ஸ்ரீ-ல-ஸ்ரீ காசிவாசி சுவாமிநாத சுவாமிகள் கலைக் கல்லூரி

திருப்பனந்தாள் – 612504

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QUESTION BANK

Title of the Paper

GENERAL CHEMISTRY – I

Course: I B.SC (CHE)

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OBJECTIVES

1. To learn the periodic properties of elements and its classifications.
2. To understand the theoretical aspects of qualitative and quantitative analyses.
3. To understand the basics of alkanes, reactive intermediates and reaction mechanisms.
4. To learn about the chemistry of cycloalkanes, alkenes and alkynes.
5. To learn about the types, preparation and properties of sols, colloids and emulsions and the determination of molecular weight of macromolecules.

UNIT I PERIODIC TABLE AND PERIODIC PROPERTIES

Quantum Numbers, Filling up of atomic orbitals: Pauli's exclusion principle, Aufbau Principle, Hunds rule of maximum multiplicity – electronic configuration. Stability associated with half-filled and completely filled orbitals.

Periodic properties of elements – variation of atomic volume, atomic and ionic radii, onization potential, electron affinity, electronegativity along periods and groups. Pauling scale of electronegativity.

Classification of elements into s, p, d and f block elements.

UNIT II ANALYTICAL METHODS

Qualitative Inorganic Analysis – Dry Test, flame test, cobalt nitrate test–wet confirmatory test for acid radicals, interfering acid radicals – elimination of interfering acid radicals.

Solubility product, common ion effect, complexation, oxidation-reduction reactions involved in identification of anions and cations – separation of cations into groups – Semi micro analysis of simple salts.

Volumetric analysis – preparation of standard solutions – normality, molarity and molality by titrimetric reactions – acid-base, redox, precipitation and complex metric titrations – indicators – effect of change in Ph – selection of suitable indicators.

UNIT III ALKANES, REACTIVE INTERMEDIATES AND METHODS FOR REACTION MECHANISMS

Introduction: Inductive, mesomeric, electromeric effects and hyperconjugation – structure of organic molecules based on sp^3, sp^2 and sp hybridization. Alkanes – sources of alkanes – general preparation – general properties – conformational analysis of ethane and n-butane.

Carbocations, Carbanions, Carbenes and Nitrenes: Generation and stability of reactive intermediates – Correlation of reactivity with structure of reactive intermediates. Free radicals: Generation, stability, identification methods – Free radical halogenation reactions and their mechanism.

Homolytic and Heterolytic cleavages of bonds, Characteristics of nucleophilic, electrophilic and free radical reactions. Thermodynamic and kinetic aspects, Hammond's postulates, isotope effects. Energy profile diagrams – Intermediate versus transition state, Product analysis and its importance, crossover experiments, kinetic methods, Isotopic effects.

UNIT IV CHEMISTRY OF CYCLOALKANES, ALKENES, DIENES AND ALKYNES

Preparation of cycloalkanes – Chemical properties – Relative stability of cyclopropane to cyclooctane – Baeyer's Strain theory – Limitations – Mono and disubstituted cyclohexanes.

Alkenes: Nomenclature – Petroleum source of alkenes and aromatics – General methods of

preparation of alkenes – Chemical properties – Markovnikov's rule and peroxide effect-Uses – Elimination reactions and its mechanisms (E_1,E_2).

Dienes: Structures and properties – conjugated dienes – stability and resonance – electrophilic addition – 1,2 addition and 1,4 addition. Alkynes: Nomenclature – General methods of preparation – Physical properties – Chemical properties – Uses.

UNIT V COLLOIDS AND MACROMOLECULES

Definition and types of Colloids- preparation, Purification (dialysis, electrodialysis and ultrafilteration) and stability of colloids, gold number.

Properties of colloids- kinetic, optical and electrical properties.

Emulsions – Types of emulsions, preparation, properties and applications, Donnan membrane equilibrium.

5.4 Osmosis – reverse osmosis and desalination. Macromolecules- Molecular weight of macromolecules- determination of molecular weight by osmotic pressure and light scattering methods.

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UNIT - I

CHOOSE THE CORRECT ANSWER

1. Both elements of first period contain valence e^- in ----------
   A. M shell
   B. N shell
   C. K shell
   D. S shell
2. A cross the period the atomic size decreases due to --------
   A. Shielding effect
   B. Photoelectric effect
   C. Increase in nuclear force of attraction
   D. Decrease in nuclear force of attraction
3. The first three periods are ---------
   A. Long periods
   B. Short periods
   C. Moderate periods
   D. All the above
4. F has e^- affinity less than that of ---------
   A. Na
   B. K
   C. Cl
   D. O
5. What is the organizational chart for elements?
   A. Atomic weight
   B. Atomic number
   C. Atom
   D. Periodic table
6. Who created the periodic table and now is it organized?
   A. Neils Bohr; atomic weight
   B. Dimitrimendeleer ;atomic weight
   C. Dimitrimendeleer ;atomic properties only
   D. Neils Bohr; atomic properties only
7. If n=3 ,the principal quantum number
   A. 8
   B. 2
   C. 18
   D. 52
8. If l =2 , the subshells is-------
   A. 5
   B. 7
   C. 1
   D. 3
9. Aufbau principle---------

A. The orbital filled with a lower energy
B. The orbital filled with a higher energy
C. The orbital filled with both lower &higher energy
D. None of the above

10. The atomic radii in moving from left to right in periodic table.
    A. Decreases
    B. Increases
    C. Decreases of cations
    D. No change

ANSWER : 1.C, 2.C, 3.B, 4.C, 5.A, 6.B, 7.C, 8.A, 9.A, 10.A.

SHORT QUESTIONS ANSWER(2MARKS)

11. What is meant by electronegativity ?
12. State Hund's Rule.
13. What are interfering acid radicals ?Give examples.
14. What is mean by equivalent weight of an oxidising agent and reducing agent ?
15. State of Aufbau principle.
16. What are atomic radii.
17. Discuss the classification of elementary based on their electronic configuration.
18. What is meant by spin quantum numbers.
19. What are elements in the periodic table and electronic configuration.
20. What is multiplicity ?Give example.

PHARAGRAPH QUESTIONS (5 MARKS)

21. State and explain pauli's exclusion principle and aufbau principle.
22. What are S,P,d and f block elements? Give any five elementsfor each type.
23. Brief account on principal and azimuthal quantum numbers and their significance.
24. Discuss the variation of electron affinity along periods and groups.
25. Write notes on quantum numbers.
26. Discuss the classification of S,P,d and f block elements.
27. Write short notes on electron affinity.
28. Explain the state and explain pauli's exclusion principle.
29. Write short notes on inert pair effect.
30. Write short notes on atomic volume.Give example.

ESSAY QUESTIONS (10 MARKS)

31. Write notes on :
    (i)Electron affinity
    (ii)Electron negativity
32. Explain diagonal relationship between the elementsin the periodic table .With examples.

33. Discuss about the factors which ionisationenergy?
34. Write notes on :
    (i)Principle quantum numbers
    (ii)Azimuthal quantum numbers
35. Write notes on :
    (i)Magnetic quantum numbers
    (ii)Spin quantum numbers
36. Explain electron affinity,electronegativity and atomic volume.
37. What are quantum numbers ? How are they classified?Explain in detail.
38. Write notes on:
    (i)Ionization potential
    (ii)Ionic radii
39. Explainhalf filled and completely filled orbitals with examples.
40. Explain diagonal relationship between Beryllium andaluminium.

UNIT - II

CHOOSE THE CORRECT ANSWER (1 MARK)

1. Solubility product is depend on --------
    A. Concentration of ions
    B. Concentration of cations
    C. Concentration of anions
    D. Solution
2. Common ion effect is due to -----
    A. Dissociation of a weak acid
    B. Dissociation of a weak base
    C. Dissociation of a strong acid
    D. Dissociation of a weak acid or weak base
3. Identification of nitrated by using -------
    A. Identifying the constituents
    B. The quantity of the solution
    C. Volume of the solution
    D. None of the above
4. Alizarin is used to defect --------
    A. Al
    B. Ag
    C. Ca
    D. Ni
5. Qualitative analysis is concerned with
    A. Identifying the constituents
    B. The quantity of the solution
    C. Volume of the solution

D. None of the above

6. Standard solution is --------
   A. Strength or concentration
   B. Mass
   C. Moles
   D. Gram
7. If volumetric principle is --------
   A. $V_1N_1 = V_2N_2$
   B. $V_2N_2 = V_1N_1$
   C. $V_2N_2 > V_1N_1$
   D. $V_2N_2 < V_1N_1$
8. Examples of primary standard
   A. $KMnO_4$, HCl
   B. H_2SO_4, HNO_3
   C. Na_2CO_3 ,HCl
   D. $H_2C_2O_4$.$2H_2O$,Na_2co_3
9. Secondary standard is --------
   A. Standardized with a primary standard
   B. To prepare standard solution
   C. Directly weighed substances
   D. None of the above
10. Indicator is ----------
   A. To fix the end point
   B. To alter the end point
   C. To change the end point
   D. To repeat the titration

Answer :1.,2.D, 3.A, 4.A, 5.A, 6.A, 7.A, 8.D, 9.A, 10.A.

SHORT QUESTIONS (2 MARKS)

11. What is common ioneffect.
12. What are principle of volumetric analysis.
13. What is meant by qualitative analysis.
14. Define solubility product.
15. What is meant by acids and bases?
16. The solubility of AgCl at 20^0C IS 0.0016 lit^{-1}.Calculate it's solubility products.
17. How will you calculate equivalent weight of an oxidizing agent?
18. What are interfering acid radicals?Give examples.
19. Define molarity.
20. What is mean by equivalent weight of an oxidizing agent and reducing agent?

PHARAGRAPH QUESTIONS (5 MARKS)

21. Write a short notes on solubility product.
22. Discuss the complexation reactions involved in qualitative analysis.
23. Elaborate the four types of titrations with examples.

24. How will you balance a redox equation using oxidation number method?
25. Write a notes on Hard and Soft acids and bases.
26. Discuss the principle involved in the elimination of interferring anions.
27. Write a short notes on indicators.
28. Write the dry test, flame test and cobalt nitrate test in inorganic qualitative analysis.
29. Describe the acid –base, redox and precipitation titrations with examples.
30. Calculate the following oxidation number of the following underlying elements.
    (i)SO_2 (ii)H_3PO_4 (iii)k_2CrO_4

ESSAY QUESTIONS (10 MARKS)

31. Discuss the application of solubility product in qualitative analysis.
32. Discuss the theory of Arrhenius concept with examples.
33. Explain the relative strength of acids and bases.
34. Write notes on :
    (i)Levelling effect (ii)normality (iii)molality
35. Explain the precipitation reactions involved in qualitative analysis.
36. Explain the complexation reactions involved in qualitative analysis.
37. Write notes on the following primary and secondary standards.
38. How will you calculate the equivalent weight of potassium permanganate and potassium dichromate?
39. Discuss the theory of HSAB with suitable examples.
40. How is oxalate, phosphate, fluoride and Borate interfering acid radicals are eliminated?

UNIT - III

CHOOSE THE CORRECT ANSWER (1 MARK)

1. Which of the following statements regarding the S_N2 mechanism is wrong?
   A. S_N2 reactions are bimolecular.
   B. S_N2 reactions are usually second order.
   C. The S_N2 mechanism occursin one step.
   D. S_N2 reactions usually occurs in two steps.
2. Which of the following statements regarding the $S_N1$mechanism is wrong?
   A. S_N1 reactions are unimolecular.
   B. S_N1 reactions are first order.
   C. The S_N1 mechanism involves a single step
   D. S_N1 reactions usually occur in two steps.
3. Which of the following is most reactive as a nucleophile?
   A. PhO^-
   B. Phs^-
   C. $PhCH_2O^-$
   D. $PhCH_2NH_2$
4. Which of the following is least basic ?
   A. PhO^-
   B. Phs^-

C. $PhCH_2O^-$

D. $PhCH_2NH_2$

5. Which of the following statements is wrong?
   A. S_N1 reactions proceed via cerbenium ion intermediates.
   B. The S_N2 mechanism does not involve an intermediates.
   C. The rate constant of an S_N1 reactions depends on the nucleofuge.
   D. The rate constant of an S_N2 reactions does not depends on the nucleofuge.
6. Which of the following statements regarding nucleophilicity is wrong?
   A. Ethoxide ion is more nuclophilic than t- butoxide in split of it's lower basicity
   B. thoxide ion is more nuclophilic than t- butoxide due to the lower steric hindrance
   C. Chloride ion is more nucleophilic than iodide ion because of it's higher basicity
   D. Bromide ion is more nucleophilic than fluoride in split of it's lower basicity
7. Which is the most reactive compound by the S_N2 mechanism.
   A. $CH_3CH_2CH_2CH_2Br$
   B. CH_3CH_2
   C. CH_3
   D. OH
8. Which is the least reactive compound by the S_N1 mechanism.
   A. $CH_3CH_2CH_2Br$
   B. CH_3CH_2
   C. CH_3
   D. OH
9. Which of the following statementsregarding the E_1 mechanism is wrong?
   A. Reactions by the E_1 mechanism are unimolecular in the rate determining step.
   B. Reactions by the E_1 mechanism usually occur in one step.
   C. Reactions by the E_1 mechanism are generally first order.
   D. Reactions by the E_1 mechanism are multi step reactions.
10. Which of the following statements is wrong?
   A. S_N2 reactions undergo partial inversion of configuration
   B. S_N1 reactions undergo partial inversion of configuration
   C. partial inversion of configuration
   D. S_N1 and S_N2 reactions partial inversion of configuration

ANSWER: 1.D,2.C, 3.B, 4.B, 5.D, 6.C, 7.A, 8.A, 9.B, 10.A.

SHORT QUESTIONS (2 MARKS)

11. Define resonance energy.
12. What are the conditions for resonance to take place.
13. What are the differences between inductive and mesomeric effects?
14. What are mesomericeffct ?
15. Why is σ - bond stronger than π bond.
16. What are SP^3hybridisatiion.
17. Define hyperconjugation.
18. What are Carbonium ion?
19. Whatare free radicals?

20. What are intermediates?

PHARAGRAPH QUESTIONS (5 MARKS)

21. Explain steric effects upon reactivity in organic compounds giving suitable examples.
22. Write notes on:
    (i)Carbenes (ii)Nitrenes
23. Explain kinetic isotopic effects.
24. Write notes on Hammond's postulates.
25. Write note on stability of carbine?
26. Write the general preparation of alkenes.
27. Explain Bayer-strain theory and it's limitations.
28. What are free radicals? How are they formed?
29. Explain inductive effect with examples.
30. Which is more acidic $\alpha -$ chloropropionic and β –chloropropionic acid ?Explain.

ESSAY QUESTIONS (10 MARKS)

31. Explain the conformationals analysis of ethane and n-butene.
32. What are carbonium ion and carbocation. Give examples.
33. Write notes on : (i)Carbenes (ii)Nitrenes (iii)Alynes.
34. What do you understand by the team reaction intermediates? Mention their uses.
35. Distinguish between inductive andresomeric effect.
36. Effect hyperconjugation ,With suitable examples.
37. Explain kinetic isotopic effects.
38. Explain steric effects upon reactivity in organic compounds giving suitable examples.
39. What do you understand by the term reaction intermediates? Mention their names.
40. What do you understand &condition for resonance with suitable examples.

UNIT – IV

CHOOSE THE CORRECT ANSWER(1 MARKS)

1. What causes the rotational barrier in alkenes ----------
   A. C (SP^2) –C (SP^2) overlap
   B. C (SP) –C (SP) overlap
   C. C (P) –C (P) overlap 2
   D. C (SP^2) –C (P) overlap
2. Which of the following statements about the physical properties of alkenes in false---------
   A. Alkenes have a lower density than water
   B. The density of alkenes increases with the number of C-atoms
   C. Cistrans isomerism affects density slightly
   D. For compounds with the same number of C-atoms alkenes have higher boiling point than alkanes.
3. What reagent is the best elecrophile--------
   A. Bromine cation,Br^+
   B. Bromine radical, $Br^{\cdot}$

C. Bromine ,Br^-
D. Bromine , Br_2

4. Which of the following is not an electrophile-------
   A. $H_2C = CH_2$
   B. H^+
   C. $Alcl_3$
   D. $CH_3CH^+CH_3$
5. Which of the following is the most acidic-----
   A. 1 –butyne
   B. 2- Butane
   C. 1 –butane
   D. Butane
6. Which of the following alkynes react with sodamide--------
   A. Cyclodecyne
   B. 2- Pentyne
   C. 2-Butyne
   D. 1- hexyne
7. Alkynes may be formed directly via elimination from which of the following
   A. Alkanes
   B. Bromoalkenes
   C. Alcohols
   D. Alkenes
8. Propadiene $CH_2= C = CH_2$ is
   A. A planar compound
   B. A cumulated diene
   C. An isolated diene
   D. A conjugated diene
9. Which of the following molecular formulas will correspond to an alkene with two double bonds----------
   A. C_4H_{10}
   B. C_5H_{12}
   C. C_6H_{10}
   D. C_8H_{16}
10. Which of the following compounds have planar molecules---------
    A. 1,3 – butadiene
    B. Dimethyl ether
    C. 1- butane
    D. Allene

ANSWER: 1.C, 2.D, 3.A, 4.A, 5.A, 6.D, 7.B, 8.B, 9.C, 10.A.

SHORT QUESTIONS (2 MARKS)

11. State Markonikov's rule.
12. Write the types of dienes.

13. What are dienes?Give examples.
14. What are conjugated dienes? Give examples.
15. How is iso propane prepared.
16. How is chloroprene prepared.
17. Define electrophilic reaction?
18. Define peroxide effects?
19. How are alkane prepared from alkenes?
20. Mention any two uses of alkynes.

PHARAGRAPHQUESTIONS (5 MARKS)

21. Write the preparation of cyclo alkanes.
22. Write on E_1 and E_2 reactions.
23. Explain the 1,2 and 1,4 addition reaction in butadiene.
24. Write the IUPAC name of the following.
    (i)CH_3OH (ii)$CH_3CH_2CH_2CHO$ (iii)CH_3COOH
    (iv)CH_3CH_2Cl (v)CH_3COCH_3
25. Illustrate hyper conjugate effects.
26. What are cycloalkanes? Give any four examples. How is cyclo pentane prepared by Dieckmann ring closure method? Mention any three chemical properties of cyclo alkane.
27. What are Dienes? How are they classified ?Give an example for each type. Compare the stability of Dienes.
28. Write the method of preparation ,Physical and chemical properties and uses of alkynes.
29. Explain Baeyer's strain theory . Mention it's limitations.
30. Discuss the mechanism of free radical substitution by halogens in alkanes.

ESSAY QUESTIONS (10 MARKS)

31. Describe the Bayer's strains theory.
32. Write a note on preparation and chemical properties of alkanes.
33. State the explain Markonikov's rule and anti-Markonikov's rule with suitable examples.
34. Explain E_1 and E_2 reaction mechanism.
35. Write the preparation of cycloalkanes.
36. Explain the stability of conjugated dienes.
37. Discuss the mechanism of free radical addition in conjugated dienes.
38. Discuss the mechanism 1,4 addition in butadiene?
39. Give a brief note on the preparation of cycloalkanes.
40. What are dienes? How are they classified?Give an example for each type.

UNIT – V

CHOOSE THE CORRECT ANSWER (1 MARKS)

1. An -------- is a sol with the continuous phase gas . Fog is an --------- of water droplets.
    A. Aerosol
    B. Emulsion
    C. Agglomerate

D. Electrophoresis

2. A -------- is a sol of solid particles scattered in a liquid .Foam is a colloidal system in which gas bubbles dispersed in a liquid or solid
    A. Colloidal suspension
    B. Streaming potential
    C. Sedimentation potential
    D. Electrophoresis
3. The ------- of colloids are of maximum importance since the interaction of the particles with each other and the principal phase is of primary concern.
    A. Magnitude
    B. Shape
    C. Surface
    D. Size
4. As the concentration increases to the critical micelle concentration soap particles abruptly collected into spherical structures called---------
    A. Ball
    B. Sphere of ions
    C. Micelles
    D. Dirt particle
5. -------- is the movement of charged surfaces with corresponding ions and water in the stationary liquid induced by an external field.
    A. Colloidal suspension
    B. Emulsion
    C. Sedimentation potential
    D. Electrophoresis
6. ---------is the charged field generated by charged particles moving in a stationary liquid.
    A. Colloidal suspension
    B. Emulsion
    C. Sedimentation potential
    D. Electrophoresis
7. ---------- is the generation of an electric field by locomotion of the liquid along stationary charged surfaces.
    A. Colloidal suspension
    B. Emulsion
    C. Sedimentation potential
    D. Electrophoresis
8. The dispersion medium for the formation of colloids forms a non – continuous phases.
    A. True
    B. False
    C. Compounance
    D. phases
9. A colloidal is a stable combination of particles of one substances that are dissolved or suspended in a second substance
    A. True

B. False
C. Water
D. Gas

10. The formation of micelles takes place only above
    A. Inversion temperature
    B. Boyle's temperature
    C. Critical temperature
    D. Kraft temperature

ANSWER: 1.B, 2.A, 3.C, 4.C, 5.D, 6.C, 7.B, 8.B, 9.A, 10.D.

SHORT QUESTIONS (2 MARKS)

11. What are the types of gels.
12. How does the gel differ from emulsions?
13. How do colloids coagulate?
14. Give the properties of gels?
15. What is colloids?Give examples.
16. How would you show that colloidal particles are electrically charged?
17. What is meant by Gold number?
18. What are macromolecules?
19. Define desalination.
20. Define electrical properties of colloids?

PHARAGRAPH QUESTIONS (5 MARKS)

21. Discuss the types of colloids?
22. Discuss the types of emulsions?
23. Write notes on the stability of colloids?
24. Describe the important properties of gels.
25. Write notes on electrophoresis .Highlights it's applications.
26. How emulsions are prepared? How is an emulsion stability?
27. Explain the preparation and optical properties of colloids.
28. What is meant by number average molecular weight of a macromolecule (M_n).
29. How is the molecular weight of a polymer is determined by light scattering method?
30. Discuss the applications of emulsions.

ESSAY QUESTIONS (10 MARKS)

31. Discuss the properties and applications of emulsions.
32. (i)Light scattering from solutionof particles small compared to wavelength.
    (ii)Light scattering from solution of particles layer compared to wavelength.
33. Discuss the determination ofmolecular weight by osmosis method.
34. Discuss the electrical properties of colloids.
35. Describe condensation methods used for the preparations of colloidal solution.
36. Explain the types,preparation,properties and uses of emulsions.
37. Discuss about Donnanmembrance equilibrium method.

38. Explain osmotic pressure.
39. Expalinkinetic,electrical and optical properties of colloids.
40. Explain dialysis and electrodialysis of methods of colloids.

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