PHYSICAL SCIENCE STRAND

PROCESSES
CONCEPTS AND APPLICATIONS
Grades 6, 7, & 8:

- Describe natural phenomena with appropriate scientific terms.
- Explain natural phenomena with scientific concepts.
- Predict future events based on scientific knowledge.
- Apply scientific reasoning and knowledge.
- Interpret and communicate scientific information using words, equations, graphs, and charts.

EXPERIMENTATION
Grades 6, 7, & 8:

- Recognize and define a problem.
- Design appropriate investigations to solve the problem.
- Predict the results of the investigation.
- Conduct investigations, collect data, and record observations.
- Interpret data, draw conclusions and assess their validity.

STRUCTURE OF MATTER
As a result of working with different materials and learning theories about the structure of matter:

Grade 6: **Students can describe the structure of atoms and the elements.**

- Describe the structure of atoms including protons, neutrons, and electrons.
- Explain how the atoms of different elements are alike and different from each other.

Students can use physical and chemical properties to classify and describe matter.

- Examine similarities and differences between elements, mixtures, and compounds.

Grade 7: **Students can use physical and chemical properties to classify and describe matter.**

- Understand similarities and differences between elements, mixtures, and compounds.

Grade 8: **Students can describe the structure of atoms and the elements.**

- Understand the organization of the elements in the periodic table.

Students can use physical and chemical properties to classify and describe matter.

- Relate the properties of metals and non-metal materials to their electronic arrangements.
- Explain how atoms combine to form new substances through ionic bonding (transferring electrons) and covalent bonding (sharing electrons).

REACTIONS AND INTERACTIONS
As a result of studying changes in matter and how they occur:

Grade 6: **Understand the differences between physical and chemical changes of matter.**

- Discuss changes in the physical state of matter (solids, liquids, and gases) in terms of the arrangement and motion of molecules, and relate heat to these changes.
- Recognize that most substances expand when heated and contract when cooled and understand the use of this phenomenon in technological applications.
- Understand that matter can be described by different properties including mass, volume, density, boiling point, and melting point.

Grade 7: **Understand the differences between physical and chemical changes of matter.**

PHYSICAL SCIENCE STRAND – (Continued)

- Understand that matter can be described by different properties including mass, volume, density, boiling point, and melting point.

Students recognize that materials interact with each other in various forms.

- Understand that in chemical reactions the total mass/energy is conserved.
- Explain basic reactions of materials with oxygen, including burning and rusting.
- Understand the chemical structure and properties of acids and bases and relate it to the properties of common household products.

Grade 8: Understand the differences between physical and chemical changes of matter.

- Understand that chemical changes involve the rearrangement of molecules, atoms or ions, that involve energy changes.
- Understand that matter can be described by different properties including mass, volume, density, boiling point, and melting point.

FORCES AND MOTION

As a result of studying the motion of different objects:

Grade 6: Students understand that energy and matter interact through forces that result in changes in motion of objects.

- Recognize that all objects have inertia (objects at rest remain at rest and objects in motion remain in motion unless acted upon by an unbalanced force).

Students understand the nature of electricity and magnetism.

- Recognize that electric charges exert forces on each other.
- Examine how electric current flows in series and parallel circuits.
- Examine how magnetism is related to the production of electricity.

Grade 7: Students understand that energy and matter interact through forces that result in changes in motion of objects.

- Understand that for every action force there is an equal and opposite reaction force.
- Examine the effects of gravitational forces on the motion and weight of objects.

Grade 8: Students understand that energy and matter interact through forces that result in changes in motion of objects.

- Understand that all objects have inertia (objects at rest remain at rest and objects in motion remain in motion unless acted upon by an unbalanced force).
- Demonstrate qualitative and quantitative understanding of how the acceleration of an object is directly proportional to the net force and inversely proportional to is mass (F=ma).
- Understand that for every action force there is an equal and opposite reaction force.
- Describe the effects of gravitational forces on the motion and weight of objects.
- Demonstrate qualitative and quantitative understanding of speed and acceleration and be able to calculate speed from distance vs. time graphs.

ENERGY SOURCES AND TRANSFORMATIONS

As a result of studying various forms of energy:

Grade 6: Students understand the nature of various forms of energy.

- Examine evidence that energy can exist in many forms including light, heat, chemical, electrical, gravitational and mechanical energy.

PHYSICAL SCIENCE STRAND – (Continued)

ENERGY SOURCES AND TRANSFORMATIONS

Grade 6 – Continued:

- Recognize that energy can neither be created nor destroyed but can be transformed from one form into another.
- Relate the use of simple machines, including ramps, levers, and pulleys to work and energy.

Grade 7: **Students understand the nature of various forms of energy.**

- Recognize that energy can exist in many forms including light, heat, chemical, electrical, gravitational and mechanical energy.
- Recognize that energy can neither be created nor destroyed but can be transformed from one form into another.
- Relate the use of simple machines, including ramps, levers, and pulleys to work and energy.

Students understand the properties of sound and light.

- Compare and contrast different types of electromagnetic energy in terms of their use in modern technologies.
- Understand that sound can be produced by vibrating objects and has different properties such as volume and pitch.
- Understand that light has a number of properties including color, brightness and direction of travel and can be absorbed, reflected, transmitted and bent using mirrors and lenses.

Grade 8: **Students understand the nature of various forms of energy.**

- Understand that energy can exist in many forms including light, heat, chemical, electrical, gravitational and mechanical energy.
- Understand that energy can neither be created nor destroyed but can be transformed from one form into another.
- Relate the use of simple machines, including ramps, levers, and pulleys to work and energy.