

# KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

[Re-accredited by NAAC with 'A' Grade 3.64 CGPA-(3<sup>rd</sup> Cycle)]

Coimbatore – 641 029



DEPARTMENT OF CHEMISTRY (UG)

QUESTION BANKS

## SUBJECTS

S.No	Name of the Subject
1.	Core Chemistry Paper - I
2.	General Chemistry
3.	Chemical Industry
4.	Inorganic Chemistry-I
5.	Organic Chemistry- I
6.	Organic Chemistry-II
7.	Physical Chemistry - I
8.	Polymer Chemistry
9.	Water Chemistry
10.	Spectroscopy And Chromatographic Techniques
11.	Allied Chemistry Physics

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## **QUESTION BANK**

**Prepared by**

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**DEPARTMENT OF CHEMISTRY (UG)**

**Core Chemistry Paper - I**

**Subject code: 18UCH101**

**Multiple Choice Questions**

**UNIT -I  
SECTION-A**

- The process of extracting metals from their ores is called  
A] Metallurgy      B] Froth floatation      C] Smelting      D] Gravity separation
- The oil which is used for mechanical floatation  
A] Neem oil      B] Pine oil      C] Coconut oil      D] Crude oil
- The two common techniques of gravity separation are  
A] Hydraulic classifier; Wilfley table      B] Stokes and Wilfley table  
C] Stokes and Newton's law      D] Hydraulic classifier and Newton's law
- Gravity separation is used for  
A] Coal      B] Natural gas      C] Petroleum      D] Bio gas
- Wilfley table is  
A] Iron table      B] Wooden table      C] Glass table      D] Steel table
- Iron ores on calcinations give anhydrous  
A] Iron oxide      B] Zinc oxide      C] Sulphur di oxide      D] Carbon monoxide
- Aluminothermic reactions are which chemical reactions  
A] Endothermic      B] Hydrophobic      C] Exothermic      D] Hydrophilic
- The technique which is used for preparing extremely pure metals is  
A] Electro refining      B] Zone refining      C] Calcination      D] Roasting
- In electro refining, a solution of a suitable salt of the metal is used as  
A] electrolyte      B] anode      C] cathode      D] none of the above
- Van-Arkel method is otherwise known as  
A] Zone refining      B] Vapour phase refining      C] Electro refining      D] Chrome plating

11. Conversion of coal to coke is called  
A] Carbonization    B] Calcination    C] Roasting    D] Sintering
12. Temperature required to convert sulphur into oxide partially or completely at which temperature  
A] approximately 1300    B] approximately 1200    C] approximately 1000-1200  
D] approximately 900
13. Zone refining is carried out in which atmosphere  
A] Inert    B] Exert    C] Compressed    D] Both (a) and (b)
14. The foam separates out and in due course, settles down this process is known as  
A] Froth floatation    B] Gravity separation    C] Magnetic separation    D] Smelting
15. Metallic sulphides for instance, are wetted by certain oils like pine oil and not by  
A] Alcohol    B] Ether    C] Water    D] Ester
16. Floatation is a selective  
A] Separation process    B] Addition process  
C] Diffusion process    D] Reduction process
17. Floatation process is used in which industry  
A] Refining    B] Mining    C] Steel    D] Fertilizer
18. Froth floatation is achieved when particles are separated based on their  
A] Surface potential    B] Viscosity    C] Surface tension    D] Potential energy
19. In hydraulic classifier, a powerful stream of water is introduced from  
A] Top of the reservoir    B] in front of the reservoir  
C] Bottom of the reservoir    D] Side of the reservoir
20. Ferromagnetic ores, as of iron that are affected by a  
A] Impurities    B] Magnet    C] ions    D] both (a) and (b)

**UNIT -I**  
**SECTION- B**

1. Write down the principles of floatation?
2. What are the applications of floatation?

3. What is gravity separation?
4. Write down the applications of aluminothermic process?
5. Explain refining of crude metal with a diagram?
6. What is a furnace?
7. Explain with diagram :  
(a) A Reverberatory furnace (b) a blast furnace?
8. What is metallurgy and write down the uses of metallurgy?
9. What is calcinations?
10. Explain the process of roasting?

**UNIT - I**  
**SECTION-C**

1. Describe mechanical floatation process?
2. Explain the two methods of gravity separation?
3. Write about alluminothermic process with application?
4. Explain zone refining?
5. What is electro refining? Give some examples with its explanation
6. Explain: (a) calcination (b) Roasting
7. Explain metallurgy with its little process?
8. What is furnace? Explain with its types?
9. Explain froth floatation process with its application?
10. Explain Van-Arkel method?

**UNIT – II**  
**SECTION - A**

1. The structural affixes-----indicates the 2 groups occupying adjacent position.  
(a) Cis                                      (b) trans                                      (c) closo                                      (d) mer
2. 'Sym' structural affixes indicates  
(a) asymmetric                              (b) symmetric                              (c) ring structure                              (d) chain structure
3. The IUPAC name for the compound  $\text{KClO}_3$   
(a) potassium chloride                              (b) potassium chlorate  
(c)potassium chloride trioxygen                              (d)potassium trioxochlorite
4. The polyatomic cations are named by adding the suffixes  
(a)-onium                              (b) –ium                              (c) –ate                              (d) –ide
5. The IUPAC name of  $\text{C}_3\text{H}_5\text{NH}^+$  cation is

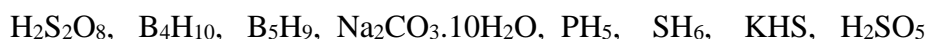
- (a) pyridine ion      (b) pyridinium ion      (c) pyridonium ion      (d) pyridinate ion
6. The monoatomic anions ended with  
 (a) -ide      (b) -ode      (c) -ium      (d) -onium
7. The IUPAC name of  $\text{NO}_2^-$  ion is  
 (a) nitrite      (b) dioxonitrate (1-)      (c) nitrogendioxide      (d) nitrous oxide
8. The trivial name of  $\text{HCO}_3^-$  ion is  
 (a) carbonic acid      (b) hydrogen trioxocarbonate  
 (c) hydrogen carbonate      (d) carbonate
9. The trivial name for  $\text{NCS}^-$  ion is  
 (a) Thiohcyanate-N      (b) Thiocyanate-S      (c) Thiocyanide-N      (d) Thiocyanide-S
10. Polyatomic anions derived from neutral molecules by  
 (a) the loss of one or more electrons      (b) the gain of one or more electrons  
 (c) the loss of one or more protons      (d) the loss of one or more protons
11. The molecules of same acid is condensed to give  
 (a) Cations      (b) anions      (c) anhydrides      (d) isopoly cations
12. Poly atomic cations obtained by adding protons to mono atomic anions are named by adding -----to the root name of the anion.  
 (a) onium      (b) ane      (c) ene      (d) hetpa
13. The IUPAC name for  $\text{H}_2\text{SO}_3$   
 (a) sulphurous acid      (b) sulphuric acid      (c) Hydrogen sulphite      (d) hydrogen sulphate
14. According IUPAC nomenclature the name of  $\text{HNO}_3$  is  
 (a) nitric acid      (b) trioxo nitric acid      (c) hydrogen trioxonitrate(-1)      (d) hydrogen nitrate
15. Mono atomic anions are named by adding ----- to the stem name of the element.  
 (a) ide      (b) ido      (c) simple salt      (d) hydrogen
16. The structural formulae of potassium hydrogen sulphide is  
 (a)  $\text{KHSO}_4$       (b)  $\text{K}_2\text{SO}_4$       (c) KHS      (d)  $\text{K}_2\text{HS}$
17. If more than two oxy acids of an element in different oxidation states, the prefix used is --  
 (a) -ane      (b) hypo      (c) -ate      (d) -ete
18. The boron hydrides are designated as  
 (a) boranes      (b) borenes      (c) borates      (d) hydranes
19. In nidoboranes the prefixes 'nido' indicates  
 (a) a ring structure      (b) chain structure      (c) a nest like structure      (d) closed structure
20. Which one of the hydride is used as a reducing agent?  
 (a)  $\text{Li}_2\text{H}$       (b)  $\text{Cr}_2\text{H}$       (c) borates      (d)  $\text{NaBH}_4$

**UNIT – II**  
**SECTION - B**

1. Name the various affixes used in inorganic nomenclature. Explain it.
2. Name any ten structural affixes used in inorganic nomenclature. Specify the structures which they signify.
3. Discuss the use of enclosing marks, Arabic numerals in inorganic nomenclature by giving suitable examples.
4. Name the following species according to IUPAC nomenclature.  
(i)  $\text{PH}_4^+$  (ii)  $\text{NO}_2$  (iii)  $\text{AsH}_4^+$  (iv)  $\text{ClO}_3^-$  (v)  $\text{NO}$
5. Discuss with examples the IUPAC nomenclature of Heteropolyatomic anions.
6. Name the following compounds according to the IUPAC nomenclature  
(i)  $\text{H}_2\text{S}_2\text{O}_8$  (ii)  $\text{NH}_3\text{BF}_3$  (iii)  $\text{AlCl}_3$  (iv)  $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$  (v)  $3\text{CdSO}_4 \cdot 8\text{H}_2\text{O}$
7. How the addition compounds and boronhydrides are named according to the IUPAC guidelines?
8. What are the rules followed to name the isopolyanions? Explain with suitable example.
9. Explain with suitable examples for writing the element.
10. How the radicals and boronhydrides are named according to the IUPAC guidelines?

**UNIT – II**  
**SECTION - C**

1. What are the rules are followed for writing the symbols of element and formulae of inorganic compounds?
2. Write a short on multiplying affixes and structural affixes.
3. How homopolyatomic anions and heteropolyatomic anions are named by using IUPAC nomenclature?
4. Name the following species according to IUPAC nomenclature  
 $\text{IH}^{2+}$ ,  $\text{SH}^{3+}$ ,  $\text{AsH}^{4+}$ ,  $\text{S}_2^{2-}$ ,  $\text{C}_2^{2-}$ ,  $\text{NO}$ ,  $\text{NO}_2$ ,  $\text{S}_2\text{O}_5$
5. How acids and oxoacids are named by using IUPAC nomenclature?
6. Discuss the nomenclature of addition compounds, salt like compounds and boron hydrides with suitable examples.
7. Name the following compounds according to IUPAC nomenclature.





8. Discuss the following in inorganic nomenclature by giving suitable examples:  
Multiplying affixes, enclosing marks, numerals and italic letters.
9. Explain acid and hydrogen nomenclature with suitable example.
10. Discuss the nomenclature of monoatomic cations, anions and homopolyatomic cations, anions with suitable examples.

### UNIT-III

#### SECTION –A

1. Which one of the following conformation is most stable conformation in ethane?  
(a) Staggered (b) skew (c) eclipsed (d) fully eclipsed
2. According to Bayer – Strain theory which one of the following cycloalkane is least stable?  
(a) cyclopropane (b) cyclobutane (c) cyclopentane (d) cyclohexane
3. What is the geometry of carbon in hydrocarbon?  
(a) linear (b) tetrahedral (c) square pyramidal (d) square planar
4. The hybridization of carbon methane is  
(a)  $sp^3$  (b)  $sp^2$  (c)  $sp$  (d) square planar
5. The general formula of alkane is  
(a)  $C_nH_{2n+2}$  (b)  $C_nH_{2n}$  (c)  $C_nH_{2n-2}$  (d)  $C_nH_{2n+4}$
6. Alkanes are also known as  
(a) saturated hydrocarbons (b) paraffins (c) unsaturated hydrocarbons  
(d) none of these
7. Which one of the following conformation is most stable conformation in n-butane?  
(a) Anti (b) Gauch (c) eclipsed (d) fully eclipsed
8. Which one of the following statement is not correct regarding the reactivity of alkanes?  
(a) Alkanes are generally inert (b) alkanes are soluble in non-polar solvent  
(c) alkanes react with acids and bases (d) alkanes react with halogens upon ignition
9. The compound with highest boiling point among the following is  
(a) n-butane (b) n-hexane (c) alkynes (d) acids
10. Decomposition of alkane is known as  
(a) degradation (b) reduction (c) cracking (d) oxidation
11. Alkenes on reduction results which one of the following compound?  
(a) alkenes (b) alkanes (c) Isoprene (d) vinyl chloride
12. In which of the following the bond angle strain is maximum  
(a) cyclopentane (b) cyclopropane (c) cyclobutane (d) cyclohexane
13. How many isomers are possible in 2-methylpropane  
(a) 2 (b) 3 (c) 4 (d) 5
14. Alkanes are the simplest class of  
(a) Inorganic compound (b) Organic Compound  
(c) Organometallic compound (d) Co-ordination compound
15. Alkanes are soluble in  
(a)  $CCl_4$  (b)  $H_2O$  (c) petroleum ether (d) ether
16. Kolbe electrolytic method may be used to prepare

- (a) Alkanes (b) Alkenes (c) Alkynes (d) All the above
17. The hybridization of carbon acetylene is  
(a) SP (b) SP<sup>2</sup> (c) SP<sup>3</sup> (d) square planar
18. Secondary alkyl halides when reduced by LiAlH<sub>4</sub> give  
(a) alkenes (b) alkanes (c) amines (d) carboxylic acids
19. The first fractional product of petroleum is  
(a) petroleum ether (b) kerosene (c) benzene (d) diesel
20. The most unstable geometry of butane is  
(a) partially eclipsed (b) fully eclipsed (c) Gauch (d) anti

### UNIT-III

#### SECTION –B

1. Write any two methods of preparation of cyclopentane.
2. Discuss the stability of cycloalkanes.
3. What is the application of Wurtz synthesis?
4. How will you prepare nitro propane and propane sulfonic acid from propane?
5. Write the preparation of cyclopropane and cyclobutane.
6. Discuss Bayer – Strain theory.
7. Explain the isomerism exhibited in alkanes. Write any two example.
8. Discuss primary, secondary and tertiary structure of alkanes with example.
9. Write notes on substitution reactions in cycloalkanes.
10. How are alkanes prepared from alkenes and alkynes.

### UNIT-III

#### SECTION –C

1. Write short notes on the conformations in n-butane with diagram.
2. Discuss the chemical properties of cycloalkanes.
3. How will you prepare alkanes from corresponding corresponding carboxylic acids?
4. What are the chemical reactions possible in alkanes?
5. Explain the possible conformations in ethane with diagram.
6. Write the chemical properties of cycloalkanes.
7. Explain the isomerism exhibited in alkanes. Write any five examples.
8. Write IUPAC nomenclature for naming alkanes.
9. Write the methods of preparation of alkanes with suitable examples.
10. Discuss the free radical mechanism of chlorination of methane.

**UNIT - IV**  
**SECTION A**

1. de Broglie equation is  
(a)  $\lambda = h/mv$  (b)  $\lambda = m v/h$  (c)  $\lambda = h m v$  (d)  $\lambda = h m/v$
2. "It is impossible to determine simultaneously the position and velocity with accuracy of a small particle like electron". This statement is  
(a) Heisenberg's uncertainty principle (b) de Broglie principle  
(c) Planck's law (d) Aufbau's principle
3. In Schrödinger's wave equation, the symbol represents the  
(a) wavelength of the spherical wave (b) amplitude of the spherical wave  
(c) frequency of the spherical wave (d) none of these
4. The energy of electron in an atomic orbital is always \_\_\_\_\_.  
(a) different (b) zero (c) infinite (d) same
5. An orbital is the space around the nucleus where the probability of finding electron is  
(a) always zero (b) maximum (c) minimum (d) always infinite
6. The Principal quantum number 'n' represents  
(a) average size of the electron cloud (b) average energy of the electron  
(c) average distance of the electron from the nucleus (d) all of the above
7. The Principal quantum number is related to the  
(a) orbital angular momentum (b) size and shape of the orbital  
(c) orientation of the orbital (d) average size of the orbital
8. The quantum number that defines the shape of the orbital occupied by the electron is  
(a) principal quantum number (b) azimuthal quantum number  
(c) magnetic quantum number (d) spin quantum number
9. The total number of sublevels in each principal level is equal to  
(a) spin quantum number (b) magnetic quantum number  
(c) azimuthal quantum number (d) principal quantum number
10. The quantum number which accounts for the splitting up of spectral lines (Zeeman effect) is  
(a) principal quantum number (b) azimuthal quantum number  
(c) magnetic quantum number (d) spin quantum number
11. The energy needed to remove a single electron (most loosely bound) from an isolated gaseous atom is called  
(a) ionisation energy (b) electron affinity (c) kinetic energy (d) electronegativity
12. Generally speaking, the ionisation energies increase when we move  
(a) from left to right in the periodic table (b) from top to bottom in a group  
(c) from right to left in the periodic table (d) none of these
13. The ionisation energy of Boron ( $Z = 5$ ) is lesser than that of Beryllium ( $Z = 4$ ). It is because  
(a) Be has an incomplete 2s orbital (b) Be has two pairs of electrons  
(c) 2p orbital is already higher in energy than 2s orbital (d) none of the above
14. A neutral atom can accept an electron to form an anion. This process involves

- (a) loss of energy (b) gain of energy (c) no change in energy (d) none of these
15. Electron affinity is expressed in  
 (a)  $\text{g mol}^{-1}$  (b)  $\text{kJ mol}^{-1}$  (c)  $\text{cal g}^{-1}$  (d)  $\text{kJ g}^{-1}$
16. When we move from left to right across a period, the electron affinity in general  
 (a) remains the same (b) decreases (c) increases (d) becomes zero
17. The attraction exerted by an atom on the electron pair bonding it to another atom by covalent bond is called  
 (a) ionisation energy (b) electron affinity (c) electro negativity (d) none of these
18. The most electronegative element in the periodic table is  
 (a) caesium (b) chlorine (c) fluorine (d) barium
19. The values of electro negativities \_\_\_\_\_ as we move from left to right in a period.  
 (a) increase (b) decrease (c) remain the same (d) none of these
20. The electron affinities \_\_\_\_\_ from top to bottom in a group  
 (a) increase (b) decrease (c) remain the same (d) none of these

#### UNIT - IV SECTION B

1. (a) What do you understand by the dual character of matter? Derive de Broglie's equation. How is it verified?  
 (b) A particle having a wavelength  $6.6 \times 10^{-4}$  cm is moving with a velocity of  $10^6$  cm  $\text{sec}^{-1}$ . Find the mass of the particle. Planck's constant =  $6.62 \times 10^{-27}$  erg sec
2. State and discuss Heisenberg's uncertainty principle
3. Discuss the following :  
 (a) Hund's Rule of Maximum multiplicity.  
 (b) Pauli's Exclusion Principle
4. What is the wavelength associated with a particle of mass 0.1 g moving with a speed of  $1 \times 10^5$  cm  $\text{sec}^{-1}$   
 ( $h = 6.6 \times 10^{-27}$  erg sec)
5. State Pauli's exclusion principle. Based on this principle show that the maximum number of electrons that can be accommodated in an orbit is 8 when  $n = 2$ .
6. State Pauli's exclusion principle and show that the maximum number of electrons in a given shell is  $2n^2$  where  $n$  is the principal quantum number of the shell.
7. Write Schrödinger wave equation.
8. What are quantum numbers? Mention all values of different quantum numbers when  $n = 2$ .
9. Discuss probability distribution curves for  $s$  and  $p$  orbitals.
10. A body moving with a speed of  $100$  m  $\text{sec}^{-1}$  has a wavelength of  $5 \times 10^{-36}$  m. Calculate the mass of the body. ( $h = 6.6 \times 10^{-34}$  kg  $\text{m}^2 \text{sec}^{-1}$ ).

**UNIT - IV**  
**SECTION C**

1. Define or explain the following terms :
  - A. Heisenberg's uncertainty principle
  - B. Schrödinger's wave equation
  - C. Zeeman effect
  - D. Pauli's exclusion principle
2. What do you mean by the 'ionization potential' of an element? Why the first ionization potential of an element is less than the second ionization potential? How does the ionization potential of an element vary with atomic volume?
3. (a) Write a note on Heisenberg's uncertainty principle. How this principle goes against Bohr's theory?  
(b) What is ionisation energy? What are the factors which affect the ionisation energy of an element?
4. Write short notes on :
  - (a) Pauli's exclusion principle
  - (b) Uncertainty principle
  - (c) Photoelectric effect
  - (d) Aufbau principle
5. Discuss the following :
  - (i) Wave nature of an electron
  - (ii) Significance of wave function
6. Calculate the momentum of a particle which has a de Broglie's wavelength of 0.1 nm.
7. What are postulates of Quantum Mechanics?
8. Write Schrödinger's wave equation for a single electron atom.
9. (a) Deduce de Broglie's relation for a matter wave and explain the terms involved in it.  
(b) Draw and explain the angular probability distribution curve for 1s electron.
10. (a) Write the electronic configuration of the elements with atomic numbers : 10, 20, 29, 49 and 63  
(b) Write Hund's rule of maximum multiplicity.  
(c) What do you understand by wave function?

**UNIT V**

1. The compressibility factor for an ideal gas is
  - a) 1.5
  - b) 1
  - c) 2
  - d)  $\infty$
2. On increasing temperature, the fraction of total gas molecule which has acquired most probable velocity will
  - a) increase
  - b) decrease

- c) remains constant  
d) cant say without knowing pressure
3. The value of Vander Waals constant ' a ' is maximum for  
a) helium  
b) nitrogen  
c) CH<sub>4</sub>  
d) NH<sub>3</sub>
4. The temperature at which a real gas obeys the ideal gas laws at fairly wide range of pressure is  
a) Critical temperature  
b) Inversion temperature  
c) Boyle's temperature  
d) Reduced temperature
5. If a gas is expanded at constant temperature  
a) The pressure increases  
b) The kinetic energy of the molecules remains the same  
c) The kinetic energy of the molecules decreases  
d) The number of molecules of the gas increases
6. In the equation of state of an ideal gas  $PV = nRT$ , the value of the universal gas constant would depend only on  
a) The nature of the gas  
b) The pressure of the gas  
c) The units of the measurement  
d) None of these
7. The value of universal gas constant depends upon  
a) temperature of the gas b) volume of the gas  
c) number of moles of gas d) none of these.
8. Which of the following is not true about ideal gas molecules?  
a) They have negligible size  
b) They do not have attractive forces  
c) They do not apply pressure  
d) They move in random motion
9. Which of the following term does not involve in ideal gas law?  
a) Pressure  
b) Volume  
c) Temperature  
d) Time
10. What is the shape of a P-T curve for ideal gas?  
a) Straight line  
b) Parabolic  
c) Hyperbolic  
d) Ellipse

11. What is the density of O<sub>2</sub> at 27°C with pressure 1 atm?
- 1.1 g/L
  - 1.3 g/L
  - 1.5 g/L
  - 1.7 g/L
12. Liquefaction of gases cannot be achieved by
- cooling
  - compressing the gas at all temperatures
  - compressing the gas as well as cooling
  - compressing the gas below critical temperature
13. A pressure of 0.101325 bar when expressed in atmospheres represents
- 0.01 atm
  - 1 atm
  - 0.1 atm
  - 10 atm
14. The value of universal gas constant depends upon
- temperature of the gas
  - volume of the gas
  - number of moles of gas
  - none of these
15. The bottle of liquid ammonia is cooled before opening the seal so as to lower its
- vapour pressure
  - surface tension
  - viscosity
  - extent of H-bonding
16. Under which of the following conditions, the real gases will approach the behaviour of ideal gas?
- 15 atm, 200 K
  - 0.5 atm, 500 K
  - 1 atm, 273 K
  - 15 atm, 500 K
17. The magnitude of van der Waals forces depends upon
- molecular size
  - number of electrons in the molecule
  - polarisability of molecules
  - all the above factors
18. Mathematical expression that describes Boyle's law is
- $PV = \text{constant}$
  - $V * \text{constant} = P$
  - $P * \text{constant} = V$
  - $V/P = \text{constant}$

19. Real gases deviate from ideal behaviour because, the molecules

- a) are colourless
- b) attract each other
- c) contain covalent bonds
- d) all the above

20. Barometer is invented by

- a) Galileo
- b) Robert Boyle
- c) Charles
- d) Torricelli

**UNIT- V**  
**Section B**

1. What are the characteristics of gases?
2. Give the parameters of the gases and explain.
3. Give the following gas laws.
  - i) Boyle's law
  - ii) Charle's laws
4. Give the following gas laws.
  - i) Gay Lussac's law
  - ii) Avagadro's laws
5. By using various gas laws derive ideal gas equation and give the terms involved in it.
6. Derive Vander Waals equation.
7. Explain the laws governing the states of matter.
8. What is liquefaction of gases? Explain.
9. A gas occupies 300 ml at 27°C and 730 mm pressure what would be its volume at STP.
10. Calculate the temperature at which 28g N<sub>2</sub> occupies a volume of 10 litre at 2.46 atm

**UNIT- V**  
**Section C**

1. Give the derivation for any three gas laws.
2. Explain the assumptions of kinetics of molecular theory of gases.
3. Derive the kinetic gas equation.
4. Explain the methods of liquefaction of gases.
5. Give the Maxwell distribution law for molecular velocity.
6. How will you calculate most probable velocity and average velocity?



7. Derive an equation for the calculation of root mean square velocity.
  8. Based on the laws of gas how ideal gas equation is derived? Explain.
  9. Enunciate the collision properties of gases and explain the following
    - i) Collision diameter
    - ii) collision frequency
  10. Give the various parameters involved in liquefaction of gases. Explain their effect on the state of the matter.
- 

## Key Answers

### UNIT- I

1. A] Metallurgy
2. B] Pine oil
3. A] Hydraulic classifier; Wilfley table
4. C] Petroleum
5. A] Iron table
6. B] Zinc oxide
7. C] Exothermic
8. A] Electro refining
9. A] electrolyte
10. A] Zone refining
11. A] Carbonization
12. A] approximately 1300
13. A] Inert
14. A] Froth floatation
15. B] Ether
16. A] Separation process
17. A] Refining
18. C] Surface tension

19. C] Bottom of the reservoir

20. A] Impurities

## UNIT – II

1. (a) Cis
2. (b) symmetric
3. (b) potassium chlorate
4. (a)-onium
5. (b)pyridinium ion
6. (a) –ide
7. (a)nitrite
8. (c) hydrogen carbonate
9. (a)Thiohcyanate-N
10. (a) the loss of one or more electrons
11. (c) anhydrides
12. (a) onium
13. (a) sulphurous acid
14. (d) hydrogen nitrate
15. (a) ide
16. (c) KHS
17. (b) hypo
18. (a) boranes
19. (c) a nest like structure
20. (d)  $\text{NaBH}_4$

## UNIT-III

1. (a) Staggered
2. (c) cyclopentane
3. (b) tetrahedral
4. (a)  $\text{SP}^3$
5. (a)  $\text{C}_n\text{H}_{2n+2}$
6. (a) saturated hydrocarbons
7. (a) Anti
8. (b) alkanes are soluble in non-polar solvent

9. (d) acids
10. (c) cracking
11. (b) alkanes
12. (b) cyclopropane
13. (a) 2
14. (b) Organic Compound
15. (d) ether
16. (a) Alkanes
17. (a) SP
18. (b) alkanes
19. (b) kerosene
20. (b) fully eclipsed

#### UNIT – IV

1. (a)  $\lambda = h/mv$
2. (a) Heisenberg's uncertainty principle
3. (b) amplitude of the spherical wave
4. (d) same
5. (b) maximum
6. (d) all of the above
7. (d) average size of the orbital
8. (b) azimuthal quantum number
9. (d) principal quantum number
10. (c) magnetic quantum number
11. (a) ionisation energy
12. (a) from left to right in the periodic table
13. (b) 2p orbital is already higher in energy than 2s orbital
14. (a) loss of energy
15. (b)  $\text{kJ mol}^{-1}$
16. (c) increases
17. (d) electro negativity
18. (c) fluorine
19. (a) increase
20. (b) decrease

#### UNIT -V

1. b) 1
2. b) decrease
3. d)  $\text{NH}_3$

4. c) Boyle's temperature
5. b) The kinetic energy of the molecules remains the same
6. c) The units of the measurement
7. d) none of these
8. c) They do not apply pressure
9. d) Time
10. a) Straight line
11. b) 1.3 g/L
12. d) compressing the gas below critical temperature
13. c) 0.1 atm
14. b) volume of the gas
15. a) vapour pressure
16. b) 0.5 atm, 500 K
17. d) all the above factors
18. a)  $PV = \text{constant}$
19. b) attract each other
20. d) Torricelli

KASC-Chemistry (UG)

**KONGUNADU ARTS AND SCIENCE COLLEGE**  
**(AUTONOMOUS)**  
**COIMBATORE-641 029**



**QUESTION BANK**

**Prepared by**  
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**DEPARTMENT OF CHEMISTRY (UG)**

KASC-Chemistry (UG)

**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)  
COIMBATORE**

**Name of the Degree: B. Sc.**

**Name of the Subject: CORE PAPER -III GENERAL CHEMISTRY**

**Subject Code:**

**UNIT I**

**SECTION - A (1 Marks)**

- 1) The number of moles of a solute per kilogram of the solvent is called  
a) Formality    b) Normality    c) Molarity    d) Molality
- 2) The normality of a solution of sulphuric acid is N/10. Its molarity will be  
a) M/5    b) M/10    c) M/20    d) M/40
- 3) The acid which cannot be used in  $\text{KMnO}_4$  titration is  
a)  $\text{H}_2\text{SO}_4$     b)  $\text{HNO}_3$     c)  $\text{HCl}$     d) Both (b) and (c)
- 4) Equivalent weight of ferrous sulphate is  
a) 178    b) 51.6    c) 392    d) 278
- 5) A solution of known concentration is the definition of a  
a) Buffer solution    b) Neutral solution    c) Standard solution    d) Saturated solution
- 6) Volume of 0.5 M NaOH required to neutralize 50 ml of 0.2 M HCl is  
a) 20 ml    b) 10 ml    c) 50 ml    d) 100 ml
- 7) Back titration is used if the reaction is  
a) very fast    b) very slow    c) moderate    d) does not take place
- 8) What is the value of the ionization constant for water at  $25^\circ\text{C}$  ?  
a) 7.0    b) 14.0    c)  $1.0 \times 10^{-7}$     d)  $1.0 \times 10^{-14}$
- 9) A solution is made by dissolving some salt in a beaker of water. The salt is referred to as the  
a) Solute    b) filtrate    c) solution    d) solvent
- 10) Primary standards are typically used in titration to determine an  
a) Unknown concentration    b) Known concentration  
c) Equivalent weight    d) Molecular weight
- 11) Which of the following is not an acid- base indicator?  
a) Methyl orange    b) Phenolphthalein    c) Litmus    d)  $\text{KMnO}_4$
- 12) The colour of methyl orange in basic solution is  
a) Yellow    b) Red    c) Orange    d) Colourless
- 13) Equivalent mass of NaOH is  
a) 20    b) 23    c) 40    d) 50

- 14) Which of the following is not rinsed?  
 a) Burette            b) Pipette            c) Titration flask            d) All
- 15) Which of the following is a primary standard?  
 a) NaOH            b) HCl            c)  $\text{KMnO}_4$             d) Mohr's salt
- 16) Which of the following is a secondary standard?  
 a)  $\text{K}_2\text{Cr}_2\text{O}_7$             b)  $\text{KMnO}_4$             c) Mohr's salt            d) Anhyd.  $\text{Na}_2\text{CO}_3$
- 17) The relation between normality and molarity of an acid is  
 a) Normality = Molarity  $\times$  Basicity            b) Molarity = Normality  $\times$  Basicity  
 c) Normality = Molarity  $\times$  Acidity            d) Molarity = Normality  $\times$  Acidity
- 18) Number of gram equivalents of a substance in one litre of the solution is called  
 a) Strength            b) Equivalent mass            c) Normality            d) Molarity
- 19) Which of the following can be used to detect the end point of titration?  
 a) pH meter            b) Potentiometer            c) Acid- base indicator            d) All
- 20) The indicator used in the titration of a weak acid with a strong base is  
 a)  $\text{KMnO}_4$             b) Phenolphthalein            c) Methyl orange            d) Litmus

## UNIT I

### SECTION B (5 marks)

- 1) What is titration error? How can it be minimized?
- 2) How would you prepare 100 ml of 0.1N HCl from:
  - i) concentrated 12 M HCl            ii) a solution of 1.5 N HCl
- 3) What are the characteristics of a 'primary standard' in volumetric analysis?
- 4) Distinguish between: i) normal solution and formal solution ii) one equivalent and one milliequivalent of an oxidant
- 5) Suggest an indicator for the titration of: i) hydrochloric acid with sodium carbonate ii) oxalic acid with sodium hydroxide iii)  $\text{Fe}^{2+}$  with potassium permanganate.
- 6) Mention some important acid-base indicators and their changes in the acidic and basic media.
- 7) What are the precautions to be made to avoid errors in titration?
- 8) What is the role of indicators in acid - base titration?
- 9) Discuss the action of phenolphthalein and methyl orange in the titration.
- 10) Explain the terms: Molarity, molality, normality, mole fraction.

**UNIT I**  
**SECTION C (8 marks)**

- 1) Explain: i) the end point may not be the equivalence point in a titration. ii) Weak acids or bases are not used as titrants.
- 2) Explain about the types of titrations involved in the volumetric analysis.
- 3) Explain in detail: i) requirements of a primary standard ii) preservation of standard solution.
- 4) Calculate the normality of solution containing 3.15g of hydrated oxalic acid ( $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ ) in 250 ml of solution. (Mol. mass = 126)
- 5) Calculate the molality of an aqueous solution containing 3.0g of urea (mol.mass= 60) in 250 g of water.
- 6) Explain the following terms with example: percentage solution, weight composition, volume composition.
- 7) Write about neutralization and precipitation titration.
- 8) Explain the term, "colour change interval" of an acid base indicator.
- 9) Mention the types of chemical reaction that can be used as the basis of titrimetric analysis. What requirements must be satisfied by these reactions for using these in titrimetry?
- 10) You have a solution of 0.61 M HCl. For a certain reaction you need 0.05 mole of HCl. How much HCl solution would you take?

**UNIT -II**  
**Section A (one mark)**

1. Oxalic acid is obtained from  
(a) Sucrose (b) Glucose (c) Fructose (d) Starch
2. IUPAC name for Oxalic acid is  
(a) Diethanoic acid (b) ethanoic acid (c) ethane- 1,2- dioic acid  
(d) ethene- 1,2- dioic acid
3. Which of the following gives oxalic acid on oxidation?  
(a) Glycerol (b) Glycol (c) Ethyl alcohol (d) Propylene glycol
4. Oxalic acid, when heated with concentrated  $\text{H}_2\text{SO}_4$  gives  
(a)  $\text{H}_2\text{O}_2$  and  $\text{CO}_2$  (b)  $\text{CO}_2 + \text{CO} + \text{H}_2\text{O}$  (c)  $\text{H}_2\text{O}_2 + \text{CO}$  (d)  $\text{CO}_2 + \text{H}_2\text{S}$
5. In adipic acid  $\text{HOOC}(\text{CH}_2)_n\text{COOH}$ , n is equal to  
(a) 1 (b) 2 (c) 3 (d) 4
6. Diethyl malonate reacts with urea to form  
(a) Barbutric acid (b) Dimedone (c) Ethylene oxide (d) Oxalic acid
7. Malonic acid on heating with  $\text{P}_2\text{O}_5$  gives  
(a) Carbon monoxide (b) Carbon dioxide  
(c) Carbon suboxide (d) Methane
8. Which of the following compound exhibits tautomerism?



- (a) Ethylacetoacetate (b) Acetic acid  
(c) Ethylacetate (d) Formic acid
9. Which of the following on heating gives rise to formic acid and  $\text{CO}_2$ ?  
(a) Propionic acid (b) Succinic acid (c) Oxalic acid (d) Picric acid
10. Acetoacetic ester exhibits  
(a) Optical isomerism (b) Tautomerism  
(c) Chain isomerism (d) None of the above
11. The IUPAC name of succinic acid is  
(a) ethane 1,2 dioic acid (b) Propane 1,3 dioic acid  
(c) Butane 1,4dioic acid (d) Pentane 1,5 dioic acid
12.  $\text{CH}_2(\text{COOH})_2$  is  
(a) Malic acid (b) Maleic acid  
(c) Malonic acid (d) Oxalic acid
13. On reduction with zinc and  $\text{H}_2\text{SO}_4$ , oxalic acid gives  
(a) Glycollic acid (b) Ethanediol  
(c) Succinic acid (d) Oxalic acid
14. What is the product when adipic acid is heated in presence of  $\text{Ba}(\text{OH})_2$ ?  
(a). Cyclopentanone (b). Glutaric acid  
(c). Succinic acid (d) Oxalic acid
15. Name the product when adipic acid undergoes condensation polymerization with 1,6diamino hexane  
(a) Polyester (b). Nylon 66 (c) Polyethylene (d) Rubber
16. The name of the process of obtaining ethylacetoacetate from ethylacetate is  
(a) Reformatsky (b) Cannizzaro  
(c) Claisen (d) Wittig
17. Ethylacetoacetate undergoes acid hydrolysis with dil. HCl to form  
(a) Acetoacetic acid (b). Succenic acid  
(c) Glutaric acid (d) Acetic acid
18. Acetone can be obtained from acetoacetic ester by  
(a) Hydrolysis (b) Reduction  
(c) Oxidation (d) Hydrolysis and heating
19. Urea reacts with acetoacetic ester gives  
(a) Barbituric acid (b) 4- methyl uracil  
(c) Succinic acid (d) Adipic acid
20. In the presence of sodium ethoxide, malonic ester forms  
(a). Carboanion (b) Carbocation  
(c) Free radical (d) Malonic acid

### SECTION B (5 marks)

- Discuss the preparation, properties and uses of malonic acid.
- (a) How is succinic acid prepared from ethylene? What happens when succinic acid is heated?  
(b) How will you convert adipic acid into Nylon 66
- Give one method of manufacture, any three reactions and two uses of oxalic acid.
- Giving suitable reactions, establish that ethylacetoacetate is mixture of ketone and enol forms.

5. How will you synthesis the following from ethylacetoacetate
  - (a) Pentan -2,4- dione
  - (b) 4-methyluracil
  - (c) Butanoic acid
  - (d) 3-methyl pentan -2 - one
6. Give the synthesis of the following from diethyl malonate.
  - (a). Glycine (b). Succinic acid (c) Crotonic acid (d) Barbituric acid
7. (i) How will you prepare a salt,esters,amides and acid halides from oxalic acid?  
 (ii) When propane-1,3-dioic acid is treated with acetaldehyde it will give which product?
8. (i) How will you prepare Butane-1,4-dioi acid from ethylene? (2 marks)  
 (ii) How will you prepare NBS from succinic acid? (3 marks)
9. (i) In maleic acid and fumaric acid which one is more acidic? Why? (3 marks)  
 (ii) How will you prepare malonic acid from chloroacetic acid? (2 marks)
10. How will you synthesis dicarboxylic acid, and ketones from diethylmalonate?

### Section C (8 Marks)

1. (i)In acetoacetic ester which type tautomerism occur? Explain it. (4 marks)  
 (ii) On bromination of maleic acid we get racemic mixture of dibromosuccinic acid but fumaric acid we will get meso isomer.Why?(4 marks)
2. (i) What are the difference between maleic acid and fumaric acid? (4 marks)  
 (ii) How will you prepare adipic acid from phenol and from benzene? (4 marks)
3. How will you synthesis ketonic acid,amino acid, $\alpha,\beta$ -unsaturated acid and allcyclic compounds from malonicester?
4. (i) What are differences between Tautomerism and resonance? (3 marks)  
 (ii) Give any five synthetic application of acetoaceticester. (5 marks)
5. (i)How will you prepare succinic acid from ethylene? (2 marks)  
 (ii) Discuss the properties and uses of oxalic acid. (6 marks)
6. (i) What are the difference between maleic acid and fumaric acid? (4 marks)  
 (ii) Explain the tautomerism present in acetoacetic ester. (4 marks)
7. (i) How will you prepare malonic acid from chloroacetic acid? (3 marks)  
 (ii) How will you synthesis dicarboxylic acid,  $\alpha,\beta$ -unsaturated acid and alkyl acetic acid from actetoacetic ester? (5 marks)
8. (i) On bromination of maleic acid we get racemic mixture of dibromosuccinic acid but fumaric acid we will get meso isomer.Why?(4 marks)  
 (ii) What are the difference between maleic acid and fumaric acid? (4 marks)
9. How will you prepare adipic acid from phenol and from benzene? Give its chemical properties.
10. Explain the preparation properties and uses of adipic acid.

## UNIT –III

### Aldehydes and Ketones

#### Section A (one mark)

- The order of reactivity in nucleophilic addition is
  - $\text{H}_2\text{C}=\text{O} > \text{CH}_3\text{CHO} > (\text{CH}_3)_2\text{C}=\text{O} > (\text{C}_2\text{H}_5)_2\text{C}=\text{O}$
  - $\text{CH}_3\text{CHO} > (\text{CH}_3)_2\text{C}=\text{O} > \text{H}_2\text{C}=\text{O} > (\text{C}_2\text{H}_5)_2\text{C}=\text{O}$
  - $(\text{CH}_3)_2\text{C}=\text{O} > (\text{C}_2\text{H}_5)_2\text{C}=\text{O} > \text{CH}_3\text{CHO} > \text{H}_2\text{C}=\text{O}$
  - $(\text{C}_2\text{H}_5)_2\text{C}=\text{O} > (\text{CH}_3)_2\text{C}=\text{O} > \text{H}_2\text{C}=\text{O} > \text{CH}_3\text{CHO}$
- Using  $\text{RMgX}$  as a reagent, a primary alcohol is prepared from
  - Acetone
  - Acetaldehyde
  - Formaldehyde
  - Ethyl chloride
- Using  $\text{RMgX}$  as a reagent, a secondary alcohol is prepared from
  - Acetone
  - Acetaldehyde
  - Formaldehyde
  - Ethyl chloride
- Using  $\text{RMgX}$  as a reagent, a tertiary alcohol is prepared from
  - Acetone
  - Acetaldehyde
  - Formaldehyde
  - Ethyl chloride
- Which of the following compound reacts with  $\text{CH}_3\text{MgBr}$  and followed by hydrolysis to form  $\text{CH}_3\text{CH}_2\text{OH}$ 
  - Formaldehyde
  - Acetaldehyde
  - Acetone
  - Ethyl chloride
- Which of the following compound reacts with  $\text{CH}_3\text{MgBr}$  to form  $(\text{CH}_3)_2\text{CHOH}$ 
  - Formaldehyde
  - Acetone
  - Ethylchloride
  - Acetaldehyde
- Which of the following Grignard reagent reacts with acetone and followed by hydrolysis to form 2-methyl butane-2-ol?
  - $\text{CH}_3\text{Mg Br}$
  - $\text{C}_2\text{H}_5 \text{Mg Br}$
  - $(\text{CH}_3)_2\text{CH-MgBr}$
  - $\text{C}_3\text{H}_7\text{MgBr}$
- Which of the following Grignard reagent reacts with formaldehyde to form propan-1-ol?
  - $\text{CH}_3\text{Mg Br}$
  - $\text{C}_2\text{H}_5 \text{Mg Br}$
  - $(\text{CH}_3)_2\text{CH-Mg-Br}$
  - $\text{C}_3\text{H}_7\text{Mg Br}$
- Benzaldehyde reacts with  $\text{CH}_3\text{MgI}$  to give an intermediate compound which on hydrolysis gives
  - $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$
  - $\text{C}_6\text{H}_5\text{C}(\text{CH}_3)_2\text{OH}$
  - $\text{C}_6\text{H}_5\text{CH}(\text{OH})\text{CH}_3$
  - $\text{C}_6\text{H}_5\text{CH}(\text{OH})\text{COOH}$
- The condensation reaction between benzaldehyde and aliphatic aldehyde or ketone containing  $\alpha$ -hydrogen atoms in the presence of dilute alkali to give  $\alpha,\beta$ -unsaturated carbonyl compounds is known as
  - Perkins reaction
  - Claisen-schmidt reaction
  - Knoevenagel reaction
  - Cannizzaro reaction
- Which one of the following does not contain  $\alpha$ -hydrogen atom?
  - Acetaldehyde
  - Propionaldehyde
  - Formaldehyde
  - Acetone
- Which one of the following undergoes aldol condensation?
  - Acetaldehyde
  - Trimethylacetaldehyde
  - Formaldehyde
  - Benzaldehyde
- Perkin's reaction is used to prepare
  - Schiff's base
  - Cinnamaldehyde
  - Benzoin
  - Cinnamic acid
- In Knoevenagel reaction, cinnamic acid is prepared when benzaldehyde is condensed with
  - Malonic ester
  - Succinic acid
  - Acetic acid
  - Acetaldehyde
- In Knoevenagel reaction the medium of the reaction is
  - Water
  - Acid
  - Pyridine
  - Benzene
- Benzaldehyde condenses with acetaldehyde in the presence of dilute alkali to give
  - Cinnamic acid
  - Benzaldehyde
  - Benzoin
  - cinnamaldehyde
- Which of the following compound cannot undergo aldol condensation in the presence of cold dilute alkali?
  - Acetaldehyde
  - Formaldehyde
  - Acetone
  - Benzaldehyde

- (a) Benzaldehyde                      (b) Propan aldehyde    (c) Acetone            (d) Acetaldehyde
18.  $\alpha$ -hydrogen of an aldehyde is  
 (a) Basic    (b) Acidic    (c) Neutral            (d) Amphoteric
19. The product formed by Perkin's reaction of benzaldehyde is  
 (a) cinnamic acid                                  (b) benzoic acid  
 (c)  $\alpha$ -methyl cinnamic acid            (d) None of these
20. Which of the reduction reaction of ketone with aluminium isopropoxide gives corresponding alcohol  
 (a) Meerwein-Ponndorf-Verley    (b) Wolf-Kishner    (c) Clemmensen            (d) None of these

### SECTION B (5 marks)

1. Explain with mechanism, the Reformatsky reaction in aromatic aldehydes and ketones.
2. Explain the mechanism of Perkin's reaction. Give example.
3. Explain the mechanism of Knoevenagel reaction. Give example.
4. Discuss briefly about the Perkins reaction with their mechanism
5. Write a note on Reformatsky reaction.
6. Write a note on Cannizzaro reaction
7. Give the mechanism of Claisen reaction.
8. Illustrate, Crossed aldol condensation with one suitable example.
9. Explain the Meerwein-Ponndorf-Varley reaction.
10. With a suitable example explain the Wolfkisher reduction reaction.

### Section C (8 marks)

1. Discuss the nucleophilic addition of Grignard reagent to carbonyl compound.
2. Explain the mechanism of  
 (i) Perkin's reaction  
 (ii) Knoevenagel reaction
3. Discuss briefly about the following reactions with their mechanism  
 (i) Perkins reaction (ii) Knoevenagel reaction.
4. Explain the reaction of  $\text{LiAlH}_4$  and  $\text{NaBH}_4$  with aldehydes. Describe the mechanism for the same.
5. Explain the Meerwein-Ponndorf-Varley reaction of ketones and describe the mechanism of the same.
6. Write notes on (a) Reformatsky reaction (b) Cannizzaro reaction
7. Give the mechanism of (a) Claisen reaction (b) Perkins reaction.
8. Complete the following  
 (i).  $\text{HCHO} + \text{CH}_3\text{MgI} \xrightarrow{\text{Hydrolysis}}$   
 (ii)  $\text{H}_3\text{COCH}_3 + \text{LiAlH}_4 \longrightarrow$   
 (iii)  $\text{CH}_3\text{COCH}_2\text{COOC}_2\text{H}_5 \xrightarrow{\text{NaBH}_4}$
9. Using appropriate carbonyl compound and  $\text{CH}_3\text{MgI}$ , how will you prepare  
 (a) p- $\text{CH}_3\text{C}_6\text{H}_4\text{-CH(OH)CH}_3$     (b)  $\text{C}_6\text{H}_5\text{C(OH)(CH}_3)_2$
10. Illustrate, with one suitable example, the following:

- (a) Cannizzaro reaction (b) Crossed aldol condensation.

**UNIT – IV**  
**SECTION – A**

1. Which one of the following is / are the ratio of fugacity  
(a) Fugacity (b) activity (c) Chemical potential (d) both a) & c)
2. Which one of the following is / are escaping tendency  
(a) Fugacity (b) activity (c) Chemical potential (d) both a) & c)
3. Expansion of gas in vacuum is the following process  
(a) spontaneous (b) reversible (c) irreversible (d) both a) & c)
4. Spontaneous changes is / are  
(a) Directional (b) unidirectional (c) irreversible (d) both b) & c)
5. Entropy is a measure of  
(a) concentration (b) velocity  
(c) Zig – Zag motion (d) randomness or disorder
6. A spontaneous reaction process with a decrease in  
(a) entropy (b) enthalpy (c) free energy (d) Internal energy
7. The free energy function (G) is defined as  
(a)  $G = H + TS$  (b)  $G = H - TS$  (c)  $G = TS - H$  (d)  $G = TS + H$
8. Which one of the following thermodynamic function is called “The arrow of time”  
(a) entropy (b) enthalpy  
(c) Gibbs free energy (d) Helmholtz energy
9. Which one of the following is measure of disorder?  
(a) entropy (b) enthalpy (c) free energy (d) chemical potential
10. Which one of the following is true for cyclic process?  
(a)  $\Delta E = 0$  (b)  $\Delta E = q - w$  (c)  $q = w$  (d)  $q \neq w$
11. Carnot cycle is a good example of  
(a) reversible (b) irreversible (c) cyclic (d) definite process
12.  $\Delta G$  refers to  
(a) entropy (b) enthalpy  
(c) Gibbs free energy (d) Helmholtz energy
13. Which one of the following is for reversible process?  
(a)  $\Delta S_{\text{sym}} + \Delta S_{\text{surr}} = 0$  (b)  $\Delta S_{\text{sym}} + \Delta S_{\text{surr}} \leq 0$   
(c)  $\Delta S_{\text{sym}} + \Delta S_{\text{surr}} > 0$  (d)  $\Delta S_{\text{sym}} + \Delta S_{\text{surr}} \geq 0$
14. Change of entropy for n moles of a gas is equal to  
(a)  $nRT \ln V_2/V_1$  (b)  $RT \ln V_2/V_1$  (c)  $nR \ln V_2/V_1$  (d)  $nRT \ln V_1/V_2$
15. The unit of entropy is  
(a) J/K (b)  $\text{JK}^{-1}\text{mol}^{-1}$  (c)  $\text{JKg}^{-1}\text{mol}^{-1}$  (d)  $\text{Jg}^{-1}\text{mol}^{-1}$
16. The relationship between free energy change and enthalpy is  
(a)  $\Delta G = \Delta H + T\Delta S$  (b)  $\Delta G = \Delta H - T\Delta S$   
(c)  $-\Delta G = \Delta H - T\Delta S$  (d)  $\Delta G = \Delta H - S\Delta T$
17. For an irreversible thermodynamic process ( $\Delta S_{\text{sym}} + \Delta S_{\text{surr}}$ ) is  
(a) = 0 (b) = 1 (c) < 0 (d) > 0
18. Efficiency of heat engine is

- (a)  $(T_2 + T_1) / T_2$       (b)  $(T_2 - T_1) / T_2$       (c)  $(T_1 + T_2) / T_2$       (d)  $(T_2 + T_1) / T_1$

19. The energy of an isolated system

- a) is always decreasing      b) is always constant  
c) is always increasing      d) none of the above

20. When the heat transfer into a system is more than the work transfer out of the system, then

- a. the internal energy of the system remains constant  
b. the internal energy of the system decreases  
c. the internal energy of the system increases  
d. none of the above

### SECTION – B

1. What are the need for second law of thermodynamics?
2. Define and express the term “activity”
3. What are spontaneous process? Explain with example.
4. What are the significance of  $\Delta A$  and  $\Delta G$ ?
5. What are the limitations of first law?
6. Vapour pressure of water at  $95^\circ\text{C}$  and  $100^\circ\text{C}$  are 634 and 760mm respectively.  
Calculate the molar heat of vapourization of water between  $95^\circ\text{C}$  and  $100^\circ\text{C}$ .
7. What are the various statement of second law of thermodynamics?
8. Define (i) Entropy  
(ii) Physical significance of entropy
9. Derive Calpeyron equation
10. Derive an equation for isothermal change in free energy.

### SECTION – C

1. Derive an expression for variation of Gibbs free energy with temperature and pressure.
2. Derive Clausius – Clapeyron equation and explain any one of its application.
3. Write brief outline on derivation of entropy from carnot cycle.
4. Derive VantHoffIsotherm. Give its applications.
5. Derive Gibbs – Helmholtz equation.
6. Derive the expression for the entropy change with T, P and V.
7. Derive Helmholtz work function.
8. What is spontaneous process?
9. Calculate the standard entropy change of the reaction  
$$\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}(\text{g})$$

The standard entropies of NO,  $\text{N}_2$  and  $\text{O}_2$  are 210.45, 191.62, 205.01  $\text{JK}^{-1}$  respectively.
10. Write note on “unattainability of absolute zero”

**UNIT – V**  
**SECTION – A**

1. Partial molal free energy is equal to
  - (a) Fugacity
  - (b) activity
  - (c) chemical potential
  - (d) entropy
2. When water is cooled to ice, its entropy
  - (a) Increases
  - (b) decreases
  - (c) remains constant
  - (d) absolute zero
3. According to third law of thermodynamics as  $T \rightarrow 0$ 
  - a)  $G = 0$
  - b)  $H = 0$
  - c)  $U = 0$
  - d)  $S = 0$
4. The third law of thermodynamics deals
  - a) Entropy
  - b) Entropy of crystalline solid
  - c) Enthalpy
  - d) Energy content
5. The entropy of the system increases in the order
  - a) gas > liquid > solid
  - b) liquid > gas > solid
  - c) solid > liquid > gas
  - d) gas > solid > liquid
6. The Boltzmann entropy equation
  - a)  $S = R \ln W$
  - b)  $S = RT \ln W$
  - c)  $S = KT \ln W$
  - d)  $S = K \ln W$
7. When  $T \rightarrow 0$   $\Delta G =$ 
  - a)  $\Delta S$
  - b)  $\Delta U$
  - c)  $\Delta H$
  - d)  $\Delta V$
8. Chemical potential is referred by the symbol
  - a)  $\mu_i$
  - b)  $\alpha_i$
  - c)  $\Delta$
  - d)  $f_i$
9. Standard absolute entropy referred by the symbol
  - a)  $S^0$
  - b)  $C^0$
  - c)  $f^0$
  - d)  $\mu^0$
10. All substances have the same heat capacity at
  - a) its boiling point
  - b) its melting point
  - c)  $0^\circ\text{C}$
  - d)  $0\text{K}$
11. With an increase in temperature the chemical potential
  - (a) Increases
  - (b) no change
  - (c) remains constant
  - (d) first increases
12.  $\lim_{T \rightarrow 0} S = ?$ 
  - a) 1
  - b)  $> 1$
  - c) 0
  - d)  $< 1$
13. Nernst theorem holds good only in the case of
  - a) solids
  - b) liquids
  - c) gases
  - d) fluids
14. Which one of the following is exception of third law of thermodynamics
  - a) CO
  - b) NO
  - c)  $\text{N}_2\text{O}$
  - d) All the above
15. The entropy of crystalline solid at absolute zero of temperature is
  - a)  $5.7 \text{ K}^{-1} \text{ mol}^{-1}$
  - b) Zero
  - c)  $5.6 \text{ K}^{-1} \text{ mol}^{-1}$
  - d)  $4.7 \text{ K}^{-1} \text{ mol}^{-1}$
16. The concept of partial molar quantity chemical potential is derived from
  - a) fugacity
  - b) activity
  - c) free energy
  - d) Internal energy
17. Which one of the following is mathematical form of Debye  $T^3$  equation
  - a)  $C_p = aT^3$
  - b)  $C_p = aT$
  - c)  $C_p = aT^2$
  - d)  $C_p = 0$

18. Which one of the following thermodynamic functions have been called “The arrow of time”?

a) entropy    b) enthalpy    c) Gibbs free energy    d) Helmholtz free energy

19. Which of the following is NOT the heat engine cycle

a) refrigerator    b) steam power plant

c) mass of gas confined in a cylinder and piston machine    d) none of the above

20. Which property of a system is constant in reversible adiabatic process?

a. pressure    b. volume    c. temperature    d. entropy

### SECTION – B

1. What are the need for second law of thermodynamics?

2. Define and express the term “activity”.

3. What are spontaneous process? Explain with example.

4. What are the limitations of first law?

5. What are the significance of  $\Delta A$  and  $\Delta G$ ?

6. What are the various statements of second law of thermodynamics

7. Vapour pressure of water at 95°C and 100°C are 634 and 760 mm respectively. Calculate the molar heat of vapourisation of water between 95°C and 100°C

8. Define (i) Entropy (ii) physical significance of entropy

9. Derive Clapeyron equation.

10. Derive an equation for isothermal change in free energy.

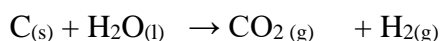
### SECTION – C

1. Derive Gibbs – Duhem equation. How does chemical potential vary with pressure.

2. (i) Write a note on determination of absolute entropies of solids, liquids and gases.

(ii) Give account of unattainability of absolute zero.

3. (i) Calculate the standard entropy change of the reaction. Standard entropy for each given brackets



(5.92 JK<sup>-1</sup>mol<sup>-1</sup>) (70.29 JK<sup>-1</sup>mol<sup>-1</sup>) (197.90 JK<sup>-1</sup>mol<sup>-1</sup>) (130.60 JK<sup>-1</sup>mol<sup>-1</sup>)

(ii) Derive the equation for entropy changes in chemical reactions

4. Derive the equations for chemical potential with temperature and pressure.

5. Explain entropy changes in chemical reactions

6. How is third law of thermodynamics verified experimentally?

7. Derive the relationship of entropy change in temperature and volume.

8. How is absolute entropy of solids determined?

9. How will determine absolute entropy of substance using third law of thermodynamics.

10. Derive Boltzmann entropy equation.



**KASC-Chemistry (UG)**

## KEY ANSWER

### Unit –I Section – A

- 1.d) Molality
- 2.c) M/20
- 3.d) Both (b)and (c)
- 4.d) 278
- 5.c) Standard solution
- 6.a) 20 ml
- 7.c) moderate
- 8.d)  $1.0 \times 10^{-14}$
- 9.a) Solute
- 10.a) Unknown concentration
- 11.d)  $\text{KMnO}_4$
12. a) Yellow
13. c) 40
- 14.c) Titration flask
15. d) Mohr's salt
16. b)  $\text{KMnO}_4$
- 17.a) Normality = Molarity  $\times$  Basicity
- 18.c) Normality
- 19.d) All
- 20.b) Phenolphthalein

### UNIT II

1. (a) Sucrose
2. (c) ethane- 1,2- dioic acid
3. (b) Glycol
4. (b)  $\text{CO}_2 + \text{CO} + \text{H}_2\text{O}$
5. (d) 4
6. (a) Barbutric acid
7. (c) Carbon suboxide
8. (a) Ethylacetoacetate
9. (c) Oxalic acid
10. (b) Tautomerism
11. (c) Butane 1,4 dioic acid
12. (c) Malonic acid
13. (a) Glycollic acid
14. (a). Cyclopentanone
15. (b). Nylon 66
16. (c) Claisen
17. (d) Acetic acid
18. (d) Hydrolysis and heating
19. (b) 4- methyl uracil
20. (a). Carboanion

### UNIT III

1. a.  $\text{H}_2\text{C}=\text{O} > \text{CH}_3\text{CHO} > (\text{CH}_3)_2\text{C}=\text{O} > (\text{C}_2\text{H}_5)_2\text{C}=\text{O}$
2. (c) Formaldehyde
3. (b) Acetaldehyde
4. (a) Acetone
5. (a) Formaldehyde
6. (d) Acetaldehyde
7. (b)  $\text{C}_2\text{H}_5\text{MgBr}$
8. (b)  $\text{C}_2\text{H}_5\text{MgBr}$
9. (c)  $\text{C}_6\text{H}_5\text{CH}(\text{OH})\text{CH}_3$
10. (b) Claisen-schmidt reaction
11. (c) Formaldehyde
12. (a) Acetaldehyde
13. (d) Cinnamic acid
14. (a) Malonic ester
15. (c) Pyridine
16. (d) cinnamaldehyde
17. (a) Benzaldehyde
18. (b) Acidic
19. (a) cinnamic acid
20. (a) Meerwein-Ponndorf-Varley

### UNIT IV

1. c) chemical potential
2. a) Fugacity
3. c) irreversible
4. d) both a) and c)
5. d) randomness or disorder
6. (d) Internal energy
7. (b)  $G = H - TS$
8. (a) entropy
9. (a) entropy
10. (c)  $q = w$
11. (a) reversible
12. (c) Gibbs free energy
13. (d)  $\Delta S_{\text{sym}} + \Delta S_{\text{surr}} \geq 0$
14. (c)  $nR \ln V_2/V_1$
15. (a) J/K
16. (b)  $\Delta G = \Delta H - T\Delta S$
17. (d)  $> 0$

18. (b)  $(T_2 - T_1) / T_2$   
19. b) is always constant  
20. c) the internal energy of the system increases

#### UNIT V

- 1.(c) chemical potential  
2.(a) Increases  
3.d)  $S = 0$   
4.a) Entropy  
5.c) solid > liquid > gas  
6.S =  $K \ln W$   
7.a)  $\Delta S$   
8.a)  $\mu_i$   
9.a)  $S^0$   
10.d) 0K  
11.(a) Increases  
12.b)  $> 1$   
13.a) solids  
14.c)  $N_2O$   
15. b) Zero  
16.c) free energy  
17.a)  $C_p = aT^3$   
18.a) entropy  
19. a) refrigerator  
20.d) entropy

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**KASC-Chemistry (UG)**

**KONGUNADU ARTS AND SCIENCE COLLEGE**  
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**COIMBATORE-641 029**



## **QUESTION BANK**

**Prepared by**

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**DEPARTMENT OF CHEMISTRY (UG)**

**SEMESTER-V**  
**SKILL BASED SUBJECT-3**  
**CHEMICAL INDUSTRY**

UNIT-I  
SUGAR INDUSTRY

1 marks

1. Transport of sugar and amino acid in plant is called
  - a. Transportation
  - b. Transpiration
  - c. Transmotion
  - d. Translocation
2. Sugar formed in mature leaves may
  - a. Travel only downwards
  - b. Travel only upwards
  - c. Travel both up and down
  - d. Get stored in leaves
3. Simplex and complex sugar may be called as
  - a. Reducing sugar
  - b. Non-reducing
  - c. Inorganic nutrient
  - d. Polysaccharides
4. India's sugar production has risen by what percent in Jan 2015
  - a. 5
  - b. 6
  - c. 7
  - d. 8
5. Cane sugar is used as
  - a. Non reducing sugar
  - b. Sweetening agent
  - c. Translocation
  - d. Inorganic nutrient
6. Sugar supplies man about \_\_\_\_\_ of the energy
  - a. 100
  - b. 19
  - c. 143
  - d. 4
7. The cane sugar juice is acid having pH from
  - a. 5.1 to 5.7
  - b. 5.7 to 6.1
  - c. 6.1 to 6.7
  - d. 7.9 to 8.1
8. Formula of sugarcane is
  - a. C<sub>12</sub>H<sub>22</sub>O<sub>12</sub>
  - b. C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>
  - c. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>
  - d. All of these
9. Manufacture of cane sugar includes \_\_\_\_\_ steps
  - a. 7
  - b. 8

- c. 12  
d. 13
10. Which fruit contain sugar
- Pine apple
  - Apricot
  - Ripe banana
  - All the above
11. \_\_\_\_\_ is used for manufacture of alcohol in fermentation process
- Molasses
  - Refining
  - Separation
  - Extraction
12. About \_\_\_\_\_% of juice is extracted from the cane
- 90-96%
  - 100%
  - 10%
  - 30-60%
13. In sulphitation and carbonation process concentrated juice is called
- Juice
  - Lime
  - Syrup
  - None of these
14. Another name for disaccharides
- Galactose
  - Bivose
  - Fructose
  - Lactose
15. What is di in the word disaccharide mean
- Two
  - Three
  - Five
  - Ten
16. How many oxygen atoms are there in disaccharides
- 22
  - 13
  - 4
  - 12
17. Which of the following favour joining of simple sugar
- Sublimation
  - Condensation
  - Coagulation
  - Addition
18. Which is not an enzyme
- Sucrose
  - Glucose
  - Fructose
  - Galactose
19. Which of them is non-reducing double sugar
- Sucrose
  - Glucose
  - Maltase



- d. Lactase
20. Which of the following is a sugar
- Malt syrup
  - Lactose
  - Dextrose
  - All the above

5 marks

- Explain sugar industry?
- Explain manufacture of cane sugar?
- Define any three steps in manufacture of cement?
- Explain double sulphination process?
- Define extraction of juice?
- Define manufacture of alcohol?
- Explain various sources from sugar is prepared?
- Write a note on cane sugar?
- Write a note on sugar?
- Why sugar is known as sweetening agent?

8 MARKS

- Briefly explain about manufacture of cane sugar?
- Define sugar as sweetening agent?
- Explain process of extraction of juice?
- Define purification of juice/
- Explain defection process?
- Write a note on sulphonation?
- Explain double sulphitation and double carlination?
- Write a note on concentration?
- Explain separation of crystal?
- Explain manufacture of sucrose from beetroot/

## UNIT-II

### Fermentation

ONE MARKS:

- Fermentation is a \_\_\_\_\_ word.  
a) Greek    b) Latin    c) English    d) French
- Fermentation is a \_\_\_\_\_ Process reaction.  
a) Endothermic    b) Oxidation  
c) Exothermic    d) Hydrolysis
- \_\_\_\_\_ of hops are sufficient per 1000 gallons of wort.

- a) 10-15 lbs      b)20-30 lbs      c)1-10 lbs      d)40-60 lbs
4. Fermentation proceeds for \_\_\_\_\_ days.  
a) 1-2 days      b)3-4 days      c)6-7 days      d)8-9 days
5. Beer contains \_\_\_\_\_ alcohol.  
a) 1-2 %      b)3-4 %      c) 1-5%      d)3-6%
6. The juice extracted from grapes \_\_\_\_\_ .  
a) bagasse      b) syrup      c) must      d) juice
7. Vinegar stronger than \_\_\_\_\_ cannot be prepared`  
a) 14%      b)7%      c) 8%      d) 15%
8. \_\_\_ enzyme is used to convert sucrose to glucose & fructose.  
a) Zymase      b) Urease      c) Invertase      d) Malyase
9. Process of fermentation occurs in \_\_\_\_\_  
a) Yeast      b) Bacteria      c) both A&B      d) viruses
10. Fermentation takes place in \_\_\_\_\_  
a) Absence of oxygen      b) Presence of oxygen  
c) Presence of carbon      d) Presence of nitrogen
11. The optimum temperature for fermentation process is \_\_\_\_\_  
a) 30-50c      b)20-80c      c)40-60c      d)10-200c
12. Zymase is originated from \_\_\_\_\_  
a) Curd      b) Milk      c) Soyabean      d) Yeast
13. \_\_\_\_\_ % of alcohol is known as rectified spirit.  
a) 91%      b) 85%      c) 95%      d)50%
14. The origin of Invertase is \_\_\_\_\_  
a) Small intestine      b) Yeast      c) Curd      d) Soyabean
15. \_\_\_\_\_ is a spait obtained in Russia from rey.  
a) Brandy      b) Vodka      c)Gin      d) Whisky
16. The skin of grape certain \_\_\_\_\_  
a) Tannin      b)Pepsin      c)Tripsin      d) Malt
17. \_\_\_\_\_ is obtained from germinated barley.  
a) Vodka      b) Gin      c) Beer      d) Rum
18. In \_\_\_\_\_ Louis Pasteur explored fermentation process.  
a) 1822      b)1842      c)1832      d)1901
19. A small amount of enzyme brings about \_\_\_\_\_ of large amount of substance.

- a) Decarboxylation      b) Decomposition  
c) Oxidation              d) Evaporation

20. The enzymes are most inactivate at \_\_\_\_\_.  
a) 70-80°C      b) 20-30°C      c) 60-90°C      d) 80-95°C

FIVE MARKS:

1. What are the conditions favourable for fermentation?
2. What is meant by fermentation .write an Example
3. Discuss the characteristics of Enzyme.
4. Give short account of some fermentation process.
5. Write the types of Alcoholic Beverages.
6. Discuss the Manufacture of Ethyl alcohol from molasses.
7. What is power alcohol? Explain
8. Write the Manufacturing process of beer and wine.
9. What are process involved in the manufacture of vinegar.
10. How wine is manufactured?

EIGHT MARKS:

1. Write in detail about the fermentation process.
2. What are enzymes? Give their characteristics.
3. Give a detail account on the Alcohol Beverages.
4. How ethyl alcohol is extracted from molasses.
5. Discus about vinegar and power alcohol.
6. How Beer and Wine are manufactured Industrially?
7. Give an account of following?
  - I. Wine
  - II. Vinegar
  - III. Power alcohol
  - IV. Beer
8. What are the conditions to be maintained in the Fermentation process? Define Enzyme
9. Describe the Manufacture of Ethyl alcohol.
10. Give a detailed account on the Fermentation process.

UNIT-III

GLASS

SECTION-A

CHOOSE THE CORRECT ANSWERS:

1. \_\_\_\_\_ is not attacked by air and oxidizing agent  
a) Cement      b) Sugar      c) glass      d) Paint

2. Feldspar is \_\_\_\_\_  
a)  $[R_2O \cdot Al_2O_3 \cdot 3H_2O]$       b)  $[R_2O \cdot Al_2O_3 \cdot 6H_2O]$   
c)  $[R_2O \cdot Al_2O_3 \cdot 4H_2O]$       d)  $[R_2O \cdot Al_2O_3 \cdot 3H_2O]$
3. \_\_\_\_\_ is used as decolouriser  
a) Calcium    b) Barium    c) Selenium    d) Magnesium
4. The refractive index of the glass is increased by \_\_\_\_\_  
a) PbO      b)  $MnO_2$       c) CaO      d) ZnS
5. High silica glass contain \_\_\_\_\_ of  $SiO_2$   
a) 98%      b) 96%      c) 92%      d) 73%
6. Glass containing \_\_\_\_\_ is used in optical purpose  
a) PbO    b)  $MnO_2$     c) CaO    d) ZnS
7. Limestone is \_\_\_\_\_  
a) calcium carbonate    b) calcium chloride  
c) calcium nitrate      d) calcium sulphate
8. The main component is used in the manufacture of glass is \_\_\_\_\_  
a)  $SiO_2$       b)  $MnO_2$       c)  $MgO_2$       d)  $FeO_2$
9. Soda glass is \_\_\_\_\_  
a) sodium silicate    b) magnesium silicate  
c) calcium silicate    d) potassium silicate
10. Quick lime is \_\_\_\_\_  
a) CaO    b)  $CaCO_3$     c) FeS    d) ZnO
11. \_\_\_\_\_ is a super cooled liquid  
a) glass    b) cement    c) sugar    d) paint
12. Boron oxide + silica \_\_\_\_\_  
a)            b) borosil      c)            d)
13. Tempered glass is used for \_\_\_\_\_  
a) optical    b) door      c) fire proof    d) fiber
14. \_\_\_\_\_ capable of absorbing uv light  
a) selenium oxide    b) cerium oxide  
c) calcium oxide      d) magnesium oxide
15. \_\_\_\_\_ has no definite composition  
a) cement      b) glass      c) sugar      d) pigment

16. \_\_\_\_\_ is a reducing agent  
a) charcoal    b) FeS    c) ZnS    d) CaCl
17. Amber is \_\_\_\_\_  
a) ZnS    b) NaCl    c) CaO    d) FeS
18. The process of removing the defects from the melt is called \_\_\_\_\_  
a) drying    b) concentrate    c) evaporation    d) refining
19. Glassware from molten glass is called \_\_\_\_\_  
a) shaping    b) refining    c) cooling    d) drying
20. Glass may be shaped by \_\_\_\_\_  
a) hard moulding    b) by machine  
c) both A&B    d) None of the above

#### SECTION-B

##### FIVE MARK QUESTIONS:

1. What are the properties of a glass?
2. Discuss about Jena glass?
3. What is meant by glass?
4. Define
  - I. Annealing
  - II. Finishing
5. Explain the formation of batch material?
6. What is flint glass?
7. Define safety glass
8. Define the following
  - I. Pyrex glass
  - II. Soda glass
9. How will you manufacture glass?
10. What are the Raw materials need for glass?

#### SECTION-C

##### EIGHT MARK QUESTIONS:

1. What ment by glass? Explain the manufacture of glass?

2. Write briefly about the properties of glass
3. Explain the formation of batch material
4. Discuss the following
  - I. Melting
  - II. Shaping
  - III. Annealing
  - IV. Finishing
5. Write the raw materials for glass and explain the physical and chemical properties?
6. Write the types of glass? Define pure glass.
7. Discuss about the melting and shaping process?
8. Write an account on Annealing and Finishing process?
9. Discuss about soda glass?
10. What is the flint glass? Explain the detail.

#### UNIT-IV

#### CEMENTS AND CERAMICS

1 marks

1. The word ceramic meant for
  - a. Soft material
  - b. Hard material
  - c. Burnt material
  - d. Raw material
2. Not a characteristic property of ceramic
  - a. High temperature
  - b. High melting strength
  - c. Low elongation
  - d. Low hardness
3. Major ingredient for traditional ceramics
  - a. SiC
  - b. SiO<sub>2</sub>
  - c. PbO<sub>2</sub>
  - d. Si<sub>3</sub>N<sub>4</sub>
4. Not a major constitution for engineering ceramics
  - a. TiO<sub>2</sub>
  - b. SiO<sub>2</sub>
  - c. ZrO<sub>2</sub>
  - d. CuSO<sub>4</sub>

5. The following ceramic product is mostly used as pigments in paint
  - a. TiO<sub>2</sub>
  - b. SiO<sub>2</sub>
  - c. UO<sub>2</sub>
  - d. ZrO<sub>2</sub>
6. Most commercial glasses consist of
  - a. Lime
  - b. Soda
  - c. Silica
  - d. All
7. Hot isostatic pressing is not a viable option if the chief criterion is
  - a. Strength without grain growth
  - b. Low cost
  - c. Zero porosity
  - d. Processing refractory ceramics
8. During sintering densification is not due to
  - a. Atomic diffusion
  - b. Surface diffusion
  - c. Bulk diffusion
  - d. Grain growth
9. The word ceramic is derived from
  - a. English
  - b. Greek
  - c. Lattice
  - d. None of these
10. Who discovered cement
  - a. Joseph aspidin
  - b. Joseph
  - c. Bohr
  - d. Newton
11. A cement of far more quick setting and much greater strength is called
  - a. Newyork cement
  - b. Cement
  - c. Portland cement
  - d. All the above
12. The essential raw material for manufacture of cements are
  - a. Limestone
  - b. Clay
  - c. Both a and b
  - d. none of the above
13. How many types of process are there in manufacture of Portland cement
  - a. 1
  - b. 2
  - c. 3
  - d. 4
14. Hydration of cement is an
  - a. Exothermic reaction
  - b. Endothermic reaction
  - c. Addition reaction
  - d. Hydrolysis
15. The term cement means

- a. Pottery
  - b. Making
  - c. Craft
  - d. None of these
16. pottery may be classified into \_\_\_\_\_ groups
- a. 4
  - b. 3
  - c. 9
  - d. 10
17. Clay products which are stone like hard and strong articles are known as
- a. Clay
  - b. Brick
  - c. Stonewares
  - d. Earth enware
18. Variety of clay products obtained by burning at lower temperature is called
- a. Ground lying
  - b. Stoneware
  - c. Earthenware
  - d. None of these
19. Ceramics are
- a. transparent
  - b. opaque
  - c. Both a and b
  - d. All of fthese
20. Which can also be included in ceramic material
- a. Glass
  - b. Cement
  - c. Plastics
  - d. All of these

5 marks

1. Define cement?
2. Define ceramics?
3. Define Portland cement?
4. Explain types of Portland cement?
5. Explain types of cement?
6. Define
  - a. Waterproof cement
  - b. White cement
7. What are essential raw material for cements?
8. Explain calcorous material?
9. Explain subdivision of cement?
10. Define classification of pottery?

8 MARKS

1. Write a note on ceramics?
2. Briefly explain general properties of ceramics?
3. Explain electrical and magnetic property?



4. Write the application of colours to pottery?
5. Explain printing lithography and sgraffito decoration?
6. Write a note on fluxing agent and special refractive materials?
7. Explain the manufacture of cement?
8. Write a note on wet process?
9. Define setting of cement?
10. Briefly explain dry process?

## UNIT-V

### PAINTS AND PIGMENTS

1 marks

1. Which is one of the most important white pigment
  - a. Tio<sub>2</sub>
  - b. Carbon black
  - c. Graphite
  - d. Lamp black
2. \_\_\_\_\_ is one of the oldest white pigment
  - a. White lead
  - b. Black lead
  - c. Green lead
  - d. Red lead
3. White lead is \_\_\_\_\_ in nature
  - a. Useful
  - b. Nice
  - c. Toxic
  - d. Non toxic
4. What is the use of tio<sub>2</sub>
  - a. Paper manufacture
  - b. Paint
  - c. Textile industry
  - d. All of the above
5. Zinc oxide is a
  - a. White pigmmt
  - b. Red pigment
  - c. Blue pigment
  - d. All the above
6. Calamine method is used in manufacture of
  - a. Zno
  - b. Tio<sub>2</sub>
  - c. Baso<sub>4</sub>
  - d. ZnS

7. Which is the oldest pigment used for inhibiting rust on iron and steel structure
  - a. White lead
  - b. Red lead
  - c. Black lead
  - d. Blue lead
8. Which is a black pigment
  - a.  $TiO_2$
  - b.  $ZnO$
  - c. Carbon black
  - d.  $ZnS$
9. Most popular yellow pigment is
  - a. Graphite
  - b. Chrome yellow
  - c.  $TiO_2$
  - d. Carbon black
10. Which is regarded as an organic dye
  - a. Pigment
  - b. Paint
  - c. Hake
  - d. Pool
11. Pigment and the extender are carried or suspended in drying oil called
  - a. Hake
  - b. Paint
  - c. Vehicle
  - d. None of these
12. Which of the paints are prepared by mixing pigments
  - a. Interior wall paint
  - b. Exterior house paint
  - c. Luminous
  - d. Marine
13. Which paint consists of phosphorescent paint composition such as pigments
  - a. Luminous paints
  - b. Marine paints
  - c. Emulsion paint
  - d. None of the above
14. Film forming materials are called as
  - a. Vehicle
  - b. Hake
  - c. Paint
  - d. Drying oil
15. Example for film forming material
  - a. Linseed oil
  - b. Soyabean oil
  - c. Castor oil
  - d. All the above
16. Which is also used to suspend pigments
  - a. Thinner
  - b. Diluent
  - c. Both a and b
  - d. Extender
17. Varnishes are classified into \_\_\_\_ types

- a. 5
  - b. 4
  - c. 2
  - d. 1
18. Which is regarded as unpigmented colloidal dispersion
- a. Thinner
  - b. Diluent
  - c. Varnishes
  - d. Extender
19. The most common and the cheapest solvent is
- a. Acid
  - b. Water
  - c. Base
  - d. Hydrocarbon
20. Solvent with a flash point below \_\_\_\_\_ is called inflammable
- a. 100 F
  - b. 200F
  - c. 250 F
  - d. 65 F

5 marks

1. Write a note on pigments?
2. Explain various kinds of pigments?
3. Requirements for pigments?
4. Write a note on paint?
5. Explain about luminous paints?
6. Define marine paints?
7. Write a note on white pigment?
8. Write a note on distemper?
9. Explain types of flammable paints?
10. Difference between paints and pigments?

8 MARKS

1. What are the requirements for good paints?
2. Explain constituents for paints?
3. Write a note on distemper?
4. Write the manufacture using calamine method?
5. Explain manufacturing of titanium dioxide?
6. Explain requirements for pigments?
7. Write a note on varnishes?
8. Define types of varnishes?
9. Explain types of paints?
10. Write a note on setting of paints?

**KASC-Chemistry (UG)**

**KONGUNADU ARTS AND SCIENCE COLLEGE**

**(AUTONOMOUS)**

**COIMBATORE-641 029**



## **QUESTION BANK**

**Prepared by**

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**DEPARTMENT OF CHEMISTRY (UG)**

INORGANIC CHEMISTRY-I  
QUESTION BANK

- The \_\_\_\_\_ sphere is enclosed in brackets in formulas for complex species, and it includes the central metal ion plus the coordinated groups.
  - ligand
  - donor
  - oxidation
  - coordination
  - chelating
- In coordination chemistry, the **donor atom** of a ligand is
  - a Lewis acid.
  - the counter ion
  - the central metal atom.
  - the atom in the ligand that shares an electron pair with the metal.
  - the atom in the ligand that accepts a share in an electron pair from the metal.
- Consider the coordination compound,  $\text{Na}_2[\text{Pt}(\text{CN})_4]$ . The Lewis acid is
  - $[\text{Pt}(\text{CN})_4]^{2-}$
  - $\text{Na}^+$
  - Pt
  - $\text{Pt}^{2+}$
  - $\text{CN}^-$
- Consider the coordination compound,  $\text{K}_2[\text{Cu}(\text{CN})_4]$ . A coordinate covalent bond exists between
  - $\text{K}^+$  and  $\text{CN}^-$
  - $\text{Cu}^{2+}$  and  $\text{CN}^-$
  - $\text{K}^+$  and  $[\text{Cu}(\text{CN})_4]^{2-}$
  - C and N in  $\text{CN}^-$
  - $\text{K}^+$  and  $\text{Cu}^{2+}$
- Given the list of ligands and their corresponding names, choose the pair that disagree.

LIGAND NAME	
(a) $\text{OH}^-$	hydroxo
(b) $\text{CN}^-$	cyanide
(c) $\text{Cl}^-$	chloro
(d) $\text{H}_2\text{O}$	aqua
(e) $\text{NH}_3$	ammine
- Select the **correct** IUPAC name for:  $[\text{FeF}_4(\text{OH})_2]^-$ 
  - diaquatetrafluoroiron(III) ion
  - diaquatetrafluoroferrate(III) ion
  - diaquatetrafluoroiron(I) ion
  - diaquatetrafluoroferrate(I) ion
  - none of these
- Select the **correct** IUPAC name for:  $[\text{Co}(\text{NH}_3)_6]^{2+}$ 
  - hexammoniacobaltate(II) ion
  - hexaammincobaltate(II) ion
  - hexammoniacobalt(II) ion
  - hexaammincobalt(II) ion
  - hexammoniacobalt ion

8. Which name-formula combination is NOT correct?
- | FORMULA  | NAME                                       |
|--|--|
| (a) $[\text{Co}(\text{NH}_3)_4(\text{OH}_2)\text{I}]\text{SO}_4$ | tetraammineaquaiodocobalt(III) sulfate     |
| (b) $\text{K}[\text{Cr}(\text{NH}_3)_2\text{Cl}_4]$              | potassium diamminetetrachlorochromate(III) |
| (c) $[\text{Mn}(\text{CN})_5]^{2-}$                              | pentacyanomanganate(II) ion                |
| (d) $[\text{Ni}(\text{CO})_4]$                                   | tetracarbonylnickel(0)                     |
| (e) $\text{Ca}[\text{PtCl}_4]$                                   | calcium tetrachloroplatinate(II)           |
9. What is the oxidation number of the central metal atom in the coordination compound  $[\text{Pt}(\text{NH}_3)_3\text{Cl}]\text{Cl}$ ?
- (a) -1  
 (b) 0  
 (c) +1  
 (d) +2  
 (e) +3
10. (Valence Bond Theory) Magnetic measurements indicate that  $[\text{Co}(\text{OH}_2)_6]^{2+}$  has 3 unpaired electrons. Therefore, the hybridization of the metal's orbitals in  $[\text{Co}(\text{OH}_2)_6]^{2+}$  is:
- (a)  $\text{sp}^3$   
 (b)  $\text{sp}^2\text{d}$   
 (c)  $\text{dsp}^2$   
 (d)  $\text{sp}^3\text{d}^2$   
 (e)  $\text{d}^2\text{sp}^3$
11. Which one of the following complexes can exhibit geometrical isomerism?
- (a)  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$  (square planar)  
 (b)  $[\text{Zn}(\text{NH}_3)_2\text{Cl}_2]$  (tetrahedral)  
 (c)  $[\text{Cu}(\text{NH}_3)_4]^{2+}$  (square planar)  
 (d)  $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$  (octahedral)  
 (e)  $[\text{Cu}(\text{CN})_2]^-$  (linear)
12. A molecule that cannot be superimposed on its mirror image is said to exhibit which of the following?
- (a) geometrical isomerism  
 (b) optical isomerism  
 (c) linkage isomerism  
 (d) reactive isomerism  
 (e) coordination isomerism
13. In which one of the following species does the transition metal ion have  $\text{d}^3$  electronic configuration?
- (a)  $[\text{Cr}(\text{NH}_3)_6]^{3+}$   
 (b)  $[\text{Co}(\text{OH}_2)_6]^{2+}$   
 (c)  $[\text{CoF}_6]^{3-}$   
 (d)  $[\text{Fe}(\text{CN})_6]^{3-}$   
 (e)  $[\text{Ni}(\text{OH}_2)_6]^{2+}$
14. (Valence Bond Theory) The coordination complex,  $[\text{Cu}(\text{OH}_2)_6]^{2+}$  has one unpaired electron. Which of the following statements are **true**?
- (1) The complex is octahedral.  
 (2) The complex is an outer orbital complex.  
 (3) The complex is  $\text{d}^2\text{sp}^3$  hybridized.

- (4) The complex is diamagnetic.  
(5) The coordination number is 6.  
(a) 1, 4  
(b) 1, 2, 5  
(c) 2, 3, 5  
(d) 2, 3  
(e) 4, 5
15. (Crystal Field Theory) Which one of the following statements is **FALSE**?
- (a) In an octahedral crystal field, the d electrons on a metal ion occupy the  $e_g$  set of orbitals before they occupy the  $t_{2g}$  set of orbitals.  
(b) Diamagnetic metal ions cannot have an odd number of electrons.  
(c) Low spin complexes can be paramagnetic.  
(d) In high spin octahedral complexes,  $\Delta_{oct}$  is less than the electron pairing energy, and is relatively very small.  
(e) Low spin complexes contain strong field ligands.
16. (Crystal Field Theory) When the valence d orbitals of the central metal ion are split in energy in an octahedral ligand field, which orbitals are raised **least** in energy?
- (a)  $d_{xy}$  and  $d_{x^2-y^2}$   
(b)  $d_{xy}$ ,  $d_{xz}$  and  $d_{yz}$   
(c)  $d_{xz}$  and  $d_{yz}$   
(d)  $d_{xz}$ ,  $d_{yz}$  and  $d_{z^2}$   
(e)  $d_{x^2-y^2}$  and  $d_{z^2}$
17. (Crystal Field Theory) How many unpaired electrons are there in a strong field iron(II) octahedral complex?
- (a) 0  
(b) 1  
(c) 2  
(d) 4  
(e) 6
18. (Crystal Field Theory) Consider the complex ion  $[\text{Mn}(\text{OH}_2)_6]^{2+}$  with 5 unpaired electrons. Which response includes all the following statements that are **true**, and no false statements?
- I. It is diamagnetic.  
II. It is a low spin complex.  
III. The metal ion is a  $d^5$  ion.  
IV. The ligands are weak field ligands.  
V. It is octahedral.
- (a) I, II  
(b) III, IV, V  
(c) I, IV  
(d) II, V  
(e) III, IV
19. (Crystal Field Theory) Strong field ligands such as  $\text{CN}^-$ :
- (a) usually produce high spin complexes and small crystal field splittings.  
(b) usually produce low spin complexes and small crystal field splittings.  
(c) usually produce low spin complexes and high crystal field splittings.  
(d) usually produce high spin complexes and high crystal field splittings.  
(e) cannot form low spin complexes.



20. In the complex formation, the central metal atom / ion acts as

- a) Lewis base b) Bronsted base c) Lewis acid d) Bronsted acid

---

**Answers:**

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

---

- The "magic numbers" for atoms are
  - numbers of electrons that confer atomic stability.
  - numbers of protons and/or neutrons that confer nuclear stability.
  - n/p ratios that confer nuclear stability.
  - atomic masses that confer nuclear stability.
  - atomic masses that indicate fissile isotopes.
- The actual mass of a  $^{37}\text{Cl}$  atom is 36.966 amu. Calculate the mass defect (amu/atom) for a  $^{37}\text{Cl}$  atom.
  - 0.623 amu
  - 0.388 amu
  - 0.263 amu
  - 0.341 amu
  - none of these
- The mass defect for an isotope was found to be 0.410 amu/atom. Calculate the binding energy in kJ/mol of atoms. ( $1 \text{ J} = 1 \text{ kg} \cdot \text{m}^2/\text{s}^2$ )
  - $3.69 \times 10^{10}$  kJ/mol
  - $1.23 \times 10^{20}$  kJ/mol
  - $3.69 \times 10^{13}$  kJ/mol
  - $1.23 \times 10^3$  kJ/mol
  - $1.23 \times 10^{23}$  kJ/mol
- Calculate the binding energy per nucleon (in units of MeV) for  $^9\text{Be}$ , for which the atomic mass is 9.01219 amu. Particle masses in amu are: proton = 1.007277; neutron = 1.008665; electron = 0.0005486. Conversion factor for  $E = mc^2$  is 931 MeV/amu.
  - 6.46 MeV
  - 6.33 MeV
  - 6.23 MeV
  - 11.39 MeV
  - 56.93 MeV
- Which isotope below has the **highest** nuclear binding energy per gram? No calculation is necessary.
  - $^4\text{He}$
  - $^{16}\text{O}$
  - $^{32}\text{S}$
  - $^{55}\text{Mn}$
  - $^{238}\text{U}$
- Which of the following statements is **incorrect**?
  - Mass defect is the amount of matter that would be converted into energy if a nucleus were formed from initially separated protons and neutrons.
  - Nuclear binding energy is the energy released in the formation of an atom from subatomic particles.

- (c) Nuclei with highest binding energies are the most stable nuclei.  
(d) Einstein postulated the Theory of Relativity in which he stated that matter and energy are equivalent.  
(e) Mass number is the sum of all protons and electrons in an atom.
7. A positron has a mass number of \_\_\_\_\_, a charge of \_\_\_\_\_, and a mass equal to that of a(an) \_\_\_\_\_.
- (a) 0, 1+, proton
  - (b) 1, 2+, proton
  - (c) 0, 1+, electron
  - (d) 1, 2+, electron
  - (e) 0, 0, proton
8. Emission of which one of the following leaves both atomic number and mass number unchanged?
- (a) positron
  - (b) neutron
  - (c) alpha particle
  - (d) gamma radiation
  - (e) beta particle
9. Which type of radiation is the **least** penetrating?
- (a) alpha
  - (b) beta
  - (c) gamma
  - (d) x-ray
  - (e) neutron
10. A radioisotope of argon,  $^{35}\text{Ar}$ , lies below the "band of stability: (n/p ratio too low). One would predict that it decays via \_\_\_\_\_.
- (a) neutron emission
  - (b) beta emission
  - (c) positron emission
  - (d) alpha emission
  - (e) fission
11. A Geiger-Muller tube is a \_\_\_\_\_ .
- (a) gas ionization detector
  - (b) cloud chamber
  - (c) fluorescence detector
  - (d) spectrophotometer
  - (e) photographic detector
12. The half life of  $^{231}\text{Pa}$  is  $3.25 \times 10^4$  years. How much of an initial 10.40 microgram sample remains after  $3.25 \times 10^5$  years?
- (a) 0.0102 micrograms
  - (b) 0.240 micrograms
  - (c) 2.18 micrograms
  - (d) 0.0240 micrograms
  - (e) 1.04 micrograms
13. Consider the case of a radioactive element X which decays by electron (beta) emission with a half-life of 4 days to a stable nuclide of element Z. Which of the following statements is CORRECT?
- (a) After 8 days the sample will consist of one-fourth element Z and three-fourths element X.

- (b) Element Z will weigh **exactly** the same as element X when decay is complete (weighed to an infinite number of significant figures).
- (c) 2.0 g of element X is required to produce 1.5 g of element Z after 8 days (to 2 significant figures).
- (d) If element X has an atomic number equal to  $n$ , then element X has an atomic number equal to  $n-1$ .
- (e) None of the above.
14. Carbon-11 is a radioactive isotope of carbon. Its half-life is 20 minutes. What fraction of the initial number of C-11 atoms in a sample will have decayed away after 80 minutes?
- (a) 1/16  
(b) 1/8  
(c) 1/4  
(d) 7/8  
(e) 15/16
15. How old is a bottle of wine if the tritium ( $^3\text{H}$ ) content (called activity) is 25% that of a new wine? The half-life of tritium is 12.5 years.
- (a) 1/4 yr  
(b) 3.1 yr  
(c) 25 yr  
(d) 37.5 yr  
(e) 50 yr
16. A Geiger counter registered 1000 counts/second from a sample that contained a radioactive isotope of polonium. After 5.0 minutes, the counter registered 281 counts/second. What is the half-life of this isotope in seconds?
- (a) 87  
(b) 110  
(c) 164  
(d) 264  
(e) 2.18
17. The  $^{14}\text{C}$  activity of some ancient Peruvian corn was found to be 10 disintegrations per minute per gram of C. If present-day plant life shows 15 dpm/g, how old is the Peruvian corn? The half-life of  $^{14}\text{C}$  is 5730 years.
- (a) 1455 years  
(b) 1910 years  
(c) 3350 years  
(d) 3820 years  
(e) 9080 years
18. Which of the following describes what occurs in the fission process?
- (a) A heavy nucleus is fragmented into lighter ones.  
(b) A neutron is split into a neutron and proton.  
(c) Two light nuclei are combined into a heavier one.  
(d) A proton is split into three quarks.  
(e) A particle and anti-particle appear in an area of high energy density.
19. Which of the following statements about nuclear fission is always **correct**?
- (a) Very little energy is released in fission processes.  
(b) Nuclear fission is an energetically favorable process for heavy atoms.  
(c) Due to its instability,  $^{56}\text{Fe}$  readily undergoes fission.  
(d) In fission reactions, a neutron is split into a proton and an electron.  
(e) All nuclear fission reactions are spontaneous.

20. Which one of the following would be most likely to undergo thermonuclear fusion?
- ${}^2\text{H}$
  - ${}^4\text{He}$
  - ${}^{56}\text{Fe}$
  - ${}^{141}\text{Ba}$
  - ${}^{235}\text{U}$
21. Which one of the following statements about nuclear reactions is **false**?
- Particles within the nucleus are involved.
  - No new elements can be produced.
  - Rate of reaction is independent of the presence of a catalyst.
  - Rate of reaction is independent of temperature.
  - They are often accompanied by the release of enormous amounts of energy.
22. Complete and balance the following equation. The missing term is \_\_\_\_\_ .
- $${}^{239}\text{Pu} + \text{alpha particle} \rightarrow \text{_____} + \text{neutron}$$
- $2\ {}^{115}\text{Ag}$
  - $2\ {}^{106}\text{Rh}$
  - ${}^{235}\text{U}$
  - ${}^{233}\text{Pa}$
  - ${}^{242}\text{Cm}$
23. When  ${}^{59}\text{Cu}$  undergoes positron emission, what is the immediate nuclear product?
- ${}^{59}\text{Ni}$
  - ${}^{58}\text{Ni}$
  - ${}^{58}\text{Cu}$
  - ${}^{59}\text{Zn}$
  - ${}^{58}\text{Zn}$
24. As a result of the process of electron capture ("K-capture") by  ${}^{211}\text{At}$ , the new isotope formed is:
- ${}^{210}\text{At}$
  - ${}^{212}\text{At}$
  - ${}^{211}\text{Po}$
  - ${}^{211}\text{Rn}$
  - ${}^{207}\text{Bi}$
25. When  ${}^{235}\text{U}$  is bombarded with one neutron, fission occurs and the products are three neutrons,  ${}^{94}\text{Kr}$ , and \_\_\_\_\_ .
- ${}^{139}\text{Ba}$
  - ${}^{141}\text{Ba}$
  - ${}^{139}\text{Ce}$
  - ${}^{139}\text{Xe}$
  - ${}^{142}\text{I}$

---

**Answers:**

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

---

1. Arrhenius defined an acid as:
- a species that can donate a proton.
  - a species that can accept a proton.
  - a source of  $\text{OH}^-$  ions in water.
  - a source of  $\text{H}^+$  ions in water.

- (e) a species that can accept a pair of electrons.
2. In the Bronsted-Lowry system, a base is defined as:
- a proton donor.
  - a hydroxide donor.
  - an electron-pair acceptor.
  - a water-former.
  - a proton acceptor.
3. In the equation:  $\text{HF} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{F}^-$
- $\text{H}_2\text{O}$  is a base and HF is its conjugate acid.
  - $\text{H}_2\text{O}$  is an acid and HF is the conjugate base.
  - HF is an acid and  $\text{F}^-$  is its conjugate base.
  - HF is a base and  $\text{H}_3\text{O}^+$  is its conjugate acid.
  - HF is a base and  $\text{F}^-$  is its conjugate acid.
4. For the system shown here:  $\text{HOBr} + \text{OH}^- \rightleftharpoons \text{H}_2\text{O} + \text{OBr}^-$   
Bronsted would classify the base species as:
- $\text{OH}^-$  and HOBr
  - $\text{H}_2\text{O}$  and  $\text{OH}^-$
  - $\text{OBr}^-$  and  $\text{OH}^-$
  - $\text{OBr}^-$  and HOBr
  - $\text{H}_2\text{O}$  and HOBr
5. Which is the **strongest** acid?
- $\text{HClO}_4$
  - $\text{HClO}_3$
  - $\text{HClO}_2$
  - $\text{HClO}$
  - HF
6. Which of these species is probably the **weakest** acid?
- HCl
  - $\text{H}_3\text{PO}_4$
  - $\text{H}_2\text{PO}_4^-$
  - $\text{HPO}_4^{2-}$
  - $\text{HNO}_3$
7. Consider the neutralization reactions between the following acid-base pairs in dilute aqueous solutions:
- $\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow$
  - $\text{HNO}_3 + \text{Mg}(\text{OH})_2 \rightarrow$
  - $\text{H}_3\text{PO}_4 + \text{Ba}(\text{OH})_2 \rightarrow$
  - $\text{HCl} + \text{KOH} \rightarrow$
  - $\text{H}_2\text{CO}_3 + \text{LiOH} \rightarrow$

For which of the reactions is the **net ionic** equation:  $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$  ?

- 1, 3
  - 1, 4, 5
  - 2, 3
  - 4
  - 1
8. Which one of the following represents the **net ionic** equation for the reaction of nitric acid with aluminum hydroxide?
- $3\text{H}^+ + \text{Al}(\text{OH})_3 \rightarrow \text{Al}^{3+} + 3\text{H}_2\text{O}$

- (b)  $3\text{HNO}_3 + \text{Al}(\text{OH})_3 \rightarrow \text{Al}(\text{NO}_3)_3 + 3\text{H}_2\text{O}$   
(c)  $\text{HNO}_3 + \text{OH}^- \rightarrow \text{NO}_3^- + \text{H}_2\text{O}$   
(d)  $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$   
(e)  $3\text{NO}_3^- + \text{Al}^{3+} \rightarrow \text{Al}(\text{NO}_3)_3$
9. Which one of the following is an amphoteric metal hydroxide?  
(a) KOH  
(b) Ba(OH)<sub>2</sub>  
(c) Pb(OH)<sub>2</sub>  
(d) LiOH  
(e) Mg(OH)<sub>2</sub>
10. According to the Lewis theory, a base \_\_\_\_\_ .  
(a) is a proton acceptor.  
(b) is a proton donor.  
(c) makes available a share in a pair of electrons.  
(d) produces OH<sup>-</sup> ions in aqueous solution.  
(e) accepts a share in a pair of electrons.
11. How many grams of Ca(OH)<sub>2</sub> are contained in 1500 mL of 0.0250 M Ca(OH)<sub>2</sub> solution?  
(a) 3.17 g  
(b) 2.78 g  
(c) 1.85 g  
(d) 2.34 g  
(e) 4.25 g
12. What volume of 12.6 M HCl must be added to enough water to prepare 5.00 liters of 3.00 M HCl?  
(a) 1.19 L  
(b) 21.0 L  
(c) 0.840 L  
(d) 7.56 L  
(e) 2.14 L
13. What is the molarity of the salt produced in the reaction of 200 mL of 0.100 M HCl with 100 mL of 0.500 M KOH?  
(a) 0.0325 M  
(b) 0.0472 M  
(c) 0.0667 M  
(d) 0.0864 M  
(e) 0.0935 M
14. What volume of 0.50 M KOH would be required to neutralize completely 500 mL of 0.25 M H<sub>3</sub>PO<sub>4</sub> solution?  
(a) 2.5 x 10<sup>2</sup> mL  
(b) 1.4 x 10<sup>3</sup> mL  
(c) 83 mL  
(d) 7.5 x 10<sup>2</sup> mL  
(e) 5.2 x 10<sup>2</sup> mL
15. A 0.6745 gram sample of KHP reacts with 41.75 mL of KOH solution for complete neutralization. What is the molarity of the KOH solution? (Molecular weight of KHP = 204 g/mol. KHP has one acidic hydrogen.)  
(a) 0.158 M  
(b) 0.099 M  
(c) 0.139 M

- (d) 0.079 M  
(e) 0.061 M
16. How many equivalents of phosphoric acid are contained in 300 mL of 4.00 M phosphoric acid? (Assume the acid is to be completely neutralized by a base.)  
(a) 0.600 eq  
(b) 1.20 eq  
(c) 2.40 eq  
(d) 3.60 eq  
(e) 4.80 eq
17. Calculate the normality of a solution that contains 4.5 g of  $(\text{COOH})_2$  in 3000 mL of solution? (Assume the  $(\text{COOH})_2$  is to be completely neutralized in an acid-base reaction.)  
(a) 0.033 N  
(b) 0.045 N  
(c) 0.066 N  
(d) 0.090 N  
(e) 0.12 N
18. What volume of 0.100 N  $\text{HNO}_3$  is required to neutralize 50.0 mL of a 0.150 N solution of  $\text{Ba}(\text{OH})_2$ ?  
(a) 50.0 mL  
(b) 75.0 mL  
(c) 100. mL  
(d) 125 mL  
(e) 150. mL
19. How many grams of  $\text{NaOH}$  would be required to neutralize all the acid in 75.0 mL of 0.0900 N  $\text{H}_2\text{SO}_4$ ?  
(a) 0.540 g  
(b) 0.270 g  
(c) 1.32 g  
(d) 0.660 g  
(e) 0.859 g
20. What is the oxidation number for carbon in  $\text{CaC}_2\text{O}_4$ ?  
(a) 0  
(b) +2  
(c) +3  
(d) +4  
(e) +6

---

**Answers:**

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

1. Consider the three statements below. Which statement(s) is(are) **true**?
1. Hydration is a special case of solvation in which the solvent is water.
  2. The oxygen end of water molecules is attracted toward  $\text{Ca}^{2+}$  ions.
  3. The hydrogen end of water molecules is attracted toward  $\text{Cl}^-$  ions.
- (a) 1 only

- (b) 2 only  
(c) 3 only  
(d) 1 and 2 only  
(e) 1, 2, and 3
2. Consider the following pairs of liquids. Which pairs are **miscible**?
1. benzene,  $C_6H_6$ , and hexane,  $C_6H_{12}$
  2. water and methanol,  $CH_3OH$
  3. water and hexane
- (a) 1, 2 only  
(b) 2 only  
(c) 1 only  
(d) 1, 2, 3  
(e) 2, 3 only
3. Calculate the **molality** of a solution that contains 51.2 g of naphthalene,  $C_{10}H_8$ , in 500 mL of carbon tetrachloride. The density of  $CCl_4$  is 1.60 g/mL.
- (a) 0.250 m  
(b) 0.500 m  
(c) 0.750 m  
(d) 0.840 m  
(e) 1.69 m
4. What is the **molality** of a solution labeled "8.6% glucose ( $C_6H_{12}O_6$ ) by weight?" (Note: If the question does not give the solvent, assume it is water.)
- (a) 0.26 m  
(b) 0.34 m  
(c) 0.44 m  
(d) 0.52 m  
(e) 0.67 m
5. Calculate the mole fraction of  $C_2H_5OH$  in a solution that contains 46 grams of ethanol,  $C_2H_5OH$ , and 64 grams of methanol,  $CH_3OH$ .
- (a) 1/3  
(b) 0.42  
(c) 1/2  
(d) 2/3  
(e) none of these
6. Which observation(s) reflect(s) colligative properties?
- (I) A 0.5 m NaBr solution has a higher vapor pressure than a 0.5 m  $BaCl_2$  solution.  
(II) A 0.5 m NaOH solution freezes at a lower temperature than pure water.  
(III) Pure water freezes at a higher temperature than pure methanol.
- (a) only I  
(b) only II  
(c) only III  
(d) I and II  
(e) I and III
7. The vapor pressure of pure water at  $85^\circ C$  is 434 torr. What is the vapor pressure at  $85^\circ C$  of a solution prepared from 100 mL of water (density 1.00 g/mL) and 150 g of diglyme,  $C_6H_{14}O_3$ , a nonvolatile substance?
- (a) 361 torr  
(b) 390 torr  
(c) 425 torr  
(d) 388 torr



- (e) 317 torr
8. The vapor pressure of a solution containing a nonvolatile solute is directly proportional to the
- molality of the solvent.
  - osmotic pressure of the solute.
  - molarity of the solvent.
  - mole fraction of solvent.
  - mole fraction of solute.
9. If 4.27 grams of sucrose,  $C_{12}H_{22}O_{11}$ , are dissolved in 15.2 grams of water, what will be the boiling point of the resulting solution? ( $K_b$  for water =  $0.512\text{ }^\circ\text{C}/m$ ) (Note: If the  $K_f$  and  $K_b$  are not given on the exam, you can find them on the back of the exam envelope.)
- $101.64\text{ }^\circ\text{C}$
  - $100.42\text{ }^\circ\text{C}$
  - $99.626\text{ }^\circ\text{C}$
  - $100.73\text{ }^\circ\text{C}$
  - $101.42\text{ }^\circ\text{C}$
10. What are the ideal van't Hoff factors for the following compounds:  
 $Ba(OH)_2$ ,  $C_6H_{12}O_6$ ,  $K_3PO_4$ ,  $HNO_3$  ?
- 1, 1, 1, 1
  - 2, 1, 2, 2
  - 3, 1, 4, 2
  - 6, 3, 5, 5
  - none of the above
11. Calculate the approximate initial boiling point (in  $^\circ\text{C}$ ) of a solution of 285 g of magnesium chloride in 2.0 kg of water. (Assume complete dissociation of the salt.)
- $103.1\text{ }^\circ\text{C}$
  - $101.6\text{ }^\circ\text{C}$
  - $102.3\text{ }^\circ\text{C}$
  - $100.8\text{ }^\circ\text{C}$
  - $104.8\text{ }^\circ\text{C}$
12. A solution made by dissolving 9.81 g of a nonvolatile nonelectrolyte in 90.0 g of water boiled at  $100.37\text{ }^\circ\text{C}$  at 760 mm Hg. What is the approximate molecular weight of the substance? (For water,  $K_b = 0.51\text{ }^\circ\text{C}/m$ )
- 240 g/mol
  - 150 g/mol
  - 79 g/mol
  - 61 g/mol
  - 34 g/mol
13. What is the freezing point of an aqueous 1.00 m NaCl solution? ( $K_f = 1.86\text{ }^\circ\text{C}/m$ ) (Assume complete dissociation of the salt.)
- $-1.86\text{ }^\circ\text{C}$
  - $+1.86\text{ }^\circ\text{C}$
  - $-3.72\text{ }^\circ\text{C}$
  - $-0.93\text{ }^\circ\text{C}$
  - $0.0\text{ }^\circ\text{C}$
14. A 17.3 mg sample of an organic compound (a non-electrolyte) was ground up with 420 mg of camphor to form a homogeneous mixture melting at  $170.0\text{ }^\circ\text{C}$ . What is the apparent formula weight of the organic compound? ( $K_f$  of camphor =  $37.7\text{ }^\circ\text{C}/m$ , m.p.)

of camphor = 178.4 °C) (Note: This is a freezing point depression problem - note the  $K_f$  of camphor - camphor is the solvent.)

- (a) 353 g/mol
  - (b) 285 g/mol
  - (c) 231 g/mol
  - (d) 185 g/mol
  - (e) 166 g/mol
15. Calculate the osmotic pressure associated with 50.0 g of an enzyme of molecular weight 98,000 g/mol dissolved in water to give 2600 mL of solution at 30.0 °C.
- (a) 0.484 torr
  - (b) 1.68 torr
  - (c) 1.96 torr
  - (d) 2.48 torr
  - (e) 3.71 torr
16. A 250 mL solution containing 21.4 g of a polymer in toluene had an osmotic pressure of 0.055 atm at 27 °C. What is the apparent formula weight of the polymer?
- (a) 15,000 g/mol
  - (b) 18,000 g/mol
  - (c) 26,000 g/mol
  - (d) 32,000 g/mol
  - (e) 38,000 g/mol
17. Which indicator (identified by a letter) could be used to titrate aqueous  $\text{NH}_3$  with HCl solution?

Indicator	Acid Range Color	Color-Change pH	Basic Range Color
(a)	pink	1.2 - 2.8	yellow
(b)	blue	3.4 - 4.6	yellow
(c)	yellow	6.5 - 7.8	purple
(d)	colorless	8.3 - 9.9	red
(e)	none of these		

### Answers:

1. (e) 2. (a) 3. (b) 4. (d) 5. (a) 6. (d) 7. (a) 8. (d) 9. (b) 10. (c) 11. (c) 12. (b) 13. (c) 14. (d) 15. (e) 16. (e) 17. (b)

Unit I

Coordination Chemistry

Part-B

(5 Marks)

1. Predict the no. of unpaired electrons, the spin-only magnetic moments at 25°C for each of the following.

- a)  $[\text{Fe}(\text{CN})_6]^{4-}$
- b)  $[\text{Ru}(\text{NH}_3)_6]^{3+}$
- c)  $[\text{Cr}(\text{NH}_3)_6]^{2+}$
- d)  $[\text{EuCl}_6]^{4-}$

2. (i) What is the coordination number of the Fe atom in  $\text{K}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$ ?

(ii) Which of the following can function as a bidentate ligand?  $\text{NH}_3$ ,  $\text{C}_2\text{O}_4^{2-}$ ,  $\text{CO}$ ,  $\text{OH}^-$

3. Draw the structure of the following complexes:

a) trans-diaqua dichloro platinum(II)

b) diamminetetra (isothiocyanato) chromate(III)

4. Explain Hund's rules.

5. What is meant by the chelate effect? Give an example.

#### Unit II

##### Nuclear Chemistry-I

6. Radionuclides decay by emission of  $\alpha$ -,  $\beta$ - or  $\gamma$ -radiation. What do these radiations consist of?

7. A certain radionuclide has a half-life of 81 min. How long will it take for the activity of a sample to decay to 1% of its initial value?

8. Briefly explain about nuclear fission and fusion reactions.

9. What is meant by transmutation? Explain

10. Enumerate radio active disintegration process.

11. How does the neutron-to-proton ratio affect the stability of an isotope? Why are all isotopes with  $Z > 83$  unstable?

#### Unit III

##### Nuclear Chemistry-II

12. Describe isotopes, isobars and isotones

13. Illustrate the radioactive carbon dating.

14. What do chemists mean when they say a substance is *radioactive*?

15. What is the significance of a *magic number* of protons or neutrons? What is the relationship between the number of stable isotopes of an element and whether the element has a magic number of protons?
16. Do you expect Bi to have a large number of stable isotopes? Ca? Explain your answers
17. Why is the amount of energy released by a nuclear reaction so much greater than the amount of energy released by a chemical reaction?
18. The stability of a nucleus can be described using two values. What are they, and how do they differ from each other?
19. Describe the energy barrier to nuclear fusion reactions and explain how it can be overcome

#### Unit IV

#### Acids & Bases

1. Arrhenius acids and bases
2. Brønsted-Lowry Acids and Bases
3. Lewis Acids and Bases
4. Lux-Flood acid-base definition
5. Usanovich acid-base definition
- 6.

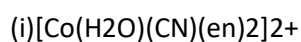
#### Part-C

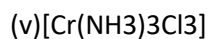
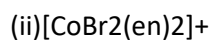
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#### Unit I

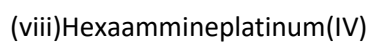
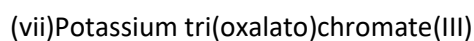
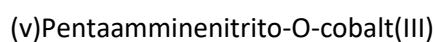
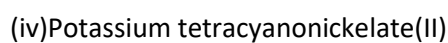
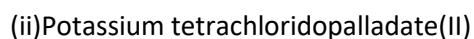
#### Coordination Chemistry

20. Explain the bonding in coordination compounds in terms of Werner's postulates.
21. Explain with two examples each of the following: coordination entity, ligand, coordination number, coordination polyhedron, homoleptic and heteroleptic.
22. What is meant by unidentate, didentate and ambidentate ligands? Give two examples for each.
23. Specify the oxidation numbers of the metals in the following coordination entities:

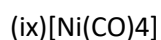
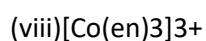
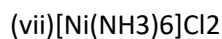
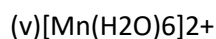
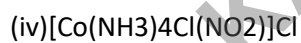
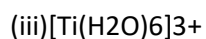
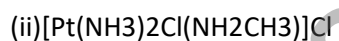
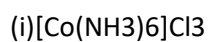




24. Using IUPAC norms write the formulas for the following:



25. Using IUPAC norms write the systematic names of the following:



26. List various types of isomerism possible for coordination compounds, giving an example of each.

27. Discuss the nature of bonding in the following coordination entities on the basis of valence bond theory: (i)  $[\text{Fe}(\text{CN})_6]^{4-}$  (ii)  $[\text{FeF}_6]^{3-}$  (iii)  $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$  (iv)  $[\text{CoF}_6]^{3-}$
28. Draw figure to show the splitting of d-orbitals in an octahedral crystal field.
29. What is crystal field splitting energy? How does the magnitude of  $\Delta_o$  decide the actual configuration of d-orbitals in a coordination entity?
30. What is spectrochemical series? Explain the difference between a weak field ligand and a strong field ligand.
31.  $[\text{Cr}(\text{NH}_3)_6]^{3+}$  is paramagnetic while  $[\text{Ni}(\text{CN})_4]^{2-}$  is diamagnetic. Explain why?
32. A solution of  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$  is green but a solution of  $[\text{Ni}(\text{CN})_4]^{2-}$  is colourless. Explain.
33.  $[\text{Fe}(\text{CN})_6]^{4-}$  and  $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$  are of different colours in dilute solutions. Why?
34. Give the oxidation state, d-orbital occupation and coordination number of the central metal ion in the following complexes: (i)  $\text{K}_3[\text{Co}(\text{C}_2\text{O}_4)_3]$  (ii)  $\text{cis-}[\text{Cr}(\text{en})_2\text{Cl}_2]\text{Cl}$   
(iii)  $(\text{NH}_4)_2[\text{CoF}_4]$  (iv)  $[\text{Mn}(\text{H}_2\text{O})_6]\text{SO}_4$
35. Discuss briefly giving an example in each case the role of coordination compounds in: (i) biological system (ii) medicinal chemistry (iii) analytical chemistry  
(iv) extraction/metallurgy of metals

## Unit II

### Nuclear Chemistry-I

36. What are particle accelerators? Explain
37. How does artificial transmutation differ from nuclear fission? Explain
38. Explain the principle of breeder reactor.
39. Differentiate between nuclear reactions and chemical reactions.
40. Describe the principle of atomic bomb.

## Unit III

### Nuclear Chemistry-II

41. Explain the applications of radioactive isotopes.
42. Describe the six classifications of nuclear decay reactions. What is the most common mode of decay for elements that have heavy nuclei? Why?
43. Explain the difference between the symbols  $e^-$  and  $\beta^-$ . What is the difference in meaning between the symbols  ${}^{42}\text{He}$  and  ${}^{42}\alpha$ ?

44. Can all the kinds of nuclear decay reactions discussed be characterized by the general equation: parent  $\rightarrow$  daughter + particle? Explain your answer.
45. Which types of nuclear decay reactions conserve both mass number and atomic number? In which do the parent and daughter nuclei have the same mass number but different atomic numbers? Which do not convert one element to another?
46. Describe a radioactive decay series. How many series occur naturally? Of these, which one no longer occurs in nature? Why?
47. Why are neutrons preferred to protons when preparing new isotopes of the lighter elements?
48. How are transmutation reactions and fusion reactions related? Describe the main impediment to fusion reactions and suggest one or two ways to surmount this difficulty.

KASC-Chemistry (UG)

**KONGUNADU ARTS AND SCIENCE  
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COIMBATORE-641 029**



**QUESTION BANK**

**Prepared by**

**Dr. V. SANGEETHA, Asst Prof & HOD**

**DEPARTMENT OF CHEMISTRY (UG)**



**CORE CHEMISTRY PAPER – VII**

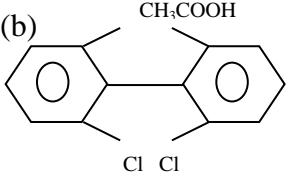
**ORGANIC CHEMISTRY- I**

**Subject code – 15UCH507**

**SECTION : A**

**UNIT : I**

- Which of the following compounds occur in enantiomeric forms  
(a) 1- chloropentane (b) 2- chloropentane (c) 3- chloropentane (d) Azo pentane
- Stereoisomers which are mirror –image of each other called  
(a) Enantiomers (b) Stereoisomers (c) Diastereomers (d) Epimers
- The number of optical isomers possible for a compound with “n” dissimilar asymmetric “c” atoms are  
(a)  $2n$  (b)  $n^2$  (c)  $n!$  (d)  $2^n$
- The necessary and sufficient condition for a compound to be optically active is due to  
(a) Presence of asymmetric carbon (b) Presence of carboxylic acid group  
(c) Presence of axis of symmetry (d) Presence of elements of symmetry
- d -lactic acid and l-lactic acid are  
(a) Enantiomers (b) Diastereomers  
(c) Geometrical isomers (d) Epimers
- The number of optical isomers for 2 –bromo-3- chloro butane are  
(a) 2 (b) 3 (c) 4 (d) 6
- Optical activity due to restricted rotation is called  
(a) Geometrical isomerism (b) Atropic isomerism  
(c) Tautomerism (d) Metamerism
- Meso tartaric acid and d-tartaric acid are called  
(a) Optical isomers (b) Diastereomers  
(c) Enantiomers (d) Configurational isomers
- Which is optically inactive  
(a) 2-butanol (b) 3 –pentaneol (c) 2-aminopentane (d) Lactic acid
- dl can be represented by  
(a) DL (b) LD (c) RS (d)  $\pm$

11. The no. of optically active isomers for the compound  $\text{CH}_3\text{-CHBr-CHBr-CH}_3$  are  
 (a) 4 (b) 3 (c) 6 (d) 2
12. Which of the following is optically active  
 a)  $\text{CH}_2\text{Cl-CH}_2\text{Cl}$  (b)  $\text{CH}_3\text{-CHCl-COOH}$  (c)  $\text{CH}_3\text{-CHCl-CH}_3$   
 (d)  $\text{CH}_2\text{Cl-CH}_2\text{-CH}_2\text{Cl}$
13. An example for an optically active compound due to overcrowding is  
 (a). Biphenyl (b) Spirane (c) Allene (d) Hexahelicene
14. Biphenyls are optically active due to  
 (a) Axillary chiral (b) Helically chiral  
 (c) Presence of ortho substitution (d) None of these
15. When the rearrangement reaction takes place within the molecule (intra molecular) the configuration of migrating sp is  
 (a) inversed (b) Retained (c) Both inverted and retained  
 (d) All the above three
16. Arrange the following groups in order of increasing priority using sequence rules  
 (a) Cl (d)  $\text{SO}_3\text{H}$  (c)  $\text{CH}(\text{CH}_3)_2$  (d)  $-\text{CH}=\text{CH}_2$
17. Arrange the following groups in order of decreasing priority using sequence rules  
 (a) Aldehyde group (b) amino group (c) Hydroxy group  
 (d) Methoxy group
18. Mesotartaric acid is optical inactive due to  
 (a) Absence of asymmetric carbonation (b) External compensation  
 (c) Internal compensation (d) Molecular asymmetry
19. Which one of the following molecule has plane of symmetry  
 (a)  $\text{CH}_3\text{Cl}$  (b)  (c)  $\text{CHClBrCOOH}$   
 (d)  $\text{CH}_3\text{-CHOH-COOH}$
20. Walden inversion is type of  
 (a)  $\text{SN}_1$  reaction (b)  $\text{SN}_2$  reaction (c)  $\text{E}_1$  reaction (d)  $\text{E}_2$  reaction

## Unit-II

1. Isocyanate is the intermediate in the following rearrangement  
(a) Beckmann (b) Hofmann (c) Claisen (d) Benzilic acid
2. Benzilic acid rearrangement takes place  
(a) In acid (b) In base (c) In neutral medium (d) On heating
3. The loss of which OH group in pinacol-pinacolone rearrangement depends on  
(a) Stability of pinacolone (b) Migratory aptitude  
(c) Stability of carbocation (d) position of migrating group
4. Beckmann rearrangement is the conversion of  
(a) An amide to primary amine (b) An oxime to N-substituted amine  
(c) An amide to urethane (d) Hydroxamic acid to primary amine
5. When the rearrangement reaction takes place within the molecule it is known as  
(a) Intra molecular rearrangement (b) Inter molecular rearrangement  
(c) Prototropic rearrangement (d) None of the above
6. Pinacol-pinacolone rearrangement is catalysed by  
(a) Acid (b) Base (c) Light (d) heat
7. Acetophenoneoxime on treatment with an acid gives  
(a) Benzaldehyde (b) Acetanilide  
(c) Acetophenone (d) Benzophenone
8. The reagent used in Beckmann rearrangement is  
(a) Br/NaOH (b) NaBr (c) PCl<sub>5</sub> (d) Cl<sub>2</sub>
9. Pinacol-pinacolone rearrangement is  
(I) Catalysed by acids (II) Catalysed by base  
(III) An intramolecular rearrangement (IV) An intermolecular rearrangement  
Of these statements which of the following is correct  
(a) I & II (b) II & III (c) I & IV (d) II & IV
10. Name of the rearrangement in which alkyl group migrates  
(a) Beckmann (b) Curtius (c) Benzilic acid (d) Claisen
11. Pinacol-pinacolone rearrangement is concerned with  
(a) Gem-diol (b) Vic-diol (c) 1,4-diol (d) 1,3-diol
12. The pair of rearrangement giving the same kind of product is  
(a) Beckmann and Hofmann (b) Curtius and Claisen  
(c) Claisen and Benzilic acid (d) Hofmann and Curtius

13. In Lossen rearrangement the migrating group migrates from  
(a) C to N (b) N to C (c) O to C (d) C to O
14. Generally .....groups are migrating in the rearrangements  
(a) Anionic (b) Cationic (c) Free radical (d) all the above three
15. N-substituted amide is formed from a ketoxime by the action  $\text{PCl}_5$  is  
(a) Beckmann rearrangement (b) Hofmann rearrangement  
(c) Schemidt rearrangement (d) Lossen rearrangement
16. When the migrating group is an anion the rearrangement is  
(a) Nucleophilic rearrangement (b) Electrophilic rearrangement  
(c) Free radical rearrangement (d) Proto tropic rearrangement
17. Whether the rearrangement is inter or intra molecular can be identified by  
(a) Optical activity  
(b) Cross over experiment  
(c) Optical activity and crossover experiment  
(d) None of the above
18. An isopolar cyclic transition state is formed in  
(a) Curtius rearrangement  
(b) Lossen rearrangement  
(c) Benzidine rearrangement  
(d) Claisen rearrangement
19. Which one of the following is the major product is benzidine rearrangement  
(a) O.semidine (b) p. semidine (c) p. benzidine (d) O. benzidine
20. Cope rearrangement takes place on heating of  
(a) 1,5-diene  
(b) 1,3-diene  
(c) 1, 4- diene  
(d) 1,2-diene

### Unit -III

1. Reducing agent used in Clemmensen reduction is  
(a) Zn / Hg in HCl (b) Ag / Hg in HCl  
(c) Ca / Hg in HCl (d) Cd / Hg in HCl
2. Benzoin condensation occurs in  
(a) aliphatic aldehydes (b) aromatic aldehydes  
(c) ketones (d) esters
3. Reaction involving simultaneous oxidation and reduction of an aldehyde to give an acid and alcohol is called  
(a) Cannizzaro reaction (b) Kolbe's Schmidt reaction  
(c) Mannich reaction (d) Gattermann reaction
4. The reaction involving carbonation of phenols to give phenolic acid is named as  
(a) Cannizzaro reaction (b) Clemmenson reduction  
(c) Benzoin condensation (d) Kolbe – Schmidt reaction.
5. The starting material used in Fisher – Indole synthesis is  
(a) phenyl hydrazone (b) phenol  
(c) aniline (d) Hydrazine
6. The catalyst used in Vilsmeier reaction is  
(a). PCl<sub>5</sub> (b). POCl<sub>3</sub>  
(c) Zn / HCl (d) Na / C<sub>2</sub>H<sub>5</sub>OH
7. Which one of the following reaction is used to convert benzene to benzaldehyde?  
(a). pinacol - pinacolone (b) Hoffmann  
(c) Gattermann Koch (d) Benzil – Benzilic acid
8. The final product formed in the Friedlander synthesis is  
(a) Quinoline (b) Isoquinoline  
(c) amide (d) anilide
9. Heating of aldehyde or ketone with Zinc – amalgam and HCl is known as  
(a) clemmenson reduction (b) pinacol - pinacolone  
(c) Birch reduction (d) Kolbe – Schmidt reaction
10. Which one of the following reducing agent used in Clemmensen reduction?  
(a). PCl<sub>5</sub> (b) Zn/ Hg / HCl  
(c) Zn / HCl (d) Na / C<sub>2</sub>H<sub>5</sub>OH

11. Aliphatic or Aromatic ketone is converted into its corresponding hydrocarbon by  
(a) Clemmenson reduction (b) pinacol - pinacalone  
(c) Birch reduction (d) Kolbe – Schmidt reaction
12. Aryl hydrozones of aldehyde or ketones are converted to Indole by --- --- synthesis.  
(a) Cannizzaro reaction (b) Clemmenson reduction  
(c) Benzoin condensation (d) Fisher – Indole synthesis
13. Which one of the following reaction is used to condensation of o-amino benzaldehyde with acetaldehyde?  
(a) Fisher – Indole synthesis (b) Clemmenson reduction  
(c) Benzoin condensation (d) Friedlander synthesis
14. Friedlander synthesis is used to prepare which one of the following compound  
(a) Quinoline (b) Isoquinoline  
(c) pyridine (d) piperidine
15. Which catalyst is used in Gattermann – Koch aldehyde synthesis  
(a)  $\text{FeCl}_3$  (b)  $\text{AlCl}_3$  (c) oxime (d) hydrazine
16. Which one of the following reaction is used to convert benzene to benzaldehyde?  
(a) Gattermann – Koch aldehyde synthesis (b) Clemmenson reduction  
(c) Benzoin condensation (d) Friedlander synthesis
17. Which one of the following reactions is used to convert Di-substituted formamides with  $\text{POCl}_3$  to aromatic aldehyde?  
(a) Vilsmeier Haach reaction (b) Friedlander synthesis  
(c) Clemmenson reduction (d) Benzoin condensation
18. Which is the product formed in Kolbe- Schmit reaction  
(a) salicylic acid (b) benzoic acid  
(c) adipic acid (d) formic acid
19. Conversion of sodium phenoxide with  $\text{CO}_2$  to salicylic acid is achieved by -----  
reaction  
(a) Kolbe- Schmit (b) Friedlander synthesis  
(c) Clemmenson reduction (d) Vilsmeier Haach reaction
20. What is the product formed by benzoin condensation  
(a) benzaldehyde (b) benzoin  
(c) benzoic acid (d) benzil

#### UNIT –IV

- The amino acid that should be supplied in diet is  
(a)  $\alpha$ - aminoacid (b)  $\beta$ - amino acid (c) essential amino acid  
(d) Non- essential amino acid
- The amino acid which is optically inactive is  
(a) Valine (b) Glycine (c) alanine (d) Phenyl alanine
- Which one corresponds to peptide bond.  
(a)  $-\text{CONH}_2$  (b)  $-\text{C}-\text{NH}-$  (c)  $-\text{C}-\text{NH}-\text{C}$  (d)  $-\text{COONH}$
- The protein present in hair is  
(a) Myosin (b) Collagen (c) Keratin (d) Casein
- The protein present in milk  
(a) Keratin (b) Casein (c) Fibroin (d) Myosin
- Protein present in silk is  
(a) Keratin (b) Fibroin (c) Pepsin (d) Collagen
- Protein with conc.  $\text{HNO}_3$  gives  
(a) Red colour (b) Blue colour (c) violet colour (d) Yellow colour
- Protein gives .....colour with ..... is  
(a) Blue colour (b) Yellow colour (c) Red colour (d) green colour
- Glycine on reduction with LAH gives  
(a) 2-aminoethanol (b) 2-amino propanol (c) Ethanol (d) hydroxy ethane
- Which one of the following is basic amino acid  
(a) Valine (b) glycine (c) Lysine (d) Cystine
- Amine acids are soluble in the solvent  
(a) Water (b) ether (c) benzene (d) Chloroform
- Find out the neutral amino acid in the following  
(a) Proline (b) Lysine (c) Glutamine (d) Aspartic acid
- On heating  $\alpha$ -amino acid gives  
(a) Diketo piperazine (b) peptide (c)  $\alpha$ - $\beta$  unsaturated acid (d) None of the above
- The enzyme used in C- terminal analysis is  
(a) Peptidase (b) Carboxypeptidase (c) Pepsin (d) zymase
- The reagent used in N-terminal analysis is  
(a) 2,5- dinitro phenyl hydrazine (b) 2,4 dinitro phenyl hydrazine

- (c) 2,3-dinitrophenyl hydrazine (d) Phenyl hydrazine
16. Sanger's reagent is used to determine  
 (a) N-terminal residue (b) C-terminal residue  
 (c) Peptide bond (d) amino group
17. Denaturation of protein takes place due to  
 (a) Changes in the primary structure (b) Changes in the secondary structure  
 (c) Changes in the primary and secondary structure  
 (d) Changes in secondary and tertiary structure
18. Primary structure of protein refers  
 (a) The order in which  $\alpha$  amino acids are arranged  
 (b) The number of  $\alpha$  amino acids  
 (c) the conformation of peptide chain  
 (d) The types of  $\alpha$  amine acids present
19. The number of poly peptide obtained when 'n' no. of  $\alpha$  amino acids react are  
 (a)  $2n$  (b)  $n^2$  (c)  $2^n$  (d)  $n^1$
20. Which one of the following amino acid is aromatic  
 (a) Glutamine (b) Phenyl alanine (c) aspartic acid (d) Leucine

#### UNIT –V

1. The heteroatom present in pyridine is  
 (a) Oxygen (b) Nitrogen (c) Sulphur (d) Phosphorous
2. Pyrrole is  
 (a) Bicyclic compound  
 (b) five membered ring  
 (c) Five membered ring with nitrogen heteroatom  
 (d) Monocyclic with oxygen heteroatom.
3. Pyrrole on oxidation with  $\text{CrO}_3/\text{H}_2\text{SO}_4$  gives  
 (a) Pyridine (b) Pyrrole acid (c) Maleic imide (d) Pyrroline
4. Indigo is prepared by the .....of indoxyl  
 (a) Reduction (b) Oxidation (c) Hydrolysis (d) Condensation
5. Some of the reaction of phenol resembles with .....  
 (a) Furan (b) thiophene (c) Pyridine (d) pyrrole
6. Which one of the following is basic in nature  
 (a) Furan (b) Pyridine (c) Pyrrole (d) Thiophene



7. Quinoline undergoes nitration to give a mixture of .....nitro quinolines  
 (a) 5&6 (b) 6&4 (c) 2&4 (d) 5&8
8. The compound undergoing Reimer-Tiemann reactions is  
 (a) Pyridine (b) Indole  
 (b) (c) Furan (d) Pyrrolidine
9. Pyridine reacts with sodamide to give .....pyridine  
 (a) N-amino (b) 3-amino  
 (b) (c) 2-amino (d) 4-amino
10. Which is non-aromatic  
 (a) Pyrrole (b) Quinoline (c) Furan (d) Piperidine
11. Piperidine is .....than pyridine  
 (a) More basic (b) Less basic (c) More acidic (d) Lossacidic
12. Quinoline or oxidation with  $K_2Cr_2O_7/H^+$  gives  
 (a) Nicotinic acid (b)  $\alpha$ -picolinic acid (c) cinchomeric acid  
 (d) none of the above
13. Nucleophilic substitution of isoquinoline takes place at position  
 (a) 1 (b) 2 (c) 3 (d) 5
14. Indigo is  
 (a) A dye (b) heterocyclic compound  
 (c) a dye and heterocyclic compound (d) a plant
15. Chi-chi babin in reaction is a  
 (a) Nucleophilic substitution (b) Electrophilic substitution  
 (c) Free radical substitution (d) aromatic electrophilic substitution
16. Diels-Alder reaction is given by  
 (a) Pyrrole (b) Pyridine (c) Furan (d) Quinoline
17. Acetylene and HCN on passing through red hot tube gives  
 (a) Pyrrole (b) Thiophene (c) Furan (d) Pyridine
18. Nicotinic acid is  
 (a) Pyridine -2- carboxylic acid (b) Pyridine -3- carboxylic acid  
 (c) Pyridine -4- carboxylic acid (d) pyrrole -2- carboxylic acid
19. Indole is  
 (a) Benzopyridine (b) Benzopyrrole (c) Benzofuran  
 (d) Benzothiophene

20. Furan with ammonia gives

- (a) Pyridine (b) Pyrrole (c) Benzofuran (d) Quinoline

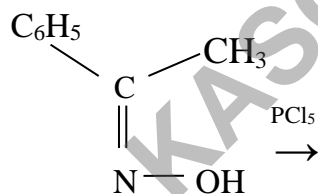
## SECTION –B

### UNIT-I

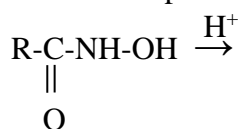
1. What is plane polarized light?
2. Explain optical activity
3. What are enantiomers? Explain with example
4. Explain diastereomers with example.
5. Explain optical activity of over crowded molecules.
6. Write the configuration (i) s-lactic acid (ii) R- glyceraldehyde
7. Write notes on resolution.
8. What is racemisation?
9. Explain sequence rules for assigning the configuration.
10. Write notes on asymmetric synthesis.

### UNIT-II

1. What is benzidine rearrangement? write all the possible products that are formed.
2. What is inter and intra molecular rearrangement. write one example for each.
3. What is meant by molecular rearrangement. Explain with example.
4. How will you convert acylazide to primary amine? Name the rearrangement and write a suitable mechanism.
5. Complete the following reaction and suggest a suitable mechanism.



6. Write notes on  
(i). Cope rearrangement (ii) Curtius rearrangement
7. Discuss Benzidine rearrangement.
8. Predict the products and suggest a mechanism



Name the rearrangement

9. What is Schmidt rearrangement. Explain the reaction and mechanism with example.

10. Explain claisen rearrangement and the mechanism of the reaction.

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### UNIT –III

1. Explain Kolbe – Schmidt reaction with its mechanism.
2. Write the mechanism of Wolf – Kishner reduction.
3. Sketch and explain Friedlander Synthesis.
4. Discuss about Benzoin condensation.
5. Explain Clemmensen reduction.
6. What is Kolbe – Schmidt reaction? Explain with suitable example and give its applications..
7. Discuss Michale addition.
8. What is Wolf – Kishner reduction . Explain.
9. What is Michale addition . Explain.
10. Discuss Mannich Reaction.

### UNIT –IV

1. What are amino acids? How are they classified
2. What is the action of heat on  $\alpha$ -amino acid
3. Explain Gabriel synthesis of  $\alpha$ -amino acid
4. Write and name the possible dipeptides obtained from glycine and alanine.
5. What happens when alanine reacts with (i)  $\text{HNO}_2$  (ii)  $\text{PCl}_5$
6. Write any two colour reactions given by protein.
7. Give the biological importance of protein.
8. How will you determine the primary structure of protein.
9. How will you convert acetic acid to glycine.
10. Write notes on (i). Denaturation (ii) Classification of protein base on physical appearance.

### UNIT V

1. How is furan prepared from succindialdehyde, malic acid.
2. Write any two methods of preparation of thiophene
3. How will you convert furan to (i) Pyrrole (ii) thiophene
4. How pyridine is isolated from coaltar
5. Write one methods of synthesis of (i) Indoxyl (ii) Indigo
6. Write notes on chi-chi babin reaction.

- How does furan react with the following. (a)  $\text{SO}_3$  / pyridine (b) Ni/  $\text{H}_2$
- How does pyridine react with (i)  $n\text{-C}_4\text{H}_9\text{Li}$  (ii)  $\text{NaNH}_2$
- Pyridine and pyrrole undergo nucleophilic substitution at 3 and 2 respectively. Account for this behavior.
- Describe the method of isolation of indigo from the natural source.

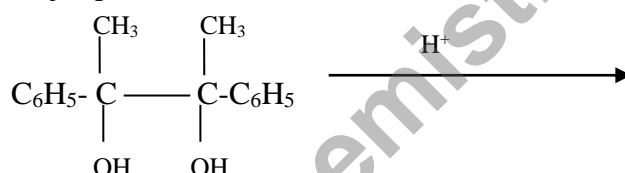
### SECTION –C

#### UNIT –I

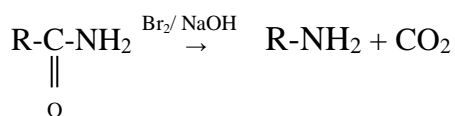
- Describe the optical isomerism of tartaric acid..
- Explain the optical isomerism of compound with one asymmetric carbon atom.
- Explain the rules for assigning R-S nomenclature.
- What is meant by asymmetric carbon? What is atropisomerism? Explain with example.
- Discuss the optical activities of biphenols, allenes and spiranes.

#### UNIT II

- Predict the major product with reason and write the mechanism



- Discuss the reaction and mechanism of Benzil –Benzilic acid rearrangement .
- Write the name of the rearrangement, structure of the product and suggest a suitable mechanism.
- With illustration explain Curtius rearrangement
- Compare and contrast Lossen and Schmidt rearrangement.
- Claisen rearrangement is inter and intra molecular rearrangement? How will you prove?
- Write notes on paraclaisen rearrangement?
- Write notes on “ migratory aptitude of various groups” in pinacol-pinacolone rearrangement .
- What is Cope rearrangement ? Write the mechanism of that reaction.
- Suggest a suitable mechanism for the following reaction.



### UNIT –III

1. Write the reaction mechanism and applications of clemmensen reduction.
2. Write the mechanism of Michale addition and Benzoin condensation reactions.
3. Explain the following reactions and mention any two of their applications.
  - (i) Gattermann – Koch
  - (ii) Kolbe - Schmidt
4. Complete and explain the following reactions.
  - (i)  $2\text{C}_6\text{H}_5\text{CHO} + \text{NaOH} \rightarrow \text{X} + \text{Y}$
  - (ii)  $\text{C}_6\text{H}_5\text{COCH}_3 + \text{HCHO} \rightarrow \text{Y}$
5. Discuss Fischer – Indole synthesis with its applications.
6. Explain (i) Friedlander Synthesis (ii) Villsmeyer reaction
7. Explain the mechanism of benzoin condensation with evidences.
8. What is Kolbe synthesis.
9. Explain the following reactions with mechanism .
  - (i) Michale addition
  - (ii) Mannich reaction
10. Discuss the following reaction with mechanism.
  - (i) Kolbe Schmidt
  - (ii). Gattermann Koach.

### UNIT IV

1. Write any three methods of preparation of  $\alpha$ -amino acids.
2. Write the classifications of  $\alpha$ -amino acids with examples.
3. Write any three reactions given by amino group and carboxylic acid group in  $\alpha$ -amino acids.
4. Define and explain (i) Iso electric point (ii) Zwitter ion
5. Write two methods of synthesis of polypeptide.
6. Write notes on secondary, tertiary structure of protein.

### UNIT V

1. Establish the structure of pyridine.
2. Compare the aromatic character of pyrrole, furan and thiophene.
3. How will you prepare isoquinoline by (i) Bischler-napieralsky reaction (ii). Beckmann rearrangement.
4. (i) What are hetero cyclic compounds?
  - (ii) Write the resonance structures of pyridine
  - (iii) why is pyridine more basic than pyrrole.

5. What happens when pyrrole reacts with
- (i) Nitric acid in acetic anhydride at  $-10^{\circ}\text{C}$
  - (ii) Chromium trioxide in sulphuric acid.
  - (iii). Benzene diazonium chloride
  - (iv) .Hydrogen and nickel.

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**KEY FOR SECTION : A**

**UNIT I**

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

**UNIT II**

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

**UNIT III**

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

**UNIT IV**

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

**UNIT V**

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



**KONGUNADU ARTS AND SCIENCE COLLEGE**

**(AUTONOMOUS)**

**COIMBATORE-641 029**



**QUESTION BANK**

**Prepared by**

**Dr. V. SANGEETHA, Asst Prof & HOD**

**DEPARTMENT OF CHEMISTRY (UG)**

**Core Chemistry Paper - X**  
**Organic Chemistry-II**

**Subject code: 14UCH610**

**Multiple Choice Questions**

1. The main source of terpenoid is \_\_\_\_\_  
(a) terpertine oil (b) olive oil (c) pine oil (d) cocounut oil
2. The terpenoids are composed of \_\_\_\_\_  
(a) hydrocarbons (b) isoprene (c) aldehydes (d) heterocyclic compound
3. Terpenoids are also called \_\_\_\_\_  
(a) alkaloids (b) hormones (c) isoprenoids (d) vitamins
4. Molecular formula of monoterpenoid is \_\_\_\_\_  
(a)  $C_{11}H_{16}$  (b)  $C_{10}H_{12}$  (c)  $C_{10}H_{14}$  (d)  $C_{10}H_{16}$
5. Tetraterpenoids are called \_\_\_\_\_  
(a) alkaloids (b) carotenoids (c) hydrocarbons (d) casin
6. Molecular formula of Tetraterpenoids is \_\_\_\_\_  
(a)  $C_{11}H_{16}$  (b)  $C_{40}H_{64}$  (c)  $C_{10}H_{14}$  (d)  $C_{10}H_{16}$
7. Terpenoids contain an open chain structure called \_\_\_\_\_  
(a) aliphatic terpenoids (b) alicyclic terpenoids (c) monoterpenoids (d) acyclicterpenoids
8. Terpenoids containing two rings in the molecule is called \_\_\_\_\_  
(a) aliphatic terpenoids (b) alicyclic terpenoids  
(c) Bicyclic Terpenoid (d) monoterpenoids
9. Expression method in the isolation of Terpenoids is generally used to extract \_\_\_\_\_  
(a) citrus fruits (b) rose (c) jasmin (d) neem leaf
10. Isolation of Terpenoid by adsorption method is used to extract \_\_\_\_\_  
(a) citrus fruits (b) rose and jasmine (c) neem leaf (d) palm
11. Rubber is a polymer of \_\_\_\_\_  
(a) ethylene (b) styrene (c) Isoprene (d) vinyl chloride
12. In this Terpenoid isoprene units are not joined to head to tail fashion  
(a) geraniol (b) dipentene (c) pinene (d) Lavandulal and carotenoids
13. The main source of geraniol is  
(a) Genarium lavender (b) rose (c) jasmin (d) orange
14. The molecular formula of geraniol is  
(a)  $C_{11}H_{16}O_8$  (b)  $C_{10}H_{12}O_9$  (c)  $C_{10}H_{14}O_{14}$  (d)  $C_{16}H_{18}O$
15. Geraniol consumes \_\_\_\_\_ number of hydrogen molecules to form saturated  
Compound  
(a) 2 (b) 3 (c) 4 (d) 5
16.  $\alpha$ - Terpineol is \_\_\_\_\_ Terpenoid  
(a) optically inactive (b) optically active (c) polymer (d) none of the above
17. The racemic mixture of  $\alpha$ - Terpineol occurs in \_\_\_\_\_  
(a) gingili oil (b) coconut oil (c) rice oil (d) cajuput oil
18. The molecular formula of  $\alpha$ - Terpineol is \_\_\_\_\_  
(a)  $C_{10}H_{18}O$  (b)  $C_{10}H_{12}O_9$  (c)  $C_{10}H_{14}O_{14}$  (d)  $C_6H_{18}O$
19.  $\alpha$ - Terpineol adds \_\_\_\_\_ moles of hydrogen to form a saturated compound

- (a) 2 (b) 3 (c) 1 (d) 5
20. The source of dipentene is \_\_\_\_\_  
(a) lemon (b) rose (c) jasmin (d) neem plant
21. The racemic modification of limonene is \_\_\_\_\_  
(a) dipentene (b) cymene (c) carotenoid (d) pinene
22. The molecular formula of dipentene is \_\_\_\_\_  
(a)  $C_{11}H_{16}$  (b)  $C_{10}H_{12}$  (c)  $C_{10}H_{16}$  (d)  $C_{10}H_{16}$
23. The number of double bonds present in dipentene is  
(a) one (b) three (c) Two (d) four
24. The source of  $\alpha$ - pinene is \_\_\_\_\_  
(a) Terpentine (b) coconut (c) ground nut (d) sunflower
25. The molecular formula of  $\alpha$ - pinene is \_\_\_\_\_  
(a)  $C_{10}H_{16}$  (b)  $C_{10}H_{12}$  (c)  $C_{10}H_{14}$  (d)  $C_{16}H_{18}$
26. Alkaloids are \_\_\_\_\_ in nature  
(a) acidic (b) neutral (c) basic (d) none of the above
27. Origin of Alkaloids are \_\_\_\_\_  
(a) animals (b) birds (c) plants (d) sea animals
28. Alkaloids must contain atleast one \_\_\_\_\_ ring  
(a) carbohydrate (b) alicyclic (c) aromatic (d) heterocyclic
29. Which one of the following is a pyridine alkaloid  
(a) pinene (b) dipentene (c) lemonine (d) piperine
30. Which one of the following Alkaloid is liquid ?  
(a) nicotine (b) cymene (c) ascorbic acid (d) thyroxin
31. The occurrence of coniine is \_\_\_\_\_  
(a) sunflower (b) hemlock (c) ground nut (d) coconut
32. Socrates was sentenced to death by drinking the oil of \_\_\_\_\_  
(a) sunflower (b) dipentene (c) limonine (d) hemlock
33. The molecular formula of coniine is \_\_\_\_\_  
(a)  $C_{11}H_{16}N_8$  (b)  $C_8H_{17}N$  (c)  $C_{10}H_{14}N_{14}$  (d)  $C_{16}H_{18}N$
34. The side chain in coniine is \_\_\_\_\_ group.  
(a) isopropyl (b) pentyl (c) n- propyl (d) isopentyl
35. Coniine is \_\_\_\_\_ compound  
(a) optically inactive (b) optically active (c) hydrocarbon (d) none of the above
36. Coniine is \_\_\_\_\_ in nature  
(a) levo rotatory (b) racemic mixture (c) meso compound (d) dextrorotatory
37. The occurrence of piperine is in \_\_\_\_\_  
(a) black pepper (b) white pepper (c) jeera (d) mustard
38. Piperine is \_\_\_\_\_  
(a) optically inactive (b) hydrocarbon (c) optically active (d) none of the above
39. The molecular formula of Piperine is \_\_\_\_\_  
(a)  $C_{17}H_{19}NO_3$  (b)  $C_8H_{17}NO_8$  (c)  $C_{10}H_{14}N_{14}O_8$  (d)  $C_{16}H_{18}NO_8$
40. The no. of double bonds present in piperine are \_\_\_\_\_  
(a) one (b) three (c) two (d) four
41. The source of nicotine is \_\_\_\_\_ in \_\_\_\_\_  
(a) gingily (b) tobacco (c) mustard (d) cajuput
42. The naturally occurring nicotine is \_\_\_\_\_

- (a) dextro rotatory (b) leavo rotatory (c) racemic mixture (d) meso compound
43. The molecular formula of nicotene is \_\_\_\_\_  
(a)  $C_{10}H_{19}N_3$  (b)  $C_8H_{17}N$  (c)  $C_{10}H_{14}N_2$  (d)  $C_{16}H_{18}N$
44. The nitrogen present in compound \_\_\_\_\_  
(a) primary (b) tertiary (c) secondary (d) tertiary
45. The main source of papaverine is in \_\_\_\_\_  
(a) poppy plant (b) neem plant (c) sunflower (d) coconut plant
46. Papaverine is \_\_\_\_\_ in nature  
(a) optically inactive (b) optically active (c) polymeric (d) none of the above
47. The molecular formula of papaverine is \_\_\_\_\_  
(a)  $C_{20}H_{21}NO_4$  (b)  $C_8H_{17}NO_4$  (c)  $C_{10}H_{14}N_2O_4$  (d)  $C_{16}H_{18}NO_4$
48. The nitrogen present in papaverine is \_\_\_\_\_  
(a) primary (b) tertiary (c) secondary (d) tertiary
49. Adrenaline is also called as \_\_\_\_\_  
(a) cymene (b) epinephrine (c) limonene (d) dipentene
50. The molecular formula of Adrenaline is \_\_\_\_\_  
(a)  $C_{19}H_{13}NO_4$  (b)  $C_8H_{17}NO_4$  (c)  $C_{19}H_{13}NO_3$  (d)  $C_{16}H_{18}NO_4$
51. The hydroxy group present in Adrenaline is \_\_\_\_\_ nature  
(a) secondary (b) primary (c) tertiary (d) none of the above
52. Thyroxin is \_\_\_\_\_ derivative  
(a)  $\beta$ - aminoacid (b)  $\alpha$ - aminoacid (c)  $\mu$ - aminoacid (d)  $\gamma$ - aminoacid
53. The molecular formula of Thyroxin is \_\_\_\_\_  
(a)  $C_{19}H_{13}NO_4I_4$  (b)  $C_{15}H_{11}NO_4$  (c)  $C_{19}H_{13}O_4NI_4$  (d)  $C_{16}H_{18}NO_4I_4$
54. Thyroxin is \_\_\_\_\_ compound  
(a) dextro rotatory (b) leavo rotatory (c) racemic mixture (d) meso compound
55. Adrenalin gives \_\_\_\_\_ colour with neutral  $FeCl_3$ .  
(a) blue (b) green (c) yellow (d) pink
56. Which one of the following is water soluble vitamin.  
(a) Vitamin B complex (b) thyroxin (c) vitamin A (d) Vitamin C
57. Which one of the following is water soluble vitamin.  
(a) vitamin A (b) Vitamin C (c) vitamin D (d) vitamin E
58. Deficiency of Vitamin  $A_1$  is \_\_\_\_\_.  
(a) night blind ness (b) beri-beri (c) scurvy (d) rickets
59. Deficiency of Vitamin  $B_1$  is \_\_\_\_\_.  
(a) night blind ness (b) Beri-Beri (c) scurvy (d) rickets
60. Deficiency of Vitamin C is \_\_\_\_\_.  
(a) night blind ness (b) Beri-Beri (c) scurvy (d) rickets
61. Deficiency of Vitamin D is \_\_\_\_\_.  
(a) night blind ness (b) Beri-Beri (c) scurvy (d) rickets
62. The source of Retinol is \_\_\_\_\_.  
(a) olive oil (b) coconut oil (c) fish oil (d) sunflower oil
63. The molecular formula of Vitamin  $A_1$  is \_\_\_\_\_.  
(a)  $C_{10}H_{30}O$  (b)  $C_{30}H_{33}O$  (c)  $C_{20}H_{30}O$  (d)  $C_5H_{30}O$
64. The number of double bonds present in Vitamin  $A_1$  is \_\_\_\_\_.  
(a) five (b) four (c) three (d) one
65. The source of Ascorbic acid is \_\_\_\_\_.

- (a) apple (b) banana (c) lemon (d) strawberry
66. The molecular formula of Vitamin C is.  
(a)  $C_6H_7O_6$  (b)  $C_6H_6O_6$  (c)  $C_6H_8O_6$  (d)  $C_6H_5O_6$
67. Monosaccharides are classified according to  
(a) the number of carbon atoms in the molecule  
(b) whether they contain an aldehyde or a ketone group  
(c) their configurational relationship to glyceraldehyde  
(d) all the above
68. Which is a monosaccharide?  
(a) sucrose (b) maltose (c) glucose (d) cellulose
69. Which is a disaccharide?  
(a) ribose (b) maltose (c) glucose (d) cellulose
70. Which of the following is not a monosaccharide?  
(a) ribose (b) fructose (c) glucose (d) sucrose
71. The designation D or L before the name of monosaccharide  
(a) indicates the direct rotation of polarized light  
(b) indicates the length of the carbon chain in the carbohydrate  
(c) indicates the position of the OH group on the carbon next to the primary alcoholic group  
(d) indicates the position of the asymmetric carbon atoms in the carbohydrate.
72. The principal sugar in blood is  
(a) sucrose (b) maltose (c) glucose (d) cellulose
73. Which one of the following statements is false about glucose?  
(a) it is a reducing sugar (b) it is a disaccharide (c) it has a pyranose form  
(d) it is a poly alcohol
74. The number of asymmetric carbon atoms in the  $\alpha$ -D-glucopyranose molecule is  
(a) 2 (b) 3 (c) 4 (d) 5
75. Which one of the following statements is false about aldohexose?  
(a) it is a monosaccharide (b) it contains potential alcoholic group  
(c)  $\alpha$ -D-glucopyranose is an aldohexose (d) fructose is aldohexose
76. All of the following monosaccharides give the same osazone except  
(a) galactose (b) fructose (c) glucose (d) maltose
77. Mutarotation is a term related to  
(a) interconversion of anomers (b) relationship between D- and L- families  
(c) hydrolysis of sucrose (d) number of monosaccharides in a carbohydrate
78. Mutarotation of glucose is characterized by  
(a) a change from an aldehyde to ketone structure (b) a change of specific rotation from a + to a - value  
(c) the presence of intramolecular bridge structure (d) number of monosaccharides in a carbohydrate
79. Common table sugar is  
(a) sucrose (b) fructose (c) glucose (d) maltose
80. By approximately what factor is the sweetness of saccharine greater than that of sugar?  
(a) 5 (b) 50 (c) 500 (d) 1000
81. Which one of the following statements is false about sucrose?  
(a) It is also called table sugar (b) It may be fermented by yeast to produce alcohol  
(c) It reduces Fehling's solution (d) It does not reduce Tollens' reagent
82. The sugar that yields only glucose on hydrolysis is \_\_\_\_\_.

- (a) Lactose (b) Sucrose (c) Maltose (d) Fructose
83. A reducing sugar will  
(a) react with Feling's test (b) not react with Feling's test  
(c) have fewer calories (d) always be a ketone
84. Which one of the following carbohydrate is not a reducing sugar?  
(a) glucose (b) Sucrose (c) lactose (d) Fructose
85. Which one of the following carbohydrates will not give a red precipitate of  $\text{Cu}_2\text{O}$  when heated with Benedic's solution ?  
(a) glucose (b) Sucrose (c) Maltose (d) Fructose
86. Which one of the following compounds reduces Tollen's reagent?  
(a) glucose (b) Sucrose (c) menthol (d) acetic acid
87. The reagent that can be used to differentiate an aldose and a ketose is \_\_\_\_\_.  
(a) Bromine water (b) Felling's solution (c) Tollen's reagent (d) none of these
88. Starch is  
(a) a trisaccharide (b) also called amylose  
(c) also amylopectin (d) a mixture of amylose and amylopectin
89. Which one of the following products is not derived from cellulose?  
(a) rayon (b) insulin (c) gun cotton (d) paper
90. All the carbon atoms in naphthalene are  
(a)  $\text{sp}$  hybridized (b)  $\text{sp}^2$  hybridized (c)  $\text{sp}^3$  hybridized (d) none of the above
91. Naphthalene undergoes oxidation with  $\text{Na}_2\text{Cr}_2\text{O}_7 / \text{H}_2\text{SO}_4$  to form  
(a) phthalic acid (b) benzoic acid (c) tetralin (d) phenylactic acid
92. Naphthalene undergoes reduction with  $\text{H}_2$  in the presence of Ni catalyst at high temperature and pressure to give  
(a) phthalic acid (b) decalin (c) tetralin (d) phenylactic acid
94. Naphthalene undergoes nitration with  $\text{HNO}_3 / \text{H}_2\text{SO}_4$  at  $60^\circ\text{C}$  to give mainly  
(a) 1-nitronaphthalene (b) 1,2-dinitronaphthalene  
(c) 2-nitronaphthalene (d) 1,5-nitronaphthalene
95. All the carbon atoms in anthracene are  
(a)  $\text{sp}$  hybridized (b)  $\text{sp}^2$  hybridized (c)  $\text{sp}^3$  hybridized (d) none of the above
96. Anthracene undergo electrophilic substitution reactions mainly at  
(a) C-1 (b) C-1 (c) C-1 (d) C-1
97. Anthracene undergoes oxidation with  $\text{O}_2 / \text{V}_2\text{O}_5$  to form  
(a) Benzoic acid (b) anthraquinone (c) phthalic acid (d) benzophenone
98. Phenanthrene undergoes nitration with concentrated nitric acid and sulphuric acid to yielded  
(a) 8-nitrophenanthrene (b) 9-nitrophenanthrene  
(c) 7-nitrophenanthrene (d) 3-nitrophenanthrene
99. Phenanthrene undergoes acylation with acetylchloride to yielded  
(a) 8-acetylphenanthrene (b) 9-acetylphenanthrene  
(c) 7-acetylphenanthrene (d) 3-acetylphenanthrene
100. All the carbon atoms in aphenanthrene are  
(a)  $\text{sp}$  hybridized (b)  $\text{sp}^2$  hybridized (c)  $\text{sp}^3$  hybridized (d) none of the above

### 5 mark questions

1. Discuss the classification of terpenoids.
2. Explain the classification of terpenoids based on the ring present in it.
3. What are the steps involved in the isolation of terpenoids.
4. How is the essential oil of jasmine isolated by the adsorption method.
5. Explain the isolation of essential oil of terpenoids by the expression method.
6. Discuss the isolation of essential oil of terpenoids by the steam distillation method.
7. How are volatile solvents used to extract essential oil in terpenoids.
8. Explain the separation of essential oils of terpenoids by the chemical method.
9. How are fractional distillation methods used to separate essential oils of terpenoids.
10. Explain the isoprene rule.
11. Discuss the special isoprene rule of terpenoids.
12. Write the exceptions of the isoprene rule in terpenoids.
13. Write the synthesis of Geraniol.
14. Sketch the synthesis of  $\alpha$ -terpeniol.
15. Write the synthesis of dipentene.
16. Discuss the synthesis of  $\alpha$ -pinene.
17. What are the basic requirements of alkaloids?
18. Discuss the classification of alkaloids.
19. Write the general properties of alkaloids.
20. How are alkaloids extracted?
21. Explain Hoffmann's exhaustive methylation.
22. Write the synthesis of coniine.
23. Discuss the synthesis of papaverin.
24. Explain the synthesis of nicotine.
25. Sketch the synthesis of piperin.
26. Write the Bergmann synthesis of coniine.
27. Discuss the synthesis of adrenalin.
28. Write the synthesis of thyroxin.
29. Discuss the structure of adrenalin.
30. Explain the structure of thyroxin.
31. Discuss the classification of vitamins.
32. Write the nomenclature of vitamins.
33. Discuss the synthesis of Retinol.
34. Write the structure of retinol.
35. Explain the synthesis of ascorbic acid.
36. Discuss the structure of retinol.
37. What are carbohydrates?
38. Discuss the classification of carbohydrate.
39. Write the preparation of glucose.
40. Explain mutarotation.
41. Write any five chemical properties of glucose.
42. How will you convert glucose to fructose?
43. How will you convert fructose to glucose?
44. Discuss the cyclic form of glucose.

45. Explain epimerization with example.
46. Write the preparation of fructose.
47. Write any five chemical properties of fructose.
48. Discuss the cyclic form of fructose.
49. What are disaccharides?
50. Discuss the structure of sucrose.
51. Discuss the structure of maltose.
52. Discuss the manufacture of starch.
53. Discuss the structure of starch.
54. Write the manufacture of cellulose.
55. Write the structure of cellulose.
56. What are the important derivatives of cellulose?
57. What are aromatic hydrocarbons? What are the main differences between aromatic and aliphatic compounds?
58. What are the main sources of aromatic compound?
59. How is benzene obtained from the light oil of coal tar?
60. How benzene is prepared? Discuss its important reactions.
61. Give the mechanism of chlorination of benzene.
62. Write the structural formula of naphthalene.
63. Discuss the orbital structure of naphthalene.
64. How naphthalene is isolated from coal-tar?
65. Write the molecular orbital structure of anthracene.
66. Write the resonance structure of anthracene.
67. How is anthracene isolated from coaltar?
68. Write the preparation of anthracene.
69. Write the preparation of phenanthrene.
70. Write the chemical reaction of phenanthrene with chlorine.

### 8 mark questions

1. Explain the general methods of isolation of terpeniol.
2. Discuss the various methods of isolation of essential oils of terpenoids.
3. How essential oil of terpenoids are separated by chemical and physical method?
4. Write the isoprene rule, special isoprene rule and exception of terpenoids from isoprene rule.
5. Elucidate the structure of geraniol.
6. How the structure of geraniol is elucidated. Confirm its structure by synthesis.
7. Elucidate the structure of  $\alpha$ -terpeniol.
8. How the structure of  $\alpha$ -terpeniol is elucidated. Confirm its structure by synthesis.
9. Write the structural elucidation of Dipentene.
10. Elucidate the structure of  $\alpha$ -pinene.
11. Discuss the general properties of alkaloids.
12. How will you find out the functional nature of oxygen in alkaloids?
13. How will you find out the presence of carboxylic acid group and carbonyl group in alkaloids?
14. How will you find out the presence of acid derivatives and ether in alkaloids.
15. Discuss the reaction to find out the functional nature of nitrogen in alkaloids.
16. Explain the degradation method to find out the structure of alkaloids.



17. How will you elucidate the structure of coniine?
18. Discuss the structural elucidation of nicotine.
19. Explain the structural elucidation of piperin.
20. How will you elucidate the structure of papaverin?
21. Explain the classification, source and deficiency diseases caused by vitamins.
22. Elucidate the structure of retinol.
23. Write the structural elucidation of retinol with synthesis.
24. Elucidate the structure of ascorbic acid.
25. Write the structural elucidation of ascorbic acid with synthesis.
26. Elucidate the structure of adrenalin.
27. Write the structural elucidation of adrenalin with synthesis.
28. Elucidate the structure of thyroxin.
29. Write the structural elucidation of thyroxin with synthesis.
30. Discuss the structural elucidation of glucose.
31. Discuss the structural elucidation of fructose.
32. Write the chemical properties of glucose.
33. Write the chemical properties of fructose.
34. Write the interconversion of glucose to fructose and viceversa.
35. Explain mutarotation.
36. What is epimerization? Write the conversion of aldose to its epimer.
37. What are disaccharides? Discuss the manufacture and structure of sucrose and maltose.
38. Explain the manufacture and structure of starch and cellulose.
39. Discuss the manufacture, structure and derivatives of cellulose.
40. Give the mechanism of Friedal-crafts acylation of benzene.
41. Give the mechanism of Friedal-crafts alkylation of benzene.
42. Give the mechanism of chlorination and bromination of benzene.
43. Give the mechanism of sulphonation and nitration of benzene.
44. How will you distinguish between benzene and cyclohexane?
45. How naphthalene is synthesized? Describe its important reactions and uses.
46. Discuss the electrophilic substitutions in naphthalene.
47. How naphthalene is synthesized? Describe its important reactions.
48. How will you synthesized anthracene from benzene?
49. How phenanthrene is synthesized? Describe its important reactions.
50. Discuss the physical and chemical properties of phenanthrene.

### Answers

- |                                   |  |   |   |
|-----------------------------------|--|---|---|
| 1.(a) terpentine oil              | 2. (b) isoprene                        | 3.(c) isoprenoids                         | 4.(d) C <sub>10</sub> H <sub>16</sub>     |
| 5. (b)carotenoids                 | 6. (b) C <sub>40</sub> H <sub>64</sub> | 7.(d) acyclicterpenoids                   | 8. (c) Bicyclic Terpenoid                 |
| 9. (a) citrus fruits              | 10.(b)rose and jasmine                 | 11.(c) Isoprene                           |   |
| 12.(d) Lavandulal and carotenoids | 13.(a) Genarium lavender               | 14. (d) C <sub>16</sub> H <sub>18</sub> O |   |
| 15. (a) 2                         | 16. (b) optically active               | 17. (d) cajuput oil                       | 18. (a) C <sub>10</sub> H <sub>18</sub> O |
| 19. (c)One                        | 20. (a)lemon                           | 21. (a)dipentene                          | 22. (c) C <sub>10</sub> H <sub>16</sub>   |
| 23. (c)Two                        | 24. (a) Terpentine                     | 25. (a) C <sub>10</sub> H <sub>16</sub>   | 26. (c) basic                             |
| 27. (c)plants                     | 28.                                    | 29. (d)piperine                           | 30. (a)nicotine                           |
| 31. (b) hemlock                   | 32. (d) hemlock                        | 33. (b) C <sub>8</sub> H <sub>17</sub> N  | 34. (c) n- propyl                         |

35. (b) optically active      36. (d) dextrorotatory      37. (a) black pepper  
 38. (c) optically inactive      39. (a)  $C_{17}H_{19}NO_3$       40. (c) two      41. (b) tobacco  
 42. (b) leavo rotatory      43. (c)  $C_{10}H_{14}N_2$       44. (b) tertiary      45. (a) poppy plant  
 46. (b) optically active      47. (a)  $C_{20}H_{21}NO_4$       48.      49. (b) epinephrine  
 50. (c)  $C_{19}H_{13}NO_3$       51. (a) secondary      52. (b)  $\alpha$ - aminoacid      53. (c)  $C_{19}H_{13}O_4Nl_4$   
 54. (b) leavo rotatory      55. (b) green      56. (a) Vitamin B complex  
 57. (b) Vitamin C      58. (a) night blind ness      59. (b) Beri-Beri      60. (b) Scurvy  
 61. (b) rickets      62. (c) fish oil      63. (c)  $C_{20}H_{30}O$       64. (a) five  
 65. (c) lemon      66. (c)  $C_6H_8O_6$       67. (d) all the above      68. (c) glucose  
 69. (b) maltose      70. (d) sucrose  
 71. (c) indicates the position of the OH group on the carbon next to the primary alcoholic group  
 72. (c) glucose      73. (b) it is a disaccharide      74. (d) 5  
 75. (d) fructose is aldohexose  
 76. (a) galactose      77. (a) interconversion of anomers  
 78. (c) the presence of intramolecular bridge structure      79. (a) sucrose  
 80. (c) 500      81. (c) It reduces Felling's solution      82. (c) Maltose  
 83. (a) react with Feling's test      84. (b) Sucrose      85. (b) Sucrose  
 86. (a) glucose      87. (a) Bromine water      88. (d) a mixture of amylose and amylopectin  
 89. (a) rayon      90. (b)  $sp^2$  hybridized      91. (a) phthalic acid  
 92. (b) decalin      93.      94. (a) 1-nitronaphthalene      95. (b)  $sp^2$  hybridized  
 96. (c) C-1      97. (b) anthraquinone      98. (b) 9-nitrophenanthrene  
 99. (b) 9-acetylphenanthrene      100. (b)  $sp^2$  hybridized

**KASC-Chemistry (UG)**

**KONGUNADU ARTS AND SCIENCE COLLEGE**

*(AUTONOMOUS)*

**COIMBATORE-641 029**



## **QUESTION BANK**

**Prepared by**

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**DEPARTMENT OF CHEMISTRY (UG)**

**SEMESTER-V**  
**CORE CHEMISTRY PAPER- VIII**  
**PHYSICAL CHEMISTRY - 1**

**Total teaching hours: 60**

**Total credits : 4**

**Multiple choice questions**

**UNIT- I**

1. Ionic compounds are generally
  - (a) good conductors of electricity
  - (b) poor conductors of electricity
  - (c) semi conductors of electricity
  - (d) all the above
2. Positive ions are generally called as
  - (a) Cations
  - (b) Anions
  - (c) Hydrogen
  - (d) None of the above
3. As the current is passed between the electrodes of the electrolytic cell, the ions migrate to the \_\_\_\_\_
  - (a) same charge electrodes
  - (b) opposite charge electrodes
  - (c) does not migrate
  - (d) None of the above
4. Different ions move at \_\_\_\_\_
  - (a) same rate
  - (b) different rate
  - (c) same rate at boiling temperature
  - (d) does not move till temperature is at 0<sup>0</sup> C
5. The fraction of the total current carried by the cation or the anion is termed as \_\_\_\_\_
  - (a) migration number
  - (b) hitter number
  - (c) current number
  - (d) transport number
6. Transport number is also known as.
  - a) Hittorf's number
  - b) Hund's number
  - c) Hitter's number
  - d) Kohlrausch's number
7. According to Arrhenius theory an electrolyte when dissolved in water gives two types of
  - (a) charged particles
  - (b) molecules
  - (c) ion pairs
  - (d) fundamental particles
8. The loss of concentration around any electrode is proportional to the speed of the ion \_\_\_\_\_
  - (a) moving near to the electrode
  - (b) depositing on the electrode
  - (c) The conductivity of an electrolyte is due to the
  - (d) none of the above
  - (a) presence of ions in the electrolyte
  - (b) free movement of ions in the solution
  - (c) reunion of ions in the solution
  - (d) release of heat energy due to ionisation

9. The electrical conductivity of an electrolyte depends upon
- the number of molecules in the electrolyte
  - the number of ions present in the electrolyte
  - the number of ions present in the solution
  - the number of molecules of the solvent
10. On passing electrical current through an electrolyte solution
- cations move towards anode
  - anions move towards cathode
  - cations move towards cathode and anions towards anode
  - both cations and anions move in same direction
11. The Hittorf's rule states that
- the loss of concentration around any electrode is proportional to the speed of the ions moving towards it
  - the loss of concentration around any electrode is proportional to the speed of the ions moving away from it
  - the loss of concentrations around both the electrodes is proportional to the sum of speed of cations and anions
  - none of the above
12. The fraction of the total current carried by the cation or anion is termed as
- fractional number
  - speed number
  - carrier number
  - transport number
13. In Hittorf method for determination of transport numbers we make use of a
- H-tube
  - V-tube
  - U-tube
  - L-tube
14. The statement of Kohlrausch's law is
- the equivalent conductance of an electrolyte at infinite dilution is equal to the product of equivalent conductances of the component ions
  - the equivalent conductance of an electrolyte at infinite dilution is equal to the difference of equivalent conductances of the component ions
  - the equivalent conductance of an electrolyte at infinite dilution is equal to the sum of equivalent conductances of the component ions
  - none of the above
15. Kohlrausch's law can be used to determine
- $\lambda_{\alpha}$  for weak electrolytes
  - absolute ionic mobilities
  - solubility of sparingly soluble salts
  - all of these
16. When a strong acid is titrated against a strong base the end point is the point of
- zero conductance
  - maximum conductance
  - minimum conductance
  - none of these
17. If the transport number of  $K^{+}$  is 0.492 in KCl solution. The transport number of  $Cl^{-}$  ion will be
- 0.984
  - 0.492
  - 0.508
  - 0.016
18. The transport number of an ion depends on the mobility of that ion. It also depends upon the
- mobility of the solvent
  - mobility of the electrolyte

- (c) mobility of the other ion with which it is associated  
 (d) none of the above
19. The ionic mobility of  $\text{Li}^+$  is small as compared to that of  $\text{K}^+$  ion. It is because  
 (a)  $\text{Li}^+$  ion is very small  
 (b)  $\text{Li}^+$  ion is heavily hydrated  
 (c)  $\text{Li}^+$  ion has only one principal quantum number  
 (d) none of the above
20. The ionic product of water is  
 (a)  $1 \times 10^{-7}$  (b)  $1 \times 10^{-10}$   
 (c)  $1 \times 10^{14}$  (d)  $1 \times 10^{-14}$

## UNIT - II

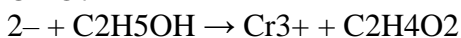
21. Electrolytic cells are electrochemical cells in which \_\_\_\_\_ reactions are forced to occur by the input of electrical energy.  
 (a) spontaneous (b) non-spontaneous  
 (c) exothermic (d) endothermic
22. In any electrochemical cell, the cathode is always \_\_\_\_\_.  
 (a) a nonmetal  
 (b) attached to a battery  
 (c) the electrode at which some species gain electrons  
 (d) the electrode at which some species lose electrons
23. In an electrolytic cell, the charge on the electrode that gives electrons to the species in solution is \_\_\_\_\_; the chemical change that occurs at this electrode is called \_\_\_\_\_.  
 (a) positive; oxidation (b) positive, reduction  
 (c) negative, oxidation (d) negative, reduction
24. The site of oxidation in an electrochemical cell is  
 (a) the anode (b) the cathode  
 (c) the electrode (d) the salt bridge
25. Which of the following statements associated with electrochemical cells is incorrect?  
 (a) the function of a salt bridge in an electrochemical cell is to complete the circuit  
 (b) cell potential is the potential difference in a voltaic cell  
 (c) a Bronsted-Lowry acid-base reaction can be the basis of the net reaction in a chemical cell  
 (d) a half-reaction corresponds to one electrode in a voltaic cell  
 Answer. (c)
26. Write the cell diagram for the reaction below  
 $\text{Cl}_2(\text{g}) + 2\text{Ag}(\text{s}) \rightarrow 2\text{Ag}^+(\text{aq}) + 2\text{Cl}^-(\text{aq})$   
 (a)  $\text{Ag} | \text{Ag}^+(\text{aq}) | \text{Cl}_2(\text{g}), \text{Cl}^-(\text{aq}) | \text{Pt}$  (b)  $\text{Ag} | \text{Ag}^+(\text{aq}), \text{Cl}^-(\text{aq}) | \text{Cl}_2(\text{g}) | \text{Pt}$   
 (c)  $\text{Pt}, \text{Cl}_2(\text{g}) | \text{Cl}^-(\text{aq}) || \text{Ag}^+(\text{aq}) | \text{Ag}$  (d)  $\text{Ag} | \text{Ag}^+(\text{aq}) || \text{Cl}_2(\text{g}), \text{Cl}^-(\text{aq}) | \text{Pt}$
27. Write the balanced equation for the voltaic cell made from  $\text{Ag}^+/\text{Ag}$  and  $\text{Cu}^{2+}/\text{Cu}$  and calculate  $E^\circ_{\text{cell}}$ .  
 (a)  $2 \text{Ag}^+(\text{aq}) + \text{Cu}(\text{s}) \rightarrow 2 \text{Ag}(\text{s}) + \text{Cu}^{2+}(\text{aq})$ ,  $E^\circ_{\text{cell}} = 1.260 \text{ V}$   
 (b)  $2 \text{Ag}^+(\text{aq}) + \text{Cu}(\text{s}) \rightarrow \text{Ag}(\text{s}) + 2 \text{Cu}^{2+}(\text{aq})$ ,  $E^\circ_{\text{cell}} = 1.140 \text{ V}$   
 (c)  $2 \text{Ag}^+(\text{aq}) + \text{Cu}(\text{s}) \rightarrow 2 \text{Ag}(\text{s}) + \text{Cu}^{2+}(\text{aq})$ ,  $E^\circ_{\text{cell}} = 0.460 \text{ V}$   
 (d)  $2 \text{Ag}^+(\text{aq}) + \text{Cu}(\text{s}) \rightarrow 2 \text{Ag}(\text{s}) + \text{Cu}^{2+}(\text{aq})$

+,  $E^\circ_{\text{cell}} = 1.140 \text{ V}$

28. Which of the following statements associated with batteries is incorrect?  
(a) in a dry cell, the reaction  $\text{Zn} \rightarrow \text{Zn}^{2+}$  continues to occur even when the battery is not being used  
(b) secondary batteries are rechargeable  
(c) the cell reaction in a primary battery is not reversible  
(d) electrodes with greater surface area give a greater potential
29. What occurs during discharge in the nickel-cadmium battery?  
(a)  $\text{Ni}^{3+}$  is reduced to  $\text{Ni}^{2+}$  (b)  $\text{Ni}^{2+}$  is reduced to  $\text{Ni}^{3+}$   
(c)  $\text{Ni}^{3+}$  is oxidized to  $\text{Ni}^{2+}$  (d)  $\text{Ni}^{2+}$  is oxidized to  $\text{Ni}^{3+}$
30. What is indicated when a chemical cell's voltage ( $E^\circ$ ) has dropped to zero?  
(a) the concentration of the reactants has increased  
(b) the concentration of the products has decreased  
(c) the cell reaction has reached equilibrium  
(d) the cell reaction has completely stopped
31. Given the redox reaction :  
 $2\text{Cr}(s) + 3\text{Cu}^{2+}(\text{aq}) \rightarrow 3\text{Cr}^{3+}(\text{aq}) + 3\text{Cu}(s)$   
Which reaction occurs at the cathode in an electrochemical cell?  
(a) reduction of  $\text{Cu}^{2+}(\text{aq})$  (b) reduction of  $\text{Cu}(s)$   
(c) oxidation of  $\text{Cr}^{3+}(\text{aq})$  (d) oxidation of  $\text{Cr}(s)$
32. Which metal is used as a coating on steel to limit corrosion?  
(a) Na (b) Ca  
(c) K (d) Zn
33. Given the cell reaction:  
 $2\text{H}_2\text{O}(l) \longrightarrow 2\text{H}_2(g) + \text{O}_2(g)$   
The cell is best described as  
(a) an electrolytic cell in which an exothermic reaction occurs  
(b) an electrolytic cell in which an endothermic reaction occurs  
(c) a galvanic cell in which an exothermic reaction occurs  
(d) a galvanic cell in which an endothermic reaction occurs
34. Standard cell potential is  
(a) measured at a temperature of  $25^\circ\text{C}$   
(b) measured when ion concentrations of aqueous reactants are 1.00 M  
(c) measured under the conditions of 1.00 atm for gaseous reactants  
(d) all of the above
35. The standard reduction potentials in volts for  $\text{Pb}^{2+}$  and  $\text{Ag}^+$  are  $-0.13$  and  $+0.80$ , respectively. Calculate  $E^\circ$  in volts for a cell in which the overall reaction is  
 $\text{Pb} + 2\text{Ag}^+ \rightarrow \text{Pb}^{2+} + 2\text{Ag}$   
(a) 1.73 (b) 0.67  
(c) 0.93 (d) 1.47
36. Given the following information,  
 $\text{Fe}^{3+}(\text{aq}) + \text{H}_2(g) \rightarrow 2\text{H}^+ + \text{Fe}^{2+}$ ,  $E^\circ_{\text{cell}} = 0.77$   
Determine  $E^\circ$  for the reaction :  
 $e^- + \text{Fe}^{3+}(\text{aq}) \rightarrow \text{Fe}^{2+}(\text{aq})$   
(a) 1.54 (b) 0.77  
(c) 0.39 (d)  $-0.77$
37. Breathalyzers determine alcohol content via the redox reaction:



Cr<sub>2</sub>O<sub>7</sub>



Which substance is a reductant (reducing agent) and which is an oxidant (oxidizing agent)?

- (a) C<sub>2</sub>H<sub>5</sub>OH, reductant; no oxidant (b) C<sub>2</sub>H<sub>5</sub>OH, reductant; Cr<sub>2</sub>O<sub>7</sub><sup>2-</sup>, oxidant  
(c) C<sub>2</sub>H<sub>5</sub>OH, oxidant; Cr<sup>3+</sup>, reductant (d) C<sub>2</sub>H<sub>5</sub>OH, reductant; Cr<sup>3+</sup>, oxidant
38. Predict the products in the electrolysis of aqueous potassium bromide.  
(a) hydrogen and bromine (b) potassium metal and oxygen  
(c) oxygen and bromine (d) potassium metal and bromine
39. Which of the following statements associated with corrosion is incorrect?  
(a) iron corrodes more readily than aluminium because iron is more active than aluminium  
(b) cathodic protection prevents corrosion by using a sacrificial anode  
(c) a corroding metal has both anodic and cathodic areas  
(d) corrosion involves both oxidation and reduction
40. Which of these statements about a galvanic cell are not true?  
i. the cathode carries a positive sign  
ii. the anions migrate toward the cathode  
iii. the electrons are released through the anode  
iv. reduction occurs at the anode  
(a) i and iii (b) i and ii  
(c) ii and iii (d) ii and iv

### UNIT-III

41. An acid is a compound that gives H<sup>+</sup> ions in water and a base is a compound that gives OH<sup>-</sup> ions in water.  
This concept was given by  
(a) Arrhenius (b) Lewis  
(c) Bronsted (d) Lowry
42. Which one of the following is the limitation of Arrhenius concept?  
(a) free H<sup>+</sup> and OH<sup>-</sup> ions do not exist in water (b) this concept is limited to water only  
(c) some bases do not contain OH<sup>-</sup> ions (d) all of these
43. According to Bronsted-Lowry concept, an acid is a substance that  
(a) accepts a proton (b) releases a proton  
(c) accepts an electron pair (d) releases an electron pair
44. A substance accepts a proton. According to Bronsted-Lowry concept it is  
(a) an acid (b) a base  
(c) a neutral substance (d) amphoteric
45. In the following reaction  
 $H_2O + HCl \rightarrow H_3O^+ + Cl^-$   
the species that acts as a Bronsted base is  
(a) H<sub>2</sub>O (b) HCl  
(c) H<sub>3</sub>O<sup>+</sup> (d) Cl<sup>-</sup>
46. When calcium oxide is dissolved in water, following reaction takes place  
 $O^{2-} + H_2O \rightarrow 2OH^-$   
The Bronsted acid is  
(a) O<sup>2-</sup> (b) H<sub>2</sub>O  
(c) OH<sup>-</sup> (d) none of these
47. In the following hypothetical reaction



The conjugate base of the acid HA is

- (a)  $\text{B}^-$  (b) HA  
(c)  $\text{A}^-$  (d) none of these
48. In the reaction between  $\text{NH}_3$  and  $\text{HCl}$   
 $\text{HCl} + \text{NH}_3 \rightleftharpoons \text{NH}_4^+$   
 $+ \text{Cl}^-$   
the conjugate acid of  $\text{NH}_3$  is  
(a)  $\text{HCl}$  (b)  $\text{NH}_4^+$   
(c)  $\text{Cl}^-$  (d) none of these
49. A weak base has \_\_\_\_\_ conjugate acid and a weak acid has a \_\_\_\_\_ conjugate base  
(a) strong, strong (b) weak, strong  
(c) strong, weak (d) weak, weak
50. Molecules or ions that can behave both as Bronsted acid and base are called  
(a) monoprotic acids (b) polyprotic acids  
(c) amphiprotic substances (d) polyprotic bases
51.  $\text{HCO}_3^-$   
– is an example of  
(a) conjugate acid (b) conjugate base  
(c) amphiprotic ion (d) amphoteric ion
52. The strength of a Bronsted acid depends upon its tendency to \_\_\_\_\_ a proton  
(a) gain (b) donate  
(c) react with (d) none of these
53. According to Lewis concept an acid is \_\_\_\_\_ acceptor  
(a) proton (b) base  
(c) electron (d) electron pair
54. All cations and molecules that are short of an electron pair act as \_\_\_\_\_  
(a) Lewis acids (b) Lewis bases  
(c) Bronsted acid (d) Bronsted bases
55. According to Lewis concept, a reaction between an acid and a base is the transfer of  
(a) a proton from acid to base (b)  $\text{OH}^-$  ion from bases to acid  
(c) electron pair from acid to base (d) electron pair from base to acid
56. The auto-ionisation of water can be represented by  
(a)  $\text{H}_2\text{O} \rightleftharpoons \text{H}^+ + \text{OH}^-$  (b)  $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$   
(c)  $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$  (d)  $\text{H}_2\text{O} + \text{HA} \rightleftharpoons \text{H}_3\text{O}^+ + \text{A}^-$
57. The strength of an acid depends upon  
(a) the concentration of  $\text{H}^+$  ions in aqueous solution  
(b) the concentration of electrons pairs in aqueous solution  
(c) the tendency to release the electron pair  
(d) the tendency to gain the electron pair
58. The concept of pH was introduced by  
(a) Arrhenius (b) Bronsted  
(c) Lewis (d) Sorensen
59. For a weak acid with  $\alpha$  as its degree of dissociation, the value of dissociation constant is given by  
(C is concentration of acid in moles per litre)  
(a)  $K_a = C \alpha$  (b)  $K_a = C \alpha^2$   
(c)  $K_a = C^2 \alpha$  (d)  $K_a = C^2 \alpha^2$
60. The strength of a base depends upon the

- (a) concentration of  $H^+$  ions in aqueous solution
- ACIDS AND BASES 973
- (b) concentration of  $OH^-$  ions in aqueous solution
- (c) concentration of electron pairs in aqueous solution
- (d) concentration of the base

#### UNIT –IV

61. Corrosion of metals involves
  - (a) Physical reactions (b) Chemical reactions (c) Both (d) None
62. The following factors play vital role in corrosion process
  - (a) Temperature (b) Solute concentration (c) Both (d) None
63. Following equation is related to corrosion rate
  - (a) Nernst equation (b) Faraday's equation (c) Either (d) Neither
64. Passivity is due to
  - (a) Higher EMF (b) Lower EMF (c) Oxide film (d) All
65. Passivity is not reason for inertness of the following
  - (a) Au (b) Al (c) Ti (d) Ni
66. Difficult to monitor and very dangerous form of corrosion
  - (a) Galvanic (b) Pitting (c) Crevice (d) Stress
67. This form of corrosion occurs due to concentration difference in a component
  - (a) Uniform (b) Galvanic (c) Inter-granular (d) Stress
68. Main form of ceramic degradation
  - (a) Corrosion (b) Weathering (c) Dissolution (d) Swelling
69. The following influences deterioration of polymers
  - (a) Weather (b) Radiation (c) Temperature (d) All
70. Following is not the main form of polymer deterioration
  - (a) Corrosion (b) Swelling and Dissolution (c) Weathering (d) Scission
71. When Pt and Co are electrically connected, which one gets corroded
  - (a) Pt (b) Co (c) None (d) Can't decide
72. Which of the following can be used for cathodic protection:
  - (a) Al (b) Cd (c) Cu (d) Either
73. Chemical kinetics is concerned with the study and measurement of the ----- of chemical reactions.
  - a) molecularity      b) order      c) Rate      d) Regularity
74. Some reactions proceed at a very high speed and their rates cannot be measured. Such reactions are-----
  - a) Slow reactions b) fast reactions c) radical reaction d) ionic reactions
75. Neutralisation of a base by an acid is ----- type of reaction
  - a) ionic reaction b) fast reactions c) radical reaction d) slow reactions
76. Precipitation of silver chloride on mixing a solution of silver nitrate with sodium chloride is ----- type of reaction
  - a) fast reactions b) ionic reaction c) radical reaction d) slow reactions
77. The unit for rate of the reaction is -----
  - a) moles/lit      b) moles-1/lit      c) moles lit-1 sec-1      d) moles/time
78. The sum of the power of the concentration of the reactants in the rate equation is
  - a) molecularity      b) order      c) rate      d) powers
79. Radioactive decay is an example of ----- reaction
  - a) second order      b) first order      c) third order      d) zero order

80. Decomposition of hydrogen peroxide is an example of ----- reaction  
a) second order      b) first order    c) third order    d) zero order

### UNIT –V

81. The study of the flow of heat or any other form of energy into or out of a system undergoing physical or chemical change is called  
(a) thermochemistry (b) thermokinetics  
(c) thermodynamics (d) thermochemical studies
82. Thermodynamics is applicable to  
(a) microscopic systems only (b) macroscopic systems only  
(c) homogeneous systems only (d) heterogeneous systems only
83. Which is not true about thermodynamics?  
(a) it ignores the internal structure of atoms and molecules  
(b) it involves the matter in bulk  
(c) it is concerned only with the initial and final states of the system  
(d) it is not applicable to macroscopic systems
84. A system that can transfer neither matter nor energy to and from its surroundings is called  
(a) a closed system (b) an isolated system  
(c) an open system (d) a homogeneous system
85. A thermos flask is an example of  
(a) isolated system (b) closed system  
(c) open system (d) heterogeneous system
86. A closed system is one which cannot transfer matter but transfer \_\_\_\_\_ to and from its surrounding  
(a) heat (b) work  
(c) radiations (d) all of these
87. A gas contained in a cylinder filled with a piston constitutes  
(a) an open system (b) a heterogeneous system  
(c) a closed system (d) an isolated system
88. A system that can transfer both energy and matter to and from its surroundings is called  
(a) an isolated system (b) a closed system  
(c) an open system (d) a heterogeneous system
89. Zinc granules reacting with dilute hydrochloric acid in an open beaker constitutes  
(a) an isolated system (b) an open system  
(c) a closed system (d) a heterogeneous system
90. A system in which no thermal energy passes into or out of the system is called  
(a) adiabatic system (b) an open system  
(c) a reversible system (d) a closed system
91. An intensive property does not depend upon  
(a) nature of the substance (b) quantity of matter  
(c) external temperature (d) atmospheric pressure  
Answer. (b)
92. Which out of the following is not an intensive property?  
(a) pressure (b) concentration  
(c) density (d) volume
93. A property that depends upon the quantity of matter is called an extensive property. Which of the following is not an extensive property?

- (a) mass (b) volume  
(c) density (d) internal energy
94. Which of the following sets of properties constitute intensive properties?  
(a) temperature, pressure and volume (b) mass, density and volume  
(c) density, pressure and temperature (d) internal energy, density and pressure
95. System in which state variables have constant values throughout the system is called in a state of  
(a) equilibrium (b) non-equilibrium  
(c) isothermal equilibrium (d) none of these
96. In an adiabatic process \_\_\_\_\_ can flow into or out of the system.  
(a) no heat (b) heat  
(c) matter (d) no matter
97. Which of the following conditions holds good for an adiabatic process?  
(a)  $dq < 0$  (b)  $dq > 0$   
(c)  $dq = 0$  (d)  $dq = \alpha$
98. An isobaric process takes place at constant \_\_\_\_\_.  
(a) temperature (b) pressure  
(c) volume (d) concentration
99. Which is true for an isobaric process?  
(a)  $dp > 0$  (b)  $dp < 0$   
(c)  $dp = \alpha$  (d)  $dp = 0$
100. An isochoric process takes place at constant \_\_\_\_\_.  
(a) volume (b) temperature  
(c) pressure (d) concentration

## SECTION - B

5 marks

### UNIT - I

1. what are the classifications of conductor
2. Define conductor. Give example.
3. Define transport number.
4. What is migration of ions. Define with example.
5. State Kohlrausch's law
6. What is Arrhenius theory?
7. Define conductometric titration.
8. Write short note on Wien effect.
9. What is the Falkenhagen effect?
10. What are the applications of conductometric measurements?

### UNIT - II

11. What is a galvanic cell?
12. Define electrode potential
13. List out the types of electrodes
14. What is a cadmium cell
15. Define irreversible cell

16. Write a short note on reversible cells
17. What are the significance of electrode potential
18. Define electrochemical series
19. State the application of electrochemical series
20. Explain reference electrode

### UNIT- III

21. Write down the biological importance of amino acids
22. Write short note on buffer solution.
23. What is pH scale?
24. State liquid junction potential
25. What are the application of EMF measurement
26. State redox indicators.
27. Explain acid base titration
28. Write any two examples of buffer solutions
29. Explain potentiometric titrations
30. Explain redox titrations

### UNIT - IV

31. Define corrosion
32. State the disadvantages of corrosion
33. Distinguish between pitting corrosion and uniform corrosion
34. Define galvanization
35. What are the types of corrosion
36. What is fuel cell
37. How fuel cell differs from electrochemical cell
38. Write a short note on discharge potential cells
39. State oxygen fuel cell
40. State hydrogen fuel cell

### UNIT - V

41. What is polarography?
42. List out the Advantages of dropping mercury electrode
43. What are the Application of polarography
44. Write a short note on any two factors affecting limiting current
45. Define limiting current.
46. Explain adsorption
47. Explain absorption
48. Differentiate adsorption and absorption
49. What are the application of adsorption
50. Explain briefly Langmuir adsorption.

### SECTION - C

**8 marks**

## UNIT - I

1. What are the classifications of conductors? Explain any two briefly
2. Explain
  - i) Electrolytic conductance
  - ii) Transport number
3. Explain Ostwald's dilution law and its limitations
4. What is Kohlrausch's law, its statements and its applications
5. State Arrhenius theory of electrolytic dissociation
6. Explain the following
  - i) Falkenhagen effect
  - ii) Wien effect.
7. Explain any two Applications of conductance measurements.
8. Explain the Debye-Huckel – Onsager theory.
9. Explain how to determine ionic product of water..
10. Define Hittorf's method

## UNIT – II

11. Give a detail account on galvanic cell.
12. Write down types of electrodes and their potentials.
13. Explain the Electrode potentials.
14. Explain about the electrochemical series and its applications.
15. Give a comparative account on the Reversible and irreversible cells.
16. Explain the Cadmium cell.
17. Give an account of the Nernst equations
18. Establish the Thermodynamic quantities of cell reactions for  $\Delta G$
19. What are the representation of cell
20. Give a detail explanation on classification of cell.

## UNIT - III

21. How do you determine pH using hydrogen electrode
22. How do you determine pH using glass electrode
23. How do you determine pH using quinhydrone electrode
24. Discuss about the buffer solutions and its actions.
25. Explain: redox potential.
26. Write about the redox indicator diphenyl amine
27. Explain the Liquid junction potential.
28. Differentiate Concentration cells with and without transport.
29. Write about Application of EMF measurements.
30. Explain Henderson's equation

## UNIT - IV

31. Explain the types of corrosion
32. Write a note i) corrosion ii) fuel cell
33. Write a note i) hydrogen fuel cell ii) oxygen fuel cell
34. Explain galvanizing.
35. Explain lithium ion cell.
36. Give a detail account on i) decomposition voltage ii) over voltage.
37. Give a short note on deposition potential cell.
38. Lead storage cell - Explain.

39. Give an account on importance of fuel cell  
40. Write a note on i) prevention of rusting ii) cathodic protection.

### UNIT - V

41. What is meant by half wave potential  
42. Give an explanation on adsorption of gases by solids  
43. Write a note on Advantages of dropping mercury electrode.  
44. Explain instrumentation of polarography with a diagram  
45. Discuss the limiting current and the factors affecting limiting current  
46. Write down the applications of polarography.  
47. Explain about adsorption and absorption.  
48. Explain i) Freundlich, ii) Langmuir isotherm  
49. Discuss the Types of adsorption  
50. List out the applications of adsorption.

Keys:

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



- 73. c
- 74. b
- 75. b
- 76. a
- 77. c
- 78. b
- 79. b
- 80. b
- 81. c
- 82. b
- 83. d
- 84. b
- 85. a
- 86. d
- 87. c
- 88. c
- 89. b
- 90. a
- 91. b
- 92. d
- 93. c
- 94. c
- 95. a
- 96. a
- 97. c
- 98. b
- 99. d
- 100. a

KASC-Chemistry (UG)

**KONGUNADU ARTS AND SCIENCE COLLEGE**

**(AUTONOMOUS)**

**COIMBATORE-641 029**



## **QUESTION BANK**

**Prepared by**

**Dr.R. VELMURUGAN, Asst Prof**

**DEPARTMENT OF CHEMISTRY (UG)**

## SEMESTER V

### MAJOR ELECTIVE-1

### POLYMER CHEMISTRY

### UNIT-1

### 1marks

1. Which of the following Polymer types is not classified on the basis of its application and properties.
  - (a) Rubber
  - (b) Plastics
  - (c) Fibres
  - (d) Synthetic
2. Which of the following is a Thermosetting Polymer?
  - (e) Polystyrene
  - (f) Poly olefins
  - (g) Nylons
  - (h) Phenolic resins
3. Which among the following Polymers have Lowest solubility.
  - (a) Polyethylene
  - (b) Polystyrene
  - (c) Nylon
  - (d) Epoxy resin
4. Which of the polymer exhibit lower value of Molar cohesion.
  - (a) Wool
  - (b) Silk
  - (c) Vulcanized rubber
  - (d) Poly styrene
5. What is the range of tensile strength exhibited by fibres?
  - (a) 300-3000
  - (b) 4000-15000
  - (c) 20000-150000
  - (d) 5000-10000
6. Which of the following kind of polymers are known for their high crystallinity?
  - (a) Isotactic
  - (b) Syndiotactic
  - (c) Atactic
  - (d) None of these
7. Which of the following category does cellulose nitrate fall into?
  - (a) Natural
  - (b) Synthetic

- (c) Semi synthetic  
(d) None of these
8. Nylon is a /an  
(a) Amides  
(b) Peptides  
(c) Polyamides  
(d) Polyesters
9. Recycle botels of plastics are made from  
(a) Terlylene  
(b) Nylon  
(c) Caprolactum  
(d) All of them
10. Most commonly used polyster is known as  
(a) Terylene  
(b) Nylon  
(c) Fast  
(d) Protein
11. The word polymer is derived from the  
(a) Greek  
(b) English  
(c) French  
(d) None of these
12. The functionality of acetylene is  
(a) 1  
(b) 2  
(c) 3  
(d) 4
13. Which of the following can be a monomer?  
(a) 1  
(b) 2  
(c) 3  
(d) 4
14. The monomer unit of pvc is  
(a) Poly vinyl chloride  
(b) Ethylene  
(c) Vinyl chloride  
(d) Vinyl bromide1
15. When the degree of polymerization of polyethylene is 100, its molecule weight is  
(a) 1400  
(b) 2800  
(c) 4200  
(d) 5600
16. Ewimi formula is used for find out the following  
(a) Weight average molecular weight

- (b) Weight average
  - (c) Molecular weight
  - (d) All the above
17. The initiator (or) Catalyst used in anionic polymerization
- (a) BF<sub>3</sub>
  - (b) TiCl<sub>4</sub>
  - (c) Butyl lithium
  - (d) Nitro benzene
18. Which polymerization is called as insertion polymerization
- (a) Free radical
  - (b) Anionic polymerization
  - (c) Coordination polymerization
  - (d) Cationic polymerization
19. Elastomers are popularly known as
- (a) Rubbers
  - (b) Fibers
  - (c) Garments
  - (d) None of the above
20. Polystyrene are popularly known as
- (a) Polyvinyl benzene
  - (b) Poly vinyl butane
  - (c) Poly vinyl pentane
  - (d) None of these

**5 marks**

1. Define Natural and Synthetic Polymers.
2. Difference between Thermosetting and Thermoplastic Polymers.
3. Write a note on Inorganic Polymer.
4. Briefly explain the types of Polymerization.
5. Explain the classification of Polymers.
6. Give an account on step Polymerization.
7. Write a short note on Group-Transfer Polymerization.
8. What are the Process involved in Chain-Polymerization?
9. Write a note on Plastic and Fibres.
10. Explain the Mechanism of Ring-Opening Polymerization.

**8 marks**

1. Define (i) Monomers and Polymers.  
(ii) Classification of Polymers.
2. Explain about Natural and Synthetic Polymers.
3. Discuss any two types of Polymerization.
4. Give an account on  
(i) Poly – Condensation.

- (ii) Poly – Addition.
5. Define Miscellaneous Polymerization reaction.
  6. Explain free-radical and co-ordination Polymerization.
  7. Write a note on Thermoplastic and Thermosetting Polymers. Give an example.
  8. Write a definition of organic and inorganic Polymers.
  9. What are the process involved in Step-Polymerization?
  10. Explain Anionic and Cationic Polymerization.

## UNIT II-Polymer properti1 mark

1. When the degree of polymerization of polyethylene is 100,its molecular weight is
  - (a) 1400
  - (b) 2800
  - (c) 4200
  - (d) 5600
2. EWiMi formula is used for find out the following
  - (a) Weight average molecular weight
  - (b) Weight average
  - (c) Molecular weight
  - (d) All the above
3. Molecular weight of polymer usually
  - (a) Decreases Tg value
  - (b) Stabilises Tg value
  - (c) Increases Tg value
  - (d) Does not affect Tg value
4. Which of the following polymer is a very good insulator
  - (a) Nylon
  - (b) Teflon
  - (c) Polyethylene
  - (d) Neoprene
5. Which of the following polyhmers has higher Tg value
  - (a) Teflon
  - (b) Polyethylene
  - (c) Pvc
  - (d) Nylon 66
6. One of the characteristic properties of polymer material is
  - (a) High temperature stability
  - (b) High mechanical strength
  - (c) High elongation
  - (d) Long –hardness
7. Polymers are \_\_\_\_\_ in nature
  - (a) Organic
  - (b) Inorganic
  - (c) Both a and b
  - (d) None

8. Following is the unique to polymeric materials
  - (a) Elasticity
  - (b) Visco-elasticity
  - (c) Plasticity
  - (d) None of the above
9. The rigidity of the polymer chain increases, the glass transition temperature
  - (a) Increase
  - (b) Decrease
  - (c) Remains the same
  - (d) None of these
10. \_\_\_\_\_ is the temperature, below which the physical properties of plastics change to glassy (or) crystalline
  - (a) Glass transition temperature
  - (b) Transition temperature
  - (c) Both a and b
  - (d) None of the above

**5 marks**

1. Write a short note on average molecular weight.
2. Explain the number average.
3. Briefly discuss about weight average molecular weight.
4. Discuss the sedimentation process.
5. Give an account on viscosity average molecular weight.
6. Explain molecular weight.
7. Describe degree of polymerization.
8. Define glass-transition temperature.
9. Explain transition and associated properties.
10. How to calculate the number-average molecular weight.

**8mark**

1. Define average molecular weight and number average molecular weight with examples.
2. Discuss the concepts of weight-average molecular weight.
3. What are the process involved in sedimentation process.
4. Give a detailed account on viscosity average molecular weight.
5. Explain molecular weight and degree of polymerization.
6. Discuss the glass transition temperature in detail.
7. Factors affecting the glass transition temperature.
8. Explain photo-oxidative degradation of polymers.
9. Calculate the number average molecular weight and weight average molecular weight with example.
10. Describe sedimentation and viscosity average molecular-weight.

### UNIT-III POLYMERIZATION TECHNIQUES

1 mark

1. What does PVC stands for
  - a. Poly vinyl chloride
  - b. Poly vinyl corck
  - c. Both a and b
  - d. None of these
2. Natural; fibre occurs as
  - a. Rubbers
  - b. Nylon
  - c. Staples
  - d. Silk
3. \_\_\_\_\_ fibres are used for making undergarments
  - a. Natural fibre
  - b. Comfort fibre
  - c. Safety fibre
  - d. All the above
4. Die casting bis relatively \_\_\_\_\_
  - a. High
  - b. Low
  - c. Medium
  - d. All the above
5. How many roles are there in calendring process
  - a. 2
  - b. 3
  - c. 7
  - d. 4
6. Casting used to produce polymeric fil is
  - a. Die casting
  - b. Film casting
  - c. Moulding
  - d. All the above
7. Compression moulding is used to produce article from
  - a. Thermoplastic
  - b. Thermosetting



- c. Plastic
  - d. None of these
8. In bulk polymerization monomer is taken in \_\_\_\_\_ state
- a. Liquid
  - b. Solid
  - c. Gas
  - d. Both a and b
9. Word plastic originated from
- a. Latin
  - b. Britain
  - c. Greek
  - d. English
10. Elastomers are popularly known as
- a. Rubber
  - b. Fibre
  - c. Solid
  - d. Glass

5 marks

1. Explain bulk polymerisation?
2. Write a note on solution polymerisation?
3. What are the polymerisation processes involved in suspension polymerisation?
4. Give an account on emulsion polymerisation?
5. Briefly explain interfacial polycondensation polymerisation?
6. Write a note on plastic and fibres?
7. Explain dye casting?
8. Define compression moulding with neat diagram?
9. Explain the process of injection moulding?
10. Define the processing technique of calendaring?

8 Mark

1. Give a detailed account on solution and bulk polymerisation?
2. Explain suspension and interfacial polycondensation?
3. Mention the process of emulsion polymerisation?
4. Write a note on elastomers and plastic?
5. Processing technique of rotational casting with neat diagram?
6. Give an account on film casting and compression moulding?
7. Explain calendaring and injection moulding?
8. Explain the characteristics of bulk and interfacial polycondensation?
9. Discuss the elastomer and fibres?
10. Explain calendaring and film casting?

Unit IV

**1 mark**

- When the degree of polymerization of polyethylene is 100, its molecular weight is
  - 1400
  - 2800
  - 4200
  - 5600
- EWiMi formula is used for find out the following
  - Weight average molecular weight
  - Weight average
  - Molecular weight
  - All the above
- Molecular weight of polymer usually
  - Decreases Tg value
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- Which of the following polymer is a very good insulator
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- Which of the following polymers has higher Tg value
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- One of the characteristic properties of polymer material is
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- Polymers are \_\_\_\_\_ in nature
  - Organic
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  - None
- Following is the unique to polymeric materials
  - Elasticity
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  - Plasticity
  - None of the above
- The rigidity of the polymer chain increases, the glass transition temperature
  - Increase
  - Decrease
  - Remains the same
  - None of these

5 mark

1. What is polystyrene and give an example?
2. Mention the use of polyester?
3. What are the properties of polyamide?
4. Explain the preparation of phenol formaldehyde resins?
5. Write the uses of epoxy resins?
6. Briefly explain the preparation of kevelar?
7. What are the uses of polyamide?
8. Give an account of poly vinyl chloride and its properties?
9. Write a note on polyurethane?
10. Write the preparation and properties of polyamide?

8 mark

1. Write the preparation, properties and uses of polystyrene?
2. Mention the preparation and properties and uses of polyester?
3. Explain the uses and properties of polyamide?
4. Give a detailed account on poly vinyl chloride?
5. Explain in detail about epoxy resins with properties and uses?
6. Write a note on kevelor with properties preparation and uses?
7. Mention the properties and preparation of phenol-formaldehyde resins?
8. What are the uses, properties and preparation of epoxy resin?
9. Explain the uses and preparation of epoxy resin and poly vinyl chloride?
10. Give an account on polyester and polystyrene?

#### UNIT-V

1 marks

1. Which of the following Polymer types is not classified on the basis of its application and properties.

(a) Rubber

(b) Plastics

(c) Fibres

(d) Synthetic

2. Which of the following is a Thermosetting Polymer?

(e) Polystyrene

(f) Poly olefins

- (g) Nylons
- (h) Phenolic resins

3. Which among the following Polymers have Lowest solubility.

- (a) Polyethylene
- (b) Polystyrene
- (c) Nylon
- (d) Epoxy resin

4. Which of the polymer exhibit lower value of Molar cohesion.

- (a) Wool
- (b) Silk
- (c) Vulcanized rubber
- (d) Poly styrene

5. What is the range of tensile strength exhibited by fibres?

- (a) 300-3000
- (b) 4000-15000
- (c) 20000-150000
- (d) 5000-10000

6. Which of the following kind of polymers are known for their high crystallinity?

- (a) Isotactic
- (b) Syndiotactic

(c) Atactic

(d) None of these

7. Which of the following category does cellulose nitrate fall into?

(a) Natural

(b) Synthetic

(c) Semi synthetic

(d) None of these

8. Nylon is a /an

(a) Amides

(b) Peptides

(c) Polyamides

(d) Polyesters

9. Recycle botels of plastics are made from

(a) Terlylene

(b) Nylon

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(b) Anionic polymerization

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(b) Fibers

(c) Garments

(d) None of the above

20. Polystyrene are popularly known as

(a) Polyvinyl benzene

(b) Poly vinyl butane

(c) Poly vinyl pentane

(d) None of these

5 MARKS

1. What is meant by pigment? Give example?
2. What are the requirements of a pigment?
3. Write the typical inorganic pigment?
4. Write the applications of a pigment?
5. Define the classification of paints?
6. Briefly explain about distempers?
7. What are the constituents of paint?
8. Discuss the setting of paint?
9. Write about emulsion paint?
10. Define the following
  - i) Solvent
  - ii) Thinner

8 marks

1. Give an detailed account of cellulose with structure?
2. Explain the synthesis of Rayon?
3. How cellulose nitrate is prepared?
4. What is known as CMC and explain how it is prepared?
5. Explain about silicones?
6. Write a short notes on drug delivery?
7. Describe the biomedical application of polymers?
8. Mention the application of artificial organs?
9. Explain about conducting polymers with example?
10. Describes in detail about cellophane and cellulose nitrate?



**KONGUNADU ARTS AND SCIENCE COLLEGE**

**(AUTONOMOUS)**

**COIMBATORE-641 029**



## **QUESTION BANK**

**Prepared by**

**Dr. K. KRISHNAVENI, Asst Prof**

**DEPARTMENT OF CHEMISTRY (UG)**

**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)  
COIMBATORE**

**Name of the Degree: B. Sc.**

**Name of the Subject: SKILL BASED COURSE I: WATER CHEMISTRY**

**Subject Code: 17 UCH4S2**

**UNIT I**

**SECTION - A (1 Mark)**

- 1) Why can the depth of a water table be high in some places and low in others?  
a) There is too much leaking occurring in certain spots b) The depth changes due to precipitation, drought, or overuse of wells c) Sedimentation occurs d) Relative humidity
- 2) The percentage of a rock's total volume that is taken up by pore space is called the -----  
a) permeability b) recharge c) aquifer d) porosity
- 3) The ability of an Earth material to transmit water is a measure of its:  
a) porosity b) aquifer characteristics c) chemical cement d) permeability
- 4) In what types of rock do most caves form?  
a) granite b) shale c) limestone d) sand stone
- 5) Most of the water coming out of continental hot springs is \_\_\_\_\_  
a) meteoric water b) magmatic water c) sea water d) metamorphic water
- 6) What is the difference between the saturated and the unsaturated zones of ground water?  
a) the saturated zone has a higher porosity than the unsaturated zone  
b) the saturated zone has a lower porosity than the unsaturated zone  
c) the pore spaces in the saturated zone are completely full of water; the pore spaces in the unsaturated zone are not completely full of water.  
d) the pore spaces in the saturated zone are not completely full of water; the pore spaces in the unsaturated zone are completely full of water
- 7) The carbon content of which of the following is generally maximum from a particular source.  
a) Humic acid b) Fulvic acid c) Humin d) All have almost same carbon content
- 8) Many of the reactions that bring about synthesis or degradation of organic matter are generally.

- a) Physical reaction   b) Chemical reaction   c) Biological reaction   d) Physiological reaction
- 9) Compounds of which of the following element are generally present in colloidal state in natural waters.
- a) Fe      b) NaCl      c) AgNO<sub>3</sub>      d) AgI
- 10) Water that is good enough to drink is called \_\_\_\_\_
- a) potable water   b) ground water   c) surface water   d) artesian water
- 11) Water is an excellent solvent because
- a) It has high dielectric constant   b) high density   c) both a&b   d) none of these
- 12) Olivine is
- a) CaSO<sub>4</sub>      b) Mg<sub>2</sub>SiO<sub>4</sub>      c) Fe<sub>3</sub>O<sub>4</sub>      d) Mg<sub>2</sub>SiO<sub>4</sub>. x H<sub>2</sub>O
- 13) Saline water contains the following salts
- a) MgSO<sub>4</sub>      b) MgCl<sub>2</sub>      c) both a & b      d) none of these
- 14) In water, at all pH values the following one is insoluble
- a) Humin      b) Humic acid      c) Fulvic acid      d) Humic material
- 15) Phenol produces a bitter taste at
- a) 1 ppm      b) 7 ppm      c) 9 ppm      d) 10 ppm
- 16) Rock salt is
- a) NaCl      b) CaSO<sub>4</sub>      c) Sulphur      d) Carbon
- 17) The impurities that occur in natural water can be classified into three group, according to their
- a) Chemical process   b) Physical process   c) Physico-chemical process   d) Biological process
- 18) Non polar molecule is
- a) CCl<sub>4</sub>      b) Humic material      c) both a&b      d) none of these
- 19) Ground water that can be used annually is about
- a) 402 Cu km      b) 380 Cu km      c) 416 Cu km      d) 350 Cu km
- 20) Which element is a natural constituent and exists in all parts of the environment.
- a) Fluoride      b) Chloride      c) Sulphur      d) Carbon

**UNIT I**  
**SECTION B (5 marks)**

1. Explain the sources of water.
2. Elaborate the uses of water.
3. Water as a solvent. Account on it.
4. Elucidate the common impurities in natural water.
5. Write short notes on i) Hardness of water ii) Temporary hardness iii) Permanent hardness
6. Explain the quality of natural water.
7. Describe the chemistry of water.
8. What is the impact of dissolved organic matter in water? Explain in detail.
9. Explain the role of water in human body.
10. Briefly explain the role of water in industries.

**UNIT I**  
**SECTION C (8marks)**

1. Discuss the effects of water on rocks and minerals.
2. Explain the colloidal material in water.
3. Describe about Humic material in water.
4. Explain the environmental phosphorus chemistry.
5. Explain the physiological importance of water.
6. How will you determine the hardness of water?
7. Write a short notes on (i) Quality of natural water ii.) water in human body
8. Explain the following in detail: i) sources of water ii) uses of water.
9. Elaborate the main quality and characteristics of water.
10. Describe the role of water : i) in human body ii) in industries.

**UNIT II**  
**SECTION - A (1 Mark)**

- 1) Colour of the water is not harmful unless it is associated with\_\_\_\_  
a) toxic chemicals b) sun light c) microorganism d) temperature
- 2) What is a major water pollutant  
a) turbidity b)sewage c)soil erosion c) rocks
- 3) What minerals are found in the run-off from agricultural land and treated and untreated sewage effluents, which are highly responsible for eutrophication of water bodies?  
a) Phosphorous and carbon b) Nitrogen and phosphorus c) Potassium and arsenic  
d) Iron and manganese
- 4) Which sector is the single-largest consumer of fresh water in India?  
a) Industry b) Power c) Domestic d)Agriculture
- 5) In extreme cases of eutrophication, water bodies no longer support  
a) Pollution b) Fishes c) Nutrients d) Algae
- 6) Which natural resources are available in sea floor that is exploited by human?  
a) Oil b) Natural Gas & Oil c) Coal d) Thermal Energy
- 7) Why warm ocean water kills fishes and planktons?  
a) Due to low Oxygen b) Due to Low Nutrients c) Due to low oxygen & Nutrients  
d) Due to presence of Salts
- 8) Which of the following industry generates coloured waste?  
a) Food processing b) Mining c) Iron and steel d) Tanneries
- 9) According to WHO, the soft water has 0 to \_\_\_\_\_ milligram per litre as  $\text{CaCO}_3$ .  
a) 30 b) 60 c) 90 d) 120
- 10) The factor affects nutrient loss in surface water is  
a) irrigation practices b) drinking water wells c) flow direction d) municipal disposal
- 11) Non biodegradable organic pollutants are  
a) Pesticides b) fats c) carbohydrates d) polymers
- 12) Nutrient rich top layer in a Lake is called  
a) Epilimnion b) hypolimnin c) thermocline d) none of these
- 13) Water analysis is usually expressed in  
a) PPM b) milligrams c) grams d) none of these
- 14) Latin word "pollutus" means

- a) Before washing   b) After washing   c) both a&b   d) none of these
- 15) The second source of phosphorus in municipal waste water is  
a) Animal wastes   b) Human wastes   c) living organism   d) All
- 16) Odour pollution of water is caused both by  
a) Physical and Chemical agents                      b) Chemical and Biological agent  
c) Physical and Biological agents                      d) Physical and biological agents
- 17) NOM is derived from the following  
a) plants              b) microbial residues              c) both a &b              d) none of these
- 18) Which element is a natural constituent and exists in all parts of the environment.  
a) Fluoride              b) Chloride              c) Sulphur              d) Carbon
- 19) For municipal water supply the turbidity should not exceed at  
a) 7 ppm              b) 10 ppm              c) 4 ppm              d) 8 ppm
- 20) The US department of Health, Education and Welfare has classified surface water pollutants into -----major categories  
a) 7                      b) 10                      c) 4                      d) 8

## Unit – II

### SECTION B (5marks)

1. Discuss about water pollution
2. Write a brief account of water pollutants
3. Discuss the surface water pollution
4. Explain source of contamination in ground water.
5. Write notes on physical pollution of water.
6. What are the types of pollution in water
7. Write notes on Ground water pollution.
8. Discuss Lake water pollution.
- 9 Discuss about River water pollution.
8. Discuss the types of water pollution
9. Discuss about Chemical pollution of water
10. Discuss about Biological pollution of water

## Unit – II

### SECTION C (8 marks)

1. Discuss the following (i) Chemical pollution of water (ii) Biological pollution of water
2. Discuss about water pollution and Write a brief account for water pollutants.
3. Explain the sources of contamination in ground water.
4. Explain the pollution of water by pesticides.
5. Write notes on: i) water pollution ii) water pollutants
6. Discuss about: i) ground water pollution. ii) lake water pollution.
7. Explain the following: chemical and biological pollution of water
8. Elaborate: i) ground water pollution ii) surface water pollution
9. Enumerate i) lake water pollution ii) sea water pollution
10. Explain: biological pollution and physiological pollution of water.

## UNIT III

### SECTION - A (1 Mark)

- 1) Which of the following contributes to turbidity in water?  
a) Colloidal dispersion b) Microorganism c) Sand d) Hardness
- 2) Copper sulphate can be used to remove ----- from water  
a) Odour b) hardness c) impurity d) ions
- 3) Aluminium sulphate used coagulant for water purification is effective at pH  
a) 6.7 b) 7.5 c) 8.5 d) 9
- 4) Huge strainers are used to  
a) force water to the treatment plant b) increase the water pressure  
c) filter large particles in the water d) filter bacteria and other harmful organisms
- 5) BOD stands for  
a) Biological Oxygen Decrease b) Biotic Oxygen Demand  
c) Biological Oxygen Demand d) None of the above
- 6) Ammonia is calorimetrically measured using  
a) Schiff's reagent b) Nessler's reagent c) Ferric chloride d) Tollen's reagent
- 7) Which of the following is used disinfectant for water purification?  
a)  $\text{CaOCl}_2$  b)  $\text{CaCl}_2$  c)  $\text{CaSO}_4$  d)  $\text{CaCO}_3$

- 8) The coagulant widely used for sewage treatment, is  
 a) alum                    b) ferric chloride            c) ferric sulphate            d) chlorinated copperas
- 9) Zinc in a water sample can be determined by  
 a) Polarographic method    b) Conductometer    c) Tintometer    d) Spectrometer
- 10) Atomic adsorption spectroscopy can be used in the determination of  
 a) Zn and Cd            b) Dissolved oxygens    c) Ammonia    d) Nitrites
- 11) Alkalinity of water determined by  
 a) Titration method            b) Atomic absorption method    c) both a & b  
 d) Spectrophotometric method
- 12) BOD is  
 a) an indicator of pollution    b) chemical used to determine the pollution  
 c) a pollutant            d) none of the above
- 13) Coagulation can be intensified by adding special reagents known as  
 a) Flocculants            b) BOD            c) COD            d) DO
- 14) Hard water contains dissolved salts of calcium and magnesium present as  
 a) Bicarbonates            b) Sulphates  
 c) Chlorides            d) Bicarbonates, Sulphates, Chlorides
- 15) International standards for drinking water the lead have a maximum allowable limit is  
 a) 0.05 mg/L            b) 0.10 mg/L    c) 0.5 mg/L    d) 0.2 mg/L
- 16) Alkalinity of water is generally presence of  
 a) Carbonate ions            b) Hydroxide ions    c) both a&b            d) Mineral acids
- 17) Indicator used in the determination of hardness of water is  
 a) phenolphthalein    b) Eriochrome black - T    c)  $\text{KMnO}_4$     d) starch
- 18) For municipal water supply the turbidity should not exceed  
 a) 10 ppm            b) 7 ppm            c) 5 ppm            d) 12 ppm
- 19) Colour is measured with an instrument known as  
 a) Colorimeter    b) Tintometer    c) Coluometer    d) Potentiometer
- 20) Which of the following is the anthropogenic source of organic matter in water  
 a) Domestic sewages    b) pulp mill effluent    c) products or by-products of industrial processes    d) pure water



### **Unit – III**

#### **SECTION B (5 marks)**

1. Write briefly about oxygen demand.
2. Mention the international standards for drinking water.
3. Explain Chemical and physical examination of water
4. Explain source of contamination in ground water.
5. Write a note on BOD and COD?
6. Explain general analytical methods of determination of metals?
7. Explain about clarification of water.
8. Chemical substances affecting potability? Explain in detail.
9. Write notes on chemical substances affecting health.
10. Explain about i)Electrical conductivity ii)Alkalinity

### **Unit – III**

#### **SECTION C (8 marks)**

1. Explain the process involved in the Chemical oxygen demand.
2. Explain the process involved in the BOD.
3. Give details about, " international standards for drinking water".
4. Write notes on: i) Electrical conductivity ii) Suspended solids
5. Write notes on: i) Dissolved solids ii) Acidity
6. Write notes on: i) Total acidity ii) Alkalinity
7. How will you measure the toxic chemical substances in water?
8. Write the general analytical methods for the determination of iron in water.
9. Write the general analytical methods for the determination of chromium in water.
10. Explain the limitations and advantages of COD and BOD.

**UNIT IV**  
**SECTION A (1 Marks)**

- 1) Zeolite softening process removes
  - a) only temporary hardness of water
  - b) only permanent hardness of water
  - c) both temporary and permanent hardness of water
  - d) the dissolved gases in permanent hard water
- 2) Conventional tertiary treatment is
  - a) chemical coagulation and flocculation
  - b) filtration
  - c) sedimentation
  - d) precipitation
- 3) Select the incorrect statement from the following option.
  - a) Water which does not form lather with soap and forms white scum is called hard water
  - b) Hard water contains dissolved calcium and magnesium salts in it
  - c) In hard water, cleansing quality of soap is depressed
  - d) Due to the presence of dissolved hardness-producing salts, the boiling point of water is depressed
- 4) Hardness of water is conventionally expressed in terms of equivalent amount of
  - a)  $\text{H}_2\text{CO}_3$
  - b)  $\text{MgCO}_3$
  - c)  $\text{CaCO}_3$
  - d)  $\text{Na}_2\text{CO}_3$
- 5) The chemical formula of zeolite is
  - a)  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
  - b)  $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$
  - c)  $\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot x\text{SiO}_2 \cdot y\text{H}_2\text{O}$
  - d)  $\text{Na}_2\text{Al}_2\text{O}$
- 6) The basis of reverse osmosis is
  - a) Osmotic pressure is greater than hydrostatic pressure
  - b) Osmotic pressure is equal to hydrostatic pressure
  - c) Hydrostatic pressure is greater than osmotic pressure
  - d) Osmotic pressure does not exist
- 7) The ion exchange resins are
  - a) Insoluble and cross linked
  - b) Soluble and cross linked
  - c) Soluble and polymers
  - d) Macro porous structure
- 8) Cation selective membrane contains
  - a) Negative charge
  - b) No charge
  - c) Positive charge
  - d) Either positive or negative charge
- 9) Which of the following is used as flocculants?
  - a) Rubber
  - b) Polyacrylamide
  - c) Hypochlorite
  - d) Chlorine dioxide
- 10) Activated silicic acid is used as a flocculant. The silicic acid can be activated by,
  - a) Mineral acids
  - b) Polyacrylamide
  - c) Hypochlorite
  - d) Chlorine dioxide

- 11) Polyacrylamide is example for  
a) Flocculants b) hardness of water c) both a & b d) strongly acidic cation exchangers
- 12) The technique used to remove biological water pollutants  
a) Ion exchange method b) UV treatment c) desalination d) osmosis
- 13) The technique used to remove chemical water pollutants  
a) Ion exchange method b) UV treatment c) coagulation d) osmosis
- 14) The technique used to convert sea water to purified water  
a) Ion exchange method b) UV treatment c) coagulation d) reverse osmosis
- 15) The degree of hardness of soft water is  
a) 10 - 20° b) 20- 30° c) 0- 10° d) 30°
- 16) Removal of coarse, dispersed and colloidal impurities from water is known as  
a) Filtration b) sedimentation c) clarification d) coagulation
- 17) The chemicals used for precipitation in chemical methods of sterilization are  
a) alum, soda ash, lime b) microorganism c) sulphuric acid d) nitric acid
- 18) Formula of bleaching powder  
a) HOCl b) NaOCl c) CaOCl<sub>2</sub> d) Cl<sub>2</sub>
- 19) Zeolites are known as  
a) Green sand b) blue sand c) white sand d) red sand
- 20) Hardness of water is divided into how many classes?  
a) 3 b) 2 c) 5 d) 4

#### UNIT IV

#### SECTION B (5 marks)

1. Explain Reverse Osmosis with neat diagram.
2. Write short notes on desalination of brackish water
3. Explain the chemical methods of sterilization of water.
4. Explain the terms sterilization and disinfection of water.
5. Explain electrochemical coagulation of water.
6. Explain about chemical methods of sterilization.
7. Explain about flocculants of water.
8. Discuss about coagulation of water.
9. Write short notes on chlorination of water

10. Explain the filtration process in water treatment.

#### UNIT IV

#### SECTION C ( 8 marks)

1. How will you determine the hardness of water by EDTA method?
2. Explain ion exchange method with neat diagram.
3. Illustrate the zeolite process with neat sketch.
4. How will you remove coarse, colloidal and dispersed impurities from water.
5. Explain the process involved in demineralization of water.
6. Write a short note on (i) Zeolite process ii) ion exchange process.
7. Explain the various steps involved in the treatment of water.
8. In the cation and anion exchangers, how is regeneration carried out?
9. List out the limitations of Zeolite process.
10. Differentiate ion exchange method and Zeolite process.

#### UNIT V

#### SECTION A (1 marks)

- 1) Purification and removal of bacteria, solid materials and other impurities from used water is classified as  
a) distillation    b) cloud seeding    c) reclamation    d) membrane filtration
- 2) Considering climate change, increase in temperature leads to  
a) Snowfall    b) higher evaporation    c) lower evaporation    d) hailstorms
- 3) Method of desalination in which molecules of water are forced to pass semi-permeable membrane is called  
a) membrane filtration    b) distillation    c) cloud seeding    d) reclamation
- 4) The objective of rain water harvesting is  
a) To reduce the runoff water    b) To reduce the water table  
c) To reduce the storage of the water    d) To reduce the evaporation
- 5) Specific area where sediments, minerals and water are drained into common outlet is classified as  
a) water detachment area    b) water catchment area



- c) preparation of water quality map    d) pollution control at industrial sources

**UNIT - V**

**SECTION B (5 marks)**

1. Outline the importance of rain water harvesting.
2. Point out the uses and conservation of water resources.
3. Write short notes on irrigated systems.
4. What do you understand by water management?
5. Explain irrigated system.
6. Write short notes on rain fed system.
7. Discuss the advantages of rain water harvesting.
8. Write the objectives of rain water harvesting.
9. Predict the main effects of overexploitation of ground water resources.
10. What do you mean by hydrological cycle?

**UNIT - V**

**SECTION C (8 marks)**

1. Explain the water management in agriculture.
2. Predict the point on water management in industries.
3. Elucidate about waste water treatment.
4. In what way you can help the society with water resources.
5. Explain (i) water management (ii) use and conservation of water resources.
6. Rain water harvesting - Explain.
7. Explain: water management in agriculture rainfed system.
8. Write a note on water quality management.
9. Discuss sea water for agriculture.
10. Explain in detail about 'Water from rocks'.

## Key Answer

### Unit –I Section – A

**Answer:** 1) (b) 2) (d) 3) (d) 4) (c) 5) (a) 6) (c) 7) (c) 8) (c) 9) (a) 10) (a)

11) (a) 12) (b) 13) (c) 14) (a) 15) (b) 16) (a) 17) (c) 18) (a) 19) (c) 20) (a)

### Unit – II Section – A

**Answer :** 1) (a) 2) (b) 3) (b) 4) (d) 5) (b) 6) (b) 7) (c) 8) (d) 9) (b) 10) (a)

11) (a) 12) (a) 13) (a) 14) (a) 15) (b) 16) (b) 17) (c) 18) (a) 19) (b) 20) (d)

### Unit – III Section – A

**Answer:** 1) (a) 2) (a) 3) (a) 4) (c) 5) (c) 6) (b) 7) (a) 8) (b) 9) (a) 10) (a)

11) (a) 12) (a) 13) (a) 14) (d) 15) (a) 16) (c) 17) (a) 18) (a) 19) (b) 20) (c)

### UNIT - IV Section – A

**Answer:** 1) (c) 2) (a) 3) (d) 4) (c) 5) (c) 6) (c) 7) (a) 8) (c) 9) (b) 10) (a)

11) ( ) 12) (b) 13) (a) 14) (d) 15) (c) 16) (c) 17) (a) 18) (c) 19) (a) 20) (2)

### UNIT - V Section – A

**Answer:** 1) (c) 2) (b) 3) (a) 4) (a) 5) (b) 6) (a) 7) (b) 8) (c) 9) (a) 10) (a)

11) (a) 12) (c) 13) (a) 14) (b) 15) (d) 16) (b) 17) (b) 18) (a) 19) (c) 20) (d)

**KONGUNADU ARTS AND SCIENCE COLLEGE**

**(AUTONOMOUS)**

**COIMBATORE-641 029**



**QUESTION BANK**

**Prepared by**

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**DEPARTMENT OF CHEMISTRY (UG)**



**SEMESTER - V**  
**CORE CHEMISTRY PAPER – VI**  
**SPECTROSCOPY AND CHROMATOGRAPHIC TECHNIQUES**

**UNIT-I Ultra – violet and visible spectroscopy**

SECTION – A

- The energy required for various transitions follow the order  
a)  $\sigma \rightarrow \sigma^* > n \rightarrow \pi^* > \pi \rightarrow \pi^* > n \rightarrow \sigma^*$     b)  $n \rightarrow \pi^* > \pi \rightarrow \pi^* > n \rightarrow \sigma^* > \sigma \rightarrow \sigma^*$   
c)  $\sigma \rightarrow \sigma^* > \pi \rightarrow \pi^* > n \rightarrow \sigma^* > n \rightarrow \pi^*$     d)  $\sigma \rightarrow \sigma^* > n \rightarrow \pi^* > n \rightarrow \sigma^* > \pi \rightarrow \pi^*$
- Which of the following group is an example is an example of a chromophore  
a) –OH    b) –NH<sub>2</sub>    c) C = O    d) –SH
- The frequency of UV radiation is greater than  
a) microwave    b) IR radiation    c) Both a) & b)    d) none of the above
- Which one of the following is not a chromophore  
a) –OH    b) –N = N    c) C = O    d) NO<sub>2</sub>
- One millimicron is  
a)  $10^{-8}$  cm    b)  $10^{-7}$  cm    c)  $10^{-6}$  cm    d)  $10^{-9}$  cm
- The spectral effect in which the intensity of absorption maximum decreases is known as  
a) Bathochromic effect    b) Hypsochromic effect  
c) Hyperchromic effect    d) Hypochromic effect
- The wavelength of transition is  $2000\text{cm}^{-1}$ . In which part of electromagnetic spectrum does this come  
a) Infrared    b) Radio wave    c) microwave    d) Ultraviolet
- Which one of the following changes takes place when radiation observed in the range 190 – 800 nm  
a) Changes in rotational energy level    b) changes in vibrational energy level  
c) Changes in electronic energy level    d) Nuclear magnetic resonance
- The increase in the intensity of absorption band is known as  
a) Bathochromic shift    b) Hypsochromic shift

- c) Hyperchromic shift      d) Hypochromic shift
10. Which one of the following is related to electronic excitation  
 a) Microwave   b) Infrared   c) IR      d) UV visible
11. Which one of the following is/are necessary conditions for UV radiation  
 a) Molecule has a dipolemoment      b) Change in the spin quantum number  
 c) Both a) & b)      d) No change in the spin quantum number
12. Which one of the following is red shift  
 a) Bathochromic shift      b) Hypsochromic shift  
 c) Hypochromic shift      d) Hyperchromic shift
13. Which one of the following is Electronic spectroscopy  
 a) IR      b) UV      c) NMR      d) Raman
14. The lowest energy transition among the following is  
 (a)  $\sigma \rightarrow \sigma^*$    (b)  $n \rightarrow \pi^*$    (c)  $\pi \rightarrow \pi^*$    (d)  $n \rightarrow \sigma^*$
15. This compound displays  $\sigma \rightarrow \sigma^*$  transitions  
 (a) Cyclohexane   (b) water   (c) propanal   (d) Thiophene
16. The compound containing heteroatom always shows \_\_\_\_\_ transition.  
 (a)  $\pi \rightarrow \pi^*$    (b)  $n \rightarrow \pi^*$    (c)  $n \rightarrow \sigma^*$    (d)  $\sigma \rightarrow \sigma^*$
17. R-band arises due to \_\_\_\_\_ transitions.  
 (a)  $\pi \rightarrow \pi^*$    (b)  $n \rightarrow \pi^*$    (c)  $n \rightarrow \sigma^*$    (d)  $\sigma \rightarrow \sigma^*$
18. Bath chromic shift is otherwise known as  
 a) Blue shift   (b) Doppler shift   (c) Red shift   (d) Green shift
19. The compound shows only  $\sigma \rightarrow \sigma^*$  band is  
 (a)  $\text{Cl}_2$    (b)  $\text{CH}_4$    (c)  $\text{CH}_3\text{Cl}$    (d)  $\text{CHCl}_3$
20. Hetero aromatic compound gives  
 (a) only  $\pi \rightarrow \pi^*$  bands      (b) both B and E bands  
 (c) under goes  $n \rightarrow \pi^*$  as well as  $\pi \rightarrow \pi^*$  transition   (d) only  $n \rightarrow \pi^*$  transition.
1. a)  $\sigma \rightarrow \sigma^* > n \rightarrow \pi^* > \pi \rightarrow \pi^* > n \rightarrow \sigma^*$
2. c)  $\text{C} = \text{O}$
3. c) Both a) & b)
4. a)  $-\text{OH}$
5. b)  $10^{-7}$       cm

6. d) Hypochromic effect
7. a) Infrared
8. c) Changes in electronic energy level
9. c) Hyperchromic shift
10. d) UV visible
11. c) Both a) & b)
12. a) Bathochromic shift
13. b) UV
14. (b)  $n \rightarrow \pi^*$
15. (a) Cyclohexane
16. (b)  $n \rightarrow \pi^*$
17. (b)  $n \rightarrow \pi^*$
18. (c) Red shift
19. (b)  $\text{CH}_4$
20. (c) under goes  $n \rightarrow \pi^*$  as well as  $\pi \rightarrow \pi^*$  transition

#### SECTION – B

1. Briefly explain the theory of electronic spectroscopy
2. Define the following terms with example
  - (i) Auxochrome
  - (ii) Chromophore
3. What is bathochromic shift? Explain.
4. State the absorption law.
5. Explain the various types of electronic transitions.
6. What is hypsochromic shift? Explain with suitable example.
7. How are all types of electromagnetic radiations arranged. Explain.
8. State and derive Beer's law.
9. What are the selection rule of UV spectroscopy.
10. What is auxochromic concept. Explain.

#### SECTION – C

1. Discuss the various types of electronic transition in UV spectra.

2. With a neat diagram explain the instrumentation of UV spectroscopy.
3. Discuss about the absorption and Intensity shifts.
4. Explain the following
  - (i) Types of absorption bands
  - (ii) Solvent effects
5. Explain the theory of electronic spectroscopy.
6. Describe Frank – Condon principle.
7. Define the following terms with examples
  - (a) Chromophore
  - (b) Auxochrome
  - (c) Red shift
  - (d) Blue shift
8. What are various types of intensity shift? Explain
9. Derive an expression for Lambert's law.
10. Identify the chromophore in the following compounds.
  - (a) cyclopentene
  - (b) toluene
  - (c) butane
  - (d) methane thiol
  - (e) chrotonaldehyde

## UNIT II

### Infrared spectroscopy

#### SECTION – A

1. Which one of the following is an IR region
  - (a)  $15\mu - 200\mu$
  - (b)  $0.8\mu - 2.5\mu$
  - (c)  $2.5\mu - 15\mu$
  - (d)  $2.0\mu - 15\mu$
2. Which one of the following is another name of Infrared spectra
  - (a) Vibrational spectra
  - (b) Vibrational – rotational spectra
  - (c) rotational spectra
  - (d) none of the above
3. Number of fundamental vibrational frequencies in the IR spectrum of  $\text{CO}_2$  is
  - (a) 1
  - (b) 2
  - (c) 3
  - (d) 4
4. Which one of the following is used to calculate the vibrational degrees of freedom for linear molecule?
  - (a)  $3n - 5$
  - (b)  $3n - 6$
  - (c)  $3n$
  - (d)  $3n + 5$
5. Which one of the following is used to calculate the vibrational degrees of freedom for non-linear molecule?
  - (a)  $3n - 5$
  - (b)  $3n - 6$
  - (c)  $3n$
  - (d)  $3n + 6$

6. Number of vibrational degrees of freedom for benzene is  
(a) six (b) nine (c) Thirty (d) seven
7. Which one of the following formula is used to calculate the total degrees of freedom?  
(a)  $3n - 5$  (b)  $3n - 6$  (c)  $3n$  (d)  $3n + 5$
8. The spectral range of IR spectroscopy  
(a) 1- 100  $\text{cm}^{-1}$  (b) 500 – 4000  $\text{cm}^{-1}$  (c) 12,500 – 25,000  $\text{cm}^{-1}$  (d) 25,000 - 70,000  $\text{cm}^{-1}$
9. Which one of the following is a type of vibrational spectroscopy  
(a) AAS (b) Raman (c) Infrared (d) X – ray powder diffraction
10. The region 4000 – 1500  $\text{cm}^{-1}$  is known as  
(a) Finger print region (b) functional group region  
(c) Reactive group region (d) All the above
11. Which one of the following is not a deformation  
(a) stretching (b) scissoring (c) rocking (d) twisting
12. Which one of the following is used to calculate the vibrational degrees of freedom for Water molecule?  
(a)  $3n - 5$  (b)  $3n - 6$  (c)  $3n$  (d)  $3n + 5$
13. Which one of the following is fundamental vibration  
(a)  $V_0 \rightarrow V_1$  (b)  $V_0 \rightarrow V_2$  (c)  $V_1 \rightarrow V_0$  (d)  $V_0 \rightarrow V_4$
14. Which one of the following having lower wavelength of absorption  
(a) Acetone (b) Chloroacetone (c) Dichloroacetone (d) Trichloroacetone
15. When molecule absorbs IR radiation results  
(a) Vibrational changes (b) Rotational changes  
(c) Both a) & b) (d) Electronic excitation
16. Which one of the following pieces of information cannot be obtained from an Infrared spectrum  
(a) molecular mass (b) presence of carbonyl bonds  
(c) presence of OH (d) NH
17. In IR spectrum, the bond which gives sharp and well defined band is / are \_\_\_\_\_.  
(a) Intermolecular hydrogen bond (b) Intramolecular hydrogen bond  
(c) both inter and intramolecular hydrogen bonds (d) none of the above

18. Sodium chloride is transparent to IR throughout the range  
(a) 650 – 450      (b) 450 – 200      (c) 4000 – 650      (d) 5000 – 6000  $\text{cm}^{-1}$
19. Which one of the following is used in calibration of spectral chart in IR spectrophotometer?  
(a) Nujol mull      (b) Chloroform      (c) Polystyrene      (d)  $\text{CCl}_4$
20. In IR spectroscopy, absence of absorption in the region 1900 – 1600  $\text{cm}^{-1}$  indicates  
(a) Presence of carbonyl group      (b) Absence of carbonyl group  
(c) Presence of hydroxyl group      (d) Absence of hydroxyl group
1. (c) 2.5 $\mu$  - 15 $\mu$   
2. (b) Vibrational – rotational spectra  
3. (d) 4  
4. (a) 3n – 5  
5. (b) 3n – 6  
6. (c) Thirty  
7. b) 500 – 4000  $\text{cm}^{-1}$   
8. (b) 500 – 4000  $\text{cm}^{-1}$   
9. (c) Infrared  
10. (b) functional group region  
11. (a) stretching  
12. (b) 3n – 6  
13. (a)  $V_0 \rightarrow V_1$   
14. (a) Acetone  
15. (c) Both a) & b)  
16. (a) molecular mass  
17. (b) Intramolecular hydrogen bond  
18. (c) 4000 – 650  
19. (c) Polystyrene  
20. (b) Absence of carbonyl group

SECTION – B

1. Define IR spectroscopy. Describe the various molecular vibrations in the technique
2. What are the factors that influence the positions of absorption frequencies from their normal value
3. Write a note on Fermi resonance.
4. Write short notes on finger print region
5. What is coupled vibrations and how do they arise.
6. What are the various solvents that are generally used in IR technique. How the change in polarity of the solvent affect the position of absorption.
7. Write the three types of groups for which the study of finger print region is most essential.
8. What are the different types of bending vibrations? Explain
9. What is stretching vibration? Explain.
10. What are overtones and combinations bands? Explain.

#### SECTION – C

1. Explain various molecular vibrations in the technique. What is the major requirement for infrared absorption.
2. Describe the effect of intermolecular and intramolecular hydrogen bonding on the position of absorption frequency of a compound. Give an example.
3. Explain the electronic factors which influence the absorption frequency.
4. Briefly describe the scanning of an IR spectrum of an organic compound.
5. Write down the following factors influencing the vibrational frequencies
  - (i) Coupled vibrations and Fermi resonance
  - (ii) Hydrogen bonding
6. Discuss factors influencing vibrational frequency.
7. Explain various sampling techniques used in IR spectroscopy.
8. Explain absorption and Intensity shifts in IR spectroscopy.
9. With a schematic diagrammatic explain the instrumentation of IR spectra.
10. What are the different modes of vibration of a molecule? Explain.

## UNIT – III

### Nuclear Magnetic Resonance (NMR) spectroscopy

#### SECTION -A

- How many signals are obtained in the NMR spectrum of  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-Cl}$ ?  
(a) 3 (b) 2 (c) 1 (d) 4
- TMS is  
(a) Tetra methyl silane (b) Tetra methyl silicone  
(c) Trimethyl silane (d) Tetra methane silane
- Spin – spin relaxation is also called as  
(a) spin – rotation relaxation (b) transverse relaxation  
(c) quadropole relaxation (d) dipolar relaxation
- How many signals are obtained in the NMR spectrum of ethyl benzene  
(a) 4 (b) 3 (c) 2 (d) 1
- Electron cloud of a bulky group, which tends to repel the electron cloud surrounding the proton, what is the effect  
(a) Inductive effect (b) Vander Waal's deshielding  
(c) Anisotropic effect (d) Paramagnetic effect
- Anisotropy is one of the factors, which influences  
(a) Chemical Shift (b) Chemical exchange  
(c) Spin – spin coupling (d) vibrational frequency
- As the distance of the proton from the electronegative atoms increases, the deshielding effect  
(a) Increases (b) decreases (c) remains same (d) Increase initially then remains same
- The higher electronegativity of the atom, is the deshielding caused to proton becomes  
(a) smaller (b) equal (c) greater (d) shorter
- How many types of protons present in  $\text{CH}_3\text{CH}_2\text{Cl}$ .  
(a) one (b) two (c) three (d) four
- How many types of protons present in  $\text{CH}_3\text{CH}_2\text{OH}$ .  
(a) one (b) two (c) three (d) four
- The commonly used solvent in NMR spectroscopy is \_\_\_\_\_.



(a)  $\text{CHCl}_3$  (b)  $\text{CH}_3\text{OH}$  (c)  $\text{C}_2\text{H}_5\text{OH}$  (d)  $\text{CDCl}_3$

12. Signals in a proton NMR spectrum do not provide information about
- (a) the relative number of hydrogen atoms in a particular environment
  - (b) the number of chemically different hydrogen atoms on adjacent atoms
  - (c) the environment of different hydrogen atoms in a molecule
  - (d) the molecular mass of an organic molecule
13. The proton NMR spectrum of propane will consist of
- (a) a triplet and a singlet
  - (b) a triplet and a quartet
  - (c) a doublet and a sextet
  - (d) a triplet and a septet
14. The proton NMR of 1-bromopropane will consist of
- (a) two doublets and a sextet
  - (b) a doublet and septet
  - (c) a singlet, a doublet and a triplet
  - (d) two triplets and a sextet
15. The proton NMR of 2-bromopropane will consist of
- (a) two doublets and a sextet
  - (b) a doublet and a septet
  - (c) a singlet, a doublet and a triplet
  - (d) a singlet, a doublet and a triplet
16. The proton NMR of 2-bromo-2-methylpropane will consist of
- (a) three quartets and a singlet
  - (b) two doublets and a singlet
  - (c) two singlets
  - (d) one singlet
17. The splitting pattern for a signal is found by
- (a) counting the number of chemically equivalent hydrogen atoms on adjacent atoms
  - (b) counting the number of chemically different hydrogen atoms on adjacent atoms
  - (c) counting the number of chemically different hydrogen atoms on adjacent atoms and adding 1
  - (d) counting the number of chemically different hydrogen atoms on adjacent atoms and subtracting 1
18. Which one of the following scale /scales used in NMR spectroscopy?
- (a) Tau
  - (b) delta
  - (c) both Tau and delta
  - (d) wavelength.
19. The molecule  $\text{HOCH}_2\text{CH}_2\text{OH}$  will have an NMR spectrum consisting of
- (a) two singlets
  - (b) a triplet and a doublet
  - (c) two doublets
  - (d) a singlet and a doublet

20. In a triplet the relative peak areas are in the ratio

- (a) 1:1:1 (b) 1:2:1 (c) 1:3:1 (d) 1:4:1

1. (a) 3

2. (a) Tetra methyl silane

3. (c) quadrupole relaxation

4. (a) 4

5. (b) Vander Waal's deshielding

6. (a) Chemical Shift

7. (b) decreases

8. (c) greater

9. (b) two

10. (c) three

11. (d)  $\text{CDCl}_3$

12. (d) the molecular mass of an organic molecule

13. (d) a triplet and a septet

14. (d) two triplets and a sextet

15. (b) a doublet and a septet

16. (d) one singlet

17. (c) counting the number of chemically different hydrogen atoms on adjacent atoms and adding 1

18. (c) both  $\tau$  and  $\delta$

19. (a) two singlets

20. (b) 1:2:1

#### SECTION- B

1. What is meant by the term chemical shift?

2. Write a short note peak area and protoncoupling in the NMR spectroscopy?

3. What is spin-spin relaxation? Explain.

4. Explain shielding and deshielding of a nucleus?

5. Explain briefly the basic theory of NMR spectroscopy?
6. How many NMR signals would you expect from cyclohexane at  $-60^{\circ}\text{C}$ . Explain.
7. What do you understand by relaxation process? Explain its significance?
8. What do you mean by Vander Waal's shielding?
9. What is TMS? What are the advantages.
10. What is precessional motion and precessional frequency? Write the conditions of precession.

#### SECTION – C

1. What is chemical shift? What are the factors affecting chemical shift?
2. Explain about FT NMR instrumentation with neat diagram?
3. What do you mean by relaxation process? Explain in detail.
4. Explain the theory of NMR phenomenon?
5. Explain briefly about shielding mechanism with neat diagram and give some examples.
6. What are the factors, which influence chemical shift? Explain briefly.
7. Give an account of coupling constant in NMR spectroscopy.
8. How are number of protons calculated from peak area in NMR spectroscopy.
9. Describe the theory of NMR spectroscopy.
10. Write note on
  - (i) NMR spectra in ethanol
  - (ii) Internal standard used in NMR

#### UNIT – IV

##### Mass spectrometry and application of spectroscopic methods

1. Mass spectrometry is used for determining which one of the following
 

(a) number of electrons	(b) molecular mass
(c) molecular formula	(d) structural formula
2. Which one of the following is used in mass spectrometry
 

(a) X-ray	(b) electrons	(c) UV-ray	(d) protons
-----------	---------------	------------	-------------
3. The  $m/e$  value in the mass spectrum shows
 

(a) number of ions	(b) molecular formula
(c) molecular mass	(d) structural formula

4. Molecular ion in the mass spectrum is called  
(a) daughter ion (b) parent ion (c) metastable ion (d) fragment ion
5. Fragment ion in the mass spectrum is called  
(a) daughter ion (b) parent ion  
(c) metastable ion (d) fragment ion
6. The largest peak in the mass spectrum is known as  
(a) base peak (b) molecular ion peak  
(c) isotopic peak (d) metastable peak
7. The highest m/e value peak is known as  
(a) base peak (b) molecular ion peak (c) isotopic peak (d) metastable peak
8. Which one of the following is used as a source in the mass spectrum  
(a) Sodium filament (b) Magnesium filament (c) Tungsten filament (d) Metastable peak
9. The use (s) of Mass spectra is  
(a) To prove the identity of two compounds (b) To establish the structure of a new compound  
(c) Identification of functional group (d) Both a and b
10. McLafferty rearrangement involves the migration of  
(a)  $\alpha$ -hydrogen (b)  $\beta$ -hydrogen (c)  $\gamma$ -hydrogen (d) no hydrogen migration
11. The minimum energy required to ionise an atom or molecule is  
(a) Ionization energy (b) Ionization potential (c) Atomic energy (d) Nuclear energy
12. McLafferty rearrangement involves cleavage of  
(a)  $\alpha$ -bond (b)  $\beta$ -bond (c)  $\gamma$ -bond (d) no cleavage
13. According to nitrogen rule the molecules having odd mass number shows  
(a) Even nitrogen atom (b) Odd nitrogen atom (c) 6 (d) 2
14. The correct order for the basic features of a mass spectrometer is...  
(a) acceleration, deflection, detection, ionisation  
(b) ionisation, acceleration, deflection, detection  
(c) acceleration, ionisation, deflection, detection  
(d) acceleration, deflection, ionisation, detection
15. Which one of the following statements about ionisation in a mass spectrometer is incorrect?

- (a) gaseous atoms are ionised by bombarding them with high energy electrons  
(b) atoms are ionised so they can be accelerated  
(c) atoms are ionised so they can be deflected  
(d) it doesn't matter how much energy you use to ionise the atoms
16. Retro Diels Alder reaction is characteristics of  
(a) Olefins (b) cyclic olefins (c) ketones (d) Allyl halides
17. Which one of the following method is used to find out functional group?  
(a) infra red spectrum (b) mass spectrum  
(c) proton NMR spectrum (d) UV spectrum
18. The method used to detect kind of proton is  
(a) infra red spectrum (b) mass spectrum  
(c) proton NMR spectrum (d) UV spectrum
19. The ion formed after the source exit and before the arrival of the collector  
(a) meta stable ion (b) daughter ion (c) Parent ion (d) daughter ion
20. The molecular ion peak of a compound observed at  $m/e$  171. The number of nitrogen atom present in the compound is  
(a) 4 (b) 0 (c) 2 (d) 1
1. (b) molecular mass  
2. (a) X-ray  
3. (c) molecular mass  
4. (b) parent ion  
5. (a) daughter ion  
6. (a) base peak  
7. (b) molecular ion peak  
8. (c) Tungsten filament  
9. (d) Both a and b  
10. (c)  $\gamma$ -hydrogen  
11. (b) ionization potential  
12. (b)  $\beta$ -bond  
13. (b) Odd nitrogen atom  
14. (b) ionisation, acceleration, deflection, detection

15. (d) it doesn't matter how much energy you use to ionise the atoms
16. (b) cyclic olefins
17. (a) infra red spectrum
18. (c) proton NMR spectrum
19. (a) meta stable ion
20. (d) 1

#### SECTION - B

1. Describe some basic principles of mass spectrometry.
2. Write a brief note on the molecular ion or the parent ion.
3. Write a note on McLafferty rearrangement.
4. Write notes on : (a) Metastable peaks (b) Molecular ion peak
5. Write detail description of metastable ions. What is the importance of metastable ions?
6. Write in detail the general fragmentation modes in the mass spectrometry?
7. Write a note on Nitrogen rule and molecular ion
8. Discuss the NMR spectra of acetaldehyde.
9. How are IR and NMR techniques used in the identification of acetone.
10. Write down the general fragmentation mode in hydrocarbon.

#### SECTION- C

1. Describe in detail about double focusing mass spectrometer with neat diagram.
2. Explain the following with example
  - (i) Retro – Diels Alder reaction
  - (ii) McLafferty rearrangement
3. How will you identify the molecule ethanol and acetone by using NMR and mass spectral techniques.
4. Explain simple cleavage modes in mass spectroscopy.
5. What is hydrogen ion transfer reaction? Explain.
6. How are Mass IR and NMR techniques in the identification of Ethanol and dimethyl ether
7. How are acetaldehyde and acetone are differentiated by IR, NMR
8. Draw and Explain NMR spectrum of Ethanol and dimethyl ether.

9. How are hydrocarbons undergo fragmentation when bombarded by beam of energetic electrons. Explain.
10. How are IR, NMR and Mass techniques used in the identification of Ethanol and dimethyl ether. Explain.

## UNIT – V

### Chromatography

#### SECTION- A

1. The basis of separation of column chromatography is  
(a) partition (b) chemical exchange (c) absorption (d) adsorption
2. In thin layer chromatography silica gel “G” contains which impurity  
a) Copper (b) Iron (c) magnesium (d) Zinc
3. Which one of the following material is used in TLC as coating material  
a) Alumina (b) Talc (c) sodium carbonate (d) Insulin
4. The process of recovery of constituents from the chromatogram is known as  
a) Filtration (b) Elution (c) decantation (d) Adsorption
5. The inert bind material used in thin layer chromatography is  
a) silica (b) phosper (c) calcium sulphide (d) alumina
6. In TLC the eluent strength is maximum for  
(a) Hexane (b) Formic acid (c) Toluene (d) Acetone
7. Which one of the following is used as binder in TLC  
(a) calcium (b) calcium sulphate (c) alumina (d) calcium silicate
8. Which one of the following is used as absorbent in column chromatography  
(a) petroleum ether (b) silica gel (c) aluminum oxide (d) benzene
9. The size of a thin layer of adsorbent is about  
(a) 0.1mm (b) 0.2mm (c) 0.3mm (d) 0.4 mm
10. The chromaplate or thin layer chromatography plate is made up of  
a) Glass b) Wood c) Fibre d) Metal
11. The eluant filled in the closed jar is  
a) Mixture of gases (b) Mixture of a liquid and a gas  
c) Mixture of solids (d) Mixture of liquids

12. Select the incorrect statement from the following options.
- a) The spots of colorless compounds are invisible to the eyes
  - b) These spots can be detected by putting the plate under ultraviolet light
  - c) These spots can be detected by placing the plate in a covered jar containing iodine crystals
  - d) None of the mentioned
13. The relative adsorption of each components of the mixture is expressed in terms of its
- a) Acceleration factor
  - b) Retardation factor
  - c) Both acceleration and retardation factor
  - d) None of the mentioned
14. Retardation factor is the ratio of
- a) Distance moved by substance from base line to distance moved by the solvent from base line
  - b) Distance moved by solvent from base line to distance moved by the substance from base line
  - c) Distance moved by substance from top line to distance moved by the solvent from top line
  - d) Distance moved by solvent from top line to distance moved by the substance from top line
15. Chromatography with solid stationary phase is called
- a) Circle chromatography
  - b) Square chromatography
  - c) Solid chromatography
  - d) Adsorption chromatography
16. Components which have small value of K have affinity for
- a) mobile phase
  - b) stationary phase
  - c) no phase
  - d) solution
17. In which type of chromatography, the stationary phase held in a narrow tube and the mobile phase is forced through it under pressure?



- a) Column chromatography
- b) Planar chromatography
- c) Liquid chromatography
- d) Gas chromatography

18. Which of the following cannot be used as an adsorbent in Column adsorption chromatography?

- a) Magnesium oxide
- b) Silica gel
- c) Activated alumina
- d) Potassium permanganate

19. Which of the following types of chromatography involves the separation of substances in a mixture over a 0.2mm thick layer of an adsorbent?

- a) Gas liquid
- b) Column
- c) Thin layer
- d) Paper

20. Liquid chromatography can be performed in which of the following ways?

- a) Only in columns
- b) Only on plane surfaces
- c) Either in columns or on plane surfaces
- d) Neither in columns nor on plane surfaces

1. d) adsorption

2. (b) Iron

3. a) Alumina

4. (b) Elution

5. (c) calcium sulphide

6. (b) Formic acid

7. (b) calcium sulphate

8. (b) silica gel

9. (b) 0.2mm

10) a) Glass

11. d) Mixture of liquids

12. a) The spots of colorless compounds are invisible to the eyes

13.b) Retardation factor

14. a) Distance moved by substance from base line to distance moved by the solvent from base line

15. d) Adsorption chromatography

16. b) stationary phase

17. a) Column chromatography

18. d) Potassium permanganate

19. c) Thin layer

20. c) Either in columns or on plane surfaces

#### SECTION – B

1. Explain the basic principles of column chromatography.
2. Define chromatography. Write the types of chromatography.
3. Explain the various methods in the preparation of thin layer plates.
4. What are the requirements for adsorbents used in column chromatography.
5. How will you purify the silica gel used in TLC.
6. What is gradient elution? Explain.
7. Draw and explain Stahl's diagram.
8. What are the coating materials used for TLC. Explain.
9. What are the 4 types of chromatography? Explain.
10. What does a high R<sub>F</sub> value mean in paper chromatography? Explain.

#### SECTION – C

1. Explain the following experimental techniques involved in thin layer chromatography
  - (i) coating material
  - (ii) preparation of thin layer in plates
  - (iii) Activation of adsorbents
2. Explain the following experimental techniques involved in column chromatography
  - (i) Apparatus
  - (ii) Adsorbents
  - (iii) solvents used
3. Explain the following in TLC
  - (i) coating materials
  - (ii) sample application
4. Discuss about column chromatographic techniques
5. Write short notes on the following
  - (i) Preparation of thin layer plates
  - (ii) Development tanks

6. How are TLC evaluated? Explain.
7. What are the principles of column chromatography? Which type of apparatus used? Draw and explain.
8. What are the different experimental techniques used in TLC? Explain.
9. Explain the detailed instrumentation of column chromatography.
10. Explain the basic principles, types and uses of paper chromatography.

KASC-Chemistry (UG)

**KONGUNADU ARTS AND SCIENCE COLLEGE**

**(AUTONOMOUS)**

**COIMBATORE-641 029**



## **QUESTION BANK**

**Prepared by**

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## SECTION A: UNIT -1

- A crystalline salt having the composition of a mixture of two simple salts but with a different crystal structure from either
  - double salts
  - coordination compound
  - complex
  - dual salts
- Some salts although containing two different metallic elements give test for only one of them in solution. Such salts are
  - double salts
  - complex salts
  - normal salts
  - none
- The complex  $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$  will give white ppt with :
  - $\text{PbCl}_2$
  - $\text{AgNO}_3$
  - KI
  - None
- Exchange of co-ordination group by a water molecule in complex molecule results in :
  - Ionization isomerism
  - Ligand isomerism
  - Hydration isomerism
  - Geometrical isomerism.
- $[\text{Co}(\text{NH}_3)_6]^{3+}$  ion is:
  - Paramagnetic
  - Diamagnetic
  - Squareplanar
  - None.
- Which of the following is most likely structure of  $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$  if  $1/3$  of total chlorine of the compound is precipitated by adding  $\text{AgNO}_3$  to its aqueous solution:
  - $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$
  - $[\text{Cr}(\text{H}_2\text{O})_3\text{Cl}_3](\text{H}_2\text{O})_3$
  - $[\text{CrCl}_2(\text{H}_2\text{O})_4]\text{Cl} \cdot 2\text{H}_2\text{O}$
  - $[\text{CrCl}_2(\text{H}_2\text{O})_5]\text{Cl}_2 \cdot \text{H}_2\text{O}$ .
- Which one of the following will be able to show cis-trans isomerism:
  - $\text{MA}_3\text{B}$
  - $\text{M}(\text{AA}')_2$
  - $\text{MAB}_3$
  - $\text{MA}_4$

8.  $K_3CoF_6$  is high spin complex. What is the hybrid state of Co atom in this complex:  
(a)  $sp^3d$   
(b)  $sp^3d^2$   
(c)  $d^2sp^3$   
(d)  $dsp^2$ .
9. The type of isomerism shown by  $[Co(en)_2(NCS)_2]Cl$  and  $[Co(en)_2(NCS)Cl]NCS$  is:  
(A) Coordination  
(B) Ionization  
(C) Linkage  
(D) all above.
10. The co-ordination number and oxidation number of X in  $[X(SO_4)(NH_3)_4]Cl$  is :  
(a) 10 and 3  
(b) 2 and 6  
(c) 6 and 3  
(d) 6 and 4
11. The IUPAC name of the compound  $[Cu(NH_3)_4](NO_3)_2$  is:  
(a) Cuprammonium nitrate  
(b) Tetraamminecopper (II) dinitrate  
(c) Tetraammine copper (II) nitrate  
(d) Tetraammine copper (III) dinitrate
12. Hexafluoroferrate(III) ion is an outer orbital complex. The number of unpaired electrons present in it is:  
(a) 1  
(b) 5  
(c) 4  
(d) Unpredictable.
13. Which of the following complex species involves  $d^2sp^3$  hybridisation:  
(a)  $[CoF_6]^{3-}$   
(b)  $[Co(H_2O)_6]^{3+}$   
(c)  $[Fe(CN)_6]^{3-}$   
(d)  $[Fe(H_2O)_6]^{3+}$ .
14. How many ions are produced from  $[Co(NH_3)_6]Cl_2$  in solution:  
(a) 6 (b) 4 (c) 3 (d) 2
15. In the complex  $Fe(CO)_x$ , the value of x is:  
(a) 3  
(b) 4  
(c) 5  
(d) 6.
16. Which is the central ion in  $[Cu(H_2O)_4]^{2+}$  ion:  
(a)  $Cu^{2+}$  (b)  $H_3O^+$  (c)  $Cu^+$  (d) None.

17. In  $K_4[Fe(CN)_6]$  the number of unpaired electrons in iron are:  
 (A) 0 (b) 2 (c) 3 (d) 5.
18. All ligands are :  
 (a) Lewis acid (b) Lewis base (c) Neutral (d) None.
19. The hybridization in  $Ni(CO)_4$  is:  
 (a) sp (b)  $sp^2$  (c)  $sp^3$  (d)  $dsp^2$ .
20. A group of atoms can function as a ligand only when  
 (a) It is a small molecule  
 (b) It has an unshared electron pair  
 (c) It is a negatively charged ion  
 (d) It is a positively charged ion.

## UNIT II

21. Which of the following is a simple sugar or monosaccharide?  
 a) Galactose  
 b) Lactose  
 c) Maltose  
 d) Sucrose
22. What is the molecular formula for Glucose?  
 a)  $CH_3OH$   
 b)  $C_6H_{12}O_6$   
 c)  $C_{12}H_{22}O_{11}$   
 d)  $C_6H_{12}O_5$
23. Maltose is composed of which two sugars?  
 a) Glucose and Glucose  
 b) Glucose and Galactose  
 c) Glucose and Fructose  
 d) Fructose and Galactose
24. In which form is Glucose stored in animals?  
 a) Starch  
 b) Glycogen  
 c) Dextrins  
 d) Cellulose
25. All are glucosans (polymers of glucose) except-  
 a) Glycogen  
 b) Inulin  
 c) Starch  
 d) Cellulose
26. Choose the Aldose sugar out of the following-  
 a) Sucrose  
 b) Ribulose  
 c) Fructose  
 d) Ribose
27. Choose the keto triose-

- a) Glyceraldehyde  
b) Erythrose  
c) Dihydroxyacetone  
d) Arabinose
28. A pentose sugar present in the heart muscle is-
- a) Xylose  
b) Lyxose  
c) Xylulose  
d) Aldose
29.  $\alpha$ -D Glucose and  $\beta$ -D glucose are-
- a) Epimers  
b) Keto- Aldose Isomers  
c) Anomers  
d) Optical isomers
30. All tests are negative for sucrose except-
- a) Benedict  
b) Seliwanoff  
c) Barfoed  
d) Osazone
31. Glucose can have ----- isomers due to the presence of 4 asymmetric carbon atoms
- a) 4  
b) 12  
c) 8  
d) 16
32. Galactose and Glucose are-
- a) Epimers  
b) Isomers  
c) Anomers  
d) Ketose- Aldose isomers
33. The compounds having same structural formula but differing in configuration around one carbon atom are called-
- a) Optical isomers  
b) Stereo isomers  
c) Anomers  
d) Epimers
34. What does the following equation represent?  $\alpha$ -D Glucose  $\rightleftharpoons$   $\beta$ -D glucose
- a) Stereo isomerism  
b) Mutarotation  
c) Optical isomerism  
d) Epimerization
35. The carbohydrate of blood group substance is-
- a) Fucose  
b) Xylose  
c) Lyxose  
d) Fructose
36. Dulcitol is a –
- a) Sugar acid  
b) Amino sugar  
c) Deoxysugars  
d) Sugar alcohol
37. Which of the following is a non reducing sugar-



- a) Arabinose
  - b) Erythrose
  - c) Trehalose
  - d) Ribulose
38. A Polysaccharide formed by  $\beta$ 1 $\rightarrow$ 4 Glycosidic linkages is-
- a) Starch
  - b) Dextrin
  - c) Glycogen
  - d) Cellulose
39. Invert sugar is-
- a) Starch
  - b) Glucose
  - c) Fructose
  - d) Hydrolytic product of Sucrose
40. The Polysaccharide found in the exoskeleton of insects is-
- a) Hyaluronic acid
  - b) Cellulose
  - c) Chitin
  - d) Chondrosamine

### UNIT III

41. A mutation has changed an isoleucine residue of a protein to Glutamic acid, which statement best describes its location in a hydrophilic exterior-
- a) On the surface since it is hydrophilic in nature
  - b) In side the core of the protein since it is hydrophobic in nature
  - c) Any where inside or outside
  - d) Inside the core of protein since it has a polar but uncharged side chain
42. Glycine and proline are the most abundant amino acids in the structure of-
- a) Hemoglobin
  - b) Myoglobin
  - c) Insulin
  - d) Collagen
43. Some proteins contain additional amino acids that arise by modification of an amino acid already present in a peptide, examples include-
- a) 4 -hydroxyproline
  - b) 5- hydroxy Lysine
  - c) Gamma Amino Butyric Acid
  - d) All of the above
44. Choose the incorrect statement out of the followings-
- a) Only L amino acids are found in the biological system
  - b) Glycine is optical inactive
  - c) Tyrosine is a modified amino acid
  - d) Seleno cysteine is 21 st amino acid
45. Choose a nano peptide out of the followings-
- a) Oxytocin
  - b) Vasopressin
  - c) Bradykinin
  - d) All of the above

46. Which out of the following amino acids carries a net positive charge at the physiological p H ?
- Valine
  - Leucine
  - Isoleucine
  - None of the followings
47. Which out of the following amino acids is a precursor for a mediator of allergies and inflammation?
- Histidine
  - Tyrosine
  - Phenyl Alanine
  - Tryptophan
48. Mother of a mal nourished child has been instructed to include a complete protein in diet for her child, which out of the followings proteins should be recommended?
- Pulses
  - Wheat
  - Soy Protein
  - Milk
49. All of the below mentioned amino acids can participate in hydrogen bonding except one
- Serine
  - Cysteine
  - Threonine
  - Valine
50. All of the following amino acids are both glucogenic as well as ketogenic except
- Isoleucine
  - Leucine
  - Tyrosine
  - Phenyl alanine
51. Which out of the following amino acid is a precursor of niacin (Vitamin)?
- Tyrosine
  - Threonine
  - Tryptophan
  - Phenylalanine
52. The greatest buffering capacity at physiological p H would be provided by a protein rich in which of the following amino acids?
- Serine
  - Cysteine
  - Alanine
  - Histidine
53. Which of the following peptides is cyclic in nature-?
- Glutathione
  - Gramicidin
  - Met enkephalin
  - Leuencephalin
54. Which out of the followings is not a fibrous protein?
- Carbonic anhydrase
  - Collagen
  - Fibrinogen
  - Keratin
55. Which of the following amino acid is a limiting amino acid in pulses?
- Leucine
  - Lysine

- c) Methionine  
d) Glutamine
56. Which out of the following is not a haemoprotein ?  
a) Catalase  
b) Myeloperoxidase  
c) Glutathione peroxidase  
d) Aconitase
57. All the below mentioned proteins are metalloproteins except-  
a) Carbonic anhydrase  
b) Xanthine oxidase  
c) Lactate dehydrogenase  
d) Superoxide dismutase
58. Which out of the following is a peptide antibiotic?  
a) Erythromycin  
b) Gramicidin  
c) Ciprofloxacin  
d) Tetracycline
59. Choose the Anticancer peptide out of the followings-  
a) Bleomycin  
b) Methotrexate  
c) Cytosine Arabinoside  
d) Dideoxy Inosine
60. Which of the following amino acids is most compatible with an  $\alpha$ -helical structure?  
a) Tryptophan  
b) Alanine  
c) Leucine  
d) Proline

#### UNIT IV

61. The study of the flow of heat or any other form of energy into or out of a system undergoing physical or chemical change is called  
(a) thermochemistry (b) thermokinetics  
(c) thermodynamics (d) thermochemical studies
62. Thermodynamics is applicable to  
(a) microscopic systems only (b) macroscopic systems only  
(c) homogeneous systems only (d) heterogeneous systems only
63. Which is not true about thermodynamics?  
(a) it ignores the internal structure of atoms and molecules  
(b) it involves the matter in bulk  
(c) it is concerned only with the initial and final states of the system  
(d) it is not applicable to macroscopic systems
64. A system that can transfer neither matter nor energy to and from its surroundings is called  
(a) a closed system (b) an isolated system  
(c) an open system (d) a homogeneous system
65. A thermos flask is an example of  
(a) isolated system (b) closed system  
(c) open system (d) heterogeneous system
66. A closed system is one which cannot transfer matter but transfer \_\_\_\_ to and from its

- surrounding  
(a) heat (b) work  
(c) radiations (d) all of these
67. A gas contained in a cylinder filled with a piston constitutes  
(a) an open system (b) a heterogeneous system  
(c) a closed system (d) an isolated system
68. A system that can transfer both energy and matter to and from its surroundings is called  
(a) an isolated system (b) a closed system  
(c) an open system (d) a heterogeneous system
69. Zinc granules reacting with dilute hydrochloric acid in an open beaker constitutes  
(a) an isolated system (b) an open system  
(c) a closed system (d) a heterogeneous system
70. A system in which no thermal energy passes into or out of the system is called  
(a) adiabatic system (b) an open system  
(c) a reversible system (d) a closed system
71. An intensive property does not depend upon  
(a) nature of the substance (b) quantity of matter  
(c) external temperature (d) atmospheric pressure
72. Which out of the following is not an intensive property?  
(a) pressure (b) concentration  
(c) density (d) volume
73. A property that depends upon the quantity of matter is called an extensive property. Which of the following is not an extensive property?  
(a) mass (b) volume  
(c) density (d) internal energy
74. Which of the following sets of properties constitute intensive properties?  
(a) temperature, pressure and volume (b) mass, density and volume  
(c) density, pressure and temperature (d) internal energy, density and pressure
75. System in which state variables have constant values throughout the system is called in a state of  
(a) equilibrium (b) non-equilibrium  
(c) isothermal equilibrium (d) none of these
76. In an adiabatic process \_\_\_\_\_ can flow into or out of the system.  
(a) no heat (b) heat  
(c) matter (d) no matter
77. Which of the following conditions holds good for an adiabatic process?  
(a)  $dq < 0$  (b)  $dq > 0$   
(c)  $dq = 0$  (d)  $dq = \alpha$
78. An isobaric process takes place at constant \_\_\_\_\_.  
temperature (b) pressure  
(c) volume (d) concentration
79. Which is true for an isobaric process?  
(a)  $dp > 0$  (b)  $dp < 0$   
(c)  $dp = \alpha$  (d)  $dp = 0$
80. An isochoric process takes place at constant \_\_\_\_\_.  
(a) volume (b) temperature  
(c) pressure (d) concentration

## UNIT V

81. Ionic compounds are generally  
(a) good conductors of electricity  
(b) poor conductors of electricity  
(c) semiconductors of electricity  
(d) all the above
82. Positive ions are generally called as  
(a) Cations  
(b) Anions  
(c) Hydrogen  
(d) None of the above
83. As the current is passed between the electrodes of the electrolytic cell, the ions migrate to the \_\_\_\_\_  
(a) same charge electrodes  
(b) opposite charge electrodes  
(c) does not migrate  
(d) None of the above
84. Different ions move at \_\_\_\_\_  
(a) same rate (c) same rate at boiling temperature  
(b) different rate (d) does not move till temperature is at  $0^{\circ}\text{C}$
85. The fraction of the total current carried by the cation or the anion is termed as \_\_\_\_\_  
(a) migration number (c) current number  
(b) Hittorff number (d) transport number
86. Transport number is also known as.  
Hittorff's number  
Hund's number  
Hittorff's number  
Kohlrausch's number
87. According to Arrhenius theory an electrolyte when dissolved in water gives two types of  
(a) charged particles (b) molecules  
(c) ion pairs (d) fundamental particles
88. The loss of concentration around any electrode is proportional to the speed of the ion \_\_\_\_\_  
moving near to the electrode (c) moving away from the electrode  
depositing on the electrode (d) none of the above  
The conductivity of an electrolyte is due to the  
(d) presence of ions in the electrolyte (b) free movement of ions in the solution
89. The electrical conductivity of an electrolyte depends upon  
(a) the number of molecules in the electrolyte  
(b) the number of ions present in the electrolyte  
(c) the number of ions present in the solution  
(d) the number of molecules of the solvent
90. On passing electrical current through an electrolyte solution  
(a) cations move towards anode  
(b) anions move towards cathode  
(c) cations move towards cathode and anions towards anode  
(d) both cations and anions move in same direction

91. The Hittorf's rule states that  
(a) the loss of concentration around any electrode is proportional to the speed of the ions moving towards it  
(b) the loss of concentration around any electrode is proportional to the speed of the ions moving away from it  
(c) the loss of concentrations around both the electrodes is proportional to the sum of speed of cations and anions  
(d) none of the above
92. The fraction of the total current carried by the cation or anion is termed as  
(a) fractional number (b) speed number  
(c) carrier number (d) transport number
93. In Hittorf method for determination of transport numbers we make use of a  
(a) H-tube (b) V-tube  
(c) U-tube (d) L-tube
94. The statement of Kohlrausch's law is  
(a) the equivalent conductance of an electrolyte at infinite dilution is equal to the product of equivalent conductances of the component ions  
(b) the equivalent conductance of an electrolyte at infinite dilution is equal to the difference of equivalent conductances of the component ions  
(c) the equivalent conductance of an electrolyte at infinite dilution is equal to the sum of equivalent conductances of the component ions  
(d) none of the above
95. Kohlrausch's law can be used to determine  
(a)  $\lambda_{\alpha}$  for weak electrolytes (b) absolute ionic mobilities  
(c) solubility of sparingly soluble salts (d) all of these
96. When a strong acid is titrated against a strong base the end point is the point of  
(a) zero conductance (b) maximum conductance  
(c) minimum conductance (d) none of these
97. If the transport number of  $K^+$  is 0.492 in KCl solution. The transport number of  $Cl^-$  ion will be  
(a) 0.984 (b) 0.492  
(c) 0.508 (d) 0.016
98. The transport number of an ion depends on the mobility of that ion. It also depends upon the  
(a) mobility of the solvent  
(b) mobility of the electrolyte  
(c) mobility of the other ion with which it is associated  
(d) none of the above
99. The ionic mobility of  $Li^+$  is small as compared to that of  $K^+$  ion. It is because  
(a)  $Li^+$  ion is very small  
(b)  $Li^+$  ion is heavily hydrated

- (c)  $\text{Li}^+$  ion has only one principal quantum number  
(d) none of the above

100. The ionic product of water is  
(a)  $1 \times 10^{-7}$  (b)  $1 \times 10^{-10}$   
(c)  $1 \times 10^{14}$  (d)  $1 \times 10^{-14}$

## SECTION-B

### UNIT I:

1. Define double salts
2. Define complexes
3. Differentiate double salts and complexes
4. What are the types of ligands
5. Explain Pauling's theory
6. Explain Werner's theory
7. Define EAN rule
8. State the biological role of hemoglobin
9. State the biological role of chlorophyll
10. What are the applications of complexes in qualitative analysis

### UNIT II

11. Explain the preparation of furan and its uses
12. What are the properties of furan
13. Explain the synthesis of pyridine
14. What are the properties of pyrrole
15. What are the chemical properties of thiophene
16. Explain the synthesis of fructose
17. Explain the interconversion of glucose to fructose
18. What are the classification of carbohydrates
19. Compare pyrrole with amine
20. Explain the interconversion of fructose to glucose

### UNIT III

21. Explain Bergmann method
22. Write a short note on DNA
23. Write a short note on RNA
24. State the biological function of DNA
25. State the biological function of RNA
26. Explain Strecker synthesis
27. List out the properties of alpha halo acid
28. Explain Gabriel phthalimide synthesis
29. What are the components of DNA
30. What are the components of RNA

## UNIT IV

31. What are the limitations faced by energetics in today's world
32. What are the needs for second law
33. Explain joule-thomson effect
34. Define free energy change
35. Differentiate between reversible and irreversible processes
36. Define enthalpy
37. What are the limitations of first law of thermodynamics
38. What are the types of system
39. Define isothermal process
40. Define adiabatic process

## SECTION V

41. Define buffer solution
42. Explain buffer action
43. Define Kohlrausch law
44. Define pH
45. What are the applications of Kohlrausch law
46. List out the principles of electroplating
47. What are the uses of electroplating
48. State the conductometric method
49. Define equivalent conductance
50. Explain molar conductance

## SECTION C

### UNIT I

1. List out the applications of EDTA
2. What are the types of ligands?
3. What are the applications of complexes in quantitative analysis
4. Define the following
  - a) Pauling's theory
  - b) Sidgwick theory
5. Define the following
  - a) EAN rule
  - b) Four coordination complexes
6. What are the applications of complexes in quantitative analysis
7. State the biological role of hemoglobin
8. Differentiate between double salts and complexes
9. Define the following
  - a) Ligand
  - b) Chelation
10. Explain the chelation with 4 examples

### UNIT II

11. Explain the synthesis and its properties of furan



12. Explain the synthesis and its properties of thiophene
13. Explain the synthesis and its properties of pyrrole
14. Explain the synthesis and its properties of pyridine
15. Compare pyrrole with amine
16. Compare pyridine with amine
17. Describe the preparation and reactions of glucose
18. Describe the preparation and reactions of fructose
19. Describe the inter conversion of glucose to fructose
20. Explain the inter conversion of fructose to glucose

### UNIT III

21. Bergmann method- Explain
22. Write a short note on DNA with structure
23. Write a short note on RNA with structure
24. State the biological function of DNA with structure
25. State the biological function of RNA with structure
26. Describe strecker synthesis with mechanism
27. List out the chemical properties of alpha halo acid
28. Explain Gabriel phthalimide synthesis with mechanism
29. What are the components of DNA. Write a brief explanation
30. What are the components of RNA Write a brief explanation

### UNIT IV

31. Describe the state and types of system
32. Explain the reversible and irreversible processes
33. Define the following
  - a) Adiabatic process
  - b) Isobaric process
34. Define the following
  - a) Isothermal process
  - b) Isochoric process
35. Explain cyclic process
36.
  - a) What are the limitations of the first law
  - b) State the first law of thermodynamics
37. List out the various statements of second law
38. Describe the following
  - a) Joule-Thomson effect
  - b) enthalpy
39. Explain the following
  - a) Free energy change
  - b) Limitations of first law of thermodynamics
40. List out the various statements of first and second law of thermodynamics

### UNIT V

41. Define the conductance of electrolytes and specific conductance
42. Describe equivalent conductance and molar conductance
43. Explain Kohlrausch law and its applications

44. Define buffer solutions and its action
45. Define pH and how to determine its solutions
46. What are the principles of electroplating and its uses
47. Define the conductometric titrations
48. How to determine the degree of dissociation
49. Describe the following
  - a) Buffer action
  - b) pH
  
50. Explain the applications of the following
  - a) Electroplating
  - b) Kohlrausch law

Answer key:

1.	A	26.	D	51.	C	76.	A
2.	B	27.	C	52.	D	77.	C
3.	A	28.	B	53.	B	78.	B
4.	C	29.	C	54.	A	79.	D
5.	B	30.	B	55.	C	80.	A
6.	C	31.	D	56.	D	81.	A
7.	B	32.	A	57.	C	82.	A
8.	B	33.	D	58.	B	83.	B
9.	B	34.	B	59.	A	84.	B
10.	C	35.	A	60.	B	85.	D
11.	C	36.	D	61.	C	86.	A
12.	B	37.	C	62.	B	87.	A
13.	C	38.	D	63.	D	88.	C
14.	C	39.	D	64.	B	89.	C
15.	C	40.	C	65.	A	90.	C
16.	A	41.	A	66.	D	91.	B
17.	A	42.	D	67.	C	92.	D
18.	B	43.	D	68.	C	93.	C
19.	C	44.	C	69.	B	94.	C
20.	B	45.	D	70.	A	95.	D
21.	A	46.	D	71.	B	96.	C
22.	B	47.	A	72.	D	97.	C
23.	A	48.	D	73.	C	98.	C
24.	B	49.	D	74.	C	99.	B
25.	B	50.	B	75.	A	100.	D