Instruction For Copying

Answers are printed in non-reproducible blue. Copy pages on a light setting in order to make multiple copies for classroom use.
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### PHYSICAL SCIENCE

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Dear Parent or Guardian,

Today our science class talked about how to work safely when doing laboratory experiments. It is important that you be informed regarding the school’s effort to promote a safe environment for students participating in laboratory activities. Please review the safety rules and this entire Safety Contract with your child. This contract must be signed by both you and your child in order for your child to participate in laboratory activities.

**Safety Rules:**

1. Listen carefully and follow directions.
2. Perform only those experiments approved by your teacher. If you are not sure about something, ask your teacher.
3. Take great care when handling and moving chemicals and hot materials.
4. Conduct yourself in a responsible manner at all times.
5. Always clean up after you have finished an experiment.
6. Always wash your hands before and after an experiment.
7. Do not eat, drink, or chew gum in the laboratory.

Date: ______________

I have read and reviewed the science safety rules with my child. I consent to my child’s participation in science laboratory activities in a classroom environment where these rules are enforced.

Parent/Guardian signature: ______________

I know that it is important to work safely in science class. I understand the rules and will follow them.

Student signature: ______________


Estimados padres o tutor:

Hoy hemos hablado en nuestra clase de Ciencias sobre cómo mantener la seguridad al realizar experimentos científicos. Es importante que ustedes estén informados del propósito de la escuela de promover un entorno seguro para los estudiantes que participan en las prácticas de laboratorio. Por favor, examinen cuidadosamente con su niño o niña las reglas siguientes y el Acuerdo de Seguridad. El acuerdo debe ser firmado tanto por uno de ustedes como por su niño o niña para que él o ella pueda participar en las actividades de laboratorio.

**Reglas de Seguridad:**

1. Escucha con atención y sigue las indicaciones.
2. Haz sólo los experimentos aprobados por tu maestro o maestra. Pregúntale a él o a ella si no estás seguro de algo.
3. Ejercita sumo cuidado al manipular y transportar productos químicos y materiales calientes.
4. Compórtate en todo momento de manera responsable.
5. No te olvides de limpiar cuando termines de realizar un experimento.
6. Lávate siempre las manos antes y después de hacer un experimento.
7. No comas, bebas ni mastiques chicle en el laboratorio.

Fecha: ________________

He leído y examinado las reglas de seguridad de ciencias con mi niño o niña. Doy mi consentimiento para su participación en las actividades del laboratorio de ciencias en un entorno donde se hagan cumplir estas reglas.

Firma de uno de los padres o tutor: ________________

Sé la importancia que tiene trabajar con seguridad en la clase de Ciencias. Comprendo las reglas y me comprometo a seguirlas.

Firma del estudiante: ________________
What do you know about animals that live in Madagascar?

Meet two scientists who are curious about the natural world and everything that lives in it. Chris Raxworthy and Paule Razafimahatratra study animals that live in Madagascar. They work at the American Museum of Natural History in New York City and at the University of Antananarivo in Madagascar.

Use the text in your book to help you answer the questions below.

1. How would you look for animals in their natural habitat?

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

2. What kinds of animals would you see in the forest?

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

3. What does an animal need to live in the forest?

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

4. How do scientists find answers to these questions?

   ________________________________________________________________
   ________________________________________________________________
Draw Conclusions

5. What do scientists do?

6. How do scientists test a hypothesis?

Explore More

How do scientists draw conclusions?

Open Inquiry

Think of your own question about why animals live in different places and different forests. Make a plan and carry out an experiment to answer your question.

My question is: ________________________________

How I can test it: ______________________________

My results are: ________________________________
What do you know about studying animals?

Procedure

1. Explore more about animals by identifying the animals that live in your neighborhood and using reference materials to research facts about them. Then answer these questions.

2. What kinds of animals, besides pets, live in your neighborhood?

3. Where do these animals find food, water, and shelter?

4. Suppose you wanted to learn more about one of these animals. What would you do?

5. Imagine you were going with Chris and Paule to a forest in Madagascar to study animals. What things would you bring?

Materials

• reference materials such as an encyclopedia or the Internet
What are some plant parts?

Purpose
Find out about the characteristics of plants.

Procedure

1. **Observe**  Look carefully at each plant. Use a hand lens to see each part clearly.

2. **Observe**  How do the plants’ leaves compare? Describe the leaves using words and pictures.

3. **Infer**  Run your finger over a leaf to feel the raised areas. These are the leaf veins. How do you think leaf veins help plants? Clue: How do your own veins help you?

4. **Observe**  Look at the roots on each plant using a hand lens. Root hairs grow from the roots. Describe the roots and root hairs using words and pictures.

5. **Observe**  Look at the stems on each plant. Draw how they look on the outside. Carefully cut the stems. Look at each stem on the inside. Draw how the stems look on the inside.

Materials
- hand lens
- scissors
- 3 plants
Draw Conclusions

6 Infer What parts do most plants have?

7 How are plants alike? How are they different?

Explore More

Communicate Research to learn how leaves, roots, and stems help a plant survive. Do all plants have these parts? Write a short report to present to your class.

Open Inquiry

Design additional activities to find out what plants need to grow.

My question is: ______________________________________________________________________

__________________________________________________________________________________

How I can test it: ____________________________________________________________________

__________________________________________________________________________________

My results are: _____________________________________________________________________

__________________________________________________________________________________
How do leaves help plants?

Purpose
In this activity you will observe various types of leaves and compare their characteristics.

Procedure
1. Observe Use the hand lens to look at several different kinds of leaves.

2. Communicate Record your observations in the chart below.

<table>
<thead>
<tr>
<th>Type of Leaf</th>
<th>Leaf Shape</th>
<th>Leaf Size</th>
<th>Leaf Color</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

3. Infer How do you think the different leaves help plants?

________________________________________

________________________________________

Draw Conclusions

4. Communicate What characteristics do all of the leaves have in common?

________________________________________

________________________________________

Materials
- various leaves
- hand lens

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Observe Stems

1. Get a stalk of celery with leaves on it. Carefully cut two inches off of the bottom. 🌿

2. Half fill a plastic jar with water. Then add five drops of food coloring to the water. Mix the water with a spoon.

3. **Observe** Place the celery into the jar. Observe the celery stalk a few times throughout the day. What do you notice?

4. **Communicate** How has your celery stalk changed? Draw a picture. Write a description.

5. **Infer** What do stems do?
Structured Inquiry
What do plants need to survive?

Form a Hypothesis
Do plants need light to grow? Do they need water? Write a hypothesis. Start with, “If plants do not get light and water, then . . . .”

Test Your Hypothesis
1. Label 4 identical plants as shown.
2. Observe How do the plants look? How tall are they? Measure them and record your observations in a chart. Use words and pictures.
3. Put the plants labeled *No Light* in a dark place, such as a closet. Put the plants labeled *Light* in a sunny place, such as on a windowsill.
4. Predict What do you think will happen to each plant? Record your predictions.

Materials
- 4 identical plants
- measuring cup and water
- ruler
5 Observe Look at the plants every other day. Water each plant labeled Water with 200 mL of water. Measure how tall the plants grow. Record your observations in your chart using words and pictures.

Draw Conclusions

6 Interpret Data Which plant grew the most after two weeks? Which plant looks the healthiest? Use your chart to help you.

7 What do plants need to survive?
Guided Inquiry

What else do land plants need to survive?

Form a Hypothesis
Do plants need air? Do they need soil? Write a hypothesis about one of these.

Test Your Hypothesis
Design an experiment to test your hypothesis. Decide which of the materials below you will use. Write the steps you will follow on a separate piece of paper.

- two identical plants
- petroleum jelly
- measuring cup
- water
- soil

Draw Conclusions
Did your results support your hypothesis? Why or why not? Share your results with your classmates.
Open Inquiry
What other questions do you have about plants and their needs? Talk with your classmates about questions you have. Choose one question to investigate. How might you answer this question? Write the steps you will need to follow. Then try it!

My question is: ________________________________________________________________

____________________________________________________________________________

How I can test it: ______________________________________________________________

____________________________________________________________________________

My results are: _______________________________________________________________

____________________________________________________________________________
How do an animal’s structures help it meet its needs?

Purpose
Observe a snail to learn about its structures.

Procedure
1. **Observe**  Look at the snail using a hand lens. What parts does it have? Handle animals with care.
2. Draw the snail. Label all the parts you can.
3. **Predict**  Which parts help the snail move? Which parts help it get food or stay safe?
4. **Experiment**  Gently touch the snail with a cotton swab. Observe the snail’s actions for a few minutes. Record what you see.
5. **Experiment**  Place a wet paper towel in the container. Record the snail’s actions. Now repeat this step using a lettuce leaf.

Materials
- snail
- cotton swab
- clear plastic container
- paper towel
- lettuce leaf
**Draw Conclusions**

6 **Communicate** On your drawing, circle the parts that the snail used to move and to eat—if it ate. Describe how it responded to its environment.

[Blank space]

7 **Infer** Think about other animals you have seen, such as hamsters, birds, and fish. Do they have the same parts as the snail? Which parts do they use to meet their needs?

[Blank space]

**Explore More**

**Experiment** Does the snail respond to light and dark? Make a plan and find out.

[Blank space]

**Open Inquiry**

Design an activity to determine how a snail responds to another type of stimulus.

My question is: ____________________________

[Blank space]

How I can test it: ____________________________

[Blank space]

My results are: _____________________________
How will a sow bug respond to its environment?

Make a Prediction
Look at a sow bug and predict how it will respond to a change in its environment.

Procedure

1. **Observe** Use the hand lens to look at the sow bug. What does it look like? What parts does it have?

2. **Predict** What do you think will happen if you touch the sow bug with the tip of a cotton swab?

3. **Experiment** Gently touch the sow bug with the tip of a cotton swab.

4. **Communicate** Describe what happened to the sow bug when you touched it with the cotton swab. Was your prediction correct?
Observe Skin Structures

1. **Infer** Use a hand lens to observe your skin. Do you see pores, or tiny holes? What function do you think they perform?

2. **Observe** Use the hand lens to look at other features of your skin. Look where the soft skin of your finger meets your fingernail. This is the cuticle. Draw what you see.

3. **Infer** Make a data table to list each structure that you see. Describe how the structures help you meet your needs. Include the following: pore, hair follicle, fingernail, vein, and cuticle.

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Purpose</th>
</tr>
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<tbody>
<tr>
<td>pore</td>
<td></td>
</tr>
<tr>
<td>hair follicle</td>
<td></td>
</tr>
<tr>
<td>fingernail</td>
<td></td>
</tr>
<tr>
<td>vein</td>
<td></td>
</tr>
<tr>
<td>cuticle</td>
<td></td>
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</tbody>
</table>
Classify

Earth is a big place. Millions of living things find homes in many different environments around our planet. With so many living things and so many environments, what can scientists do to understand life in our world? One thing they do is classify living things.

Learn It

When you classify, you put things into groups that are alike. Classifying is a useful tool for organizing and analyzing things. It is easier to study a few groups of things that are alike than millions of individual things.
Try It

Scientists classify animals by their parts, or structures. Can you?

1. To start, observe the animals shown on page 47 of your student textbook. Look for structures they have in common.

2. Then come up with a rule. What characteristic can you use to group the animals? Let’s try wings. Which animals have wings? Which animals do not? Make a table to show your groups.

<table>
<thead>
<tr>
<th>Wings</th>
<th>No Wings</th>
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<tbody>
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</table>
Apply It
Classify these animals using your own rule. Compare your classification with your classmates’. Then conduct research to find out how scientists classify these animals.

fish  eagle  frog

dog  chameleon  butterfly

bear  wild sheep  snake

squirrel  tiger  dragonfly
How do living and non-living things differ?

Purpose
Find out some characteristics of living and non-living things.

Procedure
1. Predict How are all living things alike? How are non-living things alike?

2. Make a table on a separate piece of paper. Label the columns *Living Things* and *Non-living Things*.

3. Place 4 pieces of string outside on the ground so that they form a square.

4. Observe Look for living things in your square area. List them in your table. Tell how you know they are living. Do the same with non-living things that you see.
Draw Conclusions

5 Interpret Data  What characteristics do the living things share? Which do the non-living things share?

6 Trade tables with a partner. Do the things on your partner’s table share the same characteristics as yours?

7 Infer  How are living things different from non-living things?

Explore More

Experiment  Does the amount of sunlight affect how many living things are in an area? How could you test this?

Open Inquiry

Design additional activities to differentiate between living and nonliving things.

My question is: ____________________________________________

How I can test it: ____________________________________________

My results are: ____________________________________________
Is a shell alive?

Purpose
In this activity, you will look at shells to find out if they are alive.

Procedure

1. **Observe** Use the hand lens to look at at least two different shells.

2. **Communicate** In the space below, draw two of the shells you observed.

3. **Communicate** List the characteristics of the shells you observed.

   ______________________________________________________

   ______________________________________________________

Draw Conclusions

4. **Infer** Do you think that shells are alive? Why or why not?

   ______________________________________________________

   ______________________________________________________

Materials

- assorted shells
- hand lens
- crayons
Musical Chairs

1. Play a game of musical chairs.

2. **Experiment** Change the number of chairs you use. How does this affect the game? Record your observations.

3. What do the players compete for in musical chairs?

4. **Infer** How is the competition in the game like competition in a real environment?

5. **Communicate** Share your thoughts with your classmates. What other examples of competition can you think of?
Structured Inquiry

How do trees compete for resources in a forest?

Form a Hypothesis

Trees in the forests of Tennessee can grow as high as 58 meters (about 190 feet). The trees’ branches spread wide to form the top layer of the forest. This top layer is called the canopy. How does the thickness of the canopy affect the amount of light that reaches the smaller trees and other plants? Write a hypothesis. Begin with, “If the forest canopy is thick, then . . . .”

Test Your Hypothesis

1. **Make a Model**  Use 6 sheets of brown paper to create 6 tubes of different heights. These model tree trunks.

2. Draw 3 circles with a diameter of about 8 cm on green paper. Draw 3 more circles with 4-cm diameters. Cut out the circles. These represent tree branches.

3. **Use Variables**  Tape the circles to the tree trunks. Arrange the trees on a piece of cardboard so that the trees are close to each other and form a thick canopy.

Materials

- brown and green construction paper
- masking tape
- ruler
- scissors
- cardboard
- lamp

GLE 0307.2.2
**4 Experiment** Shine a lamp down onto your forest. How much light reaches the forest floor? Record your observations.

__________________________

__________________________

**5 Use Variables** Repeat steps 3 and 4 several times. Vary the thickness of the canopy by placing the trees closer together or farther apart.

**Draw Conclusions**

**6** How does the thickness of the canopy affect the amount of light that reaches the forest floor?

__________________________

__________________________

**7 Infer** How do trees affect plants that grow on the forest floor?

__________________________

__________________________
Guided Inquiry

How do trees affect rainwater?

Form a Hypothesis
Does the canopy affect the amount of water that reaches the forest floor? Write a hypothesis.

Test Your Hypothesis
Design an experiment to see if the canopy affects the water that reaches the forest floor. Decide on the tools you will need to plan your investigation. Then write the steps you will follow. Record your results and observations.

My question is: ________________________________

____________________________________________

How I can test it: ______________________________

____________________________________________

____________________________________________

My results are: ________________________________

____________________________________________

Draw Conclusions
Did your experiment support your hypothesis? Why or why not?

____________________________________________

____________________________________________
Open Inquiry
What else would you like to learn about rain forests? For example, what happens to plants on the ground if a tree is cut down? Design an experiment to find out about new questions you have.

My question is: ____________________________________________________________

How I can test it: __________________________________________________________

My results are: ____________________________________________________________

Remember to follow the steps of the scientific process.
What kind of food do owls need?

Purpose
Find out what an owl eats by studying an owl pellet.

Procedure
1. Work with a partner. Put on plastic gloves. Place your owl pellet onto a paper plate.

2. **Predict** What do you expect to see inside the owl pellet? Write your prediction.

3. Using the tweezers, separate the objects in the owl pellet.

4. **Observe** What is in the owl pellet? Use the hand lens. Record your observations. ▲ Be Careful! Wash your hands when you are done.

Materials
- plastic gloves
- paper plate
- owl pellet
- tweezers
- hand lens
**Draw Conclusions**

5 **Interpret Data** What do the materials inside the owl pellet tell you about what an owl eats?

____________________________________________________________________________________

____________________________________________________________________________________

6 **Infer** What organisms might an owl eat? What might those organisms eat?

____________________________________________________________________________________

____________________________________________________________________________________

**Explore More**

**Interpret Data** Keep track of the things you eat in one day. Do most of your foods come from plants or animals?

____________________________________________________________________________________

**Open Inquiry**

How do the diets of animals vary depending on the type of animal and where the animal lives? Think of your own question about the diet of animals. Make a plan and carry out an experiment to answer your question.

My question is: ______________________________________________________________________

____________________________________________________________________________________

How I can test it: _____________________________________________________________________

____________________________________________________________________________________

My results are: ______________________________________________________________________

____________________________________________________________________________________
Where do the foods in your cafeteria come from?

Make a Prediction
Humans are omnivores, which means that they eat foods that come from both plants and animals. Predict: Where do the foods you eat in the cafeteria come from?

Draw Conclusions

1. Research  Take a look at your school’s cafeteria menu. List the foods. Next to each item, write where you think that food came from.

2. Draw Conclusions  Where did most of the cafeteria foods come from?

3. Think Critically  Plants get their energy from the Sun. Where do the animals you eat get energy?

Materials
• school cafeteria menu
Quick Lab

Name _______________________ Date __________

Observe Animal and Plant Structures

1. Look for photos of animals and plants in magazines or on the Internet.

2. Infer. Look at each organism's structures. How do the structures help it get food?

3. Use research materials to learn the names of each structure.

4. Communicate. Make a data table. Show how the different organisms use their structures to get food.

<table>
<thead>
<tr>
<th>Organism</th>
<th>Structure</th>
<th>How Structure Helps Organism Get Food</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
What does a seed need to grow?

Form a Hypothesis
Do seeds need water to grow? Form a hypothesis. Start with “If seeds do not get water, then . . . ”.

Test Your Hypothesis

1 **Observe** Look at the seeds with a hand lens. Draw what you see.

2 **Use Variables** Fold each paper towel into quarters. Then put two tablespoons of water onto one towel. Put the wet towel into a plastic bag. Label the bag Water. Put the dry towel into a bag. Label this bag No Water.

3 Place three seeds into each bag. Seal the bags and place them in a warm spot.

4 **Observe** Look at the seeds every day for a week. Record what you see with pictures and words. If the paper towel in the Water bag feels dry, add two tablespoons of water.

**Materials**

- 6 seeds
- 2 paper towels
- tablespoon
- hand lens
- water
- 2 plastic bags
Draw Conclusions

5 Interpret Data Which seeds changed? How did they change?

6 Infer Why do you think the seeds changed?

7 Did your results support your hypothesis?

Explore More

Experiment What would happen if you wet the paper towel with something other than water? Experiment to find out.

Open Inquiry

What other things do you think seeds need to sprout? Think of a question about what seeds need. Make a plan and carry out an experiment to answer your question.

My question is: 

How I can test it: 

My results are: 

What else do seeds need in order to grow?

Make a Prediction

Besides water, predict what a seed will need in order to start growing.

Test Your Prediction

1 Research Use your research materials to find instructions for growing three different types of plants. According to your research, what does a seed need in order to grow?

Draw Conclusions

2 How good was your prediction?

3 Think Critically Which conditions were required for some seeds but not for others? Why do you think this is so?
Fruits and Seeds

1. **Observe** Look at the fruits from three different plants. Compare their shapes and sizes.

2. Carefully cut open the fruits. How do their parts compare? Do they all have a peel or skin? Do they all have seeds?

3. **Observe** Look at the seeds from each fruit. Compare the location of the seeds in each fruit.

4. **Infer** What do all fruits have in common? How might fruits help seeds survive and grow?

**Materials**
- fruit from 3 different plants
Form a Hypothesis

You just learned how seeds grow into plants. Can seeds grow when the weather is cold? To answer questions like this, scientists start with what they know about plants. Then they use this information to turn their question into a testable statement. That is, they **form a hypothesis**.

Learn It

When you **form a hypothesis**, you make a statement that you can test by collecting data. Suppose you want to find out if plants need sunlight. Based on what you know, you could form a hypothesis like this: If plants do not get sunlight, then they will not grow.

A good hypothesis needs to be testable. You could test this statement by placing one plant in the dark and one in sunlight. Then you could observe and record what happens. A hypothesis also needs to identify the variables. In the example above, sunlight and plant growth are variables.
Try It

Form a hypothesis about what seeds need to grow. Then test that hypothesis with an experiment.

1. Think about what you know about seeds. Now form a hypothesis about this question: Will pea seeds germinate more quickly or slowly in a cold spot or in a warm spot? Begin with “If I plant a pea seed in the cold, then...”

2. Fold two wet paper towels in half and place three seeds onto each. Place each paper towel into a plastic bag and seal the bags.

3. Place one bag into a foam cup filled with ice. Place the other into an empty cup.

Materials

- water
- 2 paper towels
- 6 pea seeds
- 2 sealable plastic bags
- 2 foam cups
- ice
4 Make a chart like the one below. Use it to record your hypothesis and observations. Do your results support your hypothesis?

<table>
<thead>
<tr>
<th>Step</th>
<th>Cold</th>
<th>Warm</th>
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</thead>
<tbody>
<tr>
<td>Day 1</td>
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<td>Day 2</td>
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<td>Day 3</td>
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<tr>
<td>Day 4</td>
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</table>

**Apply It**

Now that you have learned to think like a scientist, you can answer other questions. Do seeds germinate more quickly in the light or dark? **Form a hypothesis** that answers this question. Then plan an experiment to test your hypothesis. Record all observations using pictures and words. Keep your observations in a science notebook.
How does a mealworm grow and change?

Make a Prediction
How does a mealworm change as it grows? Write a prediction.

Test Your Prediction

1. **Observe** Choose a mealworm from the terrarium. Look at it closely using a hand lens. Draw a picture of it, and then label its parts. ▲ Be Careful! Handle animals with care.

2. **Measure** Find the length of your mealworm. Record its length on your drawing.

3. Put your mealworm into the terrarium.

4. **Observe** Once a day, observe your mealworm and draw a picture of it. Label any changes you observe.

Materials
- mealworm
- ruler
- hand lens
- terrarium
- bran meal
**Draw Conclusions**

**5 Interpret Data** What small changes did the mealworm go through? What big changes did you observe?

-------------------------------------------------------------------------------------------------------------------

-------------------------------------------------------------------------------------------------------------------

**6 Infer** What are the stages in a mealworm’s life cycle?

-------------------------------------------------------------------------------------------------------------------

**Explore More**
Continue to watch your mealworm over the next few weeks. Once or twice a week, observe your mealworm and draw a picture of it. Be sure to include the date of your observation. Use your drawings to create a timeline. Show the changes that occur during a mealworm’s life cycle.

**Open Inquiry**
Explore another animal’s growth. Think of a question about animal growth. Make a plan and carry out an experiment to answer the question.

My question is: ____________________________________________________________

-------------------------------------------------------------------------------------------------------------------

How I can test it: ___________________________________________________________

-------------------------------------------------------------------------------------------------------------------

My results are: ___________________________________________________________
How do pets change as they grow?

Make a Prediction
Humans take care of many animals as pets. These animals live with us as they grow. How do the animals we choose as pets change as they grow older from birth to adulthood?

Draw Conclusions
1. Examine pictures of one or more animals that your classmates have as pets. Put the pictures of one animal in order from youngest to oldest. Describe some of the changes you see.

2. Was your prediction correct? What did you notice in the pictures that surprised you?
A Bird’s Life Cycle

1. **Observe** Look at these three photos. Put them in order to show the life cycle of a chicken.

2. **Communicate** Describe a chicken’s life cycle. How does a chicken change as it grows?

3. **Compare** How is the life cycle of a chicken similar to the turtle’s? How does it differ?
Which characteristics are passed on from parents to their young?

Make a Prediction
Which of your characteristics are inherited, or passed on, from your parents? Is your hair color or hair length inherited? Write a prediction.

Test Your Prediction

1. **Communicate** Make a data table like the one shown. Use your table to describe your traits.

2. **Classify** Some characteristics have changed since you were little. Others have not changed. Circle the characteristics that have not changed.

<table>
<thead>
<tr>
<th>Characteristic Name</th>
<th>Characteristic Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hair Color</td>
<td></td>
</tr>
<tr>
<td>Hair Length</td>
<td>long/short (circle one)</td>
</tr>
<tr>
<td>Dimples</td>
<td>yes/no (circle one)</td>
</tr>
<tr>
<td>Ear Lobes</td>
<td>attached/unattached (circle one)</td>
</tr>
<tr>
<td>Favorite Food</td>
<td></td>
</tr>
</tbody>
</table>

Draw Conclusions

3. Compare tables with your classmates. Which characteristics did most students classify as characteristics that stay the same?
4 Infer Some of your characteristics are inherited from your parents. Underline the characteristics that you think you inherited. Explain why you chose those traits.


Explore More
Make a table that has a column for each member of your family. Which characteristics do you share with your family members?


Open Inquiry
Think of a question about inherited and learned characteristics. Make a plan and carry out an experiment to answer your question.

My question is: _____________________________

________________________________________________________________________

How I can test it: __________________________

________________________________________________________________________

My results are: ___________________________

________________________________________________________________________
What characteristics do people have?

Make a Prediction
Take a moment to think about the characteristics that make you similar to or different from your classmates. Then predict how your characteristics will differ from others’ characteristics in your class. First, list some of your characteristics that you think will be different from your classmates.

Test Your Prediction
1. Take a few moments to look around and examine your classmates’ characteristics. Which characteristics do you notice that you did not list above?

Draw Conclusions
2. How are the characteristics that you noticed different among your classmates? How are their characteristics different from your characteristics? What characteristics do you think might be different that you cannot easily observe?
Inherited Traits

1. **Observe** Look at the photo of the family on page 103 of your textbook. How are these people all alike? How do they differ?

2. **Communicate** Compare the children to their mother. Discuss which of their traits are similar to their mother’s traits.

3. **Communicate** Compare the children to their father. Discuss which of their traits are similar to their father’s traits.

4. **Infer** Why do organisms look similar to, but not exactly like, their parents?
Can ocean animals live and grow in fresh water?

Make a Prediction

Can brine shrimp grow in both fresh water and salt water? Write a prediction.

Test Your Prediction

1. Fill each jar with 480 mL of water. Put two tablespoons of sea salt in one jar. Label it *Salt Water*. Label the other jar *Fresh Water*.

2. Add one teaspoon of brine shrimp eggs to each jar.

3. Observe Watch what develops in each jar over the next few days. Use a hand lens.

Materials

- 2 jars
- measuring cup and water
- sea salt
- measuring spoon
- brine shrimp eggs
- hand lens

Step 1
Draw Conclusions

4 Interpret Data In which jar did the brine shrimp eggs hatch? How could you tell?

5 Infer Can all ocean animals live and grow in fresh water? How do you know?

Explore More

Experiment Does temperature affect the hatching of brine shrimp eggs? Design an experiment to find out.

Open Inquiry

How would the type of water used for watering a plant affect the plant’s growth? Think of your own question about plants and how they grow. Make a plan and carry out an experiment to answer your question.

My question is: ____________________________

How I can test it: ____________________________

My results are: ____________________________
How are desert and forest plants different?

Make a Prediction

Plants and animals have different characteristics that allow them to live in different types of environments. Predict which characteristics allow cactus plants and fern plants to live in different ecosystems.

Materials

- cactus plant
- fern plant

Draw Conclusions

1. Observe Look at the cactus plant and the fern plant side by side. How are their stems and leaves different?

2. How do you think these features are helpful in a desert or forest environment?
Quick Lab

Name ___________________________ Date __________________

Water Temperatures

1 Fill two jars each with 200 mL of salt water. Label one jar **Sunlight** and put it in a sunny place. Label the other jar **No Sunlight** and put it in a very dark place.

2 **Observe** Measure the water temperature in each jar with a thermometer later in the day. Which jar is warmer?

3 **Infer** The two jars model two parts of the ocean. What are those parts? How are they different?
Predict

You just learned about saltwater and freshwater environments. Which do you think freezes faster, salt water or fresh water? To find answers to questions like this, scientists predict what they think will happen. Next they experiment to find out what does happen. Then they compare their results with their prediction.

Learn It

When you predict, you state the possible results of an event or experiment. It is important to record your prediction before you do an experiment, record your observations as you experiment, and record the final results. Then you have enough data to figure out if your prediction was correct.
Try It

Predict what will happen when you freeze fresh water and salt water. Write your prediction on a chart like the one shown. Then do an experiment to test your prediction.

1. Pour 125 mL of water into a plastic container. Label this container *Fresh Water*.

2. Pour 125 mL of water into another plastic container. Add 1 tablespoon of salt and stir with a spoon. Label this cup *Salt Water*.

3. Place both containers into the freezer. Check them every 15 minutes. Draw or write your observations.

4. Which freezes faster, fresh water or salt water? Was your prediction correct?

<table>
<thead>
<tr>
<th>Which Freezes Faster?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>My Predictions</strong></td>
</tr>
<tr>
<td><strong>Observations</strong></td>
</tr>
<tr>
<td>of Fresh Water</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
</tr>
<tr>
<td>of Salt Water</td>
</tr>
<tr>
<td><strong>Results</strong></td>
</tr>
</tbody>
</table>

Materials

- measuring cup
- water
- two plastic containers
- salt
- measuring spoon
Apply It

Now that you have learned to think like a scientist, make another prediction. Do you predict that salt water or fresh water will evaporate faster? Plan an experiment to find out if your prediction is correct.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Does fat help animals survive in cold environments?

Form a Hypothesis
Can fat help keep your finger warm in cold water? Write a hypothesis. Start with “If my finger has a layer of fat, then . . . .”

Test Your Hypothesis

1. Use a paper towel to spread vegetable fat over one index finger. Try to coat it completely. Leave your other index finger uncoated.

2. Predict What will happen when you put both index fingers in a bowl of ice water?

3. Experiment Put one index finger into the ice water. Ask a partner to time how long you can keep your finger in the water. Repeat with your other index finger. Record the data in a chart on a separate piece of paper.

4. Trade roles with your partner and repeat steps 1 through 3.

Draw Conclusions

5. Interpret Data Which finger could you keep in the ice water longer? Why? Did your results support your hypothesis?
Infer Walruses have a layer of fat under their skin. How does this help them survive?

________________________________________________________________________

________________________________________________________________________

Explore More
Experiment How could you measure how well fat keeps things warm? Could you use thermometers? Make a plan and test it.

________________________________________________________________________

________________________________________________________________________

Open Inquiry
What traits do animals have that allow them to survive comfortably in hot weather? Think of your own question about animal trait. Make a plan and carry out an experiment to answer your question.

My question is: __________________________________________________________

________________________________________________________________________

How I can test it: __________________________________________________________

________________________________________________________________________

My results are: ____________________________________________________________

________________________________________________________________________
What adaptations can you observe?

Make a Prediction
All animals have traits that help them live in certain environments. Predict one feature of an animal that helps it adapt to its environment. How does the trait help the animal live in a particular environment?

Draw Conclusions

1. **Observe** Look at the pictures of animals that your teacher has provided. List some of the traits you see in the photographs.

2. **Interpret Data** Describe how each trait helps an animal live in a certain environment.
Storing Water

1 **Make a Model**  Wet two paper towels. Then wrap one in wax paper. This models a plant that has waxy skin. Use the uncovered towel to model a plant that does not have waxy skin.

2 Place your models in a sunny window.

3 **Observe**  How do the paper towels feel later in the day?

4 **Infer**  How does waxy skin help desert plants survive?
Structured Inquiry

How does camouflage help some animals stay safe?

Form a Hypothesis
Which is easier to find, an animal that blends into its environment or an animal that does not blend in? Form a hypothesis. Start with “If an animal blends into its environment, then . . . .”

Test Your Hypothesis

1. Cut out 20 yellow circles and 20 brown circles.

2. **Experiment** Spread out the circles on yellow paper to model animals with and without camouflage. Then ask a classmate to pick up as many circles as he or she can in 10 seconds.

Materials

- yellow paper
- brown paper
- scissors
- stopwatch
3 Communicate How many of each color circle did your classmate pick up? In the space below, create a chart like the one shown in order to record the results.

4 Repeat steps 1 and 2 with two other classmates.

Draw Conclusions

5 Interpret Data Did your classmates pick up more yellow or brown circles? Which circles were harder to find?

6 Infer How does camouflage help animals stay safe?
Guided Inquiry

How do pale colors help some animals survive?

Form a Hypothesis
How do pale body coverings affect a desert animal’s temperature? Write a hypothesis.

Test Your Hypothesis
Design a plan to test your hypothesis. Use the materials shown. Write the steps you plan to follow.

Materials
- black beans
- white beans
- thermometers

Draw Conclusions
Did your results support your hypothesis? Why or why not? Share your results with your classmates.
Open Inquiry

What other questions do you have about plant and animal traits? Discuss with classmates the questions you have. How might you find the answers to your questions?

My question is: ____________________________________________________________

How I can test it: __________________________________________________________

My results are: ___________________________________________________________
How can a flood affect plants?

Form a Hypothesis

What happens to plants if they get too much water? Write a hypothesis.

Test Your Hypothesis

1. Label three plants A, B, and C. Water plant A once a week with 60 mL of water. Water plant B every day with 60 mL of water. Water plant C every day with 120 mL of water.

2. Predict Which plant will grow to be the tallest? Record your prediction.

3. Observe Monitor your plants every few days. Measure how tall they grow. Record how they look with words and pictures.
Draw Conclusions

4 Interpret Data How did the plants change over time? Which plant grew the tallest? Which do you think is the healthiest?

5 Infer What happens to some plants when there is a flood?

Explore More

Experiment Could your plant recover from a flood? Stop watering plant C for a week. How does the plant change?

Open Inquiry

In what other ways does a plant’s environment change? Think of your own question about changes to a plant’s environment. Make a plan and carry out an experiment to answer your question.

My question is: ________________________________________

How I can test it: ________________________________________

My results are: ________________________________________
How do plants respond to temperature changes?

Form a Hypothesis
Different plants grow with different amounts of water available and different temperatures. Fern plants typically grow in warm, humid environments. How do you think a fern plant would respond if the environment suddenly became very cold?

Test Your Hypothesis

1. Place one fern plant in a shaded spot inside the classroom. Place another fern plant in a place where temperatures are at least 5–10 degrees Celsius lower than the classroom temperature. Water each plant with the same amount of water.

2. Observe the plants every day for the next few days. What do you notice?

Draw Conclusions

3. How did the temperature change affect the plant that was placed in the cold? Would a fern plant survive if the climate suddenly turned very cold?
Map Invasive Species

1. Obtain a map of Tennessee. Ensure that the map shows county lines and major cities.

2. Research invasive species in Tennessee. Use colored markers or pencils to mark the location of each invasive species you find. Use a different color for each species.

3. **Interpret Data** Are more invasive species found in one part of the state than another? Explain.

   ________________________________________________________________

   ________________________________________________________________

   ________________________________________________________________

4. **Communicate** Share your findings with the class.
How do environmental changes affect plants?

Form a Hypothesis
Changes in the environment affect living things. A change may cause one plant to die but may not affect others. What happens to the plants listed when their environment gets more or less rain than usual? Start with “If the amount of water a plant gets changes, then . . . .”

Test Your Hypothesis

1. Fill both pans with the same amount of soil. Label one pan FLOOD and the other pan DROUGHT.

2. Use Variables  Plant one of each kind of plant in each pan.

3. Water plants in the FLOOD pan daily. Do not water plants in the DROUGHT pan.

4. Record Data  Monitor the growth of each plant. Draw and record the growth of each plant over two weeks.

Materials
- aluminum pans
- soil
- 2 cactus plants
- 2 grass plants
- 2 African violets
- watering can
- ruler
Draw Conclusions

5 Communicate  What happened to the plants in the FLOOD pan? What happened to the plants in the DROUGHT pan?

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

6 Infer  Which plants could survive during a drought? Which could survive during a flood?

_____________________________________________________________________________________

_____________________________________________________________________________________

7 Infer  Why did the environmental changes affect plants differently?

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________
How does shade affect plants?

Form a Hypothesis
What happens to plants if large trees grow above them and create shade? Write a hypothesis. Start with, “If plants become shaded, then . . . .”

Test Your Hypothesis
Design an experiment to investigate the changes that shade will make to a plant. Decide on the materials you will use. Write out the steps you will follow. Record your results and observations.

Draw Conclusions
Did the results support your hypothesis? Why or Why not? What if shade came from a building instead of large trees? Would the same things happen?
Open Inquiry

What other questions do you have about living things and environmental changes? Design an experiment to answer your questions. Your experiment must be organized to test only one variable, or item being changed. Your experiment must be written so that another group can complete the experiment by following your instructions.

My question is: ____________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

How I can test it: ____________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

My results are: ____________________________________________
_________________________________________________________________
How can organisms be classified?

Purpose
Classify organisms as thriving, threatened, or endangered.

Procedure
1. Research an organism.

2. Communicate Make a picture fact card for your organism. Draw or tape a picture of the organism on the card, and label it. On the other side, write three facts you learned about it. Share your card with the class.

Draw Conclusions
3. Classify Thriving species are successful in their environment. Endangered species are in danger of dying out. Threatened species could become endangered. Classify five organisms from your classmates’ picture cards. Classify each organism as thriving, threatened, or endangered. Record the information in a data chart. Give a reason for your classification.

<table>
<thead>
<tr>
<th>Organism</th>
<th>Classification</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Draw Conclusions

4 Communicate How do scientists classify your five organisms? Compare your classifications with scientists’ classifications.

Explore More
What are some thriving, threatened, or endangered organisms found in Tennessee? Why is each organism classified that way?

Open Inquiry
Look at photos of several different animals. Can they be classified?

My question is: ________________________________

How I can test it: ______________________________

My results are: ________________________________
How do organisms become threatened?

Purpose

In this activity you will investigate what causes living things to become threatened.

Procedure

1. Choose a plant or animal that lives in Tennessee that is classified as threatened or endangered.

2. Use research materials to find out when the organism became threatened or endangered. Find out what caused the organism to become threatened or endangered, such as habitat loss, pollution, or hunting.

3. Communicate Make a map showing where your organism lives in Tennessee.

Draw Conclusions

4. Communicate Share the information you gathered with your classmates. Compare your organisms with those other students chose. Did the causes you found also affect the organisms they chose?
A Changing Environment

1 Make five character cards. Label the cards: *prairie dog*, *snake*, *burrowing owl*, *eagle*, and *coyote*.

2 Paste the cards on a large sheet of paper.

3 Draw an arrow from each animal to the organisms it depends upon for food or shelter.

4 **Infer** What would happen if prairie dogs disappeared?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

5 **Infer** What would happen if owls disappeared?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
How do fossils tell us about the past?

Purpose
Find out how fossils can teach about the past.

Procedure

1. Mix a little glue and water in a measuring cup.

2. **Make a Model** Pour a thin layer of colored sand into a paper cup. Add a “fossil” object. Cover the object with sand of the same color. Add a little water and glue to “set” this layer. This models a fossil in rock.

3. Repeat step 2 with different objects and different colors of sand. Make three layers in all. Allow the layers to dry.

4. **Observe** Trade cups with another group. Carefully peel the paper cup away. Use the brush to find the fossils. Start at the top layer. Work your way down.

5. **Communicate** Record in a table the order in which each fossil object was found.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Fossil</th>
</tr>
</thead>
<tbody>
<tr>
<td>top</td>
<td></td>
</tr>
<tr>
<td>middle</td>
<td></td>
</tr>
<tr>
<td>bottom</td>
<td></td>
</tr>
</tbody>
</table>
Draw Conclusions

6 **Interpret Data** Which fossil was buried first? Last?
Which fossil is oldest?

7 **Infer** What can layers of rock tell us about Earth’s past?

Explore More
How else could you model a fossil? Make a plan and try it.

Open Inquiry
How does the material from which fossils are formed affect the condition they are found in? Think of your own question about fossil formation. Make a plan and carry out an experiment to answer your question.

My question is: ____________________________________________

__________________________________________________________

How I can test it: __________________________________________

__________________________________________________________

My results are: ____________________________________________

__________________________________________________________
What can you learn from a fossil?

**Purpose**
Fossils are the preserved remains of organisms that lived long ago. What types of things might you be able to learn from looking at a fossil?

**Procedure**

1. Observe the fossil sample supplied by your teacher. Describe the fossil.

2. Do you think that this fossil comes from a plant or an animal?

3. Does this fossil remind you of any present-day organisms?

**Materials**
- trilobite fossil
Fossil Mystery

1 Make a Model  Choose your favorite animal. Then use the key below to make fossil marks for your animal on some modeling clay.

<table>
<thead>
<tr>
<th>If your animal is a . . .</th>
<th>then shape the clay into a . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>mammal</td>
<td>circle</td>
</tr>
<tr>
<td>bird</td>
<td>square</td>
</tr>
<tr>
<td>amphibian</td>
<td>rectangle</td>
</tr>
<tr>
<td>reptile</td>
<td>triangle</td>
</tr>
<tr>
<td>fish</td>
<td>ball</td>
</tr>
</tbody>
</table>

2 Use the key below to make more fossil marks.

<table>
<thead>
<tr>
<th>If your animal . . .</th>
<th>then mark your clay with . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>lives in water</td>
<td>fins</td>
</tr>
<tr>
<td>lives on land</td>
<td>feet</td>
</tr>
<tr>
<td>lives both in water and on land</td>
<td>fins and feet</td>
</tr>
<tr>
<td>is a carnivore</td>
<td>pointed teeth</td>
</tr>
<tr>
<td>is an herbivore</td>
<td>flat teeth</td>
</tr>
<tr>
<td>is an omnivore</td>
<td>pointed and flat teeth</td>
</tr>
</tbody>
</table>

3 Trade your model fossil with the person sitting to your right.

4 Infer  What can you learn about the animal that your classmate chose? How do scientists use fossils to learn about extinct animals?

________________________
________________________
________________________
How do the planets compare?

Purpose
Compare objects in the solar system.

Procedure

1. Mark a line on the floor with a piece of tape.

2. **Make a Model** The line on the floor represents the position of the Sun. Measure each planet’s distance from the “Sun.” Mark the position of each planet with tape.

<table>
<thead>
<tr>
<th>Object</th>
<th>Distance from Sun (in centimeters)</th>
<th>Diameter (in centimeters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun</td>
<td>-</td>
<td>440</td>
</tr>
<tr>
<td>Mercury</td>
<td>6</td>
<td>1.6</td>
</tr>
<tr>
<td>Venus</td>
<td>10</td>
<td>3.8</td>
</tr>
<tr>
<td>Earth</td>
<td>14</td>
<td>4.0</td>
</tr>
<tr>
<td>Mars</td>
<td>22</td>
<td>2.2</td>
</tr>
<tr>
<td>Jupiter</td>
<td>74</td>
<td>44</td>
</tr>
<tr>
<td>Saturn</td>
<td>136</td>
<td>38</td>
</tr>
<tr>
<td>Uranus</td>
<td>280</td>
<td>16</td>
</tr>
<tr>
<td>Neptune</td>
<td>428</td>
<td>15.6</td>
</tr>
</tbody>
</table>

3. Make a card for the Sun and each planet. Put each card in its place.

4. Measure the diameter of each object on construction paper. Cut out a circle with the correct diameter and place it by its card.

Draw Conclusions

5. What can you learn from your model? How do the planets compare?
5 Infer In this model, the diameter of the Sun would be 440 cm. Why can’t you include it?


Explore More
Make a Model Make a new model to include the Sun. Draw your model outside using chalk.

Open Inquiry
Do all of the planets and moons move at the same speed? How can I find the speed of each planet? Think of your own question about this topic. Then design and carry out an experiment to answer your question.

My question is: ________________________________

______________________________

How I can test it: ________________________________

______________________________

______________________________

My results are: ________________________________

______________________________

______________________________

______________________________
How fast do the planets move?

Purpose
Conduct research to determine and compare the average orbital speeds of the planets in the solar system.

Procedure

1. Use Numbers Research the average orbital speeds of the planets in our solar system. In what units are the speeds listed?

2. Measure What are the average orbital speeds of the planets? List them in the table.

3. Interpret Data Which planet has the slowest average orbital speed?

4. Interpret Data Which planet has the fastest average orbital speed?

Materials
• reference books
• the Internet

<table>
<thead>
<tr>
<th>Planet</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td></td>
</tr>
<tr>
<td>Venus</td>
<td></td>
</tr>
<tr>
<td>Earth</td>
<td></td>
</tr>
<tr>
<td>Mars</td>
<td></td>
</tr>
<tr>
<td>Jupiter</td>
<td></td>
</tr>
<tr>
<td>Saturn</td>
<td></td>
</tr>
<tr>
<td>Uranus</td>
<td></td>
</tr>
<tr>
<td>Neptune</td>
<td></td>
</tr>
</tbody>
</table>
Quick Lab

Name ___________________________ Date _____________

Sizing Up Planets

1 Measure Work with a partner. Hold a marble about 30 centimeters away from you.

2 Measure Have a partner hold a tennis ball about 5 meters away from you.

3 Observe Which object seems larger? Why? Which object really is larger?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

4 Infer How can larger planets look smaller to us than smaller planets?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Chapter 4 • Planet Earth and Its Materials
Activity Lab Book

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Observe

You know that Earth is only one of the planets in our solar system. How do scientists learn about other planets? How do they learn about other objects, such as comets, that move around the Sun? They observe the Sun, planets, moons, and other objects in our solar system to learn more about them.

Learn It

When you observe, you use one or more of your senses to learn about an object or event. Remember, your senses are sight, hearing, smell, taste, and touch. Scientists often use tools, such as binoculars, microscopes, and telescopes, to make their observations.

Be Careful. You should not taste things in school unless your teacher tells you it is safe.
Try It
You can observe things, too. Look at the detail of this comet in your textbook. Observe its color and shape. Look for unique features that help you identify what it is. What detail helps you know this is a comet and not a planet?

Compare your observations with what scientists have observed previously. Conduct research to find out more about comets and planets. How are they similar? How are they different?

Apply It
The photos on the next page show details of planets and other objects in our solar system. Observe each photo carefully. Use your observations to identify what each object is. Which details helped you to identify the objects?
Does land or water cover more of Earth’s surface?

Make a Prediction
Do you think that there is more land or more water on Earth’s surface? Write your prediction.

Test your Prediction

1. Make a table for 10 spins like the one shown.

<table>
<thead>
<tr>
<th>Spin</th>
<th>Land</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. **Experiment** Slowly spin a globe. Do not look at it. Touch your finger to the globe to stop it.

3. **Observe** Did your finger stop on land or water? Record the information on the chart.

4. Repeat steps 2 and 3 nine more times.

5. **Use Numbers** How many times did you touch water? How many times did you touch land?
Draw Conclusions

Infer  Is there more land or more water on Earth?
How do your results compare with the results of others?

Explore More

Experiment  Which covers more of Earth, rivers or oceans?
Make a plan to find out.

Open Inquiry

Determine which ocean covers the largest area on Earth’s surface.

My question is: ____________________________

How I can test it: __________________________

My results are: ____________________________
**What are some land features?**

**Purpose**
Investigate different types of features on land.

**Procedure**

1. **Observe** Use a globe, atlases, or maps to identify as many different landforms as you can. List the different landforms you found.

   __________________________________________
   __________________________________________
   __________________________________________

2. Describe the different landforms.

   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
Tennessee’s Features

1 Make a Model  Draw a map of Tennessee. Decide how to show Tennessee’s land and water features. Then make a key and complete the map.

2 Observe  Where is your town or city located? Draw a large dot there. Which landforms and water features are found in your town or city? How do these features compare with those found in other parts of Tennessee?

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Communicate

You just learned about landforms and water features. Tennessee’s mountains formed millions of years ago. Its water bodies have been shaped by natural and human causes. You can communicate the details of Tennessee’s landforms and water bodies by making a Venn diagram.

Learn It

A Venn diagram can help you communicate. It shows the differences between two different things. It also shows what the two things have in common.

Read more about Tennessee mountains and valleys. Then communicate what you have learned by making a Venn diagram.
Try It

1 Draw two circles that overlap in the middle. The left side is for mountain details. The right side is for valley details. The center is for details common to both mountains and valleys.

2 Start by listing the details that mountains and valleys have in common. For example, plants grow on both mountains and valleys. What other details do mountains and valleys share?

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________________________________________________________________________

3 On the left describe how each detail is different on a mountain. On the right explain how each detail is different in a valley.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

4 Communicate your results to the class. Explain where you got your information.
Apply It

- Now read about bodies of water in Tennessee. Compare two bodies of water. For example, compare a river with a reservoir, or compare a river and a stream.

- Make a Venn diagram to communicate what you learned.

- Communicate your findings to the class. Use your Venn diagram to explain how your bodies of water are similar and different.
How do a mineral’s color and mark compare?

Make a Prediction
Some minerals leave a mark behind when you rub them on a white tile. Is the mark left behind always the same color as the mineral?

Test Your Prediction
1. Make a table like the one shown.

<table>
<thead>
<tr>
<th>Mineral Color</th>
<th>Color Left Behind</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. **Observe** Look at one mineral. Record its color in the table.

3. **Experiment** Rub the mineral across the tile. What color is left behind? Record the color in the table.

4. Repeat steps 2 and 3 for each mineral.
Draw Conclusions

5 Interpret Data How did the colors and marks of the minerals compare?

________________________________________________________________________

6 Infer When might you use mineral marks to help you tell minerals apart?

________________________________________________________________________

Explore More

Experiment Are some minerals harder than others? Make a plan to find out. Then try it.

________________________________________________________________________

Open Inquiry

Most rocks are made up of two or more minerals. How would you identify all the minerals in such a rock? Think of your own question about identifying minerals. Make a plan and carry out an experiment to answer your question.

My question is: __________________________________________________________

________________________________________________________________________

How I can test it: __________________________________________________________

________________________________________________________________________

My results are: ___________________________________________________________
How does a mineral break?

Purpose
Observe how to identify a mineral by how it breaks.

Procedure

1. **Observe** Place a few grains of salt on a dark surface. Use a hand lens to look at the grains. What is the shape of the grains?

2. **Predict** Do you think you could break a grain of salt into smaller pieces? What shape do you think the smaller pieces would have?

3. **Observe** Use the hand lens to look at the mica. How does the mica break?

4. **Infer** Do you think the way a mineral breaks can be used to identify it? Explain your answer.

Materials

- table salt
- mica
- hand lens

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Quick Lab

Classify Rocks

1. **Observe**  Use a hand lens to observe a few igneous rocks. What color are they? Are their grains large or small? Do they have a coarse texture or a fine texture?

2. **Classify**  Put the rocks into groups that are alike.

Which objects are natural and which are not?

Purpose
Identify objects as natural or made by humans.

Procedure
1. Obtain a hand lens and materials.

2. **Observe** Use a hand lens to observe, describe, and compare each of the provided materials. Record your observations. Classify each material as either natural or made by humans. Explain your reason for each classification.

Draw Conclusions
3. Compare your results with those of your classmates. Did all students get the same results? Explain.

4. **Infer** Compare your reason for classifying the material as natural or made by humans. Did natural objects have anything in common? Did the objects made by humans have anything in common?
5 How many natural objects did you use today? Make a list. Share your list with your class. Why do you think we use man-made objects more often than natural ones?

___________________________________________

___________________________________________

Explore More
How can you tell what a natural material is made from? Write a plan. Test your plan on objects found at home or at school.

___________________________________________

Open Inquiry
How do natural objects and objects made by humans change over time? Do they break down easily? Think of your own question about natural objects and objects made by humans. Make a plan and carry out an experiment to answer your question.

My question is: ________________________________

___________________________________________

How I can test it: ______________________________

___________________________________________

My results are: ________________________________

___________________________________________
What natural objects are in soil?

Purpose
Use water to help separate soil, and identify natural objects that make up the soil.

Procedure

1. Put soil into a jar to form a layer about 1 inch deep. Add water to the jar until it is about half full.

2. **Observe** Carefully swirl the contents of the jar for 1 minute. If the jar has a lid, you can carefully shake the jar and its contents. What do you observe in the jar?

3. **Observe** Let the jar sit still until the water looks almost clear. What happened to the soil?

4. **Communicate** Draw what you see in the jar. Label what you see in each layer. Use a hand lens to look at the soil if you need to.

5. **Draw Conclusions** What do you think happens when materials made by humans get into soil?
Quick Lab

Name ______________________ Date __________

Classify Natural Resources

1 Communicate Make a table like the one shown. Record any natural resources that you rely on in your everyday life.

<table>
<thead>
<tr>
<th>Name of Natural Resource</th>
<th>Renewable or Non-renewable</th>
<th>Ways to Conserve</th>
</tr>
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<tbody>
<tr>
<td></td>
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2 In the second column identify the resource as renewable or non-renewable.

3 Infer How could you conserve the resource? Record your answers in the table.

4 Communicate Compare your results with those of other classmates. Create a word web that shows how we get what we need from Earth’s resource.
Use Numbers

The average American changes his or her environment by producing about 2 kilograms (4 pounds) of trash every day! We can never get rid of trash completely. However, we can cut down on the amount we create by practicing the 3 Rs—reduce, reuse and recycle. Do students in your school practice the 3 Rs? Find out the same way scientists do—use numbers to record data.

Learn It

When you use numbers, you present data in a way that people can clearly understand. Basic math skills, such as counting and ordering numbers, help to collect and organize information. Often scientists gather and record data by asking questions or by having people fill out surveys. Then they use numbers to put the data into a chart or graph. You can do it, too.
Try It
In this activity, you will gather data and use numbers to find out how many classroom materials are reused, recycled and thrown out by students in your school. You cannot survey the whole school, but you can do a mini-survey.

1. Choose five students to survey.

2. Ask each student questions about how many classroom materials he or she threw away today. Will anything be reused?

3. Use a table like the one shown on the next page to organize your data.

Now use numbers to answer questions.

Did every student throw away some classroom material?

________________________________________________________________________

How many classroom materials did the students recycle?
How many classroom materials did they reuse?

________________________________________________________________________

How many total classroom materials did these five people use altogether?

________________________________________________________________________
Apply It

You used numbers to evaluate if students are practicing the 3 Rs. How can you get students to recycle or reuse materials more often? Design a method for reusing or recycling classroom materials.

Do you predict these same students will recycle or reuse more classroom materials? Plan another survey. Then use numbers to compare the new results to your first results. Evaluate your method based on the new results.

<table>
<thead>
<tr>
<th>Student’s Name</th>
<th>Classroom Materials Reused</th>
<th>Classroom Materials Recycled</th>
<th>Classroom Materials Thrown Away</th>
<th>Total Materials Per Student</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How can you tell air is around you?

Make a Prediction
Can air keep a paper towel inside a cup from becoming wet?

Test Your Prediction

1 Fill a container about two-thirds with water. Stuff a dry paper towel in the bottom of a cup.

2 Experiment Hold the cup upside down over the water. Push the cup straight down to the bottom of the container. Do not tilt the cup.

3 Observe Lift the cup out of the water. Do not tilt it. How does the paper towel feel?

4 Observe Repeat step 2. Slowly tilt the cup. Remove it from the water. What do you observe?

Draw Conclusions

5 Infer What escaped from the cup in step 4? How did this affect the paper towel?
**Explore**

### Infer

How do you know that air is around you?


### Explore More

**Experiment** How else could you show that air is around you? Make a plan to find out.


### Open Inquiry

What do you think would happen to the volume of air in a container if the air were heated? Think of your own question about what would happen to the volume of air in the container. Make a plan and carry out an experiment to answer your question.

My question is: ______________________________________


How I can test it: _____________________________________


My results are: ______________________________________
How does air pressure change?

Make a Prediction

Even when a plastic jug does not contain milk or water, it is not empty. It contains air. What do you think will happen to the air inside the jug when that air is allowed to cool? Make a prediction.

Test Your Prediction

1. Ask an adult to use a funnel to carefully add very hot water to the jug until the jug is about half full. **Be Careful!** Hot water can cause burns. Then ask the adult to screw the lid back on the jug.

2. Let the jug sit for about one hour so the water inside the jug can cool.

3. Observe What happened to the sides of the jug?

Draw Conclusions

4. Infer What do you think happened inside the jug to make the walls collapse?
Make a Windsock

1. Bend wire to make a circle. The circle should be about 10 cm across.

2. Cut a sleeve from an old long-sleeved shirt. Staple the sleeve’s large opening around the wire. Cut a small opening so you can tie some string to the wire.

3. Tape a small rock across from the string.

4. **Observe** Tie the string to a tree branch. Observe the windsock during the day. Keep a record of what you see.

5. **Infer** What can you tell about the wind from what you observed?

   __________________________________________

   __________________________________________

   __________________________________________

Use with Lesson 1
Measuring the Weather
Interpret Data

Have you ever noticed that some months are warmer or wetter than others? This is generally true from year to year. How did scientists figure this out? One way is to interpret data from past years.

Learn It

When you interpret data, you use information that has been gathered to answer questions or to solve problems. It is easier to interpret data when it is in a table or a graph. That way you can quickly see differences in the data.

Try It

Scientists use a variety of tools to collect information about weather conditions. They use the data to figure out the average air temperature, amount of precipitation, or air pressure of a certain place. You can organize and interpret data to draw conclusions, too.

1 Use a thermometer to measure the air temperature. Record the temperature every morning for two weeks. Place your data in a table.

<table>
<thead>
<tr>
<th>Day</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>Temp.</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>
2 Use your table to make a graph to organize your data. List the days of the weeks in order along the bottom. Label the bottom *Day*.

3 Write the number for the temperatures along the left side of the graph. Write the numbers 0, 2, 4, 6, 8, and so on. End with the number 26. Label this side and write a title for the graph.

4 Draw a bar to match each of the numbers from the data. Now use your graph to answer these questions:

   Which day was the warmest?

   Which day was the coolest?
Apply It
Suppose you want to measure air pressure and the amount of precipitation. Which tools would you use?

Use these tools to collect data once a day for one week. Then make one bar graph for each tool using your data.

Use your bar graph to interpret your data. Which day had the largest amount of precipitation? Which day had the lowest air pressure?
Explore

How much rain falls in your community?

Purpose
To measure the amount of rainfall in your community.

Procedure

1. △ Be Careful. Use the scissors to cut the top off the carton.

2. Using tape, attach the carton to the baking pan. Then put the pan on the ground outside in an open area.

3. Measure Check the carton at the same time every day. If there is water in it, measure the height of the water in centimeters.

4. Record Data Write down the daily results on a table. Then empty the carton and put it back in the same spot outside.

Day 1 Day 2 Day 3 Day 4 Day 5

Materials

- scissors
- carton
- masking tape
- baking pan
- ruler

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Chapter 5 • Conditions in the Atmosphere
Activity Lab Book

Use with Lesson 2
Clouds and Weather
Draw Conclusions

Interpret Data  Design and complete a graph to display your results.

![Graph](image)
Explore More
How close were your results to an official rain measurement for your area? Were there any problems that you ran into with the experiment? How could you improve your data collection?

________________________________________________________________________

________________________________________________________________________

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Open Inquiry
How accurate will measurements be if rain gauges are placed in different areas? Can the things the rain gauge is near affect the accuracy of calculations? Think of your own question about how putting rain gauges in different positions can affect your findings. Make a plan and carry out an experiment to answer your question.

My question is: ______________________________________________________________________

________________________________________________________________________

How I can test it: ____________________________________________________________________

________________________________________________________________________

________________________________________________________________________

My results are: _____________________________________________________________________

________________________________________________________________________
Do different containers affect precipitation measurements?

Form a Hypothesis
Form a hypothesis on whether the type of container used as a rain gauge will affect the amount of precipitation measured.

Test Your Hypothesis

1. **Experiment** Use three containers of different sizes as rain gauges. Place the containers in similar locations.

2. **Measure** Use a ruler to measure the amount of precipitation each day at the same time. Record the data for two weeks. How much precipitation did you measure in each container?

3. **Interpret Data** Make a bar graph showing the total amount of precipitation measured in each of the containers.

Draw Conclusions

4. **Communicate** Did your results support your hypothesis?
Types of Clouds

1. **Observe**  Look for clouds in the sky. How many different types of clouds do you see?

2. **Classify**  Do the clouds that you see look like cirrus, cumulus, or stratus clouds?

3. Continue your data collection for one week.

<table>
<thead>
<tr>
<th>Cloud Observation</th>
<th>Cirrus</th>
<th>Cumulus</th>
<th>Stratus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Day 3</td>
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<tr>
<td>Day 4</td>
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<td>Day 5</td>
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<td>Day 6</td>
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<tr>
<td>Day 7</td>
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</table>

4. Which type of cloud did you see most frequently?

5. Write a report about the types of clouds that you saw. Do you think you would get different results at a different time of year? Explain.
How do you describe objects?

Purpose
Explore ways to describe objects.

Procedure
1. **Observe** Select a “mystery object” in your classroom. Observe the object. What color is it? How does it feel? What is the object’s shape and size?

2. **Communicate** Record your observations in a word web like the one shown. Label each line with a word that describes your mystery object. Leave the circle blank.

3. **Infer** Trade webs with a partner. Think about the descriptive words on your partner’s web. What classroom object do the words describe? Label the circle with the name of your partner’s mystery object.

Materials
- classroom objects
- hand lens

Step 1

Step 2

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Draw Conclusions

4. Were you able to guess your partner’s mystery object? Was your classmate able to guess your mystery object?

5. What helped you most in figuring out your partner’s object?

Explore More

Experiment How might your web be different if you were blindfolded and could only touch the mystery object? Try it to find out.

Open Inquiry

How might your descriptions change if the object were in a box and you could neither see it nor feel it? Think of a question about a hidden object. Make a plan and carry out an experiment to answer your question.

My question is: _____________________________

How I can test it: ___________________________

My results are: _____________________________
What are the properties of an object?

Purpose
In this activity, you will describe the properties of an object so that someone else can infer what it is.

Procedure
1. Work with a partner. You and your partner will take turns secretly choosing an object in the classroom.

2. Choose an object and have your partner ask up to 5 questions about its properties. Each question must only have a “yes” or “no” answer.

3. Record Data Use the table below to help you.

<table>
<thead>
<tr>
<th>Property</th>
<th>Question</th>
<th>Yes or No</th>
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</tbody>
</table>

4. Communicate What object did your partner choose?

5. Interpret Data How did asking questions about the properties of the object help you to identify it?
Condense Water Vapor

**Observe** Feel an empty plastic cup. Does it feel wet or dry? Record your observations.

Fill your cup with ice cubes. Next add cold water to the cup.

**Observe** Feel your cup again. Does the cup feel wet or dry? Does the cup feel hot or cold? Record your observations.

**Observe** Look at your cup after five minutes. What do you notice about the outside of the cup? Is it wet or dry?

**Infer** Where did the water on the cup come from?
How do solids and water mix?

Make a Prediction
What will happen when you mix salt into water? What about sand and water? Sugar and water? Gelatin and water? Write your predictions.

Test Your Prediction
Label one cup salt and a second cup sand.

Measure Pour 100 mL of water into each cup. Then add one spoonful of salt to the cup marked salt. Stir well. Add one spoonful of sand to the cup marked sand. Stir well.

Observe Observe the contents of both cups carefully. What happened to the salt? The sand? Record your observations.

Label a third cup sugar and the last cup gelatin. Repeat step 2 with both substances. After stirring, leave each cup alone for 20 minutes. What happened this time?
Draw Conclusions

Communicate What happened when you mixed the four solids with water? Were your predictions correct?

________________________________________________________________________

________________________________________________________________________

Explore More
Describe the physical properties of vinegar and baking soda. Will these substances keep their physical properties when mixed together? Design an experiment to find out.

________________________________________________________________________

________________________________________________________________________

Open Inquiry
How can a mixture of salt and water be separated? Formulate a question related to this topic and design an experiment to test it.

My question is: ____________________________________________

How I can test it: ____________________________________________

________________________________________________________________________

My results are: ____________________________________________

________________________________________________________________________
How can you separate parts of a solution?

Purpose
Demonstrate that a mixture can be assembled and separated.

Procedure
Crush the rock salt using the soup can.

Pour the salt into a bowl filled with water. Stir the water until the salt dissolves.

Pass the mixture through a filter to trap its impurities.

Let the bowl sit for a few days.

What did you use to make a mixture?

How did the parts of the mixture separate?

How did the salt change during this experiment?

How do you know that a mixture was made?

Materials
- soup can
- beakers
- rock salt (ice-melting type with impurities)
- water
- filter paper
- funnel
- 2 bowls
- stirring rod
Making Crystals

Place a half teaspoon of salt water onto a black plastic plate.

Place the plate in a warm place, such as a windowsill.

**Observe** Use a hand lens to observe the plate after 24 hours.

**Predict** What factors could affect crystal growth? For example, how would the amount of salt affect crystal growth? How would temperature affect crystal growth? Try testing your prediction.
Structured Inquiry

How can you separate a mixture?

Form a Hypothesis

Mixtures can be separated in many ways. How can you use physical properties to separate a mixture? Record your hypothesis. Start with “If salt, sand, and plastic beads are mixed together, then . . . . ”

Materials

- spoon
- mixture items
- plastic cup
- sieve
- bowl
- funnel with filter paper

Test Your Hypothesis

Place a tablespoon each of salt, sand, and plastic beads in a plastic cup. This forms the mixture that you will separate.

Experiment Over a bowl, pour your mixture into the sieve. Shake it gently until no more particles fall into the bowl. Place the sieve’s contents to the side. Pour the rest of the mixture back into the plastic cup.
Add water to the mixture until the water level is 2 cm above the mixture. Stir the mixture thoroughly with a spoon.

Place filter paper in a funnel. Hold the funnel over the bowl to catch the water. Slowly pour the mixture into the funnel.

**Observe** Leave the bowl of water in a warm, dry place for two days. Record your observations.

**Draw Conclusions**

**Infer** What process was responsible for separating the water from the salt?

**Communicate** Different people can understand the same results in a different way. Share with other other groups how each part of the mixture was separated. How were your results similar? How were they different?
Guided Inquiry

How can you design your own method for separating mixtures?

Form a Hypothesis
With the help of your teacher, gather a few items to create a mixture. For example, mix together sugar, marbles, plastic-foam peanuts, and tea leaves. How can you separate your mixture? Write a hypothesis.

Test Your Hypothesis
Design an experiment to test your hypothesis. Decide on the materials you will need. Then write the steps you plan to follow. Record your observations.

Draw Conclusions
Did you follow the steps you used to separate the first mixture? Did you change the steps? Why or why not? Share your observations with your classmates.
Open Inquiry

What other questions do you have about mixtures? For example, how do stirring and shaking affect different mixtures? Design an experiment to answer your question.

Remember to follow the steps of the scientific process.

▶ My question is:

▶ My hypothesis is:

▶ How can I test it:

▶ My conclusions are:
What are some ways that heat is produced?

**Purpose**
Investigate situations that produce heat.

**Procedure**

**Observe** Place a thick rubber band against the back of your hand. Does the rubber band feel warm, hot, or cool?

**Observe** Stretch and release the thick rubber band 30 times. Repeat step 1. How does the rubber band feel? Is it warm, hot, or cool?

**Communicate** Describe how the rubber band changed.

Be careful. Place a thermometer between the palms of your hand. Record the temperature.

**Predict** How will rubbing your hands together affect their temperature? Rub your hands together for 30 seconds. Then repeat step 4.
Draw Conclusions

Communicate What happened to your hands when you rubbed them together? Was your prediction correct?

Explore More

Experiment What are some other ways that you can produce heat? Make a plan to find out. When your teacher has approved your plan, conduct your investigation and record your results.

Open Inquiry

What would happen to water if it was placed in a sunny window? Think of your own question about what would happen to the balloon. Make a plan and carry out an experiment to answer your question.

My question is: ________________________________

How I can test it: ________________________________

My results are: ________________________________
Do your hands feel warm?

Make a Prediction
How do you think your hands will feel if you hold one in ice cold water, one in hot water, and then place both in warm water?

Test Your Prediction
Fill one bowl half full with cold tap water. Add ice cubes to this bowl. Fill another bowl with lukewarm water from the tap. Fill the third bowl with hot tap water. Be Careful. Do not make the water too hot. You do not want to burn yourself. Use the thermometer to measure the temperature of the water in each bowl. Record the temperatures below.

<table>
<thead>
<tr>
<th>Bowl</th>
<th>Temperature (in °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold water</td>
<td></td>
</tr>
<tr>
<td>Lukewarm water</td>
<td></td>
</tr>
<tr>
<td>Hot water</td>
<td></td>
</tr>
</tbody>
</table>

Experiment Place one hand in ice water and one hand in hot water and count to five. Remove both hands and place them in the bowl of lukewarm water. How do your hands feel?
Melting an Ice Cube

Predict What would happen if you placed a cup of ice near a window on a sunny day?

Experiment Prepare two plastic cups with ice. Each cup should have the same number and size of ice cubes. Place one cup on a window sill or near a window. Place the other cup in the dark.

Observe Record the temperature of both cups every 5 minutes for 15 minutes. Make a table for your observations.

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature of Cup in Window</th>
<th>Temperature of Cup in Dark</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Infer What caused the change in the ice cube? How do you know?
Experiment

You just learned about heat. You read that a conductor is a material that allows heat to pass through it easily. How can you find out if something is a conductor? You can experiment to answer a question like this.

Learn It

When you experiment, you perform tests. You make observations and collect data. Then you interpret the data to answer a question. When you experiment, it is important to test only one thing at a time. This helps you know what caused your results.
Try It

Experiment to find out which is the best conductor: paper, plastic, or metal.

Which material do you think will conduct heat best: paper, plastic, or metal? Write a hypothesis.

Place a thermometer strip on the outside of a paper cup, plastic cup, and aluminum can. Record the temperature of each thermometer strip.

Fill each container with warm water.

Cover each container with plastic wrap. Use a rubber band to seal the wrap so it covers the container.

Record the temperature of each container after five minutes. For each container, subtract the original temperature from the final temperature. This will give you the increase in temperature. Record this number in a chart like the one shown below.

<table>
<thead>
<tr>
<th>Material</th>
<th>Original Temperature (°C)</th>
<th>Final Temperature (°C)</th>
<th>Temperature Increase (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>paper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>plastic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>metal</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Materials

- paper cup
- plastic cup
- aluminum can
- warm water
- plastic wrap
- 3 rubber bands
- 3 thermometer strips
Which of these containers showed the highest increase in temperature? Which showed the lowest?

____________________________________________________________________________________

____________________________________________________________________________________

Now use your results to draw conclusions.

▸ Which container conducted heat the most?

____________________________________________________________________________________

▸ Which container conducted heat the least?

____________________________________________________________________________________

Apply It

Now it is your turn to design an experiment. What are some other ways you could test heat conduction? Make a plan to find out.
Explore

How do forces change motion?

Make a Prediction
If you roll a steel ball down a ramp, it should move in a straight line. How will a magnet affect the motion of the steel ball? Write a prediction.

Test Your Prediction
Stack three books. Lean the cardboard over the top book to form a ramp. Place the fourth book at the base of the ramp to stop the ball.

Observe Roll a steel ball down the ramp. With a marker, draw the path the ball took as it rolled down the ramp.

Observe Point the magnet at one side of the ramp as shown. While holding the magnet, roll the ball again. Trace this new path.

Use Variables Move the magnet closer to the ramp. Repeat step 3.

Materials
- 4 books
- cardboard
- steel ball
- marker
- magnet
Draw Conclusions

**Interpret Data** What happened to the path of the ball in step 3? How did the magnet affect its direction?

________________________________________________________________________

________________________________________________________________________

**Infer** Look at your tracings of the ball's path. Where was the pull of the magnet strongest? Where was it weakest?

________________________________________________________________________

________________________________________________________________________

Explore More

**Communicate** What do you predict will happen if you use a stronger or weaker magnet? What if the magnet were underneath the cardboard? Test your predictions. Report your findings to your class.

________________________________________________________________________

________________________________________________________________________

Open Inquiry

How would a magnet affect other objects? Think of your own question. Design and carry out an experiment to answer your question. Compare your results and share them with the class.

My question is: ____________________________________________________________________

________________________________________________________________________

How I can test it: __________________________________________________________________

________________________________________________________________________

My results are: ____________________________________________________________________

________________________________________________________________________
How does the force of magnetism change motion?

Purpose
Determine how the force of magnetism can affect motion.

Procedure

Use the rubber band to attach a bar magnet to the back of the toy car.

Experiment Hold the other magnet behind the car so that it makes it go faster. How did you do this?

Experiment Again, roll the car. This time use the other magnet to slow down or stop the car. How did you slow down or stop the car?

Predict How might you use a magnet to change the direction of the car?

Experiment Test your prediction and report your results.
Quick Lab

Name _______________________ Date ____________

Changing Masses on a Balance

Use some clay to stick a marker to the center of a ruler. Then use clay to stick a small cup to each end of the ruler.

**Experiment** Put two large blocks in one cup. Add gram cubes to the other cup. How many cubes does it take to lift the two large blocks?

**Use Variables** Change the position of the marker. Move it closer to one end of the ruler.

**Experiment** Repeat step 2. How does the marker’s new position change your results?

**Interpret Data** How does the position of the marker change the number of gram cubes you need to lift the two large blocks?
Structured Inquiry

How do different surfaces affect a ball’s motion?

Form a Hypothesis

Have you ever been ice skating? Did you move across the ice in the same way you move on a sidewalk? How does the surface on which an object moves affect its motion? Write a hypothesis. “If an object moves on a smooth surface, then . . .”.

Materials

• three books
• cardboard
• tape
• aluminum foil
• tennis ball
• sandpaper

Test Your Hypothesis

Stack three books on the floor. Then lean a piece of cardboard against the top book to make a ramp. Tape down the edge along the floor.

Tape down a sheet of aluminum foil at the bottom of the ramp.

Observe Place a tennis ball at the top of the ramp, and let it go. Watch how far and how quickly the ball moves over the foil.
Use Variables  Remove the foil. Replace it with a sheet of sandpaper.

Observe  Place the tennis ball at the top of the ramp again, and let it go. Watch how far and how quickly the ball moves over the sandpaper.

Draw Conclusions

Interpret Data  Over which surface did the ball travel farther? Why?

Infer  What force affected the ball’s motion?
Guided Inquiry

How high will a ball bounce?

Form a Hypothesis
How does the height from which a ball is dropped affect how high it bounces. Will the bounce change if you drop it a greater length? Write a hypothesis.

Test Your Hypothesis
Design a plan to test your hypothesis. List the materials you will use. Write down the steps that you plan to follow.

Draw Conclusions
Did the ball’s bouncing change? What forces were acting on the ball? Make a graph to show how the height of the drop affected the bounce. Share your results with your classmates.
Open Inquiry

What other questions do you have about forces and motion? Make up a question you would like to know the answer to. List several investigations you could perform to find the answer. Choose the best experiment to find the answer. Then Try it!

My question is: __________________________________________

________________________________________________________________________

How can I test it: _________________________________________________

________________________________________________________________________

________________________________________________________________________

My results are: _________________________________________________

________________________________________________________________________
How can you make sounds?

Make a Prediction
Look at the paper, ruler, and rubber band. What must you do to make a sound with each object?

Test Your Prediction

Be Careful! Wear goggles.

Observe Hold a piece of paper by one corner. Wave it around. What happens?

Observe Place a ruler on a desk. Extend half of it over the edge of the desk. Hold the ruler down, and tap the other end. What happens?

Observe Wrap a rubber band around a box. Pluck the rubber band. What happens?

Draw Conclusions
What happened when you moved the paper, ruler, and rubber band?
Infer Can you make a sound with the paper, ruler, or rubber band without making it move? Explain your answer.

Infer How are sounds made?

Explore More
Experiment Test ways to change the sound you made with each object. Try to make the sounds louder or softer, higher or lower. For example, try pulling the rubber band tighter and then plucking it. Record your results and the steps you follow.

Open Inquiry
How does the length of something change the sound it makes? Think of your own question about how things make sounds. Make a plan and carry out an experiment to answer your question.

My question is: ____________________________

How I can test it: ____________________________

My results are: ____________________________
Can a balloon help you hear?

Make a Prediction
Do you think a balloon can help you hear? Write a prediction about what you think will happen if you listen through a balloon.

Test Your Prediction

Experiment Work with a partner. Have your partner walk about 10 steps away from you. Then ask your partner to turn toward you and whisper something. Can you understand what your partner said?

Experiment Blow up a balloon and tie the end closed. Now hold the balloon up to your ear. Ask your partner to whisper something again. Can you hear your partner?

Draw Conclusions

Infer Air particles are squeezed close together inside of a balloon. Why do you think you could hear better through the balloon?
Classifying Sounds

**Observe** Tap a ruler on the table to make a sound. What do the vibrations feel like? Are they fast or slow?

**Observe** Now listen carefully to the different sounds recorded by your teacher.

**Interpret Data** Rank the sounds by their volume, from loudest to softest.

**Interpret Data** Rank the sounds by their pitch, from highest to lowest.

**Communicate** Design your own demonstration to show the difference between pitch and volume. Record your own sounds or make your own instrument. Share your demonstration with the class.
Structured Inquiry

How does sound move through different types of matter?

Form a Hypothesis

You just learned that sound travels through solids, liquids, and gases. How does the state of matter affect how sound travels? Write a hypothesis.

Test Your Hypothesis

Fill a plastic bag with air and seal it. Hold the bag against your ear.

**Experiment** Tap the tines of the tuning fork against the bottom of your shoe. Then hold the base of the tuning fork against the plastic bag. Listen to the sound it makes.

Fill a plastic bag with water. Seal it and hold it against your ear.

**Experiment** Tap the tuning fork and hold it against the bag. Record any differences you hear.

Place a wooden block in a plastic bag. Squeeze out as much air as you can and seal the bag. Hold the bag against your ear.
**Experiment**  Tap the tuning fork and hold it against the bag. How is the sound different now? Record your observations.

________________________________________________________________________

________________________________________________________________________

**Draw Conclusions**

How did the tuning fork sound different through the different materials?

________________________________________________________________________

________________________________________________________________________

**Interpret Data**  Through which material was the sound loudest?

________________________________________________________________________

________________________________________________________________________

**Infer** Does sound travel best through a solid, a liquid, or a gas?

________________________________________________________________________
Guided Inquiry

How does sound move through different solids?

Form a Hypothesis
Sound can be stopped, slowed down, or absorbed, by different solids. How does sound travel through different solids?

Test Your Hypothesis
Design an experiment to investigate how sound travels through different solids. Decide on the materials you will need. You may want to try plastic, wooden, and metal objects. Write out the steps you will follow. Record your results and observations.

Draw Conclusions
Did your results support your hypothesis? Why or why not?
Open Inquiry

What other questions do you have about sound? For example, what objects block sound the best? Design an experiment to find out.

My question is: ____________________________________________________________

How I can test it: ____________________________________________________________

My results are: ____________________________________________________________
Explore

What objects do magnets attract?

Make a Prediction
What objects will be attracted to a magnet? What objects will not be attracted?

Test Your Prediction

1. Gather together a magnet and several objects from your classroom, such as a pencil, a coin, a paper clip, and a rubber band.

2. Observe Hold one of the magnet’s poles near one of the objects. Does the object move?

3. Repeat step 2 with each object you collected.

Draw Conclusions

4. Classify Which objects were attracted to the magnet? Which were not?
**Infer** What kinds of objects do magnets attract?


---

**Explore More**

**Experiment** How does a magnet change a paper clip? Put a magnet near one paper clip. Now move that paper clip near another paper clip. What happens?


---

**Open Inquiry**

What else would you like to find out about magnets? Are some magnets more powerful than other magnets? Ask your own question. Then plan and carry out a procedure to answer your question.

My question is: ________________________________

____________________________________________

How I can test it: ______________________________

____________________________________________

____________________________________________

My results are: ________________________________

____________________________________________

____________________________________________
How can you move a magnet?

Procedure
Team up with a partner to work in pairs.

1 Place a bar magnet at one end of a desk.

2 Form a Hypothesis  Think of at least two different ways to move this magnet to the other side of the desk using only the other bar magnet.

3 Experiment  Try your two different ways to see if they work.

4 Observe  Write what happened.

5 Communicate  Share your results with the class.

Materials
- 2 bar magnets with the poles marked
Iron in food

1 Predict Many foods, such as cereals, contain iron. Can a magnet attract the iron from these foods?

2 Pour some wet, iron-fortified cereal into a plastic bag. Seal the bag, and crush the cereal.

3 Experiment Rub the magnet over the plastic bag. What happens?

4 Infer What do you think the tiny bits attracted to the magnet are? Explain.

5 How could you determine which cereal has the most iron?

Materials
- small magnet
- plastic bags
- iron-fortified cereal
Structured Inquiry

How does distance affect the pull of a magnet on metal objects?

Form a Hypothesis

You know that some metal objects, such as paper clips, are attracted to magnets. What happens when you change the distance between a magnet and a pile of paper clips? How does this affect the magnet’s pull on the paper clips? Write a hypothesis. “If you move a magnet closer to a pile of paper clips, then . . .”.

Test Your Hypothesis

1. Gather a pile of paper clips on your desk. Stand up a ruler near the paper clips.

2. **Experiment** Hold a magnet as shown below. Slowly lower the magnet until it is only 1 cm above the pile.
3 Measure  Move the magnet away from the pile. Remove the paper clips and count how many stuck to the magnet. Record this data in a table.

4 Repeat steps 1–3, holding the magnet 2 cm and 3 cm away from the pile of paper clips. Record your data.

<table>
<thead>
<tr>
<th>Step 3</th>
<th></th>
<th>Number of Paper Clips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 cm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Draw Conclusions

5 At what distance did the magnet pick up the most paper clips?

Interpret Data  Does the pull of a magnet on objects get greater or smaller as the magnet moves away from the objects?
Guided Inquiry

Can magnetic force pass through an object?

Form a Hypothesis
Can magnetic force pass through different objects, such as wood, plastic, paper, or foil? Write a hypothesis.

Test Your Hypothesis
Design a plan to test your hypothesis. List the materials you will use. Write down the steps you plan to follow.

Draw Conclusions
Did any of the objects block magnetic force? Did any of the objects make the magnetic force stronger or weaker? Share your results with your classmates.
Open Inquiry
What other questions do you have about magnets? For example, what common objects are attracted to magnets. Design an experiment to find out.

Remember to follow the steps of the scientific process.

My question is: ____________________________________________

How I can test it: ____________________________________________

My results are: ____________________________________________
Design a Boat

Design a boat to transport a cargo of marbles across water.

**What to Do**

1. Fold foil into a boat shape.
2. Put the boat in water.
3. Add marbles until the boat sinks. Count the number of marbles and put them in a small plastic bag.
4. Weigh the bag of marbles. Record its weight.
5. Refine the design of your boat to increase its capacity. Load the newly designed boat with marbles you weighed. Did the boat stay afloat?
6. Compare with classmates. Did your boats differ in design? Which boat held the most weight?

**Explore More**

Choose a tool, technology, or invention that you find interesting. Conduct research to find out more about it. On a separate piece of paper, write a procedure that describes how it works. How does it help people solve problems? Share your information with your classmates.

**Materials**

- aluminum foil
- newspaper
- large container filled with water
- jar of marbles
- scale
- small plastic bag
Morse Code Message

1. Work with a partner to build a simple electric circuit. Test the switch. ▲Be careful. The wires may get warm.

2. Think of a short, simple message to send to your partner. Write your message in dots and dashes using the chart shown.

3. Send your message by flashing the light once for a dot or three times quickly for a dash. Count 3 seconds between each letter. Count 5 seconds between each word.

4. As you flash your message, have your partner write the pattern in dots and dashes. Your partner can then use the chart to decode your message.

Draw Conclusions

In what kind of situations would Morse Code be useful? Why don’t we use this technology today? How do people communicate instead?

<table>
<thead>
<tr>
<th>Letter</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.-</td>
</tr>
<tr>
<td>B</td>
<td>-...</td>
</tr>
<tr>
<td>C</td>
<td>-.</td>
</tr>
<tr>
<td>D</td>
<td>-.</td>
</tr>
<tr>
<td>E</td>
<td>.</td>
</tr>
<tr>
<td>F</td>
<td>..-.</td>
</tr>
<tr>
<td>G</td>
<td>--.</td>
</tr>
<tr>
<td>H</td>
<td>....</td>
</tr>
<tr>
<td>I</td>
<td>_.</td>
</tr>
<tr>
<td>J</td>
<td>.--</td>
</tr>
<tr>
<td>K</td>
<td>-.</td>
</tr>
<tr>
<td>L</td>
<td>.-.</td>
</tr>
<tr>
<td>M</td>
<td>.--</td>
</tr>
<tr>
<td>N</td>
<td>-.</td>
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<tr>
<td>O</td>
<td>--</td>
</tr>
<tr>
<td>P</td>
<td>--.</td>
</tr>
<tr>
<td>Q</td>
<td>--.-</td>
</tr>
<tr>
<td>R</td>
<td>-.</td>
</tr>
<tr>
<td>S</td>
<td>...</td>
</tr>
<tr>
<td>T</td>
<td>-</td>
</tr>
<tr>
<td>U</td>
<td>..-</td>
</tr>
<tr>
<td>V</td>
<td>...-</td>
</tr>
<tr>
<td>W</td>
<td>.--</td>
</tr>
<tr>
<td>X</td>
<td>-..-</td>
</tr>
<tr>
<td>Y</td>
<td>-.-</td>
</tr>
<tr>
<td>Z</td>
<td>--.</td>
</tr>
</tbody>
</table>
Model an X ray

What to Do

1. Put on the glove.
2. Place your hand over the paper.
3. Spray the liquid over your hand.
4. **Observe** Look at the print you made. Does it look like your hand?

5. **Infer** Draw a line across one of the fingers. If this were an X ray, what would the line mean?

**Materials**
- disposable glove
- white paper
- spray bottle with mixture of water and tempera paint
- dark crayon or marker
Seasons

The change of seasons can be seen in many trees. In the winter, many trees have no leaves and are dormant. They are resting and do not grow during this time. In the spring, the trees produce leaves, flowers, and fruits. In the summer, the trees make and store food. In the fall, the trees start preparing for the winter and lose their fruits and leaves. Inside the branches and trunk of a tree, during the spring and summer, the tree produces more woody tissue and grows. From year to year, this growth is shown by a new ring of wood.

Purpose

Your task is to tell the age of a tree from its branch.

Make a Prediction

Look at the rings in a tree branch. Can you predict the age of a tree by adding up the number of rings?

Materials

• small branch or tree
Test Your Hypothesis

1. Find a tree branch and count the number of rings.

2. Compare this branch with a thicker or thinner branch from another kind of tree. Does the new branch have more or fewer rings?

3. Compare the thicknesses of the rings in one tree branch. Do they vary in thickness? What might this tell you about tree growth?

Draw Conclusions

4. What did you observe? How old do you think the first tree you looked at is?

5. Is the second tree you looked at older or younger than the first tree? Why?
Critical Thinking

6 Do all places on Earth have seasons?


7 What can annual rings in a tree tell you about the environment?


Records from the Past

Fossils are the remains (leftovers) or traces (like a footprint) of a dead organism. A paleontologist is a scientist who studies fossils to learn about how life was on Earth in the past. A paleontologist goes out in the field and looks for fossils. When a fossil is found, the paleontologist carefully digs out the fossil with special tools. Then the paleontologist carefully transports the fossil back to the lab. At the lab, the paleontologist cleans the fossil and then studies the fossil to answer questions. What kind of animal did the fossil belong to? When was the animal alive? How old was the animal?

Purpose

This activity will show how animal remains are buried and how paleontologists dig them out.

Form a Hypothesis

If animal remains are preserved when buried, write a hypothesis predicting how they might be studied.

Materials

- plaster
- sand
- plastic animals
- bucket of water
- aluminum pan
- tools
Test Your Hypothesis

1. Mix sand, plaster, and water in a bucket or bowl. Use the following ratio: 3 parts sand, 1 part plaster, 1 part water. If the mixture is too dry, add a little more water, but make sure it is not too wet.

2. Pour half of the plaster/sand mixture into the aluminum pan.

3. Add various “fossils” on top of the plaster/sand mixture. Make sure that you spread them out.

4. Pour the remaining plaster/sand mixture on top of the fossils.

5. Let the fossil dig dry.

6. When the fossil dig is dry, you can start digging the fossils out with your tools. Carefully scrape away the plaster and use the brush to brush away the “dirt.”
Draw Conclusions

7. What did you observe?


8. What can you conclude about how paleontologists find fossils?


Critical Thinking

9. Why do you only find fossil bones and teeth and not other parts of animals?


10. In what way are your buried animals not like real fossils?


The Water Planet

Seventy-five percent of the Earth is covered with water. Transportation on water is very common and important. Boats used to be built out of wood because wood floats. However, today boats are made out of steel. A solid block of steel is too heavy to float. But if it is given a large, hollow, bowl-like shape, it can float.

Purpose
Your task is to design and build a clay boat that will float on water.

Form a Hypothesis
How would you design a clay boat to float on water? State your hypothesis in the form of an “if, then” statement. For example, “If the shape of the boat is . . ., then it will . . .”.

Test Your Hypothesis

1. Take a small piece of clay and roll it into a ball.

2. Shape another small piece of clay, that is about the same size, into a boat. Make sure the sides are high enough so that the boat does not flood with water.

3. Put both pieces of clay in a bowl of water.

4. Observe Observe what happens. If the boat sinks, reshape it until it floats.

Materials
- clay
- bowl of water
Draw Conclusions

5 What did you observe?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

6 Did your observations support your hypothesis?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Critical Thinking

7 Why do you sink in a pool when you curl yourself up in a ball but float when you stretch yourself out flat like a piece of paper?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

8 What would happen if more weight is added to a ship? Would it sink?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Matter

Matter can either be a gas, a liquid, or a solid. Molecules make up matter. When many molecules are linked together in a special way, a polymer is made. The longer and more complicated a polymer, the harder it is for the molecules to move and the more likely it is that the polymer is a solid. Borax is a cross-linker. This means that borax links different chains of polymers together to make a more complex polymer.

Purpose

This activity will demonstrate how a new substance, a complex polymer, can be created from other materials.

Form a Hypothesis

When mixed, liquid glue and water form a polymer. If a cross-linker like borax is added, a more complex polymer should form. Write a hypothesis that states these facts in the form of an “if, then” sentence.

Materials

- glue
- plastic cups
- food coloring
- borax
- popsicle sticks
- sandwich bags
Test Your Hypothesis

1. In a plastic cup, mix \( \frac{1}{4} \) cup of glue with 3 drops of food coloring.

2. Add 2 tablespoons of the borax solution (to make this solution, add 1 tablespoon of borax to \( \frac{1}{2} \) cup of water).

3. Using the popsicle stick, mix all this together for about 30 seconds. This forms your slime.

4. Remove the slime and knead it with your hands for about 5 minutes.

5. To make a bouncy ball, squeeze as much water out as you can while kneading it. Then roll the slime between your hands to make a ball. Now watch it bounce!
Draw Conclusions

6 What did you observe?
________________________________________________________________________
________________________________________________________________________

7 Based on your results, what is your conclusion?
________________________________________________________________________
________________________________________________________________________

Critical Thinking

8 What do you think super-absorbent molecules are?
________________________________________________________________________
________________________________________________________________________

9 In Greek, *poly* means “many” and *meros* means “parts.” What does *polymers* mean? Is this an appropriate name?
________________________________________________________________________
________________________________________________________________________
Physical and Chemical Changes

Matter can undergo both physical and chemical changes. After a physical change, the matter looks different but still has the same properties. After a chemical change, the matter has different properties and a new kind of matter is created.

Purpose
You will learn to tell the difference between physical and chemical changes.

Form a Hypothesis
When salt is sprinkled on ice, ice will melt faster. Write a hypothesis to state whether this is a physical change or a chemical change.

Materials
- ice cube
- salt
Test Your Hypothesis

1 Sprinkle salt on an ice cube.

Draw Conclusions

2 What did you observe?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

3 Based on your results, what is your conclusion?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Critical Thinking

4. Is the melting of ice with salt a physical change or a chemical change?


5. Can you explain why salt is used on the roads in areas where there is a lot of snow and ice during the winter?


Energy

Although there are many different types of energy, all types of energy are used to perform some kind of work. The energy in food is called chemical energy. The energy used to turn on lightbulbs is called electrical energy. Food and electricity contain potential energy (stored energy). When this potential energy is converted to kinetic energy (energy of motion), work is performed (such as using chemical energy from food to move muscles, using electrical energy to turn on a light-bulb, and using energy from gasoline to drive a car).

Purpose

You will learn how potential energy can be turned into kinetic energy.

Form a Hypothesis

When a compressed spring is released, it expands and jumps around. Use this fact to form a hypothesis about the relationship between potential and kinetic energy.

Materials

- small, moderately stiff spring
Test Your Hypothesis

1. Place one end of a spring on the floor and press down on it.

2. Quickly take your hand away from the spring.

Draw Conclusions

3. What did you observe?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

4. Based on your results, what is your conclusion?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Critical Thinking

5 Do you think the kinetic energy of the spring once it is released is more or less than the potential energy before it was released?

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________________________________________________________________________________________

________________________________________________________________________________________

6 Give other examples of how energy is transformed from one kind of energy into another kind of energy.

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________________________________________________________________________________________
**Light**

White light is made up of different colors of light. When white light hits an object like a prism, the colored light waves spread out and that is why we see a rainbow of colors coming out of the prism. White light can also be created by combining these rainbow colors.

**Purpose**

This experiment will prove whether or not white light is made up of the other colors of the spectrum.

**Form a Hypothesis**

The prism experiment shows that white light can be broken up into different colors of the rainbow. Write a hypothesis that uses a color wheel to test the reverse idea, that the colors of the rainbow can be combined to create white light.

---

**Materials**

- pencil
- white cardboard
- coloring pencils
- markers

---

**Step 3**

[Diagram showing a color wheel]
Test Your Hypothesis

1. Cut a circular disc with a diameter of 6 inches out of white cardboard.

2. Divide the white part of the cardboard into 6 equal pieces and color the parts as shown in the picture.

3. Push a sharp pencil half way through the center of the circle.

4. Hold the pencil with the point on the table and spin it fast.

Step 4
Draw Conclusions

5 What did you observe?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

6 Based on your results, what is your conclusion?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Critical Thinking

7 How is a rainbow formed?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

8 What is refraction?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Nocturnal Animals

Nocturnal animals are animals that are active at night. Many of these animals can see well in the dark. Humans, however, cannot see well in the dark and that is why we use artificial light such as flashlights, car lights, and lamps to see at night. You probably have experienced that when you enter a very dark room it takes a while for your eyes to get used to the dark. In fact it takes about half an hour for your eyes to fully adjust to the dark. If you used a regular flashlight to look at a star chart while you were stargazing, your eyes would need to adjust to the dark every single time you turned on the flashlight. The white light from the flashlight breaks down chemicals in your eyes that help you see in the dark.

Materials

- flashlight
- red cellophane
- rubber band
- star chart
Purpose
You will learn if using a flashlight covered with red cellophane will improve your vision at night.

Form a Hypothesis
If red light does not break down chemicals in the eye that help you to see in the dark, your eyes should adjust to the low light levels more quickly. Write a hypothesis expressing this idea.

Test Your Hypothesis
1. Turn off all the lights in your classroom, pull the window shades down, and look around with an ordinary flashlight, one that shines a beam of white light.

2. Turn the flashlight off and look around again. Is it easy to see objects?

3. Look around your classroom with a flashlight covered with red cellophane. Look around for at least half an hour.

4. Turn the flashlight off. Can you see objects in the dark better than before?

Draw Conclusions
5. What did you observe?
Critical Thinking

6 Are all stars yellow?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

7 What is a shooting star?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Structured Inquiry

How does color help living things survive?

Ask Questions
Flowers need to be noticed. They need animals to find them and help them reproduce and spread seeds. Does the color of a flower help the flower advertise itself?

Make a Prediction
What colors help a flower get noticed? Do certain colors work better than others at attracting animals in different places?

Test Your Prediction

1. Decide on a typical shape for a flower blossom. The overall size should be about 2 cm or less in diameter. Draw 10 flowers on a wrapping paper page and another 10 flowers on a black and white page. Cut them out.

2. While your back is turned, have a friend spread out the 20 cut-out flowers on a black and white page.

3. Experiment When your friend says “go,” turn around and pick up as many flowers as possible in just 3 seconds. Pick up one flower and place it on the table before you pick up another flower. Do the test 3 times.
4 **Record Data** Record the number of flowers you picked up that were colored and the number that were black and white.

<table>
<thead>
<tr>
<th>Test</th>
<th>Number of Colored Flowers</th>
<th>Number of Black and White Flowers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5 **Trade roles with your partner and repeat steps 2-3.** Record your results.

<table>
<thead>
<tr>
<th>Test</th>
<th>Number of Colored Flowers</th>
<th>Number of Black and White Flowers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6 **Record Data** Use your data to make a double bar graph showing how many flowers of each color were picked up each time you did the test.
Repeat steps 1–6, and this time, place the flowers on a colored page.

My Results

<table>
<thead>
<tr>
<th>Test</th>
<th>Number of Colored Flowers</th>
<th>Number of Black and White Flowers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

My Partner’s Results

<table>
<thead>
<tr>
<th>Test</th>
<th>Number of Colored Flowers</th>
<th>Number of Black and White Flowers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Graph:
Communicate Your Results

Have a class discussion and share your results and graphs. What did you find out? Use your data to answer these questions:

8. Which flowers were easiest to spot? Did the color of the sheet of paper make a difference?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

9. Which flowers were hardest to spot? Did the color of the sheet of paper make a difference?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

10. If flowers grew in a place where everything was brightly colored, what color flowers would be most easily noticed?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

11. How do colors help flowers get noticed? What evidence supports your idea?

________________________________________________________________________

________________________________________________________________________
Guided Inquiry

Hiding in Plain Sight

Ask Questions
Hiding helps some animals avoid being eaten. Some animals need to hide so that the animals they want to eat do not see them waiting for a meal. How are some animals able to hide but still be right in front of us?

Make a Prediction
If hiding from other animals helps living things survive, make a prediction about how animals can use color to survive.

Test Your Prediction

1. Draw a simple picture of a lizard or a frog as if you were looking straight down on it from above. Color your drawing carefully so that it can hide in the classroom in plain sight. The drawing should be 10 to 15 cm long.

2. When everyone’s drawings are colored and cut out, you and half of your classmates should tape drawings on the surfaces you have chosen. Do not hide them under or behind anything. The other half of your classmates should go out of the room while you are hiding the drawings so they cannot see where you are putting them.

Materials

- crayons, markers, or colored pencils
- scissors
- clear tape
3 After all of the drawings are hidden, your classmates will try to find and list as many of the drawings as possible in 1 minute.

Communicate Your Results
Work in groups of 4 to 8 and discuss what you found out about hiding in plain sight.

4 How many pictures were hidden? How many pictures did each student find?

________________________________________________________

________________________________________________________

5 Were some pictures easier to find than others? Describe the color of the drawing and the color of the background of 1 picture that was easy to find. Describe the color and background of a picture that was hard to find.

________________________________________________________

________________________________________________________

________________________________________________________

6 How do colors help animals hide? What evidence supports your idea?

________________________________________________________

________________________________________________________
Open Inquiry

Now You See It, Now You Don’t

Invent and test other ways to explore showing off or hiding. Design and perform an experiment. Ask a question, make a prediction, test your prediction, record your data, and communicate your findings. Make a poster to show what you did and what you found out. Here are some ideas to get you started:

- Take a showing-off and hiding survey of living things in your schoolyard. What living things in your schoolyard are most easily seen? What organisms are not easily seen? What makes them good advertisers or hiders?

- In addition to color, what structures help organisms advertise or hide? Does shape make a difference?

My question is: __________________________________________________________

________________________________________________________________________

How I can test it: __________________________________________________________

________________________________________________________________________

________________________________________________________________________

My results are: ____________________________________________________________

________________________________________________________________________
Structured Inquiry

How can you track the Sun and the Moon?

Ask Questions
How do shadows made by sunlight change during the day? Do they change in length during the day? Do they point in different directions? How can we explain the changes?

Make a Prediction
How do shadows change in length and direction with the time of day? Write a prediction.

Test Your Prediction

1. Place the construction paper in a south-facing window, or outside where you can see the Sun all day, with the pencil upright in the clay in the middle of the paper.

2. Place the clay in the middle of the paper. Stand the pencil in the clay.

3. Mark the shadow of the pencil with the red marker by drawing a line on the paper.

4. Predict Where will the shadow be in 1, 2, 3, and 4 hours? Draw lines with a blue marker to show your predictions.

Materials
• 1 pencil or other long, thin stick
• 1 piece of clay large enough to hold the stick
• 1 piece of white construction paper
• 2 colored markers (1 blue and 1 red)
Make certain that no one moves the paper during the day. As the shadow moves, trace its position with the red marker. Compare the actual positions outlined in red with your predictions marked in blue.

Repeat the experiment a few days later.

**Communicate Your Results**

7. How did the shadow change in length?

8. How did it change in direction?
Share your shadow recording with others and post them in the classroom.

Write a story about how your shadow changed in length and direction.

Were your predictions better on the second day than the first? How close were your predictions?

Have a class meeting and try to explain what made the shadows change.
Guided Inquiry

Moon Tracking

Ask Questions
Does the Moon appear to move across the sky like the Sun does? How would you find out?

Make a Prediction
Earth’s rotation causes the Sun to appear to rise, move across the sky, and set. Do all objects in the sky move in a similar way? Write a prediction about the Moon’s movement.

Test Your Prediction

1. Go outside with a parent or teacher at a time when the Moon is visible in the sky. The best times to do this would be late afternoon or early evening.

2. **Observe** Observe the Moon. Hold one arm straight out toward the horizon. Hold the other arm straight and point it toward the Moon. Draw the angle between your arms on a piece of paper. Have your parent or teacher help you. Record this measurement on a separate piece of paper.

Materials
• 12-inch ruler
Repeat step 2 both one and two hours later.

Communicate Your Results

Did the Moon’s position change over time? Did the Moon rise or fall in the sky?

During the time you observed it, did the Moon change its phase?

Do your results support your prediction? Can you explain the motion, if any, of the Moon across the sky?
Open Inquiry

More Moon Observations

Be a Moon watcher. How else can you track Moon changes? Ask a question, make a prediction, set up an investigation, record your data, and communicate your findings. Here are some suggestions to get you started:

▶ Can you explain what causes the different phases of the Moon by making a model of Earth, the Moon, and the Sun?

▶ At night, does the moonlight cast a shadow? Do shadows from the moonlight change like shadows from the Sun?

▶ Earth’s gravity holds the Moon in orbit around Earth. What effect does the Moon’s gravity have on the Earth?

▶ Can you explain why we only see one side of the Moon?
Observe the Moon at night just after a new Moon. Ask your teacher when the Moon is a new moon. Go outside with an adult and watch changes from night to night over 2 weeks. The Moon will be seen in the west above where the Sun sets. How did the Moon change in an hour? How did it change in 1 to 3 days if viewed at the same time each day?

My question is: ________________________________________

_________________________________________________________________________

How I can test it: ________________________________________

_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________

My results are: ________________________________________

_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
Structured Inquiry

How can you measure light energy?

Ask Questions
How can we collect solar energy from the Sun? How would we know if we actually collected it?

Materials
• 2 clean socks: 1 black and 1 white
• 2 clear plastic cups or 2 500-mL beakers
• 20 drops of blue food coloring
• 2 thermometers

Make a Prediction
If objects of different colors absorb different amounts of light energy, it should be possible to measure how much energy they absorb by measuring how warm they become. Write a prediction about what you think will happen to differently colored objects exposed to sunlight.
Test Your Prediction

1. Place the black and white socks on your hands as if you were putting on gloves. Hold your hands in direct sunlight for 2 to 5 minutes. Predict what you think the socks will feel like when they are held in the Sun.

2. Perform this test and record your observations. Does one sock feel warmer than the other sock?

3. Fill 2 clear plastic cups with cold water. Add 15 drops of blue food coloring to one of the cups (until the water is dark blue). Put an aluminum foil cover on each cup. Make holes in the foil covers and push the thermometers into the water.

4. Record the temperature of the water you put in the cups.

5. Set both cups in direct sunlight. Place them on a piece of white cardboard or foam.

6. Measure the temperature of the water in each cup every 5 minutes for 1 hour. Make a line graph to show the temperature change in each cup.
Repeat your experiment and compare the results to the first experiment. Record your results on the graph below.

Temperatures of Colored Water

Communicate Your Results

What happened to the socks when they were placed in sunlight? What do your experiments suggest about how energy from the Sun was being collected and stored?

How do the cups of clear and colored water act like light and dark socks when placed in the Sun? What do you think is causing the difference in temperature in the samples of water?
Guided Inquiry

Blocking Light

Ask Questions
How are shadows made? How can we change how shadows look? What are shadows made of?

Make a Prediction
To create a shadow, some opaque objects must block light that is shining toward them. Use this fact to make a prediction about what causes shadows and how their shapes might be changed.

Materials

- 1 flashlight
- 2 objects from around the classroom to use for making shadows
- paper on which to trace shadows that you make
**Test Your Prediction**

1. Pick 2 objects of different shapes that you will use to make shadows.

2. Decide how you will make a shadow by using a flashlight and one of the objects. Record how far apart the flashlight, object, and wall will be from each other.

3. On a piece of paper, draw what you think the shadow of the object will look like and how big it will be when you use a flashlight to make a shadow from the object.

4. Now make a shadow with the flashlight, and draw the actual shadow on the piece of paper where you drew your prediction.

5. Try to make different shaped shadows with the same object. Draw your results. Record what you did to change the shape of the shadow.

6. Make a shadow on a wall using an object and the flashlight. Is there a shadow in the air between the object and the image on the wall? How can you tell?
Communicate Your Results

7 Share your shadow drawings of your prediction and the actual results of making a shadow. Make a rule that would tell others how shadows are made and how we can change the shape or size of a shadow.

_________________________________________________________________________________

_________________________________________________________________________________

_________________________________________________________________________________

8 Have a shadow art show, and post drawings of actual shadows you made by moving an object into different positions. Have other students guess what object was used to make each shadow.

9 With classmates, discuss what shadows are made of. Are they made by light? The object? The wall? Is the shadow only on the wall or floor? What is the evidence for your answers?

_________________________________________________________________________________

_________________________________________________________________________________

_________________________________________________________________________________
Open Inquiry

More Brilliant Experiments

What questions about collecting or blocking light do you have? What experiments would you like to do to find out more about light? Here are some ideas:

- What kinds of shadows can you make using 2 flashlights and one object?
- What is the biggest shadow you can make in the classroom with an object the size of a baseball?
- How could you build a new sunlight (solar energy) collector? Could you use a shoebox or a plastic trash bag? How about a coffee can?

Design an experiment based on your questions. What else do you want to explore? Ask a question, make your prediction, plan an investigation, perform the experiment, record your data, and communicate your findings. Make a poster to show what you did and what you found out. What did you observe?

My question is: ____________________________________________

________________________________________________________________________

How I can test it: ____________________________________________

________________________________________________________________________

My results are: ____________________________________________

________________________________________________________________________

________________________________________________________________________
Seasons

Everyday Science Activity
Flipchart p. 62

Review the four seasons. Explain that in certain areas of the country the difference in seasons is much more pronounced than in other areas. Annual rings can be used to count the age of a tree in areas with distinct seasons. Trees in tropical areas do have rings but, because there are distinct seasons, there might be a number of small rings of growth formed over the course of one year.

Prediction Students should formulate a prediction such as the following: If the rings on the branch are counted, then the age of a tree can be determined.

Methods Suggestion: If possible take the students for a walk to look at tree branches. Otherwise, bring a tree branch to the classroom. Find a tree stump and count the rings to determine the age of a tree.

Results The age of a tree. For example: This tree is 3 years old.

Conclusion In temperate climates, growth rings are accurate indicators of a tree’s age.
Seasons

Everyday Science Activity
Flipchart p. 62

Critical Thinking Answers
6. Since the Sun’s position over the equator is more or less constant, there are no real seasons in places near the equator.

7. The annual rings can let us know if there was a drought, a fire, a disease, or some other disaster. A relatively thin annual ring indicates slow growth due to any of the above possible factors.
Records from the Past

Everyday Science Activity
Flipchart p. 63

Review how fossils are formed. Review different kinds of fossils. Show some images of real fossil digs (either online or from a book). Find recent articles on fossils findings. Have students make up questions that a paleontologist would want to find answers to once a fossil has been found.

Hypothesis Students should formulate a hypothesis such as the following: If a paleontologist found a possible fossil site, then he/she would carefully dig and try to get the fossils out using special tools.

Methods You can make your fossil dig as large as you would like, depending on the size of the aluminum pan you decide to use. The larger the fossil dig, the longer it will take to dry (depending on the humidity, it can take a couple of days). If placed in an oven at a low temperature (250° C), the drying process will speed up. After the fossil dig is placed in the oven for 1 to 2 hours, it will still need to dry out in the air. You can make one large fossil dig for a group or you can have each student make their own. Have a group make a fossil dig for another group so that the hidden fossils will be a surprise. Tools such as clay modeling tools work well. A paint brush is used to brush the dirt off.

Results A fossil dig!

Conclusion Fossils are hidden in many layers of soil, rock, and minerals. Paleontologists need to be careful when digging out fossils. Digging out fossils takes a long time, and many small and different tools are used.
Records from the Past

Everyday Science Activity
Flipchart p. 63

Critical Thinking Answers

9. The bodies of animals decay over time, but not the skeletons. The skeleton (the bony part of the animal) gets buried under soil, rock, and minerals.

10. When buried, the plastic toys in this activity remain plastic. With real animal bones buried over long periods of time, the bone material is replaced by minerals, so that the fossil is really a piece of stone.
The Water Planet

Everyday Science Activity

Flipchart p. 64

Show students a book with a history of boats. Students should see that boats used to be made of only wood. Students should also note the different shapes and have them speculate about which shapes work best.

Hypothesis  Students should formulate a hypothesis such as the following:
If a piece of clay is shaped as flat as possible with sides so that no water can get into the boat, then the boat will float.

Methods  The bigger and flatter the boat is, the better it will work. Students might need to remold the clay a couple of times to make the boat work.

Results  The ball of clay sinks to the bottom of the bowl (like a piece of steel would) and the boat floats (like a steel boat would). Students need to make sure that the bottom is as large and flat as it can be and that the boat has sides high enough so that no water can enter.

Conclusion  This experiment shows Archimedes’ Principle. This principle states that an object immersed in fluid is pushed upward by a force equal to the weight of the liquid displaced by that object. In other words, the more water displaced by an object, the stronger the force pushing the object up (which makes it float). This is why the flat, boat-shaped piece of clay floats and the ball of clay sinks. The ball of clay displaces much less water, and therefore a smaller force is pushing it up (a force not strong enough to make the ball of clay float). Archimedes’ Principle explains why a big ship can carry heavy loads without sinking, but when that same load is thrown overboard, it will sink.
The Water Planet

Everyday Science Activity
Flipchart p. 64

Critical Thinking Answers

7. When you stretch yourself out flat on the water you are like the clay boat and more water pushes against your body, making you float. When you are curled up you are like the ball of clay, less water is pushing against you and you sink.

8. The ship will sink deeper into the water until the weight of the water displaced equals the weight of the ship plus the cargo. When the ship sinks deeper, it displaces more water, and therefore increases the buoyant force pushing the ship and cargo up. But at some point, if even more weight is added, the weight of the ship exceeds the buoyant force of the water, and the ship sinks.
Matter

Everyday Science Activity

To demonstrate to students what polymers are, do the following: Have each student walk around the room. They are pretending that they are molecules. Now have 5 students hold hands. The molecules are now linked together and have formed a polymer. Have 3 or 4 students pretend they are borax molecules, which cross-link the polymer strands. These students link the polymers together. Students should observe that the more complicated the polymer the harder it becomes for the molecules to move, and the more likely it is that the polymer is a solid. Marshmallows and toothpicks can also be used to create this effect.

Hypothesis  Students should formulate a hypothesis such as the following: If the liquid glue is added to a liquid borax solution, a solid will form.

Methods Although some other white school glues do work, Elmer’s glue works best. Make one large container of the borax solution with 1 tablespoon of borax to $\frac{1}{2}$ cup of water. If the bouncy balls are still sticky or the students’ hands are sticky, have them either dip their bouncy ball or hands in the borax solution. Be careful with the slime because it can get stuck in any fabric it touches. Slime is non-toxic but it should not be eaten. Please note that the bouncy ball will not stay round and firm. It will flatten once it is allowed to “rest.”

Results The solid slime is formed when glue, water, and borax are mixed.

Conclusion When Elmer’s glue is added to water, a polymer is formed. When borax is added, the polymer chains become linked together, and it is harder for the chains to move. As more borax is added, more polymers become cross-linked and the less they can move. This makes the slime more solid.
Matter

Everyday Science Activity
Flipchart p. 65

Critical Thinking Answers
8. A superabsorbent polymer can absorb a lot of water, and when it absorbs the water it becomes a gel. These superabsorbent polymers are found in diapers. You can open up a diaper and see tiny little gritty particles.

9. Polymer means “many parts.” This makes sense since polymers are made up of many molecules chained together.
Physical and Chemical Changes

**Everyday Science Activity**

Flipchart p. 66

Review terms like matter, elements, molecules. Have the students come up with a list of physical and chemical changes.

**Hypothesis** Students should formulate a hypothesis such as the following: If salt is placed on top of an ice cube then some of the ice cube will melt.

**Methods** Students can use ice cubes and salt to make an ice sculpture.

**Results** The second ice cube sticks to the first ice cube.

**Conclusion** When salt is sprinkled on the ice cube, it causes the surface of that ice cube to melt. This means heat has been released, a sign of a chemical reaction.
Physical and Chemical Changes

Everyday Science Activity
Flipchart p. 66

Critical Thinking Answers

4. The melting of ice is a physical change. Liquid water and ice have the same properties and are therefore the same matter.

5. The mixing of the salt with the ice creates salt water. Salt water has a significantly lower freezing point than fresh water. Therefore the salt/ice mixture will melt at a temperature that would keep pure ice frozen. This helps to remove snow and ice from the roads.
Energy

Everyday Science Activity

Flipchart p. 67

Have students do research on oil and how oil is refined. Have students write about why energy is important to them and how much they use themselves every day.

**Hypothesis**  Students should formulate a hypothesis such as the following: There is potential energy in the spring when it is compressed, and this becomes kinetic energy, energy of motion, when the spring is released.

**Methods**  An elastic band can replace the spring. In this case the potential energy is added to the elastic band when it is stretched, and when released it releases kinetic energy by pulling itself together.

**Conclusion**  Objects can have potential energy that can be transformed into kinetic energy, and the reverse is also true.
Energy

Everyday Science Activity
Flipchart p. 67

Critical Thinking Answers

5. Potential energy is equal to kinetic energy, although it may be difficult for students to measure this easily.

6. Students may mention the energy in the gasoline in their parent’s cars, or the energy in a flashlight that makes the bulb shine.
Light

Everyday Science Activity

Flipchart p. 68

Use a prism to show how white light gets split up into the colors of the rainbow. Use a CD and have the students hold the non-label side in the sunlight. The sunlight will split into the rainbow colors on the CD. Students might need to tilt the CD a little bit.

Hypothesis  Students should formulate a hypothesis such as the following: If a disc with rainbow colors is spun very fast, the disc will appear white.

Methods  Instead of white cardboard, regular cardboard can be used and a white piece of paper can be glued on top. Please note that only 6 rainbow colors are used. Since indigo and violet are sometimes hard to distinguish for students, it has been combined into one color (purple).

Results  The circle appears white. Please note that due to differences in the shades or the colors and the different coloring job of each individual student, the disk might appear a light color but not completely white.

Conclusion  By spinning the circle very quickly, the different colors of light (purple, blue, green, yellow, orange, and red) merge together and we see white (the presence of all colors looks white).
Light

Everyday Science Activity
Flipchart p. 68

Critical Thinking Answers

7. A rainbow is formed when sunlight (white light) passes through rain droplets. Just like a prism, water droplets split up the white light into rainbow colors.

8. Refraction of light occurs when light travels from one medium to another (for example from air into water or from air into a glass prism). When light waves enter a different medium the speed of the waves changes and as a result the direction of the waves change. The different colors that make up white light refract differently and, as a result, we see the rainbow colors coming out of a prism or coming out of raindrops (rainbow).
Nocturnal Animals

Everyday Science Activity

Flipchart p. 69

Review the eye briefly. Explain the functions of the rods and cones. Review the star chart.

Hypothesis Students should formulate a hypothesis such as the following: If you cover a flashlight with red cellophane when stargazing then it will be easier to read a star chart or take notes.

Methods Have students first use a regular flashlight in a dark room to read something and then make the room completely dark and have them use their flashlight again and read. Repeat this with the night-vision flashlight (with the red cellophane). Students should notice that it is much easier for their eyes to adjust when they use the night-vision flashlight.

Results A night-vision flashlight!

Conclusion It takes about half an hour for the human eye to adjust to the dark. The reddish light that results from the cellophane cover, unlike white light, doesn’t break down the chemicals in our eyes that help us see in the dark. Therefore, you should use a flashlight with a red cellophane cover at night to look at a star map or make notes.
Nocturnal Animals

Everyday Science Activity
Flipchart p. 69

Critical Thinking Answers
7. No. In fact, there are red stars, yellow stars, and blue stars. Red stars are the coolest, yellow stars (like the Sun) are hotter, and blue stars are the hottest.

8. A shooting star is a meteor burning up in the Earth’s atmosphere and is not a star.
How does color help living things survive?

Learning Lab Activity
Flipchart p. 70

Student Thinking

Many students have a basic knowledge of the relationship between flowers and the attraction of insects, mainly bees as pollen collectors. Students also know quite a lot about animal camouflage as protection against predators. Many are familiar with walking stick insects, color-changing chameleon lizards, or specific mammals with fur coloration to match their habitats.

Learning Outcomes

These investigations help create opportunities for students to construct expanded explanations for animal and plant coloration. Teachers should look for and assess the following processes and procedures as students perform investigations and experiments:

▶ Being curious and asking questions
▶ Making multiple observations
▶ Differentiating evidence and opinion
▶ Recording and using data
▶ Making predictions
▶ Constructing a complete investigation to answer a question

Structured Inquiry

It Pays to Advertise

A flower’s colors function to attract pollinators, like the lights on a runway, pointing the way to the pollen and nectar they crave. Converging stripes of contrasting colors, rows of dots, a brilliant circle of color at the flower’s center, or starlike patterns—all these flower effects are virtual “road maps” for the insects that help these and other plants procreate. Students can explore colors of paper flowers and find which ones are noticed in different environments.

Issues and Answers

▶ The results are what the students actually get. Thus answering the questions requires evaluating the student data.
How does color help living things survive?

Learning Lab Activity
Flipchart p. 71

Guided Inquiry
Hiding in Plain Sight

After exploring advertising coloration patterns, students will now explore coloration for camouflage. The effects of this coloration may be to completely hide an animal in plain sight, or the coloration may just make the animal less noticeable than others around it. Of course there are other effects of coloration such as confusing an attacking predator about where to best attack for the kill. The purpose of this activity is to find and examine coloration that functions for hiding.

Issues and Answers

▶ When students design an animal they need to take in consideration the color of the environment.
▶ The test to find hidden animals needs to involve quick decisions to model the real world. Predators tend to go after the first animal they notice and do not usually take their time and look around.
▶ The results are what the students actually get. Thus answering the questions requires evaluating the student data.

Open Inquiry
Now You See It, Now You Don’t

Students may want to continue to explore ways of advertising and hiding by using what they have learned. Extending their explorations to the outside world can allow students to connect their findings to nature.

Explorations in a natural environment may help students expand their understanding of coloration. Examples of coloration in nature are numerous. Moths and butterflies may have brown and black patterning on their wings to blend into the natural coloration of bark on specific types of trees. Some small spiders are the same color as the flowers they live on. Some insects mimic other insects that predators may not like. Some insects mimic parts of plants to blend into their natural surroundings. Some animals may have coloration patterns that startle or surprise predators. An extra second or two in which a predator pauses may be all an animal needs to get away.
How can you track the Sun and the Moon?

Learning Lab Activity
Flipchart p. 72

Student Thinking
Student understanding of the Earth, Moon, and Sun system is very difficult because it requires extensive special thinking and reasoning. People in general have a very self-centered view of the world around them and so have difficulty understanding the usual diagrams of Earth and the Moon’s phases. To help build the foundation for developing this thinking, it is very helpful for students to make observations so that they recognize changes that occur because of the motions of Earth, the Moon, and the Sun.

Learning Outcomes
These activities will help students understand the magnitude of the apparent daily motion of the Sun and the Moon. Teachers should look for and assess the following processes and procedures as students perform investigations and observations:

▶ Being curious and asking questions
▶ Making multiple observations
▶ Differentiating evidence and opinion
▶ Recording and using data
▶ Making predictions
▶ Constructing a complete investigation to answer a question

Structured Inquiry
Chasing Shadows
The apparent movement of the Sun caused by the turning Earth is how we explain day and night and also record time. Students need help understanding the cause of changing shadows and interpreting their observations.

Issues and Answers
▶ This activity requires hourly recording of the change of the Sun’ shadow for at least 2 hours. More time is very helpful. Be certain to put the paper and stick where the Sun will shine on it for the entire time.
How can you track the Sun and the Moon?

Learning Lab Activity
Flipchart p. 73

Guided Inquiry
Moon Tracking

This activity will help students connect the pictures in the book with the actual motion of the Moon.

Issues and Answers

▶ Students need help in estimating angles between the Moon and the horizon. By holding arms perpendicular to each other, explain to students what a 90 degree angle looks like. They can then better estimate the angle of the Moon above the horizon.

Open Inquiry

More Moon or Shadow Observations

Students should be encouraged to investigate the motions and phases of the Moon further by looking at the Moon in the sky. Many times you make observations during the day. Students should also make observations from home (a good family activity). This activity will further help them to connect the motions and phases to what they did in the classroom. It will also connect with the other topics that they are studying, such as the daily motion of the Sun and the stars due to the rotation of Earth.

Issues and Answers

1. You can track the Moon motions during the day by comparing its position to the horizon using trees or buildings as reference points.

2. You can use shadows made by moonlight at night to track the Moon just as we did with the Sun. The shadow patterns are very similar because they are caused by the turning Earth.

3. For a week after a new moon, the Moon is easily visible in the western sky just after sunset. From night to night you can see the Moon changing phase and relationship to the position of the Sun.
How can you measure light energy?

Learning Lab Activity
Flipchart p. 74

Student Thinking
Most students have difficulty recognizing that light exists. Because they cannot use their senses to examine it as they can with most matter, they tend to discount the effects of light. Because of this thinking, it is difficult to explain solar energy, shadows, how we see, and how mirrors work. This investigation helps students formally construct ideas about light based upon their own observations of the natural world.

Learning Outcomes
These investigations help create opportunities for students to explain “light phenomena” that require them to think of light as an authentic component of nature, i.e., something that really exists. Teachers should look for and assess the following processes and procedures as students conduct investigations and experiments:

▶ Being curious and asking questions
▶ Making multiple observations
▶ Differentiating evidence and opinion
▶ Recording and using numerical data
▶ Making predictions
▶ Constructing a complete investigation to answer a question

Structured Inquiry
Collecting Light
When light energy strikes a material, it can reflect (bounce off) or become captured (collected) by the atoms in the material. One result is that the light energy becomes thermal energy and causes an increase in temperature of the material. White material tends to reflect all colors of light and black material tends to absorb or capture all colors of light.

Issues and Answers
▶ The black sock will feel hotter than the white sock.
▶ When using colored water, the water should be as dark as reasonably possible. Recognize the water can also heat by conduction from the surface on which it is placed and from the surrounding air.
Measuring light energy

Learning Lab Activity

Flipchart p. 75

Guided Inquiry

Blocking Light

Light can be blocked and can thus create darker areas (shadows) surrounded by light areas. Students see this when the dark area (area of less light) appears on a surface (i.e. shows a shadow). In these investigations students can determine how the shapes of the dark areas (the shadows) are created, how the shadows can change shape and size depending on the arrangement of the flashlight and the distances between the flashlight, object, and shadow.

Issues and Answers

▲ Drawing our predictions about making a shadow allows students to think about what makes the shape of the shadow, i.e. an object blocking a light source. Students may want to explore how shadow sizes can change by moving the object in the open-ended inquiry.

▲ Students often believe that a shadow is what you see on the wall or ground. By placing items between the shadow and the wall or ground, students can discover that the shadow extends all the way from the object to the surface where we see the shadow. A shadow is an area of lower light (darkness) surrounded by an area of greater light.

Open Inquiry

More Brilliant Experiments

Students should ask more questions about collecting and blocking light.

▲ Using multiple flashlights can create multiple shadows. Each light can be blocked individually and the conditions for making a shadow are the same for each light.

▲ Shadows on a wall can be made bigger or smaller by changing the distances between the light source, the object, and the wall. Students should be able to describe how changing the distances between the object, the flashlight, and the wall affect the size of the shadow image (i.e. an object closer to the flashlight makes a bigger shadow and a wall further away from the object makes a bigger shadow).
## Pupil Edition Materials List

### Consumable Materials

<table>
<thead>
<tr>
<th>Materials</th>
<th>Quantity Per Group</th>
<th>Kit Quantity</th>
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<td>T2</td>
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### Additional Materials

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<tr>
<td>wood block</td>
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### Everyday Science Materials List

#### Consumable Materials

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<tr>
<th>Materials</th>
<th>Quantity Per Group</th>
<th>Kit Quantity</th>
<th>Chapter/Lesson</th>
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<tbody>
<tr>
<td>Battery, D cell</td>
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<tr>
<td>Borax</td>
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<td>6/1</td>
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<tr>
<td>Cardboard, white</td>
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<td>1</td>
<td>8/2</td>
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<tr>
<td>Cellophane, red</td>
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<td>Cups, plastic</td>
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<td>Food coloring, red</td>
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<td>1</td>
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<td>Glue</td>
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#### Non-Consumable Materials

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<tr>
<td>Glass</td>
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<td>Spring, moderately stiff</td>
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### Learning Lab Materials List

#### Consumable Materials

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<th>Chapter/Lesson</th>
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<tbody>
<tr>
<td>Borax</td>
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<td>Cardboard, white</td>
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<td>Crayons</td>
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<td>8/3</td>
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<td>Lid, plastic cup</td>
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#### Non-Consumable Materials

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<th>Chapter/Lesson</th>
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<td>1/3</td>
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<td>8/3</td>
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<td>6</td>
<td>8/3</td>
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<td>Thermometer</td>
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