

# Contents

## PHYSICS

1-272

- 1. Units, Measurements and Errors** **1-11**  
Physical Quantities (1) Units (2) System of Units (2-4) Conversions of Units (5)  
Dimensional Formula and Dimensional Equation (6) Important Scientific Instrument  
and their Use (7-8) Error in Measurement (8-9) Significant Figures (9)
- 2. Motion** **12-26**  
Rest and Motion (12) Types of Motion of a Body (12) One, Two and Three  
Dimensional Motion (13) Some Basic Terms Related with Motion (13-16)  
Uniform and Non-Uniform Motion (16-17) Graphical Representation of Motion (17-19)  
Equations of Motion (19-20) Freely Falling Objects (20) Motion in a Plane : Projectile  
Motion and Circulatory Motion (21-23)
- 3. Force and Laws of Motion** **27-39**  
Force (27) Fundamental or Basic Forces in Nature (27-28) Inertia (28) Newton's  
Laws of Motion (29) Momentum (29-31) Impulse (31) Friction (32-33) Centripetal  
and Centrifugal Force (34)
- 4. Work, Power and Energy** **40-57**  
Work (40-41) Power (41) Energy (42) Kinetic Energy and Potential Energy  
(42-43) Work-Energy Theorem (43) Law of Conservation of Energy (43) Einstein's  
Mass-Energy Equivalence (44) Sources of Energy : Renewable and Non-Renewable (45)  
Conventional Sources of Energy : Fossil Fuels, Thermal Power Plants, Hydro Power Plants  
(46-47) Improvements in the Technology for Using Conventional Sources : Bio-mass,  
Bio-gas, Wind Energy (47-49) Non-Conventional Sources of Energy : Solar Energy, Solar  
Heating Devices, Solar Cooker, Solar Cell (49-52) Energy from the Sea : Tidal Energy,  
Wave Energy, Ocean Thermal Energy (52) Geothermal Energy and Nuclear Energy (53)
- 5. Gravitation** **58-67**  
Universal Law of Gravitation (58) Acceleration Due to Gravity (59) Variations  
of  $g$  (59-60) Mass and Weight (60) Planet and Satellite (61-62) Kepler's Laws of  
Planetary Motion (62) Orbital Velocity (62-63) Escape Velocity or Escape Speed (63)
- 6. Centre of Mass and Rotational Motion** **68-74**  
Centre of Mass (68) Torque (69) Couple and Equilibrium (69) Centre of Gravity (70)  
Rotational Motion (70) Moment of Inertia (70-71) Angular Momentum (71-72) Simple  
Machine (72) Lever (72-73)
- 7. Mechanical Properties of Solids** **75-79**  
Matter (75) Elasticity (75-77) Hooke's Law (77-78) Classification of Materials  
based on the Property of Elasticity (78)
- 8. Mechanical Properties of Fluids** **80-94**  
Thrust and Pressure (80) Density (81) Pressure of Liquid (81-82) Pascal's Law (82)  
Atmospheric Pressure (82-83) Buoyancy (83) Archimedes' Principle (83) Floatation (84)  
Surface Tension (85) Surface Energy (86) Angle of Contact (86) Capillarity (86-87)  
Flow of Liquids (87) Bernoulli's Theorem (88-89) Torricelli's Theorem (89) Viscosity  
(89-90) Stoke's Law (90) Terminal Velocity (90)

- 9. Simple Harmonic Motion (SHM) 95-100**  
Periodic Motion (95) Oscillatory Motion (95) Simple Pendulum (96-97) Free and Forced Oscillations (97-98) Damped Harmonic Motion (98) Resonance (98)
- 10. Heat, Temperature and Thermodynamics 101-116**  
Heat (101) Temperature and Temperature Scales (101-102) Humidity (103) Thermal Expansion of Solids, Liquids and Gases (103-105) Specific Heat (105) Water Equivalent (105) Transmission of Heat : Conduction, Convection and Radiation (106-107) Thermal Conductivity (107-108) Newton's Law of Cooling (108) Thermal Radiations (108) Kirchoff's Law, Stefan's Law and Wien's Displacement Law (109) Thermodynamics : Laws and Processes (109-110) Heat Engine (110-111)
- 11. Wave Motion and Sound 117-135**  
Waves and its Types (117) Type of Mechanical Waves : Longitudinal & Transverse (117-118) Sound Waves (119-120) Speed of Sound in Different Media (120-122) Reflection of Sound (122-123) Refraction of Sound (123) Range of Hearing (123) Infrasonic and Ultrasonic Sound (124-125) Superposition of Waves (125-129) Electromagnetic Waves (129) Electromagnetic Spectrum (129-130) Earthquake Waves (130)
- 12. Optics 136-165**  
Properties of Light (136-137) Reflection of Light (137) Mirror : Types of Mirror (137-139) Image (139) Image Formation by Spherical Mirror (139-141) Mirror Formula and Linear Magnification (141-142) Refraction of Light (142-143) Atmospheric Refraction (143-144) Scattering of Light (145) Total Internal Reflection (TIR) (145-146) Lens : Types, (146-147) Image Formation by Lenses (148-149) Lens Formula and Linear Magnification (149) Prism (150) Human Eye (151) Optical Instruments : Camera, Microscope, Telescope (152-154) Interference of Light (155) Diffraction of Light (155) Doppler's Effect (155) Polarisation (156)
- 13. Electrostatics 166-174**  
Electric Charge (166) Coulomb's Law (167) Electric Field and Electric Field Intensity (167) Electric Field due to a Hollow Conductor (167) Electric Field Lines (168) Electric Dipole (168) Electric Flux (169) Gauss's Theorem (169) Electric Potential and Potential Difference (169-170) Potential Inside a Hollow Conductor (170) Equipotential Surface (170) Electrostatic Potential Energy of a System of Charges (170) Conductors and Insulators or Dielectrics (171) Capacitance (172)
- 14. Current Electricity and its Effects 175-188**  
Electric Current (175-176) Ohm's Law (177) Resistance and Combination of Resistances (177-180) Conductance and Conductivity (180) Electric Cell (181) Heating Effect of Electric Current (181-182) Electric Power (182-183) Alternating Current (183)
- 15. Magnetic Effect of Current and Magnetism 189-206**  
Magnetic Field and Magnetic Field Lines (189-190) Direction of Magnetic Field (190) Magnetic Effects of Electric Currents (191) Force on a Moving Charge in a Magnetic Field (191) Force on a Current-Carrying Conductor in a Uniform Magnetic Field (192) Magnetism and Earth Magnetism (193-194) Magnetic Intensity (195) Magnetic Substances : Diamagnetic, Ferromagnetic and Paramagnetic (195-196) Electromagnets and Permanent Magnets (196-197) Magnetic Flux (197) Electromagnetic Induction : Laws and Types (197) Eddy Currents (198) Electric Motor (198) AC and DC Generators (199) Domestic Electric Circuits (200-201) Transformer (201)

- 16. Modern Physics (Atomic and Nuclear Physics) 207-227**  
Photoelectric Effect (207-208). Planck's Photon Hypothesis (208) Einstein's Photoelectric Equation (208) Matter waves (209) X-rays (209-210) Atomic Model (210) Nuclear Force (211-212) Nucleus Stability (212) Mass Defect and Binding Energy (212-213) Radioactivity (213) Radioactive or Becquerel Rays (213-214) Radioactive Disintegration or Decay (214-215) Units of Radioactive, Half-Life and Average Life or Mean Life (215-216) Effects of Emission on the Nucleus :  $\alpha$ -decay,  $\beta$ -decay and  $\gamma$ -decay (216-217) Soddy-Fajan's Group Displacement Law (217) Radioactive Series (217) Artificial Radioactivity (218) Applications of Radioactivity (218-220) Nuclear Fission and Nuclear Fusion (220-223)
- 17. Semiconductors 228-234**  
Types of Semiconductor (228) Extrinsic Semiconductor : *n*-type and *p*-type (228-229) *p-n* Junction (229) Some Types of Junction Diode (229-230) Transistor or Bipolar Transistor (230) Integrated Circuit, Digital Circuit and Logic Gate (230-231) LASER, MASER and RADAR (231-232)
- 18. Communication 235-244**  
Communication System (235-236) Transmission Medium or Communication Channel (236-237) Antenna : Hertz and Marconi (237) Modulation and Demodulation (237-238) Propagation of Electromagnetic Waves (238-239) Behaviour of Atmosphere towards Electromagnetic Waves (239) Satellite Communication (240) Indian Space Programmes (2005 to 2014) (240-242)
- 19. Nanotechnology 245-246**  
Concepts of Nanotechnology (245) Applications of Nanotechnology : Solar Cells, Fuel Cells, Accessible Medical Testing, Removal of Toxic Elements, A Better Cancer Treatment, Nanotechnology and Aerospace, Nano Robots (245-246) Nanotechnology in India (246) Future Prospects of Nano Mission (246)
- 20. Our Universe 247-257**  
Structure of Universe (247) Origin and Evolution of Universe : The Big-Bang Theory, Red Shift Theory, Steady State Theory, Pulsating Theory (247-248) Age of Universe (248) Celestial Bodies (249) Galaxy (250) Stars (250-251) The Solar System : The Sun, The Planets—Mercury, Venus, The Earth, The Moon, Mars, Jupiter, Saturn, Uranus and Neptune (251-255) Boundary of the Solar System : Asteroids and Comets (255-256) Meteors, Meteorites and Meteor Showers (256)

## Appendix

258-272

## CHEMISTRY

1-210

- 1. Matter and its States 1-13**  
Matter (1) Particles of Matter : Atoms and Molecules (2) States of Matter : Solid, Liquid and Gas (2-3) Two More States of Matter : Plasma and Bose-Einstein Condensate (BEC) (3) Diffusion (3-4) Interconversion of States of Matter (4) Effect of Change of Temperature and Pressure (5) Chemical Classification of Matter : Element, Compound and Mixture (5-8) Mass Terms Related to Matter : Atomic Mass, Average Atomic Mass, Molecular Mass, Formula Unit Mass, Equivalent Mass or Equivalent Weight (8-9) Physical and Chemical Changes (9) Laws of Chemical Combinations : Law of Conversion of Mass, Law of Definite Proportions, Law of Multiple Proportions, Gay-Lussac's Law of Combining Volumes (9-10) Mole Concept (10)

- 2. Atomic Structure** **14-25**  
Dalton's Atomic Theory (14) Sub-atomic Particles and their Properties (14)  
Fundamental Particles : Electrons, Protons and Neutrons (15) Non-Fundamental  
Particles : Positron, Antiproton, Neutrino and Antineutrino, Pi-mesons, Quarks and  
Bosons (15-16) Earlier Atomic Models : Thomson Model, Rutherford Model and Bohr  
Model (16-18) Characteristics of an Atom : Atomic Number and Mass Number (18)  
Different Atomic Species : Isotopes, Isobars, Isotones and Isodiaphers (18-19) Structural  
Features of an Atom : Shell and Subshell, Orbitals (19-20) Electronic Configuration : Bohr  
Burry Scheme and  $n^l$  Type Scheme (20-21) Rules for Filling Electrons in the Orbitals :  
Aufbau Principle and Hund's Rule (21) Quantum Numbers :  $n, l, m$  and  $s$  (22) Pauli  
Exclusion Principle (22)
- 3. Bonding and Chemical Reactions** **26-39**  
Chemical Bond (26) Valency (26) Electronic Theory of Chemical Bonding  
(Octet Rule) (26-27) Types of Bonding : Ionic or Electrovalent, Covalent, Coordinate or  
Dative, Hydrogen Bond and van der Waals' Forces (27-30) Chemical Formula : Empirical,  
Molecular and Structural (31) Chemical Reaction and Chemical Equation (32) Types of  
Chemical Reactions : Combination, Decomposition, Displacement, Double Displacement,  
Neutralisation, Isomerisation or Rearrangement, Reversible and Irreversible, Hydrolysis,  
Photochemical, Exothermic and Endothermic, Oxidation and Reduction (33-35) Oxidising  
Agent and Reducing Agent (35) Oxidation State or Oxidation Number (36) Corrosion,  
Fermentation and Rancidity (36-37)
- 4. Acids, Bases and Salts** **40-51**  
Acids: Types , Properties and Uses (40-42) Bases: Types, Properties and Uses  
(42-43) Modern Concepts of Acids and Bases : Arrhenius Concept, Bronsted-Lowry  
Concept and Lewis Concept (43-44) Dissolution of an Acid or a Base in Water (44) Salts:  
Types and Uses (44-45) pH Scale (45-46) Importance of pH in Everyday Life (46-47)  
Indicators (47) Buffer Solution and its Types (47-48) Hydrolysis of Salts (48) Types of Salts  
on the basis of Hydrolysis (48)
- 5. Solutions and Colloids** **52-59**  
Solution or True Solution (52) Components, Properties and Types of Solutions  
(52-53) Concentration of a Solution (53-54) Solubility (54) Colloidal Solution (54-55)  
Classification of Colloids (55-56) Properties of Colloidal Solutions (56) Emulsions (56-57)  
Suspension (57)
- 6. Gaseous State** **60-64**  
Gas Laws : Boyle, Charles, Gay Lussac, Avogadro, Combined Gas Law, Dalton's Law of  
Partial Pressures and Graham's Law of Diffusion (60-61) Perfect Gas or Ideal Gas (61)  
Ideal Gas Equation (62) Real Gases (62) Kinetic Theory of Gases (62-63) Pressure of an  
Ideal Gas (63) Different Speeds of Gaseous Molecules (63) Degree of Freedom (63-64)
- 7. Chemical Kinetics and Equilibrium** **65-71**  
Chemical Kinetics (65) Slow and Fast Reactions (65) Bond Energy, Heat of Reaction,  
Heat of Formation and Heat of Combustion (65-66) Rate of a Reaction (66-67) Activation  
Energy (67) Catalysis and its Types (67-68) Types and Uses of Catalyst (68) Order and  
Molecularity of a Reaction (68-69) Chemical Equilibrium (69) Law of Chemical  
Equilibrium & Equilibrium Constant (69) Homogeneous and Heterogeneous Equilibria (70)  
Le-Chatelier's Principle (70)

- 8. Electrochemistry** **72-79**  
Electrolysis (72) Components Required for Electrolysis : Electrolyte, Electric Current and Electrode (72) Arrhenius Theory of Electrolytic Dissociation or Decomposition (73) Faraday's Laws of Electrolysis (73-74) Products of Electrolysis (74) Applications of Electrolysis (74-75) Electrolytic Cell (75) Galvanic Cell or a Voltaic Cell (75) Electrochemical Series (75) Batteries (76) Primary Batteries : Dry Cell and Mercury Cell (76) Secondary Batteries : Lead Storage Battery, Nickel-Cadmium Cell, Lithium-Ion Battery (LIB) and Hydrogen-Oxygen Fuel Cell (77) Cell Efficiency (77)
- 9. Classification of Elements** **80-87**  
Periodic Classification (80) Mendeleev's Periodic Table : Characteristics, Advantages and Limitations (80-81) Modern Periodic Table (81-82) Characteristics of Periods and Groups (83) Types of Elements : *s*-Block, *p*-Block, *d*-Block and *f*-Block (83-84) Trends in Modern Periodic Table (Periodic Properties) (85)
- 10. Hydrogen and Its Compounds** **88-94**  
Hydrogen : Occurrence, Isotopes and Preparation (88) Special Forms of Hydrogen (88-89) Properties and Uses of Dihydrogen (89-90) Water (90) Structure of Water Molecule (91) Hard and Soft Water (91) Temporary and Permanent Hardness (91) Heavy Water (92) Hydrogen Peroxide and its Uses (92)
- 11. Metals and Their Compounds** **95-116**  
Physical and Chemical Properties of Metals (95-96) Sodium and its Compounds (97-98) Magnesium and its Compounds (98-99) Calcium and its Compounds (100-101) Aluminium and its Compounds (101-102) Manganese and its Compounds (102-103) Iron and its Compounds (103-104) Heat Treatment and Surface Treatment of Steel (104) Copper and its Compounds (105-106) Silver and its Compounds (106-107) Gold and its Compounds (107-108) Zinc and its Compounds (108) Mercury and its Compounds (109-110) Lead and its Compounds (110-111) Uranium, Thorium, Platinum and Plutonium (111-112)
- 12. Extraction of Metals** **117-122**  
Metallurgy (117) Minerals, Ores and Gangue (117-118) Steps Involved in Metallurgy (118) Concentration of Ores (119) Extraction of Crude Metals from Concentrated Ores (119-120) Refining (120)
- 13. Non-Metals and Their Compounds** **123-142**  
Physical and Chemical Properties of Non-metals (123) Carbon : Occurrence and Properties (124) Allotropes of Carbon : Diamond, Graphite, Graphene, Fullerene, Lamp Black, Charcoal, Coke and Coal (124-126) Oxides of Carbon (127-128) Silicon : Properties, Uses and Compounds (128) Nitrogen : Occurrence, Preparation, Properties and Uses (128-129) Nitrogen Fixation and Denitrification (129) Ammonia (129) Oxides and Oxoacids of Nitrogen (130) Phosphorus : Occurrence and Uses (130-131) Allotropic Forms of Phosphorus : White/Yellow, Red, Black, Scarlet and Violet (131-132) Oxides of Phosphorus (132-133) Oxygen : Occurrence, Properties and Uses (133) Ozone (133) Sulphur : Occurrence and Extraction (134) Allotropic Forms of Sulphur : Crystalline and Non-crystalline (134) Oxides and Oxoacids of Sulphur (135-136) Halogens : Fluorine, Chlorine, Bromine and Iodine (136-137) Inert Gases and Noble Gases : Helium, Neon, Argon, Krypton, Xenon and Radon (137-138) Metalloids (139)

## 14. Fuels, Combustion and Flames

143-153

Fuels and its Types (143) Calorific or Fuel Value (143-144) Fossil Fuels : Coal and Petroleum (144-145) Composition and Uses of Some Fuels : Coke, Coal Gas, Water Gas, Producer Gas, Oil Gas, Natural Gas, Liquefied Petroleum Gas (LPG), Bio Gas or Gobar Gas, Compressed Natural Gas (CNG), Petrol, Diesel, Biodiesel, Liquefied Natural Gas (LNG) and Brent Crude Oil (145-147) Cracking (147) Advancement in the Direction of Fuels (148) Combustion and its Types (148-149) Propellants (Rocket Fuels) (149) Types of Propellants : Solid, Liquid and Hybrid (149-150) Flame (150) Solar Jet (150)

## 15. Organic Compounds

154-169

Petroleum as a Source of Organic Compounds (154-155) Classification of Organic Compounds : Acyclic or Open Chain, Alicyclic or Closed Chain and Aromatic (155-156) Functional Group (156-157) Homologous Series (157) Isomerism : Structural Isomerism and Stereoisomerism (158) Hydrocarbon : Saturated, Unsaturated and Aromatic (158-160) Alcohols, Phenols, Ethers, Aldehydes, Ketones, Carboxylic Acids and Esters (160-164) Some Other Important Organic Compounds (164-166)

## 16. Food Chemistry

170-179

Carbohydrates (170) Classification of Carbohydrates : Monosaccharides, Oligosaccharides, Polysaccharides, Sugars, Non-sugars, Reducing and Non-reducing (170-171) Some Common Carbohydrates : Glucose, Fructose, Sucrose, Maltose, Lactose, Starch, Cellulose, Glycogen (171) Importance of Carbohydrates (171) Proteins (172) Classification of Proteins : Fibrous, Globular, Simple, Conjugated and Derived (172) Functions of Proteins (172) Denaturation of Proteins (172) Fats and Oils (173) Types and Functions of Fats (173) Waxes (173) Vitamins (174) Types of Vitamins : Fat Soluble and Water Soluble (174-175) Enzymes (176) Food Preservatives (176) Artificial Sweetening Agents : Saccharin, Aspartame, Alitame and Sucrolose (177) Antioxidants (177)

## 17. Chemistry in Everyday Life

180-194

Soaps (180) Manufacture (Saponification Reaction) and Types of Soaps (180-181) Detergents (181) Classification of Synthetic Detergents : Anionic, Cationic and Non-ionic (181-182) Dyes and its Classification (182) Polymers (182) Polymerisation : Addition and Condensation (182-183) Plastics : Natural and Synthetic (183-184) Rubber : Natural and Synthetic (184) Vulcanisation of Rubber (185) Fibres : Natural, Semisynthetic and Synthetic (185) Ceramics (186) Drugs : Antipyretics, Analgesics, Antibiotics, Antiseptic, Disinfectants, Sulpha Drugs, Anaesthesia and Antacids (186-187) Cosmetics (188) Glass: Types, Properties and Uses (188) Annealing of Glass (189) Coloured Glass (189) Glass Wool (189) Cement (189) Fertilizers (190-191) Explosives (191)

## Appendix

195-210

# BIOLOGY

1-320

## 1. Diversity in Living World

1-34

Classification : Basis, Objectives, History and Hierarchy (1-2) Binomial System of Nomenclature and Categories of Classification (3-4) Kingdom Monera : Bacteria, Economic Importance of Bacteria, Actinomycetes, Cyanobacteria, Rickettsia and Archaeobacteria (4-7) Kingdom Protista : Groups of Protista – Photosynthetic Protists, Protozoan Protists and Consumer-decomposes Protists, Economic Importance of Protists (7-9) Kingdom Fungi : Types of Fungi – Saprophytic, Parasitic and Symbiotic, Economic Importance of Fungi (9-11) Kingdom Plantae : Thallophyta – Cellular Structure of Algae, Types of Algae (Green, Brown and Red), Reproduction in Algae, Economic Importance of

Algae; Bryophyta – Characteristics and Economic Importance of Bryophyta; Tracheophyta – Pteridophyta, Gymnosperms and Angiosperms (12-18) Kingdom Animalia : Sub-Kingdom Protozoa; Sub-Kingdom Metazoa – Phylum Porifera (Sponges), Phylum Coelenterata (Cnidaria), Phylum Platyhelminthes (Flatworms), Phylum Aschelminthes/ Nematoda (Round/Ringworms), Phylum Annelida, Phylum Arthropoda, Phylum Mollusca, Phylum Echinodermata, Phylum Hemichordata, Phylum Chordata (18-23) Protochordates (23) Vertebrates : Class Pisces, Class Amphibia, Class Reptilia, Class Aves and Class Mammalia (23-27)

## **2. Cell : Structure and Functions 35-47**

Discovery, Shape and Size of Cells (35) Number of Cells in Living Organisms (35) Cell Theory (36) Types of Cell (36-37) Cell Structure : Cell Wall, Cell Membrane or Plasma Membrane, Nucleus (Nuclear Membrane, Nucleoplasm, Nucleolus and Chromosomes), Cytoplasm – Cytosol; Cell Organelles – endoplasmic reticulum (rough and smooth), golgi apparatus, lysosomes, mitochondria, plastids, ribosomes, centrosomes, vacuoles; Inclusions (38-43)

## **3. Cell Cycle and Cell Division 48-52**

Cell Cycle (48) Phases of Cell Cycle : Interphase (Undividing Phase), M Phase or Mitosis Phase (Dividing Phase) (48-49) Cell Division (49) Modes of Cell Division : Amitosis; Mitosis – Prophase, Metaphase, Anaphase, Telophase and Cytokinesis; Meiosis – Meiosis I and Meiosis II (49-51)

## **4. Tissue 53-64**

Plant Tissue : Meristematic Tissue – Apical Meristems, Intercalary Meristems and Lateral Meristems; Permanent Tissue or Mature Tissue – Simple Permanent Tissue (Parenchyma, Collenchyma, Sclerenchyma), Complex Permanent Tissue (Xylem, Phloem) (53-55) Animal Tissue : Epithelial Tissue or Epithelia – Simple Epithelial Tissue (Squamous Epithelium, Cuboidal Epithelium, Columnar Epithelium, Glandular Epithelium, Ciliated Epithelium and Pseudo-Stratified Epithelium); Compound Epithelia (Multilayered Epithelia) – Stratified Epithelium and Transitional Epithelium (56-59) Connective Tissue : Vascular Connective Tissue, Connective Tissue Proper and Skeletal Connective Tissue (58-60) Muscular Tissue: Striated (Striped) Muscle, Non-Striated (Smooth) Muscle, Cardiac Muscle (61-62) Neural Tissue (62)

## **5. Nutrition 65-75**

Nutrients : Macro, Micro, Essential and Non-essential (65) Nutrition in Plants (65) Types of Nutrition in Plants : Autotrophic and Heterotrophic (66-67) Mineral Nutrition in Plants (67-68) Nitrogen Fixation (68-69) Nutrition in Animals (69) Types of Nutrition in Animals : Holozoic, Parasitic and Saprozoic (69-70) Nutrients in Animals : Water, Roughage and Minerals (Inorganic Salts) (70-72) Balanced Diet (72)

## **6. Plant Morphology and Physiology 76-97**

Plant Morphology (76) Different Parts of the Plant : Root, Stem, Leaf (76-82) Plant-Water Relations (82) Processes Concerned with Plant-Water Relation : Imbibition, Osmosis and Plasmolysis (83) Transport System in Plants : Transport of Water, Transport of Minerals, Translocation of Organic Solutes (84-85) Photosynthesis (85) Process of Photosynthesis : Photochemical Phase (Light or Hill Reaction), Biosynthetic Phase (Dark or Blackman's Reaction) (85) Factors Affecting Photosynthesis : Carbon Dioxide, Light, Water, Temperature and Oxygen (85-86) Plant Growth and Development (86) Plant Growth Hormones : Auxins, Gibberellins, Cytokinins, Ethylene and Abscisic Acid (87-88) Plant Diseases : Abiotic or Non-Parasitic, Viral, Fungal and Bacterial (88-92)

## **7. Reproduction**

**98-115**

Asexual and Sexual Reproduction (98) Events in Sexual Reproduction : Pre-Fertilisation, Fertilisation and Post-Fertilisation (99) Reproduction in Lower Plants : Asexual Reproduction – Fragmentation, Spore Formation; Sexual Reproduction (99-100) Reproduction in Higher Plants : Asexual Reproduction – Apomixis, Vegetative Propagation, Tissue Culture; Sexual Reproduction (100-102) Pollination and Fertilisation (102-103) Fruit and Seeds (104) Reproduction in Animals : Asexual and Sexual (104-105) Reproduction in Humans : Male and Female Reproductive System (105-108) Mechanism Involved with Human Reproductive System : Gametogenesis, Fertilisation, Embryonic Development, Parturition and Lactation (108-109) Reproductive Health (109-110) Birth Control (Contraceptive) Methods : Barrier Methods, Hormonal Methods, Intra Uterine Devices (IUDs), Natural Methods of Family Planning, Surgical Methods and Termination (110-111) Disorders in Human Reproductive System : In Male and Female (111-112) Sexually Transmitted Diseases (STDs) (112) Acquired Immuno Deficiency Syndrome (AIDS) (112)

## **8. Systems of Human Body**

**116-170**

Human Digestive System : Alimentary Canal – Mouth, Vestibule, Buccal Cavity, Tongue, Pharynx, Oesophagus, Stomach, Intestine; Digestive Glands – Salivary or Mouth Watering, Gastric, Liver, Pancreas, Intestinal; Mechanism of Digestion of Food; Disorders of Digestive System (117-124) Human Respiratory System : Types and Phases of Respiration – Aerobic and Anaerobic; Various Organs of Human Respiratory System; Movement of Air through Respiratory System; Mechanism of Respiration; Cellular Respiration; Disorders of Respiratory System (125-129) Human Circulatory System : Blood Vascular System – Blood, Plasma, Blood Cells, Blood Clotting, Blood Groups, Lymph; Heart – Parts and Functions of Human Heart, Working and Pumping Action of Heart, Heart Beat and its Regulation; Electrocardiograph – Blood Vessels, Blood Pressure, Lymphatic System; Disorders of Circulatory System (130-139) Human Excretory System : Modes of Excretion; Functions of Different Excretory Organs – Kidneys, Ureters, Urinary Bladder, Urethra, Artificial Kidney; Disorders of Excretory System (140-144) Human Skeletal System : Types and Functions of Skeletal System; Bones; Cartilages; Joints – Fibrous, Fixed or Immovable, Cartilagenous or Slightly Movable, Synovial or Freely Movable; Disorders of Skeletal System (145-150) Human Nervous System : Neurons; Parts of Human Nervous System; Central Nervous System – Brain, Spinal Cord; Peripheral Neural System; Autonomic Neural System – Sympathetic and Parasympathetic; Sensory Reception and Processing – Eye, Ear, Nose, Skin (151-158) Human Endocrine System : Glands – Pituitary and Adrenal, Hormones; Disorders of Endocrine System (159-161)

## **9. Genetics**

**171-178**

Mendel's Experiment (171-172) Mendel's Law of Inheritance : Law of Dominance, Law of Segregation, Law of Independent Assortment (172-173) Exceptions of Mendelism ; Incomplete Dominance, Codominance, Multiple Allelism (173-174) Chromosomal Theory of Inheritance (174) Linkage and Recombination (174-175) Sex Determination in Human Beings (175) Mutation : Gene Mutation and Chromosomal Mutation (175-176) Genetic Disorders (176)

## **10. Heredity and Evolution**

**179-186**

Packaging of Hereditary Material in Eukaryotes and Prokaryotes : DNA and RNA (179-180) Central Dogma (180) Evolution (180) Origin of Life (180-181) Biological Evolution (181) Theories of Organic Evolution (181-182) Agents of Evolution (182) Evidences of Organic Evolution : From Morphology and Comparative Anatomy, From Connecting Links, From Genetics, From Embryology (183) Fossils (183) Origin and Evolution of Man (183-184)



## **11. Health and Diseases**

**187-211**

Health (187) Diseases (187) Congenital Diseases (187-188) Acquired Diseases : Communicable or Infectious Diseases – Viral, Fungal, Protozoan, Bacterial and Helminths; Preventive Measures of Infectious Diseases; Non Communicable Diseases – Degenerative, Deficiency, Genetic and Mental (188-201) Immunity : Innate and Acquired (202) Antibodies (202) Monoclonal Antibodies (203) Immune Response (203) Immunisation (203) Allergies (203) Autoimmunity (204) Biomedical Techniques : Invasive – Angioplasty and Organ Transplantation; Non-Invasive – X-Ray Radiography, Angiography, Computed Tomographic Scanning (CT Scan), Magnetic Resonance Imaging (MRI), Ultrasound Imaging (Sonography); Electroencephalography (EEG); Immunotherapy; Hormone Therapy; Positron Emission Tomography (PET); Coronary Artery Bypass Surgery; Enzyme Linked Immunosorbent Assay (ELISA); Pregnancy Test Kits (204-205)

## **12. Introduction to Biotechnology**

**212-222**

Definitions of Biotechnology (212) Old Biotechnology and Modern Biotechnology (212-213) Principles of Biotechnology : Genetic Engineering and Chemical Engineering (213) Tools of Genetic Engineering : Vector, Enzymes and Host Cell (213-214) Techniques of Genetic Engineering : Polymerase Chain reaction (PCR), Random Amplification of Polymorphic DNA (RAPD), Restriction Fragment Length Polymorphism (RFLP), DNA Fingerprinting, Gene Therapy and Cloning (214-217) Human Genome Project (HGP) (217) Applications of Biotechnology : Medicine, Vaccines and Drugs, Antibiotics, Transgenic Animals, Agriculture, Reproduction and Embryology (217-220) Environmental Biotechnology (220-221)

## **13. Environment and its Effects**

**223-242**

Environment and its Types (223) Atmosphere of Earth (223-224) Pollution and Pollutants (224-225) Air Pollution : Sources and Effects on Plants and Human Health, Smog, Acts to Control Air Pollution (226-228) Water Pollution : Sources and Effects on Plants and Human Health, Acts to Control Water Pollution, Bioremediation, Oil Zapper (228-232) Soil and Land Pollution : Sources and Effects, Control of Soil Pollution, E-Waste or Electronic Waste (232-233) Sound or Noise Pollution : Sources, Causes and Effects, Control of Noise Pollution (234) Radioactive Wastes (234-235) Climate (235) Greenhouse Effect and Greenhouse Gases (235) Global Warming (235-236) Acid Rain (236) Stratospheric Pollution (236-237) Impacts of Ozone Layer Depletion (237-238) Environment and the Health (238) Green Chemistry (238)

## **14. Ecology and Ecosystem**

**243-261**

Ecology : Autoecology and Synecology (243) Ecosystem : Types, Components and Functions (244-246) Energy Flow in Ecosystem : Food Chain, Ten Per Cent Law, Food Web (246) Trophic Level (247) Ecological Pyramids (247) Ecological Succession (247) Ecological Adaptations in Plants (247-249) Ecological Relationship (249) Nutrient Flow in Ecosystem : Nitrogen Cycle, Carbon Cycle, Oxygen Cycle, Phosphorus Cycle, Sulphur Cycle, Water Cycle (249-251) Biosphere (251) Biomes (251-252) Biodiversity : Mapping Species Biodiversity, Importance of Biodiversity, Factors Affecting Biodiversity, Effects of Loss of Biodiversity, Conservation of Biological Diversity, Biodiversity Hotspots – Western Ghats and Eastern Himalayas (252-254) Forest Conservation in India : REDD, REDD+, Wetlands, Ramsar Convention, Mangroves (254-255) National and International Conventions on Wildlife : CITES, The Tiger Summit, The Coalition against Wildlife Trafficking (CAWT), World Wide Fund (WWF) for Nature, Trade Records Analysis of Fauna and Flora in Commerce, UNESCO-WHO, CMS, CBD, BGIR, Cartagena Protocol on Biosafety, IUCN (255-257)

**15. Agriculture Science** **262-272**

Crop (262) Classification of Crops : Kharif, Rabi and Zaid (262-263) Improvements in Crop Yields : Crop Variety Improvement – Cereal Crops, Pulse Crops, Oil Seed Crops, Fibre Crops, Forage Crops, Sugar Crops, Root and Tuber Crops; Crop Production Management – Nutrient Management, Biofertilisers, Irrigation, Cropping Patterns, Intensive Cropping, Intercropping, Terrace Farming; Crop Protection Management (263-269) Seed Science, Agroforestry and Blanching (269-270) Indian Council of Agriculture Research (ICAR) (270)

**16. Economic Zoology** **273-286**

Animal Husbandry (273) Breeding (273) Artificial Insemination and Embryo Transfer (274) Cattle Farming : Cow, Buffaloes (274-276) Poultry Farming : Birds, Sheeps and Goats, Pig (Swine) or Hog, Camels (276-279) Animal Diseases : Caused by Fungi, Caused by Bacteria, Caused by Virus and Caused by Parasites (279-281) Apiculture : Social Organisation of Honey Bees, Honey Making and Products of Apiculture (282-283) Sericulture : Types of Silk and Silk Production (283-284) Aquaculture (284) Pisciculture : Food Fishes and By-products of Fishes (285)

**17. Economic Botany** **287-298**

Major Cereals : Wheat, Rice, Maize, Oats (287-289) Vegetables : Earth Vegetables, Herbage Vegetables and Fruit Vegetables (290) Some Important Plants for Drugs (290-291) Sugar Yielding Plants (291) Some Economically Important Flowering Plants : Aloe Vera, Neem, Tulsi, Turmeric, Lemongrass, Banyan Tree (292-293) Non-Alcoholic Beverages Plants : Coffee, Tea, Cocoa and Chocolate (294) Spices and Condiments (294-295) Oil Obtained from Plants (295) Fibre Plants (296)

**Appendix** **299-320**

**COMPUTER & IT**

**1-30**

**1. Introduction to Computer** **1-5**

History and Generations of Computer (1-2) Classification of Computer : Based on Size – Microcomputer, Mainframe Computer, Minicomputer and Supercomputer; BSNL Penta Tablet; Aakash/Sakshat Tablet; Aakash 2 (Ubirlate 7CI); Based on Working of System – Analog, Digital and Hybrid (2-4)

**2. Computer Architecture and I/O Devices** **6-11**

Components of a Computer : Input/Output, Central Processing Unit (CPU) and Memory Unit (6-7) Instruction Cycle (8) Input and Output Devices (8-10) Input/Output Ports (10)

**3. Data Representation** **12-13**

Number System (12) Types of Number System : Binary, Decimal, Octal and Hexadecimal (12) Computer Codes : Binary Coded Decimal (BCD), American Standard Code for Information Interchange (ASCII), Extended Binary Coded Decimal Interchange Code (EBCDIC) (12-13)

**4. Computer Software** **14-17**

System Software : Operating System – Microsoft Windows, BOSS (Bharat Operating System Solutions), Apple Macintosh, Android, Symbian, iOS, BlackBerry, Windows Phone 8-Apollo; WhatsApp Messenger; Device Drivers; System Utilities; Language Translator (14-16) Application Software (16)

## **5. Data Communication and Networking**

**18-22**

Communication Channel (18) Communication Media : Guided or Wired Technologies – Ethernet Cable or Twisted Pair, Coaxial Cable, Fibre Optic Cable; Unguided or Wireless Technologies – Radiowave Transmission, Microwave Transmission, Satellite Communication, Infrared Wave Transmission and Bluetooth (18-19) Computer Network (19) Types of Computer Network : LAN, WAN and MAN (19) Network Devices (20) Network Topology : Bus, Ring or Circular, Star, Mesh and Tree (20) Generations of Mobile Phone : 1G, 2G, 3G, 4G and 5G (21) Video Scape (21)

## **6. Internet and Computer Security**

**23-30**

Internet Connection: Dial-Up, Broadband and Wireless (23) Hyperlink and Hyper Text, Wireless Application Protocol (WAP), Internet Telephony of VOIP and Internet Protocol Version 6 (IPV6) (23-24) Internet Related Terms : World Wide Web (WWW), Web Page, Website, Web Browser, Web Server, Web Address and URL, Domain Name, Web Search Engine – Google, Google+, Google Earth, Gmail, Youtube, Yahoo, Laicos, Altavista, Hot Bot, Bing (25) Services of Internet: Chat, E-mail, Video Conferencing, Social Networking – Facebook, LinkedIn, Myspace, Twitter and Tumbler (25-26) Information Technology (26) Artificial Intelligence (27) Computer Security (28) Antivirus Software (29)