

The 8th Grade Science Pacing Guide

1st Quarter Begins

Scientific Inquiry (Approximate Duration: 1 Week Introduction/All Year Application)

Essential Questions: How do scientists solve problems?

I can:

1. Identify questions that can be answered through scientific investigations;
2. Design and conduct a scientific investigation;
3. Use appropriate mathematics, tools and techniques to gather data and information;
4. Analyze and interpret data;
5. Develop descriptions, models, explanations and predictions;
6. Think critically and logically to connect evidence and explanations;
7. Recognize and analyze alternative explanations and predictions; and
8. Communicate scientific procedures and explanations.

Physical Earth

A. The composition and properties of Earth's interior are identified by the behavior of seismic waves.(Approximate Duration: 2 Weeks)

Essential Questions: Why is the Earth's interior still hot? How do we know that the Earth has layers? How do we know what they are composed of?

I can:

1. Identify the layers of the Earth (e.g., inner core, outer core, mantle and crust).
2. Describe each layer of the Earth including its composition, state of matter and thickness.

3. Compare the layers of the Earth with the layers of the Moon (enrichment).
4. Describe the anatomy of an earthquake.
5. Identify the cause of an earthquake.
6. Explain how earthquakes are measured.
7. Compare the different types of seismic waves.
8. Explain how to locate the epicenter of an earthquake through triangulation (enrichment).
9. Analyze seismic data, graphs and charts to support current theories on earth's composition and geological history.
10. Explain how the refraction and reflection of seismic waves as they move through one type of material to another is used to identify the layers of Earth's interior.
11. Describe the formation of our planet.
12. Explain how the formation of our planet generated the heat that is present today.

B. Earth's crust consists of major and minor tectonic plates that move relative to each other. (Approximate Duration: 3 Weeks)

Essential Questions: How would you know if continents were moving? What evidence might support the idea that continents were once joined? Where is the longest mountain chain on Earth? How is it possible that the Atlantic Ocean is growing? Where on surface of the Earth could you hide Mount Everest? How can the Atlantic Ocean grow but the surface of the Earth does not? Why might earth's magnetic field affect iron containing magma? What would be the results of continents moving into each other or away from each other? What is the cause for the volcanic activity in the Hawaiian islands? What do geysers, hot springs and ocean vents have in common? How can earthquakes be dangerous far away from an epicenter? How are earth's landforms imaged and mapped?

I can:

1. Describe the continental drift theory.
2. Explain how fossil distribution and other evidence support the theory of continental drift.

3. Describe sea floor spreading.
4. Compare a mid-ocean ridge and a rift valley.
5. Describe an ocean trench.
6. Describe the process and result of subduction.
7. Explain why the size of the earth stays the same during sea-floor spreading.
8. Explain how the discovery of certain magnetized minerals in the ocean floor provide evidence for sea floor spreading.
9. Identify and describe landforms related to the ocean floor.
10. Explain how Earth's core drives convection currents in the mantle and resulting crustal movement according to the plate tectonic theory.
11. Compare the three main types of plate boundaries: divergent, convergent and transform.
12. Compare oceanic crust with continental crust.
13. Predict whether subduction will occur at a given boundary.
14. Identify and describe the landforms that are created from each of the three boundaries (trenches, mountains, island arcs, volcanoes).
15. Identify and describe the relationship between volcanic activity (geysers, hot springs, ocean vents, hotspots) and plate boundaries.
16. Identify and describe the relationship between earthquakes (faulting, tsunamis) and plate boundaries.
17. Interpret images (e.g., satellite) and maps (e.g., topographic) of various landforms related to plate tectonics.

C. A combination of constructive and destructive geologic processes formed Earth's surface. (Approximate Duration: 3 Weeks)

Essential Questions: What geologic processes in addition to plate tectonics formed Earth's surface?

Everyday Life: Did you know that the Grand Canyon is the most visited national park in the world? Did you know that Mammoth Caves in Kentucky are the longest caves in the world?

I can:

1. Compare erosion and deposition.
2. Explain how gravity causes erosion (e.g., mass wasting) and provide examples of resultant landforms (e.g., talus).
3. Explain how wind causes erosion (esp. desert) and provide examples of resultant landforms (e.g., sand dunes).
4. Explain how running water causes erosion and provide examples of resultant landforms (e.g., stages of river, floodplains, discharge rates, gradients, velocity, and delta).
5. Explain how glaciers cause erosion and provide examples of resultant landforms (moraines, outwash, tills, erratic, kettles, eskers).
6. Explain how ocean waves cause erosion and provide examples of resultant landforms (coastlines).
7. Identify various surface features using topographic, physical and aerial maps, cross-sections and virtual settings (e.g., remote sensing, satellite data, LANDSAT).
8. Explain the cause for karst topography and provide examples.
9. Compare various soil types and describe a soil profile.

2nd Quarter Begins

D. Evidence of the dynamic changes of Earth's surface through time is found in the geologic record. (Approximate Duration: 3 Weeks)

Essential Questions: How do we know that earth's surface has changed over time?

Everyday Life: Did you know if you measured the earth's history as 24 hours humans would have appeared in the last 5 minutes?

I can:

1. Explain the geology principle of Uniformitarianism.
2. Explain what relative age means.

3. Explain how the relative age of rock layers can be determined by the laws of stratigraphy (law of superposition, law of lateral continuity, law of original horizontality, and law of cross-cutting relationships).
4. Explain how the age of rock layers can be determined by index fossils.
5. Explain what absolute age means.
6. Explain how absolute age is determined
7. Describe and interpret the geologic time scale.
8. Relate Earth's climate history to present-day climate issues that includes evidence from ice core sampling as well as evidence from the geologic record.
9. Generate geologic maps of local or statewide formations based on actual data.
10. Identify local formations and interpret the environment that existed at the time of the formation using geologic research.
11. Analyze and interpret various data to draw conclusions about geologic history.

Life Science

- A. Reproduction is necessary for the continuation of every species. (Approximate Duration: 3 Weeks)

Essential Questions: Which form of reproduction is best?

I can:

- a. Explain why reproduction is necessary for the continuation of every species.
- b. Define gene and genetic mutation.
- c. Compare sexual reproduction and asexual reproduction as it relates to the number of parents.
- d. Identify organisms that reproduce sexually or asexually or both ways.
- e. Compare mitotic and meiotic cell divisions as they relate to asexual and sexual reproduction.
- f. Explain why asexual reproduction results in identical offspring or clones and produces genetic continuity which may increase or decrease an organism's chances for survival.

- g. Explain why sexual reproduction results in offspring that have a combination of genes and produces variations (new traits) in the species which may increase or decrease an organism's chances for survival.

[In sexual reproduction, a single specialized cell from a female (egg) merges with a specialized cell from a male (sperm). Typically, half of the genes come from each parent. The fertilized cell, carrying genetic information from each parent, multiplies to form the complete organism. The same genetic information is copied in each cell of the new organism.]

- B. Diversity of species occurs through gradual processes over many generations. Fossil records provide evidence that changes have occurred in number and types of species. (Approximate Duration: 3 Weeks)

Essential Questions: Does evolution really happen?

I can:

- a. Explain how fossils provide important evidence of how life and environmental conditions have changed.
- b. Explain how changes in environmental conditions can affect how beneficial a trait will be for the survival and reproductive success of an organism or an entire species.
- c. Predict the effect of a beneficial genetic mutation in a sexually reproducing population.
- d. Predict the effect of a lethal genetic mutation in a sexually reproducing population.
- e. Define gradualism.
- f. Explain how variations that exist in organisms can accumulate over many generations, so organisms can be very different in appearance and behavior from their distant ancestors.
- g. Define extinction.
- h. Explain how throughout Earth's history, extinction of a species has occurred when the environment changes and the individual organisms of that species do not have the traits necessary to survive and reproduce in the changed environment.
- i. Explain why most species that have lived on Earth are now extinct.

- j. Compare mass extinction and background extinction.

3rd Quarter Begins

- C. The characteristics of an organism are a result of inherited traits received from parent(s). (Approximate Duration: 3 Weeks)

Essential Questions: How are traits inherited?

I can:

- a. Explain how the traits of one or two parents are passed on to the next generation through reproduction.
- b. Explain that traits are determined by instructions encoded in deoxyribonucleic acid (DNA), which forms genes.
- c. Describe Mendel's work and the principles of Mendelian genetics.
- d. Explain how Mendel's two laws provide the theoretical base for future study of modern genetics.
- e. Define Mendel's first law, the Law of Segregation, and his second law, the Law of Independent Assortment.
- f. Demonstrate and illustrate how Mendel's laws apply to variety of organisms.
- g. Define gene, allele, dominant gene, recessive gene, and codominance.
- h. Describe codominant traits such as roan color in horses and cows.
- i. Analyze pedigrees limited to dominant, recessive or codominance of one trait.
- j. Conduct a long-term investigation to analyze and compare characteristics passed on from parent to offspring through sexual and asexual reproduction.
- k. Analyze phenotypes that appear in the resulting generations and what they infer about genotypes of the offspring.

Physical Science

- A. Forces between objects act when the objects are in direct contact or when they are not touching.(Approximate Duration: 3 Weeks)

Essential Questions: Which forces are really invisible?

I can:

- a. Define field.
- b. Explain how two objects can exert forces on each other without touching using the field model.
- c. Predict changes in the motion of an object when placed in a field.
- d. Define electric field.
- e. Predict changes in the motion of a charged object when placed in an electric field (e.g., repelled or attracted).
- f. Explain what happens to the strength of an electric force as the distance increases from the source.
- g. Define magnetic field.
- h. Predict changes in the motion of a magnetic object when placed in a magnetic field (e.g., repelled or attracted).
- i. Explain what happens to the strength of a magnetic force as the distance increases from the source.
- j. Describe magnetic field lines when iron filings are sprinkled around a magnet.
- k. Define gravitational field.
- l. Predict changes in the motion of an object when placed in a gravitational field.
- m. Explain what happens to the strength of a gravitational force as the distance increases from the source.
- n. Describe Newton's Universal Law of Gravity.
- o. Compare mass and weight.
- p. Provide examples of how an object's weight can vary while its mass does not.

B. Forces have magnitude and direction. (Approximate Duration: 3 Weeks)

Essential Questions: How do the forces on an object cause its motion to change?

I can:

- a. Describe how the motion of an object is always measured with respect to a reference point.
- b. Define force, magnitude and friction.
- c. List and describe the three types of friction.
- d. Draw a force diagram.
- e. Demonstrate how forces can be added.
- f. Define net force (sum of all of the forces acting on the object).
- g. Compare balanced and unbalanced forces.
- h. Explain how the net force acting on an object can change the object's direction and/or speed.
- i. Predict the motion (change of speed/direction) of an object when the net force on it is greater than zero.
- j. Explain how an object remains at rest or continues to move at a constant speed in a straight line if the net force is zero.

4th Quarter Begins

- C. There are different types of potential energy. (Approximate Duration: 3 Weeks)

Essential Questions: What does a water tower, rubber band and a piece of pizza have in common?

I can:

1. Define and calculate gravitational potential energy.
2. Explain how gravitational potential energy is associated with the mass of an object and its height above a reference point.
3. Define elastic potential energy.
4. Explain how elastic potential energy is associated with how much an elastic object has been stretched or compressed.
5. Explain how elastic potential energy is associated with the amount of force required to compress or stretch an object.

6. Define chemical potential energy.
7. Explain how chemical potential energy is associated with the position and arrangement of the atoms within substances.
8. Identify the forms of energy transferred when a chemical system undergoes a reaction.