Accelerated BFSU Science Workbook

Semester 1

Based on Building Foundations of Scientific Understanding by Bernard J. Nebel, Ph.D.

Session 1A | Lesson A/B-1

Organizing Things into Categories

Read Aloud Passage

When scientists study the world, they sort things into groups called categories. A category is a group of two or more things that share something in common. For example, you could sort a pile of buttons, coins, and pencils by color, by size, or by what they are used for. There is no single right way to sort things. The way you sort depends on what you are trying to find out.

Sorting things into categories is not just something scientists do with objects. Our brains do it all the time. When you learn new information, your brain looks for ways to connect it to things you already know. Grouping ideas together helps you remember them better.

Categories can also be broken into smaller groups. Animals is a big category. Inside that category you could make a smaller group called birds. Inside birds you could make an even smaller group called birds that can swim. Scientists use this kind of layered sorting to organize all of nature.

The most important thing to remember is this: when you sort things into a category, every item in that group shares something with the others. That shared thing is what holds the category together.

Organizing Things into Categories

Activity 1

Listen to the passage again. Write three key words or phrases that tell the most important ideas.

1. _____

2. _____

3. _____

Activity 2

Because / But / So Complete each sentence three different ways.

Scientists sort things into categories because

_____

_____

Scientists sort things into categories but

_____

_____

Scientists sort things into categories so

_____

_____

Solids, Liquids, and Gases

Read Aloud Passage

Everything around us is matter, and all matter comes in one of three forms: solid, liquid, or gas. You can tell which one something is by watching how it behaves.

Solids hold their shape on their own. A rock, a book, and an apple are all solids. You do not need to put them in a container to keep their shape.

Liquids flow and take the shape of whatever container they are poured into. Water, juice, and honey are all liquids. If you pour water into a tall skinny cup, it becomes tall and skinny. Pour it into a wide bowl and it spreads out wide. The amount of liquid stays the same, but its shape changes.

Gases spread out and fill up whatever space they are in. Air is a gas. You cannot see most gases, but they are real. When you blow up a balloon, the air inside fills every corner of the balloon.

Some things can look like they are flowing, like a pile of sand, but sand is actually a solid. Each tiny grain holds its own shape.

Session 1B | Lesson A-2 Pt.1

Solids, Liquids, and Gases

Activity 1

Fill in the blank with the correct word from the word box.

Word Box: *solid* *liquid* *gas* *shape* *container*

1. A _____ holds its own shape without a container.

2. A _____ takes the shape of whatever it is poured into.

3. A _____ spreads out to fill any space.

4. Liquids flow and change their _____, but not their amount.

5. Air is a type of _____.

Activity 2

Each group of words is a fragment. Add what is missing to make a complete sentence.

1. *flows into any container*

_____

_____

2. *a solid like a rock*

_____

_____

Changes with Temperature and Matter

Read Aloud Passage

Matter can change from one form to another when the temperature changes. When something gets warm enough, it can change from a solid into a liquid. This is called melting. Ice is a solid. When ice gets warm enough, it melts into liquid water.

When something gets cold enough, a liquid can change into a solid. This is called freezing. Liquid water freezes into ice when the temperature drops low enough. Butter and chocolate can melt and freeze too.

When a liquid gets hot enough, it can turn into a gas. This is called evaporation. When water boils, it turns into a gas called water vapor and floats away into the air. You can see this as steam.

The word matter means anything that has weight and takes up space. Solids, liquids, and gases are all forms of matter. Heat and light are not matter. They have no weight and do not take up space.

Session 2A | Lesson A-2 Pts.2+3

Changes with Temperature and Matter

Activity 1

Write three key words from the passage that name what happens when matter changes with temperature.

1. _____

2. _____

3. _____

Activity 2

Fill in the blank with the correct word from the word box.

Word Box: *melting* *freezing* *evaporation* *matter* *weight*

1. When a solid gets warm enough and becomes a liquid, that is called _____.

2. When a liquid gets cold enough and becomes a solid, that is called _____.

3. When a liquid gets very hot and turns into a gas, that is called _____.

4. Anything that has weight and takes up space is called _____.

5. Heat and light are not matter because they have no _____.

Gravity I: The Earth's Gravity

Read Aloud Passage

Gravity is a pulling force. It pulls things toward each other. The Earth is very large, and its gravity pulls everything toward the center of the Earth. That is why when you drop something, it falls down. It is being pulled toward the Earth.

Gravity gives things their weight. Weight is the measure of how hard gravity is pulling on something. A heavy rock has more weight than a feather because gravity is pulling harder on the rock.

Gravity works the same way on every side of the Earth. People who live in Australia are on the other side of the globe from us, but they do not fall off. Gravity pulls them toward the center of the Earth too, just from a different direction. Down always means toward the center of the Earth, no matter where you are standing.

Everything on Earth is affected by gravity, from tiny pebbles to huge boulders. Gravity also holds the air around our planet so it does not float away into space.

Gravity I: The Earth's Gravity

Activity 1

Because / But / So Complete each sentence three different ways.

Gravity pulls things toward the Earth because

_____

_____

Gravity pulls things toward the Earth but

_____

_____

Gravity pulls things toward the Earth so

_____

_____

Activity 2

Circle True or False for each statement.

1. **True / False** Gravity pulls things toward the center of the Earth.
2. **True / False** People in Australia fall off the Earth because they are upside down.
3. **True / False** Weight is the measure of how hard gravity pulls on something.
4. **True / False** Gravity holds the air around our planet.

Horizontal, Vertical, and Orbits

Read Aloud Passage

Two very important directions in science are vertical and horizontal. Vertical means straight up and down, in the exact direction that gravity pulls. If you tie a weight to a string and let it hang, the string points in a perfectly vertical direction. Scientists call this a plumb bob.

Horizontal means perfectly flat and level, going across rather than up or down. A flat table is horizontal. A carpenter's level is a tool that shows whether something is truly horizontal.

Vertical and horizontal are always defined by gravity. No matter where you are on Earth, vertical always points toward the center of the Earth, and horizontal is always perpendicular to that.

The Moon travels around the Earth in a path called an orbit. The Moon stays in orbit because gravity keeps pulling it toward the Earth. At the same time, the Moon is moving sideways fast enough that it keeps missing the Earth. The pull of gravity and the sideways movement balance each other out, keeping the Moon going around and around. Satellites work the same way.

Session 3A | Lesson D-1 Pts.2+3

Horizontal, Vertical, and Orbits

Activity 1

Fill in the blank with the correct word from the word box.

Word Box: *vertical* *horizontal* *gravity* *orbit* *plumb bob*

1. _____ means straight up and down in the direction gravity pulls.

2. _____ means perfectly flat and level.

3. A _____ is a weight on a string that shows a perfectly vertical line.

4. The Moon travels around the Earth in a path called an _____.

5. The Moon stays in orbit because _____ pulls it toward the Earth.

Activity 2

Turn each fragment into a complete sentence.

1. *always points toward the center of the Earth*

_____

_____

2. *keeps the Moon in orbit around the Earth*

_____

_____

Concepts of Energy I: Making Things Go

Read Aloud Passage

Energy is what makes things go, move, change, or happen. Without energy, nothing would ever move or change. There are different forms of energy, but they all share one thing in common: they can make something happen.

Heat energy can make things go. When you cook food on a stove, heat energy is what changes the food. Electrical energy can make things go too. It powers lights, fans, and computers. Light energy travels from the sun and helps plants grow. Movement energy, also called kinetic energy, is the energy that moving things have.

One of the most important rules in science is that energy cannot be created and it cannot be destroyed. Energy can only change from one form into another. When you turn on a lamp, electrical energy changes into light energy and heat energy. When you ride a bike, the energy stored in your food changes into the energy of movement.

Everything that happens around us, from a ball rolling to a fire burning, involves energy changing from one form to another.

Session 3B | Lesson C-1 Pt.1

Concepts of Energy I: Making Things Go

Activity 1

Because / But / So Complete each sentence three different ways.

Energy cannot be created or destroyed because

_____

_____

Energy cannot be created or destroyed but

_____

_____

Energy cannot be created or destroyed so

_____

_____

Activity 2

Circle True or False for each statement.

1. True / False Energy makes things move, change, and happen.

2. True / False Energy can be created if you have enough heat.

3. True / False Electrical, heat, light, and movement are all forms of energy.

4. True / False When a lamp turns on, electrical energy changes into light and heat energy.

Energy Transforms and Travels

Read Aloud Passage

Energy is always on the move. It changes from one form to another, and scientists call this an energy transformation. A simple example is a wind-up toy. When you wind it up, you are storing energy in a coiled spring. When you let it go, that stored energy changes into movement energy and the toy moves.

Energy can also travel from one place to another. Light energy travels from the sun all the way to the Earth. Heat energy can travel through objects, like a metal spoon getting hot in a warm bowl of soup. Sound energy travels through the air from a speaker to your ears.

Some sources of energy can be used over and over again. The sun keeps shining. Wind keeps blowing. Moving water keeps flowing. These are called renewable energy sources. Other sources of energy, like coal and oil, took millions of years to form inside the Earth. Once we use them up, they are gone. These are called nonrenewable energy sources.

Session 4A | Lesson C-1 Pts.2+3

Energy Transforms and Travels

Activity 1

Fill in the blank with the correct word from the word box.

Word Box: *renewable* *nonrenewable* *transformation* *stored* *travels*

1. When energy changes from one form to another, it is called an energy _____.

2. A wound-up spring has _____ energy ready to be released.

3. Light energy _____ from the sun to the Earth.

4. The sun and wind are examples of _____ energy sources.

5. Coal and oil are _____ because once they are used, they are gone.

Activity 2

Put the words in the correct order to make a complete sentence.

1. energy / forms / changes / one / from / to / another

_____

_____

2. sources / renewable / used / be / over / can / again / and / over

_____

_____

Session 4B | Lesson A-3

Air Is a Substance and the Atmosphere

Read Aloud Passage

Air is a real thing. Even though you cannot see it, air takes up space and has weight. Scientists say that air is a substance, which means it is made of real matter.

You can prove that air takes up space. If you push an upside-down cup straight down into a bowl of water without tilting it, the inside of the cup stays dry. That is because the air trapped inside is keeping the water out.

Air also has weight. If you take two identical balloons and blow one up bigger than the other, the fuller balloon will be heavier. The extra air inside adds weight.

Earth is surrounded by a thick blanket of air called the atmosphere. The atmosphere stretches many miles above the surface of the Earth and is held close by gravity. Without gravity, the air would drift away into space. When astronauts travel into space, they must bring their own air supply because there is no atmosphere in space.

Session 4B | Lesson A-3

Air Is a Substance and the Atmosphere

Activity 1

Write three key words from the passage that help explain what air is.

1. _____

2. _____

3. _____

Activity 2

Because / But / So Complete each sentence three different ways.

Air takes up space and has weight because

_____

_____

Air takes up space and has weight but

_____

_____

Air takes up space and has weight so

_____

_____

Living, Natural, and Human-Made Things

Read Aloud Passage

Everything in our world can be placed into one of three groups. The first group is living things, which scientists also call biological things. The second group is natural nonliving things, which are things that come from the Earth but are not alive. The third group is human-made things, which are things that people have built or created.

Living things grow, reproduce, need food or energy, and respond to the world around them. Dogs, trees, mushrooms, and people are all living things. Rocks, water, air, and soil are natural nonliving things. They come from the Earth, but they do not grow or reproduce on their own.

Some things can be tricky to sort. A dead leaf was once living. A wooden table is made from a natural material, but a person built it, so it belongs in the human-made group. A bird's nest is made from natural materials by an animal, not a human, so it belongs in the natural category.

Asking good questions helps us sort things correctly. Is it alive? Did a person make it? Did it come from the Earth on its own?

Session 5A | Lesson B-2 Pt.1

Living, Natural, and Human-Made Things

Activity 1

Write three key words from the passage that name the three groups things can be sorted into.

1. _____

2. _____

3. _____

Activity 2

Turn each fragment into a complete sentence.

1. *grows, reproduces, and needs food or energy*

_____

_____

2. *made by people from natural materials*

_____

_____

Session 5B | Lesson B-2 Pts.2+3

What Makes Something Living? Technology vs. Nature

Read Aloud Passage

Scientists use a checklist to decide whether something is truly living. To be alive, something must grow and develop, reproduce, respond to things around it, and need energy or food to survive. Something must meet all of these criteria, not just one or two.

Some things can trick us. Fire grows bigger and seems to move, but fire cannot reproduce and does not need food the way living things do. Crystals can grow, but they do not reproduce or respond to their surroundings.

All human-made things start as something from the Earth. Plastic comes from oil. Glass comes from sand. Metal comes from rocks called ores. Paper comes from wood. Machines need energy from outside themselves to work, like gasoline or electricity. Living things are different. They generate their own energy by eating food.

Animals also build things, but those things are natural, not human-made. A bird builds a nest from sticks. A beaver builds a dam from wood and mud. These were not made by people, so we call them natural.

Session 5B | Lesson B-2 Pts.2+3

What Makes Something Living? Technology vs. Nature

Activity 1

One detail below does NOT belong in a paragraph about what makes something living. Circle it and explain why it does not belong.

A. Living things must grow, reproduce, respond to surroundings, and need energy.

B. Fire is not alive because it cannot reproduce.

C. Solids hold their shape because their particles are packed tightly together.

D. Something must meet all the criteria, not just one or two, to be truly alive.

Why does it not belong?

_____

_____

Activity 2

Because / But / So Complete each sentence three different ways.

All human-made things start as natural materials from the Earth because

_____

_____

All human-made things start as natural materials from the Earth but

_____

_____

All human-made things start as natural materials from the Earth so

_____

_____

Matter I: All Matter Is Made of Particles

Read Aloud Passage

Here is an amazing fact about everything around you: all matter is made of incredibly tiny particles. These particles are so small that you cannot see them, even with most microscopes. But scientists know they are there because of the clues matter leaves behind.

When you spray water into the air, it breaks into tiny droplets. When you file a piece of wood, tiny bits fall off. When you dissolve salt in water, the salt seems to disappear, but it is still there as particles too small to see. All of these things give us evidence that matter is made of very small pieces.

These particles are always moving. In solids, the particles are packed tightly together and vibrate in place. In liquids, the particles are still close together but can move past each other, which is why liquids flow. In gases, the particles move very fast and spread out in all directions, which is why gases fill up any space.

The idea that all matter is made of tiny moving particles helps explain almost everything we see matter do.

Session 6A | Lesson A-4 Pt.1

Matter I: All Matter Is Made of Particles

Activity 1

Because / But / So Complete each sentence three different ways.

All matter is made of tiny particles because

_____

_____

All matter is made of tiny particles but

_____

_____

All matter is made of tiny particles so

_____

_____

Activity 2

Fill in the blank with the correct word from the word box.

Word Box: *particles* *vibrate* *flow* *spread* *evidence*

1. All matter is made of tiny _____ that are too small to see.

2. In solids, particles are packed tightly and _____ in place.

3. In liquids, particles can move past each other, which is why liquids _____.

4. In gases, particles move fast and _____ out to fill any space.

5. When salt disappears in water, it gives us _____ that matter is made of tiny pieces.

Particles and Changes in Matter

Read Aloud Passage

Now that we know all matter is made of tiny particles, we can use that idea to explain why solids, liquids, and gases behave so differently. In a solid, the particles are packed very close together and held tightly in place. They vibrate a little, but they do not move past each other. This is why a solid keeps its shape.

In a liquid, the particles can slide past each other and move around freely. This is why a liquid flows and takes the shape of its container. In a gas, the particles move very fast and spread far apart. This is why gases spread out to fill any container they are in.

Matter can also change in two very different ways. Some changes are reversible, which means you can undo them and go back to the way things were. Melting and freezing are reversible changes. Water can freeze into ice, and ice can melt back into water.

Other changes are nonreversible, which means you cannot undo them. Burning is not reversible. When wood burns, it turns into ash, smoke, and gases, and you cannot get the original wood back. Scientists call reversible changes physical changes and nonreversible changes chemical changes.

Session 6B | Lesson A-4 Pts.2+3

Particles and Changes in Matter

Activity 1

Write three key words from the passage that describe how particles behave in different states of matter.

1. _____

2. _____

3. _____

Activity 2

Circle True or False for each statement.

1. True / False In solids, particles are packed tightly and barely move.

2. True / False In gases, particles move slowly and stay close together.

3. True / False Melting and freezing are reversible changes.

4. True / False Burning wood is a reversible change because you can put the wood back together.

Sound and Vibrations

Read Aloud Passage

All sound is caused by vibrations. A vibration is a rapid back-and-forth movement. When an object vibrates, it makes the air around it vibrate too, and those vibrations travel through the air to your ears. Without vibrations, there would be no sound.

The pitch of a sound tells us how high or low the sound is. Pitch depends on how fast something vibrates. When something vibrates very fast, it makes a high-pitched sound. When something vibrates slowly, it makes a low-pitched sound. You can see this with a rubber band. A tight rubber band vibrates fast and makes a higher pitch. A loose rubber band vibrates slowly and makes a lower pitch.

The loudness of a sound depends on how big the vibration is. A bigger, wider vibration makes a louder sound. A small, gentle vibration makes a soft, quiet sound.

You can feel vibrations too. If you place your fingertips lightly on your throat while you hum, you can feel the vibrations of your vocal cords. The vibrations of your vocal cords are what create your voice.

Session 7A | Lesson C-2 Pt.1

Sound and Vibrations

Activity 1

Fill in the blank with the correct word from the word box.

Word Box: *vibrations* *pitch* *loudness* *fast* *slow*

1. All sound is caused by _____.

2. The _____ of a sound tells us how high or low it is.

3. When something vibrates very _____, it makes a high-pitched sound.

4. When something vibrates _____, it makes a low-pitched sound.

5. The _____ of a sound depends on how big the vibration is.

Activity 2

Because / But / So Complete each sentence three different ways.

Sound is caused by vibrations because

_____

_____

Sound is caused by vibrations but

_____

_____

Sound is caused by vibrations so

_____

_____

How Sound Travels

Read Aloud Passage

Sound travels by passing vibrations from one particle to the next. When something vibrates in the air, it bumps into the air particles next to it. Those particles bump into the next ones, and the vibration travels along like a chain. This is how sound moves through the air from one place to another.

Sound can travel through air, water, and solids. It actually travels faster through liquids and solids than through air. That is because the particles in liquids and solids are packed closer together and can pass vibrations along more quickly. If you press your ear against a table and someone taps the other end, you will hear it more clearly through the table than through the air.

When sound reaches your ear, it causes a thin membrane inside called the eardrum to vibrate. Those vibrations are then converted into signals that travel to your brain, and your brain interprets them as sound.

Sound needs matter to travel through. In the empty vacuum of outer space, there is no matter, which means there is nothing to pass the vibrations along. This is why outer space is completely silent.

Session 7B | Lesson C-2 Pt.2

How Sound Travels

Activity 1

Write three key words from the passage that explain how sound travels.

1. _____

2. _____

3. _____

Activity 2

One detail below does NOT belong in a paragraph about how sound travels. Circle it and explain why it does not belong.

A. Sound travels by passing vibrations from one particle to the next.

B. Sound travels faster through solids and liquids than through air.

C. Gravity holds the atmosphere close to the surface of the Earth.

D. Sound cannot travel through the vacuum of outer space because there is no matter there.

Why does it not belong?

_____

_____

Kinetic and Potential Energy

Read Aloud Passage

There are two important types of energy that scientists talk about. The first is kinetic energy, which is the energy of motion. Any object that is moving has kinetic energy. A rolling ball, a flying bird, and a rushing river all have kinetic energy. The faster something moves, and the more mass it has, the more kinetic energy it has.

The second type is potential energy, which is stored energy that is ready to be released. A ball sitting at the top of a ramp has potential energy because gravity can pull it down. A stretched rubber band has potential energy because it can spring back. A coiled spring has potential energy. A battery that is fully charged has potential energy stored as chemical energy.

These two types of energy are always changing back and forth. When you hold a ball at the top of a ramp, it has potential energy. When you let it roll, that potential energy changes into kinetic energy. At the bottom of the ramp, it has the most kinetic energy.

Energy also flows through living things. Plants take in sunlight energy and store it. Animals eat the plants and use that stored energy to move and grow. This is how energy flows from the sun to all living things.

Kinetic and Potential Energy

Activity 1

Because / But / So Complete each sentence three different ways.

A ball at the top of a ramp has potential energy because

_____

_____

A ball at the top of a ramp has potential energy but

_____

_____

A ball at the top of a ramp has potential energy so

_____

_____

Activity 2

Fill in the blank with the correct word from the word box.

Word Box: *kinetic* *potential* *motion* *stored* *releases*

1. Kinetic energy is the energy of _____.

2. Potential energy is _____ energy that is ready to be used.

3. A moving ball has _____ energy.

4. A stretched rubber band has _____ energy.

5. When a rubber band snaps, it _____ its stored energy as movement.

The Plant and Animal Kingdoms

Read Aloud Passage

Plants and animals are both living things, but they get their energy in very different ways. Plants make their own food using sunlight, water, and a gas from the air called carbon dioxide. This process is called photosynthesis. Plants do not need to move around to find food because they can make it right where they are.

Animals cannot make their own food. They must eat other organisms to get the energy they need. Some animals eat plants. These are called herbivores. Some animals eat other animals. These are called carnivores. Some animals eat both plants and animals. These are called omnivores.

There are some tricky cases. Fungi, like mushrooms, look like plants because they do not move around, but they cannot make their own food. They get their energy by breaking down dead matter. Coral looks like a plant but is actually an animal.

The most important difference to remember is this: plants make their own food through photosynthesis, and animals must consume food to get their energy. All animals are ultimately dependent on plants, because even animals that eat other animals are eating animals that ate plants.

Session 8B | Lesson B-3

The Plant and Animal Kingdoms

Activity 1

Write three key words from the passage that explain the difference between plants and animals.

1. _____

2. _____

3. _____

Activity 2

Circle True or False for each statement.

1. True / False Plants make their own food using sunlight, water, and carbon dioxide.

2. True / False Animals can make their own food through photosynthesis.

3. True / False Herbivores are animals that eat only plants.

4. True / False Mushrooms are animals because they cannot make their own food.

Distinguishing Materials

Read Aloud Passage

Everything around us is made of some kind of material. Scientists and engineers pay close attention to what things are made of because different materials behave in different ways. The main categories of materials that human-made things are built from are wood, metal, plastic, glass, rubber, and clay or ceramics.

Different materials have different properties. A property is a characteristic of a material that you can observe or measure. Metals are usually hard, shiny, and good at conducting heat and electricity. Wood is strong but can be cut and shaped, and it does not conduct electricity well. Plastic is flexible and waterproof. Glass is transparent, which means you can see through it.

Some metals are magnetic. Iron and steel are magnetic, which means a magnet will attract them. Most other metals, like aluminum, copper, and gold, are not magnetic. A magnet will not attract them.

The properties of a material determine what it is best used for. Metal is used for cooking pots because it conducts heat. Rubber is used for tires because it is flexible and grippy. Glass is used for windows because you can see through it. Matching the right material to the right job is an important part of science and engineering.

Session 9A | Lesson A-5

Distinguishing Materials

Activity 1

Fill in the blank with the correct word from the word box.

Word Box: *properties* *metal* *magnetic* *transparent* *flexible*

1. The characteristics of a material that you can observe are called its _____.

2. _____ is usually hard, shiny, and conducts heat and electricity.

3. Glass is _____, which means you can see through it.

4. Rubber is _____, which makes it useful for tires.

5. Iron is _____, which means a magnet will attract it.

Activity 2

Because / But / So Complete each sentence three different ways.

Different materials have different properties because

_____

_____

Different materials have different properties but

_____

_____

Different materials have different properties so

_____

_____

Session 9B | Lesson B-4 Pt.1

Life Cycles

Read Aloud Passage

Every living organism goes through a life cycle. A life cycle is the sequence of stages that a living thing goes through from birth to death. All life cycles include being born or hatched or sprouting, growing and developing, reproducing, and eventually dying. Reproduction ensures that a species continues even as individual organisms die.

The life cycle of a human starts as a baby. The baby grows into a child, the child grows into an adult, and the adult can have children of their own. Then the cycle continues with the next generation.

Other animals have similar life cycles, though the stages may look different. A puppy grows into a dog. A chick hatches from an egg and grows into a chicken. All of these are life cycles with the same basic steps: birth, growth, reproduction, and death.

Plants have life cycles too. A seed sprouts and grows into a plant. The plant produces flowers, which make seeds. Those seeds fall to the ground and grow into new plants. The cycle begins again.

Session 9B | Lesson B-4 Pt.1

Life Cycles

Activity 1

Write three key words from the passage that describe the stages of a life cycle.

1. _____

2. _____

3. _____

Activity 2

Turn each fragment into a complete sentence.

1. *grows from a seed into a full plant*

_____

_____

2. *the stages of every living organism's life cycle*

_____

_____

Session 10A | Lesson B-4 Pts.2+3

Metamorphosis and Variation

Read Aloud Passage

Some animals go through a dramatic change in their body during their life cycle. This is called metamorphosis. Butterflies and moths go through four stages: egg, larva, pupa, and adult. The larva, which is a caterpillar, looks completely different from the adult butterfly. Inside the pupa, the body completely reorganizes itself into the adult form.

Frogs also go through metamorphosis. A frog starts as an egg, hatches into a tadpole that breathes through gills and swims like a fish, and then gradually grows legs and loses its tail as it develops into an adult frog that breathes air.

Within any group of animals, every individual is a little different from the others. No two frogs, butterflies, dogs, or people look exactly alike. These differences are called variations. Offspring look similar to their parents, but they are not identical. Variation within a species means that some individuals will be better suited to their environment than others.

Variation is very important in nature. It is the reason why some animals survive better than others, which over many generations can lead to changes within a species.

Session 10A | Lesson B-4 Pts.2+3

Metamorphosis and Variation

Activity 1

Fill in the blank with the correct word from the word box.

Word Box: *metamorphosis* *larva* *pupa* *variation* *offspring*

1. A dramatic change in an animal's body during its life cycle is called _____.

2. The caterpillar stage of a butterfly's life cycle is called the _____.

3. Inside the _____, the caterpillar's body reorganizes into an adult butterfly.

4. Differences among individuals of the same species are called _____.

5. _____ look similar to their parents but are not identical to them.

Activity 2

Because / But / So Complete each sentence three different ways.

No two animals in a species look exactly alike because

_____

_____

No two animals in a species look exactly alike but

_____

_____

No two animals in a species look exactly alike so

_____

_____

Energy and Force

Read Aloud Passage

A force is any push or pull. When you push a door open, that is a force. When gravity pulls a ball to the ground, that is a force. When you pull a wagon, that is a force. Forces can be measured using a tool called a spring scale. Scientists measure force in units called newtons.

When all the forces acting on an object are equal and balanced, the object does not move or change its movement. When forces are unbalanced, the object will start to move, stop, or change direction. The stronger the unbalanced force, the greater the change in motion.

Force and energy are closely connected. Doing work means using a force to move something over a distance. The more force you use and the farther you move something, the more energy you use. Simple machines like levers, ramps, and pulleys help us apply forces more easily. They change the direction or size of a force so that we can do work with less effort.

Gravity, friction, and muscular effort are all examples of forces we experience every day. Understanding forces helps engineers design buildings, bridges, and machines that can handle all the forces acting on them.

Energy and Force

Activity 1

Write three key words from the passage that are most important to understand force.

1. _____

2. _____

3. _____

Activity 2

Circle True or False for each statement.

1. **True / False** A force is any push or pull.

2. **True / False** When forces are balanced, an object will speed up.

3. **True / False** Force is measured in units called newtons.

4. **True / False** Simple machines make it easier to apply forces to do work.

Session 11A | Lesson B-5

Adaptations, Food Chains, and Energy Flow

Read Aloud Passage

An adaptation is any feature that helps a living thing survive and reproduce in its environment. Adaptations can be physical features, like the sharp claws of a hawk, or behavioral, like a bear hibernating in winter. Animals that eat plants, called herbivores, often have flat grinding teeth for chewing tough plant material. Animals that eat other animals, called carnivores, often have sharp pointed teeth for tearing meat.

Energy flows through living things in a pattern called a food chain. A food chain starts with plants, which are called producers because they make their own food. Plants are eaten by herbivores, which are called primary consumers. Herbivores are eaten by carnivores, which are called secondary consumers.

At each step in a food chain, most of the energy is lost as heat. Only about one tenth of the energy passes on to the next level. This is why there are always far more plants than herbivores, and far more herbivores than carnivores.

If any part of a food chain is removed or disrupted, the whole chain is affected. If all the rabbits in an ecosystem disappeared, the foxes that depend on them would struggle to find enough food.

Session 11A | Lesson B-5

Adaptations, Food Chains, and Energy Flow

Activity 1

Fill in the blank with the correct word from the word box.

Word Box: *adaptation* *herbivore* *carnivore* *producer* *food chain*

1. Any feature that helps a living thing survive in its environment is an _____.

2. An animal that eats only plants is called an _____.

3. An animal that eats other animals is called a _____.

4. Plants are called _____ because they make their own food.

5. Energy flows through living things in a pattern called a _____.

Activity 2

Because / But / So Complete each sentence three different ways.

Plants are the beginning of almost every food chain because

_____

_____

Plants are the beginning of almost every food chain but

_____

_____

Plants are the beginning of almost every food chain so

_____

_____

Reading and Drawing Maps

Read Aloud Passage

A map is a bird's-eye view of an area drawn to scale. Scale means that everything on the map is made smaller by the same amount. If one inch on the map equals one mile in real life, that is the scale. Using scale, you can use a map to figure out real distances.

Making a map requires deciding what to include, choosing a scale, and keeping everything proportional. You can make a map of something small, like a classroom or a schoolyard, or something large, like a city or a country. The same rules apply no matter the size.

Reading a map requires understanding a few important things. A compass rose shows which direction is north, south, east, and west on the map. A legend or key explains what the symbols on the map mean. Contour lines on some maps show elevation, which is how high or low the land is.

All standard maps are oriented with north at the top. This makes it easy to match a map with a compass. When you combine a map with a compass, you can navigate, which means you can figure out where you are and how to get where you are going.

Session 11B | Lesson D-3

Reading and Drawing Maps

Activity 1

Write three key words from the passage that are important for reading or making a map.

1. _____

2. _____

3. _____

Activity 2

Turn each fragment into a complete sentence.

1. *oriented with north at the top*

_____

_____

2. *the scale of the map and real distances*

_____

_____

Distinguishing Matter from Energy

Read Aloud Passage

Two words cover everything in the universe: matter and energy. Matter is anything that has weight and takes up space. Rocks, water, air, and your body are all matter. Energy is what makes matter move and change, but energy itself does not have weight and does not take up space.

Heat is a form of energy, not matter. Even though you can feel heat, it has no weight and takes up no space. Light is a form of energy too. Light has no weight and does not occupy space. Sound is energy that travels through matter, but sound itself is not matter.

This can be tricky. Fire looks like matter because it flickers and moves, but fire is actually energy being released. Fire is heat and light energy produced when a fuel burns. The smoke and ash from fire are matter, but the fire itself is not.

Understanding the difference between matter and energy helps us make sense of many things. A battery stores chemical energy, not matter. The electricity that flows through a wire is energy moving through matter. The two concepts, matter and energy, work together to explain everything we observe.

Distinguishing Matter from Energy

Activity 1

Because / But / So Complete each sentence three different ways.

Energy does not have weight and does not take up space because

_____

_____

Energy does not have weight and does not take up space but

_____

_____

Energy does not have weight and does not take up space so

_____

_____

Activity 2

Circle True or False for each statement.

1. **True / False** Matter is anything that has weight and takes up space.
2. **True / False** Heat is a form of matter because you can feel it.
3. **True / False** Fire is energy, not matter.
4. **True / False** Light has weight and takes up space.

Session 12B | Lesson B-4A

Identifying Living Things and Their Habitats

Read Aloud Passage

Every region on Earth has its own community of plants and animals. Scientists use tools called field guides to identify the living things around them. A field guide is a book with descriptions and pictures of local plants and animals that helps you figure out exactly what you are looking at.

Learning to identify organisms by name is an important part of science. When you know the name of something, you can find out more about it. You can learn where it lives, what it eats, how it reproduces, and how it connects to other living things.

Every animal lives in a habitat, which is the specific place that provides everything it needs: food, water, shelter, and space. A rabbit's habitat is open fields and meadows. A fish's habitat is water. A woodpecker's habitat is a forest with trees. If the habitat changes or is destroyed, the animals living there cannot survive.

Plants are also adapted to specific environments. A cactus is suited to dry desert conditions. A water lily grows in ponds and lakes. A fern grows in shady, damp forest floors. Each plant grows in the conditions that match what it needs.

Session 12B | Lesson B-4A

Identifying Living Things and Their Habitats

Activity 1

Fill in the blank with the correct word from the word box.

Word Box: *habitat* *field guide* *identify* *shelter* *adapted*

1. A _____ is a book with descriptions and pictures that helps you name local organisms.

2. Scientists use field guides to _____ the living things around them.

3. A _____ is the specific place that provides everything an animal needs to survive.

4. A habitat must provide food, water, _____, and space.

5. A cactus is _____ to dry desert conditions.

Activity 2

Write three key words from the passage that are important for understanding habitats.

1. _____

2. _____

3. _____

Air Pressure

Read Aloud Passage

Even though air seems like nothing, it pushes on everything around it. This pushing force is called air pressure. Air pressure happens because the tiny particles that make up air are always moving around and bumping into surfaces. Billions of these tiny bumps every second add up to a real and powerful force.

You can prove that air pressure is real. If you push a pump into a tire or basketball and pump in more air, you can feel more and more resistance. That is because you are adding more air particles into the same space, and those particles push outward harder and harder.

Air can be compressed, which means it can be squeezed into a smaller space. When you compress air, the particles are pushed closer together, and the pressure they create is greater. This is how tires, basketballs, and bicycle tubes are inflated.

Air pressure acts in all directions at once, pushing up, down, and sideways equally. When the pressure inside and outside an object is equal, everything stays balanced. When the pressure is unequal, interesting things happen, which we will explore in the next lesson.

Air Pressure

Activity 1

Write three key words from the passage that explain what air pressure is.

1. _____

2. _____

3. _____

Activity 2

Because / But / So Complete each sentence three different ways.

Air pressure acts in all directions at once because

_____

_____

Air pressure acts in all directions at once but

_____

_____

Air pressure acts in all directions at once so

_____

_____

Air Pressure, Vacuums, and Wind

Read Aloud Passage

Air pressure acts in all directions. When air pressure is equal inside and outside an object, everything stays balanced. But when the inside pressure is greater than the outside, the object pushes outward. When the inside pressure is less than the outside, the outside air pushes inward and can crush the object.

A vacuum is a space with no air and no matter in it. A vacuum has zero air pressure. When you create a partial vacuum, meaning a space with less air than normal, the air pressure around it is greater and pushes inward. This pushing is what we call suction. A vacuum cleaner works by creating a partial vacuum at its nozzle, and the higher pressure in the room pushes dirt toward it.

The atmosphere gets thinner as you go higher. Near the ground, there is a lot of air above pushing down, which creates high pressure. High up in the mountains, there is less air above, so the pressure is lower.

Differences in air pressure also create wind. Air moves from areas of high pressure to areas of low pressure. This movement of air is wind. Weather forecasters use pressure measurements to help predict whether rain or sunshine is coming.

Session 13B | Lesson A-6 Pts.2-4

Air Pressure, Vacuums, and Wind

Activity 1

Fill in the blank with the correct word from the word box.

Word Box: *vacuum* *suction* *pressure* *wind* *atmosphere*

1. A _____ is a space with no air and no matter in it.

2. When a partial vacuum is created, the surrounding air pressure creates a pulling force called _____.

3. The _____ gets thinner as you go higher above the Earth.

4. Air moves from high _____ areas to low pressure areas.

5. The movement of air from high pressure to low pressure is called _____.

Activity 2

Put the words in the correct order to make a complete sentence.

1. pressure / air / directions / all / in / acts

_____

_____

2. areas / wind / pressure / high / from / moves / to / low

_____

_____

Day and Night and the Earth's Rotation

Read Aloud Passage

The Earth spins on its axis once every 24 hours. This spinning is called rotation. As the Earth rotates, one side faces toward the sun and has daytime, while the other side faces away from the sun and has nighttime. The pattern of day and night that we experience every day is caused by this rotation.

The sun does not actually move across the sky. It only appears to rise in the east and set in the west because the Earth is spinning. As the Earth rotates eastward, the sun appears to move westward across our sky.

The Earth's axis is tilted at an angle of about 23.5 degrees. This tilt is part of what causes the seasons. When the northern part of the Earth is tilted toward the sun, that part gets more direct sunlight and experiences summer. When it is tilted away, it gets less direct sunlight and experiences winter.

Different places on Earth experience different lengths of day and night depending on their location and the time of year. Near the poles, summer days can have sunlight for almost 24 hours, while winter days can be almost entirely dark.

Session 14A | Lesson D-2

Day and Night and the Earth's Rotation

Activity 1

Because / But / So Complete each sentence three different ways.

The Earth rotates on its axis once every 24 hours because

_____

_____

The Earth rotates on its axis once every 24 hours but

_____

_____

The Earth rotates on its axis once every 24 hours so

_____

_____

Activity 2

Circle True or False for each statement.

1. **True / False** Day and night are caused by the Earth's rotation.
2. **True / False** The sun actually moves across the sky from east to west.
3. **True / False** The Earth's axis is tilted at about 23.5 degrees.
4. **True / False** The tilt of the Earth's axis is part of what causes the seasons.

North, East, South, and West

Read Aloud Passage

North, south, east, and west are the four main compass directions. They are not just labels on a map. They are fixed directions defined by the Earth itself. North is always toward the North Pole, and south is always toward the South Pole. These never change no matter where you are on Earth.

A compass is a tool that has a small magnetic needle inside it. The needle always lines up with the Earth's magnetic field and points toward the north. Using a compass, you can always figure out which direction you are facing.

East is the direction that the Earth rotates toward. The sun always rises in the east and sets in the west because the Earth is rotating eastward. If you face the sunrise, you are facing east. Your right hand then points south, your left hand points north, and west is behind you.

All standard maps are oriented with north at the top. A compass rose is a symbol on a map that shows which direction is north, south, east, and west. Using a map and a compass together, you can orient yourself in the real world and navigate from one place to another.

Session 14B | Lesson D-3A

North, East, South, and West

Activity 1

Fill in the blank with the correct word from the word box.

Word Box: *compass* *north* *east* *compass rose* *navigate*

1. A _____ uses a magnetic needle to point toward north.

2. _____ is always toward the North Pole.

3. The sun always rises in the _____ because the Earth rotates in that direction.

4. A _____ is a symbol on a map that shows the four main directions.

5. Using a map and compass together, you can _____ in the real world.

Activity 2

Write three key words from the passage that are important for understanding directions and navigation.

1. _____

2. _____

3. _____

Magnets: Properties and Poles

Read Aloud Passage

A magnet is an object that creates a pulling force on certain materials. Magnets attract iron and materials that contain iron, like steel. They do not attract most other metals, like aluminum, copper, or gold, and they do not attract non-metals like wood or plastic.

Every magnet has two poles, called the north pole and the south pole. The poles are the places where the magnetic force is strongest. If you bring two magnets together with opposite poles facing each other, north and south, they will attract and pull toward each other. If you bring two magnets together with the same poles facing each other, north and north or south and south, they will repel and push away from each other.

This rule is easy to remember: opposite poles attract, and like poles repel.

Magnets come in many shapes and sizes. Bar magnets, horseshoe magnets, and small button magnets all follow the same rules. No matter what shape a magnet is, it always has two poles and always attracts iron-containing materials.

Session 15A | Lesson A-5A Pt.1

Magnets: Properties and Poles

Activity 1

Fill in the blank with the correct word from the word box.

Word Box: *attract* *repel* *poles* *iron* *opposite*

1. Magnets _____ iron and steel but not most other metals.

2. Every magnet has two _____, called north and south.

3. _____ poles attract each other.

4. Like poles _____ each other.

5. Magnets attract materials that contain _____.

Activity 2: Single-Paragraph Outline (SPO) Use the details to build your outline.

Write a topic sentence about what magnets are and what they do.

Topic Sentence:

_____

_____

Detail 1: Magnets attract iron and iron-containing materials but not most other metals.

Detail 2: Every magnet has a north pole and a south pole where the force is strongest.

Detail 3: Opposite poles attract each other, and like poles push away from each other.

Write a closing sentence that wraps up the main idea about magnets.

Closing Sentence:

_____

_____

Magnetic Fields and the Earth as a Magnet

Read Aloud Passage

A magnet does not have to touch something to pull on it. The pulling force of a magnet reaches out into the space around it. This region of force around a magnet is called a magnetic field. Even though you cannot see a magnetic field, you can make it visible. If you scatter tiny bits of iron called iron filings near a magnet, they arrange themselves along the invisible lines of force, showing the shape of the field.

A magnetic field can pass through many materials. It passes through paper, cloth, plastic, and even through your hand. Only materials that contain iron will block or redirect it.

The Earth itself acts like a giant magnet. It has a north magnetic pole and a south magnetic pole. The Earth's magnetic field surrounds the entire planet. A compass works because its needle is a small magnet that lines up with the Earth's magnetic field and points toward the north.

You can also temporarily magnetize some objects. If you stroke an iron nail over and over in the same direction with a magnet, the nail will become a weak magnet and can pick up small paper clips. This is called induced magnetism.

Session 15B | Lesson A-5A Pts.2+3

Magnetic Fields and the Earth as a Magnet

Activity 1

Write three key words from the passage that describe magnets and their fields.

1. _____

2. _____

3. _____

Activity 2: Single-Paragraph Outline (SPO) Use the details to build your outline.

Write a topic sentence about the Earth's magnetic field and how we use it.

Topic Sentence:

_____

_____

Detail 1: The Earth acts like a giant magnet with its own magnetic field surrounding the planet.

Detail 2: A compass works because its needle is a small magnet that aligns with the Earth's magnetic field.

Detail 3: A magnetic field can pass through paper, cloth, and plastic, but iron-containing materials can block or redirect it.

Write a closing sentence that explains why the Earth's magnetic field is useful to us.

Closing Sentence:

_____

_____