

# Contents

*Preface*

v

## **1. Basic Physics**

**1**

Structure of atom 1  
States of matter 2  
Isotopes 2  
Ionic and covalent bonds 3  
Conductor and insulators 3  
Latent heat 4  
Transmission of heat 4  
Physical effects of heat 5

## **2. Static Electricity**

**8**

Static electricity 8  
Characteristics of charged body 8  
Properties of electric lines of force 11  
Capacitance and its Unit 13  
Capacitive reactance 13

## **3. Current Electricity**

**14**

Current electricity 14  
Theories of electricity 14  
AC and DC currents 15  
Potential difference 15  
Resistances in series 16  
Resistances in parallel 17  
Condenser in series 18  
Condenser in parallel 18  
Ohm's law and Joule's law 19  
Thermal effects of electric current 19  
Thermionic emission 20  
Inductance and inductive reactance 20  
Electromagnetic induction and its types 21

Lenz's and Faraday's laws 22

Eddy currents 23

#### **4. Magnets and Magnetism 25**

Type of magnets 25

Electromagnet 26

Molecular theory of magnetism 27

Properties of magnet 27

Properties of magnetic lines of force 29

#### **5. Mains Supply 30**

The grid system 30

Wiring of the houses 31

Cartridge fuse 34

Porcelain fuse 34

Importance of fuses in physiotherapy unit 35

Importance of earthing in physiotherapy unit 36

Power plugs 36

Switches 38

Earth shock 39

Electric shock 41

International color coding of electrical supply 44

#### **6. Basic Electrical Components 46**

Capacitor (condenser) 46

Transformer 53

Semiconductor 59

Transistors 61

Metal rectifier 63

Thermionic valve 66

Diode valve 67

Triode valve 68

Choke coil 69

Smoothing circuit 71

Rheostat 72

Potentiometer 73

Voltmeter 74

Ammeter 75

Oscilloscopes 76

#### **7. Low Frequency Currents 78**

Classification of currents 78

Direct current and interrupted direct current 78

Faradic-type current and surged faradic currents 80

Electrical skin resistance 82

Types of electrodes 83

Transcutaneous electrical nerve stimulation (TENS) 86

## 8. Medium Frequency Currents 93

Russian current 94  
Production of IFT and neat labelled diagram of IFT unit 94  
Principle of production of IFT 95

## 9. High Frequency Currents 98

Principle of production 99  
Production of ultrasound 101  
Short wave diathermy 101  
Production of short wave diathermy 107

## 10. Actinotherapy 110

Electromagnetic spectrum and laws governing radiation 110  
Ultraviolet radiation (UVR) 116  
Infrared radiation (IR) 122  
Production of luminous IR lamp 124  
Contraindications of IRs 126  
Laser 128  
Production of laser 134

## 11. Superficial Heating Modalities 136

Indications of paraffin wax bath 141  
Hydrocollator pack unit 142  
Whirlpool bath 163  
Contrast bath 164  
Peloids 155  
Electrical heating pads 166  
Hot compresses 167  
Fluidotherapy 168

## 12. Testing of Apparatus 171

Electrical muscle stimulator 171  
Transcutaneous electrical nerve stimulator 173  
Interferential therapy 175  
Short wave diathermy 177  
Ultrasound therapy 179  
Infrared radiation (IR) lamp 182  
Ultraviolet radiation (UVR) lamp 184  
Laser 185