

# **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 vernier 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 ( $\hat{I}^{1/4}$ )  
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  
Convector 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  
Hookeâ€™s law  
How to find the force constant of a spring  
Breaking point  
Tensile stress, tensile strain and Youngâ€™s modulus  
Youngâ€™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