

PHYSICAL SCIENCE

**Performance Indicators
Essential Questions
Suggested Activities
Suggested Resources**

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PHYSICAL SCIENCE
UNIT I
SCIENTIFIC PROCESSES
(12%)

Performance Indicators

1. The Nature of Science:
 - (E) (1.2) a. Given an experimental procedure, the student will be able to identify the steps of the scientific method as problem, hypothesis, experiment, control, variable, data, analysis, or conclusion.
 - (E) (1.1) b. The student will be able to define “physical science”.
2. Physical Science Methods:
 - (E) (2.4) a. The student will be able to convert a measurement among related S.I. units: from kilo, hecto, deca, base, deci, centi, and milli.
 - (E) (2.4) b. Given an illustration, the student will be able to identify a bar, line, and circle graph.

Essential Questions

1. What is the study of matter and energy?
2. What is the process of gathering information through the senses?
3. Which element in an experiment does not vary?
4. What does the prefix kilo- mean?
5. How many cubic centimeters are in one 0.354 – L can of soda?
6. Percentages of a whole are representative of what type of graph?

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UNIT II MECHANICS (21%)

Performance Indicators

1. Motion and Forces:

- (E) (2.2) a. The student will be able to perform calculations involving speed, time, and distance, as well as velocity and acceleration.
- (E) (2.2) b. The student will be able to interpret distance-time graphs for velocity or velocity time graphs for acceleration.
- (E) (2.4) c. Given a scenario, the student will be able to distinguish between balanced and unbalanced forces according to Newton's first law of motion.
- (E) (2.4) d. Given a scenario, the student will be able to determine the results as predicted by Newton's second law of motion.
- (E) (2.2) e. The student will be able to compare and contrast force, mass, and acceleration with respect to Newton's second law of motion.
- (E) (2.2) f. Given a scenario, the student will be able to determine how mass and distance determine the force of gravity.
- (E) (2.2) g. The student will be able to distinguish between mass and weight, given examples in SI units.
- (E) (2.4) h. Given a scenario, the student will be able to predict the results as predicted by Newton's third law of motion.
- (C) (2.2) i. The student will be able to choose the correct scenario that illustrates the law of conservation of momentum.

2. Machines:

- (E) (1.1) a. The student will be able to identify the six types of simple machines.
- (C) (2.2) b. The student will be able to calculate mechanical advantage and the efficiency of a machine.
- (E) (2.2) c. The student will be able to compare and contrast the relationship among work, power, and time.

Essential Questions

1. What is a device that works with only one movement?
2. A ramp is an example of which simple machine?
3. Sherman swims 15m in 25 seconds. What is Sherman's average speed?
4. A man driving a large truck at the same speed as a woman driving a small car hits a wall at the same time. Which vehicle hits the wall with a greater force?
5. A boxer hits his punching bag with a force of 50 N. With what force does the punching bag return?

PHYSICAL SCIENCE

UNIT III ENERGY (25%)

Performance Indicators

1. Mechanical and Thermal Energy:

- (E) (1.1) a. The student will be able to differentiate between kinetic and potential energy.
- (C) (2.2) b. The student will be able to calculate changes in thermal energy and specific heat.
- (I) (2.4) c. The student will be able to select the situation that best illustrates the law of conservation of energy.
- (I) (2.4) d. The student will be able to compare and contrast radiation, conduction, and convection as three methods of heat transfer.

2. Waves and Sound:

- (E) (1.1) a. The student will be able to identify the parts of a transverse and a compression wave, given a diagram.
- (I) (2.4) b. Given an illustration, the student will be able to identify the amplitude, frequency, and wavelength of a wave.

3. Light:

- (I) (2.4) a. Given a diagram, the student will be able to identify parts of the electromagnetic spectrum (radio waves, microwaves, infrared, visible light, ultraviolet, x-ray, and gamma ray).
- (I) (2.2) b. The student will be able to compare and contrast the relationship among opaque, transparent, and translucent materials.
- (E) (2.4) c. Given a scenario, the student will be able to identify reflection, refraction, diffraction, and interference.

4. Electricity:

- (I) (2.4) a. The student will be able to identify how static electricity is produced.
- (C) (2.2) b. The student will be able to calculate potential difference (voltage), resistance, and current, given the formula $V=I \times R$.
- (E) (2.4) c. Given an illustration, the student will be able to identify a series and a parallel circuit.

Essential Questions

1. What is the relationship among potential difference, resistance, and current?
2. Be able to identify a series and parallel circuit.
3. Identify the amplitude on a transverse and compressional/longitudinal wave.
4. Which forms of heat transfer require matter for travel?
5. Which has more potential energy, a rug on the floor or a picture on a wall?

PHYSICAL SCIENCE
UNIT IV
STRUCTURE AND PROPERTIES OF MATTER
(30%)

Performance Indicators

1. Solids, Liquids, and Gases:

- (E) (2.4) a. The student will be able to identify the four states of matter based on volume, shape, and particle arrangement.
- (I) (2.2) b. Given a state of change graph, the student will be able to identify heat of fusion and heat of vaporization.
- (I) (2.2) c. The student will be able to calculate density, given mass and volume.
- (C) (2.4) d. The student will be able to predict how fluids exert pressure on a container (Boyle's and Charles's law).
- (C) (2.4) e. Given a scenario, the student will be able to identify Archimedes' principle and Bernoulli's principle.

2. Classification of Matter:

- (E) (2.2) a. The student will be able to compare and contrast substances and mixtures, given a description of the material.
- (I) (2.2) b. Given an example, the student will be able to distinguish among a solution, suspension, and colloid.
- (E) (2.2) c. The student will be able to differentiate between physical and chemical properties and changes.

3. Atomic Structure and the Periodic Table:

- (E) (1.1) a. The student will be able to list the names and symbols of some common elements and compounds.

- (E) (1.1) b. Given a diagram, the student will be able to select the three major subatomic particles of an atom.
 - (E) (2.4) c. The student will be able to use the periodic table to classify an element as a metal, non-metal, or metalloid and describe each group's properties.
 - (I) (2.4) d. The student will be able to use a periodic table to identify elements' atomic number, atomic mass, number of protons, number of neutrons, and number of electrons in the outer energy level.
4. Elements and their Properties:
- (E) (1.2) a. The student will be able to identify that elements in the same group will have similar properties.
 - (E) (2.4) b. The student will be able to locate and know the properties of alkali metals, alkaline earth metals, transition elements, halogens, and noble gases.
5. Solutions:
- (I) (1.2) a. The student will be able to distinguish between the solute and the solvent in a solution.
 - (I) (2.4) b. The student will be able to compare and contrast a saturated, unsaturated, and supersaturated solution.

Essential Questions

1. What state of matter has an indefinite shape and definite volume?
2. Which state of matter does a mixture of positively and negatively charged particles identify?
3. Which state of matter has a definite particle arrangement?
4. The burning of a log is an example of a physical or chemical change?
5. Would sodium have similar chemical properties to neon or potassium?
6. What is the group name of the elements found in Groups 3-12 on the Periodic Table?

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UNIT V

INTERACTIONS OF MATTER

(12%)

Performance Indicators

1. Chemical Bonding:

- (E) (2.4) a. The student will be able to determine how a compound differs from the elements that compose it.
- (E) (2.2) b. The student will be able to compare and contrast ionic and covalent bonds.
- (I) (2.4) c. Given a periodic table, the student will be able to determine the oxidation numbers.

2. Chemical Reactions:

- (E) (2.4) a. Given a chemical equation, the student will be able to identify the reactants and/or products in a chemical reaction.
- (I) (2.4) b. The student will be able to classify chemical reactions as synthesis, decomposition, single displacement, or double displacement.
- (I) (2.4) c. Given the temperature change during the reaction, the student will be able to select the reaction that is endothermic or exothermic.
- (C) (2.2) d. Given a chemical equation, the student will be able to choose the proper missing coefficient to balance the equation.

Essential Questions

1. Is the sharing of electrons considered to be covalent bonding or ionic bonding?
2. Explain how sodium and chlorine change when combined to form NaCl, table salt.
3. Write a skeleton equation for the formation of water, identifying reactants and products.