD (c) NADP⁺ (d) FH₄
- III The study of rates of chemical reactions that are catalyzed by enzymes is referred to as:
(a) first order reaction kinetics (b) zero order reaction kinetics
(c) chemical kinetics (d) enzyme kinetics
- IV Lock and key model was proposed by _____ in 1890:
(a) Henri (b) Michaelis and Menten
(c) Emil Fischer (d) Daniel Koshland
- V Amino acids are produced by the hydrolysis of
(a) Nucleic Acids (b) Carbohydrates (c) Fats (d) Proteins
- VI An amino acid contains.
(a) -NH₂ group (b) -NH₂ group and -COOH group
(c) -COOH group (d) Any other group of these
- VII The number of amino acids which form protein in nature are:
(a) 6 (b) 10 (c) 15 (d) 20
- VIII Pepsin is an example for the class of enzymes namely:
(a) Oxidoreductases (b) Transferases (c) Hydrolases (d) Ligases
- IX _____ involves substrates forming transient covalent bond with the residues present in the active site:
(a) Covalent catalysis (b) Specific acid-base catalysis
(c) General acid-base catalysis (d) Lock and key model
- X Which of the following is not a coenzyme?
(a) NADH (b) ATP (c) Synzyme (d) NADPH

Program Name: M.Sc. Chemistry

III Semester/2nd Year Examination

Subject Code: MSC-Chem-302

Subject Name: SPECTROSCOPY

[Time : 03:00 Hours]

[Max. Marks : 70]

Note: Attempt all the questions as per given instructions.

1. Multiple Choice Questions (MCQs)

[01×15=15]

- I Which of the following electromagnetic radiations are used in ESR?
(a) IR radiations (b) Radio waves
(c) X-radiation (d) Microwaves
- II Functional group region varies from
(a) 4000-1500 cm⁻¹ (b) 1500-600 cm⁻¹
(c) 6000-4500 cm⁻¹ (d) 1000-600 cm⁻¹
- III Chemical shift has the units of
(a) Parts per million (b) Parts per billion (c) Tesla (d) No unit
- IV Equivalent protons in a molecule will have
(a) Same environment (b) Same chemical shift
(c) Same shielding effect (d) All
- V Coupling constant of two nuclei is defined as
(a) Ratio of chemical shifts
(b) Distance between splitted peaks in hertz
(c) Difference of chemical shifts
(d) Ratio of absorption frequencies
- VI The stretching frequency will be highest in
(a) single bond (b) double bond
(c) triple bond (d) all will be equal
- VII Which of the following compound has most shielded protons?
(a) CH₄ (b) CH₃F (c) CH₃Cl (d) CH₃Br
- VIII NMR spectroscopy gives information about
(a) Molecular formula
(b) Molecular weight
(c) no. and types of C and H in molecule
(d) unsaturated compounds
- IX TMS stands for
(a) Tetramethylsilane (b) Trimethylsilane
(c) Tertiary methyl silane (d) None

XI Which of the following is not true for coenzymes?:

- (a) Coenzymes may be immobilized/regenerated with the use of whole-cell systems
- (b) Membrane reactors may be used to immobilize the coenzyme
- (c) They are referred to as artificial enzymes
- (d) Coenzymes may be derivatized for adequate immobilization and regeneration

XII Which of the following is an example of regeneration of the derivatized coenzymes by enzymic means?:

- (a) Formate dehydrogenase
- (b) Exocyclic N6-amino nitrogen of the adenine moiety
- (c) Dextran
- (d) Polyethylene glycol

XIII _____ is an enzyme used to dissolve blood clots:

- (a) Uricase
- (b) Lysozyme
- (c) Urokinase
- (d) Asparaginase

XIV Which of the following enzyme is used in the treatment of cancer?:

- (a) Trypsin
- (b) Lysozyme
- (c) Asparaginase
- (d) Streptokinase

XV _____ is used in treatment of skin ulcers:

- (a) Collagenase
- (b) Glutaminase
- (c) Rhodanase
- (d) Ribonuclease

Answer in long (any three) [10×3=30]

I Explain the enzyme mechanism of chymotrypsin and ribonuclease enzymes.

II Write down the origin, purification and uses of enzymes.

III Define the amino acids with suitable examples. Write down its classification also.

IV Discuss the factors which affect the enzyme action.

Answer in short (any five) [5×5=25]

I What is host-guest chemistry? Define.

II Describe the mechanism of enzyme action with the help of transition-state theory.

III Define the synzymes with its types and applications.

IV Explain the "Power House" of a cell.

V Mention the applications of immobilized enzymes.

VI Write a note on Zwitterions.

VII Discuss the kinetics of enzyme action by Michaelis-Menten & Lineweaver-Burk plots.

X Total number of fundamental vibrations obtained in CH₄ molecules are

- (a) 6
- (b) 7
- (c) 8
- (d) 9

XI Klystron is used as radiation source in----- spectroscopy.

- (a) NMR
- (b) IR
- (c) UV
- (d) ESR

XII An auxochrome contains which type of species

- (a) Non bonded
- (b) Pi
- (c) Sigma
- (d) None

XIII All the following expressions are correct except

- (a) $A = \epsilon c l$
- (b) $A = -\log T$
- (c) $T = I/I_0$
- (d) $A = \log T$

XIV Select the wavelength range corresponding to UV-visible region.

- (a) 400-800 nm
- (b) 200-800 nm
- (c) 25 μm - 2.5 μm
- (d) 2.5 μm - 1mm

XV A group producing deshielding effect causes

- (a) Increase in chemical shift
- (b) Decrease in chemical shift
- (c) splitting of the peaks
- (d) Converging of peaks

Answer in long (any three) [10×3=30]

I Discuss Beer-Lambert's law. What are the possible deviations from Beer-Lambert's law?

II Explain stretching and bending vibrations in IR spectroscopy by giving suitable representation.

III What do you mean by chemical shift? How will you differentiate between nuclear shielding and deshielding?

IV Briefly explain the Electronic Paramagnetic Resonance (EPR) spectroscopy. How will you decide whether the molecule is EPR active or inactive?

Answer in short (any five) [5×5=25]

1 Discuss the hyperfine splitting pattern in CH₃CH₂ and benzene radical in ESR spectroscopy?

II Highlight the important applications of IR spectroscopy? State which type of molecules are IR active?

III What is NMR spectroscopy is used for? State which types of nuclei are NMR active and why?

IV Discuss Woodward Fieser rule for conjugated dienes.

V State and illustrate Pascal's Triangle law in NMR spectroscopy.

VI What is the criteria for a compound to be IR active? What is the selection rule for IR spectroscopy?

VII Which of the following molecule(s) will be EPR active and why?
H₂, B₂ and O₂

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Printing Pages : 2
 Paper Code: MSC. CHEM-301
 Enrollment No. _____

C (SVSU:2024-25/1)

Program Name: M.Sc. Chemistry
 III Semester/2nd Year Examination
 Subject Code: MSc-Chem-301
 Subject Name: ANALYTICAL CHEMISTRY

[Time : 03:00 Hours]

[Max. Marks : 7

Note : 1. Attempt all the questions as per given instructions.

I. Multiple Choice Questions (MCQs) [01×15=15]

- I Thermal analysis is defined as
 (a) Measurement of concentration of materials as a function of temperature
 (b) Measurement of solubility of materials as a function of temperature
 (c) Measurement of physical properties as a function of temperature
 (d) Measurement of line positions of crystals as a function of temperature
- II What is the process of measuring the concentration of an analyte using electrical potential called?
 (a) Titration
 (c) Coulometry
 (b) Gravimetry
 (d) Voltammetry
- III What is the electrode used as a reference in electrochemical measurements?
 (a) Working electrode
 (c) Reference electrode
 (b) Indicator electrode
 (d) Counter electrode
- IV What is the function of an indicator electrode in electrochemical measurements?
 (a) It provides a stable potential reference
 (b) It completes the electrical circuit
 (c) It measures the current
 (d) It interacts with the analyte
- V What is the process of measuring the amount of charge passed during an electrochemical reaction called?
 (a) Titration
 (c) Coulometry
 (b) Gravimetry
 (d) Voltammetry
- VI During DTA (Differential thermal analysis) what kind of reference material used?
 (a) Chemically active
 (c) Inert
 (b) Physically active
 (d) Having catalytic property
- VII Which of the following gas permeable membrane is used for carbon dioxide gas sensing electrode?
 (a) Silicon rubber
 (c) Fluorocarbon
 (b) PVC membrane
 (d) Polythene
- VIII The distribution that is formed by all possible values of a statistics is known as:
 (a) Hypergeometric distribution
 (c) Sampling distribution
 (b) Normal distribution
 (d) Binomial distribution

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24/12/24

Printing Pages : 2
 Paper Code: MSC. CHEM-303
 Enrollment No. _____

B (SVSU:2024-25/R)

Program Name: M.Sc. Chemistry
 III Semester / 2nd Year Examination
 Subject Code: MSc-Chem-303
 Subject Name: PHOTOCHEMISTRY

[Time : 03:00 Hours]

[Max. Marks : 70]

Note: 1. Attempt all the questions as per given instructions.

I. Multiple Choice Questions (MCQs) [01×15=15]

- I The photo-Fries rearrangement involves a conversion of.....
 (a) Phenolic esters into hydroxy ketones
 (b) Hydroxy ketones into phenolic esters
 (c) Both of these
 (d) None of these
- II The rearrangement of 1,4-Diene is also called:
 (a) D-pi-methane rearrangement
 (b) P-pi-methane rearrangement
 (c) D-sigma-methane rearrangement
 (d) P-sigma-methane rearrangement
- III There are _____ types of cyclisation reactions:
 (a) 2 (b) 3 (c) 4 (d) 5
- IV The Barton reaction involves a conversion of..... into nitrosoalcohol:
 (a) Nitrate (b) Nitrite (c) Nitroso (d) None of these
- V Photochemical reactions are.....in nature.
 (a) Simple (b) Complex (c) Both of these (d) None of these
- VI Ozone is formed by _____ dissociation of molecular oxygen into individual oxygen atoms:
 (a) Photochemical (b) Thermochemical (c) Thermal (d) Ionic
- VII Photo oxidation reactions are of types.
 (a) 2 (b) 3 (c) 4 (d) 5
- VIII Photochemical smog consists of:
 (a) O₃ (b) NO₂ (c) Both of these (d) None of these
- IX In photochemical reactions, the presence of light is not required for the reaction to take place:
 (a) True (b) False (c) May be true or false (d) None of these
- X When the number of molecules decomposed is less than one per photon, the reaction has _____ quantum yield:
 (a) Low (b) High (c) Unpredictable (d) Variable

[1]

- IX** In Thin layer chromatography, the stationary phase is made of Solid and the mobile phase is made of
(a) gas (b) Solid (c) liquid (d) Liquid and Solid
- X** Increasing the sample size has the following effect upon the sampling error?
(a) It increases the sampling error
(b) It reduces the sampling error
(c) It has no effect on the sampling error
(d) All of the above
- XI** Which of the following is not a Column-type Liquid chromatography?
(a) Gel permeation (b) Ion exchange
(c) Liquid-solid (d) Paper
- XII** Using Chromatogram as detector in Chromatography, a graph is obtained between _____ and time.
(a) Quantity (b) Density (c) Concentration (d) Specific gravity
- XIII** What is the range of the rate in °Cmin-1 required during the heating process in TGA?
(a) 150-1000 (b) 25-50 (c) 100-200 (d) 1-20
- XIV** Which of the detectors is similar to Geiger Muller counter in construction but is filled with heavier gas?
(a) Proportional counter (b) Flow counter
(c) Semiconductor detector (d) Scintillation counter
- XV** Which of the following method can be used for the measurement of change in weight of the oxysalts?
(a) Thermoelectric analysis (b) Wagner analysis
(c) Stockbarger analysis (d) Thermal analysis
- 2. Answer in long (any three)** [10×3=30]
What is thermal analysis? How many types of thermogravimetry are there? Explain in detail.
- I** Define analytical Chemistry? Discuss Classical methods and Modern methods in analytical chemistry.
- II** Elaborate the Thermometric Titration? Discuss its instrumentation and applications.
- III** What do you mean by High pressure liquid chromatography? Explain in detail.
- 3. Answer in short (any five)** [5×5=25]
Write a short note on TGA.
- I** What do you mean by differential scanning calorimeter? Discuss the limitations and applications of differential scanning calorimeter.
- III** Account different types of errors. Explain how the errors can be reduced in measurement?
- IV** What is Stripping voltammetry? Explain the anodic stripping voltammetry (ASV) and draw the diagram of Potential versus time profile used in anodic stripping voltammetry.
- V** Determine the terms of mean and median with the help of suitable example.
- VI** How do you distinguish between IDA and NAA?
- VII** Draw the plot of current (y-axis) versus ml of titrant (x-axis) if only the titrant generates a current.

- XI** Geometrical isomerisation gives:
(a) Cis isomers (b) Trans isomers
(c) Both of these (d) None of these
- XII** When two or more molecules are decomposed per photon, the reaction has _____ quantum yield:
(a) High (b) Low (c) Unpredictable (d) Variable
- XIII** To express the relationship between the number of molecules reacting with the number of photons absorbed, the concept of _____ was introduced:
(a) Quantum efficiency (b) Photon analysis
(c) Quantum mechanism (d) Photon degradation
- XIV** The reactions which are caused by heat and in absence of light is called _____.
(a) Photochemical reactions (b) Dark reactions
(c) Reversible reaction (d) Reversible photochemical reaction
- XV** In gas phase photolysis _____ are studied.
(a) Halogens only (b) Halogens's acids only
(c) Both of these (d) None of these
- 2. Answer in long (any three)** [10×3=30]
Describe the excited states and various modes of dissipation of energy with the help of Jablonski diagram.
- I** Write down the rearrangement of 1, 4-Diene and 1, 5-Diene.
- II** Discuss the photochemical reactions with its types.
- III** Explain the fluorescence and phosphorescence.
- 3. Answer in short (any five)** [5×5=25]
Give the Photo-Fries rearrangement with mechanism.
- I** Explain the Norrish Type-I process.
- III** Write a note on photochemistry of vision.
- IV** Discuss geometrical isomerism in photochemistry.
- V** Write an essay on actinometry.
- VI** State and derive Beer-Lambert Law.
- VII** What is the atmospheric photochemistry?