

SC 105 – APPLIED SCIENCE

Course Title	Applied Science	Course Code	SC105
Year	I Year	Course Group	Basic Science
Teaching Scheme in Periods (L:T:P)	120:30:0	Credits	3.0
Methodology	Lecture+ Tutorial	Total Contact Periods	150
CIE	60 Marks	Year End Examination (YEE)	40 Marks

SECTION-I SC 105 – PHYSICS

Pre requisites

This course requires the basic knowledge of Science and Mathematics.

Course Outcomes

Upon completion of the course, the student shall be able to

CO1	Apply the concepts of units, dimensions, vectors and properties of matter to solve basic engineering problems.
CO2	Utilize the principles of thermal expansion to solve basic engineering problems and extend the formulation of Simple Harmonic Motion to oscillating bodies.
CO3	Apply the principles of electricity, magnetism and concepts of modern Physics to solve numerical problems in basic engineering applications.

CO – PO Mapping Matrix

Course Outcome/ Programme Outcome	Basic and Discipline Specific Knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation and Testing	Engineering Practices for Society, Sustainability and Environment	Project Management	Lifelong Learning	Linked PO
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	
CO 1	3	1	-	-	-	-	2	1,2,7
CO 2	3	-	-	1	-	-	2	1,4,7
CO 3	3	1	-	1	-	-	2	1,2,4,7
	3	1	-	1	-	-	2	1,2,4,7

Correlation Scale: 1 - Low 2 – Medium 3 - High

COURSE CONTENTS

Unit 1 Mechanics

Duration: 25 periods (L:20 – T:5)

Physical quantity, Fundamental and derived quantities, unit- definitions- SI units - Dimensions and dimensional formula, units and dimensional formulae for physical quantities, Principle of homogeneity –numerical problems, Applications of dimensional analysis, Limitations of dimensional analysis

Scalar and Vector quantities – definition and examples, Resolution of a vector-numerical problems, Parallelogram law of vectors – statement- expression for magnitude and direction of resultant vector –derivation, Representation of a vector in unit vectors $\hat{i}, \hat{j}$ and $\hat{k}$, Scalar product of two vectors- Numerical problems, Vector product of two vectors -numerical problems.

Projectile motion of body- examples, Oblique projection-expression for path of a projectile-derivation-Maximum height, Time of ascent, Time of descent, Time of flight, Horizontal range of a projectile in oblique projection - related numerical problems.

Friction – causes-types- Normal reaction, angle of repose and coefficient of friction- laws of static friction, expression for acceleration of a body on a rough horizontal surface- advantages and disadvantages - methods of minimizing friction.

Elasticity and elastic bodies-definition- examples, Stress and Strain-expressions-numerical problems, types of stress and strain, Elastic limit-definition, Hooke's law, Young's modulus of a wire –numerical problems, Surface tension- explanation and illustrations, capillarity and angle of contact-definitions, Viscosity-explanation- Newton's formula for viscous force-derivation-coefficient of viscosity-numerical problems- Poiseuille's equation for coefficient of viscosity-related numerical problems.

Unit 2 Energy Sources, Thermal Physics and Waves

Duration: 25 periods (L:20 – T:5)

Work, Power and Energy-explanation-numerical problems, Potential energy and Kinetic energy-explanation- examples, expressions for Potential energy and Kinetic energy and related numerical problems, law of conservation of energy-statement-examples- Non-renewable and Renewable energy sources-explanation- sources.

Thermal expansion of solids and three coefficients of expansion of solids, thermal conductivity of a solid – expression, principle of bimetallic strip, bimetallic thermostat, Boyle's law in gases – explanation- its limitations-related numerical problems, concept of Absolute Zero, Absolute scale of temperature, Charles' laws in gases in terms of absolute temperature – related numerical problems, Ideal gas equation-derivation- related numerical problems - Isothermal and Adiabatic processes, expression for work done by the gas –derivation- related numerical problems, 1st law of thermodynamics-explanation-applications, 2nd law of thermodynamics –explanation- list of applications.

Simple Harmonic Motion (SHM) – examples of SHM, time period, frequency, amplitude and phase of a particle in SHM-definitions, expressions for Displacement, Velocity, Acceleration, Time period and Frequency of a particle executing in SHM – numerical problems, Ideal simple pendulum-definition, expression for time period of simple pendulum-derivation- numerical problems.

Wave-definition-characteristics, longitudinal and transverse waves –explanation- examples – Audible range, infrasonic and ultrasonic waves, expression relating wave velocity, frequency and wavelength-derivation- numerical problems, echo –explanation- time of echo from a distant obstacle-derivation- numerical problems-applications of echo, Reverberation, reverberation time and Sabine's formula, free and forced vibrations, and resonance –examples, noise pollution-causes, effects and methods to minimize noise pollution.

Unit 3 Electricity, Magnetism and Modern Physics

Duration: 25 periods (L:20 – T:5)

Electric current and potential difference-summarize, Ohm's law-explanation-numerical problems, specific resistance-explanation-numerical problems, conductivity and conductance-definitions, combination of resistors in electric circuit –formula for series and parallel combination-related numerical problems, Kirchhoff's laws in electricity –explanation- numerical problems

Magnetic pole, pole strength, magnetic length of a bar magnet, Magnetic field, magnetic lines of force and magnetic induction, properties of magnetic lines of force, uniform and non uniform magnetic fields, magnetic flux, types of magnetic materials. Coulomb's inverse square law of magnetism-explanation-numerical problems, expression for moment of couple on a bar magnet placed in a uniform magnetic field- derivation- numerical problems, Photo electric effect-explanation-Einstein's photo electric equation, work function and threshold frequency, laws of photo electric effect, working of photocell, applications of photocell, LASER-definition, concept of energy levels, Spontaneous emission, Stimulated emission, population inversion and optical pumping, principle and working-characteristics of LASER, applications of LASER, critical angle and total internal reflection of light, principle and working of Optical fiber, applications of optical fiber, Nano scale and properties of nano materials-types of nanomaterials - applications.

Reference Books

1. Principles of Physics by N. Subrahmanyam and Brijlal, S. Chand & Co, New Delhi, edition, 1982
2. Engineering. Physics by R.K. Gaur, S.L. Gupta, Dhanpatrai Publications, New Delhi.
3. Intermediate Physics, Vol. I & II, Telugu Academy, TS, Hyderabad.
4. Fundamentals of Physics by Halliday and Resnick.
5. Physics Part-I & II, NCERT

E-learning resources

Hyper Physics website: <http://hyperphysics.phy-astr.gsu.edu/>

Learning Outcomes

Upon completion of this course the student will be able to

CO1: Apply the concepts of units, dimensions, vectors and properties of matter to solve basic engineering problems.

- 1.1 Define Physical quantity, Fundamental quantity, derived physical quantity and Unit.
- 1.2 List SI units of fundamental quantities with their symbols.
- 1.3 Define Dimensions and Dimensional formula of a physical quantity.
- 1.4 List SI units and dimensional formulae of physical quantities (Area, Volume, Density, Velocity, Acceleration, Momentum, Impulse, Force, Work, Energy, Power, Pressure, Stress, Modulus of Elasticity, Angular velocity, Torque, Frequency, Surface Tension, Coefficient of viscosity, Universal Gravitational constant, Wavelength)
- 1.5 Explain principle of homogeneity of dimensions and solve related numerical problems (finding dimensions of terms in an equation).
- 1.6 List applications of dimensional analysis.
- 1.7 List the limitations of dimensional analysis.

- 1.8 Define Scalar and Vector quantities with examples.
- 1.9 Explain resolution of a Vector into two orthogonal components and solve related numerical problems.
- 1.10 Explain Parallelogram law of vectors and develop expressions for magnitude and direction of resultant of two vectors and solve related numerical problems.
- 1.11 Represent a vector in terms of unit vectors ($\hat{i}, \hat{j}, \hat{k}$) (no explanation).
- 1.12 Explain Scalar product of vectors and solve numerical problems.
- 1.13 Explain vector product of vectors and solve related numerical problems.
- 1.14 Explain projectile motion of a body with examples and develop the expression for path of a projectile in oblique projection.
- 1.15 Develop formulae for Maximum height, Time of ascent, Time of descent, Time of flight and Horizontal range of a projectile in oblique projection and solve related numerical problems.
- 1.16 Explain friction and causes of friction.
- 1.17 Classify types of friction.
- 1.18 Explain the concept of Normal reaction, Angle of repose and Coefficient of friction.
- 1.19 Outline the laws of Static friction.
- 1.20 Develop the expression for acceleration of a body on a rough horizontal surface and solve simple numerical problems on $a = -\mu g$
- 1.21 Outline the advantages and disadvantages of friction.
- 1.22 Identify the methods of minimizing friction.
- 1.23 Define Elasticity and elastic bodies with examples.
- 1.24 Explain Stress and Strain with their expressions and solve related numerical problems.
- 1.25 Explain types of stress and strain (longitudinal, shear and bulk).
- 1.26 Define Elastic limit and explain Hooke's law.
- 1.27 Develop formula for Young's modulus of a wire having circular cross-sectional area and solve related numerical problems.
- 1.28 Explain Surface tension and illustrate Surface tension with examples.
- 1.29 Explain capillarity and angle of contact.
- 1.30 Explain Viscosity and develop Newton's formula for viscous force and explain coefficient of viscosity.
- 1.31 Outline Poiseuille's equation for coefficient of viscosity.

CO2: Utilize the principles of thermal expansion to solve basic engineering problems and extend the formulation of Simple Harmonic Motion to oscillating bodies.

- 2.1 Explain the concept of Work, Power and Energy and solve related numerical problems.
- 2.2 Explain Potential energy and Kinetic energy with examples.
- 2.3 Develop expressions for Potential energy and Kinetic energy and solve related numerical problems.
- 2.4 Explain law of conservation of energy with examples.
- 2.5 Explain Non-renewable and Renewable energy sources and list the sources.
- 2.6 Explain thermal expansion of solids and outline three coefficients of expansion of solids.

- 2.7 Explain thermal conductivity of a solid and develop the expression for it
 $Q = [KA (\theta_1 - \theta_2) t] / L$.
- 2.8 Explain principle of bimetallic strip and construct bimetallic thermostat as an automatic temperature control device in electrical gadgets.
- 2.9 Explain Boyle's law in gases and its limitations and solve related numerical problems.
- 2.10 Explain concept of Absolute Zero and Absolute temperature scale.
- 2.11 Explain Charles' laws in gases in terms of absolute temperature and solve related numerical problems.
- 2.12 Develop Ideal gas equation and solve related numerical problems.
- 2.13 Explain Isothermal and Adiabatic processes.
- 2.14 Develop the expression for work done by the gas [$W = P(V_2 - V_1)$] and solve related numerical problems.
- 2.15 Explain first law of thermodynamics and list applications of it and solve related numerical problems.
- 2.16 Explain second law of thermodynamics and list applications of it.
- 2.17 Explain Simple Harmonic Motion (SHM).
- 2.18 List the examples of SHM.
- 2.19 Define the terms time period, frequency, amplitude and phase of a particle in SHM.
- 2.20 Develop the expressions for Displacement, Velocity, Acceleration, Time period and Frequency of a particle executing in SHM and solve numerical problems.
- 2.21 Define Ideal simple pendulum and develop the expression for time period of a simple pendulum and solve numerical problems.
- 2.22 Define wave and outline its characteristics.
- 2.23 Explain longitudinal and transverse waves with examples.
- 2.24 Explain audible range, infrasonic and ultrasonic waves.
- 2.25 Develop the expression relating wave velocity, frequency and wavelength ($v = n\lambda$) and solve numerical problems
- 2.26 Explain echo and develop the formula for time of echo from a distant obstacle and solve numerical problems.
- 2.27 List the applications of echo.
- 2.28 Explain Reverberation, reverberation time and outline Sabine's formula.
- 2.29 Explain free vibrations, forced vibrations and resonance with examples.
- 2.30 Explain noise pollution and identify the causes, effects and methods to minimize noise pollution.

CO3: Apply the principles of electricity, magnetism and concepts of modern Physics to solve numerical problems in basic engineering applications.

- 3.1 Summarize electric current and potential difference.
- 3.2 Explain Ohm's law and solve numerical problems.
- 3.3 Explain specific resistance ($\rho = \frac{RA}{l}$) and solve related numerical problems.
- 3.4 Define conductivity and conductance.
- 3.5 Explain combination of resistors in electric circuit and develop formulae for equivalent resistance in series and parallel connection and solve related numerical problems.
- 3.6 Explain Kirchhoff's laws in electricity and solve numerical problems.

- 3.7 Explain magnetic pole, pole strength and magnetic length of a bar magnet.
- 3.8 Explain magnetic field, magnetic lines of force and magnetic induction.
- 3.9 List properties of magnetic lines of force.
- 3.10 Explain uniform and non uniform magnetic fields.
- 3.11 Define magnetic flux.
- 3.12 Explain types of magnetic materials (dia, para and ferro magnetic materials) based on magnetic properties.
- 3.13 Explain Coulomb's inverse square law of magnetism and solve numerical problems.
- 3.14 Develop expression for moment of couple on a bar magnet placed in a uniform magnetic field ($C = MB \sin\theta$) and solve numerical problems.
- 3.15 Explain Photo electric effect.
- 3.16 Outline Einstein's photo electric equation; explain work function and threshold frequency and solve numerical problems.
- 3.17 Outline the laws of photo electric effect.
- 3.18 Construct photocell and explain its working.
- 3.19 Identify applications of photocell.
- 3.20 Concept of energy levels (Ground state, excited state and Meta stable state).
- 3.21 Explain Spontaneous emission, Stimulated emission, population inversion, optical pumping and the principle and working of LASER
- 3.22 List the characteristics of LASER.
- 3.23 Identify applications of LASER.
- 3.24 Explain critical angle and total internal reflection of light.
- 3.25 Make use of optical properties to explain working of Optical fiber.
- 3.26 Identify applications of optical fiber.
- 3.27 Explain Nano scale and identify properties at Nano scale.
- 3.28 Classify Nano materials (zero, one, two and three dimensional).
- 3.29 Identify applications of Nano materials.

SECTION-II

SC 105-CHEMISTRY

Pre requisites

Basic knowledge of Chemistry in secondary education.

Course Objectives

After studying this course the student will be able to understand and appreciate the role of chemistry and environmental studies in different spheres of industries.

Course Outcomes

On successful completion of the course, the students will have ability to attain following Course Outcomes (CO):

CO1	Understand fundamental chemical concepts and use problem-solving skills to engineering applications, utilizing metallurgical processes for metal extraction and alloy production, and implementing corrosion control methods for metal protection.
CO2	Understand the preparation and applications of engineering materials, and apply electrochemical principles in chemical preparation, electroplating, refining, and battery construction.
CO3	Understand the different segments of environment, biodiversity, pollution impacts, sustainable practices, and apply water quality analysis and treatment methods to address domestic and industrial needs.

CO-PO-Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	-	-	1	-	2
CO2	3	1	-	-	1	-	2
CO3	3	1	-	-	3	-	3

Correlation Scale: 1 - Low 2 – Medium 3 - High

COURSE CONTENTS

Unit1: Fundamentals of Chemistry, Metallurgy and Corrosion

Duration: 25 periods (L: 20 – T: 5)

Atomic structure - atomic number – Mass number- Orbitals - Shapes of s, p and d orbitals – Aufbau principle-Hund's rule, Pauli's exclusion principle-Electronic configuration of elements, Chemical bonding–Ionic bond, Covalent bond - Properties of ionic and covalent compounds.

Oxidation-Reduction: Electronic concept of Oxidation, Reduction and Redox reaction.

Solutions –Atomic weight - Molecular weight, Equivalent weight - Mole concept – Molarity– Normality- Numerical problems on mole, molarity and normality – Ionic product of water-pH and related numerical problems- Buffer solutions - Applications of buffer solutions

Metallurgy -Characteristics of metals - Mineral, Ore, Gangue, Flux, Slag -Concentration of ore - Roasting, Calcination, Smelting-Extraction of aluminium–Alloys-Purpose of making alloys–Composition and uses of Brass, Nichrome and Duralumin.

Corrosion - Factors influencing the rate of corrosion – Electrochemical theory of corrosion – Composition cell, Stress cell and Concentration cell - Rusting of iron and its mechanism - Prevention of corrosion – Protective coatings - Cathodic protection.

Unit2: Engineering Materials and Electro Chemistry

Duration: 25 periods (L: 20 – T: 5)

Polymers - Polymerization - Types of polymerization – Addition polymerization, Condensation polymerization - Plastics - Advantages of plastics over traditional materials – Disadvantages of using plastics- Types of plastics - Preparation and uses of the following plastics: 1. Polythene 2. PVC 3.Urea formaldehyde resin4.Bakelite-Natural rubber– Vulcanization of natural rubber – Elastomers – Preparation and uses of Buna-s, Neoprene rubber - Biodegradable polymers - Advantages of biodegradable polymer

Lubricants–Classification and functions of lubricants.

Fuels- Definition and classification of fuels - Calorific value - Advantages of Gaseous fuel– Composition and uses of gaseous fuels - a) CNG b) LPG c) Producer gas.

Electrochemistry - Conductor, insulator, electrolyte–Electrolysis – Electrolysis of fused

NaCl - Applications of electrolysis - Faraday's laws of electrolysis - Numerical problems.

Galvanic cell – Standard electrode potential – Electrochemical series–EMF of cell –Batteries - Types of batteries – Leclanche' cell, Lithium –ion Battery – H₂-O₂ Fuel cell.

Unit 3: Environmental Studies and Water Technology

Duration: 25 periods (L: 20 – T: 5)

Environmental studies- introduction – Environment – Segments of environment-Important terms-Biodiversity, definition, threats to Biodiversity -e-waste –Management of e-waste. Air pollution-Causes, effects, and controlling methods – Water pollution – Causes, effects, controlling methods– Carbon credit and carbon trading - Sustainable development

Water Technology-Introduction - Soft and hard water - Causes of hardness –Types of hardness - Disadvantages of hard water using in industries-Degree of hardness-Softening methods- Permutit process, Ion exchange process–Osmosis-Reverse Osmosis-Advantages of Reverse osmosis–Desalination by electro dialysis -Drinking water - Municipal treatment of water for drinking purpose.

Reference Books

1. Engineering chemistry–Jain & Jain–Dhanpat Rai Publishing Company.
2. A Text book of Engineering Chemistry–S.S. Dara –S. Chand Publications.
3. Environmental Studies–A. K. De.
4. Environmental Studies,R.Rajagopalan,2ndEdition,2011,OxfordUniversityPress
5. Intermediate Chemistry I and II–Telugu Academy TS
6. Engineeringchemistry–
PrasantaRath,B.Ramadevi,Ch.VenkataramanaReddy&SubhenduChakroborty–
CENGAGE

E-learningresources

<https://iupac.org>,<https://www.khanacademy.org>,www.nptel.ac.in.

Learning Outcomes

Upon completion of this course the student will be able to

CO1: Understand fundamental chemical concepts and use problem-solving skills to engineering applications, utilizing metallurgical processes for metal extraction and alloy production, and implementing corrosion control methods for metal protection.

- 1.1 Define and explain atomic number and mass number.
- 1.2 Define an orbital and explain the shapes of s, p and d orbitals.
- 1.3 Define electronic configuration and apply Aufbau principle, Hund's rule, and Pauli's exclusion principle in writing electronic configuration of elements up to atomic number 30.
- 1.4 Define chemical bond.
- 1.5 Define ionic bond and explain the ionic bond formation in NaCl.
- 1.6 Define and explain the covalent bond formation in homo atomic molecules: H_2 , O_2 , N_2
- 1.7 Compare the properties of ionic compounds and covalent compounds
- 1.8 Define and explain the electronic concept of oxidation, reduction and redox reaction.
- 1.9 Define the terms: solution, solute and solvent with examples.
- 1.10 Define atomic weight, molecular weight and equivalent weight
- 1.11 Find the molecular weight and the equivalent weight of acids, bases and salts
- 1.12 Explain mole concept and solve the numerical problems on mole concept.
- 1.13 Define and explain molarity and normality.
- 1.14 Solve numerical problems on molarity and normality.
- 1.15 Define and explain the ionic product of water and solve numerical problems.
- 1.16 Define pH and solve numerical problems on pH.
- 1.17 Define buffer solution and explain the general applications of buffer solutions.
- 1.18 List the characteristics of metals.
- 1.19 Define and explain the terms 1. Mineral 2. Ore 3. Gangue, 4. Flux and 5. Slag-with examples
- 1.20 Methods for the concentration of ore i) Froth floatation and ii) Electromagnetic separation
- 1.21 Explain the roasting, calcinations and smelting processes with examples.
- 1.22 Extraction of aluminum from bauxite (Flowchart only).
- 1.23 Define an alloy and explain the purpose of making alloys.
- 1.24 Explain the composition and uses of the following alloys i) Brass ii) Nichrome and iii) Duralumin
- 1.25 Define corrosion
- 1.26 Explain the factors influencing the rate of corrosion based on i) Nature of metal and

- ii) Environment of metal.
- 1.27 Explain the electrochemical theory of corrosion.
- 1.28 Explain the formation of a) Composition cell b) Stress cell and c) Concentration cell.
- 1.29 Define rust and explain the mechanism of rusting of iron with chemical equations.
- 1.30 Explain the following methods of prevention of corrosion:
 - a) Protective coatings i) Metallic coatings (anodic and cathodic coatings)
 - ii) Inorganic coatings and iii) Organic coatings
 - b) Cathodic protection i) Sacrificial anode method and ii) Impressed voltage method

CO2: Understand the preparation and applications of engineering materials, and apply electrochemical principles in chemical preparation, electroplating, refining, and battery construction.

- 2.1 Define polymer and polymerization
- 2.2 Explain addition polymerization and condensation polymerization with examples.
- 2.3 Define the term plastic
- 2.4 Summarize the advantages of plastics over traditional materials
- 2.5 Explain the disadvantages of using plastics on environment.
- 2.6 Explain the types of plastics (thermoplastics and thermosetting plastics) with examples.
- 2.7 Identify the differences between thermo plastics and thermosetting plastics
- 2.8 Explain a preparation method and uses of the following plastics: a) Polythene, b) Poly Vinyl chloride, Urea formaldehyde resin and d) Bakelite (flow chart for Bakelite i.e. Without chemical equations).
- 2.9 Define the term natural rubber
- 2.10 Explain the processing of natural rubber from latex.
- 2.11 Write the chemical structure of natural rubber.
- 2.12 Explain the process of vulcanization of natural rubber with chemical equations.
- 2.13 Compare the characteristics of natural rubber and vulcanized rubber
- 2.14 Define the term elastomer.
- 2.15 Explain the preparation and uses of the following elastomers- a) Buna-S b) Neoprene rubber.
- 2.16 Define bio degradable polymer and mention the advantage of biodegradable polymers.
- 2.17 Define and classify the lubricants based on physical state.
- 2.18 Explain the functions of lubricants
- 2.19 Define fuel and classify the fuels based on the occurrence and physical state with examples.
- 2.20 Define calorific value
- 2.21 Explain the advantages of gaseous fuels
- 2.22 Explain the chemical composition and uses of a) CNG b) LPG and c) Producer gas
- 2.23 Define the terms– a) conductor b) insulator c) electrolyte and d) non-electrolyte.
- 2.24 Define electrolysis.
- 2.25 Explain the electrolysis of fused NaCl.
- 2.26 Explain the applications of electrolysis a) Electrolytic refining of copper and b)

- Electro plating.
- 2.27 State and explain Faraday's laws of electrolysis
- 2.28 Define chemical equivalent, electro chemical equivalent and find the relationship between them
- 2.29 Numerical problems based on Faraday's first law and second law of electrolysis.
- 2.30 Define galvanic cell.
- 2.31 Explain the construction and working of Daniel cell.
- 2.32 Distinguish between electrolytic cell and galvanic cell.
- 2.33 Explain electrode potential, oxidation potential, reduction potential and standard Electrode potential.
- 2.34 Define electrochemical series and explain its significance.
- 2.35 Define and explain the EMF of galvanic cell and solve the numerical problems.
- 2.36 Define battery and state the types of batteries (primary and secondary battery) with examples.
- 2.37 Explain the construction, working and applications of Dry cell (Leclanche' cell) and Lithium-ion Battery
- 2.38 Explain the construction, working and advantages of Hydrogen-Oxygen fuel cell

CO3: Understand the different segments of environment, biodiversity, pollution impacts, sustainable practices, and apply water quality analysis and treatment methods to address domestic and industrial needs.

- 3.1 Define and explain different segments of environment: i) Atmosphere, ii) Hydrosphere, iii) Lithosphere and iv) Biosphere
- 3.2 Define the terms: i) Pollutant, ii) Contaminant iii) Pollution, iv) Receptor v) Particulates.
- 3.3 Define biodiversity and explain the threats to biodiversity
- 3.4 Explain the methods of conservation of biodiversity
- 3.5 Define e-waste and explain the sources of e-Waste
- 3.6 Explain the effect of e-waste on environment and human beings
- 3.7 Explain the management of e-waste-a) Land filling, b) Incineration and c) Recycling.
- 3.8 Define air pollution
- 3.9 Explain the causes of air pollution
- 3.10 Explain the effects of air pollution on human beings.
- 3.11 Explain greenhouse effect, its consequences and control methods
- 3.12 Explain acid rain, its consequences and control methods
- 3.13 Explain ozone layer depletion, its consequences and control methods
- 3.14 Explain the controlling methods of air pollution
- 3.15 Define water pollution
- 3.16 Explain the causes of water pollution
- 3.17 Explain the effects of water pollution on living and non-living things
- 3.18 Explain the control methods of water pollution.
- 3.19 Understand the concept of carbon credits and carbon trading (elementary level)

only)

- 3.20 Understand the advantages and disadvantages of carbon trading
- 3.21 Sustainable development a) Environmental sustainability b) Social sustainability c) Economic sustainability
- 3.22 Define the terms soft water and hard water.
- 3.23 Define hardness of water and name the salts responsible for hardness.
- 3.24 Define and explain the types of hardness of water—temporary and permanent hardness
- 3.25 Identify the disadvantages of using hard water in industries i) Paper industry, ii) Sugar industry iii) Pharmaceutical industry and iv) Boilers
- 3.26 Define degree of hardness of water and its units—ppm, mg/L
- 3.27 Solve the numerical problems on degree of hardness of water.
- 3.28 Removal of total hardness by i) Permutit process and ii) Ion exchange process.
- 3.29 Define osmosis and reverse osmosis (RO).
- 3.30 List the applications and advantages of reverse osmosis.
- 3.31 Define and explain the desalination of sea water by electro dialysis process.
- 3.32 List the essential qualities of drinking water.
- 3.33 Explain the method of municipal treatment of water for drinking purpose with diagram.
 - a) Sedimentation and coagulation b) filtration, c) sterilization by bleaching powder and ozonization

Course Content and Blue Print of Marks for MID Examinations & Year End Examination (YEE)

MID–I EXAM

S.No	Unit Name	R	U	A	Remarks
Section I-Physics					
1	Unit-I	1, 2	3(a) 3(b)	4(a) 4(b)	
Total Questions		2	2	2	
Section II- Chemistry					
2	Unit-I	1, 2	3(a) 3(b)	4(a) 4(b)	
Total Questions		2	2	2	
MID–II EXAM					
S.No	Unit Name	R	U	A	Remarks
Section I-Physics					
1	Unit-II	1, 2	3(a) 3(b)	4(a) 4(b)	
Total Questions		2	2	2	
Section II- Chemistry					
2	Unit-II	1, 2	3(a) 3(b)	4(a) 4(b)	
Total Questions		2	2	2	

Year End Examination

S.No	Unit Name	R	U	A	Remarks
Section I-Physics					
1	Unit-I or II	1	5(a)	7(a)	
2	Unit-III	2,3,4	5(b), 6(a), 6(b)	7(b), 8(a), 8(b)	
Total Questions		4	4	4	
Section II- Chemistry					
1	Unit-I or II	1	5(a)	7(a)	
2	Unit-III	2,3,4	5(b), 6(a), 6(b)	7(b), 8(a), 8(b)	
Total Questions		4	4	4	

DIPLOMA EXAMINATION (C 26)
MID 1 EXAMINATION
SC 105 Applied Science
Model Question paper

Duration: 1hour

Max. Marks: 20

SECTION – I (PHYSICS)

PART-A

Instructions: 1. Answer **ALL** questions.

2. Each question carries **ONE** mark.

2 X 1 = 2

1. Define fundamental physical quantity.
2. Define angle of contact.

PART-B

Instructions: 1. Answer **ALL** questions.

2. Each question carries **THREE** marks.

1 X 3 = 3

- 3 (a). The displacement of a particle moving along x-axis with respect to time is $x=at+bt^2-ct^3$.
Find the dimensional formulae of a, b and c.

(OR)

- 3(b). A ball is kicked into air with velocity of 20 ms^{-1} at an angle 30° with the Earth's surface.
Find maximum height reached by the ball. (Take $g = 10 \text{ ms}^{-2}$)

PART-C

Instructions: 1. Answer **ALL** questions.

2. Each question carries **FIVE** marks.

1 X 5 = 5

- 4(a). Develop expressions for magnitude and direction of resultant of two vectors using parallelogram law of vectors.

(OR)

- 4(b). Develop Newton's formula for viscous force and explain coefficient of viscosity.

SECTION-II

(CHEMISTRY)

PART-A

Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark. 2X1 =2

1. Define orbital.
2. Mention any two factors influencing rate of corrosion.

PART-B

Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks. 1X3 =3

- 3 (a) State and explain Aufbau principle.
(OR)
3(b) Define flux. Write about the two types of fluxes

PART-C

Instructions: 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks. 1X5 =5

- 4(a) Define ionic bond and explain the chemical bond formation in NaCl
(OR)

- 4(b) Explain sacrificial anode method of prevention of corrosion.

DIPLOMA EXAMINATION (C 26)
MID 2 EXAMINATION
SC 105 Applied Science
Model Question paper

Duration: 1 hour

Max. Marks: 20

SECTION – I (PHYSICS)

PART-A

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.

2 X 1 = 2

1. What is kinetic energy?
2. Define reverberation.

PART-B

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

1 X 3 = 3

- 3(a). Find the power of a machine gun if it fires 120 bullets per minute. The bullet travels with a velocity of 200 m/s and mass of each bullet is 20 grams.

(OR)

- 3(b). The acceleration of a particle in S.H.M. is 0.09 ms^{-2} when its displacement is 0.25 m. Find the period of oscillation.

PART-C

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.

1 X 5 = 5

- 4(a). Develop the relation between Pressure, Volume and Temperature of an ideal gas.

(OR)

- 4(b). List five methods to minimize noise pollution..

SECTION-II (CHEMISTRY)

PART-A

Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark. 2 x 1 = 2

1. Define lubricant.
2. What are thermo plastics?

PART-B

Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks. 1X3 =3

3(a) Explain the chemical composition and uses of CNG and LPG.

(OR)

3(b) What is anode and cathode in dry cell? Write the chemical reactions that takes place at two electrodes.

PART-C

Instructions: 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks. 1X5 =5

4(a) Explain the preparation and uses of i) urea formaldehyde resin and ii) polyvinyl chloride.

(OR)

4(b) What is emf? Calculate the e.m.f. of the cell $\text{Ca} / \text{Ca}^{2+} // \text{Pb}^{2+} / \text{Pb}$. The standard reduction potential values of calcium and lead electrodes are -2.9 V and -0.12 V respectively.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA EXAMINATION (C 26)
YEAR END EXAMINATION
SC 105 Applied Science
Model Question paper

Duration: 2 hours

Max. Marks: 40

SECTION – I (PHYSICS)

PART – A

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.

4X 1 = 4

1. Name the dimensional formula of power.
2. Define magnetic field.
3. Define conductivity.
4. What is photo electric effect?

PART – B

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

2X 3 = 6

- 5 (a). If $\vec{A} = \hat{i} + 2\hat{j} + n\hat{k}$ and $\vec{B} = 4\hat{i} + 3\hat{j} - 2\hat{k}$ are perpendicular vectors then find the value of n.

(OR)

- 5(b) Explain Coulomb's inverse square law of magnetism.

- 6(a) Develop the formula for equivalent resistance of resistors connected in series in electric circuit.

(OR)

- 6(b) Outline Einstein's Photoelectric equation.

PART – C

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.

2 X 5 = 10

- 7(a). Develop expressions for magnitude and direction of resultant of two vectors using parallelogram law of vectors.

(OR)

- 7(b). Explain Kirchhoff's laws in electricity.

- 8(a). Explain the working of optical fibre.

(OR)

- 8(b). Explain principle and working of a LASER.

**SECTION-II
(CHEMISTRY)**

PART – A

Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.

4X1 =4

1. Define polymer.
2. Define hydrosphere.
3. What is carbon trading?
4. List the chemicals that cause temporary hardness

PART-B

Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

2X3 =6

- 5(a). Explain the anomalous electronic configurations of chromium and copper.

(OR)

- 5(b) Define osmosis and reverse osmosis. Give examples.

- 6(a) Write any three disadvantages of using hard water in industries.

(OR)

- 6(b) Explain the reasons for greenhouse effect, its consequences and controlling methods

.PART-C

Instructions: 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.

2X5 =10

- 7 (a) Calculate the weight of copper deposited when 2 amperes of electric current is passed for two hours through CuSO_4 solution. (Atomic weight of Cu is 63.5)

(OR)

- 7(b) Explain the process of removal of hardness of water by ion exchange process.

- 8(a) Identify any five controlling methods of air pollution and explain.

(OR)

- 8(b) Select and explain any three management methods of e-waste.