



PHYSICS

A TEXTBOOK
FOR SECONDARY
SCHOOLS
(CLASSES IX-X)



NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

PHYSICS

A Textbook for Secondary Schools

(Classes IX-X)

PHYSICS

A Textbook for Secondary Schools

(Classes IX-X)

Presented by the Central Board of Secondary Education



NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

Contents

Foreword	Page
Acknowledgements	ii

Chapter 1 OUR UNIVERSE

1.1. How do we classify the heavenly bodies ?	1
1.2. What is a constellation ?	1
1.3. What is the zodiac or rashī ?	2
1.4. What is a galaxy ?	2
1.5. What is the solar system ?	3
1.6. Is the sun moving round the earth or the earth round the sun ?	6
1.7. Astronomy in ancient India	7

Chapter 2 THE DESCRIPTION OF MOTION

2.1. What are scalars and vectors ?	9
2.2. Is there any difference between speed and velocity ?	10
2.3. What is acceleration ?	11
2.4. How can we calculate the distance when acceleration is given ?	12
2.5. What is free fall ?	13

Chapter 3 LAWS OF MOTION

3.1. When does a body move ?	13
3.2. What is the relation between force and acceleration ?	16
3.3. Is force related to momentum ?	18
3.4. What is the difference between mass and weight ?	19
3.5. Is reaction related to action ?	19
3.6. Does momentum change when bodies interact ?	20

Chapter 4 MOMENTS AND MACHINES

4.1. What is meant by the moment of a force ?	...	24
4.2. The principle of moments	...	25
4.3. What is meant by a couple ?	...	26
4.4. How do we define the centre of gravity ?	...	26
4.5. When do we say that a body is in equilibrium ?	...	28
4.6. How to obtain the correct weight of a body, using a faulty balance ?	...	29
4.7. Why is it possible to lift a large load, using a screw-jack ?	...	30

Chapter 5 WORK AND ENERGY

5.1. Work	...	34
5.2. What is the relationship between work and energy ?	...	35
5.3. What is kinetic energy ?	...	35
5.4. What is potential energy ?	...	36
5.5. Is energy lost during interactions ?	...	38
5.6. Heat engines	...	39

Chapter 6 ELASTICITY OF SOLIDS

6.1. How do solids behave under applied forces ?	...	45
6.2. On what factors does the deformation of a solid body depend ?	...	46
6.3. What is Hooke's law ?	...	46
6.4. How is the stress-strain relation studied experimentally ?	...	47

Chapter 7 FLOTATION

7.1. Archimedes' principle	...	49
7.2. Flotation	...	51

Chapter 8 KINETIC THEORY OF GASES

8.1. The kinetic theory and gas laws	...	54
8.2. Specific heat of gases	...	55

Chapter 9 LIQUEFACTION AND HUMIDITY

9.1. Can we liquefy a gas ?	...	57
9.2. What is refrigeration	...	58
9.3. What is humidity ?	...	59

Chapter 10 SOUND

10.1. Types of waves	...	63
10.2. What do we understand by frequency and wave length?	...	65
10.3. What is resonance?	...	66
10.4. Resonance in an air column	...	67
10.5. The velocity of a wave motion	...	67
10.6. What do we understand by a musical note and a musical scale?	...	68
10.7. Ultrasonic waves and their uses?	...	69
10.8. The vibration of strings	...	70

Chapter 11 SPHERICAL MIRRORS

11.1. Reflection from a curved surface	...	73
11.2. Concave mirror	...	74
11.3. Convex mirror	...	77

Chapter 12 REFRACTION

12.1. What is refraction?	...	80
12.2. Laws of refraction	...	81
12.3. Refractive index	...	82
12.4. Passage of light from a denser to a rarer medium	...	82
12.5. Combination of refracting media	...	83
12.6. Total internal reflection	...	84
12.7. Refraction through a prism	...	85
12.8. Is refraction the cause of some common observations?	...	85

Chapter 13 LENSES

13.1. The convex lens	...	90
13.2. Images formed by a convex lens	...	91
13.3. The concave lens	...	93
13.4. The magnifying glass or a simple microscope	...	94
13.5. Telescope	...	95
13.6. Defects of vision	...	96

Chapter 14 ELECTROSTATICS

14.1. What is Coulomb's law?	...	98
------------------------------	-----	----

Chapter 14 ELECTROSTATICS

14.1. What is Coulomb's law ?	...	98
14.2. What is the intensity of an electric field ?	...	100
14.3. What is electrostatic potential difference ?	...	100
14.4. What is meant by the capacitance of a conductor ?	...	100
14.5. What is a capacitor ?	...	100
14.6. How do different factors affect the capacitance of a capacitor ?	...	101
14.7. How are capacitors combined ?	...	101
14.8. What do we mean by the conservation of charge ?	...	104

Chapter 15 ELECTRIC CURRENT

15.1. Ohm's law	...	105
15.2. Resistances in series and in parallel	...	107
15.3. The e.m.f. of a source of electric energy	...	108
15.4. Ohm's law for a complete circuit	...	109
15.5. Arrangements of cells	...	110

Chapter 16 MAGNETISM

16.1. Magnetic field due to the current in a straight conductor	...	112
16.2. Magnetic field due to a circular coil	...	114
16.3. Interaction between two current-carrying conductors	...	114
16.4. Motion of charges in a magnetic field	...	115
16.5. Electromagnet	...	117
16.6. What is the principle of a microphone ?	...	118
16.7. Telephone and hearing-aid	...	119
16.8. The inverse square law	...	119
16.9. Magnetic intensity in the end-on position	...	120
16.10. Magnetic intensity in the broad-side-on position	...	121
16.11. Mapping of a magnetic field	...	122
16.12. Elements of terrestrial magnetism	...	122
16.13. Neutral points	...	124

Chapter 17 PHYSICS IN DAILY LIFE

17.1. What is thermionic emission ?	...	126
17.2. How do we convert an alternating current into a direct current ? What is a rectifier ?	...	128
17.3. What is a triode valve and what are its uses ?	...	129
17.4. What are transmitters and receivers ?	...	132
17.5. What is photo-electric effect ?	...	134
17.6. What are semi-conductors ?	...	135

Answers

