8th GRADE SCIENCE 2006

Topic: Earthquakes

Essential Questions:

1. What causes earthquakes?
2. How are earthquakes measured?
3. How can scientists predict earthquakes and avoid hazards?
4. What measures are scientists taking to prevent earthquake damage?

Performance Indicators			Essential Knowledge and Skills	Classroom Ideas	Assessment Ideas
• Analysis of earthquake wave data (vibrational disturbances) leads to the conclusion that there are layers within Earth. These layers in the crust, mantle, outer core, and inner core have distinct properties. • Plates may collide, move apart, or slide past one another. Most volcanic activity and mountain building occur at the boundaries of these plates, often resulting in earthquakes. • Folded, tilted, faulted, and displaced rock layers suggest past crustal movement.			• Stresses on Earth's crust produce shearing, compression and tension in rock. • Faulting and folding of the crust forms mountains and other features. • Seismic waves carry an earthquake's energy through the Earth. • There are two types of seismic waves: P-waves and S-waves. • There are three types of earthquake scales: moment magnitude, Mercalli and Richter. • Earthquakes can cause damage to buildings and other structures. • New buildings can be designed to withstand minor earthquakes. • For people who live in earthquake-prone areas, it's important to have an earthquake safety plan.	• Stress activity (clay or Play Doh) • Fault activity (fault blocks) • Seismic waves demo (Slinky) • Earthquake Safety Plan poster	• Finding an Epicenter lab • Earthquake resistant building project • Earthquake hazards lab

Connections to Text:

Connections to Technology:

Vocabulary: earthquake stress shearing tension compression fault strike-slip normal reverse hanging wall footwall folds anticline syncline focus epicenter seismic waves P-waves S-waves surface waves seismograph Mercalli scale Richter scale moment magnitude scale liquefaction tsunamis aftershock base-isolated building

Topic: Force

Essential Questions:

1. How do Newton's Laws explain how objects interact on Earth?
2. How can we measure force?
3. What forces can change an object's motion?

Performance Indicators			Essential Knowledge and Skills	Classroom Ideas	Assessment Ideas
• 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. • Force is directly related to an object's mass and acceleration. The greater the force, the greater the change in motion. • For every action there is an equal and opposite reaction. • 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. • Friction is a force that opposes motion.			• Unbalanced forces cause motion in an object. • Newton's 1st Law of Motion: Inertia • Newton's 2nd Law of Motion: Force = Mass x Acceleration • Friction is a force that occurs when two surfaces rub against each other. • Weight vs. mass. • The force of gravity acts upon all objects in the Universe. • Newton's 3rd Law of Motion: Action and Reaction. • Momentum = Mass x Velocity • Centripetal force exerts force on an object traveling in a circular motion.	• Billiard balls activity (momentum)	• Inertia lab • Newton's 2nd law lab • Friction lab • Egg drop project • Newton's rocket lab • Newton's scooters lab

Connections to Text:

Connections to Technology:

Vocabulary: force net force unbalanced force balanced force inertia newton friction gravity air resistance terminal velocity weight momentum centripetal force

Topic: Forces in Fluids

Essential Questions:

1. How do fluids exert force?
2. How is fluid pressure used in every day situations?
3. How does fluid pressure keep a boat afloat or a plane in the air?

Performance Indicators			Essential Knowledge and Skills	Classroom Ideas	Assessment Ideas
• Pressure is the force per unit area on a surface. • The upward force on an object submerged in a fluid is called the buoyant force. • Bernoulli's Principle states that fluid speed increases when the pressure of that fluid decreases.			• Pressure = force / area • Pressure decreases with elevation and increases with depth. • Buoyant forces keep boats afloat. • Bernoulli's Principle allows planes to fly.	• Fluid demos • Bill Nye: Buoyancy • Loopy Loops project: Bernoulli's Principle	• Spinning Sprinklers lab • Buoyancy boats project

Connections to Text:

Connections to Technology:

Vocabulary: pressure pascal fluid Pascal's Principle hydraulic system buoyant force Archimedes' Principle Bernoulli's Principle

Topic: The Metric System

Essential Questions:

1. How can matter be measured?

Performance Indicators			Essential Knowledge and Skills	Classroom Ideas	Assessment Ideas
• All matter has a definite mass. • Gases have neither a determined shape nor a definite volume. Gases assume the shape and volume of a closed container. • A liquid has definite volume, but takes the shape of a container. • A solid has definite shape and volume. Particles resist a change in position. • 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.			• Mass of an object can be measured using a triple-beam balance. • Length of an object can be measured using a metric ruler. • Volume of a rectangular solid can be measured using a meter stick and the formula: Volume = length x width x height. • Volume of an irregular solid can be measured using water displacement method and a graduated cylinder. • Density of an object can be measured by finding the mass and volume of that object and then using the formula: Density = Mass / Volume.	• Practice finding volume of objects in the classroom (rectangular solids using volume formula) • Practice water displacement method of finding volume with graduated cylinders (clay, rocks, marbles, etc. • Practice using density formula	• Measuring Heights lab; students measure their heights and graph the results for the entire class • Density lab (using density cubes) • Metric Stations lab

Connections to Text:

Connections to Technology:

Vocabulary: mass volume density rectangular solid irregular solid weight triple-beam balance graduated cylinder meter stick

Topic: Minerals

Essential Questions:

1. How do scientists identify different minerals?
2. How do minerals form?
3. How can minerals be useful to humans?

Performance Indicators			Essential Knowledge and Skills	Classroom Ideas	Assessment Ideas
• Rocks are composed of minerals. • Only a few rock-forming minerals make up most of the rocks of Earth. • Minerals are identified on the basis of physical properties such as streak, hardness, and reaction to acid.			• A mineral is a naturally occurring, inorganic solid that has a crystal structure and a definite chemical composition. • Each mineral has its own specific properties that can be used to identify it. • Hardness, color, streak, luster, density, crystal shape, cleavage and reaction with acid are all properties used to identify minerals. • Minerals can form in two general ways: crystallization from magma or lava and by crystallization of minerals from a water solution. • Minerals are a source of metals, gemstones and many other materials used by humans.	• Movie: Splendid Stones • Evaporation of saltwater activity	• Mineral Identification lab • Mineral identification practical quiz

Connections to Text:

Connections to Technology:

Vocabulary: mineral inorganic crystal Mohs hardness scale streak luster cleavage fracture solution gemstone ore

Topic: Motion

Essential Questions:

1. How can we determine and measure motion?
2. How can we determine if an object is accelerating?

Performance Indicators			Essential Knowledge and Skills	Classroom Ideas	Assessment Ideas
• The motion of an object is always judged with respect to some other object or point. • The motion of an object can be described by its position, direction of motion, and speed.			• The motion of an object is determined by its change in position relative to a reference point. • Speed formula: Speed = distance / time • Average Speed formula: Average speed = total distance / total time • An object's velocity is speed plus direction. • Acceleration is the rate in which velocity changes; increases, decreases or changes direction. • Acceleration formula: Acceleration = final velocity – initial velocity / time	• Formula practice: (speed, average speed and acceleration) • Bill Nye: Motion	• Graphing motion lab • Acceleration roller coaster lab

Connections to Text:

Connections to Technology:

Vocabulary: motion reference point speed velocity acceleration

Topic: Plate Tectonics

Essential Questions:

1. How does a geologist determine the internal structure of the Earth?
2. What is the Earth composed of?
3. How can heat energy be transferred in the Earth?
4. How has Alfred Wegener's theory of continental drift and scientists' knowledge of sea-floor spreading helped us learn more about plate tectonics?
5. What is the theory of Plate Tectonics?

Performance Indicators			Essential Knowledge and Skills	Classroom Ideas	Assessment Ideas
• The rock at Earth's surface forms a nearly continuous shell around Earth called the lithosphere. • 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). • Continents fitting together like puzzle parts and fossil correlations provided initial evidence that continents were once together. • The Theory of Plate Tectonics explains how the "solid" lithosphere consists of a series of plates that "float" on the partially molten section of the mantle. Convection cells within the mantle may be the driving force for the movement of the plates. • Plates may collide, move apart, or slide past one another. Most volcanic activity and mountain building occur at the boundaries of these plates, often resulting in earthquakes. • 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.			• Geologists study the processes of Earth. • The Earth has 4 main layers: crust, mantle, outer core and inner core. • Heat can be transferred in three ways: conduction, convection and radiation. • Alfred Wegener developed the theory of Drifting Continents. • Pangaea was a supercontinent that "broke apart" 200 million years ago. • In sea-floor spreading, molten material erupts along the mid-ocean ridge and hardens to form rock. • In subduction, the ocean floor sinks back into the mantle beneath deep ocean trenches. • The theory of plate tectonics explains how Earth's plates move and interact with each other. • There are three types of plate boundaries: convergent, divergent and transform.	• 3-D model of the interior of the Earth • Movie: Journey to the Center of the Earth (how the Jules Verne novel had a base in science) • Heat transfer demonstrations • Recreating Pangaea posters	• Black can lab • Plate Tectonics lab (drawing and labeling plate boundaries)

Connections to Text:

Connections to Technology:

Vocabulary: geologist crust basalt granite mantle lithosphere outer core inner core radiation conduction convection radiation convection current Pangaea continental drift mid-ocean ridge trench subduction sea-floor spreading plate transform convergent divergent plate tectonics fault rift valley

Topic: Rocks

Essential Questions:

1. How do scientists identify different rocks?
2. How are rocks classified?
3. How can rocks be useful to humans?
4. How are rocks "recycled" throughout the Earth?

Performance Indicators	Essential Knowledge and Skills	Classroom Ideas	Assessment Ideas
• Rocks are composed of minerals. • Rocks are classified according to their method of formation. • The three classes of rocks are sedimentary, metamorphic, and igneous. • Most rocks show characteristics that give clues to their formation conditions. • The rock cycle model shows how types of rock or rock material may be transformed from one type of rock to another.	• Geologists classify rocks based on their texture, mineral composition and origin. • Three kinds of rocks are: igneous, sedimentary and metamorphic. • Igneous rocks form when magma or lava cools and hardens. • Sedimentary rocks form when sediment is eroded, deposited, compacted and cemented. • Metamorphic rocks are formed when heat and/or pressure is added to existing rock.	• Movie: Earth Rocks! • Rock packet • Rock Cycle diagram	• Rock identification lab • Rock identification practical quiz • Rock stories

Connections to Text:

Connections to Technology:

Vocabulary: texture grain igneous sedimentary metamorphic extrusive intrusive porphyritic sediment erosion deposition compaction cementation foliated rock cycle

Topic: Volcanoes

Essential Questions:

1. What processes contribute to the formation of volcanoes?
2. How are earthquakes measured?
3. How can scientists predict volcanic eruptions and avoid hazards?
4. What composes the interior of a volcano?

Performance Indicators	Essential Knowledge and Skills	Classroom Ideas	Assessment Ideas
• The interior of Earth is hot. Heat flow and movement of material within Earth cause sections of Earth's crust to move. This may result in earthquakes, volcanic eruptions, and the creation of mountains and ocean basins. • Plates may collide, move apart, or slide past one another. Most volcanic activity and mountain building occur at the boundaries of these plates, often resulting in earthquakes.	• Volcanoes are openings in Earth's crust where magma reaches the surface as lava, creating new landforms. • Most volcanoes occur near plate boundaries, but some form at hot spots. • An eruption occurs when gasses and magma rush to the surface of the Earth. • There are two types of eruptions: quiet and explosive. • Volcanoes pose many hazards to people. • There are three types of volcanoes: shield, cinder cone and composite. • There are volcanoes on other planets.	• Hot Spot demo • Volcano diagram (colored and labeled) • Movie: Mt. Pinatubo • Volcano types jigsaw activity	• Plotting earthquakes and volcanoes lab • Volcano research project (Power Point)

Connections to Text:

Connections to Technology:

Vocabulary: volcano lava island arc magma Ring of Fire hot spot magma chamber pipe vent lava flow crater silica pahoehoe aa pyroclastic flow active dormant extinct hot spring geyser shield cinder cone composite caldera dike sill

Topic: Work and Machines

Essential Questions:

1. What is required for work to be done on an object?
2. What makes some machines more efficient than others?
3. How can machines help us do work?

Performance Indicators	Essential Knowledge and Skills	Classroom Ideas	Assessment Ideas
• Machines transfer mechanical energy from one object to another. • A machine can be made more efficient by reducing friction. Some common ways of reducing friction include lubricating or waxing surfaces. • Machines can change the direction or amount of force, or the distance or speed of force required to do work. • Simple machines include a lever, a pulley, a screw, a wedge, a wheel and axle, and an inclined plane. • A complex machine uses a combination of interacting simple machines, e.g., a bicycle.	• Work = Force x Distance • A machine makes work easier by changing the direction or amount of force needed to accomplish a task. • Six basic kinds of simple machines. • There are many simple machines in the human body.	• Practice with work formula • Machine or NOT machine? activity • Junk yard wars: Extreme Machines	• Simple machines packet • Lever lab • Weight room lab

Connections to Text:

Connections to Technology:

Vocabulary: work joule machine input force output force mechanical advantage efficiency inclined plane wedge screw lever wheel and axle pulley compound machine gears tendon