BUDDHA SERIES

(Unit Wise Solved Question & Answers)

Course – B.Sc. Bio 2nd year 3rd semester

College – Buddha Degree College
(DDU Code-859)

Department: Science
Subject: Chemistry

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UNIT-1

Chemical Kinetics

1. The rate of a reaction depends on:
A) Only products
B) Only reactants
C) Reactant concentration
D) Catalyst only
Answer: C

2. The molecularity of a reaction is:
A) A variable value
B) Determined experimentally
C) Always an integer
D) Same as order
Answer: C

3. Which of the following is **not** true about molecularity?
A) It cannot be zero
B) It is a theoretical concept
C) It can be fractional
D) It refers to the number of molecules involved in a single step
Answer: C

4. The rate law expression is determined by:
A) Products
B) Balanced equation
C) Experiment
D) Stoichiometry
Answer: C

5. In a **zero-order** reaction, rate is:
A) Proportional to concentration
B) Constant
C) Exponentially decreasing
D) Inversely proportional to concentration
Answer: B

6. A **first-order** reaction has units of rate constant:
A) $\text{mol L}^{-1} \text{s}^{-1}$
B) s^{-1}
C) $\text{L mol}^{-1} \text{s}^{-1}$
D) $\text{mol}^{-2} \text{L}^{2} \text{s}^{-1}$
Answer: B

7. Half-life of a **first-order** reaction is:
A) Constant
B) Proportional to concentration
C) Inversely proportional to concentration
D) Dependent on temperature only
Answer: A

8. For a **second-order** reaction, the half-life is:
A) Constant
B) Independent of concentration
C) Inversely proportional to initial concentration
D) Independent of rate constant
Answer: C

9. A **pseudo-first-order** reaction is:
A) A true first-order reaction
B) A second-order reaction appearing first-order
C) Independent of any concentration
D) A zero-order reaction
Answer: B

10. Mean life (τ) of a first-order reaction is related to half-life ($t_{1/2}$) as:
A) $\tau = 0.693 \times t_{1/2}$
B) $\tau = t_{1/2} / 0.693$
C) $\tau = 2 \times t_{1/2}$
D) $\tau = \sqrt{t_{1/2}}$
Answer: B

Methods to Determine Order

11. In the **differential method**, the order is obtained by:
A) Measuring concentration over time
B) Calculating slope of rate vs. concentration curve
C) Integrating rate law
D) Measuring half-lives
Answer: B

12. The **method of integration** involves:
A) Constant rate measurement
B) Comparing slope of log plots
C) Comparing rate constants
D) Only initial concentration
Answer: B

13. In the **half-life method**, a plot of $t_1/_2$ vs. $1/[A]_0$ gives a straight line for:
A) Zero-order
B) First-order
C) Second-order
D) Third-order
Answer: C

14. The **isolation method** is useful when:
A) All concentrations are equal
B) Only one reactant is present
C) One reactant is in large excess
D) Temperature varies
Answer: C

Theories of Chemical Kinetics

15. According to the **Arrhenius equation**, the rate constant increases with:
A) Decrease in temperature
B) Increase in activation energy
C) Increase in temperature
D) Decrease in molecular mass
Answer: C

16. Activation energy is the:
A) Energy released in reaction
B) Average kinetic energy
C) Minimum energy required to start a reaction
D) Final energy of products
Answer: C

17. The Arrhenius equation is:
A) $k=Ae^{-Ea/RT}$
B) $k=Ae^{RT/Eak}$
C) $k=E_a/RT$
D) $k=Ae^{-RT/Ea}$
Answer: A

18. In **collision theory**, molecules must:
A) Collide with any energy
B) Collide with orientation and energy
C) Collide slowly
D) Avoid collisions
Answer: B

19. Transition state theory assumes:
A) Reactions occur in one step
B) Reactants form activated complexes in equilibrium
C) Reactions occur without energy
D) All collisions lead to product formation
Answer: B

20. Rate constant according to transition state theory is proportional to:
A) Energy of reactants
B) Product concentration
C) Equilibrium constant of activated complex
D) Pressure
Answer: C

Phase Equilibrium

21. Number of **phases** in ice-water equilibrium is:
A) 1
B) 2
C) 3
D) 0
Answer: B

22. Components in a water system (H_2O only) are:
A) 2
B) 1
C) 3
D) 4
Answer: B

23. Gibbs phase rule is:
A) $F = C - P + 1$
B) $F = P - C + 2$
C) $F = C - P + 2$
D) $F = C - P - 2$
Answer: C

24. In a one-component system, maximum number of co-existing phases is:
A) 2
B) 1
C) 3
D) 4
Answer: C

25. The Pb-Ag system exhibits:
A) Triple point
B) Eutectic behavior
C) Phase immiscibility
D) No melting point
Answer: B

UNIT-2

Aromaticity and Chemistry of Arenes

1. A compound is aromatic if it:
A) Contains a six-membered ring
B) Is cyclic and follows Huckel's rule
C) Has conjugated single and double bonds
D) Has at least one benzene ring
Answer: B

2. Which of the following is **antiaromatic**?
A) Cyclobutadiene
B) Benzene
C) Toluene
D) Cyclohexane
Answer: A

3. Benzene is aromatic because:
A) It has alternating double bonds
B) It has 4n electrons
C) It has 6 π electrons in a cyclic conjugated system
D) It is planar
Answer: C

4. Which of the following is **non-aromatic**?
A) Cyclobutadiene
B) Cyclopentadienyl anion
C) Cycloheptatriene
D) Cyclopropenyl cation
Answer: C

5. What is the correct IUPAC name for $C_6H_5CH_2OH$?
A) Benzyl alcohol
B) Phenol
C) Benzenol
D) Hydroxybenzene
Answer: A

6. Which is **not** an electrophilic aromatic substitution reaction?
A) Halogenation
B) Nitration
C) Sulphonation

D) Hydrogenation
Answer: D

7. In the MO picture of benzene, the six π electrons occupy:
A) All bonding and antibonding orbitals
B) Only bonding orbitals
C) Only antibonding orbitals
D) Non-bonding orbitals
Answer: B

8. Which is the correct order of stability?
A) Aromatic > Non-aromatic > Antiaromatic
B) Non-aromatic > Aromatic > Antiaromatic
C) Antiaromatic > Non-aromatic > Aromatic
D) Antiaromatic > Aromatic > Non-aromatic
Answer: A

9. The intermediate in electrophilic aromatic substitution is:
A) Free radical
B) Arene
C) Carbocation (arenium ion)
D) Carbanion
Answer: C

10. Friedel-Crafts alkylation requires:
A) Lewis acid catalyst
B) Strong base
C) UV light
D) Oxidizing agent
Answer: A

11. Which group is **meta-directing** in electrophilic aromatic substitution?
A) -OH
B) $-NH_2$
C) $-NO_2$
D) $-CH_3$
Answer: C

12. Which group is **ortho/para-directing**?
A) -CN
B) $-SO_3H$
C) $-CH_3$
D) -COOH
Answer: C

13. The sulphonation of benzene uses:
A) $HNO_3 + H_2SO_4$
B) $Cl_2 + FeCl_3$
C) Fuming H_2SO_4
D) $AlCl_3 + CH_3Cl$
Answer: C

14. In nitration of benzene, the electrophile is:
A) NO_2^-
B) NO_2^+
C) HNO_3
D) HSO_4^-
Answer: B

15. Which compound is **not** an arene?
A) Benzene
B) Toluene
C) Cyclohexene
D) Naphthalene
Answer: C

Chemistry of Alcohols

16. Which of the following is a **primary (1°) alcohol**?
A) Isopropanol
B) Ethanol
C) Tert-butanol
D) Cyclohexanol
Answer: B

17. Alcohols can be prepared by reducing:
A) Ketones
B) Aldehydes
C) Carboxylic acids
D) All of the above
Answer: D

18. Which reagent is commonly used to reduce esters to alcohols?
A) $KMnO_4$
B) PCC
C) $LiAlH_4$
D) HCl
Answer: C

19. Which alcohol exhibits the **strongest** hydrogen bonding?
A) Methanol
B) Ethanol
C) Propanol
D) All equal
Answer: A

20. Alcohols are acidic due to:
A) Polar O–H bond
B) Carbonyl group
C) Resonance
D) Presence of alkyl groups
Answer: A

21. Which test can distinguish 1°, 2°, and 3° alcohols?
A) Lucas test
B) Benedict's test
C) Iodoform test
D) Baeyer's test
Answer: A

22. Which of the following is a **dihydric alcohol**?
A) Ethanol
B) Methanol
C) Ethylene glycol
D) Isopropanol
Answer: C

23. The IUPAC name of glycerol is:
A) 1,2,3-Propanol
B) Propan-1,2,3-triol
C) Trihydroxypropane
D) Glycerin
Answer: B

24. Oxidation of **primary alcohols** gives:
A) Ketones
B) Aldehydes or carboxylic acids
C) Esters
D) Alkanes
Answer: B

25. Reaction of alcohol with **sodium metal** evolves:
A) CO_2
B) H_2
C) O_2

D) Cl_2
Answer: B