GENERAL CHEMISTRY

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UNIT I

1. According to the kinetic molecular model of gases, molecules are considered to be:

a. Stationary
b. Indivisible
c. Infinitely small
d. All of the above

2. What does the kinetic gas equation relate?

a. Pressure and volume
b. Temperature and volume
c. Pressure, volume, and temperature
d. Pressure and temperature

3. Which of the following is a postulate of the kinetic molecular model?

a. Molecules are in constant motion
b. Molecules occupy fixed positions
c. Molecules have no kinetic energy
d. Molecules attract each other strongly

4. The Maxwell-Boltzmann distribution describes the

a. Speed distribution of molecules in a gas
b. Position of molecules in a solid
c. Energy levels of molecules in a liquid
d. Density of molecules in a gas

5. The most probable velocity in a Maxwell-Boltzmann distribution corresponds to the

a. Mode
b. Median

c. Mean d. Average

6. What is the relationship between average speed and root mean square speed in a gas?
a. Average speed = Root mean square speed
b. b. Average speed > Root mean square speed
c. Average speed < Root mean square speed
d. No specific relationship

7. The law of equipartition of energy is based on the idea that
a. Energy is conserved
b. Energy is distributed equally among all molecules
c. Energy is randomly distributed
d. Energy is partitioned equally among all accessible degrees of freedom

8. What is the molecular basis of heat capacities in the kinetic molecular model?
a. Molecules have heat capacities
b. Molecules absorb heat through vibrations and rotations
c. Molecules release heat through collisions
d. Molecules store energy in their electronic configurations

9. How are degrees of freedom related to the motion of molecules?
a. They restrict molecular motion
b. They define the number of independent ways a molecule can move
c. They control molecular collisions

d. They determine molecular size

10. The collision frequency in a gas is directly proportional to

a. Pressure
b. Temperature
c. Volume
d. All of the above

11. What is collision diameter in the context of kinetic theory?

a. Diameter of individual gas molecules
b. Average distance between molecules
c. Diameter of the container
d. Distance traveled by a molecule between collisions

12. The root mean square speed of gas molecules is most influenced by their:

a. Mass
b. Temperature
c. Pressure
d. Volume

13. Which distribution helps in understanding the range of speeds of gas molecules?

a. Normal distribution
b. Exponential distribution
c. Poisson distribution
d. Binomial distribution

14. The average kinetic energy of gas molecules is directly proportional to

a. Pressure
b. Temperature

b. Volume	d. Mass

15. What does the law of equipartition of energy state regarding degrees of freedom?

a. All degrees of freedom have equal energy
b. Energy is not associated with degrees of freedom
c. Each degree of freedom contributes ½ kT to the energy
d. Degrees of freedom are fixed and cannot change

16. The average kinetic energy of gas molecules is given by the expression

a. ½ mV^2	b. 3/2 kT
c. PV	c. RT

17. The Maxwell-Boltzmann distribution curve is characterized by:

a. A single peak	b. Multiple peaks
c. No peaks	d. Straight lines

18. What is the significance of the most probable velocity in the Maxwell-Boltzmann distribution?

a. It is the average velocity of all molecules
b. It is the velocity at the peak of the distribution
c. It is the root mean square velocity
d. It is the velocity at the median of the distribution

19. Which factor does not affect the collision frequency of gas molecules?

a. Temperature	b. Pressure

c. Volume d. Molecular mass

20. The collision frequency is defined as the number of collisions per unit:
a. Time b. Distance
c. Volume d. Mass

21. What does the term "degrees of freedom" refer to in the context of kinetic theory?
a. The freedom of molecules to move in any direction
b. The number of independent translational, rotational, and vibrational motions
c. The constraint on molecular motion
d. The freedom of molecules to escape from a container

22. What is the relationship between pressure and the root mean square speed of gas molecules?
a. Directly proportional
b. Inversely proportional
c. No relationship
d. Quadratically proportional

23. The average kinetic energy of gas molecules is proportional to the
a. Square root of temperature
b. b. Cube root of temperature
c. Fourth root of temperature
d. Fifth root of temperature

24. According to the kinetic molecular model, what happens to the kinetic energy of gas molecules when the temperature is increased?

a. Increase	b. Decreases
c. Remains constant	d. No effect

24. Deviations from ideal gas behavior are most prominent at

a. Low temperatures	b. High pressures
c. pressures	d. High temperatures

25. The compressibility factor (Z) for an ideal gas is:

a. 1	b. 0
c. Infinity	d. Variable

26. At high pressures, real gases exhibit a compressibility factor (Z):

a. Less than 1	b. Greater than 1
c. Equal to 1	d. Approaching zero

27. Vander Waals equation corrects for ideal gas behavior by considering:

a. Molecular size	b. Molecular speed
c. Molecular weight	d. Molecular density

28. The Vander Waals equation for real gases introduces correction terms for:

a. Attraction and repulsion
b. Temperature and pressure
c. Volume and temperature

d. Kinetic energy and potential energy

29. The Vander Waals equation is most accurate for gases with:

a. Small molecules	b. Large molecules
c. High temperatures	d. Low pressures

30. The Virial equation expresses the compressibility factor (Z) as a series of:

a. Volumes
b. Pressures
c. Temperatures
d. Powers of the molar volume

31. The Boyle temperature is the temperature at which a gas behaves most like an

a. Ideal gas	b. Real gas
c. Perfect gas	d. Diatomic gas

32. The law of corresponding states relates the behavior of different gases at the same

a. Temperature
b. b. Pressure
c. Volume
d. Critical temperature and pressure

33. The law of corresponding states suggests that gases at the same reduced conditions have similar

a. Compressibility factors	b. Molecular weights

c. Van der Waals constants
d. Boyle temperatures

34. Liquefaction of gases is achieved by
a. Increasing temperature
b. Decreasing pressure
c. Increasing pressure and decreasing temperature
d. Increasing volume

35. The critical temperature is the temperature above which a gas cannot be liquefied, regardless of:
a. Pressure applied
b. Volume occupied
c. Temperature reached
d. Molar mass

36. The numerical value of the compressibility factor (Z) for an ideal gas is:
a. 0
b. 1
c. Infinity
d. Variable

37. The Vander Waals equation incorporates correction factors for:
a. Molecular weight
b. Volume and pressure
c. Temperature and volume
d. Temperature and pressure

38. The Boyle temperature is the temperature at which the second virial coefficient becomes
a. Zero
b. Negative
c. Positive
d. Infinite

39. The term "corresponding states" refers to the concept that
a. Different gases behave similarly under the same conditions
b. Gases have the same molecular structure
c. Gases correspond to liquids at certain states
d. Different states of matter correspond to each other

40. The critical point of a gas is defined by its
a. Critical temperature and pressure
b. Critical volume and pressure
c. Critical temperature and volume
d. Critical density and temperature

40. The Boyle temperature is a characteristic temperature for
a. Real gases
b. Ideal gases
c. Gases with high compressibility factors
d. Gases at low pressures

42. The law of corresponding states suggests that at the same reduced conditions, gases exhibit:
a. Similar behavior
b. Different behavior
c. Ideal behavior
d. No behavior

43. The primary factor responsible for deviations from ideal

gas behavior is

a. Molecular weight	b. Molecular size
c. Molecular speed	d. Molecular composition

44. Which equation accounts for both attractive and repulsive forces between gas molecules?

a. Vander Waals equation	b. Ideal gas equation
c. Virial equation	d. Boyle's law

45. The compressibility factor (Z) for an ideal gas is independent of

a. Temperature	b. Pressure
c. Volume	d. All of the above

46. The second virial coefficient in the Virial equation accounts for

a. Attractive forces
b. Repulsive forces
c. Both attractive and repulsive forces
d. No forces

47. Boyle's temperature is the temperature at which a gas behaves ideally at

a. Low pressure	b. High pressure
c. Low temperature	d. High temperature

48. The law of corresponding states is based on the idea that gases at the same reduced conditionshave the same

a. Molecular weight	b. Temperature
c. Volume	d. Compressibility factor

49. The critical pressure is the pressure above which a gas cannot be liquefied, regardless of

a. Temperature	b. Volume
c. Molar mass	d. Boyle temperature

50. The Boyle temperature is unique for each gas and occurs at a temperature where

a. The gas is at its melting point
b. The gas behaves ideally
c. The gas undergoes a phase transition
d. The gas reaches its critical temperature

ANSWERS

1.c, 2.c, 3.a, 4.a, 5.a, 6.c, 7.d, 8.b, 9.b, 10.d, 11.a, 12.b, 13.a, 14.b, 15.c, 16.b, 17.a,18.b, 19.c, 20.c, 21.b, 22.a, 23.a, 24.a, 25.b, 26.a, 27.b, 28.a, 29.a, 30.a, 31.d, 32.a, 33.d, 34.a, 35.c, 36.a, 37.b, 38.b, 39.a, 40.a, 41.a, 42.a, 43.b, 44.a, 45.b, 46.c, 47.a, 48.d, 49.a, 50.b

5 MARKS

1 .Explain the postulates of the kinetic molecular model of gases. Derive the kinetic gas equation and discuss how it is related to the macroscopic properties of gases.

2. Discuss the Maxwell-Boltzmann distribution of speeds of gas molecules. Explain the significance of average, root mean square, and most probable velocities. How does this distribution help in understanding the behavior of gas molecules?

3. Elaborate on the law of equipartition of energy. Discuss the concept of degrees of freedom and its relationship with the molecular basis of heat capacities. How does this law contribute to our understanding of the thermal behavior of gases?

4. Explain the factors influencing collision frequency in a gas. Define collision diameter and mean free path. How are these parameters related to the molecular motion and interactions in a gas?

5. Discuss deviations from ideal gas behavior in real gases. Explain the compressibility factor (Z) and how it varies with pressure for different gases. Illustrate the limitations of the ideal gas equation and how real gas behavior is better described by equations of state.

6. Provide an in-depth analysis of the Vander Waals equation for real gases. Explain the physical significance of the correction terms and how they account for deviations from ideal behavior. Compare and contrast the Vander Waals equation with the ideal gas equation.

7. Explore the Virial equation as an alternative model for real gases. Discuss the significance of the second virial coefficient in understanding gas behavior. How does the Virial equation account for non-ideal behavior, and in what ways does it improve upon the ideal gas model?

8. Define Boyle temperature and explain its relevance in the liquefaction of gases. Discuss the law of corresponding states and how it helps in generalizing the behavior of different gases. Provide examples of numerical problems involving the core concepts of real gases, equations of state, and liquefaction.
9. Transitioning to the topic of liquids and solids, discuss the fundamental differences in the behavior of molecules in the gaseous, liquid, and solid states. Highlight the key properties that distinguish these states from each other.
10. Explain the concept of intermolecular forces and their role in determining the physical properties of liquids. Compare and contrast the types of intermolecular forces in liquids and discuss how they influence properties such as boiling point, viscosity, and surface tension.

10MARKS

1. Discuss the postulates of the kinetic molecular model of gases. Provide a step-by-step derivation from the kinetic gas equation based on these postulates. (2 marks)
2. Examine the Maxwell-Boltzmann distribution of speeds of gas molecules. Define and explain the significance of average, root mean square, and most probable velocities. How does the distribution contribute to our understanding of gas behavior? (3 marks)

3. Investigate the deviations from ideal gas behavior in real gases. Explain the concept of compressibility factor (Z) and its variation with pressure for different gases. Compare and contrast the ideal gas equation with the Vander Waals equation, highlighting the correction terms. (2 marks)

4. Elaborate on the Virial equation as an alternative model for real gases. Discuss the role of thesecond virial coefficient and its significance in describing non-ideal gas behavior. How does the Virial equation improve upon the limitations of the ideal gas model? (2 marks)

5. Examine the phenomenon of liquefaction of gases, emphasizing the Boyle temperature and the law of corresponding states. Provide numerical problems that involve core concepts such as compressibility factor and equations of state for real gases. (1 mark)

6. Transitioning to the study of liquids and solids, discuss the fundamental differences in thebehavior of molecules in the gaseous, liquid, and solid states. Highlight key properties that distinguish these states from each other. (3 marks)

7. Explain the concept of intermolecular forces and their role in determining the physical properties of liquids. Compare and contrast the types of intermolecular forces in liquids and discuss how they influence properties such as boiling point, viscosity, and surface tension. (2 marks)

UNIT II

1. What is the phenomenon that causes liquids to form droplets on surfaces?

a. Capillarity
b. Surface tension
c. Viscosity
d. Adhesion

2. Which property of liquids is responsible for their resistance to flow?

a. Surface tension
b. Viscosity
c. Capillarity
d. Evaporation

3. What is the SI unit of viscosity?

a. N/m^2
b. kg/m^3
c. Ns/m^2
c. Pa·s

4. Which application involves the use of surface tension in a practical way?

a. Soap bubbles
b. Boiling point
c. Viscosity measurement
d. Capillary action

5. In the context of liquids, what does the term "capillarity" refer to?

a. The ability to evaporate
b. The rise or fall of liquids in narrow tubes

c. The resistance to flow

d. The ability to freeze

6. What is the key difference between crystalline and amorphous structures?

a. Crystalline structures have a repeating pattern, while amorphous structures do not.

b. Amorphous structures have a repeating pattern, while crystalline structures do not.

c. Crystalline structures are isotropic, while amorphous structures are anisotropic.

d. Amorphous structures are isotropic, while crystalline structures are anisotropic.

7. Which term describes the absence of a definite shape in amorphous solids?

a. Isotropy b. Anisotropy

c. Rigidity d. Isotacticity

8. What is the primary factor that determines the melting point of a crystalline substance?

a. Molecular weight b. Molecular geometry

c. Arrangement of particles d. Viscosity

9. What term is used to describe the phenomenon where two or more substances have the samecrystal structure but different chemical compositions?

a. Isotropy b. Isomorphism

c. Isotacticity d. Polymorphism

10. In polymorphism, what is the significance of having different crystal structures for the samesubstance?
a. It affects the melting point.
b. It influences the color.
c. It impacts solubility.
d. It leads to different physical properties.

11. What are symmetry elements in crystallography?
a. Elements with high atomic number
b. Elements with repeating patterns
c. Elements representing symmetry operations
d. Elements with isotropic properties

12. Which of the following is a symmetry element in crystals?
a. Plane b. Temperature
c. Pressure d. Volume

13. What are Miller indices used for in crystallography?
a. Describing the lattice structure
b. Identifying isotropic properties
c. Representing symmetry elements
d. Indexing crystallographic planes and directions

14. What is the term for the basic repeating unit in a crystal lattice?

a. Unit cell b. Symmetry element
c. Lattice point d. Miller index

15. How many Bravais lattices are there in three-dimensional space?
a. 5 b. 7
c. 9 d. 11

16. What is the key equation used in X-ray diffraction to determine crystal structure?
a. Avogadro's equation
b. Bragg's equation
c. Maxwell's equation
d. Schrödinger's equation

17. What is the coordination number in a simple cubic structure?
a. 4 b. 6
c. 8 d. 12

18. In which type of packing are spheres arranged in layers with each sphere directly above thesphere in the layer below?
a. Simple cubic packing
b. Body-centered cubic packing
c. Face-centered cubic packing
d. Hexagonal close packing

19. What is the coordination number of atoms in a face-

centered cubic (FCC) structure?

a. 4 b. 6

c. 8 d.12

20. In hexagonal close packing (HCP), what is the coordination number of atoms in the secondlayer?

a. 3 b. 6

c. 9 d. 12

21. Which of the following structures has the highest packing efficiency?**

a. Simple cubic

b. Body-centered cubic

c. Face-centered cubic

d. Hexagonal close packing

22. In the sodium chloride (NaCl) crystal structure, the coordination number of Na+ ions is

a. 4 b. 6

c. 8 d. 12

23. What is the coordination number of Cs+ ions in the CsCl crystal structure?

a. 4 b. 6

c. 8 d. 12

24. The coordination number of Zn2+ ions in the zinc sulfide

(ZnS) crystal structure is

a. 4 b. 6
c. 8 d. 12

25. In the rutile structure of TiO_2, the coordination number of Ti^{4+} ions is

a. 4 b. 6
c. 8 d. 12

26. Which structure has a higher coordination number: NaCl or CsCl?

a. NaCl
b. CsCl
c. Both have the same coordination number
d. It depends on temperature

27. What type of bonding is predominant in the structure of diamond?

a. Metallic b. Covalent
c. Ionic d. Van der Waals

28. The structure of graphite is composed of layers of

a. Tetrahedral units b. Octahedral units
c. Trigonal planar units d. Hexagonal rings

29. Which of the following statements is true regarding the electrical conductivity of diamond andgraphite?

a. Diamond is a good conductor, and graphite is an insulator.

b. Diamond is an insulator, and graphite is a good conductor.
c. Both diamond and graphite are insulators.

d. Both diamond and graphite are good conductors.

30. The layers in graphite are held together by:
a. Covalent bonds
b. Ionic bonds
c. Van der Waals forces
d. Metallic bonds

31. Which of the following has a higher density: diamond or graphite?
a. Diamond
b. Graphite
c. Both have the same density
d. It depends on temperature

32. What is a stoichiometric defect in a crystal?
a. A defect where the crystal has an incorrect stoichiometry
b. A defect involving the loss of stoichiometry
c. A defect where the crystal has the correct stoichiometry
d. A defect involving the gain of stoichiometry

33. Which of the following is an example of a nonstoichiometric defect?
a. Frenkel defect
b. Schottky defect
c. Both a and b
d. None of the above

34. In a Schottky defect, what is the nature of the vacancy created?

a. A cation vacancy
b. An anion vacancy
c. A cation-anion pair vacancy
d. It depends on the crystal structure

35. What type of defect is responsible for increasing electrical conductivity in semiconductors?

a. Frenkel defect	b. Schottky defect
c. Impurity defect	d. Interstitial defect

36. Which defect involves the movement of ions from their regular lattice sites to interstitial sites?

a. Frenkel defect	b. Schottky defect
c. Both a and b	d. None of the above

37. Which model of the atom incorporates both particle and wave-like properties of electrons?

a. Bohr Model	b. Wave Mechanical Model
c. Classical Model	d. Quantum Model

38. In classical mechanics, electrons are often treated as:

a. Particles with definite trajectories
b. Waves with continuous motion
c. Particles with fixed positions
d. Waves with quantized energy

39. According to the wave mechanical model, what is the probability density function used to describe the position of an electron in an atom?

a. Wavefunction
b. Quantum number
c. Electron configuration
d. Orbit

40. How does the concept of quantized energy levels in the Bohr model differ from the wave mechanical model?

a. Bohr model allows continuous energy levels, while wave mechanical model has quantized levels
b. Wave mechanical model allows continuous energy levels, while Bohr model has quantized levels
c. Both models have identical concepts of energy levels
d. Neither model considers energy levels

41. What term is used to describe the region around the nucleus where there is a high probability offinding an electron?

a. Orbit b. Shell
c. Orbital d. Path

42. The Bohr model describes electrons as moving in fixed paths called:

a. Orbitals b. Orbits

c. Shells d. Subshells

43. Which of the following is a major limitation of the Bohr model when compared to the wave mechanical model?

a. It cannot explain the stability of atoms
b. It cannot explain the emission spectrum of hydrogen
c. It does not consider quantized energy levels
d. It cannot describe the behavior of electrons in multi-electron atoms

44. How does an orbital differ from a Bohr orbit?

a. Bohr orbits have definite shapes, while orbitals do not
b. Orbitals describe the probability of finding an electron, while Bohr orbits depict definite paths
c. Orbitals have quantized energy levels, while Bohr orbits do not
d. Both represent the same concept

45. In the wave mechanical model, what does the principal quantum number (n) represent?

a. Size of the orbital
b. Shape of the orbital
c. Spin of the electron
d. Orientation of the orbital

46. Which of the following statements is true regarding the behavior of electrons in the wave mechanical model?

a. Electrons follow precise trajectories around the nucleus.
b. The exact position and momentum of an electron can be simultaneously known.
c. Electrons exhibit both particle and wave-like behavior.
d. Electrons occupy specific orbits without any uncertainty.

47. Which of the following is a fundamental postulate of quantum mechanics?

a. Deterministic nature of particles
b. Continuous trajectories of particles
c. Quantization of energy levels
d. Absolute predictability of particle properties

48. According to quantum mechanics, the state of a system is described by:

a. Classical variables only
b. Wavefunctions
c. Only observable quantities
d. Definite trajectories

49. The probability interpretation of wave functions suggests that the square of the wave functionamplitude gives the probability of finding:

a. Momentum of a particle
b. Spin of a particle

c. Particle at a specific position
d. Particle's mass

50. What is the mathematical representation of a wave function denoted by ψ?
a. Energy
b. Momentum
c. Wavefunction
d. Angular momentum

ANSWERS

1.b, 2.b, 3.d, 4.a, 5.b, 6.a, 7.b, 8.c, 9.b, 10.d, 11.c, 12.a, 13.d, 14.a, 15.b, 16.b, 17.c,18.b, 19.d, 20.b, 21.c, 22.b, 23.a, 24.c, 25.a, 26.a, 27.b, 28.d, 29.b, 30.c, 31.a, 32.c, 33.c, 34.c, 35.c, 36.a, 37.b, 38.a, 39.a, 40.b, 41.c, 42.b, 43.d, 44.b, 45.a, 46.c, 47.c, 48.b, 49.c, 50.c

UNIT III

1.According to the probability interpretation, what does it mean if the square of the wave functionamplitude is large at a particular position?

a. High probability of finding the particle at that position
b. Low probability of finding the particle at that position
c. The particle is in definite motion
d. The particle's velocity is known

2. The uncertainty principle, a key concept in quantum mechanics, is attributed to which physicist?

a. Max Planck
b. Werner Heisenberg
c. Louis de Broglie
d. Erwin Schrödinger

3. Which of the following statements is consistent with the probability interpretation of wavefunctions?

a. The wave function directly provides the precise position of a particle.
b. The square of the wave function amplitude represents the probability density of a particle.
c. Wave functions only describe the momentum of a particle.
d. Probability has no role in quantum mechanics.

4. Quantum mechanics postulates that certain physical properties are quantized. What does "quantized" mean in this context?

a. Continuous and unbounded

b. Discrete and specific values
c. Random and unpredictable
d. Inversely proportional

5. Which postulate of quantum mechanics asserts that certain pairs of properties, like position andmomentum, cannot be precisely known simultaneously?
a. Probability postulate b. Uncertainty principle
c. Wave-particle duality d. Superposition principle

6. What is the significance of the probability amplitude in quantum mechanics?
a. It represents the particle's velocity.
b. It provides information about the particle's charge.
c. It determines the particle's energy.
d. It contributes to the probability of finding the particle at a specific position.

7. What does the Schrödinger wave equation describe in quantum mechanics?
a. Particle's trajectory in space
b. Probability distribution of a particle's position
c. Momentum of a particle
d. Electron charge distribution

8. Which fundamental constant appears in the Schrödinger wave equation?
a. \(h\) (Planck's constant)

b. \(c\) (speed of light)
c. \(G\) (gravitational constant)
d. \(e\) (elementary charge)

9. The Schrödinger equation is a key tool for describing the behavior of:
a. Classical particles only
b. Electrons in quantum systems
c. Photons in electromagnetic fields
d. Subatomic particles in nuclear reactions

10. What does the term "probability density" refer to in the context of the Schrödinger equation?
a. The likelihood of an electron having a certain velocity
b. The likelihood of an electron being in a specific orbital
c. The probability of an electron's charge distribution
d. The probability of an electron's mass distribution

11. In the Schrödinger equation, what does the symbol Ψ represent?
a. Probability density
b. Electron charge
c. Velocity of the electron
d. Angular momentum

12. Which term is associated with the region where the probability density of finding an electron issignificant in an orbital?
a. Nodal plane
b. Orbital boundary

c. Electron cloud
d. Principal quantum number

13. The visualization of orbitals often involves representing areas where the probability density ishigher as:
a. Dark regions b. Light regions
c. Colored regions d. Transparent regions

14. What is the shape of an s orbital in three-dimensional space?
a. Spherical b. Prolate spheroid
c. Dumbbell-shaped d. Tetrahedral

15.In visualizing orbitals, the term "nodal plane" refers to:
a. The region of highest probability density
b. A plane where the probability of finding an electron is zero
c. The outer boundary of an orbital
d. The region where the electron has maximum energy

16. Which quantum number is primarily responsible for determining the shape of an orbital?
a. Principal quantum number (n)
b. Azimuthal quantum number (l)
c. Magnetic quantum number (m)
d. Spin quantum number (s)

ANSWERS

1.a, 2.b, 3.b, 4.b, 5.b, 6.d, 7.b, 8.a, 9.b, 10.b, 11.a, 12.c, 13.b, 14.a, 15.b, 16.b.

5 MARKS

1. Compare classical mechanics with the wave mechanical model of the atom. Highlight the key differences in their approaches to describing the behavior of electrons.
2. Discuss how the wave mechanical model overcame the limitations of classical mechanics inunderstanding atomic structure.
3. Differentiate between a Bohr orbit and an orbital. Discuss the limitations of Bohr's model and how the concept of orbitals in the wave mechanical model addresses these limitations.
4. Explain the postulates of quantum mechanics. Discuss how these postulates laid the foundation forthe development of modern quantum theory. Discuss the significance of the wave function (Ψ) and itssquare (Ψ^2).
5. Provide insights into the formulation of the Schrödinger wave equation and its role in describing the behavior of particles.
6. Discuss the concept of probability density in quantum mechanics. How are orbitals visualized based on probability density?
7. Explain the significance of Ψ and Ψ^2 in understanding

distribution of electrons in an atom.

8. Features of the periodic table; classification of elements - Periodic trends for atomic size- Atomicradii, Ionic,
9. Discuss the key features of the periodic table. Explain how elements are organized in the modernperiodic table and the significance of periods and groups.
10. Describe the classification of elements in the periodic table. Discuss the basis for the classificationand explain the significance of periods and groups in predicting the properties of elements.
11. Explain the concept of atomic size and atomic radii in the periodic table. Discuss the trends inatomic size across periods and down groups.
12. Describe the trends in ionic radii across the periodic table. Explain the factors influencing the sizeof cations and anions.
13. Discuss how the size of ions relates to their positions in the periodic table.
14. Define ionization energy and discuss the trends in ionization energy across periods and downgroups in the periodic table.

10 MARKS

1. Briefly explain the classical model of the atom and its limitations.
2. Discuss the key features that make the wave mechanical model a more accurate representation ofatomic behavior.
3. Discuss the differences between Bohr orbits and

orbitals in terms of their conceptualization and accuracy in describing electron behavior.

4. Explain how the probability interpretation challenges classical determinism and contributes to the understanding of electron behavior.
5. Discuss the concept of visualizing orbitals in terms of electron probability density. Explore how the Schrödinger equation contributes to the development of three-dimensional visualizations of orbitals.
6. Outline the key features of the periodic table, including periods, groups, and the arrangement of elements based on atomic number.
7. Explain the basis for the classification of elements into groups and periods on the periodic table.
8. Explain ionization energy and discuss the periodic trend for ionization energy across the periodic table.
9. Introduce electronegativity scales (e.g., Pauling scale) and their significance. Discuss practical applications of electronegativity in understanding chemical bonding and predicting molecular properties.
10. Present a set of problems involving the core concepts of the periodic table, including atomic size, ionization energy, electron affinity, and electronegativity. Require students to solve these problems, applying their knowledge of periodic trends and electronic structure

UNIT –IV

1. Which group do elements like nitrogen, phosphorus, arsenic, antimony, and bismuth belong to?

a. Group 14
b. Group 15
c. Group 16
d. Group 17

2. What is the chemical formula for hydrazine?

a. H_2O_2
b. $H_2N\text{-}NH_2$
c. HNO_3
d. H_2SO_4

3. Which of the following compounds is NOT a hydrazine derivative?

a. Hydrazine hydrate ($H_2N\text{-}NH_2$)
b. Hydroxylamine (NH_2OH)
c. Phosphine (PH_3)
d. Phosphorous pentachloride (PCl_5)

4. What is the structure of phosphorous pentachloride (PCl_5)?

a. Trigonal planar
b. Tetrahedral
c. Octahedral
d. Square pyramidal

5. Which of the following is an oxyacid of phosphorous?

a. H_2SO_4
b. H_3PO_3
c. HNO_3
d. $HClO_4$

6. What is the common oxidation state of phosphorus in H3PO4 (phosphoric acid)?

a. +1	b. +3
c. +5	c. +7

7. Elements of Group 16 are commonly known as:

a. Halogens	b. Alkali metals
c. Chalcogens	d. Noble gases

8. Which of the following allotropes of sulfur has a puckered ring structure?**

a. Rhombic sulfur	b. Monoclinic sulfur
c. Amorphous sulfur	d. Cyclo-sulfur (cyclo-S8)

9. Ozone (O3) is a triatomic molecule. What is its molecular shape?

a. Linear	b. Bent (V-shaped)
c. Trigonal planar	d. Tetrahedral

10. Caro's acid (H2SO5) is an example of which type of oxyacid of sulfur?

a. Sulfurous acid	b. Perchloric acid
c. Persulfuric acid	d. Peracetic acid

11. Which of the following halogens has the highest electronegativity?

a. Fluorine	b. Chlorine
c. Bromine	d. Iodine

12. What is a peculiar property of fluorine compared to other halogens?

a. Low electron affinity	b. Low reactivity
c. Small atomic size	d. High electronegativity

13. Halogen acids include HF, HCl, HBr, and HI. Which one is the strongest acid among them?

a. HF	b. HCl
c. HBr	d. HI

14. What is the common oxidation state of halogens in their compounds?

a. +1
b. -1
c. 0
d. Varies depending on the halogen

15. Which of the following halogens exhibits positive oxidation states in its compounds?

a. Fluorine	b. Chlorine
c. Bromine	d. Iodine

16. The oxyacid HClO4 is known as:

a. Chlorous acid	b. Perchloric acid
b. Hypochlorous acid	d. Chloric acid

17. What is the shape of the inter-halogen compound ICl

(iodine monochloride)?

a. Linear b. Trigonal planar

c. T-shaped d. Square pyramidal

18. ClF3 is an example of an inter-halogen compound. What is its molecular geometry?

a. Linear b. Trigonal planar

c. T-shaped d. Tetrahedral

19. BrF5 is an inter-halogen compound. What is its hybridization state of the central atom?

a. Sp b. sp2

c. sp3 d. sp3d2

20. Which of the following inter-halogen compounds is known for having seven fluorine atomsbonded to one iodine atom?

a. ICl b. ClF3

c. BrF5 d. IF7

21. Where are noble gases located in the periodic table?

a. Group 1 b. Group 14

c. Group 18 d. Group 17

22. Which noble gas is commonly used in the study of organometallic compounds?

a. Helium b. Neon

c. Argon	d. Xenon

23. What is the general electronic configuration of noble gases?
a. ns^2np^4	b. ns^2np^5
c. ns^2np^6	d. ns^2np^3

24. Which noble gas is known for forming compounds with high electronegative elements?
a. Helium	b. Neon
c. Argon	d. Xenon

25. What is the structure of $XeF2$ (xenon difluoride)?
a. Linear	b. Trigonal planar
c. T-shaped	d. Square plana

26. $XeF4$ (xenon tetrafluoride) has a molecular shape of:
a. Linear	b. Square planar
c. Square pyramidal	d. Octahedral

27. What is the hybridization state of xenon in $XeOF4$?
a. Sp	b. sp2
c. sp3	d. sp3d2

28. What is the common oxidation state of xenon in its compounds?
a. +2	b. +4

c. +6
d. +8

29. Which noble gas compound is known for its square pyramidal geometry?

a. XeF2
b. XeF4
c. XeOF4
d. XeF6

30. In XeF2, how many lone pairs of electrons are present around the xenon atom?

a. 0
b. 1
c.2
d. 3

ANSWERS

1.b, 2.b, 3.c, 4.d, 5.b, 6.c, 7.c, 8.d, 9.b, 10.c, 11.a, 12.d, 13.a, 14.b, 15.d, 16.b, 17.c,18.d, 19.d, 20.d, 21.c, 22.d, 23.c, 24.d, 25.c, 26.b, 27.d, 28.c, 29.d, 30.c.

5-MARKS

1. Discuss the general characteristics of Group 15 elements, highlighting key trends in electron affinity, oxidation states, and oxidizing power. Provide examples to support your explanation.

2.Explore the chemistry of hydrazine (H2N-NH2) and hydroxylamine (NH2OH), discussing their preparation methods, properties, and significant applications.

3. Examine the chemistry of phosphorus compounds,

focusing on the preparation, properties, and reactions of PH_3, PCl_3, and PCl_5. Highlight any peculiarities observed in their behavior.

4. Compare the oxy acids of phosphorus, H_3PO_3 and H_3PO_4, detailing their structures, preparation methods, and applications.
5. Investigate the general properties of Group 16 elements, emphasizing the structure and allotropy of sulfur and selenium. Provide examples of allotropes and their significance.
6. Analyze the chemistry of ozone (O_3), discussing its structure, properties, and role in the atmosphere. Explain its classification and the importance of the ozone layer.
7. Classify and explain the properties of oxides of sulfur and selenium, emphasizing their roles in environmental processes.
8. Discuss the structure, general characteristics, and applications of halogens, focusing on electronegativity, electron affinity, oxidation states, and oxidizing power.
9. Explore the peculiarities of fluorine compared to other halogens, addressing its unique characteristics and reactivity.
10. Examine the chemistry of inter-halogen compounds (ICl, ClF_3, BrF_5, and IF_7), providing insights into their structures, preparation, and notable properties.

10 MARKS

1. Explain the general characteristics of Group 15 elements, discussing trends in atomic size,

electronegativity, and ionization energy. Provide examples and applications of these elements inchemical processes.

2. Investigate the chemistry of hydrazine (H_2N-NH_2) and hydroxylamine (NH_2OH), elaborating on their preparation methods, chemical properties, and industrial applications. Compare and contrast their reactivity.
3. Analyze the chemistry of phosphorus, with a focus on phosphine (PH_3), phosphorus trichloride (PCl_3), and phosphorus pentachloride (PCl_5).
4. Compare and contrast the oxy acids of phosphorus, H_3PO_3 and H_3PO_4, discussing their structures, preparation, and roles in various chemical processes. Explore the significance of these acids in industrial applications.
5. Examine the general properties of Group 16 elements, elucidating on the structure and allotropy of sulfur and selenium. Discuss the role of these elements in different oxidation states and their impact on the environment.
6. Investigate the chemistry of ozone (O_3), focusing on its structure, properties, and functions in the Earth's atmosphere. Discuss the classification of ozone and its importance in environmental chemistry.
7. Classify and elaborate on the properties of oxides of sulfur and selenium, discussing their roles in chemical processes and environmental impact. Compare and contrast their behavior in various conditions.
8. Explore the general characteristics of halogens, emphasizing electronegativity, electron affinity, oxidation states, and oxidizing power. Discuss the peculiarities of

fluorine and its significance in chemical reactions.

9. Analyze the properties of halogen acids (HF, HCl, HBr, and HI), oxides, and oxy acids (HClO4). Discuss their preparation methods, chemical properties, and applications in different industries.

10. Examine the chemistry of inter-halogen compounds (ICl, ClF3, BrF5, and IF7), providing detailed insights into their structures, preparation methods, and chemical reactivity.

UNIT-V

1. What is the source of benzene in the petrochemical industry?

a. Coal tar
b. Natural gas
c. Petroleum
d. Wood tar

2. What is the molecular formula of benzene?

a. C4H8
b. C5H10
c. C6H6
d.7H14

3. The stability of the benzene ring is due to:

a. High reactivity
b. Aromaticity
c. Low boiling point
d. Non-planarity

4. According to Huckel's (4n+2) rule, how many π electrons does a compound need to be aromatic?

a. 2
b. 4
c. 6
d. 8

5. What is the molecular orbital picture of benzene?

A) It has three σ bonds and three π bonds.
B) It has six σ bonds and no π bonds.
C) It has six σ bonds and six π bonds.

d. It has three σ bonds and six π bonds.

6. Which of the following electrophilic substitution reactions involves the introduction of a nitrogroup into the benzene ring?

a. Halogenation	b. Sulphonation
c. Nitration	d. Friedel-Craft's acylation

7. In the general mechanism of aromatic electrophilic substitution, what role does the catalyst play?

a. It stabilizes the electrophile
b. It generates the electrophile
c. It stabilizes the benzene ring
d. It acts as a reducing agent

8. What electrophilic substitution reaction involves the introduction of an alkyl group into thebenzene ring?

a. Nitration	b. Halogenation
c. Friedel-Craft's alkylation	d. Friedel-Craft's acylation

9. Which of the following reactions introduces an acyl group into the benzene ring?

a. Nitration	b. Halogenation
c. Friedel-Craft's alkylation	d. Friedel-Craft's acylation

10. What is the role of a Lewis acid in Friedel-Craft's alkylation and acylation reactions?

a. It acts as an electrophile
b. It generates a nucleophile
c. It stabilizes the benzene ring
d. It increases the reaction rate

11. What is the correct nomenclature for the following polynuclear aromatic hydrocarbon?
a. Naphthalene   b. Anthracene
c. Biphenyl   d. Phenanthren

12. How is naphthalene synthesized through the Haworth synthesis?
a. By Diels-Alder reaction
b. By Elbs reaction
c. By Diels-Alder and Haworth synthesis
d. By the cyclization of a diene and a dienophile

13. Which of the following reactions is NOT a typical electrophilic substitution reaction of naphthalene?
a. Nitration   b. Sulphonation
c. Halogenation   d.Friedel-Crafts alkylation

14. Anthracene is synthesized through the Elbs reaction, Diels-Alder reaction, and Haworth synthesis.What is the primary purpose of the Diels-Alder reaction in anthracene synthesis?**
a. Introduction of substituents at C-9 and C-10

b. Formation of a double bond between C-9 and C-10
c. Preferential substitution at C-9 and C-10
d. Formation of a triple bond

15. What is the correct order of reactivity of naphthalene towards electrophilic substitution reactions (from most reactive to least reactive)?
a. Nitration > Sulphonation > Halogenation
b. Halogenation > Nitration > Sulphonation
c. Sulphonation > Nitration > Halogenation
d.Halogenation > Sulphonation > Nitration

16. In the Haworth synthesis of naphthalene, what type of reaction is involved?
a. Nucleophilic substitution
b. Electrophilic substitution
c. Cyclization
d. Rearrangement

17. What is the preferential substitution pattern observed in the reactions of anthracene?
a. C-1 and C-2
b. C-4 and C-5
c. C-9 and C-10
d. C-2 and C-3

18. Besides its use in chemical synthesis, what is another notable application of anthracene?
a. Fuel additive
b. Antiseptic

c. Fluorescent dye d. Lubricant

19. What is the correct IUPAC nomenclature for the following compound?

a. Naphthalene b. Anthracene

c. Biphenyl d. Phenanthrene

20. How is naphthalene synthesized through the Haworth synthesis?

a. By Diels-Alder reaction

b. By Elbs reaction

c. By Diels-Alder and Haworth synthesis

d. By the cyclization of a diene and a dienophile

21. Which of the following is NOT a typical electrophilic substitution reaction of naphthalene?

a. Nitration b. Sulphonation

c. Halogenation d. Friedel-Crafts alkylation

22. Anthracene is synthesized through the Elbs reaction, Diels-Alder reaction, and Haworth synthesis.What is the primary purpose of the Diels-Alder reaction in anthracene synthesis?

a. Introduction of substituents at C-9 and C-10

b. Formation of a double bond between C-9 and C-10

c. Preferential substitution at C-9 and C-10

d. Formation of a triple bond

23. What is the correct order of reactivity of naphthalene towards electrophilic substitution reactions(from most reactive to least reactive)?

a. Nitration > Sulphonation > Halogenation
b. Halogenation > Nitration > Sulphonation

c. Sulphonation > Nitration > Halogenation
d. Halogenation > Sulphonation > Nitration

24. In the Haworth synthesis of naphthalene, what type of reaction is involved?

a. Nucleophilic substitution
b. Electrophilic substitution
c. Cyclization
d. Rearrangement

25. What is the preferential substitution pattern observed in the reactions of anthracene?

a. C-1 and C-2 b. C-4 and C-5
c. C-9 and C-10 d. C-2 and C-3

26. Besides its use in chemical synthesis, what is another notable application of anthracene?

a. Fuel additive b. Antiseptic
c. Fluorescent dye d. Lubricant

27. What reaction is involved in the preferential substitution at C-9 and C-10 in anthracene?

a. Electrophilic substitution
b. Nucleophilic substitution
c. Radical substitution
d. Addition reaction

28. What is one significant use of polynuclear aromatic hydrocarbons like anthracene?

a. Food preservative	b. Antacid
c. Antiseptic	d. Fluorescent materials

ANSWERS

1.c, 2.c, 3.b, 4.c, 5.c, 6.c, 7.b, 8.c, 9.d, 10.a, 11.a, 12.c, 13.d, 14.b, 15.b, 16.c, 17.c,18.c, 19.a, 20.c, 21.d, 22.b, 23.b, 24.c, 25.c, 26.c, 27.a, 28.d.

5-MARKS

1. Discuss the sources of benzene in the industrial context and elaborate on its molecular structure.How does the stability of the benzene ring differ from that of aliphatic compounds?
2. Explain the molecular orbital picture of benzene, emphasizing the concept of aromaticity and howit aligns with Huckel's (4n+2) rule. Provide examples to illustrate the application of Huckel's rule in aromatic compounds.

3. Explore the general mechanism of electrophilic substitution reactions in aromatic compounds. Discuss the

key steps involved and how this mechanism is applicable to reactions such as nitration,sulphonation, halogenation, Friedel-Craft's alkylation, and acylation.
4. Provide a detailed account of the nomenclature and Haworth synthesis of naphthalene. Discuss itsphysical properties and reactions, focusing on electrophilic substitution reactions such as nitration, sulphonation, halogenation, Friedel-Craft's acylation, and alkylation.
5. Investigate the synthesis of anthracene through the Elbs reaction, Diels-Alder reaction, and Haworth synthesis. Highlight the physical properties of anthracene and delve into its reactions,emphasizing the Diels-Alder reaction and the preferential substitution at C-9 and C-10.
6. Discuss the preferential substitution at C-9 and C-10 in anthracene, elucidating the factors thatinfluence this pattern. Additionally, explore the industrial and practical uses of anthracene.
7. Compare and contrast the electrophilic substitution reactions of benzene, naphthalene, and anthracene. Highlight any similarities or differences in their reactivity and the types of productsformed.
8. Explain the Haworth synthesis of naphthalene, providing a step-by-step mechanism. Discuss the conditions under which this synthesis is favorable and any limitations associated with the process.

9. Evaluate the role of Friedel-Craft's acylation and alkylation in the synthesis of polynuclear aromatic

hydrocarbons. Discuss the selectivity and regiochemistry observed in these reactions.

10. Illustrate the applications of Huckel's (4n+2) rule in predicting the aromaticity of various compounds, including benzene and other polynuclear aromatic hydrocarbons.

UNIT I

1 MARKS

1. What is the primary focus of the thermodynamic derivation of equilibrium constants Kp and Kc?
a. Heat transfer in reactions
b. Kinetic parameters
c. Reaction spontaneity
d. Equilibrium concentrations

2. Which of the following represents the relationship between Kp and Kc for a given reaction?
a. $K_p = K_c$
b. $K_p = K_cRT$
c. $K_p = K_c(1 - \Delta n)$
d. $K_p = K_c + \Delta nRT$

3. What does the standard free energy change (ΔG°) represent in the context ofchemical reactions?
a. Activation energy
b. Gibbs free energy at standard conditions
c. Enthalpy change at standard conditions
d. Rate constant

4. Which of the following is the correct
derivation of the van’t Hoff reaction isotherm?
a. \(\frac{{d(\ln K)}}{{dT}} = \frac{{\Delta

H}}{{RT^2}} \)
b. \(\frac{{d(\ln K)}}{{dT}} = \frac{{\Delta H}}{{RT}} \)
c. \(\frac{{d(\ln K)}}{{dT}} = \frac{{\Delta S}}{{R}} \)
d. \(\frac{{d(\ln K)}}{{dT}} = \frac{{\Delta G}}{{RT^2}} \)

5. DeDonder’s treatment of chemical equilibria is primarily associated with:
a. Thermodynamics
b. Quantum mechanics
c. Kinetics
d. Statistical mechanics

6. What is the concept of chemical affinity related to in the context of chemical equilibria?
a. Activation energy
b. Reaction spontaneity
c. Reaction rate
d. Equilibrium constant

7. Which of the following is true regarding the temperature dependence of the equilibrium constant(K)?
a. K increases with temperature for endothermic reactions
b. K is independent of temperature
c. K decreases with temperature for exothermic reactions
d. K is not affected by temperature changes

8. The relation between Gibbs free energy change (\(\Delta G \)) and equilibrium constant (K) isgiven by:

a. \(\Delta G = -RT\ln K \)
b. \(\Delta G = RT\ln K \)
c. \(\Delta G = -RT/K \)
d. \(\Delta G = RT/K \)

9. What is the significance of \(\Delta n\) in the context of equilibrium constants?
a. Change in enthalpy
b. Change in entropy
c. Change in the number of moles of gas
d. Change in Gibbs free energy

10. According to the van’t Hoff reaction isotherm, how does the equilibrium constant (K) changewith temperature?
a. K is constant with temperature
b. K increases with temperature for exothermic reactions
c. K decreases with temperature for endothermic reactions
d. K is inversely proportional to temperature

11. What is the van’t Hoff isochore primarily concerned with?
a. Temperature changes
b. Pressure changes
c. Volume changes
d. Concentration changes

12. The pressure dependence of the equilibrium constant is described by which equation?
a. Boyle's Law
b. Charles's Law
c. van’t Hoff equation
d. Le Chatelier's principle

13. Adsorption can be categorized into which two main types?
a. Physical and chemical adsorption
b. Exothermic and endothermic adsorption
c. Fast and slow adsorption
d. Reversible and irreversible adsorption

14. Which of the following is NOT a type of adsorption isotherm?
a. Freundlich adsorption isotherm
b. Langmuir adsorption isotherm
c. Boyle's adsorption isotherm
d. BET adsorption isotherm

15. The Freundlich adsorption isotherm is expressed as:
a. $P = aV$ b. $\theta = KP^n$
c. $P = K\theta^n$ d. $V = KT$

16. What does the Langmuir adsorption isotherm describe?
a. Multilayer adsorption b. Monolayer adsorption
c. Reversible adsorption d. Irreversible adsorption

17. The BET isotherm is primarily associated with:
a. Physical adsorption b. Multilayer adsorption
c. Chemical adsorption d. Monolayer adsorption

18. Which of the following is an assumption or postulate of the BET isotherm?
a. Adsorption occurs on a single layer

b. Adsorption is irreversible
c. Adsorption is independent of temperature
d. Adsorption is independent of pressure

19. The BET equation is used to describe the adsorption of:
a. Gases on solids b. Liquids on solids
c. Gases on liquids d. Liquids on liquids

20. In the BET equation, what does the term \(C\) represent?
a. Monolayer capacity b. Pressure
c. Temperature d. Surface area

ANSWERS

1.d, 2.c, 3.b, 4.a, 5.a, 6.b, 7.a, 8.a, 9.c, 10.b, 11.c, 12.c, 13.a, 14.c, 15.c, 16.b, 17.b,18.a, 19.a, 20.a.

5 MARKS

1. Explain the thermodynamic derivation of equilibrium constants, Kp, and Kc. Highlight the key steps and concepts involved in obtaining these expressions.
2. Elaborate on the relations between Kp and Kc for a given chemical reaction. Provide examples to illustrate how these constants are interrelated and the conditions under which they may be equal or differ significantly.
3. Discuss the significance of the standard free energy change (\(\Delta G^\circ \)) in the context of chemical reactions. Include the conditions under which a reaction is spontaneous or non-spontaneousbased on \(\Delta G^\circ\).

4. Provide a detailed derivation of the van't Hoff reaction isotherm. Highlight the key assumptions and mathematical expressions involved in understanding the temperature dependence of the equilibrium constant.
5. Explain DeDonder’s treatment of chemical equilibria. Discuss the key principles and insights that DeDonder introduced to enhance our understanding of chemical equilibrium from a thermodynamicperspective.
6. Define and explain the concept of chemical affinity. While avoiding mathematical derivations, discuss how chemical affinity is related to the spontaneity of reactions and their tendency to reachequilibrium.
7. Explore the temperature dependence of equilibrium constants. Discuss how changes in temperature impact the position of equilibrium and the magnitude of equilibrium constants, providing examples tosupport your explanation.
8. Describe the van’t Hoff isochore and its significance in thermodynamics. Highlight any practical applications or implications of considering isochoric processes in the study of chemical systems.
9. Elaborate on the pressure dependence of equilibrium constants. Discuss the van’t Hoff equation and how it relates changes in pressure to alterations in the equilibrium constant. Provide examples toillustrate this relationship.
10. Provide an in-depth discussion on adsorption, covering physical and chemical adsorption. Explain the types of adsorption isotherms, focusing on the Freundlich adsorption isotherm. Include the conditions under which it is applicable and its significance in understanding adsorption phenomena.

10MARKS

1. In detail, derive the expressions for equilibrium constants, Kp, and Kc, from a thermodynamic perspective. Explain the significance of each term in these expressions and how they relate to the state of chemical equilibrium.
2. Explore and discuss the various relations between Kp and Kc. Provide a comprehensive analysis of the factors that influence the relationship between these equilibrium constants
3. Investigate the concept of standard free energy change (\(\Delta G^\circ \)) and its role in determining the spontaneity of chemical reactions.
4. Perform a detailed derivation of the van't Hoff reaction isotherm. Include the fundamental assumptions, mathematical steps, and the physical interpretation of the resulting equation.
5. Provide an extensive overview of DeDonder's treatment of chemical equilibria. Explore the key principles, methodologies, and any novel insights that DeDonder introduced to enhance the understanding of chemical equilibrium within the framework of thermodynamics
6. Define and elaborate on the concept of chemical affinity. Discuss how chemical affinity is related to thermodynamic functions and how it influences the progress of reactions

towards equilibrium. Provide illustrative examples to support your discussion.

7. Analyze the temperature dependence of equilibrium constants. Explore the theoretical basis for this dependence and discuss how changes in temperature affect the position of equilibrium.
8. Examine the van’t Hoff isochore in detail. Discuss its significance in thermodynamics, focusing on how it differs from other thermodynamic processes.
9. Investigate the pressure dependence of equilibrium constants, with a particular focus on the van’t Hoff equation.
10. Provide a comprehensive discussion on adsorption, covering both physical and chemical adsorption. Explore the different types of adsorption isotherms, with a detailed focus on the Freundlich adsorption isotherm.
11. Explain the derivation of the rate constant for a second-order reaction when the reactants are taken at different initial concentrations.
12. Discuss the derivation of the rate constant for a second-order reaction when the reactants are taken at the same initial concentrations. Highlight the similarities and differences compared to the case with different initial concentrations.
13. Outline the experimental methods used for determining the rate constant of a second-order reaction. Highlight the procedures involved and how these may vary when the initial concentrations of reactants are different versus the

same.

14. Provide a detailed derivation of the rate constant for a third-order reaction when the reactants aretaken at the same initial concentrations. Discuss the mathematical steps involved and the resulting expression for the rate constant.

15. Explore the derivation of half-life periods for second and third-order reactions when the initial concentrations of reactants are equal. Discuss the expressions for the half-life periods and the insightsgained from these derivations.

16. Explain the experimental methods used to determine the order of a reaction in kinetics. Discuss the principles and applications of volumetry, manometry, polarimetry, and colorimetry in identifyingand verifying reaction orders.

17. Discuss the impact of temperature on reaction rates. Explain the theoretical foundations and experimental observations regarding how temperature influences the kinetics of chemical reactions.

18. Provide a step-by-step derivation of the Arrhenius equation. Discuss the key assumptions and mathematical expressions involved in expressing the temperature dependence of reaction rates.

19. Define the concept of activation energy within the context of the Arrhenius equation. Discuss thesignificance of activation energy in understanding the energy barriers that reactions must overcome.

20. Explain the experimental methods used to determine the Arrhenius frequency factor and energyof activation. Discuss the techniques, measurements, and analyses involved in obtaining these parameters and their importance in

characterizing reaction kinetics.

5 marks:

1. Explain the postulates of the kinetic molecular model of gases. How do these postulates lead to the derivation of the kinetic gas equation?
2. Discuss the Maxwell-Boltzmann distribution of the speed of molecules. Explain the concepts of average, root mean square, and most probable velocity. How are these velocities related to the temperature of the gas?
3. Elaborate on the average kinetic energy of gas molecules. How is it related to temperature, and what insights does it provide into the behavior of gas particles?
4. Describe the law of equipartition of energy. Explain the concept of degrees of freedom and how they relate to the molecular basis of heat capacities in gases.
5. What is collision frequency, collision diameter, and mean free path in the context of the kinetic molecular model? How do these parameters influence the behavior of gas molecules?
6. Investigate the deviations from ideal gas behavior. Define and discuss the compressibility factor (Z). How does Z vary with pressure for different gases, and what insights can be gained from such variations?
7. Compare and contrast the equations of state for real gases, including Vander Waal's equation and the Virial equation. Explain the significance of Boyle temperature in

these equations.

8. How does the law of corresponding states relate to real gases? Discuss the liquefaction of gases and the role of intermolecular forces in this process.

9. Solve numerical problems involving core concepts of real gases, such as using equations of state todetermine properties like pressure, volume, and temperature.

Certainly! Here are some potential 5-mark questions based on the given syllabus about Liquids, Crystalline and Amorphous solids, Symmetry elements, Crystallography, Atomic Solids, and Defectsin Solids:

10. Define surface tension and viscosity in liquids. Explain the molecular basis of surface tension andhow it manifests at the liquid-air interface.

11. Discuss the applications of surface tension in everyday life and industrial processes. Provide examples where surface tension plays a crucial role.

12. Elaborate on viscosity in liquids. How does viscosity depend on molecular structure, and what are its practical implications? Provide examples of applications where viscosity is a critical factor.

a. Describe how surface tension and viscosity are interrelated. How can these properties be manipulated for specific applications?

b. Discuss the significance of surface tension and viscosity in biological systems, if any.

a. Highlight the differences between crystalline and amorphous solids in terms of their geometry, isotropy, anisotropy, and melting points.

b. Explain the concepts of isomorphism and polymorphism in the context of crystalline solids. Provide examples of materials exhibiting these phenomena.

c. Discuss the importance of symmetry elements in crystallography. Define and explain plane, center, and axis symmetry elements. How are these elements used in the classification of crystal systems?

d. Describe Miller indices and their significance in crystallography. Explain how unit cells and space lattices contribute to the understanding of crystal structures.

e. Explain Bragg's equation and how it is employed in X-ray diffraction studies. What information can be obtained about crystal structures using X-ray diffraction?

a. Compare and contrast the packing in atomic solids, including simple cubic, body-centered cubic, face-centered cubic, and hexagonal close packing.

b. Determine the coordination number in typical crystal structures such as NaCl, CsCl, ZnS, and TiO2. Discuss the relationship between crystal structure and properties in the context of diamond andgraphite.

c. Solve numerical problems involving core concepts related to packing in atomic solids, coordinationnumbers, and crystal structures.

a. Differentiate between stoichiometric and nonstoichiometric defects in solids. Provide examples anddiscuss the impact of these defects on the properties of materials.

b. Explain how defects in solids can be intentionally introduced for specific purposes in materialscience and engineering.

a. Classify liquid crystals and explain their unique properties. Discuss the applications of liquidcrystals in technology and everyday products.

b. Highlight the role of liquid crystals in electronic displays and other emerging technologies.

UNIT II

1. What type of radiation is composed of helium nuclei?

a. α particles	b. β particles
c. γ rays	d. Neutrons

2. What is the charge of a β particle?

a. +1	b. 0
c. -1	d. +2

3. Which type of radiation has the highest penetrating power?

a. α particles	b. β particles
c. γ rays	d. Neutrons

4. What is the measure of the time it takes for half of a radioactive substance to decay?

a. Decay constant	b. Half-life period
c. Fajan-Soddy rule	d. Geiger-Nattal rule

5. According to the Fajan-Soddy group displacement law, what is displaced during radioactive decay?

a. Electrons	b. Protons
c. Neutrons	d. Other radioactive atoms

6. What is the rule that governs the number of α and β particles emitted during decay?

a. Fajan-Soddy rule	b. Geiger-Nattal rule
c. Isotopic rule	d. Decay constant rule

7. What term is used for atoms having the same number of protons but different neutrons?
a. Isotopes b. Isobars
c. Isotones d. Isodiaphers

8. Which of the following refers to atoms with the same mass number but different atomic numbers?
a. Isotopes b. Isobars
c. Isotones d. Isodiapheres

9. What are nuclei with the same number of neutrons but different numbers of protons called?
a. Isotopes b. Isobars
c. Isotones d. Isodiaphers

10. What term is used for nuclei having the same neutron excess?
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c. Isotones d. Isodiaphers

11. What is nuclear isomerism?
a. Radioactive decay
b. Different nuclear structures with the same mass number and atomic number
c. Isotopic variation
d. Nuclear fusion

12. What is a series of radioactive decays, starting from a parent isotope and ending at a stabledaughter isotope?

a. Decay constant
b. Radioactive decay series
c. Half-life series
d. Fission series

13. What are numbers that represent the number of protons or neutrons that form a complete shellwithin a nucleus?

a. Quantum numbers
b. Magic numbers
c. Atomic numbers
d. Isotopic numbers

14. What is the unit of radioactivity?

a. Coulomb
b. Curie
c. Rutherford
d. Roentgen

15. What is the unit used to express the number of disintegrations per second?

a. Curie
b. Rutherford
c. Roentgen
d. Becquerel

16. What is the unit of exposure to X-rays or gamma rays in air?

a. Coulomb
b. Curie
c. Rutherford
d. Roentgen

17. What is the ratio of neutrons to protons in a stable nucleus according to the nuclear stabilityconcept?

a. 1:1
b. 1:2
c. 1:3
d. Varies for different elements

18. What quantity represents the energy required to completely disassemble a nucleus into itsconstituent protons and neutrons?

a. Decay constant
b. Binding energy
c. Magic number
d. Half-life

19. What is the term for the difference in mass between the nucleus and its individual nucleons?

a. Mass excess
b. Mass defect
c. Mass gap
d. Mass imbalance

20. What is the fraction of the total nuclear mass that is converted into energy during nuclear reactions?

a. Mass excess
b. Mass defect
c. Packing fraction
d. Binding energy

21. What is the formula for calculating the binding energy (BE) of a nucleus?

a. BE = Mass defect × Speed of light
b. BE = Mass defect × Atomic number
c. BE = Mass defect × Half-life
d. BE = Mass defect × Nuclear radius

22. What is the formula for calculating the decay constant (λ) in radioactive decay?

a. λ = ln(2) / Half-life
b. λ = Half-life × ln(2)
c. λ = ln(2) × Decay constant
d. λ = Decay constant / ln(2)

23. Which of the following is a measure of the time required for half of a radioactive substance todecay?

a. Decay constant b. Half-life
c. Magic number d. Binding energy

24. What is the process of determining the age of rocks using the decay of radioactive isotopes?

a. Radiocarbon dating b. Radioactive dating
c. Isotope dating d. Nuclear dating

25. What is the primary source of energy in nuclear reactors?

a. Solar energy b. Nuclear fission
c. Geothermal energy d. Wind energy

26. In a nuclear reactor, the controlled splitting of a heavy nucleus is known as:

a. Nuclear fusion b. Nuclear decay
c. Nuclear fission d. Nuclear reaction

27. Which of the following is a product of nuclear fission reactions in a reactor?

a. Helium	b. Uranium
c. Xenon	d. Oxygen

28. Which is the first nuclear power plant in India?
a. Tarapur Atomic Power Station
b. Kakrapar Atomic Power Station
c. Rajasthan Atomic Power Station
d. Kalpakkam Nuclear Power Plant

28. Which type of reactor is the Tarapur Atomic Power Station?
a. Pressurized Heavy Water Reactor (PHWR)
b. Boiling Water Reactor (BWR)
c. Pressurized Water Reactor (PWR)
d. Fast Breeder Reactor (FBR)

29. The reactor at Kalpakkam Nuclear Power Plant is of which type?
a. Boiling Water Reactor (BWR)
b. Pressurized Water Reactor (PWR)
c. Fast Breeder Reactor (FBR)
d. Pressurized Heavy Water Reactor (PHWR)

30. What is the primary energy release mechanism in the sun?

a. Nuclear fission	b. Nuclear decay
c. Nuclear fusion	d. Chemical reaction

30. In a fusion reaction, two light nuclei combine to form a heavier nucleus. What is the energyreleased called?

a. Kinetic energy b. Potential energy
c. Binding energy d. Activation energy

31. Which type of radiation is most harmful to living tissues?

a. α particles b. β particles
c. γ rays d. Neutrons

32. What is the term for the process of radiation emission from an unstable nucleus?

a. Nuclear fusion b. Radioactive decay
c. Nuclear fission d. Nuclear transmutation

33. Which of the following is a measure of the ionizing potential of radiation?

a. Rad b. Rem
c. Roentgen d. Curie

34. What is the most common method of disposing of low-level radioactive waste?

a. Incineration b. Deep geological repositories
c. Surface storage d. Ocean dumping

35. High-level radioactive waste is typically stored in:

a. Shallow pits
b. Ocean trenches

c. Deep geological repositories
d. Open-air facilities

36. What is the purpose of a containment building in a nuclear power plant?
a. To store radioactive waste
b. To house the reactor core
c. To generate electricity
d. To control radiation emissions

37. What is the function of a moderator in a nuclear reactor?
a. To absorb neutrons
b. To slow down neutrons
c. To initiate fission reactions
d. To cool the reactor core

38. Which safety feature prevents the overheating of nuclear fuel in a reactor?
a. Control rods b. Coolant circulation
c. Moderator d. Reflector

39. Emergency cooling systems in nuclear reactors are designed to:
a. Increase reactor temperature
b. Maintain reactor pressure
c. Prevent a core meltdown
d. Accelerate fission reactions

40. What is the primary purpose of the containment system in

a nuclear power plant?

a. To produce electricity
b. To store nuclear fuel
c. To control radiation releases
d. To house the control room

41. What is the term for a sudden and uncontrollable increase in nuclear fission reactions?

a. Meltdown
b. Criticality
c. verheat
d. Explosion

42. Which organization is responsible for regulating nuclear safety in many countries, including theUnited States?

a. IAEA (International Atomic Energy Agency)
b. NRC (Nuclear Regulatory Commission)
c. WHO (World Health Organization)
d. UN (United Nations)

43. What term is used for atoms with the same number of protons but different neutrons?

a. Isotopes
b. Isobars
c. Isotones
d. Isodiaphers

44. What is the total number of protons and neutrons in an isotope?

a. Atomic number
b. Mass number

c. Isotopic number d. Nuclear charge

45. In isotopes, the number of___________remains the same.
a. Protons b. Electrons
c. Neutrons d. Both A and B

46. Which isotope is commonly used in medical imaging?
a. Uranium-235 b. Carbon-14
c. Iodine-131 d. Hydrogen-1

47. What isotope is commonly used in smoke detectors?
a. Americium-241 b. Cobalt-60
c. Radon-222 d. Strontium-90

48. Isotopes are often used in agriculture to:
a. Irradiate crops
b. Determine soil pH
c. Measure rainfall
d. Improve seed germination

49. What is the primary purpose of using isotopic tracers?
a. To increase the mass of substances
b. To track the movement of substances
c. To decrease the half-life of substances
d. To generate heat in chemical reactions

49. Which of the following isotopes is commonly used as a

tracer in medical diagnostics?

a. Uranium-235 b. Technetium-99m
c. Carbon-14 d. Potassium-40

50. Tracers are widely employed in environmental studies to:

a. Track pollutants
b. Generate heat
c. Promote plant growth
d. Measure atmospheric pressure

51. Radiocarbon dating is based on the decay of which isotope?

a. Uranium-235 b. Carbon-14
c. Potassium-40 d. Thorium-232

52. What is the half-life of Carbon-14?

a. 5,730 years b. 10,000 years
c. 50,000 years d. 100,000 years

53. In radiocarbon dating, the ratio of Carbon-14 to Carbon-12 in living organisms is assumed to be:

a. Equal
b. Greater in Carbon-14
c. Greater in Carbon-12
d. Constant

54. The age of rocks and fossils can be determined by

measuring the:

a. Uranium-235 content
b. Carbon-14 decay
c. Potassium-40 accumulation
d. Thorium-232 activity

55. If a sample originally containing 100 grams of Carbon-14 now contains 25 grams, how manyhalf-lives have passed?

a. 1
b. 2
c. 3
d. 4

56. Calculate the remaining amount of Carbon-14 in a sample that originally had 200 grams if twohalf-lives have passed.

a. 25 grams
b. 50 grams
c. 100 grams
d. 200 grams

57. If the half-life of Carbon-14 is 5,730 years, what is the approximate age of a fossil sample thatcontains 1/8th of the original Carbon-14?

a. 2,865 years
b. 11,460 years
c. 17,190 years
d. 22,920 years

58. What is the percentage of Carbon-14 remaining in a sample after three half-lives?

a. 12.5%
b. 25%

c. 50%   d. 75%

59. If a rock originally contained Uranium-235, how much of it would be left after four half-lives?
a. ¼   b. 1/8
c. 1/16   d. 1/32

60. What type of radiation is composed of helium nuclei?
a. α particles   b. β particles
c. γ rays   d. Neutrons

61. What is the charge of a β particle?
a. +1   b. 0
c. -1   d. +2

62. Which type of radiation has the highest penetrating power?
a. α particles   b. β particles
c. γ rays   d. Neutrons

63. What is the measure of the time it takes for half of a radioactive substance to decay?
a. Decay constant   b. Half-life period
c. Fajan-Soddy rule   d. Geiger-Nattal rule

64. According to the Fajan-Soddy group displacement law, what is displaced during radioactivedecay?
a. Electrons   b. Protons
c. Neutrons   d. Other radioactive atoms

65. What is the rule that governs the number of α and β particles emitted during decay?

a. Fajan-Soddy rule b. Geiger-Nattal rule
c. Isotopic rule d. Decay constant rule

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d. Roentgen

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b. Rutherford
c. Roentgen
d. Becquerel

75. What is the unit of exposure to X-rays or gamma rays in air?

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c. Rutherford	d. Roentgen

76. What is the ratio of neutrons to protons in a stable nucleus according to the nuclear stabilityconcept?

a. 1:1	b. 1:2
c. 1:3	d. Varies for different elements

77. What quantity represents the energy required to completely disassemble a nucleus into itsconstituent protons and neutrons?

a. Decay constant	b. Binding energy
c. Magic number	d. Half-life

78. What is the term for the difference in mass between the nucleus and its individual nucleons?

a. Mass excess	b. Mass defect
c. Mass gap	d. Mass imbalance

79. What is the fraction of the total nuclear mass that is converted into energy during nuclear reactions?

a. Mass excess	b. Mass defect
c. Packing fraction	d. Binding energy

80. What is the formula for calculating the binding energy (BE) of a nucleus?

a. BE = Mass defect × Speed of light
b. BE = Mass defect × Atomic number
c. BE = Mass defect × Half-life
d. BE = Mass defect × Nuclear radius

81. What is the formula for calculating the decay constant (λ) in radioactive decay?

a. $\lambda = \ln(2) / \text{Half-life}$
b. $\lambda = \text{Half-life} \times \ln(2)$
c. $\lambda = \ln(2) \times \text{Decay constant}$
d. $\lambda = \text{Decay constant} / \ln(2)$

82. Which of the following is a measure of the time required for half of a radioactive substance todecay?

a. Decay constant
b. Half-life
c. Magic number
d. Binding energy

83. What is the process of determining the age of rocks using the decay of radioactive isotopes?

a. Radiocarbon dating
b. Radioactive dating
c. Isotope dating
d. Nuclear dating

ANSWERS

1.a, 2.c, 3.c, 4.b, 5.a, 6.b, 7.a, 8.b, 9.c, 10.d, 11.b, 12.b, 13.b, 14.b, 15.d, 16.d, 17.a, 18.b, 19.b, 20.c, 21.a, 22.a, 23.b, 24.a, 25.b, 26.c, 27.c, 28.a, 29.d, 30.c, 31.c, 32.b, 33.b, 34.c, 35.c, 36.b, 37.b, 38.b, 39.c, 40.c, 41.b, 42.b, 43.a, 44.b, 45.a, 46.c, 47.a, 48.a, 49.b, 50.a, 51.b, 52.a, 53.d, 54.b, 55.b, 56.a, 57.c, 58.a, 59.d, 60.a, 61.c, 62.c, 63.b, 64.a, 65.b, 66.a, 67.b, 68.c, 69.c, 70.b, 71.b, 72.b, 73.b, 74.d, 75.d, 76.a, 77.b, 78.b, 79.c, 80.a, 81.1, 82.b, 83.a.

5 MARKS:

1. Explain the concept of natural radioactivity. Discuss the three types of radiation - α, β, and γ rays -highlighting their properties and behaviors during radioactive decay. (5 marks)
2. Describe the Fajan-Soddy group displacement law and its significance in understanding radioactive decay. How does it contribute to the identification of daughter products in a decay series? (5 marks)
3. Discuss the nuclear stability concept. Explain the role of the neutron-proton ratio, magic numbers, binding energy, and mass defect in determining the stability of a nucleus. Provide examples to illustrate these concepts. (5 marks)

2. Radioactive Decay Series and Isotopes:

1. Define and explain nuclear isomerism. How does it differ from other forms of nuclear structure? Provide examples to illustrate the concept. (5 marks)

2. Discuss the characteristics and significance of radioactive decay series. Provide a detailed explanation of the decay series of a common radioactive element. (5 marks)
3. Differentiate between isotopes, isobars, and isotones. Provide examples of each and explain their relevance in nuclear physics. (5 marks)

3. Units and Simple Calculations:

1. Define the units Curie, Rutherford, and Roentgen in the context of nuclear physics. Explain when and why each unit is used. (5 marks)
2. Perform a simple calculation involving the determination of the binding energy of a nucleus using the mass defect. Provide the necessary steps and formulae involved. (5 marks)
3. Explain the concept of packing fraction and its significance in nuclear physics. Perform a calculation involving the packing fraction of a nucleus. (5 marks)

4. Isotopes and Their Uses:

1. Discuss the uses of isotopes in various fields. Highlight the significance of isotopes as tracers in scientific research and medical applications. (5 marks)
2. Explain how radiocarbon dating is used to determine the age of rocks. Discuss the underlying

principles and the isotopes involved in this dating technique. (5 marks)

3. Provide examples of isotopes used in medical imaging and industrial applications. Explain the specific characteristics that make these isotopes suitable for their respective purposes. (5 marks)

5. Isotopes, Tracers, and Radiocarbon Dating:

1. Explain the concept of isotopes and their role as tracers in scientific applications. Provide examples of how isotopic tracers are used in different fields and industries. (5 marks)
2. Discuss the principles behind radiocarbon dating and how it is used to determine the age of rocks. Include the isotopes involved and the mathematical calculations used in this dating technique. (5 marks)
3. Work out a numerical problem related to radiocarbon dating. Use a hypothetical example to demonstrate the steps involved in calculating the age of a rock sample. (5 marks)

6.Nuclear Energy, Fission, Fusion, and Reactors:

4. Explain the principles of nuclear energy, with a focus on nuclear fission and fusion reactions. Discuss the major differences between these two processes and their potential applications. (5 marks)
5. Provide an overview of the major nuclear reactors in India. Discuss their types, features, and

contributions to the country's energy production. (5 marks)

6. Work out a numerical problem related to nuclear fission. Calculate the energy released in a fission reaction, considering a specific isotope and its properties. (5 marks)

a. Discuss the potential hazards associated with radiation exposure. Explain the factors that determine the level of risk and the health effects of ionizing radiation on living organisms. (5 marks)

b. Outline the methods for the disposal of radioactive waste. Discuss the challenges associated with the disposal process and the criteria for selecting appropriate disposal methods. (5 marks)

c. Explain the safety measures implemented in nuclear facilities to mitigate radiation risks. Discuss the role of containment systems, emergency cooling, and other safety features in preventing accidents. (5 marks)

10 MARKS:

1. Define and explain the concept of nuclear isomerism. Provide an example illustrating the occurrence of nuclear isomerism in a specific isotope. (2 marks)
2. Discuss the Fajan-Soddy group displacement law and its significance in the context of radioactive decay. How does it contribute to our understanding of nuclear transformations? (2 marks)

3. Explain the Geiger-Nattal rule in the context of radioactive decay. How is it applied in predicting the emission of α and β particles during decay? (2 marks)
4. Define and differentiate between isotopes, isobars, and isotones. Provide examples for each category, highlighting their nuclear characteristics. (2 marks)
5. Describe the principles of radioactive decay series. Provide an example of a well-known decay series and discuss the key features of each decay step. (2 marks)
6. Discuss the significance of magic numbers in nuclear physics. How do magic numbers contribute to the stability of atomic nuclei? (2 marks)
7. Explain the concept of nuclear stability, focusing on the neutron-proton ratio. Discuss the implications of different neutron-proton ratios on nuclear stability. (2 marks)
8. Define and discuss the terms binding energy, packing fraction, and mass defect in the context ofnuclear physics. How are these quantities interrelated? (2 marks)
9. Define and explain the units Curie, Rutherford, and Roentgen in the measurement of radioactivity and radiation exposure. Provide examples of situations where each unit is applicable. (2 marks)
10. Perform a simple calculation involving the determination of the half-life of a radioactive isotope. Explain the steps involved and the relevance of half-life in radioactive decay. (2 marks)

UNIT III

1. What is the common nomenclature for halogen derivatives in organic chemistry?

a. Halides
b. Haloalkanes
c. Halogens
d. Hydrohalides

2. In the IUPAC nomenclature, what is the priority for naming alkyl halides?

a. Alphabetical order of halogen
b. Alphabetical order of alkyl group
c. Priority based on atomic number
d. Priority based on molecular weight

3. Which physical property generally increases with the increase in the size of halogen in alkylhalides?

a. Boiling point
b. Melting point
c. Solubility
d. Density

4. Which of the following alkyl halides is expected to have the highest boiling point?

a. CH_3Cl
b. CH_3Br
c.CH_3I
d. CH_3F

5. What is the most common reaction type for alkyl halides?

a. Oxidation
b. Reduction
c. Nucleophilic substitution
d. Electrophilic addition

6. In nucleophilic substitution reactions, what does SN1 represent?
a. Substitution Nucleophilic Unimolecular
b. Substitution Nucleophilic Bimolecular
c. Substitution Nucleophilic Trimolecular
d. Substitution Nucleophilic Zero Order

7. Which nucleophilic substitution mechanism involves a concerted, one-step process?
a. SN1 b. SN2
c. SN3 d. SN0

8. In SN2 reactions, what is the stereochemistry of the product?
a. Retention of configuration
b. Inversion of configuration
c. Racemization
d. No change in configuration

9. Which factor significantly influences the rate of SN2 reactions?
a. Substrate concentration
b. Nucleophile concentration
c. Solvent polarity
d. Temperature

10. What is the order of the rate-determining step in SN1 reactions?

a. First order	b. Second order
c. Zero order	d. Third order

11. Which class of alkyl halides undergoes SN1 reactions more readily?

a. Methyl halides	b. Primary alkyl halides
c. Secondary alkyl halides	d. Tertiary alkyl halides

12. What is the major product in an SN1 reaction of a chiral secondary alkyl halide?

a. Racemic mixture
b. Enantiomerically pure product
c. Optically inactive product
d. Diastereomeric mixture

13. What is the driving force for nucleophilic substitution reactions?

a. Decrease in entropy
b. Increase in entropy
c. Formation of a stable intermediate
d. Formation of a strong acid

14. Which of the following is a common nucleophile in SN2 reactions?

a. OH^-	b. H^+

c. H_2O d. H_3O^+

15. What is the order of reactivity in SN2 reactions for the following alkyl halides: CH_3X, RCH_2X,R_2CHX, R_3CX?

a. $CH_3X > RCH_2X > R_2CHX > R_3CX$

b. $R_3CX > R_2CHX > RCH_2X > CH_3X$

c. $R_3CX > R_2CHX > CH_3X > RCH_2X$

d. $CH_3X > R_2CHX > RCH_2X > R_3CX$

16. Which of the following is an example of an SN1 reaction?

a. SN1: $CH_3Br + OH^- \rightarrow CH_3OH + Br^-$

b. SN2: $CH_3Br + OH^- \rightarrow CH_3OH + Br^-$

c. SN1: $CH_3Br + CN^- \rightarrow CH_3CN + Br^-$

d. SN2: $CH_3Br + CN^- \rightarrow CH_3CN + Br^-$

17. In an SN2 reaction, what is the order of attack of the nucleophile?

a. Front side

b. Back side

c. Random side

d. Both front and back simultaneously

18. Which type of nucleophilic substitution reaction is more likely to result in racemization of chiralcenters?

a. SN1 b. SN2

c. SN3 d. SN0

19. What is the common nomenclature for dihalogen derivatives?

a. Dihalides	b. Dihydrohalides
c. Dihalogens	d. Dichlorides

20. How are dihalogen derivatives classified based on the carbon atom to which halogens areattached?

a. Primary, Secondary, Tertiary
b. Geminal, Vicinal, Terminal
c. Aliphatic, Aromatic, Alicyclic
d. None of the above

21. What is a common method for the preparation of geminal dihalides?

a. Halogenation of alkanes
b. Halogenation of alkenes
c. Halogenation of alkynes
d. Halogenation of aromatics

22. Which physical property is typically affected by the introduction of halogens in dihalogenderivatives?

a. Boiling point	b. Melting point
c. Density	d. Color

23. What is a significant application of trihalogen derivatives in the pharmaceutical industry?

a. Flavor enhancers	b. Catalysts
c. Anesthetics	d. Antiseptics

24. Which class of dihalogen derivatives is commonly used as refrigerants?

a. Chlorofluorocarbons (CFCs) b. Bromocarbons

c. Iodocarbons d. Fluorocarbons

25. In the IUPAC nomenclature for aromatic halogen compounds, which position gets the lowestnumber for substitution?

a. Meta b. Para

c. Ortho d. Alpha

26. What is a common method for the preparation of aryl halides from benzene?

a. Friedel-Crafts alkylation

b. Friedel-Crafts acylation

c. Electrophilic aromatic substitution

d. Nucleophilic aromatic substitution

27.What is a notable property of aryl halides compared to alkyl halides?

a. Higher boiling points b. Lower reactivity

c. Greater solubility in water d. Less stability

28. Which halogen is commonly used in the preparation of aryl halides?

a. Fluorine b. Chlorine

c. Bromine d. Iodine

29. What is a significant use of aryl halides in organic synthesis?

a. Catalysts b. Reducing agents
c. Protecting groups d. Solvents

30. Which type of reaction is commonly involved in the preparation of aryl halides from aryl diazonium salts?

a. Nucleophilic substitution
b. Electrophilic substitution
c. Elimination
d. Addition

31. What is the key feature of the mechanism of nucleophilic aromatic substitution involving benzyne intermediate?

a. Concerted mechanism
b. Radical mechanism
c. Stepwise mechanism
d. Rearrangement mechanism

32. What is the role of benzyne intermediate in nucleophilic aromatic substitution reactions?

a. Nucleophile b. Leaving group
c. Reactive intermediate d. Electrophile

33.In nucleophilic aromatic substitution with benzyne intermediate, where does the nucleophileattack?

a. Ortho position b. Meta position

c. Para position d. Alpha position

34. What type of reaction is benzyne intermediate involved in?

a. SN1 b. SN2

c. E1 d. E2

35.Which reagent is commonly used to generate benzyne in a nucleophilic aromatic substitutionreaction?

a. Br2 b. NaOH

c. NaN3 d. AlCl3

36. In benzyne-mediated nucleophilic substitution, what is the consequence of attack at the orthoposition?

a. Formation of a new benzene ring

b. Rearrangement of the substituents

c. Formation of a double bond

d. Retention of the benzene ring

37. How are aryl alkyl halides named according to IUPAC nomenclature?

a. By listing alkyl group first

b. By listing aryl group first

c. Alphabetical order of halogen

d. Alphabetical order of alkyl group

38. What is the common name for benzyl chloride?

a. Chlorobenzene	b. Benzene chloride
c. Benzyl chloride	d. Chloromethylbenzene

39. How is benzyl chloride typically prepared?

a. Direct chlorination of benzene
b. Chlorination of toluene
c. Chlorination of benzyl alcohol
d. Reduction of benzene with hydrogen chloride

40. What is a significant property of benzyl chloride compared to simple alkyl halides?

a. Higher boiling point	b. Lower reactivity
c. Higher solubility in water	d. Greater stability

41. Which of the following is a common use of benzyl chloride?

a. Food flavoring	b. Pesticide
c. Perfume	d. Lubricant

42. What is the IUPAC nomenclature for alcohols?

a. Alkanols	b. Alkanes
c. Alcohols	d. Hydroxyalkanes

43.How are alcohols classified based on the number of hydroxyl groups present?

a. Monohydric, Dihydric, Trihydric

b. Primary, Secondary, Tertiary
c. Aliphatic, Aromatic, Alicyclic
d. Primary, Monomeric, Polymeric

44. Which method is commonly used for the preparation of alcohols?
a. Halogenation of alkanes
b. Hydrogenation of alkenes
c. Hydrolysis of ethers
d. Reduction of carbonyl compounds

45. What is a characteristic property of alcohols?
a. Low boiling points
b. Acidic nature
c. Nonpolar nature
d. Ability to form hydrogen bonds

46.Which test is commonly used to identify the presence of hydroxyl groups in alcohols?
a. Tollens' test b. Iodoform test
c. Baeyer's test d. Fehling's test

47. What is the primary product obtained from the oxidation of diols by periodic acid?
a. Carbonyl compounds b. Carboxylic acids
c. Alcohols d. Ketones

48. What is the role of lead tetraacetate in the oxidation of diols?

a. Oxidizing agent
b. Reducing agent
b. Acidic catalyst
d. Base

49. Which functional group is commonly formed in the oxidation of diols?

a. Hydroxyl group
b. Carbonyl group
c. Nitro group
d. Alkene group

50. What is the byproduct formed in the oxidation of diols by periodic acid?

a. Iodine
b. Water
c. Iodide ions
d. Periodate ions

51. Which diol is commonly used in the laboratory for oxidation reactions?

a. Ethylene glycol
b. Propylene glycol
c. Glycerol
d. Butylene glycol

ANSWERS

1.b, 2.a, 3.a, 4.c, 5.c, 6.a, 7.b, 8.b, 9.a, 10.a, 11.d, 12.a, 13.b, 14.a, 15.d, 16.c, 17.b, 18.b, 19.a, 20.b, 21.c, 22.a, 23.d, 24.a, 25.c, 26.c, 27.b, 28.c, 29.c, 30.b, 31.c, 32.c, 33.a, 34.a, 35.c, 36.b, 37.b, 38.c, 39.c, 40.b, 41.b, 42.c, 43.a, 44.b, 45.d, 46.b, 47.a, 48.a, 49.b, 50.d, 51.a.

UNIT IV

1. What is the IUPAC nomenclature for alkyl halides?

a. Alkanes	b. Alkyl halides
c. Haloalkanes	d. Halides

2. How are alkyl halides classified based on the carbon atom to which halogens are attached?

a. Primary, Secondary, Tertiary
b. Geminal, Vicinal, Terminal
c. Aliphatic, Aromatic, Alicyclic
d. Mono, Di, Trihalides

3. Which physical property generally increases with the increase in the size of halogen in alkylhalides?

a. Boiling point	b. Melting point
c. Density	d. Solubility

4. What is a common reaction of alkyl halides with nucleophiles?

a. Electrophilic substitution
b. Nucleophilic substitution
c. Elimination
d. Addition

5. In which mechanism does the nucleophile attack the substrate simultaneously with the departureof the leaving

group?

a. SN1 b. SN2

c. SN3 d. SN0

6. How are dihalogen derivatives classified based on the carbon atom to which halogens areattached?

a. Primary, Secondary, Tertiary
b. Geminal, Vicinal, Terminal
c. Aliphatic, Aromatic, Alicyclic
d. Mono, Di, Trihalides

7. What is a common method for the preparation of geminal dihalides?

a. Halogenation of alkanes
b. Halogenation of alkenes
c. Halogenation of alkynes
d. Reduction of halohydrocarbons

8. Which of the following is a significant application of trihalogen derivatives?

a. Flavor enhancers
b. Catalysts
c. Antiseptics
d. Lubricants

9. What is a notable property of trihalogen derivatives compared to dihalogen derivatives?

a. Higher boiling point
b. Lower reactivity

c. Higher solubility in water
d. Greater stability

10. Which class of dihalogen derivatives is commonly used as refrigerants?
a. Chlorofluorocarbons (CFCs)
b. Bromocarbons
c. Iodocarbons
d. Fluorocarbons

11. In the IUPAC nomenclature for aromatic halogen compounds, which position gets the lowestnumber for substitution?

a. Meta b. Para
c. Ortho d. Alpha

12. What is a common method for the preparation of aryl halides from benzene?
a. Friedel-Crafts alkylation
b. Friedel-Crafts acylation
c. Electrophilic aromatic substitution
d. Nucleophilic aromatic substitution

13. Which of the following is a common use of aryl halides in organic synthesis?

a. Catalysts b. Reducing agents
c. Protecting groups d. Solvents

14. What is a significant property of aryl halides compared to alkyl halides?

a. Higher boiling points

b. Lower reactivity
c. Greater solubility in water
d. Greater stability

15. Which type of reaction is benzyne intermediate involved in?

a. SN1 b. SN2
c. E1 d. E2

16. What is the common name for benzyl chloride?

a. Chlorobenzene b. Benzene chloride
c. Benzyl chloride d. Chloromethylbenzene

17. How is benzyl chloride typically prepared?

a. Direct chlorination of benzene
b. Chlorination of toluene
c. Chlorination of benzyl alcohol
d. Reduction of benzene with hydrogen chloride

18. What is a significant property of benzyl chloride compared to simple alkyl halides?

a. Higher boiling point
b. Lower reactivity

c. Higher solubility in water
d. Greater stability

19. Which of the following is a common use of benzyl chloride?

a. Food flavoring	b. Pesticide
c. Perfume	d. Lubricant

20. Which test is commonly used to identify the presence of hydroxyl groups in alcohols?

a. Tollens' test	b. Iodoform test
c. Baeyer's test	d. Fehling's test

ANSWERS

1.c, 2.a, 3.a, 4.b, 5.b, 6.b, 7.c, 8.c, 9.b, 10.a, 11.c, 12.c, 13.c, 14.b, 15.a, 16.c, 17.c, 18.b, 19.b, 20.b.

5 MARKS

1. Nomenclature and Classification of Alkyl Halides

a. Explain the IUPAC nomenclature for alkyl halides, providing examples for different classes.

Discuss the significance of classifying alkyl halides into primary, secondary, and tertiary categories.

2. Physical Properties and Chemical Reactions of Alkyl Halides

a . Outline the physical properties of alkyl halides and explain the factors influencing their boilingpoints.

b. Discuss the general chemical reactions of alkyl halides, emphasizing nucleophilic substitutionreactions.

3. Nucleophilic Substitution Reactions

a. Differentiate between SN1 and SN2 mechanisms, providing examples for each.

- Discuss the factors influencing the choice between SN1 and SN2 mechanisms in nucleophilic substitutions.

4. Nomenclature, Classification, and Preparation of Di and Tri Halogen Derivatives

a . Explain the nomenclature and classification of dihalogen derivatives, providing examples.

b . Discuss common methods for the preparation of dihalogen derivatives and their applications.

c. Extend the discussion to trihalogen derivatives, emphasizing their properties and applications.

5.Nomenclature, Preparation, and Properties of Aromatic Halogen Compounds

a. Describe the IUPAC nomenclature for aromatic halogen compounds, highlighting key principles.

b. Discuss methods for the preparation of aromatic halogen compounds, with a focus on electrophilic aromatic substitution reactions.

c. Explore the properties and uses of aromatic halogen compounds in organic synthesis.

6. Mechanism of Nucleophilic Aromatic Substitution - Benzyne Intermediate

a.Provide a detailed explanation of the benzyne intermediate in nucleophilic aromatic substitutionreactions.

b. Illustrate the mechanism step by step, emphasizing the role of benzyne in the overall reaction.

c.Discuss the types of reactions where benzyne intermediates are commonly encountered.

7. Nomenclature and Preparation of Aryl Alkyl Halides

a. Explain the nomenclature of aryl alkyl halides and provide examples.

b.Discuss methods for the preparation of aryl alkyl halides, emphasizing the importance of these compounds in organic synthesis.

8.Describe the IUPAC nomenclature for alcohols, providing examples for different classes. d.Classify alcohols based on the number of hydroxyl groups and discuss common methods for their preparation.

9. Properties, Uses, and Tests for Hydroxyl Groups in Alcohols

a. Explore the physical and chemical properties of alcohols, including their ability to formhydrogen bonds.

b.Discuss the uses of alcohols in various industries.

c. Detail the tests used to identify the presence of hydroxyl groups in alcohols.

10. Oxidation of Diols: Mechanism and Applications

a. Provide a detailed explanation of the oxidation of diols by periodic acid and lead tetraacetate.

b. Discuss the mechanism involved in these oxidation reactions, emphasizing the formation of carbonyl compounds.

c. Explore the applications of diol oxidation reactions in organic synthesis.

UNIT V

1. What is the common constitution of glucose and fructose?

a. C6H12O5
b. C5H10O5
c. C6H12O6
d. C5H10O6

2. Which of the following reactions is characteristic of both glucose and fructose?

a. Esterification
b. Osazone formation
c. Saponification
d. Halogenation

3. Mutarotation refers to:

a. Conversion of glucose to fructose
b. Spontaneous change in the optical rotation of a solution over time
c. Formation of osazones
d. Hydrolysis of glycosidic bonds

4. Which structure is NOT a cyclic form of monosaccharides?

a. Pyranose
b. Furanose
c. Linear
d. Cyclone

5. The Haworth projection formula is used for the determination of:

a. Molecular weight
b. Ring size
c. Optical rotation
d. Boiling point

6. Epimerisation involves the conversion of one sugar into another by changing the configuration atthe:
a. Anomeric carbon
b. Aldehyde group
c. Ketone group
d. Chiral center farthest from the carbonyl group

7. Which enzyme catalyzes the epimerisation of D-arabinose to D-glucose?
a. Isomerase b. Mutase
c. Arabinase d. Epimerase

8. What is the result of the epimerisation of D-glucose to D-mannose?
a. Change in optical rotation
b. Change in reducing power
c. Conversion of an aldose to a ketose
d. Interconversion of stereoisomers

9. What is the cyclic structure of glucose called?
a. Pyranose b. Furanose
c. Glucopyranose d. Glucofuranose

10. What is the mechanism of mutarotation?
a. Isomerization between α and β anomers
b. Glycosidic bond formation
c. Epimerization of all chiral centers

d. Hydrolysis of the cyclic structure

11. What is the product of the reaction between glucose and phenylhydrazine?

a. Glycoside	b. Osazone
c. Ester	d. Furanose

12. What is the furanose form of a monosaccharide?

a. A five-membered ring structure
b. A six-membered ring structure
c. A linear structure
d. A branched structure

13. Which sugar is the epimer of D-glucose at the C-2 carbon?

a. D-mannose	b. D-galactose
c. D-ribose	d. D-fructose

14. What is the common name for the cyclic form of glucose?

a. Glucopyranose	b. Glucofuranose
c. Glucolactone	d. Glucose-6-phosphate

15. What is the primary function of the Haworth projection formula?

a. Determine molecular weight
b. Represent three-dimensional structure
c. Identify reducing sugars
d. Determine ring size

16. Which of the following sugars undergoes mutarotation?

a. D-fructose	b. D-mannose
c. D-glucose	d. D-ribose

17. What is the stereochemical relationship between D-glucose and D-fructose?

a. Diastereomers	b. Enantiomers
c. Epimers	d. Constitutional isomers

18. What is the mechanism of the mutarotation process

a. Isomerization of the aldehyde group
b. Intramolecular rearrangement of hydroxyl groups
c. Oxidation of the anomeric carbon
d. Reduction of the carbonyl group

19. Which of the following is a reducing sugar?

a. Sucrose	b. Lactose
c. Maltose	d. All of the above

20. What is the result of the epimerisation of D-fructose to D-glucose?

a. Change in optical rotation
b. Conversion of a ketose to an aldose
c. Formation of a glycosidic bond
d. Conversion of a reducing sugar to a non-reducing sugar

21. What is the common feature of sucrose and lactose?
a. Both are reducing sugars.
b. Both are monosaccharides.
c. Both are disaccharides.
d. Both are polysaccharides.

22. What is the primary sugar found in sucrose?
a. Glucose
b. Fructose
c. Galactose
d. Maltose

23. Which of the following bonds connects the monosaccharide units in sucrose?
a. Glycosidic bond
b. Peptide bond
c. Ester bond
d. Hydrogen bond

24. Lactose is composed of which two monosaccharides?
a. Glucose and fructose
b. Glucose and galactose
c. Glucose and maltose
d. Fructose and galactose

25. What is the enzyme that hydrolyzes sucrose into its monosaccharide components?
a. Sucrase
b. Lactase
c. Amylase
d. Maltase

26. What is the reducing sugar component in lactose?

a. Glucose b. Galactose
c. Fructose d. Mannose

27. Which of the following statements about sucrose is true?
a. It is commonly known as milk sugar.
b. It is a reducing sugar.
c. It consists of glucose and galactose.
d. It is found in table sugar.

28. The glycosidic bond in lactose is formed between:
a. Glucose and fructose
b. Glucose and galactose
c. Galactose and fructose
d. Two glucose molecules

29. What is the common name for lactose intolerance?
a. Glucose malabsorption
b. Fructose intolerance
c. Galactosemia
d. Lactase deficiency

30. Which of the following disaccharides is responsible for the sweet taste in table sugar?
a. Lactose b. Maltose
c. Sucrose d. Galactose

31. What is the primary function of polysaccharides in living

organisms?

a. Energy storage b. Structural support

c. Enzyme activation d. DNA synthesis

32. Which of the following is a storage polysaccharide in plants?

a. Starch b. Cellulose

c. Chitin d. Glycogen

33. Cellulose is a polymer composed of repeating units of:

a. Glucose b. Fructose

c. Galactose d. Maltose

34. Which enzyme is responsible for the hydrolysis of starch into maltose units?

a. Amylase b. Cellulase

c. Maltase d. Sucrase

35. Cellulose derivatives, such as cellulose nitrate, are commonly used in the production of:

a. Plastics b. Textiles

c. Paper d. Pharmaceuticals

36. What is the primary difference between cellulose and starch in terms of glycosidic linkages?

a. Cellulose has α-1,4-glycosidic linkages, while starch has β-1,4-glycosidic linkages.

b. Starch has α-1,4-glycosidic linkages, while cellulose has β-1,4-glycosidic linkages.

c. Both have α-1,4-glycosidic linkages.
d. Both have β-1,4-glycosidic linkages.

37. Which of the following is a derivative of cellulose used in photographic films?

a. Cellulose nitrate	b. Cellulose acetate
c. Ethyl cellulose	d. Cellulose sulfate

38. What is the purpose of adding nitric acid to cellulose to produce cellulose nitrate?

a. Increase solubility
b. Enhance elasticity
c. Improve flame resistance
d. Enhance biodegradability

39. Ethyl cellulose is commonly used in the production of:

a. Explosives	b. Coating materials
c. Food additives	d. Fertilizers

40. Which polysaccharide is a major component of plant cell walls and provides rigidity to plantcells?

a. Glycogen	b. Starch
c. Chitin	d. Cellulose

41. Starch is a polysaccharide composed of repeating units of:

a. Glucose	b. Fructose

c. Galactose d. Maltose

42. Cellulose is a linear polymer of glucose linked by:
a. Alpha-1,4-glycosidic bonds
b. Beta-1,4-glycosidic bonds
c. Alpha-1,6-glycosidic bonds
d. Beta-1,6-glycosidic bonds

43. Which of the following is a common derivative of cellulose used in the production of photographic films and plastics?
a. Cellulose nitrate b. Cellulose acetate
c. Ethyl cellulose d. Methyl cellulose

44. Cellulose acetate is obtained by the esterification of cellulose with:
a. Acetic acid b. Nitric acid
c. Sulfuric acid d. Hydrochloric acid

45. Ethyl cellulose is a cellulose derivative obtained by the esterification of cellulose with:
a. Ethyl alcohol b. Methanol
c. Butanol d. Isopropyl alcohol

46. Cellulose nitrate is commonly known as:
a. Rayon b. Cellophane
c. Gun cotton d. Collodion

47. The process of converting cellulose into cellulose nitrate involves the reaction with:

a. Nitric acid	b. Acetic acid
c. Sulfuric acid	d. Hydrochloric acid

48. Cellulose acetate is widely used in the production of:

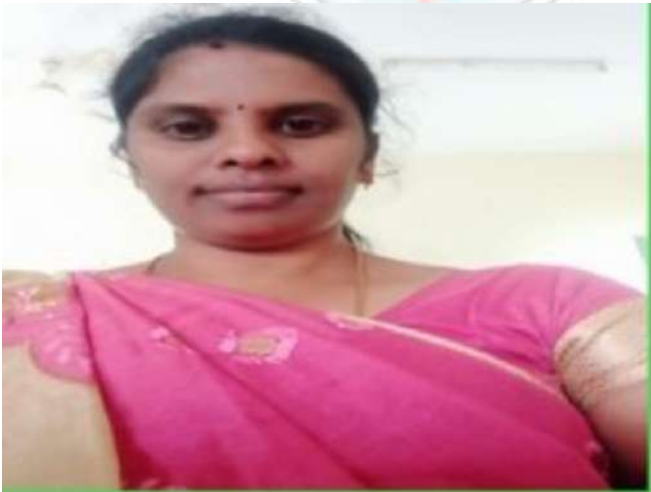
a. Adhesives	b. Explosives
c. Textiles	d. Plastics

49. Ethyl cellulose is known for its:

a. Water solubility	b. Flame retardancy
c. High conductivity	d. Low melting point

50. Cellulose derivatives, such as cellulose nitrate, find application in the production of:

a. Food additives	b. Explosives and films
c. Building materials	d. Synthetic rubber



ABOUT THE A

c. Ethyl cellulose d. Methyl cellulose

53. Cellulose acetate is commonly used in the production of:
a. Explosives b. Textiles and plastics
c. Pharmaceutical films d. Adhesives

54. The chemical modification of cellulose to produce cellulose nitrate involves the substitution ofhydroxyl groups with:
a. Nitro groups b. Acetyl groups
c. Ethyl groups d. Methyl groups

55. Ethyl cellulose is characterized by its:
a. Water solubility
b. High flammability
c. Insolubility in most organic solvents
d. Low molecular weight

c, 5.b, 6.a, 7.c, 8.d, 9.c, 10.a, 11.b, 12.a, 13.b,
, 17.a, 18.b, 19.d, 20.b, 21.c, 22.a, 23.a, 24.b,
l, 28.b, 29.d, 30.c, 31.b, 32.a, 33.a, 34.a, 35.a,
, 39.b, 40.d, 41.a, 42.b, 43.a, 44.a, 45.a, 46.c,
, 50.b, 51.c, 52.a, 53.b, 54.a, 55.c.

FIVE MARKS QUESTIONS:

1. Explain the process of mutarotation in monosaccharides, highlighting its significance in the context of glucose and fructose.
2. Describe the cyclic structures of monosaccharides (Pyranose and Furanose forms), emphasizing the determination of ring size using the Haworth projection formula.
3. Discussing the configurations of monosaccharides
4. Examples of epimerisation and interconversions, such as the conversion of D-arabinose to D-glucose and vice versa,
5. Epimerisation of D-glucose to D-mannose.
6. Compare and contrast the chemistry and structures of sucrose and lactose, emphasizing their roles and significance.
7. Discuss the properties and applications of selected derivatives of polysaccharides,
8. Explain the cellulose nitrate, cellulose acetate, and ethyl cellulose.

TEN MARKS QUESTIONS:

1. Discuss the comprehensive journey of carbohydrates, covering the classification, constitution, and reactions of monosaccharides like glucose and fructose.
2. Explore key aspects such as Osazone formation, mutarotation mechanisms, and the significance of cyclic structures (Pyranose and Furanose forms).

3. Elaborate on the determination of ring size through the Haworth projection formula. Transition intothe configuration of monosaccharides, emphasizing epimerisation and interconversions
4. Illustrate specific examples like the conversion of D-Arabinose to D-glucose and vice versa, as well as the epimerisation of D-glucose to D-mannose.
5. Explain the disaccharides, focusing on the chemistry and structure of Sucrose and Lactose.
6. Discuss the polysaccharides, exploring the structures and applications of starch and cellulose, and presenting derivatives such as cellulose nitrate, cellulose acetate, and Ethyl cellulose.

UNIT I

1. What is the common feature among furan, pyrrole, thiophene, and pyridine that imparts uniquestability and properties?

a. Aliphatic structure	b. Aromaticity
c. Triple bond	d. Chirality

2. Which of the following compounds is NOT a five-membered aromatic ring?

a. Furan	b. Pyrrole
c. Thiophene	d. Pyridine

3. How is furan typically prepared?

a. Dehydration of a diol
b. Decarboxylation of furfural
c. Knorr synthesis
d. Reaction with phosphorus pentasulfide

4. Pyrrole is a key component in the synthesis of:

a. Pesticides
b. Pharmaceuticals
c. Plastics

5. Thiophene is characterized by the presence of:

a. Oxygen	b. Nitrogen
c. Sulfur	d. Halogens

6. Which of the following is a common use of pyridine?

a. Flavoring agent	b. Fuel additive
c. Solvent	d. Bleaching agent

7. In the comparative study of basicity, why is pyrrole less basic than typical amines?

a. It lacks a lone pair.
b. The lone pair is delocalized within the aromatic ring.
c. It has a positive charge.
d. It is highly reactive.

8. What factor contributes to the enhanced basicity of pyridine compared to pyrrole

a. Presence of a positive charge
b. Hindered nitrogen atom
c. Delocalized lone pair
d. Lack of resonance

9. How does the basicity of pyrrole and pyridine generally compare to most amines?

a. Stronger	b. Weaker
c. Similar	d. Unpredictable

10. What is the significance of furan derivatives in industrial applications?

a. Flavor enhancers
b. Resins, solvents, and pharmaceuticals
c. Explosives
d. Fertilizers

11. Quinoline is synthesized through which method?
a. Skraup's synthesis
b. Grignard reaction
c. Friedel-Crafts acylation
d. Diels-Alder reaction

12. What is the key starting material for the Skraup's synthesis of quinoline?
a. Aniline
b. Benzene
c. Acetylene
d. Pyrrole

13. Isoquinoline is obtained through which synthetic method?
a. Skraup's synthesis
b. Bischler and Napieralski synthesis
c. Diels-Alder reaction
d. Grignard reaction

14. The Fischer indole synthesis involves the reaction of:
a. Aniline and ketone
b. Phenylhydrazine and aldehyde
c. Aniline and isocyanide
d. Phenylhydrazine and ketone

15. What is the key reagent used in the Fischer indole synthesis?
a. Hydrochloric acid
b. Acetic anhydride
c. Phosphorus pentoxide
d. Formic acid

16. Which reaction is commonly used for the synthesis of

indole derivatives?

a. Friedel-Crafts alkylation
b. Diels-Alder reaction
c. Grignard reaction
d. Fischer esterification

17. Skraup's synthesis is a method for the synthesis of:

a. Pyrrole
b. Furan
c. Quinoline
d. Indole

18. In Bischler and Napieralski synthesis, the reaction involves the condensation of:

a. Aniline and acetic anhydride
b. Aniline and ketone
c. Phenol and formaldehyde
d. Pyrrole and acetylene

19. What type of reaction is involved in the Fischer indole synthesis?

a. Condensation
b. Hydrolysis
c. Reduction
d. Oxidation

20. Which of the following is a characteristic feature of isoquinoline?

a. Seven-membered ring
b. Two fused rings
c. Six-membered ring
d. Five-membered ring

21. Terpenes are classified based on the number of isoprene units they contain. How many carbonatoms and double bonds does one isoprene unit have?

a. C_4, 1 double bond
b. C_5, 2 double bonds
c. C_6, 1 double bond
d. C_5, 1 double bond

22. The isoprene rule states that terpenes are built from multiples of how many carbon units?

a. 3
b. 4
c. 5
d. 6

23. Which of the following is a common method for the isolation of terpenes from plant sources?

a. Steam distillation
b. Simple distillation
c. Fractional distillation
d. Vacuum distillation

24. How many isoprene units are present in a monoterpene?

a. 1
b. 2
c. 3
d. 4

25. Citral is a terpene known for its lemon-like fragrance. What is its chemical formula?

a. $C_{10}H_{16}$
b. $C_{10}H_{18}O$
c. $C_{10}H_{16}O$
d. $C_{10}H_{18}$

26. Geraniol is commonly found in rose oil and citronella oil. How many isoprene units are presentin geraniol?

a. 2 b. 3
c. 4 d. 5

27. Alpha-pinene is a monoterpene found in pine trees. How many isoprene units contribute to itsstructure?

a. 1 b. 2
c. 3 d. 4

28. Which class of terpenes contains 20 carbon atoms derived from five isoprene units?

a. Monoterpenes b. Sesquiterpenes
c. Diterpenes d. Triterpenes

29. What is the general formula of terpenes based on the isoprene rule?

a. $(C5H8)n$ b. $(C5H10)n$
c. $(C10H16)n$ d. $(C15H24)n$

30. Which method is commonly used for the synthesis of terpenes in the laboratory?

a. Grignard reaction
b. Diels-Alder reaction
c. Friedel-Crafts alkylation
d. Wittig reaction

31. The structural elucidation of terpenes is often

carried out using spectroscopic techniques. Which technique is particularly useful for determining the connectivity of atoms in a molecule?

a. NMR spectroscopy
b. Mass spectrometry
c. Infrared spectroscopy
d. UV-Vis spectroscopy

32. In the isoprene rule, what is the basic structural unit from which terpenes are derived?

a. Butadiene
b. Isoprene
c. Propene
d. Ethylene

33. How is the isoprene rule related to the classification of terpenes?

a. It determines the molecular weight of terpenes.
b. It establishes the number of isoprene units in terpenes.
c. It defines the color of terpenes.
d. It dictates the odor of terpenes.

34. What is the general odor characteristic of terpenes?

a. Sweet
b. Bitter
c. Floral
d. Minty

35. What is the primary function of terpenes in plants?

a. Energy storage
b. Structural support
c. Defense against herbivores

d. Water transport

36. The synthesis of terpenes often involves the assembly of isoprene units through what type ofreaction?

a. Substitution	b. Elimination
c. Addition	d. Condensation

37. Which terpene is commonly used in the perfume industry for its floral scent and is found inrose oil?

a. Citral	b. Geraniol
c. Alpha-pinene	d. Limonene

38. The isoprene rule helps explain why terpenes often have what type of structural feature?

a. Branched chains	b. Cyclic structures
c. Aromatic rings	d. Multiple double bonds

39. Which class of terpenes is characterized by the presence of 30 carbon atoms derived from sixisoprene units?

a. Monoterpenes	b. Sesquiterpenes
c. Diterpenes	d. Triterpenes

40. In the structural elucidation of terpenes, which spectroscopic technique is commonly used toanalyze the characteristic absorption bands of functional groups?

a. NMR spectroscopy
b. Mass spectrometry
c. Infrared spectroscopy

d. UV-Vis spectroscopy

ANSWERS

1.b, 2.d, 3.a, 4.b, 5.c, 6.c, 7.b, 8.c, 9.b, 10.b, 11.a, 12.a, 13.b, 14.a, 15.c, 16.a, 17.c, 18.a, 19.a, 20.c, 21.d, 22.c, 23.a, 24.b, 25.c, 26.c, 27.b, 28.b, 29.a, 30.b, 31.a, 32.b, 33.b, 34., 35.c, 36.d, 37.b, 38.b, 39.c, 40.c.

FIVRE MARKS QUESTIONS:

1. Explain the classification of amino acids into essential and non-essential types.
2. Provide a brief overview of the preparation methods for alpha amino acids, focusing on glycine, alanine, and tryptophan.
3. Discuss the general properties of amino acids, highlighting Zwitter ions and the concept of isoelectric point.
4. Transition to peptides and proteins, elaborating on the Bergmann method for peptide synthesis.
5. Explain the classification of proteins based on physical and chemical properties and physiologicalfunctions.
6. Discuss an elementary treatment of the primary and secondary structures of proteins,
7. Explain the helical and sheet structures, and touch upon the process of denaturation of proteins.

TEN MARKS QUESTIONS:

1. Provide a detailed account of the classification of amino acids, emphasizing the distinction between essential and non-essential types.
2. Explore the methods used in the preparation of alpha amino acids, with a focus on glycine, alanine,and tryptophan.
3. Discuss the general properties of amino acids, delving into Zwitter ions and the concept of isoelectric point.
4. Explain theShift to peptides and proteins,
5. Elucidating the Bergmann method for peptide synthesis.
6. Explore the classification of proteins based on physical and chemical properties, as well as physiological functions.
7. Explain theexamination of the primary and secondary structures of proteins, including an elementary treatment of helical and sheet structures.
8. Discussing the process of denaturation in proteins.

UNIT II

1. What is the classification of amino acids based on the nature of their side chains?

a. Branched-chain and straight-chain

b. Polar and non-polar

c. Essential and non-essential

d. Alpha and beta

2. Which of the following amino acids is essential and must be obtained from the diet?

a. Alanine

b. Glycine

c. Tryptophan

d. Ser

3. What is the process of preparing alpha-amino acids from natural sources or chemical synthesiscalled?

a. Amination

b. Esterification

c. Amidation

d. Amino acid synthesis

4. Which of the following amino acids is known as the simplest and most basic?

a. Glycine

b. Alanine

c. Tryptophan

d. Serine

5. What is the general property of amino acids that allows them to act as both acids and bases inaqueous solutions?

a. Isomerization

b. Amphipathicity

c. Zwitterion formation

d. Esterification

6. Which amino acid is known for containing a hydrophobic side chain and is commonly found in proteins' interior?

a. Glutamic acid	b. Leucine
c. Arginine	d. Lysine

7. What is the isoelectric point of an amino acid?

a. The pH at which the amino acid is neutral
b. The pH at which the amino acid is most acidic
c. The pH at which the amino acid is most basic
d. The pH at which the amino acid has the maximum optical rotation

8. Which of the following amino acids is a non-essential amino acid?

a. Valine	b. Leucine
c. Glycine	d. Isoleucine

9. What is the term for the special sequence of amino acids that determines a protein's structure andfunction?

a. Codon
b. Peptide bond
c. Polypeptide chain
d. Primary structure

10. In the context of amino acids, what does the term "essential" mean?

a. Important for taste
b. Must be obtained from the diet

c. Basic in nature
d. Synthesized in the body

11. What is the Bergmann method used for in peptide synthesis?
a. Determining protein structure
b. Analyzing amino acid composition
c. Synthesizing peptides
d. Identifying physiological functions

12. Peptides are composed of:

a. Nucleotides	b. Amino acids
c. Monosaccharides	d. Fatty acids

13. In the classification of proteins based on physical and chemical properties, which criterion iscommonly used?

a. Size	b. Color
c. Solubility	d. Taste

14. The primary structure of proteins refers to:
a. Spatial arrangement of amino acids
b. Linear sequence of amino acids
c. Helical structure of the protein
d. Protein folding pattern

15. What is the elementary treatment of helical and sheet structures in the secondary structure ofproteins?
a. Tertiary structure

b. Quaternary structure
c. Alpha-helix and beta-sheet
d. Denaturation

16. Denaturation of proteins involves:
a. Breaking peptide bonds

b. Unraveling the protein's secondary and tertiary structures
c. Synthesizing new peptide bonds
d. Classifying proteins based on functions

17. Which of the following is NOT a physiological function-based classification of proteins?

a. Enzymes	b. Structural proteins
c. Transport proteins	d. Reducing proteins

18. The secondary structure of proteins involves the arrangement of amino acids into:
a. Linear sequences
b. Helices and sheets
c. Complex three-dimensional structures
d. Tertiary structures

19. What is the primary factor influencing protein solubility?

a. Size of the protein	b. Temperature
c. pH	d. Presence of ions

20. What is the general term for the specific sequence of amino acids in a protein?

a. Tertiary structure	b. Quaternary structure
c. Primary structure	d. Secondary structure

21. Which of the following amino acids is considered nonpolar and achiral?

a. Glycine	b. Alanine
c. Tryptophan	d. Aspartic acid

23. Phenol is more acidic compared to alcohols due to:

a. Greater electronegativity of oxygen
b. Larger size of the phenyl group
c. Presence of a pi bond in the phenyl ring
d. Resonance stabilization in the phenolate ion

24. The resonance-stabilized structure of the phenoxide ion involves:

a. Positive charge on oxygen
b. Negative charge on oxygen
c. Negative charge on the ring carbons
d. Positive charge on the ring carbons

25. What effect does resonance stabilization have on the acidity of phenol?

a. Decreases acidity
b. Increases acidity
c. No effect on acidity
d. Changes the color of phenol

26. Which factor contributes significantly to the stabilization of the phenoxide ion?
a. Electronegativity of carbon
b. Presence of sp3 hybridization in the ring
c. Resonance delocalization
d. Greater atomic weight of oxygen

27. What role does the pi-electron cloud in the benzene ring play in the acidity of phenol?
a. It reduces the stability of the phenolate ion
b. It increases the stability of the phenolate ion
c. It has no influence on acidity
d. It disrupts the resonance stabilization

28. The resonance-stabilized structure of the phenolate ion exhibits:
a. Aromaticity b. Anti-aromaticity
c. Aliphatic character d. Increased basicity

29. What structural feature of phenol contributes to its higher acidity compared to alcohols?
a. Presence of a double bond
b. Presence of a hydroxyl group
c. Benzene ring conjugation
d. Greater molecular weight

30. Compared to cyclohexanol, why is phenol more acidic?
a. Cyclohexanol has a larger ring size
b. Phenol has a smaller ring size

c. Phenol has resonance stabilization
d. Cyclohexanol has more hydrogen atoms

31. What effect does the resonance stabilization have on the lone pair of electrons in phenol?
a. Increases its reactivity
b. Decreases its reactivity
c. Makes it less available
d. Makes it more electronegative

32. Which statement best describes the relationship between phenol's acidity and its resonance stabilization?
a. Phenol's acidity decreases with increased resonance stabilization
b. Phenol's acidity increases with increased resonance stabilization
c. Resonance stabilization has no impact on phenol's acidity
d. Phenol's acidity is inversely proportional to resonance stabilization

33. In phenol, the pi electrons in the benzene ring:
a. Are localized
b. Are highly reactive
c. Are delocalized
d. Are absent

34. Phenol's acidic nature is attributed to the:
a. Presence of an alkyl group
b. Conjugation within the benzene ring
c. Presence of an aldehyde group

d. Electronegativity of carbon

35. What property of the phenolate ion makes it highly stable?
a. Presence of a positive charge on oxygen
b. Lack of resonance stabilization
c. Presence of a negative charge on oxygen
d. Greater number of hydrogen atoms

36. Which chemical reaction is used in the preparation of phenol by treating chlorobenzene withsodium hydroxide under high temperature and pressure?
a. Sandmeyer reaction
b. Fries rearrangement
c. Kolbe-Schmitt reaction
d. Gattermann-Koch reaction

37. Alkylation of phenol involves the introduction of an alkyl group using:
a. Alkyl halides and a strong base
b. Alkyl halides and an acid catalyst
c. Alkenes and a reducing agent
d. Alkynes and a nucleophile

38. Which reaction involves the formation of phenol from chlorobenzene by treating it with sodiumhydroxide and carbon dioxide under high temperature and pressure?
a. Reimer-Tiemann reaction
b. Gattermann reaction
c. Kolbe-Schmitt reaction

d. Friedel-Crafts reaction

39. The acylation of phenol involves the introduction of an acyl group using:
a. Acyl halides or anhydrides and a base or Lewis acid
b. Alkyl halides and a strong base
c. Aldehydes and a reducing agent
d. Ketones and a nucleophile

40. What is the byproduct formed during the preparation of phenol through the Kolbe-Schmitt reaction?
a. Water
b. Carbon dioxide
c. Sodium chloride
d. Carbon monoxide

41. In the Kolbe-Schmitt reaction, what role does carbon dioxide (CO2) play?
a. Oxidizing agent
b. Reducing agent
c. Electrophile
d. Nucleophile

42. The Reimer-Tiemann reaction involves the conversion of:
a. Benzene to phenol
b. Toluene to phenol
c. Chlorobenzene to phenol
d. Phenol to benzene

43. What reagent is used in the Reimer-Tiemann reaction to convert chloroform to the phenolicproduct?
a. Sodium hydroxide
b. Copper catalyst
c. Carbon monoxide
d. Silver nitrate

44. Which reaction mechanism is associated with the synthesis of phenol from benzene via chlorobenzene using copper powder and sodium chloride?
a. Fries rearrangement
b. Gattermann-Koch reaction
c. Kolbe-Schmitt reaction
d. Sandmeyer reaction

45. In the Gattermann-Koch reaction, what role does the copper catalyst play?
a. Acts as a reducing agent
b. Acts as a catalyst for the formation of the electrophile
c. Acts as a base
d. Acts as an oxidizing agent

46. Which named reaction involves the treatment of phenol with carbon dioxide and hydrogenchloride to form salicylic acid?
a. Fries rearrangement
b. Kolbe-Schmitt reaction
c. Houben-Hoesch reaction
d. Sandmeyer reaction

47. The Houben-Hoesch reaction is utilized to convert phenol to:
a. Salicylic acid
b. Benzoic acid
c. Acetylsalicylic acid (Aspirin)

d. Aniline

48. The preparation of phenol from benzene via chlorobenzene involves which named reaction?
a. Reimer-Tiemann reaction
b. Gattermann-Koch reaction
c. Sandmeyer reaction
d. Fries rearrangement

49. What reagent is involved in the Sandmeyer reaction for the synthesis of phenol from aniline?
a. Copper powder
b. Nitrous acid
c. Sodium hydroxide
d. Sulfuric acid

50. Which reaction mechanism involves the conversion of phenol to salicylic acid by treating it withcarbon dioxide and sulfuric acid?
a. Kolbe-Schmitt reaction
b. Houben-Hoesch reaction
c. Reimer-Tiemann reaction
d. Gattermann-Koch reaction

51. What is the primary product of the alkylation of monohydric phenol?
a. Alkane
b. Alkene
c. Alkyne
d. Alkylated phenol

52. In the alkylation of phenol, what type of reaction mechanism is commonly observed?

a. Substitution	b. Addition
c. Elimination	d. Rearrangement

53. Which of the following functional groups is introduced during the acylation of monohydricphenol?

a. Alkyl group	b. Acyl group
c. Hydroxyl group	d. Amino group

54. What is the role of a catalyst in the acylation of phenol?

a. It initiates the reaction.
b. It acts as a reducing agent.
c. It increases the reaction rate.
d. It stabilizes the reaction products.

55. In the Kolbe reaction, what type of bond formation occurs between two phenoxide ions?

a. C-C bond	b. C-O bond
c. O-H bond	d. C-H bond

56. What product is obtained in the Reimer-Tiemann reaction involving phenol?

a. Chlorobenzene	b. Phenol aldehyde
c. Phenol ketone	d. Phenol ether

57. Which reagent is commonly used in the Gattermann reaction for the formylation of phenol?

a. Carbon monoxide	b. Hydrogen peroxide
c. Formic acid	d. Formaldehyde

58. In the Houben-Hoesch reaction, what type of compound is formed from phenol?

a. Ether b. Ester
c. Amine d. Aldehyde

59. What is the purpose of the Kolbe reaction in the context of phenol synthesis?

a. Formylation b. Alkylation
c. Carboxylation d. Dehydration

60. Which of the following is a characteristic feature of the Reimer-Tiemann reaction?

a. Formation of a halogenated product
b. Introduction of an aldehyde group
c. Introduction of a methyl group
d. Oxidation of phenol

61. What type of reaction mechanism is typically associated with the Gattermann reaction?

a. Electrophilic aromatic substitution
b. Nucleophilic substitution
c. Radical addition
d. Redox reaction

62. What is the primary product of the Houben-Hoesch reaction involving phenol and an acidchloride?

a. Ester b. Ether
c. Amine d. Aldehyde

63. In the alkylation of phenol, which of the following is commonly used as an alkylating agent?

a. Alkali metal b. Alkane

c. Alkyl halide d. Alkyl oxide

64. Which of the following reactions involves the introduction of a formyl group into phenol?

a. Kolbe reaction

b. Reimer-Tiemann reaction

c. Gattermann reaction

d. Houben-Hoesch reaction

65. What is the primary product of the Houben-Hoesch reaction involving phenol and an acid anhydride?

a. Ester b. Ether

c. Amine d. Aldehyde

ANSWERS

1.b, 2.c, 3.d, 4.a, 5.c, 6.b, 7.a, 8.c, 9.d, 10.b, 11.c, 12.b, 13.c, 14.b, 15.c, 16.b, 17.d, 18.b, 19.c, 20.c, 21.a, 22.a, 23.d, 24.b, 25.b, 26.c, 27.b, 28.a, 29.c, 30.c, 31.c, 32.b, 33.c, 34.c, 35.c, 36.c, 37.a, 38.c, 39.a, 40.b, 41.c, 42.c, 43.a, 44.b, 45.b, 46.c, 47.a, 48.b, 49.b, 50.a, 51.d, 52.a, 53.b, 54.c, 55.a, 56.c, 57.d, 58.b, 59.c, 60.b, 61.a, 62.a, 63.c, 64.c, 65.b

FIVE MARKS QUESTIONS:

1. Explain the acidity of phenol, detailing its basis on resonance stabilization.
2. Describe the preparation of phenol via the alkylation of monohydric phenol. Provide the mechanism involved in this reaction.
3. Discuss the process and mechanism involved in the acylation reaction of monohydric phenol to produce phenol.
4. Explain the mechanisms of the Kolbe, Reimer-Tiemann, Gattermann, and Houben-Hoeschreactions used in the synthesis of phenol.
5. Summarize the methods used in the preparation of phenol, emphasizing their mechanisms and their significance in organic synthesis.
6. Discuss the preparation methods for catechol, highlighting the synthetic pathways and their significance in organic synthesis.
7. Explain the preparation process of resorcinol, detailing the methods used and its applications in various industries.
8. Elaborate on the preparation of alpha and beta naphthols, outlining the synthetic routes and their significance in organic chemistry.
9. Discuss the properties of catechol, emphasizing its chemical and physical characteristics and its significance in different applications.

10. Describe the properties of resorcinol, highlighting its chemical reactivity, physical properties, and applications in industries.

TEN MARKS QUESTIONS:

1. Explain the acidity of phenol based on resonance stabilization, detailing the resonance structures and their influence on phenol's acidity.
2. Discuss the reactions of monohydric phenol in alkylation and acylation processes, outlining the mechanisms involved in these reactions.
3. Explain the mechanisms involved in Kolbe, Reimer-Tiemann, Gattermann, and Houben-Hoesch reactions for the synthesis of phenols, elucidating their reaction pathways.
4. Describe the preparation methods of catechol, resorcinol, alpha, and beta naphthols, outlining theirsynthetic routes and their significance in organic synthesis.
5. Discuss the properties of catechol, resorcinol, alpha, and beta naphthols, emphasizing their chemical reactivity, physical properties, and their importance in various industries.

UNIT III

1. The glycosidic bond in lactose is formed between:
a. Glucose and fructose
b. Glucose and galactose
c. Galactose and fructose
d. Two glucose molecules

2. What is the common name for lactose intolerance?
a. Glucose malabsorption
b. Fructose intolerance
c. Galactosemia
d. Lactase deficiency

3. Which of the following disaccharides is responsible for the sweet taste in table sugar?
a. Lactose b. Maltose
c. Sucrose d. Galactose

4. What is the primary function of polysaccharides in living organisms?
a. Energy storage
b. Structural support
c. Enzyme activation
d. DNA synthesis

5. Which of the following is a storage polysaccharide in plants?

a. Starch b. Cellulose
c. Chitin d. Glycogen

6. Cellulose is a polymer composed of repeating units of:
a. Glucose b. Fructose
c. Galactose d. Maltose

7. Which enzyme is responsible for the hydrolysis of starch into maltose units?
a. Amylase b. Cellulase
c. Maltase d. Sucrase

8. Cellulose derivatives, such as cellulose nitrate, are commonly used in the production of:
a. Plastics b. Textiles
c. Paper d. Pharmaceuticals

9. What is the primary difference between cellulose and starch in terms of glycosidic linkages?
a. Cellulose has α-1,4-glycosidic linkages, while starch has β-1,4-glycosidic linkages.
b. Starch has α-1,4-glycosidic linkages, while cellulose has β-1,4-glycosidic linkages.
c. Both have α-1,4-glycosidic linkages.
d. Both have β-1,4-glycosidic linkages.

10. Which of the following is a derivative of cellulose used in photographic films?
a. Cellulose nitrate b. Cellulose acetate

c. Ethyl cellulose
d. Cellulose sulfate

11. What is the purpose of adding nitric acid to cellulose to produce cellulose nitrate?

a. Increase solubility
b. Enhance elasticity
c. Improve flame resistance
d. Enhance biodegradability

12. Ethyl cellulose is commonly used in the production of:

a. Explosives
b. Coating materials
c. Food additives
d. Fertilizers

13. Which polysaccharide is a major component of plant cell walls and provides rigidity to plantcells?

a. Glycogen
b. Starch
c. Chitin
d. Cellulose

14. Starch is a polysaccharide composed of repeating units of:

a. Glucose
b. Fructose
c. Galactose
d. Maltose

15. Cellulose is a linear polymer of glucose linked by:

a. Alpha-1,4-glycosidic bonds
b. Beta-1,4-glycosidic bonds
c. Alpha-1,6-glycosidic bonds
d. Beta-1,6-glycosidic bonds

16. Which of the following is a common derivative of cellulose used in the production of photographic films and plastics?

a. Cellulose nitrate b. Cellulose acetate
c. Ethyl cellulose d. Methyl cellulose

17. Cellulose acetate is obtained by the esterification of cellulose with:

a. Acetic acid b. Nitric acid
c. Sulfuric acid d. Hydrochloric acid

18. Ethyl cellulose is a cellulose derivative obtained by the esterification of cellulose with:

a. Ethyl alcohol b. Methanol
c. Butanol d. Isopropyl alcohol

19. Cellulose nitrate is commonly known as:

a. Rayon b. Cellophane
c. Gun cotton d. Collodion

20. The process of converting cellulose into cellulose nitrate involves the reaction with:

a. Nitric acid b. Acetic acid
c. Sulfuric acid d. Hydrochloric acid

21. Cellulose acetate is widely used in the production of:

a. Adhesives b. Explosives
c. Textiles d. Plastics

22. Ethyl cellulose is known for its:
a. Water solubility b. Flame retardancy
c. High conductivity d. Low melting point

23. Cellulose derivatives, such as cellulose nitrate, find application in the production of:
a. Food additives b. Explosives and films
c. Building materials d. Synthetic rubber

24. Which cellulose derivative is often used in the pharmaceutical industry for its film-formingproperties and controlled release characteristics?
a. Cellulose nitrate b. Cellulose acetate
c. Ethyl cellulose d. Methyl cellulose

25. The reaction of cellulose with acetic acid anhydride leads to the formation of:
a. Cellulose acetate b. Cellulose nitrate
c. Ethyl cellulose d. Methyl cellulose

26. Cellulose acetate is commonly used in the production of:
a. Explosives b. Textiles and plastics
c. Pharmaceutical films d. Adhesives

27. The chemical modification of cellulose to produce cellulose nitrate involves the substitution ofhydroxyl groups with:
a. Nitro groups b. Acetyl groups
c. Ethyl groups d. Methyl groups

28. Ethyl cellulose is characterized by its:
a. Water solubility
b. High flammability
c. Insolubility in most organic solvents
d. Low molecular weight

ANSWERS

1.b 2.d, 3.c, 4.b, 5.a, 6.a, 7.a, 8.a, 9.b, 10.b, 11.c, 12.b, 13.d, 14.a, 15.b, 16.a, 17.a, 18.a, 19.c, 20.a, 21.c, 22.b, 23.b, 24.c, 25.a, 26.b, 27.a, 28.c.

FIVE MARKS QUESTIONS:

1. Explain the process of mutarotation in monosaccharides, highlighting its significance in the context of glucose and fructose.
2. Describe the cyclic structures of monosaccharides (Pyranose and Furanose forms), emphasizing the determination of ring size using the Haworth projection formula.
3. Discussing the configurations of monosaccharides
4. Examples of epimerisation and interconversions, such as the conversion of D-arabinose to D-glucose and vice versa,
5. Epimerisation of D-glucose to D-mannose.
6. Compare and contrast the chemistry and structures of sucrose and lactose, emphasizing their roles and significance.

7. Discuss the properties and applications of selected derivatives of polysaccharides,
8. Explain the cellulose nitrate, cellulose acetate, and ethyl cellulose.

TEN MARKS QUESTIONS:

1: Discuss the comprehensive journey of carbohydrates, covering the classification, constitution, and reactions of monosaccharides like glucose and fructose.

2. Explore key aspects such as Osazone formation, mutarotation mechanisms, and the significance of cyclic structures (Pyranose and Furanose forms).

3. Elaborate on the determination of ring size through the Haworth projection formula. Transition intothe configuration of monosaccharides, emphasizing epimerisation and interconversions

4. Illustrate specific examples like the conversion of D-Arabinose to D-glucose and vice versa, as well as the epimerisation of D-glucose to D-mannose.

5.Explain the disaccharides, focusing on the chemistry and structure of Sucrose and Lactose.

6.Discuss the polysaccharides, exploring the structures and applications of starch and cellulose, and presenting derivatives such as cellulose nitrate, cellulose acetate, and Ethyl cellulose.

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, 17.a,
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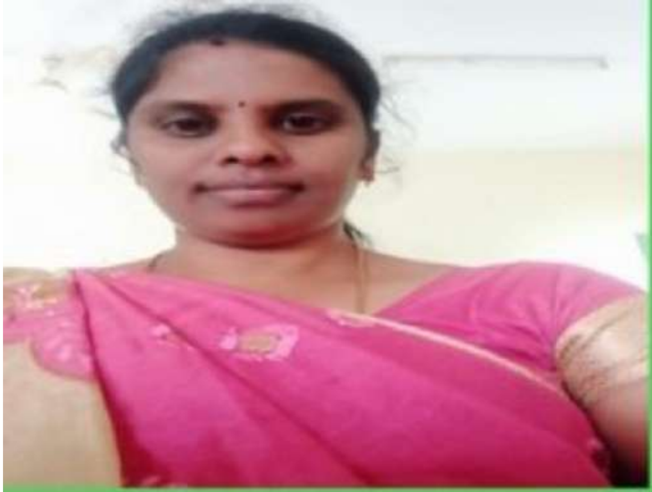

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