

CONTENTS

CHAPTER 1

Quantities, Units and Measurement
What is physics?
Matter
Principle of conservation of energy
Measurements in physics
Basic(fundamental) units and derived units
Multiples and sub-multiples of units
Dimensional analysis
Uncertainties in measurement
Measurement of length
Metre rule
The venier calipers
The micrometre screw gauge
Measurement of mass and weight
Mass
The chemical or beam balance
The lever balance
Weight
Reasons why weight varies on the earth surface
Measurement of time
Frequency and period of oscillation
Time measuring devices
The ticker timer
Measurement of volume
Measurement of volume of liquids
Measurement of density
Difference between density and relative density
Measurement of relative density of insoluble particles

CHAPTER 2

Motion
Type of motion
Linear motion
Scalars and vectors

Distance and displacement
Speed and velocity
Types of speed
Velocity
Acceleration
Positive and negative acceleration
Uniform and non-uniform acceleration
Displacement time graph
Velocity-time graph

CHAPTER 3

Force and Motion
What is a force?
Effects of forces
Types of forces
Force field
Contact or mechanical forces
Friction
Types of friction
Static friction:
Kinetic or dynamic friction
Nature and laws of friction
Coefficient of friction (μ)
Determination of coefficient of static friction
Friction on inclined plane
The laws of solid friction
Disadvantages of friction
Methods (ways) of reducing friction
Advantages of friction

CHAPTER 4

Uniform circular motion
Centripetal acceleration
Centripetal force
Centrifugal force
Motion in a vertical circle
Application of centripetal and centrifugal forces
Angular motion

CHAPTER 5

Work, energy, and power
The concept of work

Work done by inclined forces
Work done against friction
Force-displacement graph
Energy
Mechanical energy
Gravitational potential energy
Formula for kinetic energy
Energy transformation in a mechanical system
Energy transformation in a simple pendulum
Conservative force field
Power

CHAPTER 6

Heat and Temperature; Thermal expansion of solids and liquids
Heat
Kinetic theory explanation of heat
Temperature
Differences between heat and temperature
Thermometers
Construction of liquid-in-glass Thermometer
Expansion of Solids and Liquids
Evidence of expansion
Kinetic Theory Explanation of Expansion
Linear Expansion
Linear expansivity
Measurement of Linear expansivity of a solid
Superficial and Cubic Expansivity
Application of Expansion
Useful applications of expansion
Riveting
Fitting metal tyre to its wheel
Bimetallic strips
Electric thermostat
Gas thermostat
Cracking of a thick glass cup
Buckling of railway track
Expansion of liquids
Proof that liquids expand
Cubic (volume) expansivity of a liquid
Experimental determination of apparent cubic expansivity of a liquid
The peculiar expansion of water
Reason why water freezes from the top

CHAPTER 7

Change of state

Change of state by heating or cooling

How to find the melting point of a substance

Cooling curve naphthalene

Explaining melting using kinetic theory

Evaporation and vaporization

Explaining evaporation using kinetic theory

Factors that affect evaporation

Vaporization

CHAPTER 8

Transmission of Heat

Conduction

Using kinetic theory to explain heat transfer by conduction

Thermal conductivity

Comparing thermal conductivity of different solids

Water as bad conductor of heat

Air as bad conductor of heat

Uses of good and bad conductors of heat

Convection

Convection in gases

Applications of convection

Land and sea breezes

The car radiator

Convective heater

The domestic water supply

Refrigerator

House ventilation

Radiation

Detection of radiation

Good and bad radiators

Good and bad absorbers of radiation

The law of radiation

Uses of radiation

Infrared radiation

Other uses of radiation

CHAPTER 9

Description and properties of fields

What is a field?

Type of fields

Gravitational field
Gravitational field line and strength
Acceleration due to gravity
The effect air resistance
Measurement of acceleration due to gravity
Magnetic field
Plotting a magnetic field
Magnetic field line
Magnetic flux and magnetic flux density
Characteristics of magnetic field lines
Magnetic field pattern
Horseshoe magnets
Electric field line
Electric field pattern
Direction and strength of electric field

CHAPTER 10

Electric charge
Application of electric charge
Atom is the source of electric charge
Charging objects
Static electricity
The laws of electric charges
Conductors and insulators
The electroscope
Description of electroscope
Detection of charges
Determining the nature of a charge
Difference between conductors and insulators
Electrostatic induction
Different ways of charging an object
The electrophorus
Using the stored energy
Charge distribution
Discharge action of a point
Lightning and lightning conductor

CHAPTER 11

Electric current
Generating electric current
Electric current- electric in motion
Current and quality of charge

The electromotive force (emf)
The potential difference (pd)
Generating electric current
Generating electric current from chemical energy
Generating electric current from mechanical energy
Generating electric current from light energy
Generating electric current from heat energy
Electric circuit
Simple electric circuit
Short circuit
Circuit elements or components
Series and parallel circuits
Measurement of voltage or p.d. in a parallel circuit
Resistance
Ohm's law
Ohmic and non-ohmic conductors
Verification of Ohm's law
Graph of voltage against current
Conductivity
Effect of temperature on resistance
Types of resistors
Arrangement of resistors
Combining resistors in both series and parallel
Parallel combination in series with a third resistor
Electrical energy and power
Electric energy
Electric power
Power rating
The heating effect of current
Applications of heating effect of current
Fuse rating
The Electrical filament lamp

CHAPTER 12

Particle nature of matter
Atoms as matter
Evidences for the existence of atoms
The size of an atom
The atomic structure
Element
Compound
The size of a molecule

Molecules are in constant motion
Brownian motion in a gas
Space between molecules
Kinetic theory of matter
State of matter
Change of state
Space lattice
Growing crystals in the laboratory
Amorphous solids
Differences between crystalline and amorphous substances

CHAPTER 13

Elastic and molecular properties of matter
Elastic properties of solids
Elasticity
Molecular explanation of elasticity
Loading a spring
Hooke's law
How to find the force constant of a spring
Breaking point
Tensile stress, tensile strain and Young's modulus
Young's modulus
Elastic energy
Molecular properties of liquids
Cohesion and adhesion
Surface tension
Coefficient of surface tension
Molecular explanation of surface tension
Effects of surface tension
Factors that affect surface tension
Capillary action
Angle of contact
Effects of capillary action
Viscosity and terminal velocity
Determination of terminal velocity
Application of viscosity and terminal velocity

CHAPTER 14

Solar energy
What is solar energy?
Applications of solar energy technology
Solar heating panel

Types of solar heating panel

Constructing a solar panel

The industrial units

Photon

Electrical continuity testing

Solution to questions