| **วิชา(Subject) ....Science (ICSE).......****ช่วงชั้น (Level) … 3 (M.1-4)…..****20 weeks(2 periods/week): Teaching 36 periods and Examination 4 periods/semester, Total: 40 periods** |
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| **ชั้นมัธยมศึกษาปีที่ 1 (Secondary 1)** | **ชั้นมัธยมศึกษาปีที่ 2 (Secondary 2)** | **ชั้นมัธยมศึกษาปีที่ 3 (Secondary 3)** | **ชั้นมัธยมศึกษาปีที่ 4 (Secondary 4)** |
| **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** |
| **ภาคเรียนที่ (Semester) 1** | **ภาคเรียนที่ (Semester) 2** | **ภาคเรียนที่ (Semester) 1** | **ภาคเรียนที่ (Semester) 2** | **ภาคเรียนที่ (Semester) 1** | **ภาคเรียนที่ (Semester) 2** | **ภาคเรียนที่ (Semester) 1** | **ภาคเรียนที่ (Semester) 2** |
| 1. **Solving Problem in Science (4 periods)**
	1. Scientific Method (Problem, Observation, Hypothesis, Conclusion or inference)
	2. Data presentation
2. **Change in Matter (4 periods)**
	1. Matter
	2. Classification of Matter Based on States
	3. Materials and their Classification
	4. Kinetic Theory of Matter
	5. Law of Conservation of Mass
3. **The Atom (8 periods)**
	1. Evaluation of the atomic models
	2. Structure of an atom (Dalton’s Atomic Theory)
	3. Sub-atomic particles and its properties
4. **Periodic Table (8 periods)**
	1. History of the Modern Periodic Table
	2. Elements
	3. Atomic Number and mass Number
	4. Metals, Non-metals and Metalloids
	5. Alloys
	6. Formation of compounds and Ions
	7. Isotopes, Isotones and Isobars
5. **Pure Substance and Mixture (8 periods)**
	1. Classification of Pure substance and Mixtures
	2. Methods of Separation of Mixtures
	3. Acids and Alkalis
6. **Air and Water (4 periods)**
	1. Air composition
	2. Atmospheric Pollution
	3. Water composition
	4. Water pollution and treatment

**36 periods** | 1. **Cell (4 periods)**
	1. Microscope
	2. Cell theory
	3. Unicellular and Multicellular cell
	4. Plant and animal cell
2. **Tissue, Organ, Body System (4 periods)**
	1. Differentiation – Collective terms: Cell, Tissue, Organs
	2. Animal Tissue
	3. Plant Tissue
	4. Plant major organs
	5. Animal major organ
3. **Plant Transportation (4 periods)**
	1. Diffusion and Osmosis
	2. Effects of osmosis in plants and animals
	3. Plant vascular transport (Xylem & Phloem)
	4. Water absorption in the roots
4. **Plant propagation (3 periods)**
	1. Artificial methods of vegetative propagation
	2. Economic importance of artificial propagation
	3. Hybridization and Micro propagation
5. **Photosynthesis and Respiration (5 periods)**
	1. Basic process of photosynthesis
	2. Factors affecting Photosynthesis
	3. Plant respiration
	4. Factors affecting plant respiration
	5. Animal inhalation and exhalation
	6. Raw material and Product of human
6. **Photosynthesis (5 periods)**
	1. Chloroplast structure and function
	2. Light reaction raw materials and product
	3. Dark reaction
	4. Factor affecting photosynthesis
7. **Reproduction in plants (5 periods)**
	1. Types of plant reproduction
	2. Plant reproductive parts
	3. Pollination(Self and cross-pollination, Agents of Pollination)
	4. Fertilization
	5. Seed and seed germination
8. **Heat Energy (4 periods)**
	1. Nature of Heat
	2. Effects of Heat
	3. Measuring Temperature
	4. Expansion
	5. Specific heat capacities
	6. Latent heat; loss and gain of heat involving change of state for fusion only
	7. Global warming and Green House Effect
9. **Heat Transfer (2 periods)**
	1. Flow of Heat
	2. Conduction, Convection and Radiation

**36 periods** | 1. **Digestive System(6 periods)**
	1. Processes of Nutrition
	2. Enzymes for Digestion
	3. Nutrient Deficiency
	4. Parts of Digestive system and function
	5. Enzyme present indigestive Tract
	6. Types of Digestion
	7. Parts and Presence of Enzymes
	8. Nutrition (Molecular Building blocks and catalyst, Malnutrition and deficiency)
2. **Respiratory System(4 periods)**
	1. Brief Concept: Mechanism of breathing- Inspiration/Expiration
	2. Tissue respiration and heart production
	3. Differences between aerobic respiration in plants and animals
3. **Circulatory System(6 periods)**
	1. Heart Internal and External Parts and Functions
	2. Blood Pressure: Systole and Diastole
	3. Blood vessels differences, structure and functions
	4. Blood Components and functions
	5. ABO and Rh-Blood Group and determination
	6. Universal donor and acceptor (Heart- Lungs Relationship)
4. **Reproduction (6 periods)**
	1. Changes during Puberty
	2. Parts and function of male and female reproductive system
	3. Menstrual Cycle and Fertilization
	4. Stages of Fetal Development
	5. Birth Control (Permanent and Temporary, Sexually Transmitted)
	6. Diseases and Prevention (AIDS, Gonorrhea, Syphilis)
5. **Nervous System (5 periods)**
	1. Structure and Function of the neuron
	2. Autonomic and Peripheral nervous system
	3. Reflex arch and voluntary reflex
	4. Sense Organs
6. **Excretory System (3 periods)**
	1. Kidney: diseases and causes
	2. Nephron Function and Urine Formation
	3. Importance of Kidney
7. **Endocrine System (3 periods)**
	1. Pancreas-Insulin and Glucagon
	2. Adrenal
	3. Thyroid and Pituitary
8. **Movement and Locomotion (3 periods)**
	1. Function of human skeleton
	2. Axial and appendicular skeleton
	3. Types of joints

**36 periods** | 1. **Realm of Ecology (4 periods)**
	1. Species
	2. Population
	3. Community
	4. Ecosystem
	5. Biosphere
2. **Environment(5 periods)**
	1. Component of Ecosystem
	2. Type of biotic components
	3. Relationship Between Biotic Component
	4. Interactions between biotic and abiotic components
3. **Habitat(4 periods)**
	1. Type of habitat
	2. Result and effects of over human activity (Pollution, Acid rain and Global warming)
4. **Energy flow in Ecosystem(4 periods)**
	1. Food chain
	2. Food web
	3. Food Pyramid and number
5. **Nutrient Cycle and Importance (3 periods)**
	1. Carbon cycle
	2. Nitrogen cycle
	3. Role of Nutrient cycle
6. **Light(16 periods)**
	1. Speed of light in different medium
	2. Reflection (Type of surface, Types of reflection)
	3. Plane Mirror and uses
	4. Image in plane mirror
	5. Diffuse, Reflected light, Incident light, boundary, normal line, angle of reflection and incidence
	6. Curve Mirrors and uses
	7. Total internal reflection
	8. Type of reflection
	9. Concave and convex
	10. Refraction of light (Refraction on different media)
	11. Lenses
	12. Light Colors (Light Spectrum, Primary and Secondary Colors, Additive Colors)
	13. Light Color Filter

**36 periods** | 1. **Measurement and Physical Quantity: (4 periods)**
	1. Base Quantities
	2. Derived Quantities
	3. SI Units
	4. Measuring Length: Vernier Callipers, Micrometer screw gauge and basic instruments
	5. Measuring Time: Simple Pendulum
	6. Graph of Length VS Time
2. **Motion in one Dimension (7 periods)**
	1. Scalar and vector Quantities
	2. Distance and Displacement
	3. Speed and Velocity
	4. Acceleration
	5. Uniformly accelerated motion
	6. Graph of Distance-time and speed-time
3. **Laws of motion (4 periods)**
	1. Contract and Non-contract Forces
	2. Resultant Forces
	3. Newton’s 1st Law
	4. Newton’s 2nd Law
	5. Newton’s 3rd Law
4. **Laws of Motion (6 periods)**
	1. Linear momentum
	2. Universal Law of Gravitation
	3. Free fall
	4. Mass and Weight
5. **Fluids (5 periods)**
	1. Pressure with depth
	2. Transmission of pressure in liquid
	3. Atmospheric Presser
	4. Buoyancy, Archimedes’ Principle
	5. Floatation
	6. Relative Density
	7. Determining relative density of solid
6. **Translational and Rotational Motion (5 periods)**
	1. Moment of Force
	2. Center of Gravity
	3. Introduction to translational and rotational motion
	4. Uniform Circular Motion
7. **Force, Work, Power and Energy (5 periods)**
	1. Contact and non-contract forces; cgs & SI units
	2. Turning forces concept
	3. Machines as force multipliers

**36 periods** | 1. **Force, Work, Power and Energy (8 periods)**
	1. Work, Power, Energy and their relation with force
	2. Energy sources
	3. Forms of Energy
	4. Machines as force multipliers
	5. Principle of conservation of energy
2. **Simple Machine (8 periods)**
	1. Types of Simple Machines
	2. Mechanical Advantage
	3. Velocity Ratio
	4. Efficiency
3. **Electricity and Magnetism (12 periods)**
	1. Static Electricity
	2. Simple electric circuit using an electric cell and a bulb to introduce the idea of current(including its relationship to charge) potential difference; insulators and conductors; closed and open circuits; direction of current (electron flow and conventional); resistance in series and parallel.
	3. House hold circuits
	4. Properties of a bar magnet
4. **Sound (8 periods)**
	1. Production of sound (Relation between vibration and frequency, Parts of sound waves, Pitch, Volume, Loudness, Quality of sound, Human Larynx and vocal cord)
	2. How Sound Travel (Production of sound, Speed of sound in different media, Compression and rarefaction)
	3. Detection of sound (Ear parts and functions, Range of Hearing (audible and non-audible), Importance of sound, Noise/sound pollution)

**36 periods** | 1. **Basic/brief Cell theory (Review) (3 periods)**
	1. Prokaryotic and eukaryotic cell
	2. Cell Organelles
	3. Plant and Animal Differences
2. **Cell Cycle and Cell Division (Review) (4 periods)**

2.1. Mitosis and Meiosis2.2. Chromosome structure and Nucleic Acid2.3. Replication and Transcription 1. **Genetics (Review) (4 periods)**
	1. Mendel’s laws of inheritance (Heterozygous, homozygous, dominant, recessive, genotype, phenotype, allele)
	2. Monohybrid and di-hybrid
	3. Blood Genotype determination
	4. Sex-linked inheritance and Pedigree Analysis
2. **Flower Structure (Review) (2 periods)**

4.1. Brief Functions of flowering parts4.2. Complete and incomplete flower4.3. Inflorescence: Spike; raceme, umbel1. **Plant Cell Transportation (Review) (2 periods)**
	1. Cell Membrane and cell equilibrium
	2. Characteristics
	3. Function
	4. Brief Passive and Active Transport
2. **Brief Osmosis and diffusion,** **(3 periods)plasmolysis and deplasmolysis, hyper, hypo and isotonic (Review)**
	1. Water absorption in root hair
	2. Xylem and phloem

6.1. Sieve and companion elements of phloem6.2. Cohesive and adhesive forces1. **Transpiration (Review) (2 periods)**
	1. Stomata transpiration
	2. Factors affecting plant transpiration
	3. Plant transpiration adaptation
2. **Plant Respiration (Review) (2 periods)**
	1. Aerobic and anaerobic respiration
	2. Krebs Cycle
	3. Glycolysis
3. **Photosynthesis: (Basic Equation: Product and raw materials) (Review) (4 periods)**

9.1. Chloroplast structure – site of photosynthesis9.2. Light Reaction and cyclic and non-cyclic photophosphorylation9.3. Photochemical phase (Dark reaction-biosynthetic phase (Calvin Cycle, Biosynthetic phase- C4 pathway), Photosynthesis adaptation, Factors affecting photosynthesis)1. **Ecology (Review) (2 periods)**
	1. Brief Basic Ecosystem(Biotic and Abiotic, Biotic Types)
	2. Relationship: Prey-Predator: Mutualism: Parasitism
	3. Energy Transfer - Food chain, Food web, Food pyramid
2. **Biodiversity (Review) (2 periods)**

11.1. Brief Kingdom Classification11.2. Class Organization11.3. Biodiversity1. **Health and Hygiene(4 periods)**
	1. Bacteria – Types and control
	2. Virus – nature and structure of virus, Intro to HIV and spread
	3. Parasites-spread and control
	4. Brief idea of endemic, pandemic, and sporadic, vaccination: immunization; antitoxin; serum; antiseptics; disinfectants; penicillin; sulphonamide drugs; First Aid
	5. Health organizations; Red Cross and WHO
	6. Hygiene: personal and social factors, carriers, air and water borne diseases
2. **Waste Segregation and management/Pollution(2 periods)**

13.1. Types of pollution - air, water (fresh and marine), soil, radiation and noise.13.2. Sources of wastes – domestic, industrial, agricultural, commercial and other establishments 13.3. Methods of safe disposal of waste: segregation, dumping, composting, drainage, treatment of effluents before discharge, incineration, use of scrubbers and electro static precipitators13.4. Effects of pollution on climate, environment, human health and other organisms13.5. Greenhouse effect and global warming and Ozone layer depletion.13.6. Acid rain**36 periods** | 1. **Wave (14 periods)**

14.1. Transverse waves14.2. Longitudinal waves14.3. Electromagnetic waves1. **Electricity and Magnetism (12 periods)**
	1. Ohm’s Law; concepts of emf, potential difference, resistance; resistances in series and parallel; simple direct problems using combinations of resistors in circuits.
	2. Electrical power and energy
	3. Magnetic effect of a current (principles only, laws not required); electromagnetic introduction; transformer
2. **Modern Physics (10 periods)**
	1. Thermionic emission; simple qualitative treatment of a hot cathode ray tube
	2. Radioactivity and changes in the nucleus; background and safety precautions

**36 periods** |