Course Code: 23HS0801 **R23**

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY::PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road–517583

QUESTIONBANK (DESCRIPTIVE)

Subject with Code: Chemistry (23HS0801) **Course & Branch**: B.Tech.; EEE, CSM, CAD & IOT
Year & Sem: I Year & I Sem **Regulation:** R23

UNIT-I
STRUCTURE AND BONDING MODELS

1	Write the following a) Bond order b) Heisenberg Uncertainty principle c) Schrodinger wave equation d) Significance of Ψ and Ψ^2 e) HOMO and LUMO	[L1] [CO1]	[10M]
2	a) Explain Planck's Quantum Theory. b) Write short notes on Wave-Particle duality of matter	[L2] [CO1] [L2] [CO1]	[5M] [5M]
3	a) Write the postulates of molecular orbital theory. b) Calculate the bond order in O_2, O_2^+ and O_2^-.	[L2] [CO1] [L3] [CO1]	[5M] [5M]
4	a) Derive Schrodinger wave equation? b) Explain the significance of the Ψ and Ψ^2.	[L3] [CO1] [L2] [CO1]	[8M] [2M]
5	a) Explain de Broglie's dual nature hypothesis b) What is Heisenberg's uncertainty principle?	[L2] [CO1] [L1] [CO1]	[5M] [5M]
6	a) Sketch the molecular orbital diagram for Oxygen (O_2). Explain its bond order and magnetic property based on MOT theory. a) Explain π- molecular orbital of 1, 3- Butadiene with a neat sketch.	[L3] [CO1] [L3] [CO1]	[5M] [5M]
7	a) Illustrate the molecular orbital diagram of CO molecule and calculate its bond order and explain its magnetic property. b) Explain the molecular orbital diagram for N_2 molecule and calculate its bond order and explain its magnetic property.	[L2] [CO1] [L2] [CO1]	[5M] [5M]
8	a) Explain π- molecular orbital of Benzene with a neat sketch. b) Differentiate bonding and anti-bonding molecular orbitals.	[L2] [CO1] [L3] [CO1]	[6M] [4M]
9	Derive equation for a particle in one dimensional box.	[L3] [CO1]	[10M]
10	a) Calculate the bond order of CO, N_2, F_2, O_2 and explain the magnetic properties based on MOT theory. b) Explain HOMO and LUMO energy levels of Benzene molecule.	[L3] [CO1] [L2] [CO1]	[5M] [5M]
11	Discuss the important postulates of Molecular Orbital Theory with merits and demerits.	[L2] [CO1]	[10M]

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UNIT -II
MODERN ENGINEERING MATERIALS

1	Define the following a) Semiconductor b) Superconductor c) Intrinsic and Extrinsic Semiconductor d) Supercapacitor e) Nanomaterial	[L1] [CO2]	[10M]
2	a) Explain in detail about principle and classification of semiconducting materials. b) Summarize the important applications of Semiconductors.	[L2] [CO2] [L2] [CO2]	[6M] [4M]
3	Discuss about the principle, classification and applications of Superconductors.	[L1] [CO2]	[10M]
4	a) Draw the band diagrams for conductors, semi-conductors and Insulators. b) Explain the applications of nanomaterials.	[L2] [CO2] [L2] [CO2]	[5M] [5M]
5	a) Write the Properties of Nano materials. b) What are the different types of CNTs?	[L2] [CO2] [L1] [CO2]	[5M] [5M]
6	a) What is meant by Nano materials? How the Nano materials Classified. c) Discuss the properties of Carbon nanotubes.	[L1] [CO2] [L2] [CO2]	[4M] [6M]
7	a) Write a short note on classification of Carbon Nano Tubes. d) Write a note on applications of fullerenes.	[L1] [CO2] [L1] [CO2]	[5M] [5M]
8	a) Compare the band diagrams of Insulators, Semi-conductors and Conductors. e) Write short notes on Intrinsic and Extrinsic Semiconductors.	[L3] [CO2] [L2] [CO2]	[5M] [5M]
9	a) Discuss the classification and properties Graphene nanoparticles. b) Outline the important applications of Graphine nanoparticles.	[L2] [CO2] [L2] [CO2]	[6M] [4M]
10	a) Explain the basic principle and Classifications of Super Capacitors. b) Discuss applications of Super Capacitors.	[L2] [CO2] [L2] [CO2]	[6M] [4M]
11	a) Explain about p-type and n-type semiconductor. b) Discuss about Type-I and Type-II Superconductors with examples.	[L1] [CO2] [L2] [CO2]	[5M] [5M]

UNIT III
ELECTROCHEMISTRY AND APPLICATIONS

1	Define the following a) Single electrode potential b) Primary Battery c) Second Battery d) Electrochemical sensor e) Oxidation and Reduction	[L1] [CO3]	[10M]

2	a) Define Electrochemical cell? Explain the construction, working principle and mechanism of an Electrochemical cell. b) What is single electrode potential? Calculate the single electrode potential of zinc in 0.05M $ZnSO_4$ solution at 298.15 K. {$E^0_{Zn/Zn^{2+}}$ = -0.763V}	[L1] [CO3] [L3] [CO3]	[6M] [4M]
3	Derive the Nernst equation for a single electrode potential and explain the terms in equation and write its applications.	[L2] [CO3]	[10M]
4	a) Explain construction and working of Daniel cell b) Calculate the emf of iron-copper voltaic cell [$Fe/Fe^{+2}//Cu^{+2}/Cu$] with standard potential of copper and iron as + 0.34 V and – 0.44 V respectively.	[L1] [CO3] [L3] [CO3]	[5M] [5M]
5	Discuss the titration curves obtained in the following Acid – Base Conductometric titrations a) Strong acid with weak base b) Weak acid with strong base	 [L3] [CO3] [L3] [CO3]	 [5M] [5M]
6	a) What is primary Battery? Write about construction, cell reactions and applications of Zinc-Air battery. b) Differentiate Primary and Secondary Batteries with examples.	[L1] [CO4] [L2] [CO4]	[6M] [4M]
7	a) Discuss about potentiometric sensors with examples. b) Explain amperometric sensors with examples.	[L2] [CO4] [L2] [CO4]	[5M] [5M]
8	Discuss the titration curves obtained in the following Acid – Base Conductometric titrations a) Weak acid with weak base b) Strong acid with strong base	 [L3] [CO3] [L3] [CO3]	 [5M] [5M]
9	Write a note on construction, cell reactions and applications of Lithium-Ion rechargeable cell.	[L2] [CO4]	[10M]
10	a) Define Fuel cell? Describe the Construction and Working principle and uses of Polymer electrolyte membrane fuel cell. b) Write short note on Hydrogen-Oxygen fuel cell.	[L2] [CO4] [L2] [CO4]	[5M] [5M]
11	a) Discuss of construction and working of conductivity cell. b) Explain about Potentiometric redox titrations	[L2] [CO3] [L2] [CO3]	[5M] [5M]

UNIT-IV
POLYMER CHEMISTRY

1	Explain the following a) Polymer b) Monomer c) Polymerization d) Conducting polymers e) Biodegradable polymer	[L1] [CO5]	[10M]
2	a) What is functionality of monomer? Explain in detail. b) Discuss preparation, properties and applications of Teflon.	[L1] [CO5] [L1] [CO5]	[5M] [5M]

3	Explain different types of polymerizations with examples in detail.	[L2] [CO5]	[10M]
4	Explain the following mechanism. a) Free radical addition polymerization. b) Anionic addition polymerization.	 [L2] [CO5] [L2] [CO5]	 [5M] [5M]
5	a) Distinguish between Chain growth and step growth polymerization withexamples. b) Write about Co-ordination or Ziegler-Natta polymerization.	[L3] [CO5] [L2] [CO5]	[5M] [5M]
6	a) Discuss the synthesis, properties and applications of Polyvinyl Chloride (PVC) polymer. b) Distinguish between Thermoplastics and Thermosetting plastics.	[L2] [CO5] [L2] [CO5]	[5M] [5M]
7	a) Describe the preparation, properties and uses of Bakelite. b) Write about cationic addition polymerization.	[L4] [CO5] [L3] [CO5]	[5M] [5M]
8	a) Write about synthesis, properties and applications of Poly Glycolic Acid. b) Write about synthesis, properties and applications of Poly Lactic Acid.	[L2] [CO5] [L2] [CO5]	[5M] [5M]
9	Describe the preparation, properties and uses of the following a) Nylon-6, 6 b) Carbon Fibers	 [L2] [CO5] [L2] [CO5]	 [5M] [5M]
10	a) Write the mechanism of conduction and engineering applications of Poly acetylene conducting polymer. b) Write the mechanism of conduction and engineering applications of polyaniline conducting polymer.	[L1] [CO5] [L2] [CO5]	[5M] [5M]
11	a) Write the preparation, properties and application of Buna-S rubber andBuna-N rubber. a) Write the applications of conducting polymers.	[L2] [CO5] [L2] [CO5]	[6M] [4M]

UNIT-V

INSTRUMENTAL METHODS AND APPLICATIONS

1	Define the following a) Beer-Lamber law b) Electromagnetic radiation c) Chromatography d) Stationary phase e) Mobile phase	[L1] [CO6]	[10M]
2	a) Explain the different regions of electromagnetic spectrum. b) Derive equation for Beer – Lambert's law.	[L1] [CO6] [L2] [CO6]	[5M] [5M]
3	a) Discuss principle of UV-Visible Spectroscopy. b) Sketch the Instrumentation of UV-Visible spectroscopy and explain its components.	[L2] [CO6] [L2] [CO6]	[4M] [6M]
4	Explain the various possible electronic transitions occurs in a molecule by absorbing the UV-Visible radiation.	[L2] [CO6]	[10M]

5	a) Give an account on principle and instrumentation of IR spectroscopy. b) Write the applications of IR spectroscopy.	[L2] [CO6] [L2] [CO6]	[6M] [4M]
6	a) Explain in detail about Fundamental modes of IR Spectroscopy. b) Discuss about selection rules of IR Spectroscopy.	[L2] [CO6] [L2] [CO6]	[5M] [5M]
7	a) What is meant by Chromatography? Write about principle and instrumentation of HPLC chromatography with neat diagram. b) Write about the important applications of HPLC Chromatography.	[L2] [CO6] [L2] [CO6]	[6M] [4M]
8	a) Explain various classifications of Chromatographic technique. b) Write about important applications of UV-Visible Spectroscopy.	[L2] [CO6] [L2] [CO6]	[6M] [4M]
9	a) What is the use of detector in chromatographic technique and what are the different types of detectors used in HPLC technique. b) Discuss the principle and applications of IR Spectroscopy	[L2] [CO6] [L2] [CO6]	[4M] [6M]
10	a) Discuss about different components in HPLC technique. b) Explain the classification of chromatographic methods based on type of mobile phase and stationary phase.	[L2] [CO6] [L2] [CO6]	[5M] [5M]
11	a) Explain in detail about Stretching and bending vibrations. b) Discuss the basic components of UV-Visible spectroscopy.	[L2] [CO6] [L2] [CO6]	[5M] [5M]

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BIT BANK (OBJECTIVE)

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UNIT -I
STRUCTURE AND BONDING MODELS

1. How many bonding molecular orbitals are found in 1,3 butadiene [ ]
   A) Three B) Four C) Two D) Zero
2. Which of the following ions is diamagnetic? [ ]
   A) N_2^+ B) O_2^- C) Be_2^+ D) NO^+
3. Which of the following diatomic molecules have bond order three [ ]
   A) F_2 B) Cl_2 C) O_2 D) N_2
4. The bond order of heteronuclear diatomic molecules of NO^- and CN^- [ ]
   A) 2 & 3 B) 3 & 2 C) 2 & 2.5 D) 1.5 & 2
5. Number of molecular orbitals present in benzene molecule is [ ]
   A) Four B) Zero C) Three D) Six
6. There is net force of attraction due to presence of greater number of bonding molecular orbitals over anti bonding molecular orbitals, then the bond order is_____ [ ]
   A) Positive B) Negative C) Zero D) None
7. The electrical conductivity of a metal decreases with rise in_ [ ]
   A) Pressure B) Temperature C) pH D) Both A&B
8. Which of the following is paramagnetic in nature? [ ]
   A) CN^- B) NO^+ C) NO^- D) CN^+
9. Which of the following is diamagnetic in nature? [ ]
   A) He_2 B) H_2 C) H_2^- D) Both A&B
10. Which of the following pair of molecule/ions are paramagnetic in nature [ ]
    A) N_2^+ & N_2^- B) N_2^- & N_2 C) N_2 & N_2^+ D) N_2 & N_2^{2-}
11. Which of the following pair of molecule/ions are paramagnetic in nature [ ]
    A) O_2^+ & O_2^{2-} B) O_2 & O_2^- C) O^{2-} & O_2 D) O_2^+ & O_2^{2-}
12. Which of the following Formula to determine the node of molecular orbitals [ ]
    A) n B) n+1 C) 2n-1 D) n-1
13. How many bonding molecular orbitals are found in 1,3 butadiene [ ]
    A) 3 B) 4 C) 2 D) 0
14. Which hybridization of carbon in benzene [ ]

A) SP B) SP^2 C) SP^3 D) SP^3d^2

15. Which theory explains the photoelectric effect [ ]
A) Planck's Theory B) Bohr atomic model C) J.J. Thomson model D) Rutherford model

16. The individual particle of matter is known as _____ [ ]
A) Atom B) Electron C) Neutron D) Proton

17. The electrons fill lower energy orbitals before they fill higher energy orbitals [ ]
A) Paulis exclusion principle B) Aufbau principle C) Hund's Rule D) Slater's Rule

18. The electrons are found within a fairly easily defined region of space [ ]
A) Orbit B) protons C) Orbitals D) Nucleus

19. The electrons are revolved around the nucleus in a definite path [ ]
A) Orbit B) Protons C) Orbitals D) Molecule

20. The net charge of an electron experiences in an atom with multiple electrons [ ]
A) Orbit B) Orbitals C) Effective nuclear charge D) Aufbau principle

21. According to Schrodinger wave equation electrons are treated as [ ]
A) Particle B) Wave C) Matter D) All of these

22. Which of the following ions is diamagnetic? [ ]
A) N_2^+ B) O_2^- C) Be_2^+ D) NO^+

23. The bond order in order in O_2^+ ion is _ [ ]
A) 2 B) 2.5 C) 1.5 D) 3

24. The bond order in N_2^+ is the same as in [ ]
A) CN^- B) O_2^- C) NO D) F_2

25. Hydrogen molecule formed by combination of orbitals [ ]
A) s-s orbitals B) p-p orbitals C) d-d orbitals D) s-p orbitals

26. Which of the following molecule is not homonuclear [ ]
A) H_2 B) N_2 C) O_2 D) NO

27. The interaction between a pair of orbitals of the same type [ ]
A) Attractive B) Repulsive C) There is no interaction D) None of the mentioned

28. The value of Ψ^2 is always [ ]
A) Negative B) Positive C) Both D) None

29. _____Orbitals has complex shape. [ ]
A) s - orbitals B) d - orbitals C) f - orbitals D) Molecular orbitals

30. The CO molecule contained one σ and_____π bonds [ ]
A) 1 B) 2 C) 4 D) 3

31. Substances which are attracted towards magnetic field is known as [ ]
A) Paramagnetic B) Diamagnetic C) Ferromagnetic D) Antiferromagnetic

32. Among the following which is not a heteronuclear molecule [ ]
A) CO B) NO C) F_2 D) CN

33. Potential energy of a particle in the box in one dimensional system [ ]

A) Zero B) Infinite C) Positive D) Negative

34. According to Planks quantum theory, the small packets of electromagnetic radiation is known as [ ]
A) Quanta B) Photon C) Both A & B D) None of this

35. The energy of quanta is equals to [ ]
A) $h\upsilon/2$ B) $h\upsilon$ C) $h\upsilon/4$ D) None of this

36. More energetic electromagnetic radiation among this_____ [ ]
A) X-rays B) UV-rays C) Radio waves D) IR rays

37. According to Heisenberg's hypothesis, if the position of a particle known exactly, velocity will be [ ]
A) Zero B) Highest C) Lowest D) Infinite

38. Energy order of bonding molecular orbitals of p-orbitals in O_2 molecule is [ ]
A) $\sigma 2p_x < \pi 2p_y = \pi 2p_z$ B) $\pi 2p_y = \pi 2p_z < \sigma 2p_x$ C) $\sigma 2p_x = \pi 2p_y < \pi 2p_z$ D) $\pi 2p_z < \sigma 2p_x = \pi 2p_y$

39. The orbitals responsible for π bonding in a molecule [ ]
A) P_y orbital B) P_x orbital C) P_z orbital D) Both A & C

40. Highest Occupied Molecular Orbital (HOMO) in 1,3-Butadiene is [ ]
A) π_1 B) π_2 A) π^*_3 d) π^*_4

UNIT -II
MODERN ENGINEERING MATERIALS

1. The resistivity of a super conductor is [ ]
A) Zero B) Finite C) Infinite D) None

2. An p-type semiconductor is obtained by doping pure Si with [ ]
A) Pentavalent impurity B) Tetravalent impurity C) Trivalent impurity D) All

3. Which of the following nanomaterial show effective catalytic activity for methanation of $CO + H_2$ at low temperature [ ]
A) Palladium B) Palladium colloids C) MoS_2 D) Rhodium Hydrosols

4. Fullerenes and Dendrimers are considered as _____in Nanoscale [ ]
A) One dimensional B) Three dimensional C) Two dimensional D) None of these

5. Nanowires and Nanotubes are_____in Nanoscale [ ]
A) One dimensional B) Three dimensional C) Two dimensional D) None of these

6. The term Nano Stands for __ [ ]
A) 1 Billionth of centimeter B) 1 Billionth of Meter C) 1 Billionth of Foot D) None of these

7. Which of the following important properties of Nanomaterials differ significantly from other materials [ ]
A) High surface area B) Lower surface area C) Increase constant size D) None of these

8. Which of the following nanomaterial act as sensors of gases like NO_2 and NH_3 on the basis of increasing electrical conductivity [ ]

A) Carbon Nanotubes B) Thin film C) Zinc Oxide D) Palladium

9. Which of the following nano wires show Photoluminescence [ ]

A) Zinc Oxide B) Semi-Conductor C) Silicon D) Carbon

10. In Nanomaterials, atoms or molecules are fabricated in nanoscale range [ ]

A) 1-10 nm B) 100-120 nm C) 10-20 nm D) 20-30 nm

11. Who is the father of Nanomaterial Science [ ]

A) Grahambel B) Dalton C) Richard Feynmen D) Newton

12. Which of the following is considered as one dimensional in the nanoscale [ ]

Quantum Dots B) Carbon Nanotubes C) Fullerenes D) Thin films

13. A Nanocrystal of 10 nm in size has approximately of atoms on the surface [ ]

A) 80% B) 20% C) 15% D) 5%

14. Zinc oxide Nanowires exhibits at room temperature as [ ]

A) Magnetic Materials B) UV Laser C) Storage device D) Super Conductors

15. The Nano tubes of MoS_2 and CoS_2 are used as [ ]

A) Semi-Conductors B) Insulators C) Storage device D) Solid Lubricants

16. The Nanotubes of MoS_2 and WS_2 used as___ [ ]

A) Solid lubricants B) Super conductors C) Semiconductors D) Catalyst

17. An n-type semiconductor is obtained by doping pure Si with [ ]

A) Pentavalent impurity B) Tetravalent impurity C) Trivalent impurity D) All

18. The conductivity of semiconductors increases with [ ]

A) Increase in temperature B) Decrease in temperature C) Increase in Pressure D) None of these

19. At 0 K, the conduction band in semiconductor is _____ [ ]

A) Lies lower in energy B) Not occupied with electrons C) Fill with electrons D) None of these

20. After doping, the excess negative charge created in _____type of semiconductor. [ ]

A) P-type semiconductor B) N-type semiconductor C) Intrinsic semiconductor D) None of these

21. Critical temperature range of Type-I superconductors [ ]

A) Below 8 K B) Above 8 K C) Above 100 K D) None of these

22. Meissner effect exhibited by [ ]

A) Type – II Superconductors B) Type – I superconductors C) Bother A & B D) None of these

23. The temperature at which materials behave as superconductors is called [ ]

A) Absolute B) Mean temperature C) Critical D) Crystalline

temperature | temperature | temperature

24. Which of the following material has highest critical temperature [ ]

A) Hg | B) Cd | C) Pb | D) MgB_2

25. After doping, the positive hole formed in _____type of semiconductor. [ ]

A) P-type semiconductor | B) N-type semiconductor | C) Intrinsic semiconductor | D) None of these

26. The distinct properties of nanomaterials are due to _____ [ ]

A) Large surface area | B) Quantum effect | C) Both A & B | D) None of these

27. Example for one dimensional nanomaterial is [ ]

A) Nanowires | B) Dendrimers | C) Surface coatings | D) None of these

28. Carbon nanotubes are also called as [ ]

B) Fullerenes | B) Buckytubes | C) Graphenes | D) None

29. Among the following, Type – II superconductor is [ ]

A) Nb_3Al | B) MgB_2 | A) Both A & B | C) Hg

30. The fullerene is consisting of [ ]

A) 12 pentagonal and 20 hexagonal rings | B) 20 pentagonal and 12 hexagonal | C) 15 pentagonal and 15 hexagonal | D) None of these

31. The device that can store and release the energy is [ ]

A) Superconductor | B) Supercapacitor | C) Semiconductor | D) Conductor

32. The electrodes in supercapacitors are separated by [ ]

A) Electrolyte | B) Insulators | C) Isolators | D) Bothe B & C

33. The electrodes in electrical double layer supercapacitor are made up of _____ [ ]

A) Metal oxides | B) Carbon or its derivatives | C) Conducting polymers | D) None of these

34. The formation of electrical double layer is associated with_____ [ ]

A) Hybrid capacitors | B) Pseudo-capacitors | C) Electrical double layer capacitors | D) None of these

35. The electrodes in electrochemical supercapacitors are made up of [ ]

A) Conducting polymers | B) Metal oxides | C) Bother A & B | D) Only B

36. Pseudo-supercapacitors store and release the energy by [ ]

A) Formation of electrical double layer | B) Redox reaction | C) Both A & B | D) None of these

37. The supercapacitor uses electrodes with different properties is _____ [ ]

A) Hybrid supercapacitor | B) Pseudo-capacitors | C) Electrical double layer capacitors | D) None of these

38. Graphene is a_____ [ ]

A) Zero dimensional | B) One dimensional | C) Two dimensional | D) Three dimensional

material material material material

39. The basic element that forms the graphene is [ ]
A) Hydrogen B) Oxygen C) Carbon D) None of these

40. No of carbon atoms present in Buckminster fullerene are [ ]
A) 60 B) 70 C) 80 D) 75

UNIT-III
ELECTROCHEMISTRY AND APPLICATIONS

1. A galvanic cell converts [ ]
A) Chemical energy into electrical energy B) Electrical energy into chemical energy C) Chemical energy into heat energy D) Electrical energy into heat energy

2. The electrochemical cell that converts electrical energy into chemical energy is [ ]
A) Daniel Cell B) Electrolytic cell C) Galvanic cell D) All of these

3. In galvanic cell, oxidation and reduction occurs at, respectively [ ]
A) Cathode and Anode B) Anode and Cathode C) Electrolyte D) None of these

4. If E^0 Ag^+ /Ag=0.799 V and E^0 Zn^{2+}/Zn=-0.763 V, then [ ]
A) Ag can oxidize H_2 to H^+ B) Ag can reduce Zn^{2+} C) Zn can reduce Ag+ D) Zn^{2+}can be reduced by H_2

5. Pure water does not conduct electricity because it is [ ]
A) Almost not ionized B) Decomposed easily C) Low boiling D) Neutral

6. Which of the following is not a non-electrolyte? [ ]
A) Acetic acid B) Glucose C) Ethanol D) Urea

7. Which of the following is a primary reference electrode [ ]
A) Calomel electrode B) Hydrogen electrode C) Glass electrode D) None of these

8. Which of the following is an example for strong acid [ ]
A) CH_3COOH B) HCl C) HNO_3 D) Both B & C

9. Which of the following is an example for strong base [ ]
A) NaOH B) KOH C) $Ca(OH)_2$ D) All of these

10. Which of the following is an example for weak acid [ ]
A) HF B) HCN C) HCOOH D) All of these

11. Which of the following is an example for weak base [ ]
A) NH_3 B) NH_4OH D) CH_3NH_2 D) All of these

12. When iron/zinc is added to $CuSO_4$ solution, copper is precipitated, it is due to____ [ ]
A) Oxidation of Cu^{2+} B) Hydrolysis of $CuSO_4$ C) Ionization of $CuSO_4$ D) Reduction of Cu^{2+}

13. The main purpose of salt bridge in the voltaic cell is [ ]
A) To maintain flow B) To maintain charge C) Barrier for electron D) None of these

of electrons | neutrality of solution | transfer

14. The difference in potential of the two half-cells at a cell known as _____ [ ]
A) EMF of the cell | B) standard electrode | C) Reduction | D) Oxidation

15. The tendency of an electrode to lose (or) gain electrons when it is in contact with its own ions is called [ ]
A) Hydration | B) Oxidation | C) Reduction | D) Electrode potential

16. The difference of potential which causes the flow of current from one electrode to another electrode is called [ ]
A) Oxidation | B) Reduction | C) Neutralization | D) Electro motive force

17. The potential of the standard hydrogen electrode is [ ]
A) 1 V | B) 0 V | C) 10 V | D) 0.5 V

18. Conductivity of a solution is directly proportional to [ ]
A) No. of ions | B) Mobility of ions | C) Both A & B | D) Neither A & B

19. The graph obtained in Strong acid vs Strong base conductometric titrations have _____ shape [ ]
A) 'V' Shape | B) 'S' Shape | C) 'L' shape | D) None

20. In conductometric titrations, the concentration of the titrant must be _____times as the solution being titrated. [ ]
A) Four | B) Two | C) Three | D) Ten

21. In primary battery, the electrode reactions are [ ]
A) Irreversible | B) Reversible | C) Constant | D) None of these

22. The anode and cathode in Zn-air battery respectively is [ ]
A) Zn metal & Air | B) Porous carbon paste & Zn metal | C) Zn metal & Porous carbon paste | D) Air & Zn metal

23. In secondary battery, the electrode reactions are [ ]
A) Irreversible | B) Constant | C) Reversible | D) None of these

24. With increase in dilution, the conductivity of a soltion [ ]
A) Decreases | B) Does not change | C) Increases | D) Increases first than decreases

25. In the cell: $Cu/Cu^{+2}//Ag^{+}/Ag$, which of the is not correct [ ]
A) 'Ag' electrode is the negative electrode | B) 'Cu' electrode is the negative electrode | C) Ag^{+} reduced to Ag | D) Cu is oxidized to Cu^{+2}

26. The indicator electrode in the potentiometric sensor is [ ]
A) Calomel electrode | B) Bulb electrode | C) Hydrogen electrode | D) None these

27. The bulb electrode is [ ]
A) Selective to H^{+} ions | B) Selective to metal ions | C) Both A & B | D) None of these

28. Glucometer is example for [ ]
A) Potentiometric | B) Conductometric | C) Amperometric | D) None of these

sensors sensors sensors

29. Amperometric sensor is useful to findout the following [ ]
A) Estimation of Glucose B) pH of solution C) Estimation of uric acid D) Cell potential

30. Which of the following is secondary battery [ ]
A) Zn-Air battery B) Lead acid battery C) Li-ion Battery D) None of these

31. Which of the following is primary battery [ ]
A) NICAD battery B) Lead acid battery C) Zn-air battery D) Lithium-ion battery

32. The electrodes in conductivity cell are made up of [ ]
A) Carbon derivatives B) Platinum electrodes C) Hydrogen electrodes D) None of these

33. Cell constant of a conductometric cell_____ [ ]
A) Increases with dilution B) Depends on the nature of electrolyte C) Decreases with dilution D) Is independent of the nature of electrolyte

34. The anode and cathode in Li-ion battery respectively are [ ]
A) $LiCoO_2$ & Graphite B) Porous Carbon & Graphite C) Graphite & $LiCoO_2$ D) None of these

35. The Li-ion battery works by [ ]
A) Redox reaction involved in it B) Transfer of Li-ions between the electrodes C) H^+ ions transportation D) None of these

36. What is the voltage produced by the H_2-O_2 fuel cell, operating under standard conditions [ ]
A) 1.0 V B) 1.23 V C) 2.0 V D) 0.5 V

37. H_2-O_2 fuel cells are used as auxiliary energy source in [ ]
A) Aeroplanes B) Trains C) Space vehicles D) Automobile engines

38. Which of the following is not true in the case of fuel cells [ ]
A) They store chemical energy B) They do not store chemical energy C) Efficiency is twice that of conventional power plant D) Reactants are supplied constantly

39. In polymer electrolyte membrane fuel cells, the membrane is used to transfer of [ ]
A) Electrons B) Electrode material C) H^+ ions D) None

40. The indicator electrode in potentiometric titrations is [ ]
A) Calomel electrode B) Hydrogen electrode C) Platinum electrode D) None of these

UNIT-IV
POLYMER CHEMISTRY

1. A plastic which can be softening on heating and hardened on cooling is called [ ]
A) Thermosetting B) Thermoplastic C) Thermite D) Bakelite

2. Molecular mass of polymer is_____ [ ]

A) Large B) Small C) Negligible D) Very small

3. The word polymer was derived from the Greek word, poly means [ ]
   A) Mono B) Many C) Dimer D) Monomer
4. The common catalyst used in co-ordination chain polymerization is [ ]
   A) Nickel B) Ziegler-Natta catalyst C) Palladium D) Platinum
5. Which of the following is an example for homopolymer [ ]
   A) Teflon B) PVC C) Polythene D) All of these
6. Vulcanization of rubber is mainly done by addition of_____ [ ]
   A) Oxygen gas B) MgO_2 C) Sulphur D) ZnO
7. A good example of condensation polymerization is [ ]
   A) Polythene B) Teflon C) Bakelite D) Polypropylene
8. Fluorine atoms are present in [ ]
   A) Nylon B) Styrene C) Polythene D) Teflon
9. Bakelite is chemically called as [ ]
   A) Polybutylene B) Phenol-Formaldehyde resin C) Polystyrene D) Polypropylene
10. Buna-S rubber is made up of the monomers_____ [ ]
    A) Butadiene + Phenol B) Butadiene + Styrene C) Butadiene + Acrylonitrile D) Styrene + Phenol
11. Homopolymer is made up of _____ [ ]
    A) Different kinds of monomer units B) Same monomer units C) Both of these D) None
12. Phenol-Formaldehyde resin is commercially known as [ ]
    A) Nylon B) PVC C) Bakelite D) Teflon
13. Buna-S rubber is also known as [ ]
    A) Nitrile rubber B) Polyurethane C) Styrene rubber D) Butyl rubber
14. Nylon is a _____ [ ]
    A) Polyester B) Polyamide C) Vinyl polymer D) PVC
15. The process of vulcanization makes rubber _____ [ ]
    A) Soft B) Hard C) Elastic D) Swells oils
16. Buna-N rubber is also known as [ ]
    A) Nitrile rubber B) Polyurethane C) Styrene rubber D) Butyl rubber
17. Styrene rubber is produced by co-polymerization of _____ [ ]
    A) Butadiene + Pheno B) Butadiene + Styrene C) Butadiene + Acrylonitrile D) Styrene + Phenol
18. Buna-N rubber is made up of the monomers_____ [ ]
    A) Butadiene+ Phenol B) Butadiene + Styrene C) Butadiene + Acrylonitrile D) Styrene + Phenol
19. Nitrogen atoms are present in_____ [ ]
    A) Teflon B) Polythene C) Nylon D) Polyvinyl chloride

20. Co-polymerization is also known as [ ]

A) Step growth polymerization | B) Chain growth polymerization | C) Stereo specific polymerization | D) Coordination polymerization

21. Addition-polymerization is also known as [ ]

A) Step growth polymerization | B) Chain growth polymerization | C) Stereo specific polymerization | D) Coordination polymerization

22. The repeating units present in a polymer chain are known a_ [ ]

A) Monomer | B) Dimers | C) Polymer | D) Tetramers

23. The number of bonding sites in a monomer is known as___ [ ]

A) Degree of polymerization | B) Tacticity | C) Functionality | D) Silicones

24. An example of Thermoplastic is____ [ ]

A) Polystyrene | B) PVC | C) Polythene | D) All of these

25. An Example of co-polymer is_ [ ]

A) PVC | B) Polythene | C) Teflon | D) Buna-S

26. Tetraflouro ethylene is the monomer of____ [ ]

A) Nylon-6,6 | B) Polythene | C) Teflon | D) PVC

27. Condensation polymerization is also known as [ ]

A) Step growth polymerization | B) Chain growth polymerization | C) Stereo specific polymerization | D) Coordination polymerization

28. Styrene rubber is also known as [ ]

A) Buna-S | B) Nytrile | C) Thikol | D) Vulcanized rubber

29. Carbon fibers are a new breed of high strength materials consisting of extremely thin fibers about 0.005 to _____mm in diameter. [ ]

A) 0.025 | B) 0.010 | C) 0.015 | D) 0.020

30. An Example of Condensation polymer is _____ [ ]

A) PVC | B) Polythene | C) Nylon-6,6 | D) Teflon

31. Bakelite is a excellent _____ [ ]

A) Conductor | B) Semiconductor | C) Insulator | D) None of these

32. Thermoplastics are prepared by [ ]

A) Condensation polymerization | B) Addition polymerization | C) Co-polymerization | D) Coordination polymerization

33. Thermosetting plastics are prepared by [ ]

A) Co-polymerization | B) Coordination polymerization | C) Condensation polymerization | D) Addition polymerization

34. In preparation of conducting polymer, p-doping involves treatment of polymer with [ ]

A) Metal | B) Lewis acid | C) Lewis base | D) None of these

35. Among the following, example for conducting polymers is/are [ ]

A) Polyvinyl Chloride | B) Polyaniline | C) Polyacetylene | D) Both B & C

36. The carbon nanofibers are present using the following precursor [ ]

A) Rayon B) Polyacrylonitrile C) Both A & B D) PVC

37. Hetero polymer is made up of [ ]
A) Same monomer units B) Different monomer units C) Both of these D) None of these

38. In preparation of conducting polymer, n-doping involves treatment of polymer with [ ]
B) Lewis acid C) Lewis base C) Plastics D) None of these

39. Polyglycolic acid and Polylactic acid are examples for _____ polymers [ ]
A) Conducting polymers B) Elastomers C) Bio-degradable polymers D) Plastics

40. Among the following, bio-degradable polymer is [ ]
A) Polyvinyl chloride B) Polylactic acid C) Polyacetylene D) Polyaniline

UNIT-V
INSTRUMENTAL METHODS AND APPLICATIONS

1. In the equation, A = εbc, what quantity is represented by "ε"? [ ]
A) Absorptivity (B) Molar absorptivity (C) Path length (D) None of these

2. Among the given electromagnetic radiation, which has lowest energy [ ]
A) UV rays B) IR rays C) Visible Rays D) Radio waves

3. Which of the given electromagnetic radiation has lowest wavelength [ ]
A) X-rays B) Radio waves C) IR rays D) Visible Rays

4. In electromagnetic spectrum, visible region range is _____ [ ]
A) 1 μm – 100 μm B) 1 nm – 10 nm C) 1 cm – 10 cm D) 400 nm – 700 nm

5. Highest energy radiation among the visible radiation is [ ]
A) Blue B) Red C) Green D) Yellow

6. Beer – Lambert's law not applicable when _____ [ ]
A) Monochromatic light B) High concentration of sample C) Constant Temperature D) None of this

7. UV-Vis spectroscopy, only $\sigma \rightarrow \sigma^*$ transitions are shown by [ ]
A) Saturated Compounds B) Unsaturated Compounds C) Alcohols D) None of these

8. Which of the following electromagnetic radiation has highest wavelength [ ]
A) X- rays B) Cosmic rays C) Radio waves D) Gamma rays

9. UV-Vis spectroscopy of organic compounds is usually concerned with which electronic transition(s)? [ ]
A) $\sigma \rightarrow \sigma^*$ B) $n \rightarrow \sigma^*$ C) $n \rightarrow \pi^*$ & $\pi \rightarrow \pi^*$ D) None of these

10. Infrared Spectroscopy provides valuable information about [ ]
A) Molecular weight B) Melting point C) Conjugation D)Functional groups

11. The most commonly used monochromators are [ ]
A) Light B) Prisms C) Lamp D) None

12. The UV radiation source is _____ [ ]
A) Deuterium Lamp B) Tungsten Lamp C) Nichrome wire D) Nerst Glober

13. The Visible radiation source is _____ [ ]

A) Deuterium Lamp B) Tungsten Lamp C) Nichrome wire D) Nerst Glober

14. The cuvettes used in the UV- Visible spectroscopy are made up of [ ]

A) Steel B) Quartz C) Silicate glass D) Both B & C

15. Generally, the thickness of the cuvette is _____ [ ]

A) 1 cm B) 2 cm C) 10 cm D) 1 m

13. The commonly used detector in UV-Visible spectroscopy is [ ]

A) Globay cell B) Bolometers C) Photomultiplier tubes D) None of this

14. IR Spectroscopy is also known as _____ [ ]

A) Vibrational Spectroscopy B) Electronic Spectroscopy C) Rotational Spectroscopy D) None of this

15. Chage in the inter-atomic distance along the bond axis is known as [ ]

A) Bending B) Scissoring C) Stretching D) Rocking

16. In plane bending's are known as [ ]

A) Wagging B) Scissoring C) Stretching D) Twisting

17. The source of Infrared radiation is _____ [ ]

A) Nernst Glober B) Hydrogen Lamp C) Nichrome wire D) Both A & C

18. The functional group region in IR Spectroscopy ranges from ____ to ____ [ ]

A) 4000 cm^{-1} – 1300 cm^{-1} B) 2000 cm^{-1} – 1000 cm^{-1} C) 1300 cm^{-1} – 900 cm^{-1} D) 900 cm^{-1} – 400 cm^{-1}

19. The molecules that are not active in IR Spectroscopy are [ ]

A) H_2O B) H_2 C) Cl_2 D) Both B & C

20. Which of the following is not an IR vibrational mode [ ]

A) Stretching B) Scissoring C) Rolling D) Rocking

21. The commonly used technique to identify the functional groups in molecules is [ ]

A) UV-Visible Spectroscopy B) IR Spectroscopy C) HPLC D) None of these

22. The O-H stretching frequency in water molecule can be seen in the range of _____ [ ]

A) 3700 cm^{-1} – 3100 cm^{-1} B) 2250 cm^{-1} – 2000 cm^{-1} C) 3200 cm^{-1} – 2800 cm^{-1} D) 900 cm^{-1} – 600 cm^{-1}

23. The selection rule for the vibrational spectroscopy is [ ]

A) $\upsilon = \pm 1, 2, 3\ldots$ B) $\upsilon = 0$ C) $\upsilon = 0, 1$ D) None of these

24. The mid IR range is [ ]

A) 4000 – 200 cm^{-1} B) 200 – 10 cm^{-1} C) 12800 – 4000 cm^{-1} D) None of these

25. Beer-Lambert law gives the relationship between_____ [ ]

A) Reflected radiation and concentration B) Energy scattered radiation and concentration C) Energy absorption and concentration D) energy absorption and reflected radiation

26. The following spectroscopy is used to find colorings in food samples [ ]

A) UV-Visible spectroscopy B) Chromatography C) IR Spectroscopy D) None of these

27. The transmittance can give by [ ]

A) I_0/I B) $I + I_0$ C) $I \times I_0$ D) I/I_0

28. What are the detectors used in IR spectroscopy? [ ]

A) Photo conductivity cell (B) Barriel layercell (C) Photo multiplier tubes (D) none

29. Chromatography is an analytical method used to separate and analyze [ ]

A) Simple mixtures B) Viscous mixtures C) Complex mixtures D) Metals

30. In chromatography, the stationary phase can be [ ]

A) Solid or liquid B) Solid only C) Liquid or gas D) Liquid only

31. In chromatography, the stationary phase can be [ ]

A) Liquid B) Gas C) Solid D) Solid or Liquid

32. The time taken by the analyte after sample injection to reach the detector is called [ ]

A) Passage time B) Solute migration rate C) Adjusted retention time D) Retention time

33. In HPLC Chromatography, the mobile and stationary phases respectively [ ]

A) Gas, Solid B) Liquid, Gas C) Liquid, Solid D) Gas, Liquid

34. In chromatography, the mobile phase can be [ ]

A) Solid B) Liquid C) Gas D) B & C

35. HPLC stands for [ ]

A) High Pressure Liquid Chromatography B) High Performance Liquid Chromatography C) High Placed Liquid Chromatography D) Both A & B

36. The composition of the solvent during an isocratic elution in HPLC [ ]

A) Changes continuously B) Changes in a serious of steps C) Remains constant D) None of these

37. In the reverse phase HPLC, the column and mobile phase are [ ]

A) Non-polar solvent and non-polar column B) Non-polar solvent and polar column C) Polar solvent and non-polar column D) Any of the above

38. In HPLC chromatography, the mobile phase is [ ]

A) Gas B) Liquid C) Solid D) Both A & B

39. The gradient elution of composition of the solvent in HPLC means [ ]

A) Mobile phase is constant B) Mobile phase is variable C) Both A & B D) None of these

40. The commonly used detectors in HPLC chromatography are [ ]

A) Refractive index detector B) UV-Vis detector C) Mass-spectrometric detector D) All of these