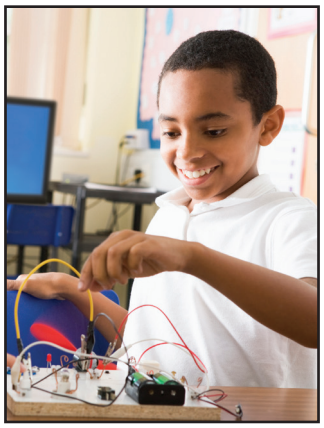

PHYSICAL SCIENCE

Hands-On STEAM Science Series

Written by George Graybill, Ph. D.

GRADES 1 - 5

Reading Level 3

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STEAM & NGSS Skills

Physical Science

	Skills for STEAM and NGSS	Reading						
		Force and Motion	Energy	Light and Sound	Electricity and Magnetism	Matter and Materials	Simple Machines	Hands-on Experiments
Science	• Demonstrate Understanding	✓	✓	✓	✓	✓	✓	✓
	• Explain Scientific Causation	✓	✓	✓	✓	✓		✓
	• Describe	✓	✓	✓	✓	✓	✓	✓
	• Classify and Organize	✓	✓	✓	✓	✓	✓	✓
	• Observation	✓	✓	✓	✓	✓	✓	✓
Technology	• Application to Own Life	✓	✓	✓	✓	✓	✓	✓
	• Create and Construct			✓		✓	✓	✓
	• Recall Information	✓	✓	✓	✓	✓	✓	✓
	• Integration of Technology and Virtual Learning			✓				✓
	• Utilize Alternative Research Tools		✓	✓	✓		✓	✓
Engineering	• Construct Experiments			✓	✓	✓	✓	✓
	• Group Work			✓			✓	✓
	• Distinguish Meanings	✓	✓	✓	✓	✓	✓	✓
	• Make Inferences	✓	✓	✓	✓	✓		✓
	• Draw Conclusions	✓	✓		✓	✓	✓	✓
Arts	• Project-Based Learning			✓	✓	✓	✓	✓
	• Design and Application			✓	✓	✓	✓	✓
	• Match Vocabulary to Definition	✓	✓	✓	✓	✓	✓	
	• Define Vocabulary	✓	✓	✓	✓	✓	✓	
	• Compile Research Information				✓	✓		✓
Mathematics	• Utilize Math Concepts in Experiments	✓					✓	✓
	• List Details/Facts	✓	✓	✓	✓	✓	✓	✓
	• Sequence	✓	✓	✓		✓		✓
	• Identify Cause and Effect	✓	✓	✓	✓	✓	✓	✓
	• Identify Supporting Evidence		✓	✓	✓	✓	✓	✓

Based on STEAM and Next Generation Science

Contents

Assessment Rubric

Physical Science

Student's Name: _____ Assignment: _____ Level: _____

	Level 1	Level 2	Level 3	Level 4
Understanding Concepts	Demonstrates a limited understanding of concepts. Requires teacher intervention.	Demonstrates a basic understanding of concepts. Requires little teacher intervention.	Demonstrates a good understanding of concepts. Requires no teacher intervention.	Demonstrates a thorough understanding of concepts. Requires no teacher intervention.
Analysis & Application of Key Concepts	Limited application and interpretation in activity responses.	Basic application and interpretation in activity responses.	Good application and interpretation in activity responses.	Strong application and interpretation in activity responses.
Creativity & Imagination	Limited creativity and imagination applied in projects and activities.	Some creativity and imagination applied in projects and activities.	Satisfactory level of creativity and imagination applied in projects and activities.	Beyond expected creativity and imagination applied in projects and activities.
Application of Own Interests	Limited application of own interests in independent or group environment.	Basic application of own interests in independent or group environment.	Good application of own interests in independent or group environment.	Strong application of own interests in independent or group environment.

STRENGTHS:

WEAKNESSES:

NEXT STEPS:

Teacher Guide

*Our resource has been created for ease of use by both **TEACHERS** and **STUDENTS** alike.*

Introduction

Introduce your primary and elementary students to the world of physical science. In this ready-made resource, we provide vital information to get your students started on physical science concepts like Force and Motion, Energy, Light and Sound, Electricity and Magnetism, Matter and Materials, and Simple Machines. With every concept we introduce, there are hands-on experiments and graphic organizers to help aid your students through the learning process. Written to grade with vocabulary to match, this resource can be used as a stepping stone to lifelong learning in the scientific field. Get your students excited about Science with STEAM initiatives and Next Generation Science Standards. Our hands-on approach to learning allows students to get down and dirty with science, engaging their imagination and intrigue.

How Is Our Resource Organized?

STUDENT HANDOUTS

Reading passages and **activities** *(in the form of reproducible worksheets)* make up the majority of our resource. The reading passages present important grade-appropriate information and concepts related to the topic. Embedded in each passage are one or more questions that ensure students understand what they have read.

For each reading passage there are **BEFORE YOU READ** activities and **AFTER YOU READ** activities.

- The BEFORE YOU READ activities prepare students for reading by setting a purpose for reading. They stimulate background knowledge and experience, and guide students to make connections between what they know and what they will learn. Important concepts and vocabulary are also presented.
- The AFTER YOU READ activities check students' comprehension of the concepts presented in the reading passage and extend their learning. Students are asked to give thoughtful consideration of the reading passage through creative and evaluative short-answer questions, research, and extension activities.

Hands-on Experiments for each chapter topic are included to further develop students' thinking skills and understanding of the concepts. The **Assessment Rubric** *(page 4)* is a useful tool for evaluating students' responses to many of the activities in our resource. The **Comprehension Quiz** *(page 48)* can be used for either a follow-up review or assessment at the completion of the unit.

PICTURE CUES

This resource contains three main types of pages, each with a different purpose and use. A **Picture Cue** at the top of each page shows, at a glance, what the page is for.

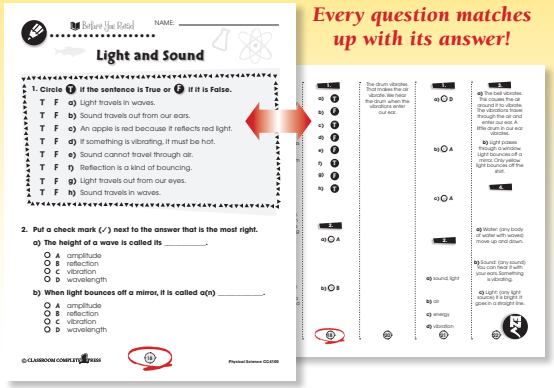
Teacher Guide
- Information and tools for the teacher

Student Handout
- Reproducible worksheets and activities

Easy Marking™ Answer Key
- Answers for student activities

EASY MARKING™ ANSWER KEY

Marking students' worksheets is fast and easy with our **Answer Key**. Answers are listed in columns – just line up the column with its corresponding worksheet, as shown, and see how every question matches up with its answer!

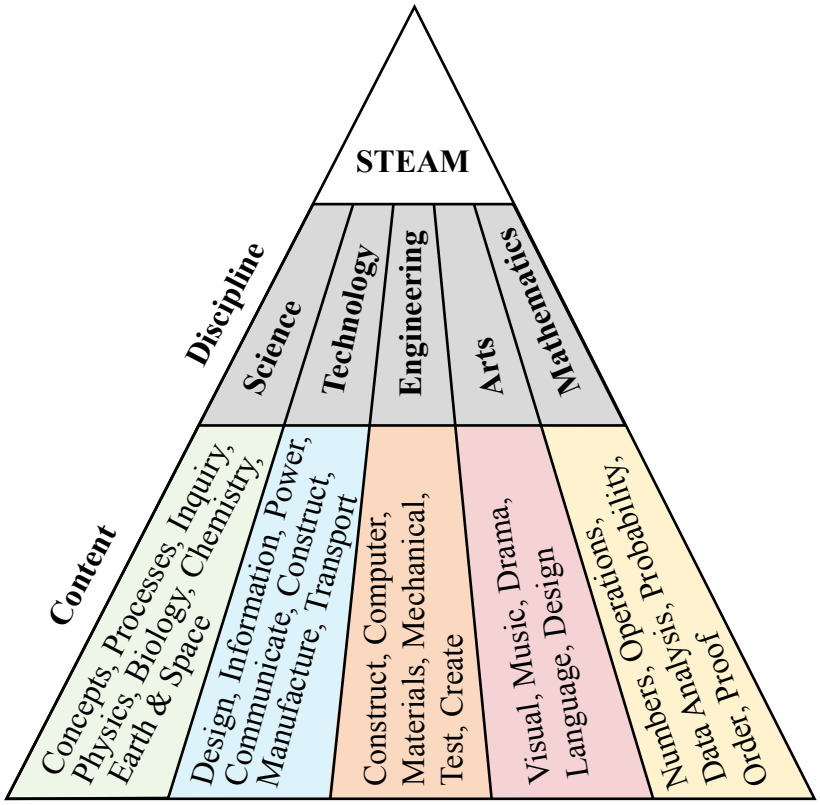


STEAM & NGSS

Our resource is an effective tool for any ***SCIENCE PROGRAM.***

The activities in this resource meets the Next Generation Science Standards (NGSS) and STEAM initiatives. The NGSS aim to integrate the content and skills of science in an approach to teaching and learning. The standards set out by the NGSS are designed to provide quality science education to students based on content-rich material and practice with aligned curricula. We pair this with our tried-and-true teaching pedagogy for a complete science program. The STEAM standards aim to integrate the content and skills of science, technology, engineering, arts, and mathematics in an approach to teaching and learning. STEAM brings a new hands-on approach to learning that encourages students to explore and interact with what they are learning.

Our resource, therefore, is an effective tool for any Science program. Whether it is used in whole or in part, or adapted to meet individual student needs, this resource provides teachers with the important questions to ask, interesting content, which promote creative and meaningful learning.



Vocabulary

amplitude
balanced
current
electric charge
electric force
electrons
energy
energy of motion
food energy
force
force of gravity
gravity
heat energy
inclined plane
lever
light energy
light waves
magnet
magnetic force
mass
matter
negative charge
north pole
particles
properties
positive charge
pulley
screw
reflection
sound waves
south pole
static
stored energy
unbalanced
vibrating
water vapor
waves
wavelength
wedge
wheel and axle

NAME: _____

Force and Motion

1. Circle T if the sentence is True or F if it is False.

T	F	**a)**	Down means the same thing as south.
T	F	**b)**	A force is a push or a pull.
T	F	**c)**	Solid things do not move.
T	F	**d)**	Force is the same thing as energy.
T	F	**e)**	Gravity is a force.

2. Put a check mark (✓) next to the answer that is the most right.

a) Which of these keeps you from floating off into space?

- ○ **A** air
- ○ **B** electricity
- ○ **C** gravity
- ○ **D** magnetism

b) Which way does the force of gravity pull?

- ○ **A** south
- ○ **B** down
- ○ **C** north
- ○ **D** up

c) An unbalanced force can make a thing do all of these, except _____.

- ○ **A** sit still
- ○ **B** slow down
- ○ **C** move faster
- ○ **D** change direction

NAME: _____

Force and Motion

A **force** is a push or a pull. You use a pulling force to pull a carrot out of the ground. You use a pushing force to push a lawnmower. Right now there is one force pulling you and another force pushing you. Can you feel the forces?

The force pulling you down is called the **force of gravity**. If you are sitting down, gravity is holding you in the chair. **Gravity** is always pulling. Don't worry that gravity might shut off and cause you to float up out of the chair. Actually, everything pulls on everything else. We don't feel the pull unless one of the things is very big. The Earth is very big. It is the Earth pulling on you and on other things that causes gravity.

What would you say the word "down" means? Gravity tells us the answer. Down is the direction that gravity pulls. That direction is towards the center of the Earth.

Isaac Newton lived a long time ago. A story says he found gravity when an apple hit him on the head. Really he thought, 'Why do apples always fall down?

When a force acts on something, it can make it move. The thing won't move if there is a force just as strong acting against the first force. Then we say the forces are **balanced**. This means the forces add up to zero. The forces on something moving can also be balanced. Then the moving thing will just go on moving at the same speed.

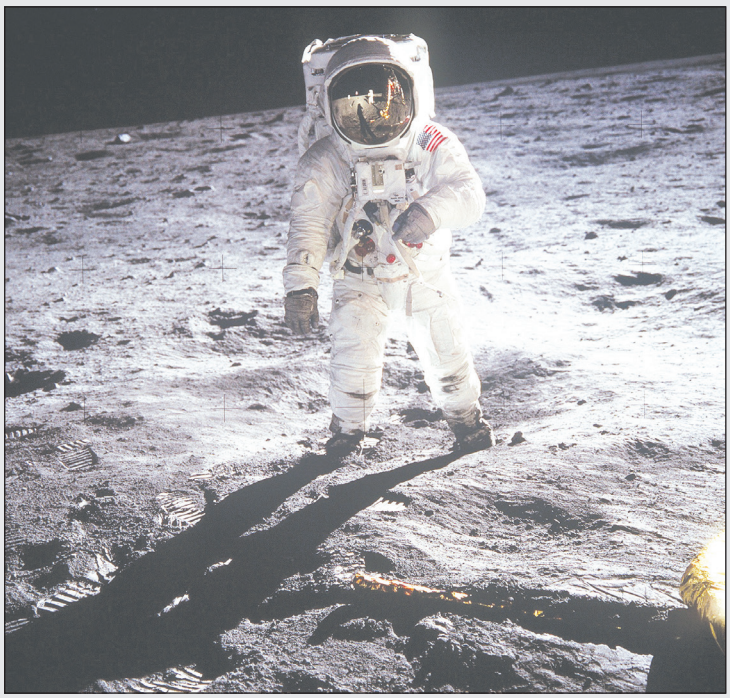
NAME: _____

Reading Passage

Force and Motion

Gravity is pulling on you, and you aren't moving. That is because another force is balancing gravity. Are you sitting in a chair? Then it is the force of the chair pushing up on you that balances gravity. Can you feel it?

Forces on something can also be **unbalanced**. This changes the way the thing moves. It might go faster, it might slow down, or it might change direction. For example, when something starts to fall it speeds up. This is because the force of gravity is stronger than the forces slowing it down.



The force of gravity is less on the Moon. This is because the Moon is smaller than the Earth.

When you drop a ball, it moves faster and faster until it hits the ground. Are the forces acting on the ball balanced? Explain.

_____

_____

Putting it all together: When forces on a thing are balanced, the thing doesn't change its motion. When forces are unbalanced, the thing changes its motion.

NAME: _____

Force and Motion

1. Put a check mark (✓) next to the answer that is the most right.

a) Something is sitting still. What do you know about the forces acting on it?

- ○ **A** The forces on it are balanced.
- ○ **B** All the forces are pulling it down.
- ○ **C** Only the force of gravity is acting on it.
- ○ **D** Forces are pushing on it from every direction.

b) Something changes the direction an object is moving. What do you know about the forces acting on it?

- ○ **A** The forces add up to zero.
- ○ **B** The force of gravity is zero.
- ○ **C** The forces are unbalanced.
- ○ **D** The forces are all pushing from one direction.

2. Use the words below to finish each sentence. Use each word once. Some words won't be used.

gravity **unbalanced** **balanced** **speeding up** **sitting still**

a) A moving car is slowing down because the forces on it are _____.

b) As an apple hangs from a tree, the stem is pulling up on it. The force pulling down on it is _____.

c) An airplane flies through the air without changing its height or its speed. The forces on the plane are _____.

d) The forces on a rock are balanced. The rock is either moving in one direction at the same speed or it is _____.

NAME: _____

Force and Motion

3. Answer the questions in full sentences.

a) Explain how you can be sitting still when there are two forces acting on you.

_____

_____

b) Explain how an unbalanced force can make a moving thing change direction. Give an example.

_____

_____

Extension & Application

4. A skydiver jumps from an airplane. Two forces act on her as she falls. One is gravity and the other is called air resistance. Air resistance is the air pushing up on her. The faster she goes, the harder it pushes. It is the same push you feel when you try to walk into a strong wind. These are the ways her speed changes on the way down:

1) First she speeds up.
2) Soon the push of air resistance is the same as the pull of gravity. Now her speed stays the same.
3) When she opens her parachute, air resistance pushes harder. Now she slows down.
4) Again, she reaches a speed that stays the same.
5) Near the ground a wind is blowing. Now she drifts to one side.
6) She lands on the ground. She sits there and thinks about the fun she had.

Think about each of the six parts of her fall from the airplane to the ground. For each part, tell whether the forces on her were balanced or unbalanced. Describe the forces acting on her in each part. Use the graphic organizer on page 12 to write your answers.

NAME: _____

Force and Motion

Balanced and Unbalanced Forces on a Skydiver

Part of Her Fall	Were Forces Balanced or Unbalanced?	Explanation
1. She jumps out of the plane. She speeds up.		
2. She is falling at a constant speed. Air resistance equals gravity.		
3. She opens her parachute and slows down. Air resistance is greater than gravity.		
4. She is falling at a constant speed. Air resistance equals gravity.		
5. Wind blows from the side.		
6. She lands and sits still.		

NAME: _____

Energy

1. Circle T if the sentence is True or F if it is False.

T	F	a)	The kind of energy the Sun sends to Earth is called energy of motion.
T	F	b)	We get energy from an apple when we eat it.
T	F	c)	Some animals get energy when they eat other animals.
T	F	d)	Energy is a kind of force.
T	F	e)	Plants store energy. Animals don't.

2. Put a check mark (✓) next to the answer that is the most right.

a) What is energy?

- ○ **A** Force.
- ○ **B** Power.
- ○ **C** Very high speed.
- ○ **D** What is needed to change things.

b) What kind of energy travels from the Sun to the Earth?

- ○ **A** light
- ○ **B** food energy
- ○ **C** stored energy
- ○ **D** energy of motion

c) Food energy is a kind of _____ energy.

- ○ **A** heat
- ○ **B** light
- ○ **C** motion
- ○ **D** stored

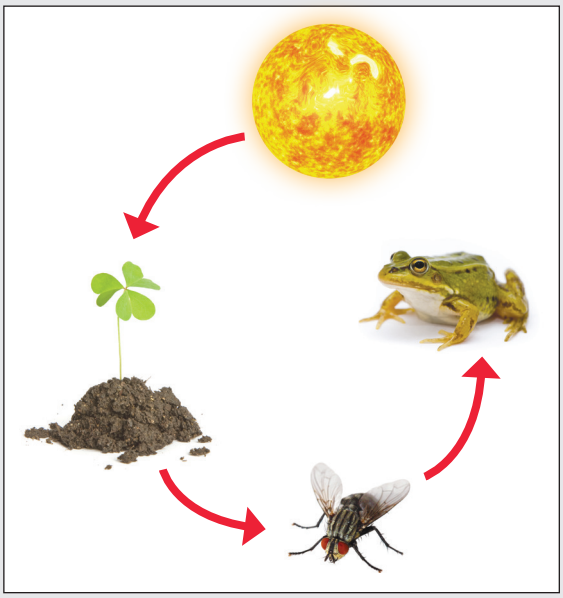
NAME: _____

Energy

Energy is like happiness. It's hard to say what it is, but you know when you've got it. People say that energy is what you need to change things. But let's wait until we have looked at all the kinds of energy. That is the best way to get a feel for what energy is.

We need a lot of energy here on Earth. We need energy to get up in the morning. We need it to cook breakfast. We need it to travel to school. You may be surprised to learn that almost all of the energy we use came from just one place—the Sun! The Sun sends energy to Earth in the form of **light energy**.

These are called solar cells. The Sun beats down on them. They take in energy from the Sun. They change this into electricity.



The plant stores energy from the sun. The bug gets energy when it eats the plant. The frog gets energy when it eats the bug.

When light energy meets the ground, some of it changes into **heat energy**. That is how Earth stays warm enough for us to live here. Some of the light energy is also changed into **food energy** by green plants. This is a kind of **stored energy**. It is stored in plants until we eat them. Then, we have energy to do things. If we eat meat, the energy we get comes from what is stored in the animal. The animal got it from eating plants.

NAME: _____

Energy

Even the stored energy in fuels came from the Sun. This is true of oil and coal. This energy was also stored by plants a very long time ago. The plants died and ended up underground. The weight of rocks on top made the plants into oil and coal. This was done very slowly.

This plant died and ended up underground. Over time the rocks on top turned it into oil and coal.

Where do plants get their energy?

_____

_____

Gasoline is what we put in a car to give it energy. Gasoline is made from oil. The energy that was stored in oil goes into the gasoline. The energy in gasoline makes a car speed up. After the car is moving, it has another kind of energy. This is called **energy of motion**. This energy came from the gasoline. The energy in gasoline came from oil. The energy in oil came from plants. The energy in plants came from the sun.

It is easy to see stored energy and energy of motion changing back and forth. You go up on a swing. Now you have stored energy. You come back down on a swing. Now you have energy of motion. The two kinds of energy change back and forth on a swing.

NAME: _____

Energy

1. Circle T if the sentence is True or F if it is False.

T	F	a)	A falling leaf has energy of motion.
T	F	b)	Food energy is energy of motion.
T	F	c)	Light energy can change into heat energy.
T	F	d)	A bird in the sky has energy of motion but not stored energy.
T	F	e)	Coal has stored energy.

2. Five energy changes are shown. Put the changes in order from 1 to 5.

_____ **a)** A man gets energy by eating meat from the cow.

_____ **b)** Light travels from the Sun to the Earth.

_____ **c)** The man uses energy stored in his body to run.

_____ **d)** Grass changes light into stored energy.

_____ **e)** A cow eats the grass.

NAME: _____

Energy

3. Answer the questions in full sentences.

a) A raindrop falls from the sky into a lake. The stored energy and energy of motion changes as the drop falls. Explain how.

_____

_____

b) Explain what keeps the Earth warm enough for us to live here.

_____

_____

Extension & Application

4. a) Find a place where stored energy is changing into energy of motion. Look for the place around your house or outside. Tell about the change.

_____

_____

_____

b) Find a place where energy of motion is changing into stored energy. Look for the place around your house or outside. Tell about the change.

_____

_____

_____

NAME: _____

Light and Sound

1. Circle T if the sentence is True or F if it is False.

T F **a)** Light travels in waves.

T F **b)** Sound travels out from our ears.

T F **c)** An apple is red because it reflects red light.

T F **d)** If something is vibrating, it must be hot.

T F **e)** Sound cannot travel through air.

T F **f)** Reflection is a kind of bouncing.

T F **g)** Light travels out from our eyes.

T F **h)** Sound travels in waves.

2. Put a check mark (✓) next to the answer that is the most right.

a) The height of a wave is called its _____.

- ○ **A** amplitude
- ○ **B** reflection
- ○ **C** vibration
- ○ **D** wavelength

b) When light bounces off a mirror, it is called a(n) _____.

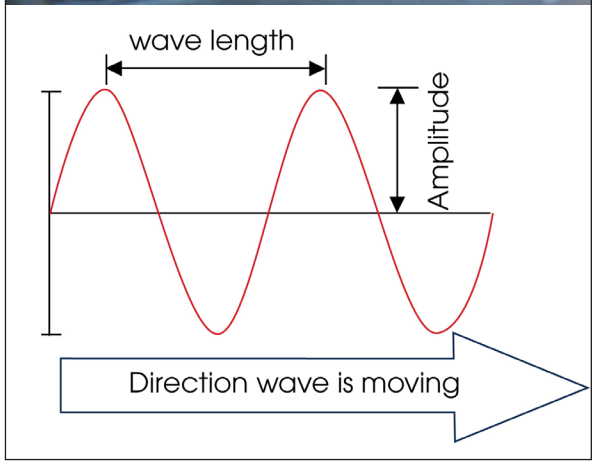
- ○ **A** amplitude
- ○ **B** reflection
- ○ **C** vibration
- ○ **D** wavelength

NAME: _____

Reading Passage

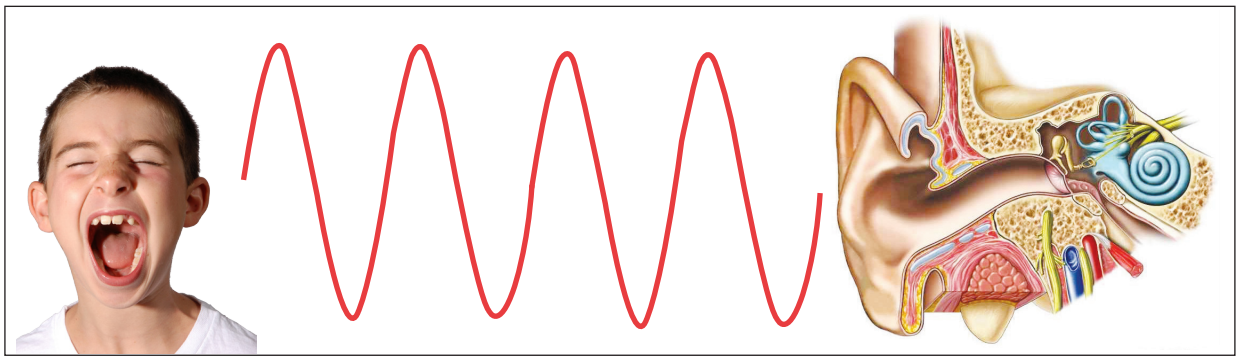
Light and Sound

Dropping a pebble in a pond makes **waves**. The bottom picture shows how the waves would look if you were in the pond up to your eyes. This view shows two important things about waves: **amplitude** and **wavelength**. Amplitude is how far the wave rises above the middle of the wave. Wavelength is how far it is between tops of waves.



We can see water waves. There are two other important kinds of waves that we can't see. These are **sound waves** and **light waves**.

Stretch a rubber band as far as you can between your thumbs. Ask someone to pluck the stretched rubber band. You will hear a nice sound. You will also see the rubber band moving back and forth so fast it is just a blur. This back and forth motion is called **vibrating**. This vibration makes the air next to it vibrate too. You can't see the air vibrate because it is made up of little bits too small to see. The vibration in the air spreads out away from the rubber band until it reaches your ears. This makes a little drum in your ear vibrate and you hear the sound. All sounds you hear get to your ears this way.



NAME: _____

Light and Sound

Why do you hear a noise when you hit a drum with a drumstick?

_____

_____

Light also travels in waves. There is no easy way to show this. We think of light as being just white. Actually, light is made up of all the colors in a rainbow. Each color has a different wavelength. When light is split into its different wavelengths, we see a rainbow.

The white light turns into a rainbow on the left. A rainbow seen outside on the right.

This clover looks green. This is because it reflects only green light.

Light travels in a straight line through the air. Light can pass right through some things, like glass or water. Light bounces off of other things, like a mirror. This is called **reflection**. Some things reflect only one color of light. For example, a green leaf reflects only green light.

Sound waves travel much faster than water waves. Light waves travel much faster than sound waves. Waves carry energy from one place to another. They don't carry things from place to place.

NAME: _____

Light and Sound

1. Put a check mark (✓) next to the answer that is the most right.

a) Light and sound both travel in _____.

- ○ **A** currents
- ○ **B** streams
- ○ **C** rays
- ○ **D** waves

b) Which waves shows speeds from slowest to fastest?

- ○ **A** water, sound, light
- ○ **B** sound, water, light
- ○ **C** light, sound, water
- ○ **D** water, light, sound

c) What do sound waves and light waves carry from place to place?

- ○ **A** energy
- ○ **B** force
- ○ **C** heat
- ○ **D** material

2. Use the words below to finish each sentence.

energy	vibration	sound	air	light

a) We can see waves on a lake. We cannot see _____ or _____ waves.

b) Sound waves travel through the _____ to our ears.

c) Waves carry _____ from one place to another.

d) Sound waves are caused by a _____.

NAME: _____

Light and Sound

3. Answer the questions in full sentences.

a) Someone hits a bell and it rings. Explain how you hear the ringing from across the room.

_____

_____

b) Explain what happens to light when it meets each of these things: a window, a mirror, a yellow shirt.

_____

_____

Extension & Application

4. Get into groups and use the graphic organizer on page 23. Show how kinds of waves are the same and how they are different. Use the internet to help you.

Make small models of each type with your group. Describe your models below.

a) Water: _____

_____

b) Sound: _____

_____

c) Light: _____

_____

NAME: _____

Light and Sound

	Water Waves	Sound Waves	Light Waves
Which is fastest? Which is slowest? Which is in between?			
Do these waves carry energy? (Yes or No) Give examples.			
Do these waves carry material? (Yes or No) Give examples.			
Can you see these waves? (Yes or No) Give examples.			

NAME: _____

Electricity and Magnetism

1. Circle T if the sentence is True or F if it is False.

T F **a)** Magnetic force pulls, but it can't push.

T F **b)** A lightning bolt is a stream of electrons.

T F **c)** Magnets don't have to touch to affect each other.

T F **d)** An iron nail will stick to a magnet.

T F **e)** Electrical wires can shock you when you touch them.

T F **f)** Two things with minus charges push away from each other.

2. Use the words below to finish each sentence.

north pole **south pole** **negative** **positive**
push **electrical spark** **pull**

a) A flash of lightning is like a(n) _____, only bigger.

b) Magnetic force can _____ or _____.

c) The ends of a magnet are called the _____ and the _____.

d) A(n) _____ charge connects to a negative charge.

e) A(n) _____ charge is pushed away from a negative charge.

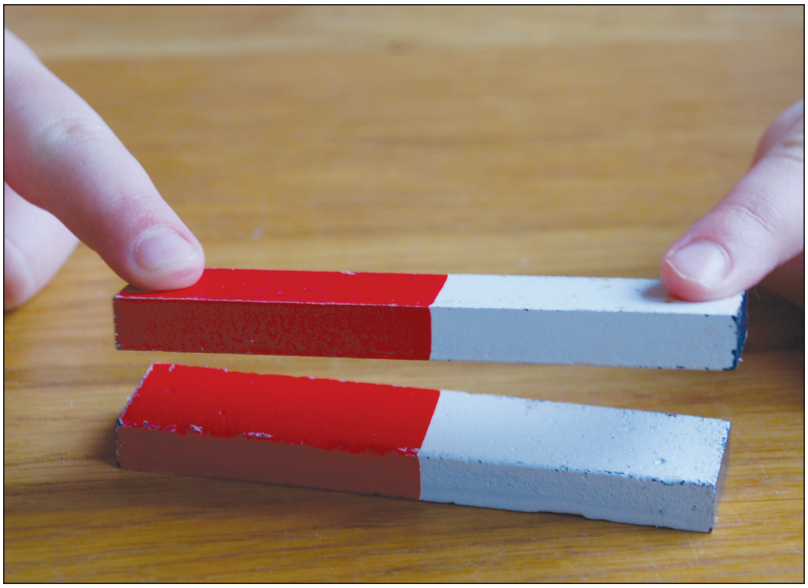
NAME: _____

Reading Passage

Electricity and Magnetism

A lot of people didn't like Isaac Newton's ideas about gravity. He said gravity could pull on something across empty space without touching it. That was just too weird for some people. It sounded like magic.

But it's true. The Moon and the Earth are thousands of miles (kilometers) apart. If Earth's gravity didn't pull on the Moon, the Moon would just float away. There are two other forces that act without touching. They are **electric force** and **magnetic force**. The force of gravity only pulls. Electric and magnetic forces can push and pull.



Do you have **magnets** stuck to your fridge? This is because the outside of a fridge is made of iron. Iron is a type of metal. All things made of iron are pulled toward a magnet. Two magnets can push or pull each other. One end of a magnet is called the **north pole**. The other is called the **south pole**. The north pole of one magnet is pulled to the south pole of another. Two magnet poles that are the same push each other away. So, the north pole of one magnet pushes away the north pole of another.

NAME: _____

Electricity and Magnetism

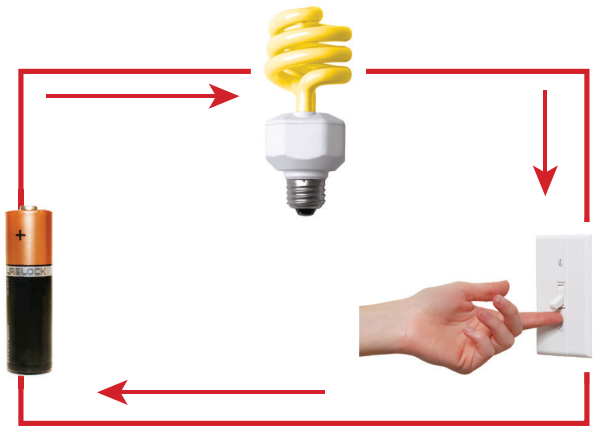
Electric forces work the same way. This happens between things that have **electric charges**. A **positive charge** is pulled to a **negative charge**. Positive means plus. Negative means minus. Charges that are the same push each other away. Charges are caused by things called **electrons**. You can't see these. Extra electrons give a thing a negative charge. Less gives something a positive charge.

What if a very big positive charge comes close to a big negative charge? A spark jumps between them like a lightning bolt. Electrons jump from the clouds to the ground. The same thing happens when you touch a metal doorknob. You get a small "zap". This is because you have been charged. The zap is like a very small lightning bolt.

If you rub a rubber balloon on wool cloth, you can stick it to the wall or ceiling. Why does it stick? Try it!

_____

_____



These things have to do with **static electricity**. Static means not moving. Electricity that goes through wires is called **current electricity**. Here the electrons are moving. There will be no zaps from this. The electrons move down a wire to your lamp. Then, electrical energy turns into light energy.

NAME: _____

Electricity and Magnetism

1. Put a check mark (✓) next to the answer that is the most right.

a) Which of these can pull but not push?

- ○ **A** The force of magnets.
- ○ **B** The force of positive charges.
- ○ **C** The force of gravity.
- ○ **D** The force of electrons.

b) What is a bolt of lightning?

- ○ **A** The force of gravity.
- ○ **B** The force of magnets.
- ○ **C** Electrons moving through a wire.
- ○ **D** A stream of electrons.

2. With a straight line, connect each word on the left with its meaning on the right.

1	electrical force	force between poles of magnets	A
2	force of gravity	electrons flowing in a wire	B
3	magnetic force	the pull of Earth on other things	C
4	current electricity	the ends of a magnet	D
5	north and south poles	force between charges	E

NAME: _____

Electricity and Magnetism

3. Answer the questions in full sentences.

a) Explain what causes a bolt of lightning.

_____

_____

b) Name the poles of a magnet. Use the names of the poles to explain when magnets push and when they pull.

_____

_____

Extension & Application

4. Look for static electricity. Try rubbing a blown up balloon on something. Then, see if it will stick to the wall. Rub it on different things. Rub it on wool. Rub it on your hair. Rub it on a cat. Try other things.

a) Which rubbing made the balloon stick? Which rubbing worked best?

_____

_____

_____

_____

b) Was there electrical force when the balloon stuck to the wall? Explain.

_____

_____

_____

_____

NAME: _____

Matter and Materials

1. Put a check mark (✓) next to the answer that is the most right.

a) All things we can touch are made of _____.

- ○ **A** energy
- ○ **B** force
- ○ **C** matter
- ○ **D** solids

b) How many different forms can water have?

- ○ **A** one
- ○ **B** two
- ○ **C** three
- ○ **D** four

c) These can all be properties of matter, except _____.

- ○ **A** is blue
- ○ **B** is hard
- ○ **C** can burn
- ○ **D** has energy

2. Circle T if the sentence is True or F if it is False.

T F a) When wood burns, it turns into ashes and smoke. Cooling the ashes and smoke turn them back into wood.

T F b) Matter is made of little things too small to see.

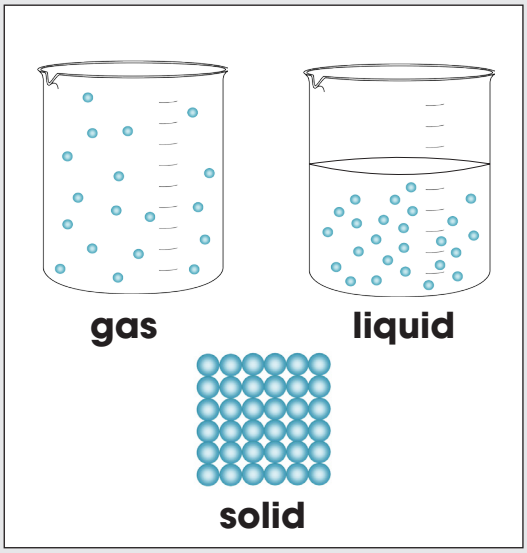
T F c) Heating ice turns it into liquid water.

T F d) All solid things have the same properties.

NAME: _____

Matter and Materials

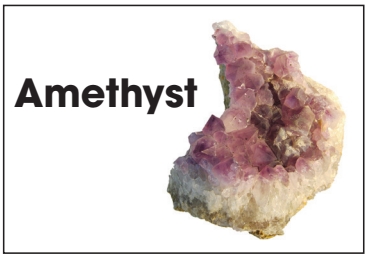
Matter is easy to understand. Matter is just *stuff*. Pretty much everything is matter, except energy. We say all matter has **mass** and takes up space. Mass is a measure of how much matter is in a thing. Mass is not the same as weight, but it is what gives a thing weight. Water, rocks, air, and even you are all made of matter.



The balls show what particles would look like if you could see them.

Each kind of matter has its own special **properties**. Properties are how we tell what something is like. To find out what kind of matter a thing is made of, we can look at its properties. Is it hard? What color is it? Does it burn? Does it float? For example, rocks are hard, water flows, and paper burns.

Crystals are solid materials with interesting properties. We can tell a crystal by its color, shape, and hardness. Look at the pictures of three different crystals. How would you describe them?



Matter is made of little **particles** (bits of matter) much too small to see. It is the particles that give a thing its properties. Properties depend on three things:

- Which kind of particles a thing is made of.
- How tightly they are packed together.
- Whether the particles are stuck in fixed places or can move around.

NAME: _____

Matter and Materials

The shape of a crystal is based on how its particles are put together. If you look at a grain of salt, you will see that it is square. This is because its particles are in square layers.

Air and water flow because their particles can move around. A rock is hard and heavy. This is because its particles are tight and can't move around.

Heating and cooling something can make it change. Heating water makes it boil. It changes into a gas. This gas is called **water vapor**. Cooling water makes it freeze. It turns into a solid. This solid is called ice. Heating paper makes it burn. This changes the paper into ashes, smoke and gases.

Explain how you could change ice into water vapor. Try this with your teacher or parent.

_____

_____

Many people think the cloud above boiling water is water vapor. It is not. It is made of tiny drops of water, like all clouds. We cannot see water vapor.

There are different kinds of changes. Frozen water can melt. It turns back into a liquid. Smoke and ashes can't turn back into paper. There is another difference. Some changes can make something new. Ice, water and vapor are all just different forms of water. Ashes and smoke are different than paper. This is because the particles have been moved around. If there is a flame, it means something new has been made. If something changes color or gives off a gas, it might also mean something new has been made—but not always.

NAME: _____

Matter and Materials

1. Use the words below to finish each sentence.

solid	gas	mass	liquid	particles

a) Water can be a _____, a _____ or a gas.

b) All matter has _____ and takes up space.

c) All matter is made of _____ too small to see.

d) Water vapor is a _____.

2. Put a check mark (✓) next to the answer that is the most right.

a) Water flows because its particles _____.

- ○ **A** are wet
- ○ **B** are small
- ○ **C** cannot freeze
- ○ **D** can move around

b) Which is always a sign that a new material has been formed?

- ○ **A** A flame is seen.
- ○ **B** A gas is given off.
- ○ **C** A liquid gets hard.
- ○ **D** A solid becomes liquid.

c) All these changes can go back the way they were, except _____.

- ○ **A** when a solid melts
- ○ **B** when a liquid boils
- ○ **C** when a solid burns
- ○ **D** when a liquid freezes

NAME: _____

Matter and Materials

3. Answer the questions in full sentences.

a) Explain what matter is. Explain what mass is.

_____

_____

b) Tell two ways that burning wood is different from boiling water.

_____

_____

Extension & Application

4. Look around your house. Find a solid. Find a liquid. Find a gas. Tell what each thing is like by its properties.

a) What are the properties of the solid?

_____

_____

b) What are the properties of the liquid?

_____

_____

c) What are the properties of the gas?

_____

_____

NAME: _____

Simple Machines

1. Circle T if the sentence is True or F if it is False.

T	F	a)	A small car is a simple machine.
T	F	b)	A ball is a simple machine.
T	F	c)	A hammer is a simple machine.
T	F	d)	We can sit back and watch while a simple machine does our work.
T	F	e)	Simple machines make work easier.

2. Put a check mark (✓) next to the answer that is the most right.

a) Which is a simple machine?

- ○ **A** a rope
- ○ **B** a wedge
- ○ **C** eye glasses
- ○ **D** an electric fan

b) All of these are simple machines, except _____.

- ○ **A** a pulley
- ○ **B** a screw
- ○ **C** a fence
- ○ **D** an inclined plane

c) What kind of simple machine is an oar that is used to row a boat?

- ○ **A** a lever
- ○ **B** a wedge
- ○ **C** a wheel and axle
- ○ **D** an inclined plane

NAME: _____

Reading Passage

Simple Machines

Simple machines really are simple. They are hand tools we use every day. The bad news is that simple machines don't do the work for us. The good news is that they make the work easier. When we use one of these machines, we push or pull with a small force over a long distance. The machine then gives us a big force over a small distance.

A hammer is a lever.
A doorknob is a wheel and axle.

There are 6 simple machines. They are: **lever**, **wheel and axle**, **inclined plane**, **screw**, **wedge**, and **pulley**.

For the machines shown, you push or pull a little bit over a long distance. The other end of the lever then makes a big force push or pull over a short distance. Have you ever tried to pull a nail out of a board with your fingers? Can you see why the wheel and axle is really a lever that can spin all the way around?

Now look at the pictures of the inclined plane, the wedge and the screw. These are all also really the same machine. The wedge is just two inclined planes back to back. The screw is a very long inclined plane wound around and around.

screw **wedge** **inclined plane**

NAME: _____

Simple Machines

What kind of simple machine is a knife?

_____

_____

Finally, we have pulleys. Pulleys are made of ropes and wheels. You pull with a small force on a rope and the thing you are lifting is pulled with a large force. If it is easy to pull the rope, you will have to pull a lot of rope to raise the load a little bit.

The crane uses a pulley to lift heavy things.

Usually we use a simple machine to turn a small force into a big force. Sometimes it is the other way around. We use a big force to make a small force that acts over a big distance. Think about using a hammer to pound a nail instead of pulling one out. You swing the hammer with a big force, and the hammerhead hits the nail head. It drives the nail in because we have made the hammerhead go very fast. You couldn't push a nail into wood with your thumb, could you? Baseball bats work the same way. We put a lot of force on one end so that the other end is going very fast when it hits the ball (…unless we miss).

Sometimes putting together two or more simple machines makes a new machine. These new machines are called compound machines. One example is an axe. The handle is a lever, and the head is a wedge. Another is a can opener. We turn the wheel of a wheel and axle with our fingers while a wedge cuts through the top of the can.

NAME: _____

Simple Machines

1. Look at the picture of the person raising a flag. Which simple machine is he using?

- ○ **A** lever
- ○ **B** pulley
- ○ **C** screw
- ○ **D** wedge

2. Circle T if the sentence is True or F if it is False.

T	F	a)	Simple machines can increase force.
T	F	b)	The head of an axe is a wedge.
T	F	c)	An inclined plane is two wedges side by side.
T	F	d)	When we pull a nail from a board with a hammer, we are using a pulley.
T	F	e)	A wheel and axle can also be seen as a kind of lever.

NAME: _____

Simple Machines

3. Answer the questions in full sentences.

a) Explain why a wedge is a kind of inclined plane.

_____

_____

_____

b) Pick a simple machine. Explain its main advantage and its main disadvantage.

_____

_____

_____

_____

Extension & Application

4. Use the graphic organizer on page 39 to finish this activity.
Draw each of the simple machines. The drawing can be very simple. For each simple machine, show where you would push or pull when you use it. Draw an arrow pointing to that spot and the letter F, like this: F ----->.

Then, get into groups and experiment with each simple machine. Make a compound machine. Use at least two simple machines.

How does your machine work?
How does it help you?

NAME: _____

Graphic Organizer

Simple Machines

The Six Simple Machines

Lever	Wheel and Axle
Pulley	Inclined Plane
Wedge	Screw

Study of Balanced and Unbalanced Forces

You will study the forces of gravity and air resistance. This is what you will need:

- A rubber balloon
- A feather
- A small ball, like a golf ball, tennis ball, or baseball
- A stepladder
- A stopwatch
- A tape measure

You will see what happens when you drop the balloon, the feather, and the ball from different heights. Work with a friend. Think about these ideas:

- Gravity pulls things to the ground when they fall.
- Air resistance pushes up on falling things.
- The faster something falls, the greater the air resistance is pushing up on it.
- If there were no air resistance, the force of gravity would always be an unbalanced force for falling things.

This is what you do:

1. Work with a friend. One person will drop things. The other will try to measure how long it takes them to hit the ground. Write down your measurements and what you see.
2. Blow up the balloon and tie a knot to keep the air in.
3. Drop the balloon from 4 feet above the floor. Stand on the stepladder and drop it from 8 feet above the floor.
4. Use the stopwatch to time how long it took to fall.
5. Did the balloon speed up all the way to the ground? If it did, the forces were always unbalanced. Did the balloon seem to fall at the same speed after a while? If it did, the forces were balanced after that point.
6. Did it take twice as long to fall 8 feet as it did 4 feet? If it did, the forces were balanced all the way. If it took less than twice as long, the forces were unbalanced all or part of the time.
7. Repeat steps 3, 4, 5, 6 for the feather and the ball.

Explain what happened. Explain what the measurements you took mean. Explain using what you know about balanced and unbalanced forces.

Measuring the Speed of Sound and Distance of Lightning

Speed of Sound:

Have you heard an echo? We hear an echo when sound bounces off something in the distance. Work with a friend. This is what you will need:

- A stopwatch.
- Something tall, hard, and flat near a big empty space. The tall flat thing could be a wall of your school. The empty space could be a playing field.
- A tape measure or meter stick to measure the distance to the wall.
- Two flat, smooth blocks of wood about the size of bricks.

This is what you do:

- Clap the blocks together and listen for the echo.
- One person will clap the blocks. The other person will measure the time from the clap to the echo.
- Find the speed of sound. (Distance there and back ÷ Time)

How Far Away Was the Lightning?

If the echo study is hard to do, try this. In this study you will find out how far away a lightning bolt struck. This is what you will need:

- A stopwatch.
- A thunderstorm.
- A dry, safe place to watch the storm.

The light from a lightning bolt travels very fast. It is too fast to measure easily. For this study, you can pretend that the light took no time at all to get to you. The thunderclap happens at the same time as the lightning. The sound takes longer to reach you—long enough to measure the time. It takes the sound of thunder about 5 seconds to travel 1 mile (1.6 km). This is what you do:

1. Hold the stopwatch, and be ready to click it.
2. When you see a lightning flash, click the watch button.
3. When you hear the thunder, click it again. The time on the watch will be how long it took the sound to reach you.

Electric and Magnetic Forces in Action

Part 1. Electric Force

You will see how electric forces push and pull. This is what you will need:

- a roll of clear plastic tape
- a balloon
- something made of wool or a cat

This is what you do:

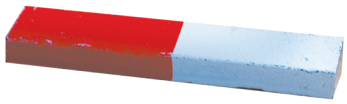
1. Tear off two pieces of tape about as long as your hand. Stick them to a desk or tabletop. Smooth them down. Leave one end free so you can peel them off.
2. Peel one strip of tape off with your right hand. Peel the other strip off with your left hand.
3. Let the strips hang down. Bring them slowly toward each other. Watch what happens.
4. Blow up the balloon and tie it shut.
5. Rub the balloon on the wool or the cat.
6. Try to stick the balloon to the wall or the ceiling.

Which things had the same charge (both positive or both negative)? Which things had different charges (one positive, the other negative)?

Part 2. Magnetic Force

You will see how the same poles on a magnet push each other away. You will also see how different poles pull each other together. This is what you will need:

- three bar magnets—bar magnets look like this:
- a glass or plastic tube that the magnets will just fit into.



This is what you do:

1. Hold the tube up on end. Drop the magnets in one at a time.
2. What do you see? Are any of the magnets "floating"?
3. Try putting the magnets in different ways. Try to find a way that makes the top two magnets float above the others.

What does it mean when the top magnets float? What does it tell you about the magnet poles of the different magnets?

Getting a Little Help From Simple Machines

This is what you will need:

- A long flat board and a short square block. They should look like this:

- About 10 feet (3 meters) of string.
- A one-pint (500 ml) plastic water bottle. The bottle will have one pint or 16 oz. (500 ml) written on the label.
- A spring scale. The scale should be marked in ounces (ml). It should go up to at least 16 ounces (500 ml).

This is what you do:

1. Tie a small loop of string around the neck of the bottle.

2. Put the hook on the scale through the loop and lift the bottle. Read the weight of the bottle on the scale. Change the water level in the bottle until the weight is 16 ounces (500 ml).

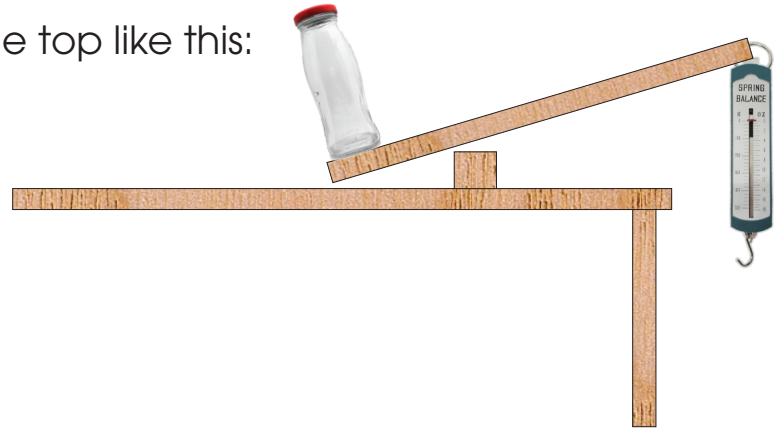
3. Making an inclined plane: Put the small block under one end of the board.

4. Lay the bottle on the low end. Hook the scale hook through the loop of string on the bottle.

5. Pull the bottle up the inclined plane.

6. Read the scale to see how much force is needed to move the bottle.

7. Making a lever: Put the board, block, bottle, and scale on a table top like this:



8. Pull down on the scale. How much force is needed to lift the bottle? Is it less than 16 ounces (500 ml)?

How the Sun Warms the Earth

When sunlight strikes the surface of the Earth, some of the energy is changed into heat energy. Light energy goes through Earth's air easily. Heat energy does not go through air as easily. Some of the heat is trapped here. This makes the Earth warmer. This is called the "greenhouse effect." Have you been to a greenhouse? It is a glass house. It works like Earth's air. Light comes in through the windows and warms the inside. The windows then trap the heat. Plants can grow inside the greenhouse that could not grow outside in the winter.

You can make a little greenhouse. This is what you will need:

- a large glass bowl
- something black, like black paper or cloth
- two thermometers (Thermometers measure temperature. Temperature measures how hot something is.)

This is what you do:

1. Go outside on a sunny day.
2. Put the black paper or cloth down and cover it with the bowl.
3. Put one thermometer inside the bowl and one outside.
4. Read the temperature on both thermometers and write down the readings.
5. Come back in an hour and read the thermometers again. Write the readings down.

This is a greenhouse you would see at a store.

What did the temperatures you read tell you? Was it hotter inside the bowl than outside? Explain.

Air is Something. (It is not Nothing.)

We walk into an empty room. We say that there is nothing in the room. This is not true. The room is filled with air. Air is something. It is matter because it has mass and takes up space. In this activity, we will see that air takes up space and that it can flow like water.

This is what you will need:

- a plastic spring water bottle (It should be very light and be able to bend easily.)
- a sink with a hot water tap
- a refrigerator

This is what you do:

1. Empty as much of the water out of the bottle as you can. (Now it is filled with just air.)
2. Fill the sink with hot water from the tap. It should be just a little deeper than the height of the bottle.
3. Take the top off the bottle and hold it in the hot water. Don't let any water get inside.
4. While the bottle is still in the hot water put the cap on tightly.
5. Put the bottle in the freezer. Leave it there for about 15 minutes.
6. Take the bottle out and look for any changes in its shape.
7. Take the cap off. Make the bottle the shape it was before you put it in the freezer.
8. Put the bottle back in the freezer with the cap off.
9. After 15 minutes, take the bottle out and quickly put the cap on.
10. Take the cap off. Right away pretend you are pouring water from it onto your hand.
11. Notice what you feel.

Cold air takes up less space than hot air. How does this explain what you saw in step 6? Cold air is heavier than hot air. How does this explain what you felt in step 11?

NAME: _____

Crossword Puzzle!

Across

1. The head of an axe is one.

5. Make one with a board and a block.

9. Not static electricity—the other kind.

11. A ramp is an _____ plane.

13. Sound _____ come from a ringing bell.

15. It has mass and takes up space.

16. Some of the Sun's energy changes into _____ energy.

Down

2. Some are positive and some are negative.

3. It keeps you from floating off into space.

4. The color of grass is an example of this.

6. This simple machine has a lever that spins all the way around.

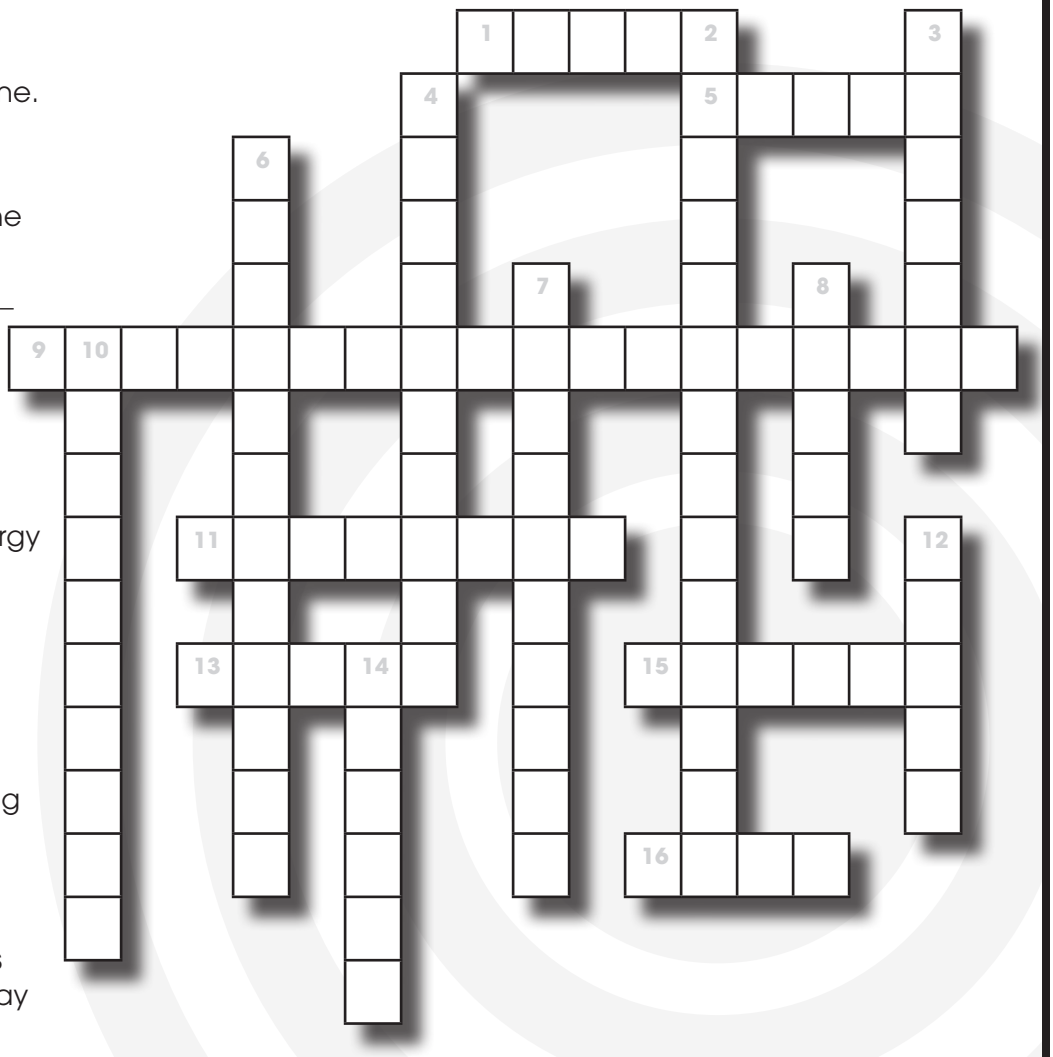
7. When light bounces, it is called a _____.

8. This simple machine is like a long ramp going in a circle.

10. The kind of force that makes something change how it is moving.

12. A push or a pull.

14. Light and heat are kinds of _____.



Word List

current electricity
electric charge
energy
force
gravity
heat
inclined
lever
matter
properties
reflection
screw
unbalanced
waves
wedge
wheel and axle

NAME: _____

Word Search

Find all of the words in the Word Search. Words are written across, up, down, on an angle, and some are even written backwards.

amplitude	heat energy	negative charge	stored
balanced	lever	particles	vapor
charge	light energy	positive	wedge
energy	magnet	properties	wheel and axle
food	mass	screw	
force	matter	sound	
gravity	motion	sound waves	

S	O	U	N	D	W	A	V	E	S	A	B	C	D	N
E	F	G	S	H	H	I	C	H	A	R	G	E	E	E
J	K	Y	E	L	E	R	E	V	E	L	M	V	N	G
O	M	G	L	T	E	N	G	A	M	P	I	Q	R	A
F	O	R	C	E	L	S	T	V	U	T	W	X	Y	T
Z	T	E	I	A	A	M	P	L	I	T	U	D	E	I
B	I	N	T	C	N	D	S	S	E	F	G	E	H	V
W	O	E	R	V	D	S	O	U	N	D	M	R	Y	E
E	N	T	A	J	A	P	K	L	M	N	A	O	T	C
R	O	H	P	M	X	P	F	E	E	Q	T	T	I	H
C	W	G	R	S	L	T	O	U	V	N	T	S	V	A
S	E	I	T	R	E	P	O	R	P	E	E	X	A	R
Y	D	L	Z	A	B	C	D	D	E	F	R	R	R	G
G	G	H	D	E	C	N	A	L	A	B	I	J	G	E
H	E	A	T	E	N	E	R	G	Y	L	M	N	O	Y

NAME: _____

Comprehension Quiz

22

Part A

Circle T if the sentence is TRUE or F if it is FALSE.

T F 1) Gravity only pulls on things sitting on the ground.

T F 2) If something is moving in a straight line without changing speed, the forces on it are balanced.

T F 3) Light is a kind of energy.

T F 4) We cannot see sound waves.

T F 5) Light travels faster than sound.

T F 6) Lightning is a kind of current electricity.

T F 7) Particles in ice can change places with each other.

7

Part B

Put a check mark (✓) next to the answer that is the most right.

a) Which two simple machines could you make with just a board and a brick?

- ○ **A** A pulley and a lever.
- ○ **B** A lever and an inclined plane.
- ○ **C** An inclined plane and a screw.
- ○ **D** A screw and a wheel and axle.

b) What do we know about the forces acting on something that is falling without changing its speed?

- ○ **A** No forces are acting on it.
- ○ **B** Only gravity is acting on it.
- ○ **C** There is no force of air resistance.
- ○ **D** The forces acting on it are balanced.

2

SUBTOTAL: /9

NAME: _____

Comprehension Quiz

Part C

Answer each question in full sentences.

1. Wavelength and amplitude have to do with waves. Explain what wavelength means. Explain what amplitude means. 2

_____

_____

_____

2. Explain two things that light can do when it meets a solid object. 2

_____

_____

_____

3. Explain what happens when a bolt of lightning jumps from a cloud to the ground. 2

_____

_____

4. Explain how a solid, a liquid, and a gas are different. Talk about particles to explain the differences. 3

_____

_____

_____

5. Explain how you would use two pulleys and a rope to lift a heavy object. 4

_____

_____

_____

SUBTOTAL: /13

1.

a) F

b) T

c) F

d) F

e) T

2.

a) C

b) B

c) A

The forces are unbalanced because the speed is changing.

1.

a) A

b) C

2.

a) unbalanced

b) gravity

c) balanced

d) sitting still

3.

a) Gravity is pulling you down. What you are sitting on is pushing up with an equal force.

b) An unbalanced force means the two forces are different. Like a force from a direction that is not the direction of motion. This can make the thing change direction. Like a change in breeze can change the way a leaf falls.

4.

1. Unbalanced – Gravity is stronger than air resistance. She is speeding up.

2. Balanced – Forces are equal. Speed stays the same.

3. Unbalanced – Air resistance is stronger than gravity. She is slowing down.

4. Balanced – Forces are equal. Her speed stays the same.

5. Unbalanced – The wind changes her direction.

6. Balanced – The force of the ground pushing up is the same as gravity. She is not moving.

1.

a) F

b) T

c) T

d) F

e) F

2.

a) D

b) A

c) D

EZ

Plants get their energy from the sun.

1.

a) T

b) F

c) T

d) F

e) T

2.

a) 4

b) 1

c) 5

d) 2

e) 3

3.

a) The drop falls. Stored energy is changed into energy of motion. The more it falls, the less stored energy it has. Energy of motion goes up as long as speed goes up.

b) Light energy comes from the Sun. It changes into heat energy when it hits the ground.

4.

a) Answers will vary, but may include: An apple falling from a tree. Gasoline making a car move.

b) Answers will vary, but may include: Lifting a book onto a shelf. Eating food and then running.

1.

a) T

b) F

c) T

d) F

e) F

f) T

g) F

h) T

2.

a) ✓ A

b) ✓ B

The drum vibrates. That makes the air vibrate. We hear the drum when the vibrations enter our ear.

1.

a) ✓ D

b) ✓ A

c) ✓ A

2.

a) sound, light

b) air

c) energy

d) vibration

3.

a) The bell vibrates. This causes the air around it to vibrate. The vibrations travel through the air and enter our ear. A little drum in our ear vibrates.

b) Light passes through a window. Light bounces off a mirror. Only yellow light bounces off the shirt.

4.

a) Water: (any body of water with waves) move up and down.

b) Sound: (any sound) You can hear it with your ears. Something is vibrating.

c) Light: (any light source) it is bright. It goes in a straight line.

1.

a) F

b) T

c) T

d) T

e) F

f) T

2.

a) electrical spark

b) push, pull

c) north pole, south pole

d) positive

e) negative

When you rub a balloon with wool, it picks up extra electrons. It now has a negative charge. It sticks because the wall has a positive charge.

1.

a) ✓ C

b) ✓ D

2.

1 E

2 C

3 A

4 B

5 D

3.

a) A cloud gets a large negative charge. A positive charge builds up in the ground under it. When electrons jump from the cloud to the ground, we see a lightning bolt.

b) North and south. A north pole and a south pole pull at each other. Two north poles or two south poles push each other away.

4.

a) Answers will vary, but may include: wool, hair

b) Yes there was force. Force is needed to keep the balloon stuck to the wall.

1.

a) ✓ C

b) ✓ C

c) ✓ D

2.

a) F

b) T

c) T

d) F

EZ

Heat the ice until it melts. Heat the liquid water until it boils.

1.

a) solid, liquid

b) mass

c) particles

d) gas

2.

a) ✓ **D**

b) ✓ **A**

c) ✓ **C**

3.

a) Matter is anything that has mass and takes up space. Mass is how much matter is in something.

b) Water vapor can change back to liquid water. Smoke and ashes can't change back to wood. Burning wood makes something new. Boiling water doesn't.

4.

Answers will vary, but may include:

a) Solid:
Hard, smooth, keeps its shape.

b) Liquid:
Clear, can change shape, wet, flows.

c) Gas:
No color, flows, can't see it.

1.

a) **F**

b) **F**

c) **T**

d) **F**

e) **T**

2.

a) ✓ **B**

b) ✓ **C**

c) ✓ **A**

A knife is a wedge.

1.

✓ **B**

2.

a) **T**

b) **T**

c) **F**

d) **F**

e) **T**

3.

a) A wedge is two inclined planes back to back.

b) A simple machine has the advantage that it increases force. A simple machine has the disadvantage that the force must be done over a long distance.

4.

Drawings will vary.

Across

1. wedge

5. lever

9. current electricity

11. inclined

13. waves

15. matter

16. heat

Down

2. electric charge

3. gravity

4. properties

6. wheel and axle

7. reflection

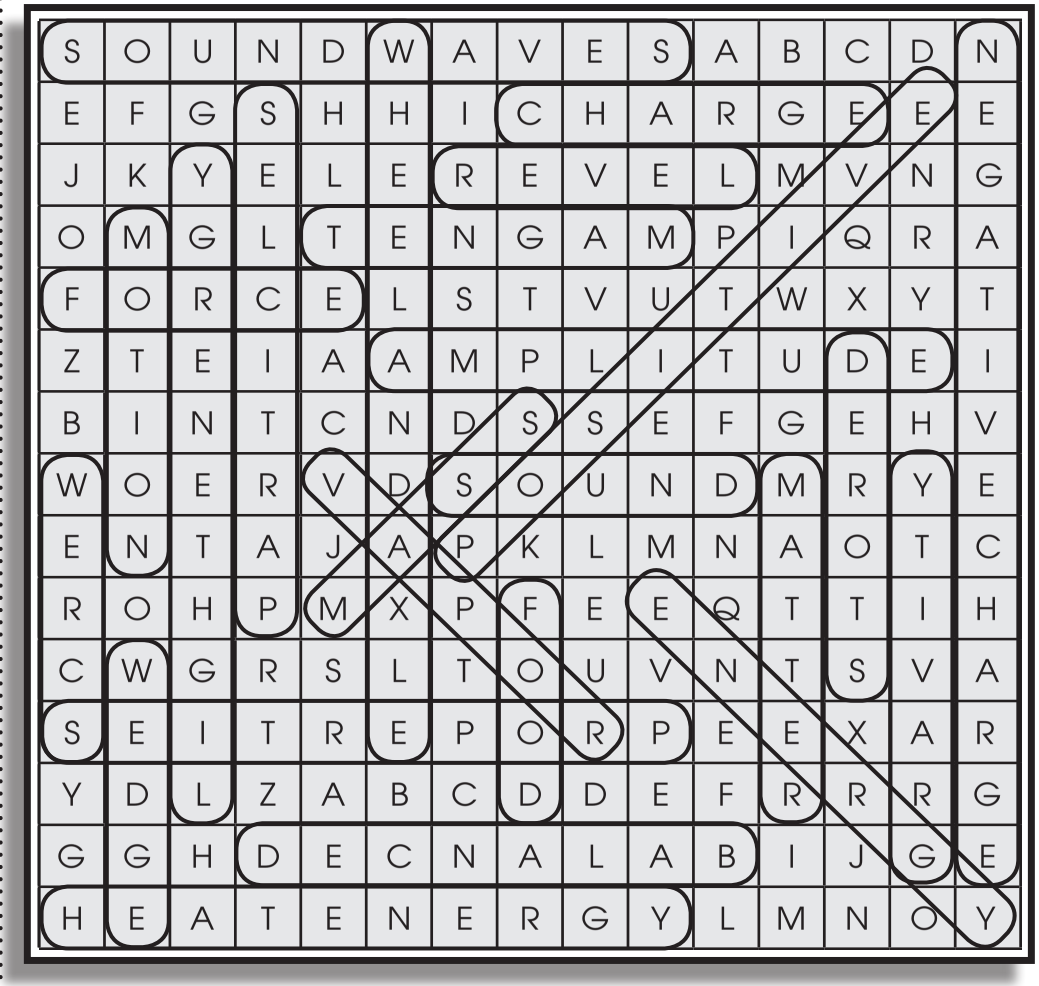
8. screw

10. unbalanced

12. force

14. energy

Word Search Answers



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G	G	H	D	E	C	N	A	L	A	B	I	J	G	E
H	E	A	T	E	N	E	R	G	Y	L	M	N	O	Y

Part A

1) F

2) T

3) T

4) T

5) T

6) F

7) F

Part B

a) B

b) D

EZV

Part C

1. Wavelength is the distance between waves. Amplitude is the height of a wave.

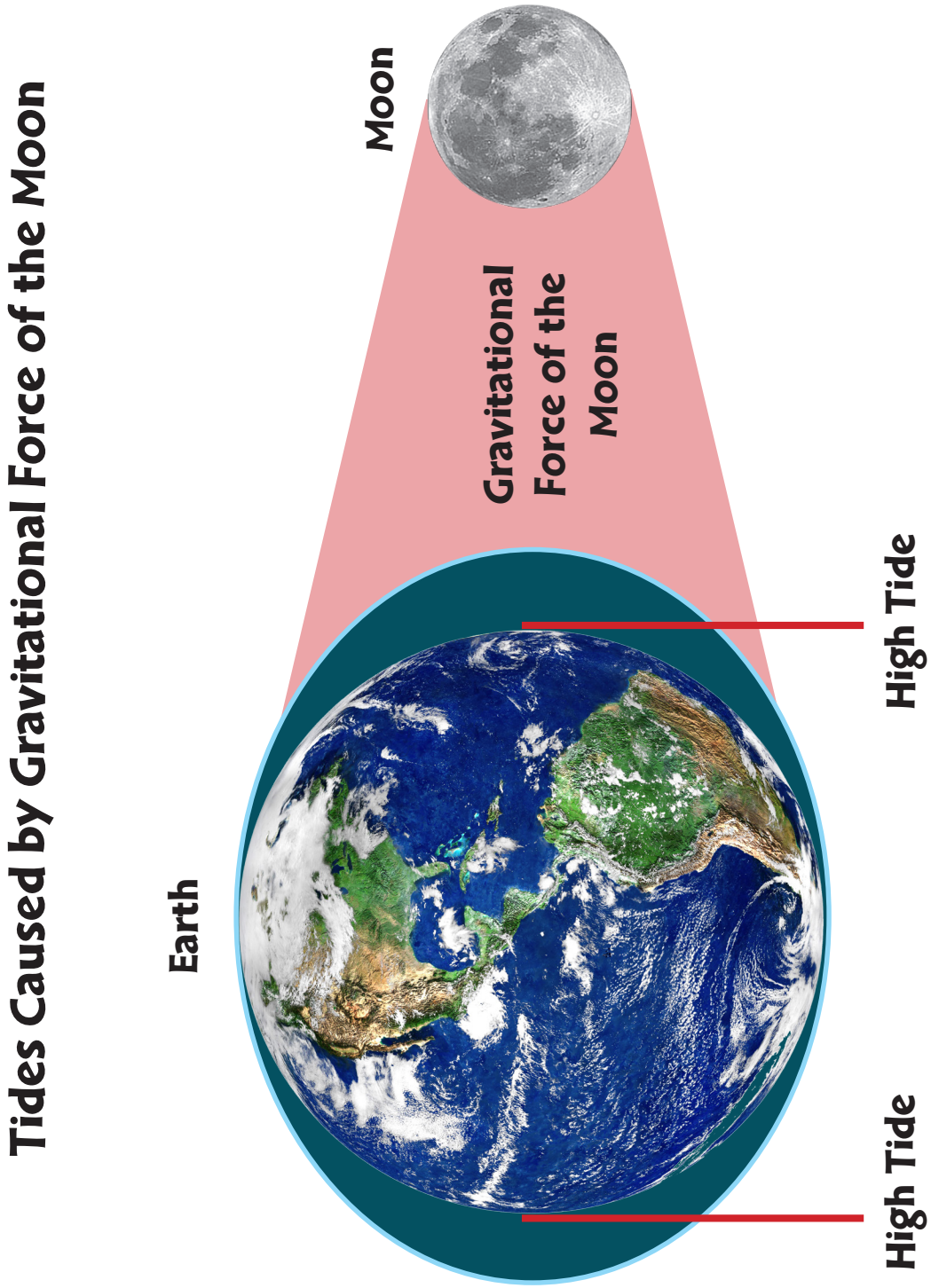
2. Answers will vary, but may include: Light can pass through the object. Light can bounce off (be reflected by) the object.

3. Electrons go from the cloud to the ground.

4. A solid has particles close together that can't move around. A liquid has particles close together that can move around. A gas has particles far apart that can move around.

5. Attach one pulley to the object and the other to the ceiling. Tie the rope to the upper pulley. Pass the rope around the lower pulley and up over the upper pulley. Let the rope hang down and pull down on it.

Gravity and Tides



Coal Formation Timeline

300 million years ago

Plants died in swamps.

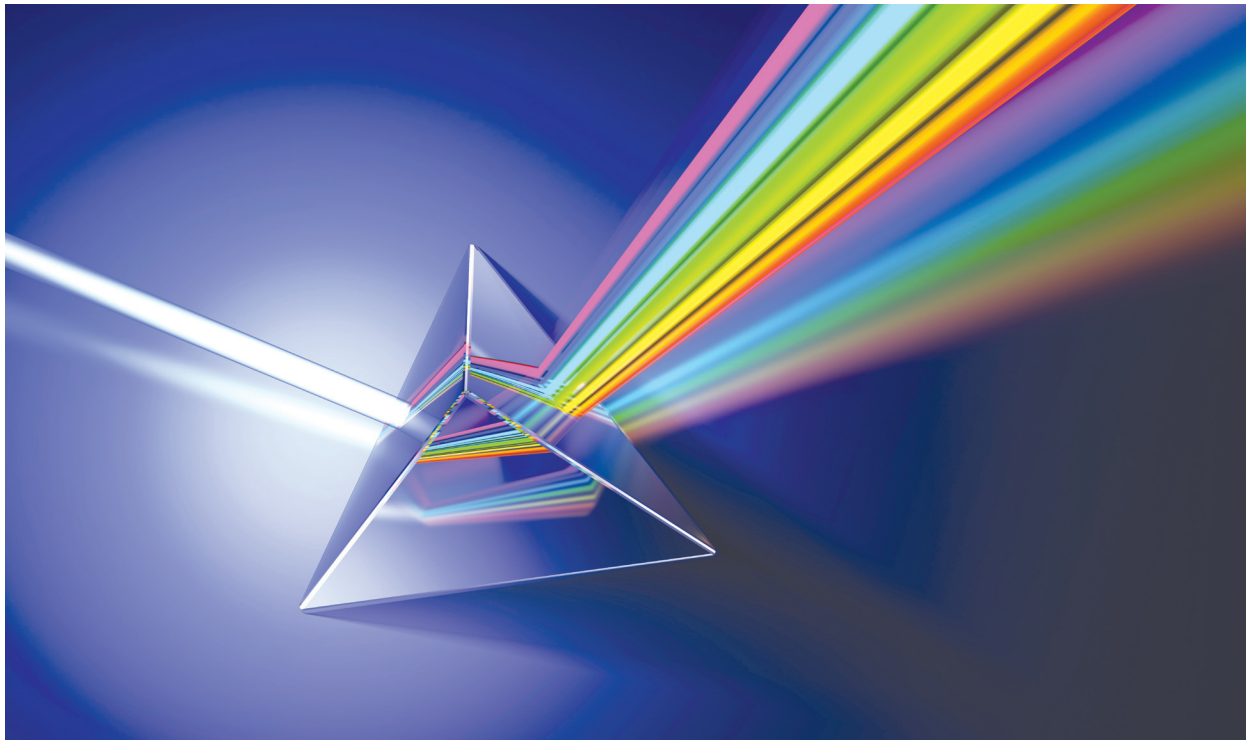
100 million years ago

Plants were covered by water and dirt.

Over millions of years

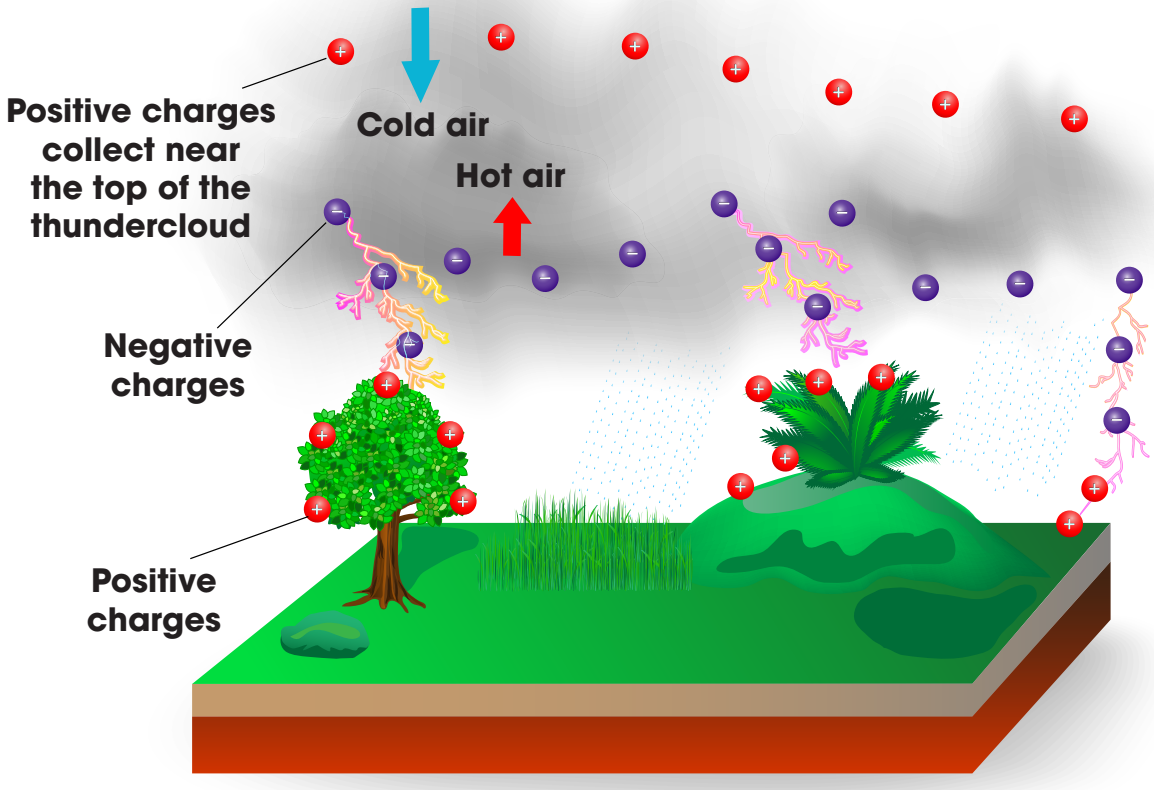
Heat and weight turned plants into coal.

Lights and Prisms

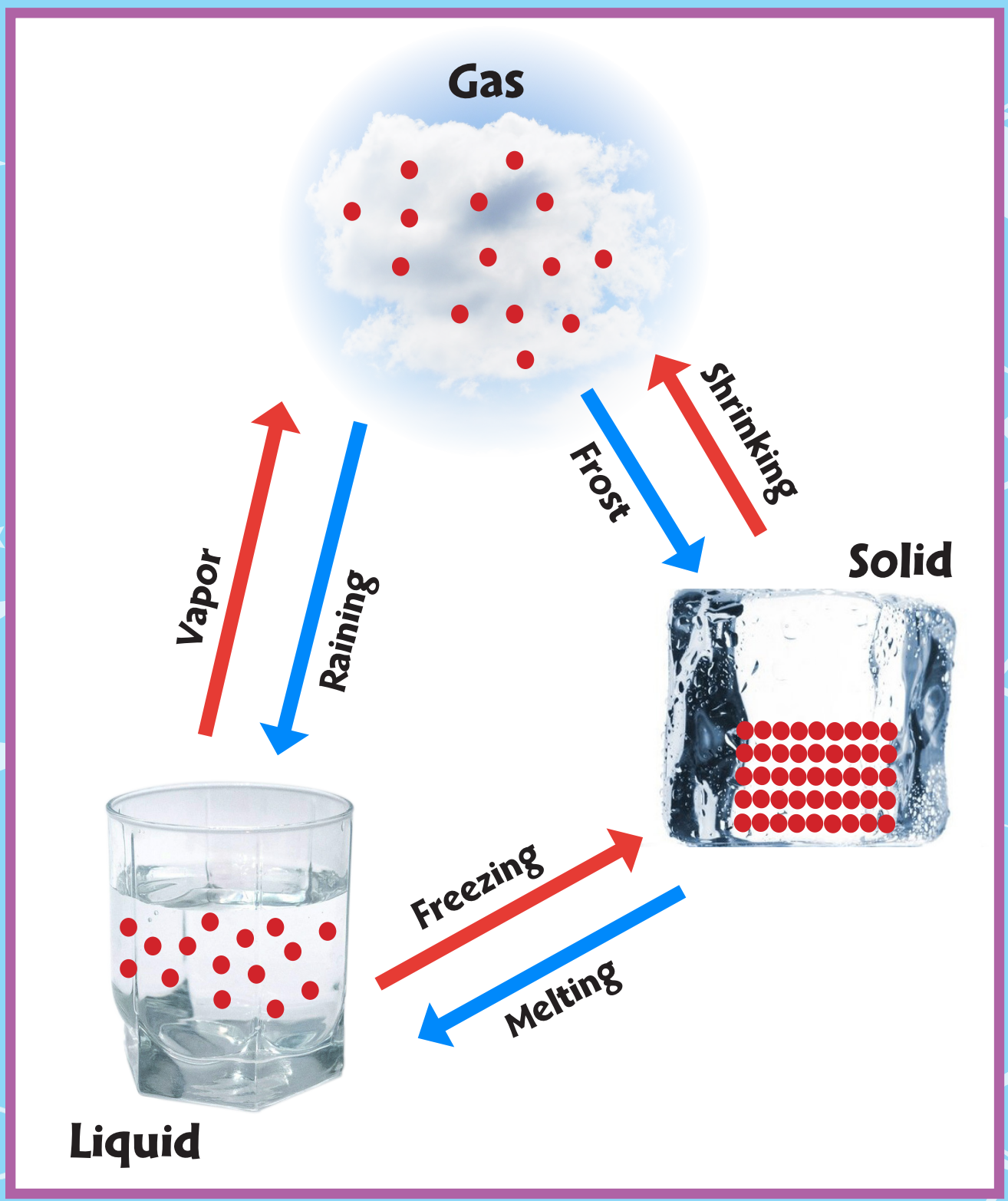


How Lightning Works

How Lightning is Formed

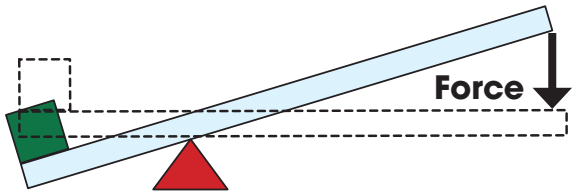


Solid, Liquid, Gas

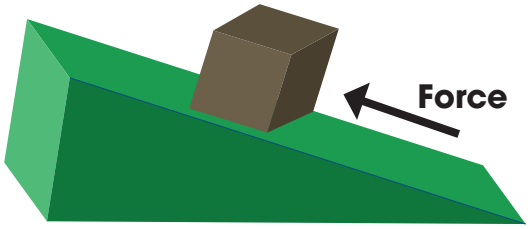


The Six Simple Machines

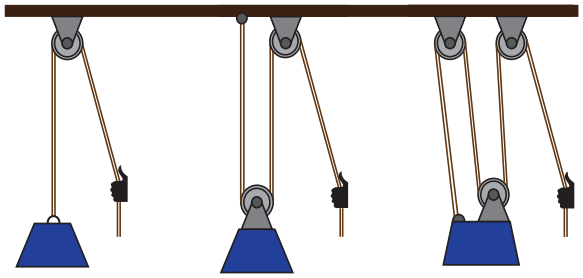
LEVER



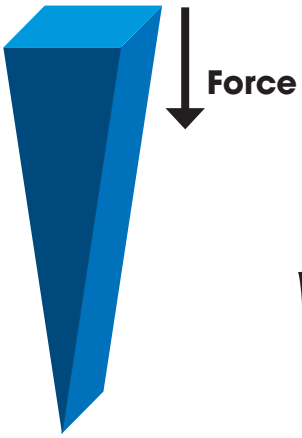
INCLINED PLANE



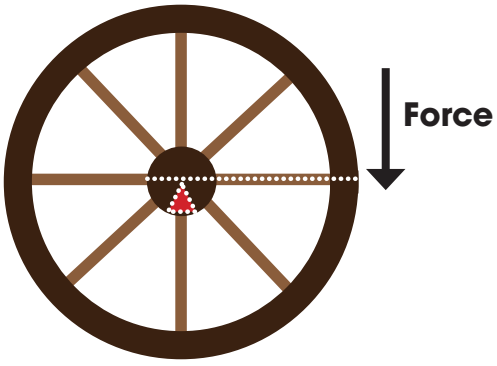
PULLEYS



WEDGE



WHEEL and AXLE



SCREW

Ridges →
(Inclined plane wrapped around.)