

ICATS CONTESTS

SCIENCE: COURSE OUTLINE AND LEARNING OUTCOMES

GRADE 7-8

1. BRANCHES OF BIOLOGY

Introduction to Biology:

- Students should be able to explain the fundamental concepts of biology and its importance in understanding life on Earth.

Cell Biology:

- Students should be able to describe the structure and function of cells and understand the role of cells as the basic unit of life.

Genetics:

- Students should be able to explain the principles of heredity, including Mendelian genetics, and understand how traits are passed from one generation to the next.

Ecology:

- Students should be able to describe the basic concepts of ecology, including the relationships between organisms and their environments, and the impact of human activities on ecosystems.

Evolution:

- Students should be able to explain the theory of evolution by natural selection and understand how species change over time.

Botany:

- Students should be able to identify and describe the main characteristics of plants and understand their role in the environment and human society.

Zoology:

- Students should be able to identify and describe the main characteristics of animals and understand their diversity and adaptation to different environments.

Microbiology:

- Students should be able to explain the importance of microorganisms in various biological processes and their impact on human health and the environment.

Anatomy and Physiology:

- Students should be able to describe the structure and function of the human body, including major organ systems and their role in maintaining health.

Biotechnology:

- Students should be introduced to the basic concepts of biotechnology and its applications in areas such as medicine, agriculture, and environmental science.

Ethical and Environmental Considerations:

- Students should be able to discuss the ethical considerations and environmental implications of advances in biology and biotechnology.

Scientific Inquiry:

- Students should develop skills in scientific inquiry, including making observations, forming hypotheses, conducting experiments, and analyzing data.

2. ELECTROSTATICS

- **Understand the concept of electric charge:** Students should be able to explain what electric charge is and describe the fundamental properties of charged particles (protons and electrons).
- **Learn the laws of electrostatics:** Students should understand Coulomb's law, which describes the force between charged objects, and be able to apply it to solve problems related to electrostatic interactions.

- **Recognize different methods of charging objects:** Students should be able to explain how objects can be charged by friction, conduction, and induction and provide examples of each.
- **Identify conductors and insulators:** Students should be able to distinguish between materials that allow the easy flow of electric charge (conductors) and those that resist the flow of electric charge (insulators).
- **Explain the principles of static electricity:** Students should be able to describe the phenomenon of static electricity, its causes, and real-life applications, such as lightning, static shocks, and the operation of photocopiers.

3. GEOLOGY:

- **Understand Earth's structure:** Students should be able to describe the Earth's layers, including the crust, mantle, outer core, and inner core, and understand their composition and characteristics.
- **Learn about plate tectonics:** Students should comprehend the theory of plate tectonics, explaining how the Earth's lithosphere is divided into moving plates and the geological phenomena associated with plate boundaries, such as earthquakes and volcanoes.
- **Identify major rock types:** Students should be able to distinguish between igneous, sedimentary, and metamorphic rocks and explain the processes by which these rocks form.
- **Explain geological processes:** Students should be able to describe the processes that shape the Earth's surface, including erosion, deposition, weathering, and geological time scales.
- **Recognize the impact of geology on society:** Students should understand how geological processes and resources affect human activities, such as mining, construction, and environmental issues like landslides and groundwater pollution.

4. CELL BIOLOGY:

- **Understand the cell as the basic unit of life:** Students should recognize that cells are the fundamental building blocks of all living organisms and describe the key features of a typical animal or plant cell.
- **Learn about cell organelles:** Students should be able to identify and explain the functions of major organelles within a cell, including the nucleus, mitochondria, endoplasmic reticulum, Golgi apparatus, and more.

- **Comprehend cellular processes:** Students should understand fundamental cellular processes such as cellular respiration, photosynthesis, and cell division (mitosis and meiosis), and be able to explain their significance in sustaining life.
- **Explore genetic material and DNA:** Students should grasp the role of DNA as the genetic material, the structure of the DNA molecule, and the process of replication, transcription, and translation.
- **Connect cell biology to health and disease:** Students should recognize the relevance of cell biology to human health, including how abnormalities at the cellular level can lead to diseases and how advances in cell biology contribute to medical research and treatment.

5. FORMS OF ENERGY

Forms of Energy:

- Understand that energy is the capacity to do work and can exist in various forms.
- Describe how energy is conserved and transformed from one form to another.
- Identify and classify different forms of energy, including kinetic, potential, thermal (heat), light, sound, and gravitational potential energy.
- Explain the concept of mechanical energy, which encompasses kinetic and potential energy.
- Recognize that energy is a fundamental concept in the understanding of natural phenomena.

Heat:

- Explain that heat is a form of energy that results from the motion of atoms and molecules.
- Understand the difference between temperature and heat and how they relate.
- Describe how heat is transferred through conduction, convection, and radiation.
- Identify and explain everyday applications of heat transfer, such as cooking, insulation, and climate control.
- Understand the concept of specific heat capacity and its significance in heating and cooling processes.

Light:

- Explain that light is a form of electromagnetic radiation with properties like wavelength and frequency.
- Understand that light can travel through a vacuum and transparent materials.
- Identify the characteristics of light, including reflection, refraction, dispersion, and the formation of shadows.
- Recognize how light is essential for vision and its role in optical devices like lenses and mirrors.
- Describe the concept of the electromagnetic spectrum and its various types of waves.

Sound:

- Explain that sound is a form of mechanical energy that results from the vibration of particles in a medium.
- Understand the properties of sound waves, including frequency, amplitude, wavelength, and speed.
- Identify how sound travels through different mediums, including air, solids, and liquids.
- Explain the behavior of sound waves with respect to reflection, refraction, and interference.
- Recognize the applications of sound in various technologies, including music, communication, and medical imaging.

Potential Energy:

- Define potential energy as the energy an object possesses due to its position or condition.
- Recognize that potential energy can exist in various forms, such as gravitational potential energy, elastic potential energy, and chemical potential energy.
- Calculate potential energy using appropriate formulas and units.
- Understand how changes in an object's height or position affect its gravitational potential energy.
- Identify real-world examples where potential energy is converted into kinetic energy and vice versa.

Kinetic Energy:

- Define kinetic energy as the energy of motion possessed by an object.
- Calculate kinetic energy using appropriate formulas and units.
- Recognize the relationship between an object's mass and velocity on its kinetic energy.
- Explain how kinetic energy can be transferred or transformed within a closed system.
- Identify practical applications of kinetic energy in everyday life and technology.

Gravitational Potential Energy:

- Explain gravitational potential energy as the energy stored in an object due to its height above a reference point.
- Understand the factors influencing gravitational potential energy, such as mass, height, and gravitational acceleration.
- Calculate gravitational potential energy for objects at various heights.
- Relate gravitational potential energy to the concept of work done when objects are lifted or lowered.
- Identify the connection between gravitational potential energy and the conservation of mechanical energy in a system.

6. FORCE

- Define force and understand that it is a push or pull on an object.
- Identify different types of forces, such as gravitational force, frictional force, and magnetic force.
- Explain how forces are represented using arrows in diagrams, including the direction and magnitude of the force.
- Recognize that force is a vector quantity, which means it has both magnitude and direction.

Work:

- Define work as the product of force and the distance over which the force is applied (Work = Force × Distance).
- Understand that work is done when an object is moved in the direction of the applied force.
- Calculate the work done when given the force and distance values.

- Differentiate between work being done and no work being done (e.g., lifting a book vs. holding a book).

Speed:

- Define speed as the rate of change of distance with time (Speed = Distance / Time).
- Differentiate between speed and velocity, with an emphasis on speed being a scalar quantity.
- Interpret and calculate speed when given distance and time values.
- Understand how to represent speed using graphs.

Measurement:

- Explain the importance of measurement in science and daily life.
- Understand the metric system and its units for length (meter), mass (gram), and time (second).
- Use appropriate tools and units for measuring length, mass, and time.
- Convert between different units within the metric system (e.g., centimeters to meters).

Movement:

- Describe the concept of motion and how it involves a change in an object's position.
- Differentiate between uniform motion and non-uniform motion.
- Explain the factors affecting the speed and direction of an object's motion, including forces and inertia.

Measuring Devices:

- Identify and describe common measuring devices, such as rulers, balances, and stopwatches.
- Use measuring devices accurately to measure length, mass, and time.
- Understand the precision and limitations of various measuring instruments.

Graphs:

- Understand the importance of graphs in representing scientific data and relationships.
- Create and interpret graphs, including line graphs and bar graphs.

- Identify and label axes, scales, and units on a graph.
- Use graphs to analyze and compare data, including trends in motion and forces.

Distance:

- Define distance as the total path length covered during a motion.
- Understand the difference between distance and displacement, emphasizing that displacement includes both distance and direction.

Laws of Motion:

- Introduce and understand Newton's three laws of motion: a. Newton's First Law (Law of Inertia) - An object at rest tends to stay at rest, and an object in motion tends to stay in motion with the same speed and in the same direction unless acted upon by an unbalanced force. b. Newton's Second Law - The acceleration of an object is directly proportional to the net force acting on it and inversely proportional to its mass ($F = ma$). c. Newton's Third Law - For every action, there is an equal and opposite reaction.
- Provide real-life examples and applications of Newton's laws of motion.
- Apply Newton's laws to solve problems related to force, motion, and equilibrium.

7. THERMODYNAMICS

Understanding Temperature and Heat:

- Define temperature as a measure of the average kinetic energy of particles in a substance.
- Differentiate between temperature scales, including Celsius and Fahrenheit.
- Explain the concept of heat transfer and distinguish between conduction, convection, and radiation.

The Laws of Thermodynamics:

- Describe the first law of thermodynamics (conservation of energy) and its application to various systems.
- Explain the second law of thermodynamics (entropy) and its implications for energy flow and the direction of natural processes.

Energy Transformation:

- Recognize that energy can change from one form to another, such as potential energy to kinetic energy or thermal energy.
- Analyze energy transformations in common systems, like the conversion of electrical energy into heat in a resistor.

Heat and Temperature Changes:

- Calculate changes in temperature and heat using the specific heat capacity equation.
- Understand that the amount of heat energy transferred is directly proportional to the temperature change and the mass of the substance.

Thermal Expansion:

- Explain the concept of thermal expansion and its significance in everyday life, such as the expansion of solids and liquids with temperature.

Phase Changes and Latent Heat:

- Describe the different phases of matter (solid, liquid, gas) and the transitions between them.
- Explain the concept of latent heat and how it is related to phase changes, such as melting, boiling, and condensation.

Heat Engines and the Carnot Cycle:

- Understand the basic principles of heat engines and their role in various applications, including the operation of car engines and power plants.
- Introduce the Carnot cycle and its importance in the context of ideal heat engines.

Applications of Thermodynamics:

- Discuss real-world applications of thermodynamics, such as refrigeration, air conditioning, and energy conservation.
- Analyze the efficiency and energy transformations in these systems.

Climate Change and Thermodynamics:

- Explain how the principles of thermodynamics relate to climate change and global warming, including the greenhouse effect and the role of human activities.

Safety and Practical Applications:

- Emphasize safety measures when working with thermodynamic systems, including handling high-temperature materials and operating equipment.
- Discuss practical applications of thermodynamics in everyday life and technology.

Experimental Skills:

- Develop experimental skills in conducting simple thermodynamics experiments, recording data, and drawing conclusions from observations.

Problem Solving and Critical Thinking:

- Apply thermodynamic principles to solve problems and analyze real-world scenarios involving energy transfer and heat flow.

8. WATER CYCLE:

- **Understand the Water Cycle Phases:** Describe the different phases of the water cycle, including evaporation, condensation, precipitation, and collection.
- **Identify Factors Influencing the Water Cycle:** Explain how factors such as temperature, humidity, and topography affect the rate and intensity of the water cycle.
- **Analyze Local Water Cycle Patterns:** Investigate and analyze the water cycle patterns in the local environment and discuss their significance for the community.
- **Demonstrate Water Cycle Models:** Create models or diagrams illustrating the water cycle and be able to label its key components and processes.
- **Connect Water Cycle to Climate:** Discuss the connection between the water cycle and climate change, including the impact of increased evaporation on weather patterns.

9. GREENHOUSE GASES:

- **Define Greenhouse Gases:** Define greenhouse gases and understand their role in trapping heat in the Earth's atmosphere.

- **List Common Greenhouse Gases:** Identify common greenhouse gases, such as carbon dioxide (CO₂), methane (CH₄), and water vapor (H₂O), and explain their sources.
- **Explain the Greenhouse Effect:** Describe the greenhouse effect and its importance for maintaining Earth's temperature.
- **Analyze Human Activities:** Investigate how human activities, such as burning fossil fuels and deforestation, contribute to the increase in greenhouse gas concentrations.
- **Discuss Global Warming:** Explain the concept of global warming and its potential consequences on climate, ecosystems, and sea levels.

10. TEMPERATURE:

- **Define Temperature:** Define temperature as a measure of the average kinetic energy of particles in a substance.
- **Temperature Scales:** Convert between different temperature scales, such as Celsius and Fahrenheit.
- **Measure Temperature:** Use appropriate tools to measure temperature accurately and understand the significance of precision in scientific measurements.
- **Explain Heat Transfer:** Describe the different methods of heat transfer, including conduction, convection, and radiation.
- **Effects of Temperature:** Discuss the effects of temperature on physical and chemical properties of matter and biological processes.

11. RADIATION:

- **Types of Radiation:** Differentiate between various types of radiation, including electromagnetic radiation (e.g., visible light, ultraviolet, and infrared) and nuclear radiation (e.g., alpha, beta, and gamma radiation).
- **Radiation in Daily Life:** Recognize sources of radiation in everyday life, including the Sun, electronic devices, and medical applications.
- **Safety Precautions:** Understand the importance of safety precautions when dealing with sources of ionizing radiation and the potential health risks associated with exposure.
- **Radiation Shielding:** Explain how materials and structures can be designed for effective radiation shielding, such as in nuclear facilities and space travel.
- **Radiation's Role in the Universe:** Explore the role of radiation in astronomical phenomena, such as the emission and absorption of radiation by celestial bodies.

12. EVAPORATION:

- **Define Evaporation:** Define evaporation as the process by which a liquid changes into a gas at the surface, due to the escape of high-energy particles.
- **Factors Influencing Evaporation:** Identify and explain factors that influence the rate of evaporation, including temperature, humidity, and surface area.
- **Evaporation in the Water Cycle:** Recognize the role of evaporation in the water cycle and its contribution to cloud formation and precipitation.
- **Practical Applications:** Discuss practical applications of evaporation, such as cooling systems, desalination, and food preservation.
- **Experimental Skills:** Conduct experiments to measure and compare the rate of evaporation under different conditions and present findings effectively.

13. EXCHANGE OF GASES:

- **Respiration and Photosynthesis:** Understand the processes of respiration and photosynthesis and their role in the exchange of gases, specifically oxygen and carbon dioxide, in living organisms.
- **Respiratory System:** Explain the mechanisms of gas exchange in the human respiratory system, including the roles of the lungs and alveoli.
- **Photosynthetic Organs:** Describe the role of leaves and chloroplasts in plants in the exchange of gases during photosynthesis.
- **Gas Transport in Blood:** Understand how gases are transported in the bloodstream and the importance of hemoglobin in oxygen transport.
- **Environmental Impact:** Discuss how human activities, like deforestation and air pollution, affect the exchange of gases in ecosystems and the atmosphere.

14. HUMAN BODY SYSTEM

Identify and describe the major human body systems:

- Explain the functions and components of the circulatory system, respiratory system, digestive system, nervous system, skeletal system, muscular system, and integumentary system.

Understand the structure and function of organs within each system:

- Describe the key organs and tissues in each system and their roles in maintaining homeostasis and overall health.

Explain the interactions between body systems:

- Describe how different systems work together to accomplish specific functions, such as how the circulatory system delivers oxygen to body tissues and removes waste products.

Explore the concept of homeostasis:

- Define homeostasis and explain its importance in regulating bodily functions, maintaining a stable internal environment, and responding to external changes.

Understand the role of cells in the human body:

- Explain the basic structure of cells, their functions, and how they contribute to the overall function of body systems.

Discuss the impact of lifestyle choices on the human body:

- Analyze the effects of nutrition, exercise, and substance use on the health and functioning of the human body.

Analyze the role of genetics in human variation:

- Understand how genetics influence traits, inherited diseases, and variations in the human population.

Identify common diseases and disorders related to each body system:

- Describe the causes, symptoms, and preventive measures for common diseases and disorders associated with various body systems.

Apply the scientific method to investigate questions about the human body:

- Formulate research questions, design experiments, collect and analyze data, and draw conclusions related to human biology.

Recognize the ethical and social implications of scientific advancements in the field of human biology:

- Discuss bioethical issues related to topics such as genetic engineering, organ transplantation, and medical research involving human subjects.

Communicate scientific findings effectively:

- Present research findings and knowledge about the human body systems through written reports, oral presentations, and visual aids.

Develop an appreciation for the complexity and wonder of the human body:

- Foster a sense of curiosity and wonder about the intricacies of the human body and its place in the natural world.

Stomach:

- Explain the structure and function of the stomach, including its role in the digestive system.
- Describe the processes of mechanical and chemical digestion that occur in the stomach.
- Understand the role of enzymes and gastric juice in breaking down food in the stomach.
- Identify common digestive disorders related to the stomach, such as ulcers, and discuss their causes and treatments.
- Analyze the importance of a balanced diet and proper nutrition for maintaining a healthy stomach.

Heart:

- Describe the anatomy and structure of the heart, including its chambers, valves, and blood vessels.
- Explain the role of the heart in the circulatory system and how it pumps blood throughout the body.
- Understand the cardiac cycle and the electrical signals that control heartbeats.
- Recognize the importance of a healthy lifestyle in maintaining heart health and preventing cardiovascular diseases.
- Identify common heart-related conditions and disorders, such as hypertension, and discuss their causes and prevention.

Lungs:

- Explain the structure of the respiratory system, focusing on the lungs and their associated structures.
- Describe the process of breathing, including inhalation and exhalation, and the role of the diaphragm.
- Understand the exchange of oxygen and carbon dioxide in the alveoli of the lungs.

- Discuss the impact of smoking and air pollution on lung health and the risks associated with respiratory diseases.
- Explore the importance of maintaining healthy lungs and strategies for lung health.

Respiration:

- Define respiration as the process of obtaining and utilizing oxygen and releasing carbon dioxide in living organisms.
- Explain the difference between aerobic and anaerobic respiration and their energy production.
- Understand the importance of oxygen in cellular respiration and the production of ATP.
- Discuss the role of the respiratory and circulatory systems in transporting gases and nutrients.
- Explore the effects of exercise and physical activity on respiration and energy metabolism.

15. PLANTS

Plant Anatomy and Physiology:

- Explain the structure and function of plant cells, including cell wall, cell membrane, chloroplasts, and vacuoles.
- Describe the role of photosynthesis in converting sunlight into chemical energy and producing oxygen.
- Understand the processes of transpiration and respiration in plants.

Plant Classification:

- Categorize plants into major groups, including vascular and non-vascular plants.
- Differentiate between gymnosperms and angiosperms and describe their key characteristics.

Plant Reproduction:

- Explain the various methods of plant reproduction, including seed production and asexual reproduction (e.g., vegetative propagation).
- Understand the role of pollination and fertilization in sexual reproduction in flowering plants.

Plant Adaptations:

- Describe how plants have adapted to various environmental conditions, such as deserts, rainforests, and aquatic habitats.
- Explain the concept of coevolution between plants and pollinators.

Plant Growth and Development:

- Understand the different stages of plant growth from seed germination to maturity.
- Describe the factors that influence plant growth, including light, water, nutrients, and temperature.
- Explore the concept of tropisms, such as phototropism and gravitropism, and how they impact plant growth.

Plant Ecology:

- Discuss the importance of plants in ecosystems, including their roles in carbon cycling and oxygen production.
- Analyze the impact of human activities on plant ecosystems and biodiversity.
- Understand the concept of invasive plant species and their effects on native flora.

Human Uses of Plants:

- Identify and describe the economic and ecological importance of various plant species, including food crops, timber, and medicinal plants.
- Explore sustainable practices in agriculture and forestry to ensure the long-term availability of plant resources.

Scientific Inquiry and Experimentation:

- Design and conduct experiments related to plant growth, such as investigating the impact of different variables on plant development.
- Collect and analyze data using appropriate scientific methods and tools.

Environmental Stewardship:

- Understand the importance of conserving plant species and biodiversity for the health of the planet.

- Discuss ways to promote responsible and sustainable use of plant resources.

Communication and Collaboration:

- Present findings and insights related to plants effectively through various media, including written reports and presentations.
- Work collaboratively in group projects to solve real-world plant-related problems.

16. POLLUTION

Define Pollution:

- Define pollution and differentiate between natural and human-induced pollution.

Types of Pollution:

- Identify and classify different types of pollution, including air pollution, water pollution, soil pollution, and noise pollution.

Causes of Pollution:

- Describe the main sources and causes of pollution, such as industrial activities, transportation, agriculture, and improper waste disposal.

Environmental Consequences:

- Explain the environmental consequences of pollution, including the impact on ecosystems, biodiversity, and the atmosphere.

Health Impacts:

- Understand the potential health effects of pollution on humans, including respiratory problems, waterborne diseases, and long-term health issues.

Air Pollution:

- Investigate the sources and effects of air pollution, including the role of pollutants like carbon monoxide, sulfur dioxide, and particulate matter.

Water Pollution:

- Explore the sources and effects of water pollution, such as contamination by industrial effluents, agricultural runoff, and sewage.

Soil Pollution:

- Examine the causes and consequences of soil pollution, including the impact on soil fertility and agriculture.

Noise Pollution:

- Describe the sources and effects of noise pollution on human health and well-being.

Monitoring and Measurement:

- Learn about methods and tools used to monitor and measure pollution levels in the environment.

Environmental Laws and Regulations:

- Understand the role of local and international laws and regulations in controlling and preventing pollution.

Mitigation and Solutions:

- Explore strategies and technologies for mitigating pollution, including recycling, waste reduction, renewable energy, and sustainable agriculture.

Individual and Collective Responsibility:

- Emphasize the importance of individual and collective responsibility in preventing pollution and protecting the environment.

Case Studies:

- Analyze real-world case studies of pollution incidents and their consequences, such as oil spills, industrial accidents, or deforestation.

Sustainable Practices:

- Promote sustainable practices that reduce pollution and contribute to a cleaner and healthier environment.

Current Environmental Issues:

- Stay informed about current environmental issues related to pollution, such as climate change, plastic pollution, and emerging contaminants.

Communication and Advocacy:

- Develop communication and advocacy skills to raise awareness about pollution-related issues and promote positive change in the community.

Environmental Ethics:

- Discuss the ethical considerations surrounding pollution and its impact on future generations.

17. GLOBAL WARMING

- **Define Global Warming:** Describe global warming as the long-term increase in Earth's average surface temperature due to human activities, primarily the release of greenhouse gases.
- **Identify Greenhouse Gases:** Recognize major greenhouse gases, including carbon dioxide (CO₂), methane (CH₄), and water vapor (H₂O), and understand their role in trapping heat in the Earth's atmosphere.
- **Explain the Greenhouse Effect:** Describe the natural greenhouse effect and explain how human activities, such as the burning of fossil fuels, have enhanced this effect, leading to global warming.
- **Understand Climate Change:** Recognize that global warming is a driving force behind climate change and be able to differentiate between weather and climate.
- **Analyze Climate Data:** Interpret climate data, including temperature records and carbon dioxide concentrations, to observe trends and patterns related to global warming.
- **Discuss Consequences of Global Warming:** Identify and describe the environmental, social, and economic consequences of global warming, such as rising sea levels, extreme weather events, and impacts on ecosystems and human societies.
- **Examine the Carbon Cycle:** Explain the carbon cycle and the role of carbon reservoirs, emphasizing how human activities, like deforestation and the burning of fossil fuels, affect carbon cycling.
- **Explore Mitigation Strategies:** Explore various strategies and solutions to mitigate global warming, such as reducing greenhouse gas emissions, transitioning to renewable energy sources, and enhancing energy efficiency.
- **Evaluate Adaptation Measures:** Discuss adaptive strategies that can help communities and countries cope with the impacts of global warming, including building resilient infrastructure and sustainable land use planning.
- **Understand International Agreements:** Describe major international agreements and protocols aimed at addressing global warming, such as the Paris Agreement, and their objectives.

- **Analyze Climate Models:** Understand how climate models are used to predict future climate changes and assess their reliability and limitations.
- **Discuss Ethical and Social Implications:** Consider the ethical and social aspects of global warming, including issues related to environmental justice, equity, and responsibility.
- **Engage in Scientific Inquiry:** Conduct hands-on experiments and investigations related to global warming, using appropriate scientific methods to collect and analyze data.
- **Communicate Findings:** Present findings and data on global warming in clear and coherent written, oral, or visual formats, and engage in constructive discussions with peers.
- **Advocate for Sustainability:** Recognize the importance of individual and collective action in mitigating global warming and encourage responsible behaviors, such as reducing energy consumption and supporting sustainable practices.

18. COMPOUNDS/ MIXTURES

Differentiate between compounds and mixtures:

- Define compounds and mixtures and provide examples of each.
- Explain that compounds are made up of different elements chemically combined, whereas mixtures are combinations of substances that are not chemically bonded.

Identify elements and compounds:

- Recognize common elements on the periodic table.
- Identify and name simple compounds, e.g., water (H₂O), carbon dioxide (CO₂), and sodium chloride (NaCl).

Understand the concept of chemical bonding:

- Explain that chemical bonds hold the atoms together in compounds.
- Describe the types of chemical bonds (ionic and covalent) and their differences.

Describe the properties of compounds:

- Explain that compounds have unique properties different from the elements they are made of.
- Provide examples of properties of common compounds, such as the properties of water or table salt.

Explore mixtures:

- Describe the characteristics of mixtures, such as no fixed composition and variable properties.
- Classify mixtures into homogeneous (solutions) and heterogeneous mixtures.

Separate mixtures:

- Understand various separation techniques for mixtures, including filtration, distillation, and chromatography.
- Explain the principles behind each separation method and when they are used.

Understand the concept of physical change:

- Describe how the separation of mixtures involves physical changes, as no new substances are formed during separation.

Analyze the importance of compounds and mixtures in everyday life:

- Recognize the role of compounds in the composition of essential substances, such as water in living organisms.
- Explain the significance of mixtures in various industries and daily activities, like food preparation and environmental processes.

Apply knowledge of compounds and mixtures:

- Solve problems involving the composition of compounds and the separation of mixtures.
- Conduct simple experiments to demonstrate the principles of compounds and mixtures.

Safety and ethical considerations:

- Emphasize the importance of handling substances safely and following ethical guidelines in scientific investigations and experiments.