5/12/16

Science Grade 7

The Physical Setting

STANDARD 4: Physical Setting -- Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity. *Objects in the universe are composed of matter. Matter is anything that takes up space and has mass. Matter is classified as a substance or a mixture of substances. Knowledge of the structure of matter is essential to students' understanding of the living and physical environments. Matter is composed of elements which are made of small particles called atoms. All living and nonliving material is composed of these elements or combinations of these elements.*

PERFORMANCE INDICATOR 3.1 - Observe and describe properties of materials, such as density, conductivity, and solubility**.**

Major Understandings:

- 3.1h Density can be described as the amount of matter that is in a given amount of space. If two objects have equal volume, but one has more mass, the one with more mass is denser
- 3.1i Buoyancy is determined by comparative densities.

PERFORMANCE INDICATOR 3.2 - Distinguish between chemical and physical changes

Major Understandings:

- 3.2c During a chemical change, substances react in characteristic ways to form new substances with different physical and chemical properties. Examples of chemical changes include burning of wood, cooking of an egg, rusting of iron, and souring of milk.
- 3.2d Substances are often placed in categories if they react in similar ways. Examples include metals, nonmetals, and noble gases.
- 3.2e The Law of Conservation of Mass states that during an ordinary chemical reaction matter cannot be created or destroyed. In chemical reactions, the total mass of the reactants equals the total mass of the products.

PERFORMANCE INDICATOR 3.3 - Develop mental models to explain common chemical reactions and changes in states of matter

Major Understandings:

- 3.3b Atoms and molecules are perpetually in motion. The greater the temperature, the greater the motion
- 3.3c Atoms may join together in well-defined molecules or may be arranged in regular geometric patterns.
- 3.3d Interactions among atoms and/or molecules result in chemical reactions

- 3.3e The atoms of any one element are different from the atoms of other elements.

- 3.3f There are more than 100 elements. Elements combine in a multitude of ways to produce compounds that account for all living and nonliving substances. Few elements are found in their pure form.

- 3.3g The periodic table is one useful model for classifying elements. The periodic table can be used to predict properties of elements (metals, nonmetals, noble gases).

Key Idea 4: Energy exists in many forms, and when these forms change energy is conserved. *Introduction: An underlying principle of all energy use is the Law of Conservation of Energy. Simply stated, energy cannot be created or destroyed. Energy can be transformed, one form to another. These transformations produce heat energy. Heat is a calculated value which includes the temperature of the material, the mass of the material, and the type of the material. Temperature is a direct measurement of the average kinetic energy of the particles in a sample of material. It should be noted that temperature is not a measurement of heat.*

PERFORMANCE INDICATOR 4.1 - Describe the sources and identify the transformations of energy observed in everyday life.

Major Understandings:

- 4.1a The Sun is a major source of energy for Earth. Other sources of energy include nuclear and geothermal energy.

- 4.1b Fossil fuels contain stored solar energy and are considered nonrenewable resources. They are a major source of energy in the United States. Solar energy, wind, moving water, and biomass are some examples of renewable energy resources.

- 4.1c Most activities in everyday life involve one form of energy being transformed into another. For example, the chemical energy in gasoline is transformed into mechanical energy in an automobile engine. Energy, in the form of heat, is almost always one of the products of energy transformations.

- 4.1d Different forms of energy include heat, light, electrical, mechanical, sound, nuclear, and chemical. Energy is transformed in many ways.

- 4.1e Energy can be considered to be either kinetic energy, which is the energy of motion, or potential energy, which depends on relative position.

PERFORMANCE INDICATOR 4.2 - Observe and describe heating and cooling events**.**

Major Understandings:

- 4.2a Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature.

- 4.2b Heat can be transferred through matter by the collisions of atoms and/or molecules (conduction) or through space (radiation). In a liquid or gas, currents will facilitate the transfer of heat (convection).

- 4.2c During a phase change, heat energy is absorbed or released. Energy is absorbed when a solid changes to a liquid and when a liquid changes to a gas. Energy is released when a gas changes to a liquid and when a liquid changes to a solid.

- 4.2d Most substances expand when heated and contract when cooled. Water is an exception, expanding when changing to ice.

- 4.2e Temperature affects the solubility of some substances in water.

PERFORMANCE INDICATOR 4.3 - Observe and describe energy changes as related to chemical reactions.

Major Understandings:

- 4.3a In chemical reactions, energy is transferred into or out of a system. Light, electricity, or mechanical motion may be involved in such transfers in addition to heat.

PERFORMANCE INDICATOR 4.4 - Observe and describe the properties of sound, light, magnetism, and electricity

Major Understandings:

- 4.4a Different forms of electromagnetic energy have different wavelengths. Some examples of electromagnetic energy are microwaves, infrared light, visible light, ultraviolet light, X-rays, and gamma rays.

- 4.4b Light passes through some materials, sometimes refracting in the process. Materials absorb and reflect light, and may transmit light. To see an object, light from that object, emitted by or reflected from it, must enter the eye.

- 4.4c Vibrations in materials set up wave-like disturbances that spread away from the source. Sound waves are an example. Vibrational waves move at different speeds in different materials. Sound cannot travel in a vacuum.

- 4.4d Electrical energy can be produced from a variety of energy sources and can be transformed into almost any other form of energy.

- 4.4e Electrical circuits provide a means of transferring electrical energy.

- 4.4f Without touching them, material that has been electrically charged attracts uncharged material, and may either attract or repel other charged material.

- 4.4g Without direct contact, a magnet attracts certain materials and either attracts or repels other magnets. The attractive force of a magnet is greatest at its poles.

PERFORMANCE INDICATOR 4.5 - Describe situations that support the principle of conservation of energy.

Major Understandings:

- 4.5a Energy cannot be created or destroyed, but only changed from one form into another.

- 4.5b Energy can change from one form to another, although in the process some energy is always converted to heat. Some systems transform energy with less loss of heat than others.

Key Idea 5: Energy and matter interact through forces that result in changes in motion. *Introduction: Examples of objects in motion can be seen all around us. These motions result from an interaction of energy and matter. This interaction creates forces (pushes and pulls) that produce predictable patterns of change. Common forces would include gravity, magnetism, and electricity. Friction is a force that should always be considered in a discussion of motion. When the forces acting on an object are unbalanced, changes in that object's motion occur. The changes could include a change in speed or a change in direction. When the forces are balanced, the motion of that object will remain unchanged. Understanding the laws that govern motion allows us to predict these changes in motion*

PERFORMANCE INDICATOR 5.1 - Describe different patterns of motion of objects.

Major Understandings:

- 5.1a The motion of an object is always judged with respect to some other object or point. The idea of absolute motion or rest is misleading.
- 5.1b The motion of an object can be described by its position, direction of motion, and speed.
- 5.1c An object's motion is the result of the combined effect of all forces acting on the object. A moving object that is not subjected to a force will continue to move at a constant speed in a straight line. An object at rest will remain at rest.
- 5.1d Force is directly related to an object's mass and acceleration. The greater the force, the greater the change in motion.
- 5.1e For every action there is an equal and opposite reaction.

PERFORMANCE INDICATOR 5.2 - Observe, describe, and compare effects of forces (gravity, electric current, and magnetism) on the motion of objects.

Major Understandings:

- 5.2a Every object exerts gravitational force on every other object. Gravitational force depends on how much mass the objects have and on how far apart they are. Gravity is one of the forces acting on orbiting objects and projectiles.
- 5.2b Electric currents and magnets can exert a force on each other.
- 5.2c Machines transfer mechanical energy from one object to another.
- 5.2d Friction is a force that opposes motion.
- 5.2e A machine can be made more efficient by reducing friction. Some common ways of reducing friction include lubricating or waxing surfaces.
- 5.2f Machines can change the direction or amount of force, or the distance or speed of force required to do work.
- 5.2g Simple machines include a lever, a pulley, a wheel and axle, and an inclined plane. A complex machine uses a combination of interacting simple machines, e.g., a bicycle.

INQUIRY AND PROCESS SKILLS

Reasoning and Inquiry Skills

Classifying – arranging or distributing objects, event, or information representing objects or events in classes according to some method or system

Comparing and contrasting – identifying similarities and differences between or among objects, events, data, systems, etc.

Generalizing – drawing general conclusions from particulars

Inferring – drawing a conclusion based on prior experiences

Making decisions – identifying alternatives and choosing a course of action from among the alternatives after basing the judgment for the selection on justifiable reasons

Predicting – making a forecast of future events or conditions expected to exist

Communicating and Representation Skills

Oral Observations – playing a variety of roles in group discussions and asking questions to seek elaboration and clarification of ideas

Written Observations – presenting information in ways appropriate to a given task

Graphic Representations – using a range of equipment and software to integrate several forms of information in order to create good-quality audio, video, graphic, or text-based presentations

Collaboration and Connections Skills

Working Effectively – contributing to the work of a brainstorming group, laboratory partnership, cooperative learning group, or project team; planning procedures; identifying and managing responsibilities of team members; and staying on task, whether working alone or as part of a group

Presenting Results – using a variety of media to present the solution and to communicate the results

Self-regulation Skills

Investment in Learning – actively participates in lessons, engages in the learning process, identifies and uses necessary resources, develops a positive work ethic with consistent quality of work, uses time wisely, and demonstrates age-appropriate independence

Responsibility – comes with appropriate materials, respects rights of others to learn, completes work promptly, and utilizes an organizational system

PROCESS SKILLS BASED ON STANDARD 4

General Skills:

- follow safety procedures in the classroom and laboratory
- safely and accurately use the following measurement tools:
    - metric ruler
    - balance
    - stopwatch
    - graduated cylinder
    - thermometer
- use appropriate units for measured or calculated values
- recognize and analyze patterns and trends
- sequence events
- identify cause-and-effect relationships
- use indicators and interpret results

PHYSICAL SETTING SKILLS

- given the latitude and longitude of a location, indicate its position on a map and determine the latitude and longitude of a given location on a map
- using identification tests and a flow chart, identify mineral samples
- use a diagram of the rock cycle to determine geological processes that led to the formation of a specific rock type 4. plot the location of recent earthquake and volcanic activity on a map and identify patterns of distribution
- use a magnetic compass to find cardinal directions
- measure the angular elevation of an object, using appropriate instruments
- generate and interpret field maps including topographic and weather maps
- predict the characteristics of an air mass based on the origin of the air mass
- measure weather variables such as wind speed and direction, relative humidity, barometric pressure, etc.
- determine the density of liquids, and regular- and irregular-shaped solids
- determine the volume of a regular- and an irregular-shaped solid, using water displacement