

Time: 3 Hours**Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) What is the principle of EDTA method? Describe the estimation of hardness of water by EDTA method. 6M
- b) A one litre of water sample containing 16mg of calcium bicarbonate, 14 mg of magnesium bicarbonate, 13.6 mg calcium sulphate, 11.1 calcium chloride and 9.5 mg magnesium chloride. Calculate temporary, permanent and the total hardness of water sample in ppm. 4M

(OR)

2. a) What is potable water? Write the steps taken for removal of suspended impurities. 6M
- b) Write the advantages of demineralization over zeolite process. 4M

UNIT-II

3. a) Explain different possible electronic transitions in the molecules by absorbing UV-VIS radiation. 6M
- b) What are absorption shifts? Write about Hypsochromic shift with example. 4M

(OR)

4. a) Mention the condition for a molecule to be IR active. Explain various vibration modes in IR Spectroscopy. 6M
- b) Explain the principle of NMR Spectroscopy. 4M

UNIT-III

5. a) Define the terms functionality and degree of polymerisation. 4M
- b) Explain the functions of different ingredients used in compounding of plastics 6M

(OR)

6. a) Distinguish between thermoplastic and thermosetting plastics. 6M
- b) Write a brief note on injection moulding process of plastics 4M

UNIT-IV

7. a) Discuss the mechanism of bimolecular nucleophilic substitution reactions of alkyl halides 4M
- b) Write the reaction and mechanism of electrophilic addition reactions. 6M

(OR)

8. a) Explain the reaction and mechanism of Pinacol-Pinacolone rearrangement. 6M
- b) Narrate the differences between E1 and E2 reactions with suitable example. 4M

UNIT-V

9. a) Define corrosion? Explain the mechanism of chemical corrosion. 6M
- b) Write a brief note on proper selection and design of materials for corrosion control of metal. 4M

(OR)

10. a) What is cathodic protection? Describe the sacrificial anode and impressed current techniques for prevention of corrosion. 6M
- b) Mention the two techniques of metal coating. 4M

UNIT-VI

11. a) Give an account on the principles of green chemistry. 6M
- b) What are renewable energy sources? How can renewable energy benefit the environment? 4M

(OR)

12. a) Describe construction and working of lead-acid battery with the reactions during discharging and charging. 6M
- b) Distinguish between primary and secondary batteries with suitable examples 4M

**APPLIED PHYSICS
(Common to AI&ML, CSE &IT)****Time: 3 Hours****Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Explain how Newton's rings are formed in the reflected light. Derive an expression for diameters of dark and bright rings. 6M
- b) In Newton's rings experiment, the diameter of the 15th ring was found to be 0.59 cm and that of the 5th ring was 0.336 cm. if the radius of the plano convex lens is 100cm. compute wavelength of light used. 4M

(OR)

2. a) Derive Fraunhofer Diffraction due to Single Slit and discuss its Intensity Distribution. 6M
- b) Distinguish between Fraunhofer and Fresnel diffraction. 4M

UNIT-II

3. a) List out the basic characteristics of Lasers 4M
- b) With neat diagram explain the construction and working of He-Ne (four level) laser system. 6M

(OR)

4. a) What is pumping? Explain the role of optical resonator in laser 4M
- b) Write the Applications of Lasers in Industry, Scientific and Medical Fields. 6M

UNIT-III

5. a) What is the working principle of Optical fiber 4M
- b) Derive expression for numerical aperture of an optical fiber. 6M

(OR)

6. a) Distinguish between step index and graded index optical fibers. 6M
- b) List out the advantages of optical fibers in communications. 4M

UNIT-IV

7. a) State and explain Heisenberg's Uncertainty Principle 6M
- b) An electron is confined inside a infinite potential box of width 1×10^{-10} m. calculate the energy in ground and first two excited states. 4M

(OR)

8. a) Derive time independent Schrodinger wave equation. 6M
- b) Obtain expression for the wavelength of electron accelerated to a potential of V 4M

UNIT-V

9. a) Derive Maxwell's equations in free space and write significance of Maxwell's equations 6M
- b) State and explain Biot- Savart law 4M

(OR)

10. a) State and prove Ampere's law 6M
- b) Define Faraday's Law of Induction, Lenz's Law 4M

UNIT-VI

11. a) Describe the dependence of Fermi level on carrier concentration and temperature 4M
- b) What are the various currents possible in semiconductor? Derive the expression for the currents. 6M

(OR)

12. a) Explain Hall effect and derive expression for hall coefficient. 6M
- b) The following data are given for intrinsic germanium at 300K. $n_i = 2.4 \times 10^{19}/m^3$, $\mu_e = 0.39 \text{ m}^2\text{V}^{-1}\text{s}^{-1}$, $\mu_p = 0.19 \text{ m}^2\text{V}^{-1}\text{s}^{-1}$ calculate the resistivity of the sample. 4M

AR18

CODE: 18BST108

SET-1

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

I B.Tech II Semester Supplementary Examinations, August, 2022

CHEMISTRY

(Common to CE, ME, ECE Branches)

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Explain shapes of following molecules with the help of VSEPR theory. i) H_2O ii) XeF_2 8M
b) Draw the Molecular Orbital Energy Level diagram of O_2 –molecule 4M
- (OR)
2. a) Explain the variation of Atomic and ionic sizes across the groups and periods in a periodic table 6M
b) Explain the following with examples. i) sp^2 hybridization ii) sp^3 hybridization 6M

UNIT-II

3. a) Define fluorescence and phosphorescence with help of Jablonski diagram 6M
b) Discuss Finger print region in IR spectroscopy 6M
- (OR)
4. a) Discuss the principle of NMR spectroscopy 6M
b) Define Chemical Shift in NMR and explain its consequences 6M

UNIT-III

5. a) Discuss about the electrochemical series and its importance 6M
b) Discuss the Factors effecting the rate of corrosion 6M
- (OR)
6. a) Describe the construction and working of i) standard hydrogen electrode 6M
ii) calomel electrode
b) Explain the following i) sacrificial anodic protection ii) impressed current cathodic protection 6M

UNIT-IV

7. a) Define isomerism and explain about cis – trans isomerism with suitable examples 6M
b) Explain SN^1 and SN^2 mechanisms with examples. 6M
- (OR)
8. a) Explain addition polymerizations with suitable examples. 6M
b) Discuss the various classifications of polymers with suitable examples 6M

UNIT-V

9. a) Define green chemistry and explain any six principles of it. 6M
b) What are photovoltaic cells and explain their role in making solar energy into current 6M
- (OR)
10. a) Explain the construction, working and cell reactions of Lead-Acid battery 6M
b) Discuss the difference between Batteries and Super capacitors. 6M

**ENGINEERING PHYSICS
(Mechanical Engineering)****Time: 3 Hours****Max Marks: 60 M**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) What are damped oscillations? Deduce the equation of motion of a damped harmonic oscillator and obtain its solution 7 M
b) Discuss about critical damped oscillations 3 M

(OR)

2. a) Give the differentiation between overdamped and critical damped oscillations 5 M
b) What are forced oscillations? Obtain an expression for the amplitude of forced oscillations. 5 M

UNIT-II

3. a) What are Newton's rings? How are they formed? Why are they circular? 4 M
b) Discuss Fraunhofer diffraction due to single slit and derive its intensity. 6 M

(OR)

4. a) Distinguish between Interference and Diffraction 3 M
b) Discuss the interference of plane parallel film due to reflected light. 7 M

UNIT-III

5. a) What is meant by a LASER? Explain the characteristics of lasers, Explain the main components of any laser system 6 M
b) Explain the properties of LASER 4 M

(OR)

6. a) Give the production of LASER by using RUBY crystal. 7 M
b) What are the applications of lasers 3 M

UNIT-IV

7. a) Give the applications of the optical fibre 6 M
b) Define numerical aperture and acceptance angle 4 M

(OR)

8. a) Distinguish between step-index and graded-index fibres. 6 M
b) Draw the block diagram of the fibre optic communication system and explain the function of each block. 4 M

UNIT-V

9. a) Describe seven crystal systems 7 M
b) Give the difference between primitive and non-primitive lattices with the help of a diagram 3 M

(OR)

10. a) Describe the FCC crystal structure and obtain the expression for the packing factor of the FCC 7 M
b) Give the list of the characteristics of crystal lattices. 3 M

UNIT-VI

11. a) Give the difference among three types of magnetic materials 7 M
b) Discuss soft and hard magnetic materials. 3 M

(OR)

12. a) Distinguish between Type- I and Type- II superconductors. 7 M
b) How we are using the superconductors in our general life 3 M

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Describe the principle and formation of Newton's rings with neat diagram and give a method to determine wavelength of monochromatic light. 8 M
- b) Explain the reason for formation of circular rings in Newton's rings experiment. 4 M
- (OR)
2. a) Discuss Fraunhofer diffraction due to single slit. Derive the conditions for central maximum, minima and secondary maxima of single slit diffraction pattern. From this, obtain intensity distribution curve. 8 M
- b) Distinguish between interference and diffraction. 4 M

UNIT-II

3. a) Explain different types of optical fibers. 6 M
- b) Discuss the various applications of optical fibers. 6 M
- (OR)
4. a) Discuss about acceptance angle and numerical aperture of an optical fiber. 7 M
- b) Calculate the refractive indices of core and cladding material of a fiber having numerical aperture 0.22 and fractional refractive index change 0.012. 5 M

UNIT-III

5. a) Derive Schrödinger time independent wave equation 7 M
- b) An electron is bound in one dimensional infinite well of width 1×10^{-10} m. Find the energy value of an electron in the ground state and first two excited states. (Ground state $n=1$, first and second excited states are $n=2$ and $n=3$) 5 M
- (OR)
6. a) Derive Schrödinger wave equation for an electron in one dimensional potential well and explain variation of its energy levels 8 M
- b) Describe Heisenberg's uncertainty principle 4 M

UNIT-IV

7. a) State and explain Maxwell's equations in integral form for electromagnetic fields. 8 M
- b) Deduce the relation between electric potential and electric field. 4 M
- (OR)
8. a) State and explain Faraday's law 6 M
- b) Explain Biot-Savart law. 6 M

UNIT-V

9. a) Explain Hall effect. Derive expression for Hall coefficient of p-type semiconductors. Discuss the applications of Hall effect. 8 M
- b) Derive the expression for intrinsic electrical conductivity. 4 M
- (OR)
10. a) Explain direct and indirect bandgap semiconductors. 8 M
- b) Explain the temperature dependence of Fermi level in p-type semiconductor 4 M

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a Write the necessary theory to determine the radius of curvature of lens using Newton's rings method. 10
b In Newton's rings experiment the diameter of 8th ring was found to be 0.350 cm and that of 18th ring 0.650 cm. If the wavelength of light 6000 Å is used then find the radius of curvature of the Plano-convex lens. 4

(OR)

2. a Distinguish between interference and diffraction. 4
b Discuss in detail Fraunhofer diffraction due to single slit with energy distribution Curve. 10

UNIT-II

3. a Explain the characteristics of laser beam. 4
b Explain the construction and working principle of He-Ne laser with a neat diagram. 10

(OR)

4. a Explain the principle of optical fibre with neat diagram. 6
b Derive an expression for acceptance angle and numerical aperture of optical fibre. 8

UNIT-III

5. a Write the properties of de-Broglie matter waves and Derive the expression for de-Broglie wave length 7
b Derive the Schrödinger time dependent wave equations. 7

(OR)

6. a Derive the Eigen values of free particle in one dimensional box. 10
b Calculate the de-Broglie wavelength of an electron moving with velocity 10^9 m/sec. ($m_e = 9.11 \times 10^{-31}$ Kg). 4

UNIT-IV

7. a Derive the relation between B, H, I and μ_r , χ 4
b Write the properties of dia, Para and Ferromagnetic materials. 10

(OR)

8. a Explain the hysteresis loop with neat graphical diagram, observed in ferromagnetic materials. 10
b Distinguish between Soft and Hard magnetic materials with neat diagram. 4

UNIT-V

9. a Explain Dielectrics in external field with neat diagram. 6
b Explain in detail, the phenomenon of ferroelectric hysteresis 8

(OR)

10. a Derive the relation between D, E and P 4
b Explain the electronic polarizability in atoms and Obtain an expression for electronic polarizability in terms of radius of the atom. 10

AR16

CODE: 16BS1004

SET-I

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

I B.Tech II Semester Supplementary Examinations, August-2022

**ENGINEERING CHEMISTRY
(Common to CE, ME, CSE & IT)**

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a Discuss various types of polymerization with suitable examples 6M
b Define polymer, monomer, degree of polymerization and functionality. 8M
- (OR)
2. a With suitable chemical reactions explain setting and hardening of cement. 6M
b Explain various chemical constituents of Portland cement. Write their functions. 8M

UNIT-II

3. a Describe the estimation of total hardness of water by EDTA method 8M
b With a neat sketch discuss zeolite process 6M
- (OR)
4. a What are various disinfection methods of water? Explain any two methods. 7M
b Discuss anyone method of desalination of brackish water. 7M

UNIT-III

5. a How proper design of machine can control corrosion? Explain. 6M
b Explain the mechanism of electrochemical corrosion. 8M
- (OR)
6. a Discuss various cathodic protection methods for corrosion control. 8M
b Explain (i) galvanic corrosion (ii) pitting corrosion 6M

UNIT-IV

7. a Define and explain octane and cetane number. Write their significance. 8M
b Explain the preparation of synthetic petrol by Bergius process 6M
- (OR)
8. a Define lubricant. Explain its functions. 6M
b Define flash point, fire point, cloud point and pour point 8M

UNIT-V

9. a Derive Nernst equation for single electrode potential 6M
b Explain construction and working of photovoltaic cell. 8M
- (OR)
10. a What is electrochemical series? Write its significance. 8M
b Describe the construction, working and applications of calomel electrode 6M