



Table of Contents 2017-18



Biology

1. Formed by Cells

• Engage

- The Size of Life

• Explore

- Under the Microscope

• Explain

- The Cell: Structural Unit of Life
- How Many Cells?
- Cell Sizes
- A Matter of Quantity
- Cell Structure
- Cell Types
 - Prokaryotes
 - Eukaryotes
- Animal and Plant Cells
 - Cell Diversity
 - Organization Into Tissues
- One-Celled Eukaryotic Organisms

• Elaborate

- Classifying Cells

• Evaluate

2. Life Processes

• Engage

- That's Life

• Explore

- Plant Responses to the Environment

• Explain

- Life Processes
- Living Organisms and the Environment
- The Response of Living Organisms
 - To Changes in the Environment
 - To Internal Changes
- Reproduction
- Growth and Development
- Nutrition
 - Obtaining Material from the Environment
 - Two Forms of Nutrition
 - Living Organisms Use Energy
 - From the Organism to the Environment

• Elaborate

- About Butterflies, Caterpillars, and Cabbages

• Evaluate

3. Nutrition

• Engage

- Why Do We Eat?

• Explore

- How do Plants Feed Themselves?

• Explain

- What Is Nutrition?
- Two Types of Nutrients
- Nutrient Intake from the Environment

- Taking In Inorganic Nutrients

- Obtaining Organic Nutrients

- Autotrophic Organisms

- What Is Photosynthesis?

- The Color of Photosynthesis

- Photosynthesis and Energy

- Heterotrophic Organisms

- Obtaining Nutrients from Food

- Using Nutrients

- Matter for Growth and Repair

- Obtaining Energy from Nutrients

- Energy for Cells

- Cellular Respiration and Photosynthesis

- Getting Rid of Waste

- Nutritional Models

• Elaborate

- Feeding under the Sun

• Evaluate

4. Responses to the Environment

• Engage

- The Sixth Sense

• Explore

- No Senses?

• Explain

- Interacting with the Environment

- Regulating Internal Conditions

- Stimuli

- Receptors

- Sense Organs

- Coordination

- Coordination in Animals

- The Nervous System in Vertebrates

- Neurons

- The Endocrine System

- Coordination in Plants

- Responses

- Animal Responses

- Plant Responses

- Responses in Unicellular Organisms

- Behavior

- Innate Behavior

- Learned Behavior

- Living Organisms and Communication

• Elaborate

- Strange Behaviors

• Evaluate

5. Reproduction

• Engage

- Life's Mysteries

• Explore

- How are Living Organisms Created?



- **Explain**

- Only Life can Generate Life
- Two Methods of Reproduction
- Asexual Reproduction
 - Identical Copies of a Single Parent
 - Organisms that Reproduce Asexually
 - Types of Asexual Reproduction
- Sexual Reproduction
 - Combining Traits
 - Organisms that Reproduce Sexually
 - The Perspective from the Cell
 - Sex Cells
 - Fertilization
 - Embryonic Development
 - An Organism's Biological Cycle

- **Elaborate**

- Born on the Same Day

- **Evaluate**

6. Reproduction in Seed Plants

- **Engage**

- The Potato Plant

- **Explore**

- Cherry Time

- **Explain**

- Two Modes of Reproduction
 - Asexual Reproduction
 - Sexual Reproduction
- The Flower
 - The Reproductive Organs of the Flower
- Pollination
 - Wind Pollination
 - Pollination By Flying Animals
- Pollen Tubes and Fertilization
- Seed Formation
 - Seed Parts
- Fruit Development
- Seed Dispersal
- Seed Germination
- Biological Cycle of Flowering Plants

- **Elaborate**

- Tons of Almonds

- **Evaluate**

7. Diversity of Life

- **Engage**

- Putting Things in the Right Order

- **Explore**

- Many Ways of Classifying

- **Explain**

- Why Do We Classify Life Forms?
- Unit of Classification: Species
- Early Classifications

- Linnaeus' Classification System

- The System of Binomial Nomenclature

- Classification and Evolution

- Phylogenetic Trees

- Classification Criteria

- Current Systems of Classification

- The Five-Kingdom System

- Kingdom Animalia

- Kingdom Plantae

- Kingdom Fungi

- Kingdom Protista

- Kingdom Monera

- The Three-Domain System

- Viruses: A Case Apart

- **Elaborate**

- The Encyclopedia of (School) Life

- **Evaluate**

8. The Living Cell

- **Engage**

- We Are Cells

- **Explore**

- Many Diverse Cells

- **Explain**

- The Chemistry of Life

- The Human Being, a Multicellular Organism

- Human Cells

- The Organelles of Human Cells

- The Macromolecular Complexes of Human Cells

- The Cell's Nucleus and Genetic Material

- Different Cells

- Tissues, Organs, and Systems

- Main Tissues of the Human Body

- Epithelial Tissue

- Connective Tissue

- Muscle Tissue

- Nervous Tissue

- Cell Responses to the Environment

- Human Homeostasis

- Exchange of Substances

- Cell Nutrition

- Energy

- Matter

- Cell Division

- **Elaborate**

- Cancer

- **Evaluate**

10. Human Nutrition

- **Engage**
 - Space Food
- **Explore**
 - Exploring Digestion
- **Explain**
 - Nutrients
 - Food Nutrients
 - Carbohydrates
 - Fats
 - Proteins
 - Vitamins
 - Water and Minerals
 - Diet
 - The Processes of Human Nutrition
 - Obtaining Nutrients
 - Digestion
 - Digestive Glands
 - Intestinal Absorption
 - Breathing
 - Transportation of Substances
 - Blood
 - Blood Vessels
 - The Heart
 - The Circulation of Blood
 - Removing Waste Substances
 - Regulation of the Body's Internal Environment
 - Nutrition and Health
 - Diet-Related Diseases
 - Eating Disorders
 - Guidelines for Maintaining Healthy Habits
- **Elaborate**
 - Analyze Your Diet!
- **Evaluate**

11. Human Responses to the Environment

- **Engage**
 - False Perceptions
- **Explore**
 - Exploring Perception
- **Explain**
 - Interacting with the Environment
 - Detecting Stimuli
 - Receptors
 - Sight
 - Hearing
 - Smell
 - Taste
 - Touch
 - Coordination
 - The Human Nervous System
 - Structure of the Nervous System
 - The Nerve Impulse
 - Neurons
 - The Endocrine System
 - Hormone Regulation

- Responses
- Human Behavior
- The Locomotor System
 - The Skeletal System
 - The Muscular System
- Disorders in Responses to the Environment
 - Drugs
 - Guidelines for a Healthy Lifestyle
 - The Immune Response
- **Elaborate**
 - United against Diabetes
- **Evaluate**

12. Human Reproduction

- **Engage**
 - Understanding Human Reproduction
- **Explore**
 - Key Processes of Human Reproduction
- **Explain**
 - Characteristics of Human Reproduction
 - The Human Life Cycle
 - Gametes
 - Reproductive Systems
 - Anatomy of Reproductive Systems
 - The Menstrual Cycle
 - Fertilization
 - Pregnancy
 - Implantation
 - Embryonic and Fetal Nutrition
 - Birth
 - Postnatal Period
 - Mother's Return to Prepregnant State
 - Newborn Care
- **Elaborate**
 - In Vitro Fertilization
- **Evaluate**

13. Ecology

- **Engage**
 - Reefs
- **Explore**
 - A Remote Island
- **Explain**
 - What Is Ecology?
 - Definition of an Ecosystem
 - Components of an Ecosystem
 - Abiotic Factors
 - Biotic factors
 - Biotic Interactions
 - Interactions within a Population
 - Interactions among Different Populations
 - Adaptations by Living Organisms
 - Habitat and Ecological Niche
 - Feeding Relationships
 - Food Chains and Food Webs



- The Flow of Matter and Energy in Ecosystems
- Biomes
- Terrestrial Biomes
 - Classification
- Aquatic Biomes
 - Classifying Aquatic Biomes
- Soil as an Ecosystem
- Biodiversity of an Ecosystem
 - Importance of Biodiversity
- Human Impact on Earth's Ecosystems

• **Elaborate**

- Invaders!

• **Evaluate**

14. Flow of Matter and Energy in Ecosystems

• **Engage**

- Spheres of Life

• **Explore**

- A Base on Mars

• **Explain**

- Ecosystems
 - Components of an Ecosystem
- Feeding Relationships
 - Trophic Levels
 - Food Chains and Food Webs
- Food
 - Food Production
 - Obtaining Energy from Food
- Energy Flow
 - Energy Flow in Ecosystems
 - Energy Pyramids
- Cycling of Matter
 - Cycles of Matter within Ecosystems
 - The Carbon Cycle
 - The Nitrogen and Phosphorus Cycles
- Trophic Parameters
 - Biomass
 - Productivity
 - The P/B Ratio
 - Trophic Pyramids
- Population Dynamics
 - Growth Curves
 - Reproductive Strategies
 - Interaction among Populations
- Community Dynamics
 - Ecological Successions
 - Human Impact

• **Elaborate**

- Minute Ecosystems

• **Evaluate**

15. Genetic Material

• **Engage**

- That's How We Are

• **Explore**

- Dog Breeds

• **Explain**

- Inherited Traits
 - Determined by the Genetic Material
 - Transmission of Genetic Material
 - Many Cells and the Same Genetic Material
- Acquired Traits
- DNA
 - Genes
 - Variants Of a Gene
- Chromosomes
 - Pairs of Chromosomes
 - Sex Cells and Chromosomes
 - The Role of Chromosomes in Reproduction

• **Elaborate**

- Genes—a Current Issue

• **Evaluate**

15. Molecular Genetics

• **Engage**

- Mutants!

• **Explore**

- Codes

• **Explain**

- Genetic Material
 - Different Cells but the Same Genetic Material
- DNA
 - Chemical Structure of the DNA Molecule
 - Cells and DNA
 - The Cell Cycle
 - DNA Replication
 - Cell Division
- From DNA to Proteins
 - Proteins
 - Genes
 - RNA
 - Transcription
 - Translation
 - The Genetic Code
- Mutations
 - Induced Mutations
- Biotechnology
 - Genetic Engineering: Techniques
 - Genetic Engineering: Applications

• **Elaborate**

- Viruses!

• **Evaluate**

16. Heredity

• Engage

- A Chip Off the Old Block

• Explore

- Decoding the Laws of Inheritance

• Explain

- Heredity
 - The Study of Heredity
- Principles of Heredity
 - Law of Dominance
 - Law of Segregation (I)
 - Law of Segregation (II)
 - Law of Segregation (III)
 - Law of Independent Assortment (I)
 - Law of Independent Assortment (II)
- Inheritance and Probability
- Inheritance and Genetics
 - Genes and alleles
 - Genes and DNA
 - Genes, proteins and hereditary traits
 - Chromosomes
- Meiosis
 - Meiotic Recombination
- Beyond Mendel's Laws of Inheritance
- Sex-Determination System
- Sex-Linked Traits
- Genetic Disorders
 - Diagnosing Genetic Conditions
- Genes or the Environment?

• Elaborate

- Congress on Hereditary Diseases

• Evaluate

17. Evolution

ANNEX

1. Invertebrates

• Explain

- A World of Invertebrates
- The Animal Kingdom
- The Main Animal Taxa
- Phylum Porifera
 - Description, Life Processes, and Diversity
- Phylum Cnidaria
 - Description, Life Processes, and Diversity
- Phylum Plathelminthes
 - Description, Life Processes, and Diversity
- Phylum Nematoda
 - Description, Life Processes, and Diversity
- Phylum Annelida
 - Description, Life Processes, and Diversity
- Phylum Mollusca
 - Description, Life Processes, and Diversity
- Phylum Arthropoda
 - Description, Life Processes, and Diversity
- Phylum Echinodermata
 - Description, Life Processes, and Diversity

2. Vertebrates

• Explain

- The Animal Kingdom
- The Main Animal Taxa
- Chordates
- Vertebrates: Main Characteristics
- Fishes
 - What Is a Fish?
 - Description, Life Processes, and Diversity
- Amphibians
 - In Between Two Worlds
 - Description, Life Processes, and Diversity
- Reptiles
 - The Conquest of Solid Ground
 - Description, Life Processes, and Diversity
- Birds
 - Feathered Dinosaurs
 - Description, Life Processes, and Diversity
- Mammals
 - What Is a Mammal?
 - Description, Life Processes, and Diversity
- Evolution of Vertebrates

3. Microorganisms and fungi

4. Plants

Earth Science

1. The Earth in the Universe

• Engage

- Inconceivably Large

• Explore

- Finding Our Place in the Universe

• Explain

- What Is the Universe?
- How do We Know about the Universe?
- Historical Models of the Universe
 - Aristotle's Model
 - Ptolemy's Model 13
 - The Breakdown of Ptolemy's Model
 - Copernicus' Model
 - Kepler's Model
- The Current Model of the Universe
 - The Solar System
 - The Sun Is a Star
 - Stars Are "Furnaces" of Matter
 - Stars Are Born in Nebulae
 - Stars and Nebulae Are Grouped Into Galaxies
 - Galaxies Move Away from Each Other
 - The *Big Bang*

• Elaborate

- A Trip Through the Universe

• Evaluate

2. The Solar System

• Engage

- Travelers

• Explore

- A Small-Scale Solar System

• Explain

- What Is the Solar System?
- Our Star, the Sun
 - The Sun, a Nuclear Reactor
 - The Structure of the Sun
 - The Evolution of the Sun
- The Planets of the Solar System
- Inner or Rocky Planets
 - Mercury
 - Venus
 - Earth
 - Mars
- Outer or Gaseous Planets
 - Jupiter
 - Saturn
 - Uranus
 - Neptune
- Other Objects of the Solar System
- The Formation of the Solar System

• Elaborate

- *Eyes on the Solar System*

• Evaluate

3. The Earth–Sun–Moon System

• Engage

- The Seasons

• Explore

- A Model for the Sun–Earth System

• Explain

- The Sun–Earth System
 - The Sun, a Source of Light and Heat
 - Earth's Rotation and the Day–Night Cycle
 - Earth's Orbital Motion
 - The Tilt of Earth's Rotational Axis and the Ecliptic
 - The Length of Days and Nights
 - The Seasons
 - Equinoxes and Solstices
 - Climatic Zones
- The Earth–Moon System
 - The Moon, Our Satellite
 - Theories of Formation of the Moon
 - The Moon's Orbital Motion
 - The Moon's Rotational Motion
- The Sun–Earth–Moon System
 - Lunar Phases
 - Eclipses
 - Lunar Orbit and Eclipses
 - Solar Eclipse
 - Lunar Eclipse
 - The Daily Tidal Cycle
 - The Monthly Tidal Cycle

• Elaborate

- Astronomical Observations

• Evaluate

4. Minerals and Rocks

• Engage

- Rocks

• Explore

- Three Rocks

• Explain

- The Geosphere
- The Layers of the Geosphere
- What Is a Mineral?
- The Properties of Minerals
 - Optical Properties
 - Mechanical Properties
 - Physical Properties
 - Chemical Properties
- ¿How Do Minerals Form?



- Classifying Minerals
- What Are Rocks?
 - Rocks and Their Characteristics
 - Igneous Rocks
 - Sedimentary Rocks
 - Metamorphic Rocks
- Types of Metamorphic Rocks
- The Rock Cycle

• **Elaborate**

- A “Key” Tool for Identifying Rocks

• **Evaluate**

5. Planet Water

• **Engage**

- Searching for Life, Searching for Water

• **Explore**

- Water in Motion

• **Explain**

- Water On Earth
 - Origin of Water on Earth
 - The Earth Is Unique!
 - Water Distribution on Earth
- Properties of Water
- A Universal Solvent
 - Hard to Heat It and Cool It
 - Changes of State
 - The Density of Ice
- The Water Cycle
 - Model of the Water Cycle
 - What Moves the Water Cycle?
- Water and Living Organisms
- Water and Human Activities
 - Collecting Water from the Natural Cycle
 - Preparing Water for Use
 - Using Water
 - Returning Water to the Natural Cycle
 - Saving Water

• **Elaborate**

- The Use of Water in School

• **Evaluate**

6. Weather and Atmosphere

• **Engage**

- Is It Going to Rain?

• **Explore**

- Air in Motion

• **Explain**

- Earth’s Atmosphere
 - Composition of the Atmosphere
 - Density and Atmospheric Pressure
 - Layers of the Atmosphere

- Energy in the Atmosphere
- Energy Transfer and the Natural Greenhouse Effect
- Atmosphere and Life

· **Atmospheric Motion**

- Air Circulation on a Stationary Earth
- Global Air Circulation on Earth
- Cyclones and Anticyclones
- Air Masses

- Temperature and Humidity of an Air Mass

- The Motion of Air Masses & the Formation of Fronts

· **Weather Phenomena**

- Cloud Formation

- Cloud Types

- Precipitation

- Local Breezes

- Storms

· **The Weather Forecast**

- The Weather Station

- Weather Forecast Maps

· **Atmosphere and Human Activities**

• **Elaborate**

- Weather Observers

• **Evaluate**

7. Earth’s Internal Processes

• **Engage**

- What Lies Beneath?

• **Explore**

- Exploring the Earth’s Deep Interior

• **Explain**

- A Planet Brimming with Energy
- The Study of Earth’s Interior
- Structure of the Geosphere
- Origin of the Geosphere
- Internal Dynamics of the Geosphere
 - Earth’s Magnetic Field
 - Motion in the Lithosphere
 - Plate Boundaries
 - Divergent Plate Boundaries
 - Convergent Boundaries
 - Continental Drift
- Volcanoes
 - Volcanic Regions
 - Types of Volcanic Eruptions
 - Magma Viscosity
 - Volcanic Landforms
 - Volcanic Hazard
 - The Study of Volcanoes

Earth Science: Planet Earth

- Earthquakes
 - Folds and Faults
 - Seismic Waves
 - Magnitude of an Earthquake
 - Seismic Hazards
 - The Study of Earthquakes

- **Elaborate**

- Investigating Plate Boundaries

- **Evaluate**

8. Earth's External Processes

- **Engage**

- Washing Away Footprints

- **Explore**

- Harder than Rock?

- **Explain**

- A Changing Surface
 - Earth's External Processes
 - Agents
 - Weathering
 - Erosion
 - Transportation
 - Sedimentation
 - Mobile Agents
 - Wind
 - Runoff
 - Rivers
 - River Landscapes
 - Groundwater
 - Karst Landscapes
 - Glaciers
 - The Action of Mountain Glaciers
 - The Sea
 - Coastal Landscape
 - Living Organisms
 - Soil
 - Composition
 - Formation
 - Sedimentary Rock Formation
 - Detrital Rocks
 - Nonclastic Sedimentary Rocks
 - Humans as Agents of External Processes

- **Elaborate**

- Desertification

- **Evaluate**

9. History of the Earth

1. What Is Science?

- **Engage**
 - What Is a Scientist?
- **Explore**
 - Accounting for the Unknown
- **Explain**
 - We Humans Ask Ourselves Questions
 - The First Answers: Myths
 - From Myth to *Logos*
 - The Scientific Revolution
 - A Method for Obtaining Answers
 - Possible Answers
 - Types of Answers
 - Scientific Laws
 - Scientific Theories
 - Creative Answers
 - Answers Science Cannot Provide
 - Scientific Disciplines
 - Great Personalities in Science
 - Science and Technology
- **Elaborate**
 - Is This Science?
- **Evaluate**

2. Mass, Volume and Density

- **Engage**
 - At the Grocery Store
- **Explore**
 - Playing Around with Liquids
- **Explain**
 - What is Matter?
 - Mass
 - Measuring Mass
 - Volume
 - Measuring Volume
 - Liquids
 - Solids with Regular Shapes
 - Other Solids
 - Density
 - The Concept of Density
 - Formulas
 - Units of Density
 - A Magnitude that Characterizes Substances
 - Buoyancy of Materials
- **Elaborate**
 - The King's Crown
- **Evaluate**

3. Change of State

- **Engage**
 - Same Material, Different State
- **Explore**
 - Heating and Cooling Substances
- **Explain**
 - The Three States of Matter
 - The Effect of Heat On Substances
 - Progressive Changes
 - Regressive Change
 - The Effects of Heat on the Density of Substances
 - The Effects of Heat on the Pressure of Gases
 - Changes of State and Temperature
 - Melting Point
 - Boiling Point
 - Boiling Point and Evaporation
 - Condensation
 - Sublimation
 - Changes of State: General Outline
- **Elaborate**
 - The Invention of the Thermometer
- **Evaluate**

4. Pure Substances and Mixtures

- **Engage**
 - Separating Waste
- **Explore**
 - Mixtures in the Kitchen
- **Explain**
 - Classifying Substances
 - Homogeneous and Heterogeneous
 - Pure Substances and Mixtures
 - Pure Substances and Their Specific Properties
 - Mixtures and the Properties of Their Components
 - Heterogeneous Mixtures
 - Diversity of Heterogeneous Mixtures
 - Homogeneous Mixtures or Solutions
 - Types of Solutions
 - Almost Homogeneous Mixtures
 - Colloids
 - Separation of Mixtures
 - Heterogeneous Mixtures
 - Homogeneous Mixtures
- **Elaborate**
 - Waste Water Treatment
- **Evaluate**



5. A World of Particles

- **Engage**
 - What is Matter Made of?
- **Explore**
 - Exploring the Corpuscular-Kinetic Theory
- **Explain**
 - Matter Is Made Up of Particles
 - Particles and States of Matter
 - Properties of Solids
 - Properties of Liquids
 - Properties of Gases
 - Effects of Heat on Particles
 - Expansion and Contraction
 - In Solids and Liquids
 - Gas Pressure
 - Changes of State
 - Melting and Boiling Points
 - Evaporation and Condensation
 - Mixtures
 - Formation of Solutions
 - Formation of Colloids
 - Density
- **Elaborate**
 - Making Science Popular
- **Evaluate**

6. Substances Change

- **Engage**
 - Transformations
- **Explore**
 - Transformations and Iron Nails
- **Explain**
 - Physical Properties
 - Properties of an Object
 - Properties of a Substance
 - Physical Changes
 - Expansions, Contractions, and Changes of State
 - Chemical Properties
 - Chemical Changes
 - Identifying Chemical Changes
 - Color Change
 - Change of Smell
 - The Formation of Gases
 - Changes of Temperature
 - Difficult to Revert
 - Chemical Reactions
 - Types of Chemical Reactions
 - Matter is Preserved in Changes of State

- **Elaborate**
 - Chemical Changes for Solving Crimes
- **Evaluate**

7. The Atomic Structure of Matter

- **Engage**
 - Is Water Pure?
- **Explore**
 - A Game of Letters and Chemical Reactions
- **Explain**
 - Two Types of Substance
 - Elements
 - Compounds
 - Compounds or Mixtures?
 - The Atomic Theory
 - Atoms and Elements
 - Combinations of Atoms and Compounds
 - Chemical Reactions
 - List of Elements
 - Periodic Table of the Elements
 - Chemical Formula of a Compound
- **Elaborate**
 - The Materials Around You
- **Evaluate**

8. Aqueous Solutions

- **Engage**
 - Water and Salt
- **Explore**
 - What a Glass of Water Can Contain
- **Explain**
 - Homogeneous Mixtures
 - Aqueous Solutions
 - Soluble and Insoluble Substances
 - Miscible and Immiscible Liquids
 - Concentration of a Solution
 - Three Ways of Expressing Concentration
 - Density versus Concentration
 - Solubility
 - Solubility of Solids and Temperature
 - Solubility of Gases, Temperature, and Pressure
 - Graphs of Solubility versus Temperature
 - Rate of Dissolution
- **Elaborate**
 - Freshwater Fish
- **Evaluate**

9. Atoms

• Engage

- Transmutation

• Explore

- Looking Into the Atom

• Explain

- The History of the Atom
 - The Atomic Theory
 - Atomic Models
- Structure of the Atom
- Units on an Atomic Scale
- Characterizing the Atom
- Isotopes
- Mass of an Atom and Atomic Mass of an Element
- Ions
- Atom Bonds
- Atoms Transform
 - Natural Radioactivity
 - Artificial Radioactivity and Nuclear Reactions
 - Uses of Radioactivity
- Mole

• Elaborate

- The Nuclear Power Plant

• Evaluate

10. Elements and Compounds

• Engage

- Cards and Elements

• Explore

- Sorting Chemical Elements

• Explain

- Pure Substances
 - Undergoing Physical Changes
 - Undergoing Chemical Changes
- Elements and Compounds
- Abundance of Elements
- Periodic Table of Elements
 - History of the Classification of Elements
 - Groups and Periods
 - Physical Properties
 - Chemical Properties
- Compounds and Chemical Formula
- Groups of Atoms
- Molecular Substances
 - Molecules and Molecular Formula
 - Molecular Substances and Properties

- Crystals

- Crystal Lattice Structures and Empirical
- Types of Crystalline Structures
- Molecular Mass and Molar Mass

• Elaborate

- Different Structures, Different Properties

• Evaluate

11. Chemical Reactions

• Engage

- The Magic of Fire

• Explore

- Is Mass Conserved?

• Explain

- Chemical Reaction
 - Signs of a Change
 - Invisible Changes
- Conservation of Mass
 - Atomic Model
- Chemical Equation
- Collision Model of a Chemical Reaction
- Types of Chemical Reactions
- Reactions Depending on the Rearrangement of Atoms
- Reactions Depending on the Exchange of Particles
 - Acid-Base Reactions
 - pH
 - Reduction-Oxidation Reactions (Redox)
- Reactions Depending on the Exchange of Energy
 - Exothermic and Endothermic
 - Graphic Representation
- Reaction Rate
 - Catalysts
- Chemical Reactions in Living Organisms
- Chemical Reactions in Industry

• Elaborate

- Controlling a Chemical Reaction

• Evaluate

12. The Chemical Bond

13. Quantitative Chemistry



ANNEX

Formula Writing & Inorganic Nomenclature

• Explain

- Writing Formulas and Names
 - Name, Formula, and Composition
- Valence
- Oxidation Number
 - Using Oxidation Numbers
- Greek Prefixes and Roman Numerals
- Elementary Substances
- Binary Compounds
 - Metal Hydrides
 - Binary Acids
 - Metal Oxides
 - Nonmetal Oxides
 - Other Nonmetal Covalent Compounds
 - Binary Salts
- Ternary Compounds
 - Hydroxides
- Compounds and Common Names

Organic Chemistry

Physics

1. Motion and Speed

• Engage

- A Race Winner

• Explore

- Car Races

• Explain

- The Nature of Motion
- Position and System of Reference
- Trajectory
- Trajectory, Distance, and Displacement
- The Role of Time in the Description of Motion
- Travelled Distance vs. Time Graph
- Speed
 - Concept and Formula
 - Units of Speed

• Elaborate

- Home to School

• Evaluate

2. Acceleration

• Engage

- Changes of Speed

• Explore

- Qualifying Session

• Explain

- Average Speed
- Instantaneous Speed
- Uniform Motion
- Nonuniform Motion
- Speed on Graphs of Distance vs. Time
- Distance vs. Time Graphs and Nonuniform Motion
- Speed vs. Time Graphs
- The Velocity Vector
- Acceleration
 - Positive, Zero, and Negative Acceleration
 - Acceleration on Speed vs. Time Graphs
- The Acceleration Vector

• Elaborate

- Speed under Control

• Evaluate

3. Forces

• Engage

- Where Is the Force?

• Explore

- Forces Acting on a Ball

• Explain

- What Is a Force?

- Agents Exert, Receivers Receive
- The Effects of Forces

- Representing Forces
- Net Force and Center of Mass

- Addition of Forces

- Types of Forces
- Action-at-a-Distance Forces

- Gravity
- Magnetic and Electric Forces

- Contact Forces
- The Pressure of a Force

- Forces and Motion
 - Newton's First Law
 - Inertia
 - Newton's Second Law
 - Newton's Third Law

• Elaborate

- Road Safety

• Evaluate

4. Operations with Forces

• Engage

- In Balance

• Explore

- Hanging from One or Two Ropes

• Explain

- Describing Forces
- The Effect of Forces
- Addition
 - Forces in the Same or Opposite Direction
 - Forces in Different Directions
- Force Resolution into Components
- Other Operations with Vectors
 - Product of a Vector with a Number
 - Vector Subtraction

• Elaborate

- The Inclined Plane

• Evaluate

5. Energy

• Engage

- Energy and Height

• Explore

- Roller Coaster

• Explain

- A Changing Universe
- Energy
 - Energy and Changes
- Two Key Types of Energy
- Forms of Energy



- Mechanical Energy
- Characteristics of Energy
 - The Law of Conservation of Energy
 - Transformation, Transfer, and Transport of Energy
 - Degradation of Energy
- Energy Flow Diagrams
- Work and Heat
 - Calculating the Work Done by a Force
- Using Energy
 - Simple Machines
 - Efficient Use of Energy in Machines
- Sources of Energy
 - Nonrenewable Sources of Energy
 - Renewable Sources of Energy

• **Elaborate**

- Saving Energy at Home

• **Evaluate**

5. Heat and Temperature

• **Engage**

- A Winter Morning

• **Explore**

- The Snowman

• **Explain**

- Heat or Temperature?
- The Corpuscular-Kinetic Model and the Energy Model
- Thermal Energy
- Temperature
 - Temperature Scales
- Thermal Energy vs. Temperature
- Thermal Equilibrium
- Heat
- Effects of Heat on Objects
 - Changes in Temperature and Specific Heat
 - Expansion and Contraction
 - Changes of State and Latent Heat
- Three ways in which energy moves as heat
 - Conduction
 - Conduction: Insulators and Conductors
 - Convection
 - Radiation
- Thermometers

• **Elaborate**

- The Perfect Mug

• **Evaluate**

6. Waves

• **Engage**

- Let's Go to the Stadium!

• **Explore**

- Crowd Waves Around the Stadium

• **Explain**

- Wave Model
 - Types of Waves
 - Wave Properties
- Wave–Matter Interactions
 - A Change in the Propagation Medium
- Wave-Wave Interaction
- Sound
 - Properties of Sound
 - Echo and Reverberation
 - The Human Ear
- Electromagnetic Waves
 - Electromagnetic Spectrum
- Visible Light
 - Light–Matter Interactions
 - Shadows and Penumbra
 - Decomposition of White Light
 - The Color of an Object
 - Reflection and Mirrors
 - Refraction and Lenses
 - Sight

• **Elaborate**

- Powers of Perception

• **Evaluate**

7. Electricity and Magnetism

• **Engage**

- Electricity Everywhere

• **Explore**

- Balloons, Lightning, and Circuits

• **Explain**

- Electricity
 - Electric Charge
 - Units of Electric Charge
 - Electric Forces: Coulomb's Law
 - Electric Field
 - Charging
 - Balancing Charge Imbalances
 - Insulators and Conductors
- Electric Circuit
 - Electric Current
 - Circuit Components
 - The Closed Circuit and Chain Analogy
 - Types of Circuits
 - Voltage, Current, Resistance, and the

River Analog

· Relationship between Electric Magnitudes:

Ohm's Law

· Joule Heating

· Electric Power

· Magnetism

· Magnets

· Magnetic Forces

· Magnetic Field

· Magnetic and Nonmagnetic Materials

· Electromagnetism

· Electromagnetic Machines

· Electricity Use

· Electricity Production

· Electric Power Distribution

· Home Electrical System

• Elaborate

· The Home Electrical System

• Evaluate

8. Kinematics

• Engage

· Motion without Forces?

• Explore

· The Virtual Lab

• Explain

· What Is a Force?

· Forces as Vectors

· Net Force

· Force Addition

· Force Resolution into Components

· Forces and Motion

· Newton's First Law

· Inertia

· Newton's Second Law

· Newton's Third Law

· The Weight Force

· The Normal Force

· Friction

· Friction Forces Exerted by Surfaces

· The Spring Force

· The Centripetal Force

· The Gravitational Force

· Newton's Law of Universal Gravitation

· Planetary and Satellite Motions

· Orbital Paths

• Elaborate

· Designing a Dynamometer

• Evaluate

9. Forces and Motion

• Engage

· Motions

• Explore

· The Kinematics Lab

• Explain

· Motion

· Frames of Reference

· Path, Distance, and Displacement

· Displacement Vector

· Velocity

· Speed and Velocity

· Velocity Vector

· Velocity and Position-Time Graphs

· Average Velocity and Instantaneous Velocity

· Acceleration Vector

· Acceleration and Velocity-Time Graphs

· Acceleration Vector

· Motions with Constant Acceleration

· Uniform Linear Motion (ULM)

· Interpreting ULM

· ULM of Two Objects

· Uniformly Accelerated Motion (UAM)

· Velocity Equation

· Position Equation

· Free Fall

· Uniform Circular Motion (UCM)

· Angular and Linear Quantities

· Velocity, Acceleration, and Turning Radius

• Elaborate

· Speedometer Design and Setup

• Evaluate

10. Work and energy

• Engage

· Perpetual Motion?

• Explore

· Snowboarding

• Explain

· Systems

· Internal and External Forces

· A System's Energy

· Two Key Types of Energy

· Law of Conservation of Energy

· Energy Transformation, Transfer, and Transport

· Work

· Calculating the Work Done by a Force



- Mechanical Energy
 - Conservation of Mechanical Energy in an Isolated System
 - Nonconservation of Mechanical Energy
 - Energy and Changes
- Relationship between Work and Energy
- Heat
- Effect of Heat on a System
 - Expansion and Contraction
 - Changes in Temperature and Specific Heat
 - Changes of State and Latent Heat
- Equivalence Work-Heat
- Degradation of Energy
- Total Energy of a System
- Machines
 - Power
 - Efficiency
 - Mechanical Machines
 - Thermal Machines
- **Elaborate**
 - Rube Goldberg Machines
- **Evaluate**