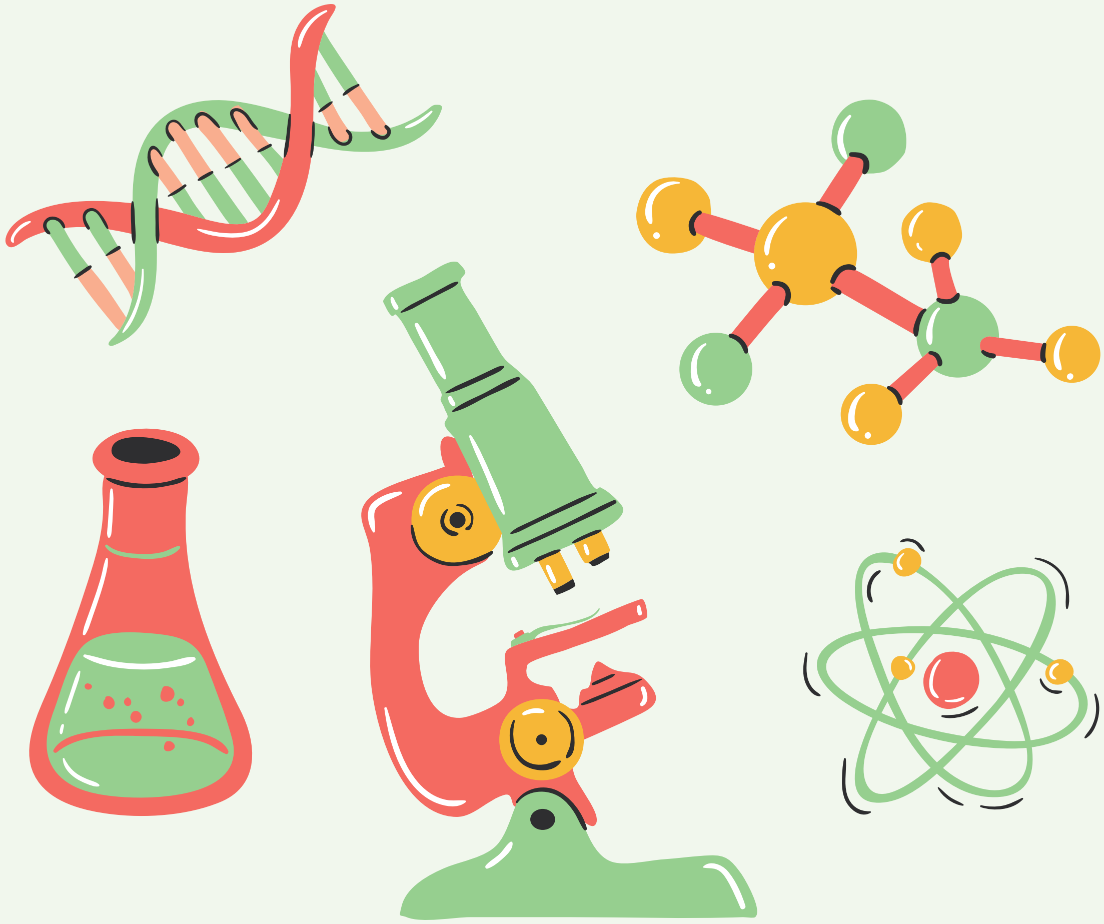
Science



This notebook belongs to:

Summer Work

This notebook belongs to:

Please complete the following

Must Do

MS-PS1-2 Reading and Questions

Please Complete One

MS-ESS2-1 Reading and Open Ended

MS-LS2-1 Reading and Open Ended

MS-PS1-2 Reading and Questions

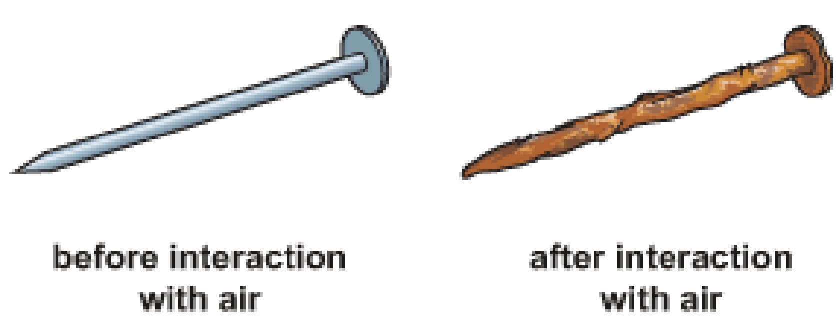
How do we tell whether two samples are the same or different substances? Is a silver coin made out of a different substance than a pencil lead? What evidence do you have that these are different substances? You might say that the pencil lead will write on paper and the coin will not. In other words, the silver coin and the pencil lead have different properties. Each pure substance can be identified by its unique set of chemical and physical properties.

Physical properties can be determined without changing the identity of a substance. For example, you can determine the density of a rock sample without changing the rock. Other physical properties include melting point, boiling point, color, odor, solubility, malleability, and conductivity.

Chemical properties describe how a substance interacts with other substances. Chemical properties are determined by observing whether or not a substance will change into a different substance under certain conditions. For example, you can determine that a coin is not made of a flammable substance by observing that it will not burn in a candle flame. Another chemical property is reactivity, or the ability to react with other materials.

In a chemical reaction, atoms in the reactant substance or substances are rearranged into different molecules, which are called the products of the reaction. The products have different properties than the reactants did. When substances interact, how can we tell whether or not a chemical reaction has taken place?

There are signs that indicate that a reaction may have happened, such as the release or absorption of energy and the appearance of gas bubbles. But sometimes these changes happen even if no reaction has taken place. For example, when water boils, gas bubbles form in the water, but no reaction is taking place. The only definite way to tell that a chemical reaction has taken place is to compare the properties of the substances before and after they interact to see whether there are products that have different properties from the original substances. This is a way to tell whether a reaction has taken place because the changes in the patterns of the substances at the molecular level determine the properties of the substances we can observe and test.



MS-PS1-2 Reading and Questions

The nail has changed after being left out in the rain for several weeks. The rust that has formed on the nail is a different color than the nail was originally. And the rust material breaks into pieces easily, unlike the material of the nail before it interacted with the rain and air. The differences in the properties of the two substances are evidence that a chemical reaction took place.

The table below shows the properties of density and color for two liquids, water and hydrogen peroxide. The two liquids were exposed to sunlight for 2 weeks, and then the density of each liquid was measured again. The density of sample 2, which was originally hydrogen peroxide, has changed. So, even though the two samples are both still clear liquids, we can conclude that a chemical reaction has taken place because the density of sample 2 has changed.

	Sample 1	Sample 2
Original liquid	water	hydrogen peroxide
Original density	1.0 g/cm^3	1.45 g/cm^3
Original color	clear liquid	clear liquid
Density after being exposed to sunlight for 2 weeks	1.0 g/cm^3	1.0 g/cm^3
Color after being exposed to sunlight for 2 weeks	clear liquid	clear liquid

MS-PS1-2 Reading and Questions

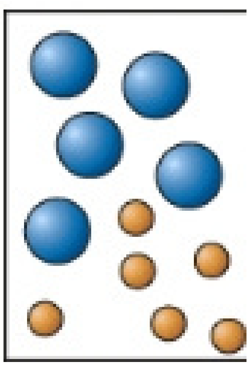
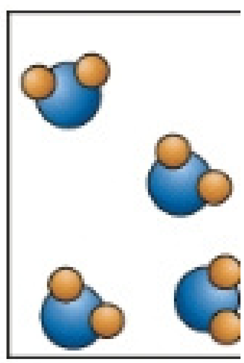
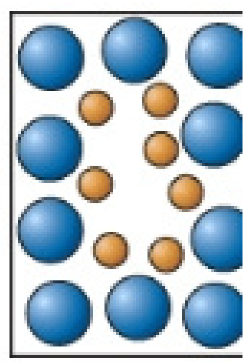
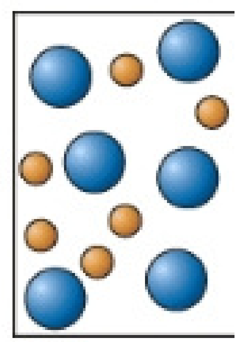
1) A teacher performs a demonstration where chemicals are mixed together. The class records data from the demonstration to look for evidence of a chemical change. Which piece of data best supports that a chemical change took place?

Choose the correct answer.

a) One of the materials that was mixed dissolved completely.
b) The temperature dropped 4 °C after the materials were mixed.
c) One of the materials changed from one state of matter to another.
d) The mass of the materials measured 73 grams both before and after mixing.

2) A student is using a computer model to explore chemical reactions. The circles of different sizes in the model represent the different molecules that are being mixed together. Which of these models shows a chemical reaction has taken place?

Choose the correct answer.

3) What evidence shows that a chemical reaction has taken place? Select the correct button in the table to show whether each statement is evidence of a chemical reaction or is not evidence of a chemical reaction

	Evidence of a chemical reaction	Not evidence of a chemical reaction
A. The chains on a swing rust.	○	○
B. Bubbles rise in a glass of soda.	○	○
C. The temperature of water lowers when it is put in the refrigerator.	○	○
D. Steel wool is sprayed with vinegar, and it starts to smell like eggs.	○	○
E. The temperature of two chemicals lowers when they are mixed together.	○	○
F. Raw eggs are placed in boiling water, and after 15 minutes they look, smell, and taste different on the inside.	○	○

MS-PS1-2 Reading and Questions

4) A chef is observing the characteristic properties of a white powdery substance used for cooking in order to identify it. Which of these properties can be used as evidence to identify the substance? Write each property in the correct box to show if it can be used to help identify the substance or not

Can Help Identify the Substance	Cannot help identify the substance

a. mass b. color c. density d. temperature e. ability to dissolve in specific substances f. reaction with specific liquids

5) A student completes an investigation with a partner. They take a dark-colored penny and put it in a small paper cup. They add five drops of vinegar and a small amount of table salt to the cup. They swirl the mixture around with a toothpick. After stirring, they observe that the penny has changed to a lighter color and the appearance of the surface is more shiny. The students then predict what will happen to the penny over time. One of them predicts that it will slowly become dark again.

- **Use evidence to justify the prediction of the student that the penny will become dark again.**
- **Explain what type of change happened when the students mixed the penny, vinegar, and salt in the cup, and support the explanation with evidence. (You can answer on a separate piece of paper and attach it to this if you need more space)**

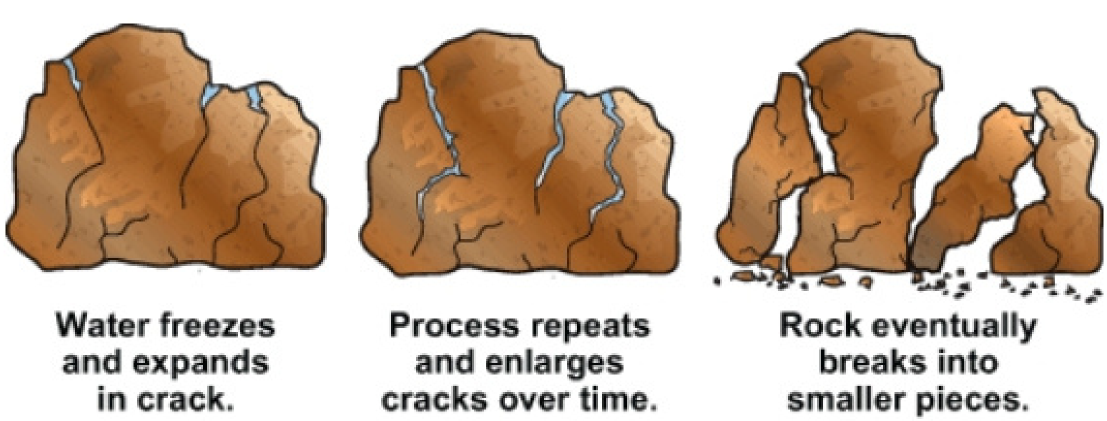
MS-ESS2-1 Reading and Open Ended

The Earth system is divided into the hydrosphere, biosphere, geosphere, and atmosphere. Each part interacts with, and depends on, the other parts. Energy from the sun and from deep within Earth continuously flows through the Earth system and drives processes that cause matter to change and cycle. There are different cycles in the Earth system, such as the carbon cycle, water cycle, and rock cycle. Each cycle involves observable changes in matter. For example, plants grow from seeds. Snow falls and later melts into a mountain stream. Volcanoes spew lava onto the surface that later cools into a rock.

The rock cycle involves processes that produce rock, sediment, and soil and processes that dissolve and melt rock. Imagine finding a rock in the park. Will it still be there in a million years? What processes might move or change it? Let's say a rainstorm washes your rock into a nearby creek. Over a very long time, the moving water causes your rock to collide with other rocks and break down into tiny pieces. The stream carries the pieces away, and they are deposited on a lake bottom as the stream flows into the lake. These pieces, called sediment, are buried with more sediment as the years go by. The lake dries up, and the sediment is cemented together to form a sedimentary rock.

Weathering is the process that breaks down or disintegrates rock. In the example, the stream caused weathering. Erosion is the transport of rocks and sediment and happened as the stream carried the sediment toward the lake. Deposition is when sediment is laid down. This happened as the sediment was dropped to the bottom of the lake.

Models of rock cycle processes can be very useful. For example, landslides involve the rapid erosion of rocks and soil along a hillside. Landslides can be dangerous if they happen near roads or buildings. Computer models that map information about precipitation patterns, rock and soil types, and the shape of the land surface can be used to predict where landslides are more likely to occur. This can help builders and construction workers plan more carefully. Weathering, erosion, and deposition are driven by energy from the sun, which also drives related processes in the water cycle. Water causes physical weathering in cold climates as it flows into cracks and spaces in rock and repeatedly freezes and thaws. As the diagram shows, this process causes rock to crumble into pieces over time.

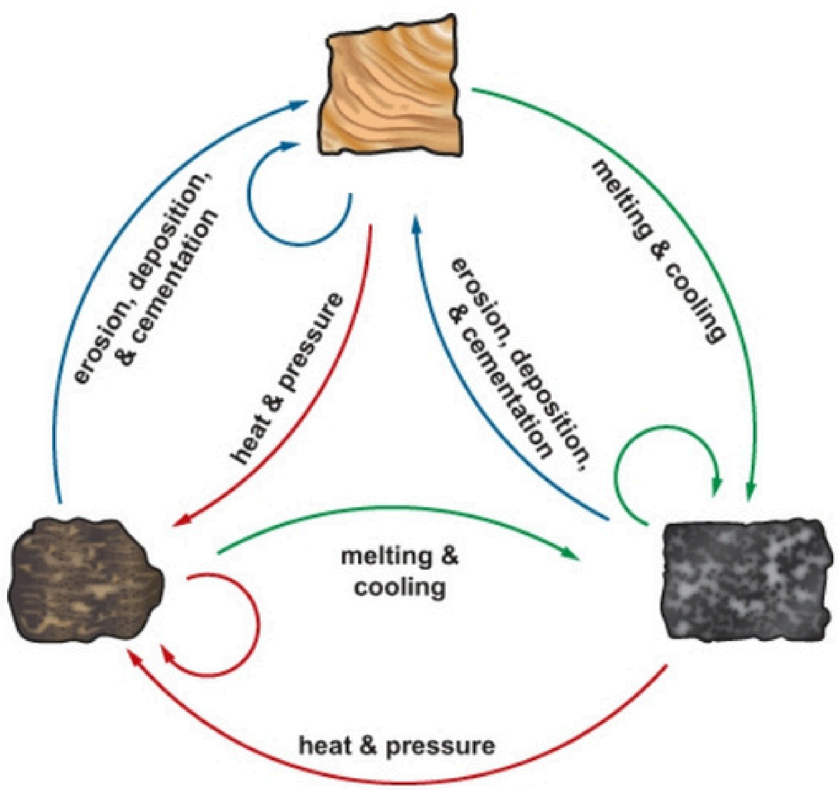


MS-ESS2-1 Reading and Questions

Chemical weathering happens when parts of a rock interact with water or air and undergo chemical changes. Limestone is a common sedimentary rock affected by chemical weathering. Where groundwater pools into the spaces in limestone, water dissolves the limestone to form features such as caves and sinkholes. Living things also cause weathering. For example, tree roots can grow in rocky areas and cause the rock to break down over time.

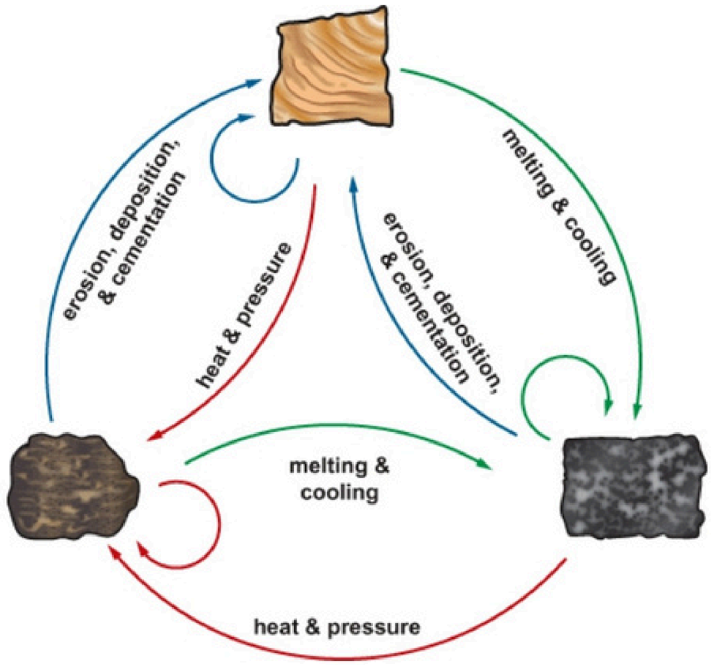
If weathering is constantly breaking rock down, why isn't Earth's surface covered in sediment? Rock cycle processes not only form sedimentary rock, but also igneous and metamorphic rocks. For example, extrusive igneous rocks form as lava cools. Limestone can change into a metamorphic rock called marble due to high underground temperature and pressure.

The rock cycle processes that heat and melt rock are driven by Earth's internal energy. This energy drives the movement of Earth's *tectonic plates*, which are large slabs of Earth's outer layer. The plates move so slowly we cannot feel their movement, but it is this movement that drives processes such as volcanic eruptions. Rock cycle models such as this one show the relationships between major rock types and the processes that change them.



MS-ESS2-1 Reading and Open Ended

The image shows the process and types of rock in the rock cycle.



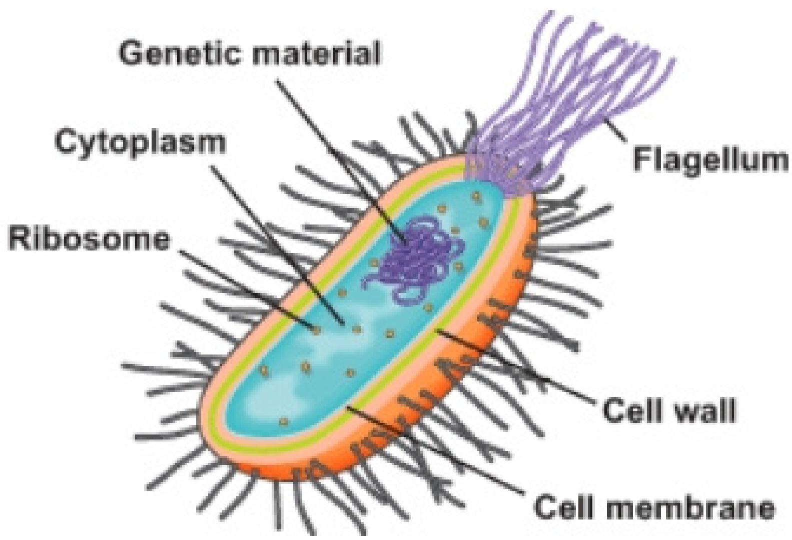
- **Label each rock type in the diagram above**
- **Describe two characteristics of each rock type.**
- **Using those characteristics for each rock type, explain the role of energy and cycling of matter in forming that type of rock.**

MS-LS1-2 Reading and Open Ended

All living things are made of one or more cells. Cells are the smallest subsystem of an organism. Some organisms, unicellular organisms, are made of only a single cell. Multicellular organisms are made up of many cells. In any organism, every cell is a system made of specialized structures that work together so the cell can function as a whole.

Although there are different types of cells, there are a few things that all cells have in common. The cell membrane surrounds and protects the cell. The cytoplasm is all the content inside the cell except the nucleus and supports the structures inside the cell. All cells contain genetic material, which has all of the information a cell needs to function. There are two categories into which all cells can be placed: prokaryotic cells and eukaryotic cells.

Prokaryotic cells are always unicellular organisms. Prokaryotic cells, like the one shown below, have a cell wall on the outside of the cell membrane. The cell wall provides structural support to the cell. The cell membrane controls what enters and exits the cell. Several structures are found in the cytoplasm of prokaryotic cells. Ribosomes make proteins that the cell uses to function. The genetic material has information that directs all cell functions. Some prokaryotic cells have hairlike flagella that help the cell move.



Multicellular organisms are made up of eukaryotic cells. The main difference between prokaryotic cells and eukaryotic cells is that eukaryotic cells have membrane-bound organelles, including a nucleus, mitochondria, and chloroplasts. Organelles carry out specific functions within the cell. As shown below, animal and plant cells have many organelles in common.

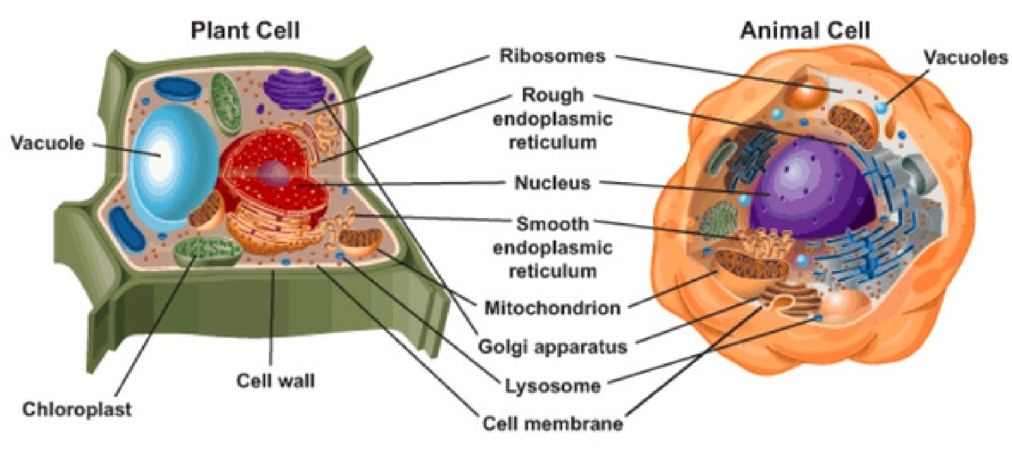
MS-LS1-2 Reading and Open Ended

Both cell types have a cell membrane, cytoplasm, and a nucleus. The nucleus, often called the control center of a cell, contains the cell's genetic material. Both cells also have mitochondria. Often called the powerhouses of cells, each mitochondrion changes the energy stored in food into a form of energy the cell can use. This is critical to the function of the cell as a whole. Without energy, a cell could not function. Some types of cells that use a lot of energy, such as nerve cells or muscle cells, have more mitochondria compared to cells that use less energy, such as skin cells. Both animal and plant cells have two types of endoplasmic reticulum (ER). Rough ER has ribosomes on its surface and is involved in making and processing proteins. Smooth ER does not have ribosomes. Smooth ER makes lipids that are used to make cell membranes and the membranes around organelles. The Golgi apparatus moves proteins from the ER to other parts of the cell where they are used. Lysosomes break down food and recycle important molecules for reuse in the cell. Vacuoles store wastes and other materials. Plants usually have one large vacuole that also provides structure for the cell. Animal cells have smaller vacuoles and more of them.

Some differences exist between plant and animal cells. Notice that the plant cell has a cell wall. The cell wall is rigid and helps support a plant structurally. Chloroplasts are also found in plant cells. Chloroplasts are organelles that capture the energy in sunlight. Through the process of photosynthesis, chloroplasts change light energy into chemical energy that can be used by the plant. Photosynthesis is how plants make their own food. The energy in the food is then broken down in mitochondria, the same way the energy in food is broken down in animal cells.

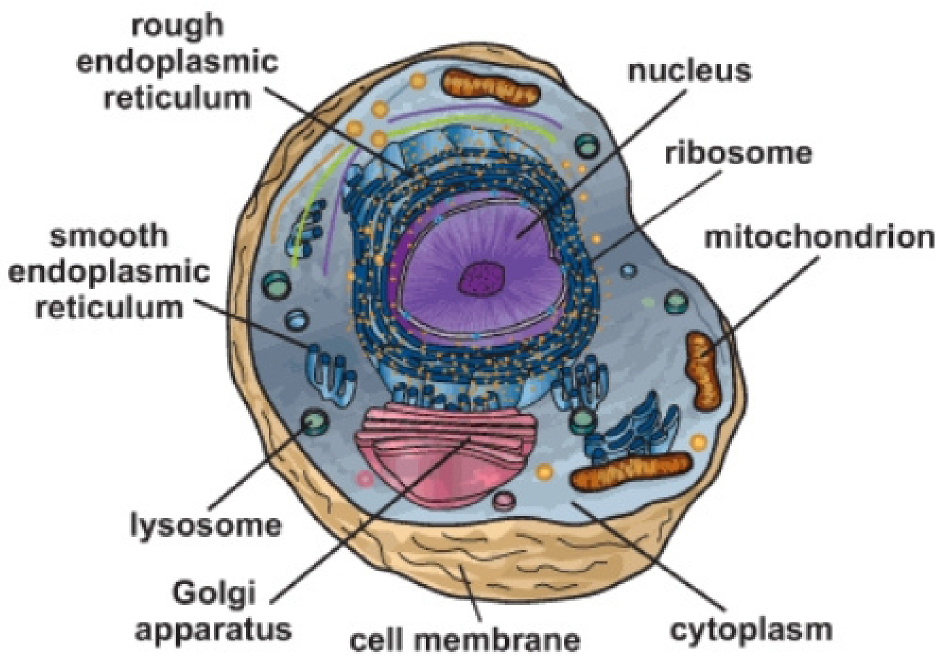
Most cells are microscopic. When scientists want to learn more about natural systems that are very small, very large, or very complicated, they make models to represent the system. What kind of models can be used to represent cells? The diagrams on these pages are examples of one type of model. These are two-dimensional models. Materials such as modelling clay, dried beans, buttons, pipe cleaners, and beads could be used to make a three-dimensional (3-D) model of a cell. Computer software can also make a 3-D model of a cell.

An analogy is another kind of model. In the case of a cell, analogies could be made between each organelle and its function. For example, the cell membrane could be security, controlling what enters and exits a cell. The mitochondria could be the engines of the cell, changing energy from one form to another so it can be used by the cell. The chloroplasts could be solar panels, capturing the energy in sunlight. The nucleus could be the command center, giving out instructions to all cell organelles.



MS-LS1-2 Reading and Open Ended

The model shows the structure of an animal cell and its organelles.



- **Explain the function of the cell membrane.**
- **Describe how the cell membrane allows organelles to carry out their function.**
- **Use the model to predict what could happen to the cell if the cell membrane broke apart.**