5th Grade Science
STAAR Review

REVISED 2012
Nature of Science – Scientific Process

Scientists use different tools for different jobs. The tools include thermometers, rulers, stopwatches, graduated cylinders, and balance scales.

Triple-beam balances have three numbers that are added together to find the mass of an object.

Be safe during experiments. Follow lab rules and talk to the teacher if there is a problem.

In order for an investigation to have valid results, you must do at least 3 trials. Scientists repeat their experiments several times until they can verify their results and then draw valid conclusions.

When you do an experiment everything should be kept the same except what you are testing. Only one variable in an investigation can be changed. Everything else must remain the same.

Finding out what has changed and what is being measured can help identify the question being tested.

Nature of Science - Safety

Safety first. In any science investigation, whether in the classroom, lab, or field your priority should be to follow safety guidelines before, during and after any work. Ask your teacher when you are not sure what to do.

Never breathe in any liquid.

Wear appropriate clothing. Tie back long hair or long sleeves. Wear goggles when working with any liquid.

Use gloves or hot pads when using warm or hot materials.

Wear an apron to protect clothing from chemicals or liquids.

You should know these symbols. (Pictures used may vary)

Always wash your hands after an experiment.

- Wear eye protection
- Flammable
- Wear an apron
- Fire extinguisher
- Toxic or poisonous chemical
- No open flames
- Wear gloves
- Electrical hazard
- Recycle

Sedimentary Rock Formation

- Sediment is small pieces of rock, sand, soil, and remains of organisms. Flowing water or wind often move sediment.
- Sedimentary rock is formed by sediment that has been packed into layers over many years.

Fossils and Fossil Fuels

- **Fossils** are the traces or remains of organisms that lived long ago. Most fossils are found in sedimentary rock.
- Fossils can provide clues to how life and environmental conditions have changed. Fish fossils found on dry land show the land was once covered by an ocean.
- **Fossil fuels** are created from the remains of ancient organisms that were buried by sediment and changed by heat and pressure over millions of years. Coal, oil, and natural gas are fossil fuels.

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**Nature of Science - Scientific Tools**

- Different tools have different jobs.
- Length can be measured with a metric ruler or a meter stick.
- Mass is measured with a balance which can be a simple pan balance, or a more scientific triple beam balance.
- Time is measured with a stopwatch or timer.
- Volume is measured with a graduated cylinder, beaker, or measuring cup.
- A collecting net can be used to catch flying or swimming critters.

![Thermometer](image1.png) - used to measure temperature. Scientists use degrees Celsius.

![Safety goggles](image2.png) - used to protect your eyes when doing experiments in the lab.

![Scale with spring](image3.png) - used to measure weight. It is measured in metric units: milligram (mg), gram (g), and kilogram (kg).

![Apron](image4.png) - used to protect clothing and chest area while working on experiments.

![Double pan balance](image5.png) - used to compare mass to a known mass. Always use metric weights.

![Triple beam balance](image6.png) - used to measure mass in the metric system. Each bar represents a different place value, hundreds, tens, and ones. Add the three numbers to find the mass.
### Essential Vocabulary

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- **Microscope**: used to observe objects too small for the eye.
- **Hand lenses**: used to observe details of materials or to observe objects closely.
- **Graduated cylinder**: used to measure liquids in milliliters (mL) and liters (L).
- **Meter stick**: used to measure length of items using the metric system.
- **Measuring cups**: used to measure larger quantities of water in metric units.
- **Stop watch**: used to record beginning and ending times during lab work and experiments.
- **Compass**: used to find the direction in relation to the North Pole.
- **Collecting nets**: used to collect samples of animals, plant life, etc.
- **Hot Plate**: used to heat items, usually liquids—wear gloves because items will be HOT.
- **Magnets**: used to test the magnetism of different metals and metallic mixtures.
Earth Science - The Planets

- A planet is a large object that moves around a star.
- The planets in our solar system complete an orbit or trip around the Sun.
- Gravity is the force that keeps the planets in orbit around the Sun, and the Moon in orbit around the Earth.
- The planets in the solar system are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.
- You might remember the order with this little phrase:

**My Very Educated Mother Just Sold Us Nachos**
Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune

HINT: Mars is the 4th planet and has 4 letters

Nature of Science – Measurement

- In the metric system, length is measured in meters, mass is measured in grams, and volume is measured in liters.
- The metric system is based on the number 10 and multiples of 10, such as 100 and 1,000. This makes it easy to change from one unit to another unit.
- The freezing and melting temperature of pure water is always 0°C. The boiling temperature of pure water is always 100°C.
Life Science - Plants
- Living things are called organisms. This includes both plants and animals.
- Plants have 3 main parts: The roots, the stem, and the leaves.
- The roots take in the water; the stem moves the water through the plant.
- The leaves trap sunlight (in the chloroplast in the cells) and take in carbon dioxide.
- Plants make their own food during the process called **photosynthesis**.
- Water, sunlight and carbon dioxide enter the plant during photosynthesis.
- Energy from the Sun turns the water and carbon dioxide into sugar, which is the plant’s food.
- Oxygen leaves the plant after the process of photosynthesis.
- Plants have many different adaptations to allow them to survive in their environment. A cactus has thorns instead of leaves to avoid excessive evaporation of water. The rose has thorns to prevent them from being eaten. The leaf of a pine tree is long, narrow, and pointy. It doesn’t allow a lot of water to be lost.
- The trees in the rainforest compete for sunlight. Since the top or canopy of the rainforest is so dense, the trees try to grow higher that the other trees around them.
- In the rainforests there are also some vines that creep up the side of trees looking for sunlight.
- Most plants reproduce with seeds. The seed has enough food to produce a new plant.
- Seeds can be dispersed by wind, water, or animal movement to allow for plant reproduction. This increases the plant’s chance of survival.
- Some plants, like ferns, mushrooms and moss reproduce by **spores**. A wall protects the majority of spores. Each spore has the chemicals needed to grow a new plant.
- **Bulbs** store the energy they need to create a new plant from year to year. Some plants that grow by bulbs are onions and tulips.
- All plant traits and behaviors are inherited. Plants do not have brains, therefore they cannot learn.

Earth Science – Earth & Sun
- The Earth rotates on its axis. This takes one day. This gives us our night and day.
- The Earth revolves around the Sun. This takes one year (about 365 days).
- Earth has different seasons. Each season depends on the Earth’s location in relationship to the Sun and on what hemisphere is tilted towards the Sun.
- When our half of the world is tilted to the Sun we have summer. When our half of the world is tilted away from the Sun we have winter.

  - The Earth’s rotation causes the Sun to appear to rise in the East, move across the sky and set in the West.
  - Shadows are shortest at midday, and longest in the early morning or late afternoon.
Earth Science – Characteristics of the Earth & Moon

- Objects weigh less on the Moon than on the Earth because the Moon has less gravitational pull.
- Ocean tides are caused by the gravitational pull from the Moon. Tides cause water levels to rise and fall about every 6-8 hours. There are 2 tides daily.
- The Earth is warmer than the Moon. The “light” of the Moon is actually the reflection of the Sun.
- The Moon has no liquid water, no living things, and no atmosphere. The Moon does not have weathering or erosion because there is no atmosphere on the moon.
- Earth is a planet that is made of rock with areas of water. It is much smaller than the Sun and can support life. The Earth has an atmosphere and weather.

- The Moon has four main phases.
- The phases start with a new Moon, then a first quarter, a full Moon, a third (last) quarter, then a new Moon again.
- The lunar cycle (the 4 phases) takes about 28 days (about a month). This is the same time it takes for the Moon to complete one revolution around the Earth.

Life Science – Animals and the Ecosystem

- An ecosystem includes all living and non-living parts in a place and how organisms interact with one another and their environment. Every living organism lives in an ecosystem.
- Living organisms can affect ecosystems. Building a highway destroys habitats. An overpopulation of grazers would eat all the grass affecting the food supply for other organisms.
- Living things interact with non-living things such as soil, water, air, weather, fire, and natural disasters.
- Animals live in an area called a habitat. Many habitats make up an ecosystem.
- A group of ecosystems in an area with the same climate and organisms is called a biome. Deserts, Tropical Rain Forests, Deciduous Forests, and Grasslands are types of biomes.
- Deserts have less than 5 inches of rain a year. Most deserts are hot during the day and cool at night. Animals and plants living there have adapted to an environment with little rain and long periods of extreme heat. Most animals living in a desert obtain their water by eating plants.
- Prairies or grasslands have a great variety of animals and many different types of grasses. Animals have plenty of room and oxygen. Animals living in the prairie compete for food during droughts or periods with no rain. Most of the animals living in a prairie are birds, small mammals and insects.
- Forests can be deciduous or rainforests. In deciduous forests, the plants and animals have to adapt to changes in the weather. Trees lose their leaves in the fall, and they grow back in the spring. Many of the animals in this type of forest store food for the cold season, or they hibernate. Many birds living in a deciduous forest migrate to warmer climates during the winter.
- Rainforests have plants with wide leaves, trees that compete for sunlight, and a great variety of animals. The animals living in a rainforest must be adapted to the heat and humidity. Monkeys, for example, have long tails to hang and balance themselves on the trees. Parrots have long and strong beaks to break seeds and fruits they take from trees.
Life Science – Inherited and Learned Behaviors

- **Inherited traits** are characteristics passed down from parent to offspring like hair and eye color. For example, a puppy born from a black and white mother and black and white father will likely have black and white fur, too.
- **Learned characteristics** are things learned by interacting with the environment. Behaviors can be learned by observing other organisms, being taught by a parent or sibling, or by trial and error (practicing).
- Sometimes a behavior can be both inherited and learned. For example, lions are born knowing they need to hunt for food, but they must learn how to hunt by observing and following the model of their mothers.

Life Science – Animals

- The structures of an organism help it survive. Feathers, fur, claws, talons, webbed feet, and teeth, are examples of structures.
- Webbed feet help animals swim; sharp claws help animals climb and catch prey; fur keeps animals warm.
- Animals have adapted different ways to get food. Birds and other animals have different mouth and/or beak structures.

- Animals have many different protective adaptations.
- Porcupines have sharp quills to defend themselves against predators trying to attack them.
- Skunks can spray their enemies. Turtles can retreat into their hard shells.
- Rabbits eliminate the heat in their bodies through their long ears.
- Reptiles have scales to prevent water loss in hot, dry places.

Earth Science – Weather

- The Sun is responsible for our weather patterns. Weather is different in different places on the Earth.
- It is warmest near the equator.
- It is colder near the North and South Poles.
- **Weather** is the current picture of the conditions in a particular place. (It is rainy; it is cloudy). (This of it as one picture)
- **Climate** is the average picture of the weather in a particular place over a long period of time. (Think of it as an entire photo album)
- Warm air is less dense than cold air, so warm air rises. As warm air rises it cools and becomes denser. Then, it sinks back to the Earth’s surface where it warms again.
- Wind happens because this warming and cooling cycle is happening at different rates on Earth.

- As wind blows over a mountain range, it usually brings with it precipitation. If a mountain is next to a large body of water, the side that is closest to the water will get more rain and the other side will be drier. It rains more near oceans and mountains.
- A sudden change in wind direction, air temperature, and cloud cover most likely signals a change in the weather.

Earth Science – Characteristics of the Earth & Moon

- The Earth and Moon are alike because they are both spheres and made up of rock and dirt. Both have mountains and valleys.
- The Earth has water and living things. The Moon does not.
- The Earth revolves around the Sun. The Moon revolves around the Earth.
- The Earth has more gravity than the Moon. The Earth is larger than the Moon.
Earth Science – Sun

Almost everything on Earth is related to the Sun and its energy. The Sun provides Earth with heat and light. The Sun is responsible for the water cycle, plant growth, wind, and weather.

Earth is one of eight planets in our Solar System. All of these planets revolve around our solar system’s only star – the Sun. (sol = Sun)

The Sun is the major source of energy of the Earth. The Sun’s energy is called solar energy.

The Sun has a corona (the light around it) and sunspots (cool areas on the Sun that look darker).

The Sun is made up of very hot gasses. The Sun is not the largest star in the galaxy, but it is Earth’s closest star and the only star in our solar system.

Our solar system is part of the Milky Way Galaxy. The Milky Way Galaxy is one of possibly millions of galaxies in the universe.

The Sun is the center of our Solar System.

Earth Science – Water Cycle

Water is a renewable resource because it continuously renews itself through the water cycle.

The Sun’s energy heats the water in the ocean causing evaporation. The Sun’s energy drives the water cycle.

Evaporation (water turning from a liquid to a gas) starts with heat energy, usually from the Sun.

As the water vapor rises through the atmosphere it reaches cooler temperatures and condenses (turns from gas to liquid).

Condensation happens when the rising warm moist air meets cooler air higher in the atmosphere.

Condensation changes a gas (water vapor) to a liquid (water drops).

Depending on weather conditions and altitude, it falls back to Earth as precipitation in the form of rain, sleet, hail, or snow.

Life Science – Food Chain & Food Web

A decomposer breaks down dead organisms or waste from organisms and returns nutrients to the soil. Fungi, bacteria, insects (FBI) and earthworms are examples.

A predator is any animal that hunts other animals for food. An example of a predator is a lion hunting a rabbit. A ladybug eating an aphid is also an example of a predator.

Prey is the animal that is hunted and eaten.

A producer makes its own food. All plants are producers.


Herbivores eat only plants. Carnivores eat meat like insects, spiders and mammals. Omnivores eat both plants and animals.

Energy transfers from organism to organism in a food chain. This energy starts with the Sun, is used by producers to create their own food, and is transferred to consumers and decomposers.

Many connected food chains are called food webs.

The arrows show the direction that energy is flowing in a food chain – from what is being eaten to who is getting energy from that food source.

Life Science – Animal Life Cycles

All organisms go through a life cycle. Some go through a metamorphosis.

A complete metamorphosis has four stages – egg, larva, pupa, and adult. (ELPA)

Most insects, like the butterfly, go through a complete metamorphosis.

Frogs also go through a type of change as they grow.

Egg - The mother frog lays eggs in the water.

Tadpole - It lives in the water and breathes with its gills.

Froglets - In this stage the frog develops legs and begins to live in the water.

Adult frog - At this stage, the frog breathes with its lungs and lives on land.

Grasshoppers and dragonflies are insects that go through incomplete metamorphosis. They go from egg to nymph to adult (ENA)

The nymph is a smaller version of the adult.
Life Science – Carbon Dioxide-Oxygen Cycle

The Carbon Dioxide – Oxygen Cycle shows how oxygen exits plants and enters animals.

The Carbon Dioxide – Oxygen Cycle also shows how carbon dioxide enters plants and exits animals. Many animals get the oxygen they need in order to live by breathing air. They breathe out another gas as a waste. This waste gas is called carbon dioxide.

Plants take in carbon dioxide and release oxygen. Animals take in oxygen and release carbon dioxide.

In this way both gases are cycled through the atmosphere and through living things.

Here is a diagram showing how this cycle works.

Earth Science – Sand and Soil

Soil covers almost all of the Earth’s land. Some soils take about 1,000 years to make about inch of soil.

Soil is made up of four different materials: weathered rock that contains minerals, humus which is made from parts of decayed or rotting organisms, air, and water.

Topsoil contains most of the nutrients necessary for plant growth. Topsoil is also the first to erode.

Sand, silt, and clay are names that describe the size of individual particles in the soil. Sand is the largest particle; clay is the smallest.

The capacity to retain water depends on the size of the spaces between the grains in the soil. The more water that comes out, the less water is retained.

Clay is not a good soil because it won’t allow water to pass through it. It retains too much water and causes plant roots to rot.

Sand is not a good soil because water passes through it too quickly. The plant cannot absorb the water fast enough.

Most beaches are formed by deposits of sediments like sand or pieces of shells. Beaches can change their shape because of erosion during storms.

Ocean water can weather away rock found on the land and form the sand that covers beaches.

Sedimentary rock records can be used to determine what an area was like long ago. Layers of sediment that were laid down millions of years ago are on the bottom of the rock layers. The newest sediment is at the top.

Fossils found in rock layers can also tell a lot about what the environment was like long ago.
Earth Science – Forces of Change

- **Glaciers** are large sheets of ice that move slowly across the land and can form valleys and lakes.
- As glaciers move down the slope of a mountain, they scrape the land. The large masses of ice carry with them pieces of rock, sediment, and debris. Sometimes as glaciers push rocks and boulders down a mountain they pile up to form hills.
- Glaciers should **NOT** be confused with **icebergs**. Icebergs are large pieces of ice that float in the water.
- **Volcanoes** can change the shape of the Earth by adding more land or changing the appearance of the existing one. The Hawaiian Islands were formed by volcanoes.
- **Earthquakes** can change the surface of the Earth by causing huge cracks.
- **Caves** are often formed in limestone rock. A combination of chemical processes and water erosion is responsible for most cave formations.
- **Beaches** can suffer drastic erosions during hurricanes and bad storms. Strong winds and forceful tides can wash away entire beaches. This can even change the appearance and shape of the land.

Earth Science – Natural Resources

- **Resources** are things people use to help them do work. Natural resources are resources that are found in nature.
- **Resources** like plants, animals, water, and air are classified as **renewable resources**. Renewable resources can be replaced over and over again in a very short amount of time.
- **Nonrenewable Resources** cannot be replaced in our lifetime. Fossil fuels like oil, natural gas, and coal are nonrenewable. They take millions of years to create. People are using them up faster than they can be replaced by nature.
- Minerals are also a nonrenewable resource.
- **Fossil fuels** are nonrenewable resources that can be used for energy. Fossil fuels like natural gas and coal are used to power cars and provide electricity for our homes.
- Some renewable resources can also be used for energy. These are **alternative energy resources**. The wind, solar energy, geothermal energy, (heat from deep inside the Earth), hydroelectric power (energy from moving water), and biofuels (fuels made from once living organisms) are examples of alternative energy resources.

Physical Science – Matter and its Properties

- All things are made up of matter. Matter makes up everything.
- The amount of matter in an object is its **mass**.
- Weight of an object is based on the gravitational pull on the mass of the object.

![Scale with springs to measure weight](image)
![Scale to compare mass to a known mass](image)
![Triple beam balance to measure mass](image)

- The more mass an object has, the more it weighs on Earth.
- Weight can change depending on the force of gravity. The object’s mass will not change. Imagine that you go to the Moon. The Moon has a gravity force that is less than the one on Earth. You would weigh less on the Moon, but your mass would be the same. The gravity force is approximately six times greater on Earth than it is on the Moon.
- Matter can be classified by **physical properties** like mass, magnetism, physical state (solid, liquid, gas), relative density (sinking and floating), solubility in water, or the ability to conduct or insulate heat or electricity.
- An object will float if its density is less than water.
- An object will sink if its density is greater than water.
- A substance is soluble in water if it dissolves. Sugar and salt are soluble in water. Sand is not soluble in water.

Physical Science – States of Matter

- Matter can be in one of three states: Solid, Liquid, or Gas.
- Solids retain, or keep, their own shape. The particles of a solid are packed tightly together and have low energy.
- Liquids keep their volume, but take the shape of the container they are in. The particles of a liquid can flow past one another and have medium energy.
- Gases take on both the shape and volume of their containers. The particles of a gas can move about freely and have high energy.
- Heating or cooling a substance can change its state of matter.
Physical Properties of Matter

- As temperature increases/rises (gets hotter) matter goes from a solid to a liquid to a gas: ice changes to water and then to water vapor.
- Look at these diagrams. They show what happens to the molecules in matter as they change states.
- As temperature decreases/falls (gets colder) matter goes from a gas to a liquid to a solid: water vapor changes to water and then to ice.

Physical Science – Energy

- Energy is the ability to change matter or do work.
- Types of energy include mechanical (movement), light, thermal (heat), electrical, and sound energy.
- Animals, including people, get energy from the food they eat. An animal's body needs energy to stay alive.
- Mechanical energy includes any movement, and often results in some change of position, such as with a car driving, ball rolling or pump moving water.
- Light energy is useful for visibility, and can come from sources such as the Sun or electric lights in our homes.
- Sound energy is based on the vibration of particles, and can help communicate or share information.
- Electricity flows in circuit. An electric circuit is the path that electricity takes from one end of the battery to the other.
- Electricity can be used to produce, heat, sound, and light.

Earth Science – Our Earth

- **Landforms** are formations that can be found on the surface of the Earth. Mountains, valleys, deltas, canyons, sand dunes, rivers, beaches, and volcanoes are examples of different landforms.
- The Earth’s surface is constantly changing below and on its surface because of forces of nature. Many things, like wind, water, and ice can change Earth’s surface and create landforms.
- Some of these changes can happen slowly while others quickly. For example, it can take wind and rain over millions of years to wear down a mountain. Glaciers also take a long time to scrape Earth’s surface, forming a valley.
- A volcano can change an area within a few hours or days. Earthquakes and landslides can change the surface in a matter of seconds.

Earth Science - Erosion, Weathering, Deposition

- **Weathering** is when rock and dirt are broken down into smaller pieces by wind, ice, or water. (worn down)
- **Erosion** occurs after weathering when the sediment, small pieces of rock and dirt, move to a new place.
- Usually smaller pieces of sediment can travel farther than larger pieces.
- **Deposition** occurs when the sediment, pieces of rock and dirt, are left in a new place after erosion.

- Weathering breaks and smooths; Erosion takes and moves; Deposition drops and creates new land. (WED)

Earth Science—Forces of Change

- **Canyons** are formed when rivers weather away the land over thousands of years. A river is usually at the bottom of a canyon.
- **Deltas** are formed by moving water as sediment is deposited at the mouth of a river.
- **Sand dunes** are formed by wind moving sand.
Physical Science – Mixtures & Solutions

- Matter can be combined in mixtures and solutions. Some matter can be dissolved.
- Most mixtures can easily be separated with screens, filters, and other tools. Iron filings can be taken out of a mixture with a magnet.
- Solutions can be separated by evaporation.
- Physical changes only change a substances shape, size or appearance, but NOT its properties. Wood cut into tiny pieces is still wood. Tomatoes added to a salad still look and taste like tomatoes. Mixtures retain each item’s physical properties.

- **Density** is another physical property of matter. Mixing objects of different densities (amount of matter in an object) often causes the mixture to separate into layers. More dense objects will sink.
- In this graphic, the corn syrup is the more dense than water and the vegetable oil is the less dense than water.

Some of the physical properties of solutions can change. When salt is dissolved in water it shrinks and become part of the liquid. The liquid now tastes salty.

Physical Science – Force

- An object can move when a force is applied to it. Any push or pull is a force.

- **Friction** is determined by how rough or smooth something is. The more friction, the harder it is to move.
- **Gravity** is the force that pulls all objects in the universe towards each other.
- **Magnetism** is also a force. It repels (pushes away) or attracts (pulls towards) iron or steel objects.

- **Simple machines** use force to make our work easier.
- Examples of simple machines are pulleys, levers, screws, and wheels and axles.

Physical Science – Conductors and Insulators

- **Conductors** are materials that allow energy like electricity and heat to flow through easily.
- **Metals such as copper, aluminum, gold, and silver** are good conductors. Water is a good conductor.
- **Wire in an electric circuit** is a conductor. Pots are made out of metals so they will conduct heat.
- **Insulators** are poor conductors. They do not allow electricity, heat, or sound to flow easily. We use insulators to protect us from electricity and heat.
- Some common insulator materials are glass, plastic, rubber, air, and wood.
- The handles of kitchen tools are made out of wood or plastic so they do not conduct heat. They are insulators. Insulation is in your home to keep the cold air from leaving and the hot air from entering in the summer. In winter insulation keeps the heat inside your house and the cold air outside.

Physical Science – Light Energy

- **Light** travels in straight lines called rays. Light can be refracted (bent) or reflected (bounced back).
- **Refraction** happens when light passes from one type of matter to another at an angle. Light waves bend as they slow down or speed up moving from one medium to another. This picture shows light waves going from air to water. This bending of light is called refraction. (Think of a runner going from a paved track to sand and how that makes his speed change).
- Light that travels through eyeglasses is refracted. Other examples of refraction include a rainbow and a prism.
- A mirror, water, and tinted windows **reflect** light. Lenses in glasses, cameras, and telescopes refract light.
- Although smooth, shiny surfaces reflect light the best, any object that you can see which doesn’t have its own light, is reflecting light from some other source.
- The Moon reflects light from the Sun.