ஸ்ரீ-ல-ஸ்ரீ காசிவாசி சுவாமிநாத சுவாமிகள் கலைக் கல்லூரி

திருப்பனந்தாள் – 612504

S.K.S.S ARTS COLLEGE, THIRUPPANANDAL - 612504

QUESTION BANK

Title of the Paper

GENERAL CHEMISTRY II

Course: I B.Sc (CHE)

Prepared by

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SEMESTERII CORE COURSEII

GENERAL CHEMISTRY – II

UNITI CHEMICAL BONDING

1.1 Ionic bond – formation, variable electrovalency– Lattice energy, Born – Haber Cycle. Covalent bond - formation, variable covalency, maximum covalency, covalent character in ionic bond – Fajans Rule. Polarisation – partial ionic character of a covalentbond.

1.2 VB theory, MO theory – Basic principles of bonding and antibonding orbitals, applications of MOT to H_2 He_2, N_2 & O_2 – molecular orbital sequence, comparison of VB & MOTheories.

1.3 Hybridisation – Formation of $BeCl_2$ &BCl_3. VSEPR theory of simple inorganic molecules–$BeCl_2$,$SiCl_4$,PCl_5,SF_6,IF_7,XeF_6,BF_3&H_2O.

1.4 Hydrogen bonding – Intermolecular &Intramolecular H_2– bondingand consequences.

UNITII CHEMISTRY OF s-BLOCK & ZERO GROUP ELEMENTS AND METALLURGY

2.1 General characteristics of s-block elements – comparative study of elements – alkali metals and their hydroxides, oxides and halides, alkaline earth metals and their oxides, carbonates andsulphates.

2.2 DiagonalrelationshipofLi&Mg,Be&Al,chemistryofNaOH,KI&Mg$(NH_4)PO_4$.

2.3 Metallurgy : Occurrence of metals – concentration of ores – froth floatation, magnetic separation, calcination, roasting, smelting, flux, aluminothermic process, purification of metals – electrolysis, zone refining, van Arkel de-Boer process.

2.4 Zero group elements – position in the periodic table, occurrence, isolation, applications, compounds of Xe – XeF_6 &$XeOF_4$.

UNITIII CHEMISTRY OF BENZENE AND BENZENOIDCOMPOUNDS

3.1 Aromaticity – Huckle's rule - structure of benzene – Benzene-preparation, chemical properties and uses. Aromatic electrophilic substitution reactions and mechanism– Orientationandreactivityinsubstitutedbenzenes.

3.2 Polynuclear aromatic hydrocarbons – Nomenclature, Naphthalene from coal tar and petroleum – Laboratory preparation, Structure of Naphthalene, Aromatic character, Physical properties, Chemical properties, Uses. Mechanism of Aromatic electrophilic substitution – Theory of orientation andreactivity.

3.3 Anthracene, Phenanthrene from coal tar and petroleum, Laboratory preparation, Molecular Orbital structures, Aromatic Characters, Physical Properties,Chemical

properties and uses. Preparation of biphenyls, Physical and Chemical properties and uses.

UNITIV ALKYL AND ARYLHALOGENS

4.1 Nomenclature of haloalkanes – structure - general preparations of haloalkanes - physical and chemical properties anduses.

4.2 Nucleophilic aliphatic substitution reaction mechanisms (S_N1 and S_N2) –Stereochemicalaspects.

4.3 Halobenzenes: Theory of orientation and reactivity - general preparation – properties - uses. Electrophilic and nucleophilic aromatic substitution reaction mechanisms.

UNITV ATOMIC STRUCTURE AND BASIC QUANTUMMECHANICS

5.1. Rutherford's and Bohr's model an atom- Bohr's theory and origin of hydrogen spectrum. Sommerfield's extension of Bohr'stheory.

5.2. Electromagneticradiation-definitionsfor□,uandvelocity.

5.3. Dualism of light -Particle nature of radiation- black body radiation and Planck's quantumtheory,photoelectriceffectandComptoneffectofmatter.

5.4. De Broglie hypothesis and Davisson and Germer experiment. Heisenberg's uncertainty principle. Schrodinger wave equation (Derivation not needed). Physical significance of □and□².

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UNIT - I

Choose the Correct Answer (1 Marks)

1. Formation of ionic bonds in some ionic compounds.
   A. NaCl
   B. K
   C. Cl
   D. Na
2. A alkali metal Cations.
   A. Li $>k^{+}>Cs^{+}>Rb^{+}>Na^{+}$
   B. $Li^{+}>Na^{+}>k^{+}>Rb^{+}>Cs^{+}$
   C. $Na^{+}>Cs^{+}>Li^{+}>Rb^{+}>k^{+}$
   D. $Cs^{+}>Na^{+}>Li^{+}>k^{+}>Rb^{+}$
3. Polarizing power of a cation and polarizability of the ---------
   A. Cation
   B. 50% Cation
   C. 50% anion
   D. Anion
4. Decrease in ionic character
   A. HF $>AlCl_3$
   B. NaF>$Macl_2$
   C. NaF>NaCl
   D. PbF_4 >NaCl
5. Increase in Covalent Character.
   A. NaI>NaCl>LiI
   B. NaCl<NaI<LiI
   C. LiI>NaI>NaCl
   D. NaI<LiI<NaCl
6. The poor in electrical conductivity?
   A. $BeCl_2$
   B. $MgCl_2$
   C. $NaCl_2$
   D. $CaCl_2$
7. Simple inorganic molecules of Linear Compounds.
   A. H_2O
   B. NH_3
   C. SF_6
   D. $BeCl_2$
8. Number of e^{-} in bond order Formula.
   A. ½ (N_a-N_b)
   B. ½ (N_b- N_a)
   C. (N_a- N_b)
   D. (N_b–N_a)
9. The total No.of.electrons in O_2 Molecule.
   A. 8
   B. 10

C. 12
D. 16

10. The electronic configuration of O_2 Molecule.
    A. $1S^2\ 2S^2\ 2P_x^2\ 2P_Y^1\ 2P_z^1$
    B. $1S^2\ 2S^1\ 2P_x^1 2P_y^1\ 2P_z^1$
    C. $1S\ 2S^2\ 2P_x^2\ 2P_y^2\ 2P_z^2$
    D. $1S^2\ 2S^2\ 2P_x\ 2P_y^1\ 2P_Z^1$

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

Short Questions (2 Marks)

11. Define an ionic bond?
12. State Fajan's rule.
13. Define an electrostatic force?
14. Define lattice energy.
15. Define polarizing power and polarisability.
16. Calculate the electronegativity of chlorine on Mulliken's scale.
17. Define hydration energy.
18. What is bond order.
19. Why He_2 does not exist?
20. Define bonding orbitals?

Paragraph Questions (5 Marks)

21. Draw and explain the Molecular Orbital diagram of He_2 molecule.
22. Describe the hybridizations in IF_7 and XeF_6 molecule.
23. State and explain Fajan's rule.
24. Explain the shape of IF_7.
25. Explain the calculation of percentage of ionic character from the electro negativity value.
26. Draw the explain the molecular orbital diagram of CO molecule.
27. Explain Born-Haber Cycle.
28. Explain the Valence bond theory.
29. State and explain VSEPR theory ?
30. Explain SP-hybridisation orbitals.

Essay Type Questions (10 Marks)

31. Draw and explain the Molecular orbital diagram of N_2 and O_2.
32. Explain the inorganic molecules of structure.
33. (i) $BeCl_2$ (ii) IF_7(iii)Pcl_5
34. Describe the hybrid orbital theory.
35. Explain the partial ionic character of a Covalent bond.
36. Describe the comparision between the VB and MO theory.
37. (i) Explain the Mulliken scale of electronegativity and disadvantages.
    (ii) MO theory of bonding and anti-bonding orbitals.
38. Brief explain the $SP, SP^{2,}, SP^3$hybridisation.
39. (i) Explain the partial ionic character of a ∏bond?
    (ii) Characteristics of hybrid orbitals?
40. Brief explain the orbital overlap and types of orbital overlap.

UNIT-II

Choose the correct answer (1 Marks)

1. The atomic number of hydrogen.
   A. 4
   B. 1
   C. 2
   D. 5
2. What are alkali metals elements.
   A. sodium
   B. Aluminium
   C. Plattinum
   D. Silver
3. Complete the reaction and products.
   $Li + 2H_2O \rightarrow ?$
   A. $2LioH + H_2$
   B. LioH
   C. $AlCl_2$
   D. $BeCl_2$
4. Castner process developed by the year
   A. 1986
   B. 1901
   C. 1890
   D. 1805
5. At cathod reaction.
   $2Na^+ + 2e^- \rightarrow ?$
   A. $2Na^+$
   B. Na
   C. 2Na
   D. $2Na^-$
6. Characterstics of caustic soda
   A. White crystalline
   B. Coloured solid
   C. Coloured liquid
   D. White solid.
7. The laboratory preparation (or) reagent.
   A. Na_2Co_3
   B. NaOH
   C. NH_4OH
   D. NO_3
8. If electrolytic of sodium beryllium fluoride compounds
   A. Na_2BeF_4
   B. Na_2Co_3
   C. NH_4OH
   D. BeF_4^-
9. Preparing the compounds from line stone.
   A. Calcium Chloride
   B. Iron
   C. Calcium Oxide

D. Calcium hydroxide

10. Present in the hydrated salt and calcium hydroxide
    A. $Ca(OH)_2$
    B. $CaCo_3$
    C. Cao
    D. $CaCl_2$

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

Short Questions (2 Marks)

11. What is nascent hydrogen? Give its uses.
12. List out the types of cement.
13. How is KBr Prepared? Give its uses.
14. How is Mg (NH_4) po4.6H2O prepared?
15. What is meant by metallurgy?
16. Write note on compounds of alkaline earth metals of sulphate.
17. White short notes on atomic hydrogen.
18. What is meant by setting of cement?
19. What is electron affinity?
20. Write the electronic configuration of the elements.

Paragraph Questions (5 Marks)

21. Explain about the calcination.
22. Explain the diagram diagonal relationship between Be and Al.
23. Discuss the diagonal relationship between Mg and Li.
24. Describe the chemistry of $MgCo_3$.
25. Explain the general characteristics of alkali metals.
26. Give two ores of potassium .Discuss the method of extraction of potassium.
27. How will you prepare lithium.
28. What are the compositions of cement.
29. Preparation of Na_2Co_3 in industrial methods.
30. Explain the Gossage's method(preparation and properties)

Essay Questions (10 Marks)

31. Explain about the resemblance of Li and Mg.
32. How magnesium is extracted ?explain.
33. Explain the methods of extraction ,chemical properties and uses of beryllium.
34. What are the used of sodium hydroxide and sodium carbonate?
35. Write short notes on occluded hydrogen.
36. Write short notes on atomic hydrogen.
37. Brief explain the group –IA of periodic table.
38. (i) Describe the $MgSo_4.7H_2O$.
    (ii) Explain the extraction of calcium.
39. Explain the alkaline earth metal compounds.
40. Brief the notes on industrial preparation of the compounds.

UNIT- III

Choose the correct answer (1 Marks)

1. Aromatic character of Huckel rule.
   A. (4+2n)∏ e^-
   B. (4n+2)∏e^-
   C. (4+2)n∏e^-
   D. 4n∏e^-
2. The no .of ∏ electrons in benzene.
   A. 8
   B. 4
   C. 6
   D. 1
3. If no. of benzene ring is ferrocene compounds.
   A. 2
   B. 5
   C. 6
   D. 1
4. The formation of nitronium ion.
   A. $HoNo_2$
   B. H_3O^+
   C. HSO_4^-
   D. NO_2^+
5. Anthracene molecular formula of benzene ring.
   A. $C_{14}H_{10}$
   B. $C_{12}H_{10}$
   C. C_8H_{10}
   D. $C_{12}H_8$
6. The acylation more catalyst is formed.
   A. Lewis acid
   B. lewis base
   C. Conjugated acid
   D. Conjugated base
7. Which are electron donating groups.
   A. NHR
   B. NO_2
   C. $CoCH_3$
   D. SO_3H
8. Electron withdrawing groups of the benzene ring.
   A. COOH
   B. NR_2
   C. NHR
   D. NH_2
9. The boiling point of benzene is--------
   A. 320 K
   B. 330 K
   C. 353 K
   D. 298 K

10. Naphthalene molecular formula of benzene.
    A. $C_{10}H_8$
    B. C_8H10
    C. C_6H_6
    D. $C_{12}H_8$

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

Short Questions (2 Marks)

11. Define Aromaticity.
12. Write any two chemical properties of benzene.
13. Mention the uses of phenanthracene.
14. Define resonance hybrid.
15. Write the structure of phenanthracene.
16. What is isotopic effect.
17. Define Huckel's rule.
18. Give the uses of biphenyl.
19. Write the physical properties of anthracene.
20. Give the structures of Naphthalene ,anthracene, biphenyl?

Paragraph Questions(5 Marks)

21. Write the reduction and oxidation reactions and uses of naphthalene.
22. How is phenanthracene prepared from coal tar? Write it's properties and uses.
23. How benzene is prepared ?Explain.
24. Discuss the chemical properties of anthracene.
25. Explain the structure of naphthalene.
26. Discuss the sulphonation,reduction and oxidation reactions of phenanthracene.
27. Describe the electrophilic substitution reaction of sulphonation.
28. Describe the Haworth synthesis of anthracene.
29. Explainthe following reaction of phenanthracene?
    (i)Friedel –Craft acylation
    (ii) Nitration
    (iii)Sulphonation.
30. Explain the Diel's -alter reactions.

Essay Questions (10 Marks)

31. (i) Give the physical properties of benzene.
    (ii)Explain any two chemical properties of benzene with it's mechanism.
32. Bring out the preparation and chemical properties of biphenyl.
33. Give any four methods of preparation of anthracene.
34. Explain the mechanism of nitration of benzene in aromatic compounds.
35. How istoluene prepared from benzene ?Give the preparation of toluene.
36. (i) Write a short notes on intermediate complexes mechanism.
    (ii) How will you prepare 9-Bromo anthracene from anthracene?
37. (i) Describe the mechanism of Friedel craft's acylation.
    (ii) Write notes on nitration of anthracene.
38. Discuss the structure of phenanthracene,preparation properties anduses.
39. (i) Explain more easily nitrated than benzene to nitro benzene.
    (ii) Give the preparation of toluene.

40. (i) Explain phenanthrene on oxidation gives which acid?
(ii) Discuss the Haworth's synthesis of naphthalene?

UNIT-IV

Chooser the correct answer (1 Marks)

1. Which of the following reagents can not be usedto prepare are allyl chloride from an alcohol.
   A. HCl+ $ZnCl_2$
   B. $SOCl_2$
   C. NaCl
   D. PCl_5
2. 2-propanol reacts with KBr and concentrated H_2SO_4 to give
   A. 1- Bromopropane
   B. 1,3 Bromopropane
   C. 2-Bromopropane
   D. 2,2 – Dibromopropane
3. Alkyl halides undergoes
   A. Electophilic substitution reaction
   B. Electrophilic addition reaction
   C. Nucleophilic substitution reaction
   D. Nucleophilic addition reaction
4. Isopropyl bromide reacts with alcohol KOH togive.
   A. Propene
   B. Isopropyl alcohol
   C. propane
   D. n-Propyl alcohol
5. Which alkyl halides react must reality by nucleophilic substitution?
   A. CH_3CH_2Cl
   B. CH_3CH_2I
   C. CH_3CH_2Br
   D. CH_3CH_2F
6. Which of the following factor influence whether a reaction .Will proceed by an SN_1,$SN_2$and E_1,E_2 mechanism.
   A. Structure of the alkyl halide
   B. Solvent
   C. Concentration of reagents
   D. Nature of the nucleophile
7. Which compound reacts must rapidlyby an SN_1mechanism.
   A. Methyl chloride
   B. Isopropyl chloride
   C. Ethyl chloride
   D. Tert-butyl chloride
8. Which of the following substituents is an ortho,paradirector and beingdeactivating.
   A. $–NH_2$
   B. –Cl
   C. $–OCH_3$
   D. –OH

9. Which compound undergoes substitution reactionsfaster then benzene?
   A. Nitrobenzene
   B. Acetyl chloride
   C. Isopropyl chloride
   D. Aniline
10. The general character of aryl groups----------
   A. Aromatic
   B. Aliphatic
   C. phenol
   D. alcohol

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

Short Questions (2 Marks)

11. What happens when n-propyl halide is treated with alcoholic KOH?
12. What is saytzeff rule? Give an example.
13. How alkyl halides prepared ? Give are example.
14. How is chloro benzene prepared?
15. What are aryl halides? How are theyprepared?
16. What happenswhen benzyl chloride is treated with aqueous NaOH?
17. Explain why the nitro group acts as a meta-director.
18. How is benzyl chloride prepared.
19. Write a note on ullmann reaction.
20. How will you synthesis benzyl alcohol frombromo benzene?

Paragraph Questions (5 Marks)

21. Discuss the mechanism of nucleophilic substitution reactions of alkyl halides.
22. How will you synthesis of isopropyl bromide from n-propyl bromide
    (i)Alcoholic KOH/Heat
    (ii) HBr(apply markonikov rule)
23. Explain why benzene is more readily nitro than nitro benzene.
24. How will you synthesis DDT from chloro benzene.
25. Explain why aniline is more reactive then benzene in Friedel- craft's reactions.
26. White a notes on directive effect of methyl group.
27. Explain why toluene is more readily nitro then benzene.
28. How will you distinguish between chlorobenzene and n-hexyl chloride.
29. Using simple chemical tests, how could distinguish between the following compounds.
    (i)Bromo benzene
    (ii)Benzyl chloride
    (iii)Vnyl bromide
30. How will you synthesis from alkyl halides and uses.

Essay Questions (10 Marks)

31. Discuss the mechanism of SN_1 and SN_2 reactions of alkyl halides.
32. Explain why benzene undergoes electrophilic substitution reactions ,where asallowes undergo addition reactions.
33. Give the general mechanism of chlorinationof benzene.
34. Write a notes on Friedel-craft's reaction and mechanism.
35. How will you synthesis the following compounds from benzene.

(i)Acetophenone
(ii) Chloro benzene
(iii) Benzophenone
(iv) Benzenehexa chloride

36. Write a notes on :Directivehyluence of nitro group.
37. Explain why phenol is nitrated more readily than benzene.
38. 4 secondary alcohol (a) C_3H_8O, react withthionyl chloride to give compound(b) C_3C_7Cl Compound B reacted with benzene in the presence of aluminium chloride to form (c) C_9H12. Identify A,B and C ,Write equations for all the reactions.
39. Give the general mechanism of electrophilic aromatic substitutions reactions?
40. There isomers (A) ,(B) and (C) of formula C_8H_9 forgive the following compoundson oxidation.
    (i)Gives benzoic acid
    (ii)Gives phthalic acid
    (iii)Gives bp-chloro benzoic acid.
    (A) is optically active . Both (A),and (B),but not(C)gives a white precipitate .When warmed with alcoholic $AgNO_3$ SOLUTION.Identify (A),(B) and(C).

UNIT – V

Choose Correct Answer (1 Marks)

1. If the azimuthal quantum number of an atom is 2, the magnetic quantum number can have values.
   A. 1,0,-1
   B. 2,1,0,-1,-2
   C. 1,-1
   D. 2,1,0
2. According to the Bohr modelof hydrogen atom,the following quantity is quantized.
   A. A linear momentum
   B. Angular momentum
   C. The linear velocity
   D. The angular velocity
3. If the de Broglie wave length of the fourth Bohr of hydrogen atom is $4A^0$,The present of the unit is------
   A. $4A^0$
   B. 4 nm
   C. $16A^0$
   D. 16 nm
4. In the Compton effect, the Compton wavelength is the value corresponding to the scattering angle equal to
   A. 90^0
   B. 180^0
   C. 270^0
   D. 0^0
5. According to the Bohr correspondence principle ,classical mechanics and quantum mechanics gives the same result when,
   A. The system interacts with radiation
   B. The system is placed in the magnetic field

C. The system is placed in the electric field
D. The system are in highly excited quantum state

6. The magnetic of angular momentum of a 3d orbitals(in units of h)is
   A. 3
   B. Root 3
   C. 4
   D. 2
7. The splitting of energy levels in the pleasements of electric filled is called
   A. Zeeman effect
   B. Stark effect
   C. Raman effect
   D. Photo electric effect
8. The atomic orbitals not allowed in quantum theory is
   A. 3f
   B. 4p
   C. 5g
   D. 4d
9. The splitting of energy levels in the plagments of amagnetic field is called-----
   A. Stark effect
   B. Zeeman effect
   C. Raman effect
   D. Photo electric effect
10. The energy level shell is a atom-------
    A. K,L,M,N
    B. N,M,L,K
    C. L,M,N
    D. K,L,M

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

Short Questions (2 Marks)

11. Define velocity.
12. What is electro magneticradiation.
13. Define wavelength?
14. Define Heisenberg's uncertainty principle.
15. What is one Einestein's.
16. What do you understand by dried character of matter?
17. State Einestein's photo electric equation?
18. Calculate the wavelength associated with an electron (mass $9.1x10^{-31}$kg) moving a velocity of 10^{-3}m sec^{-1}($h=6.626x10^{-34}kgm^2sec^{-1}$) .
19. Define Dualism of light.
20. What are natures of radiation?

Paragraph Questions (5 Marks)

21. Explain Bohr's atom model of hydrogen spectrum.
22. Discuss about the Davisson Germer experiment.
23. Brief explain the Schrodinger wave equation.
24. Explain the Rutherford's atom model.
25. Discuss about the planck's quantum theory.

26. Give a brief account on electromagnetic radiation.
27. Explain the Rutherford's atom model.
28. describe the black body radiations.
29. Electronic configuration and orbital diagram.
    (i)B (ii)Na (iii) Zn
30. Explain quantum numbers.

Essay Questions (10 Marks)

31. (i)Write down all the possible values of azimuthal quantum number.
    (ii) Specify the no .of e^- that can be accommodated.
32. Energy level orbitals and orbital splitting .
33. Explain the specify the no. of atomic orbitals and energy level diagram.
34. Brief the notes on protons, electrons and neutrons.With in example
35. What is the total possible no .of emission lines ,when the excited electrons of a H atom in n=6 drops all the second excited excited state?
36. Explain the sommerfield's extension of Bohr's theory.
37. Calculate the De-broglie wavelength of a body of mass 1mg moving with avelocity of$10ms^{-1}$.
38. Write notes on Compton effect and matter,Give in example
39. Explain Bohr's theory of hydrogen spectrum.
40. Write the notes particle nature of radiatipons. Give examples.

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