

**SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY::PUTTUR
(AUTONOMOUS)**

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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	Illustrate the molecular orbital diagram of O_2^+ and O_2^{2-} . Explain its bond order and magnetic property based on MOT theory.	[L2] [CO1]	[10M]
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	Derive equation for a particle in one dimensional box.	[L3] [CO1]	[10M]
7	a) Sketch the molecular orbital diagram for Oxygen (O_2). Explain its bond order and magnetic property based on MOT theory. b) Explain π - molecular orbital of 1, 3- Butadiene with a neat sketch.	[L3] [CO1] [L3] [CO1]	[5M] [5M]
8	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]
9	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]
10	Calculate the bond order of F_2 & NO molecule and explain the magnetic properties based on MOT theory.	[L3] [CO1]	[10M]
11	Discuss the important postulates of Molecular Orbital Theory with merits and demerits.	[L2] [CO1]	[10M]

UNIT -II
MODERN ENGINEERING MATERIALS

1	Define the following a) Semiconductor b) Superconductor c) Intrinsic and Extrinsic Semiconductor d) Super capacitor 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 nano materials.	[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. b) Discuss the properties of Carbon nanotubes.	[L1] [CO2] [L2] [CO2]	[4M] [6M]
7	a) Write a short note on classification and properties of Fullerenes. b) 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. b) Write short notes on Intrinsic and Extrinsic Semiconductors.	[L3] [CO2] [L2] [CO2]	[5M] [5M]
9	a) Discuss the classification and properties Graphine 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. { $E_{Zn/Zn^{2+}}^0 = -0.763V$ }	[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 with examples. b) Write about Co-ordination or Ziegler-Natta polymerization.	[L3] [CO5] [L2] [CO5]	[5M] [5M]
6	a) Discuss the synthesis, properties and applications of Polyvinylchloride (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] [L2] [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 poly aniline conducting polymer.	[L1] [CO5] [L2] [CO5]	[5M] [5M]
11	a) Write the preparation, properties and application of Buna-S rubber and Buna-N rubber. b) Write the applications of conducting polymers.	[L2] [CO5] [L2] [CO5]	[6M] [4M]

UNIT-V
INSTRUMENTAL METHODS AND APPLICATIONS

1	Define the following a) Beer- Lambert's 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]