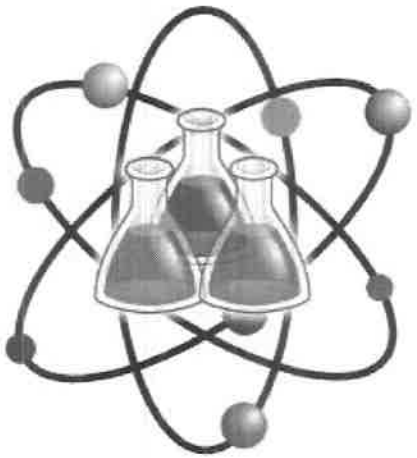
# My Science Journal
# (Earth and Sun)

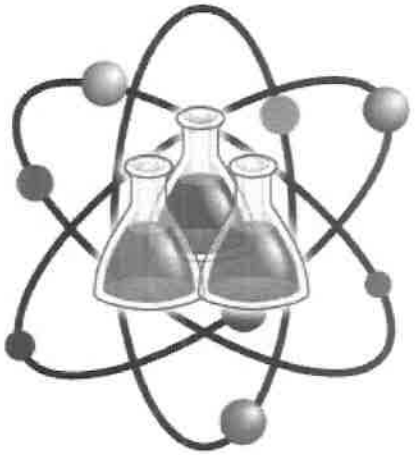
Name_____



5th Grade


# My Science Journal
# (Earth and Sun)


Name _____



5th Grade

How and why does your shadow change during the day?

How and why does your shadow change during the day?

# Shadow Challenges

1. Can you use your shadow hand to touch your shadow head?
2. Can you use your real hand to touch your shadow head?
3. Can you make your shadow very small?
4. Can you separate yourself from your shadow?
5. Can you touch your partner's shadow knee with your shadow hand?
6. Can you make your shadow disappear?
7. Can you slip into someone else's shadow?
8. Can you make your shadow shake hands with someone else's shadow?
9. Can you play shadow tag? Don't let another person step on your shadow.
10. Make up your own challenge.

Be sure to label your own shadow outline with your name and time of day it was drawn. What do you think your shadow will look like in 3–5 hours? Record your ideas in your notebook. Include a drawing.



# Shadow Challenges

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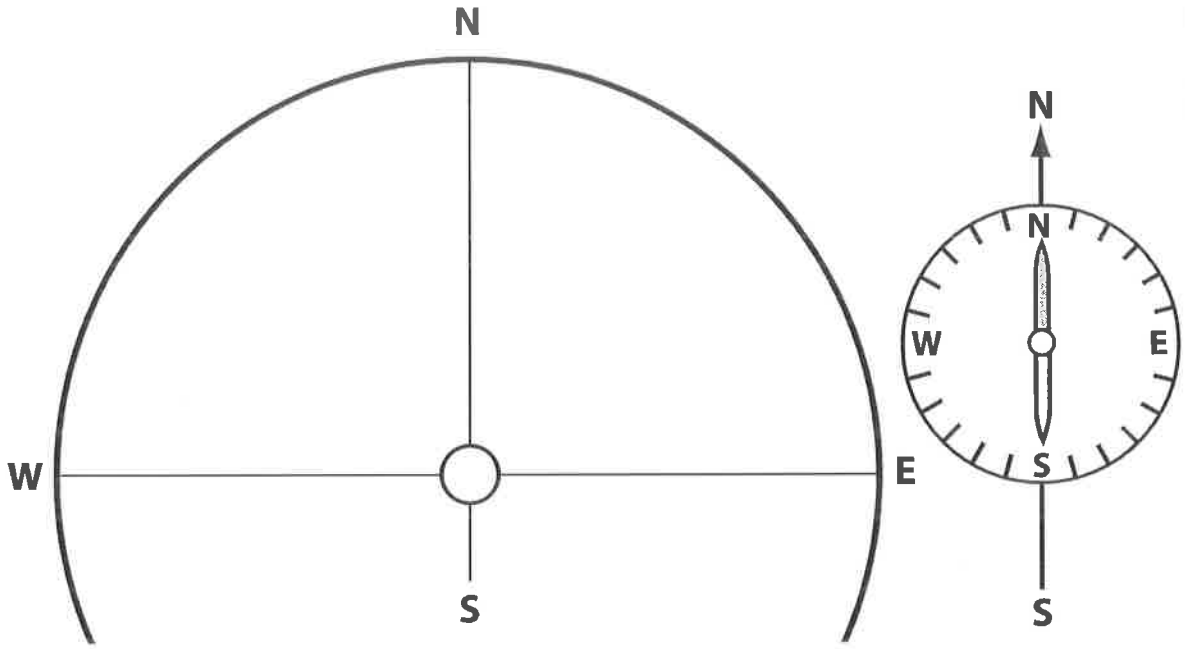
Earth and Sun Module
Investigation 1: The Sun
No. 1—Notebook Master

# Sun Tracker Recording





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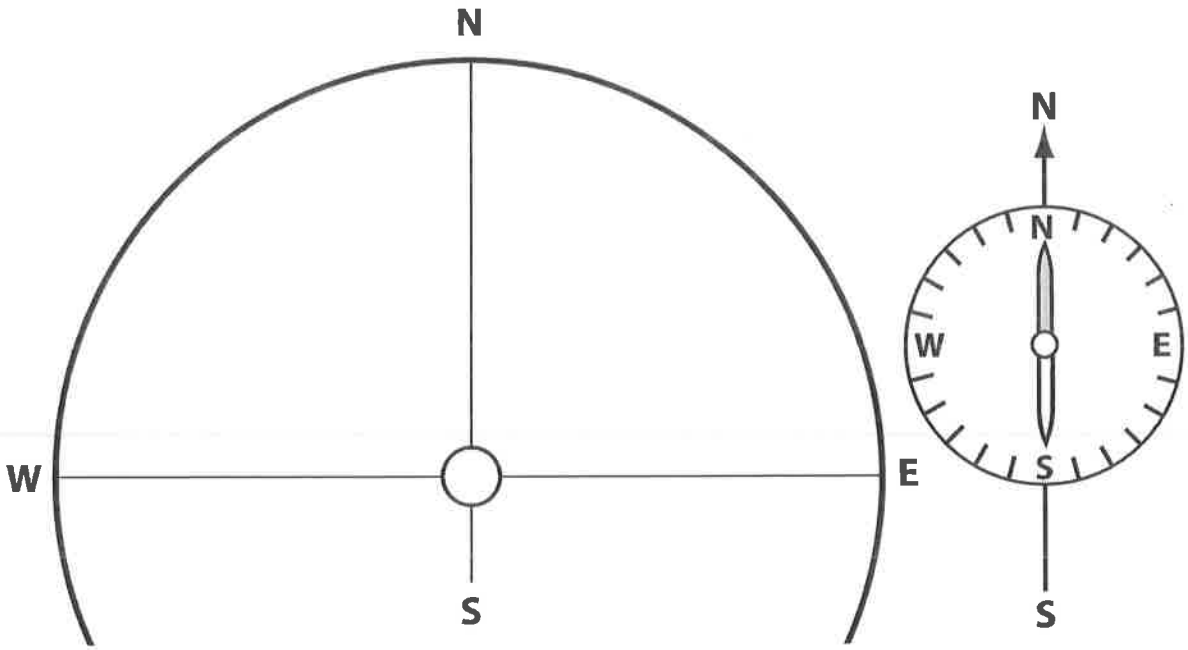


Earth and Sun Module
Investigation 1: The Sun
No. 2—Notebook Master

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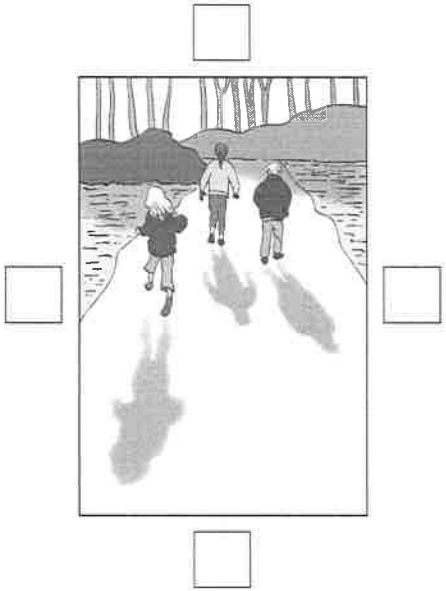
What can be learned by studying the length and direction of shadows?

What can be learned by studying the length and direction of shadows?

# Response Sheet—Investigation 1



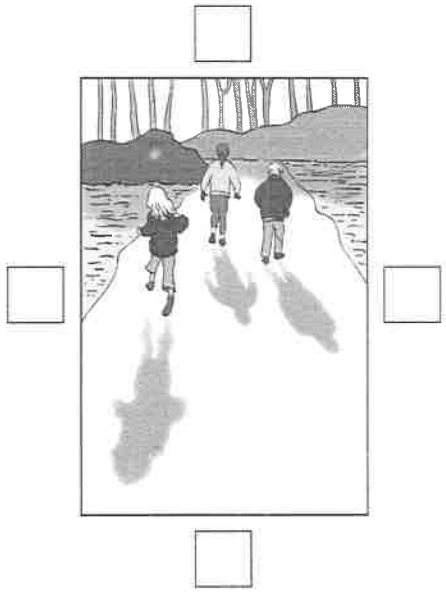
This drawing shows students walking down a path on a winter morning. You are looking at their backs.

1. Write a letter in the box above the picture to indicate which direction the students are facing. Write **N** for north, **S** for south, **E** for east, or **W** for west.
2. How did you know which direction the students were facing?
3. Fill in the rest of the boxes to show the other compass directions.
4. Does the picture show early morning or late morning? How do you know?





# Response Sheet—Investigation 1



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Earth and Sun Module
Investigation 1: The Sun
No. 3—Notebook Master

What causes day and night?

What causes day and night?

## Day/Night Questions

1. Why is it dark at night?

2. At any given time, how much of Earth is in day and how much is in night?

3. What makes the Sun "rise" and "set"?

4. Does the Sun rise in the morning all over the world? Explain.

5. Which side of Earth is in daylight?

6. If Earth did not rotate on its axis, would there be day and night on Earth? Explain.





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Earth and Sun Module
Investigation 1: The Sun
No. 4—Notebook Master

**How can you explain why we see some natural objects only in the night sky, some only in the day sky, and some at both times?**

How can you explain why we see some natural objects only in the night sky, some only in the day sky, and some at both times?

# Night-Sky Log

Bring this sheet back to school on Friday morning.

**Monday** Date _____ Time _____
Observations

**Tuesday** Date _____ Time _____
Observations

**Wednesday** Date _____ Time _____
Observations

**Thursday** Date _____ Time _____
Observations





# Night-Sky Log

Bring this sheet back to school on Friday morning.

**Monday** Date _____ Time _____
Observations

**Tuesday** Date _____ Time _____
Observations

**Wednesday** Date _____ Time _____
Observations

**Thursday** Date _____ Time _____
Observations

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Earth and Sun Module
Investigation 2: Planetary Systems
No. 5—Notebook Master

How would you describe the size of and distance between Earth, the Moon, and the Sun?

How would you describe the size of and distance between Earth, the Moon, and the Sun?

## Modeling Earth, Moon, and Sun

Here are some data about Earth, the Moon, and the Sun.

| Object | Diameter (kilometers) | Orbit distance (Earth diameters) |
|---|---|---|
| Moon | 3,476 | 30 |
| Earth | 12,742 | 12,000 |
| Sun | 1,400,000 | |

Build models of Earth, the Moon, and the Sun to observe the size and distance relationships among them.

Start with your 12-centimeter Earth globe and your Moon ball. The sizes are about right to represent the size relationship.

Use a meter tape to position the Moon ball at the right distance to model the Earth/Moon distance relationship.

The Moon is a little more than 30 Earth diameters away from Earth.





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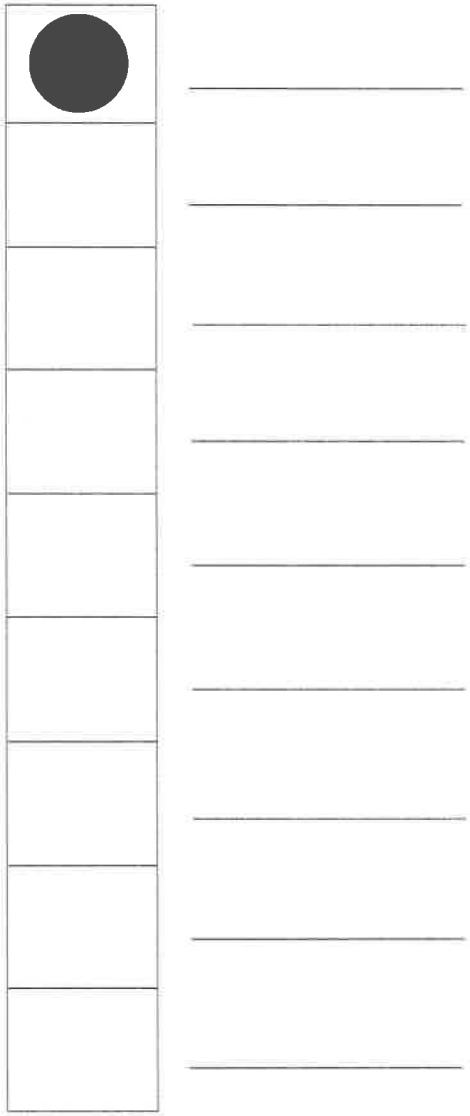
Investigation 2: Planetary Systems
No. 6—Notebook Master

**How does the shape of the Moon change over 4 weeks?**

**How does the shape of the Moon change over 4 weeks?**

# Phases of the Moon

The Moon orbits Earth during a 4-week lunar cycle. In each box, place the phase of the Moon we see from Earth during the cycle. Then name each phase.



waxing gibbous, third quarter, full Moon, waning crescent, waxing crescent, new Moon, first quarter, waning gibbous





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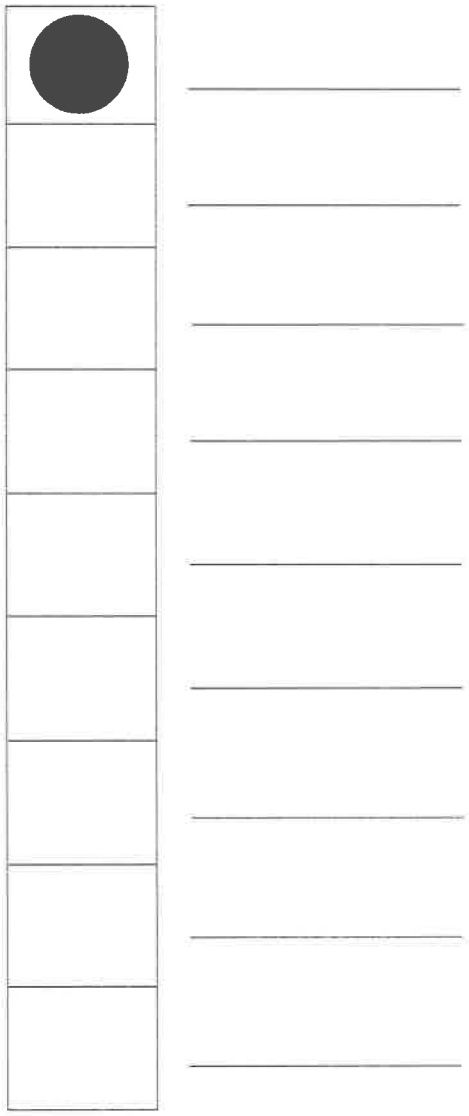

waxing gibbous, third quarter, full Moon, waning crescent, waxing crescent, new Moon, first quarter, waning gibbous

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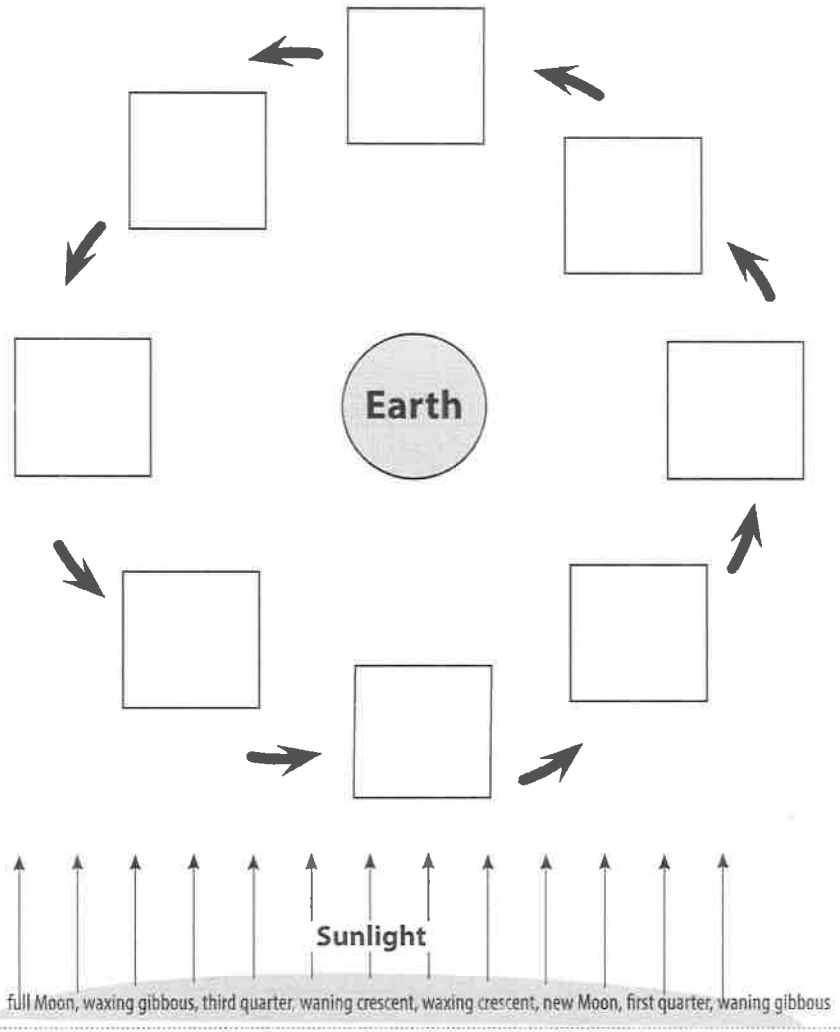
Investigation 2: Planetary Systems
No. 7—Notebook Master

# Looking at the Moon from Earth

The Moon orbits Earth during a 4-week lunar cycle. Place in each box the phase of the Moon we see from Earth during the cycle, and name the phase. Note where the Sun is.



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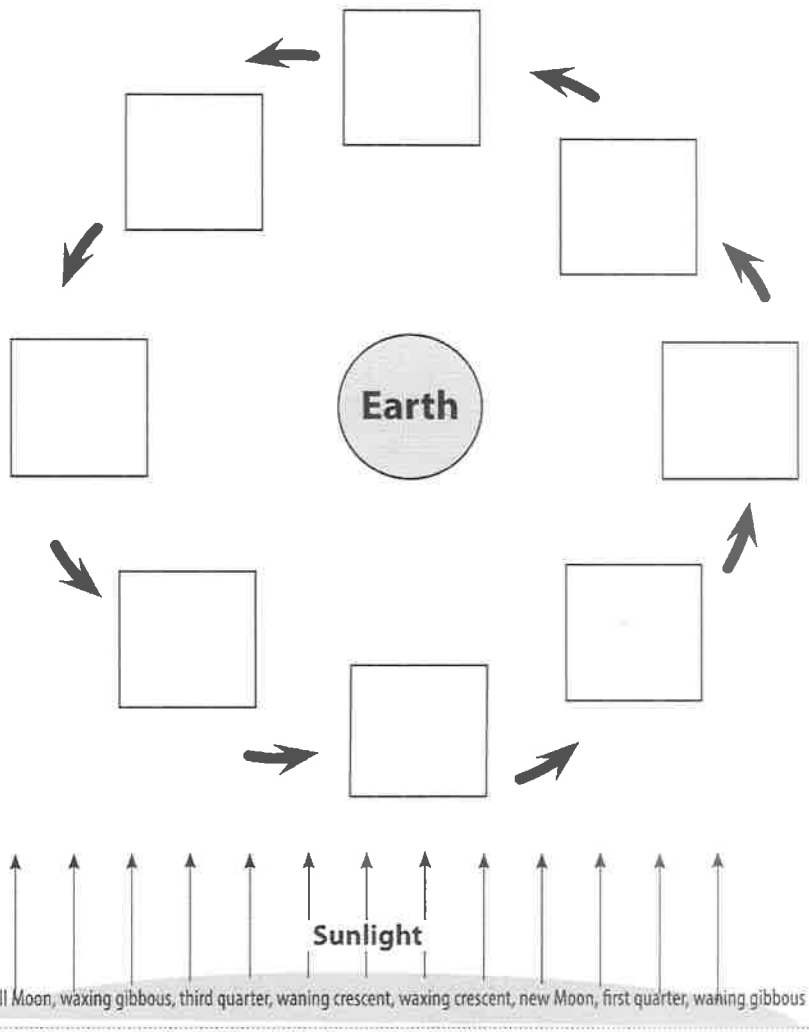


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Earth and Sun Module
Investigation 2: Planetary Systems
No. 8—Notebook Master

How do the parts of the solar system interact?

How do the parts of the solar system interact?

# Solar System Data

| | |
|---|---|
| | |
| | |
| | |
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| | |
| | |
| | |
| | |
| | |
| | |
| Sun | |

1. Record the planets and other solar system objects in order, starting with the Sun. Use the table on the left side of this sheet. If a planet has a moon, write its name in the space below the planet.
2. Use a colored pencil to lightly shade the planets that are made of gas. Use another color to shade the planets that are made of rock.
3. How big are the planets? Write the names of the planets in order from largest diameter to smallest diameter. (Use the first two letters of the planet's name.)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

4. How long does it take for a planet to orbit the Sun? Write the names of the planets in order from shortest to longest orbit time.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

5. How far are the planets from the Sun? Write the names of the planets in order from closest to farthest from the Sun.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

6. What is the surface temperature of the planets? Write the names of the planets in order from highest to lowest surface temperature.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |





# Solar System Data

| | |
|---|---|
| | |
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| | |
| | |
| | |
| | |
| Sun | |

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| | | | | | | | |
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| | | | | | | | |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

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Earth and Sun Module
Investigation 2: Planetary Systems
No. 9—Notebook Master

## Response Sheet—Investigation 2

A friend at another school sends you an email. In that email your friend tells you that they are studying the solar system in science class. Your friend is confused about gravity.

They read in a science book that gravity is a force that keeps planets in orbit around the Sun. But your friend thought that gravity is the force that pulls things toward the center of Earth. For example, when you drop a ball, it falls down to the ground.

Your friend asked this question. Is it possible that both these things could be true about gravity?

Write a reply to your friend. What would you tell your friend to help him or her answer this question?





## Response Sheet—Investigation 2

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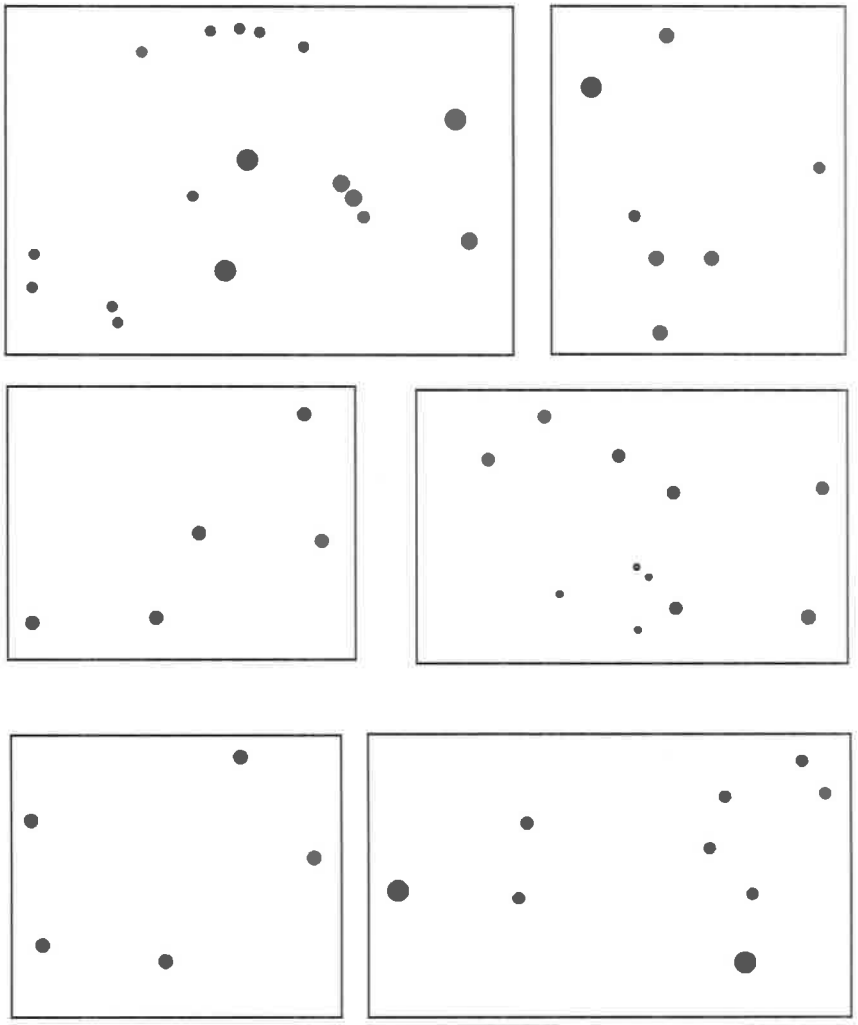
Earth and Sun Module
Investigation 2: Planetary Systems
No. 10—Notebook Master

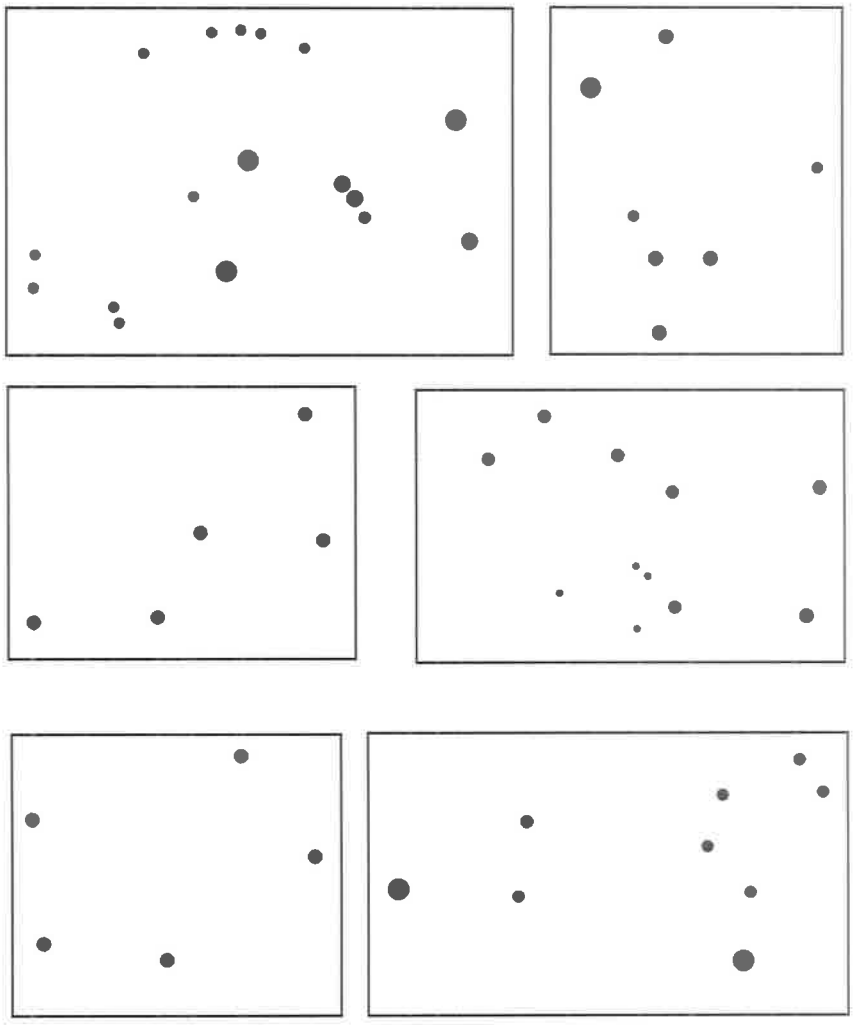
# Star Patterns







Star Patterns



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Earth and Sun Module
Investigation 2: Planetary Systems
No. 11—Notebook Master

Why do stars appear to move across the night sky?

Why do stars appear to move across the night sky?

## *All about Stars* Review

1. How many stars are there?
2. What is the name of the star closest to Earth?
3. What happens to stars at the end of their lives?
4. What is a constellation?
5. What is the Milky Way?
6. What does a telescope do?
7. Why are telescopes put on top of mountains or in space?





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Investigation 2: Planetary Systems
No. 12—Notebook Master

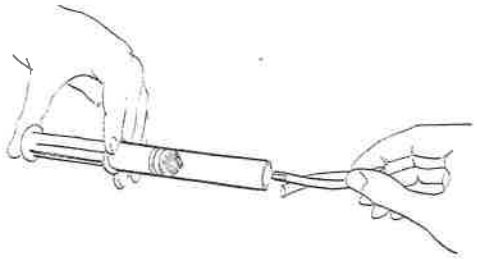
What is air?

What is air?

## Air Investigations

### What is air?

While exploring air with a syringe, write three observations and three questions.





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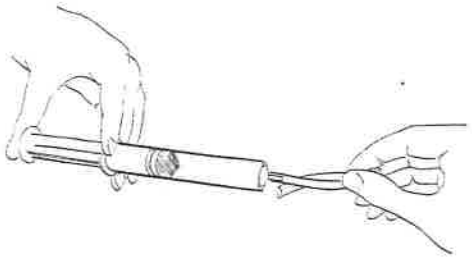

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Earth and Sun Module
Investigation 3: Earth's Atmosphere
No. 13—Notebook Master

What is Earth's atmosphere?

What is Earth's atmosphere?

## Atmosphere Questions

1. What is Earth's atmosphere?
2. Describe how the amount of air changes as you travel up through Earth's atmosphere.
3. How high above Earth's surface does the troposphere reach?
4. What kinds of activities occur in the troposphere?
5. What layer of the atmosphere do you think is of greatest interest to meteorologists? Why do you think so?
6. How do humans rely on Earth's atmosphere?
7. What kinds of things can humans do to protect the atmosphere?





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Earth and Sun Module
Investigation 3: Earth's Atmosphere
No. 14—Notebook Master

Updated 12/2017

How do meteorologists measure and record weather variables?

How do meteorologists measure and record weather variables?

## Weather Data

| Day | Temp. (°C) | Humidity (%) | Wind speed (km per hour) | Wind direction | Visibility (km) | Air pressure (millibars) | Other observations |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |

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Earth and Sun Module
Investigation 3: Earth's Atmosphere
No. 15—Notebook Master

## Weather Data

| Day | Temp. (°C) | Humidity (%) | Wind speed (km per hour) | Wind direction | Visibility (km) | Air pressure (millibars) | Other observations |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |

## Heating Earth Materials Data

Materials in sunshine

| Elapsed time (minutes) | Soil temperature (°C) | Water temperature (°C) |
|---|---|---|
| 0 | | |
| 3 | | |
| 6 | | |
| 9 | | |
| 12 | | |
| 15 | | |

At 15 minutes, record and move to shade →

Materials in shade

| Elapsed time (minutes) | Soil temperature (°C) | Water temperature (°C) |
|---|---|---|
| 18 | | |
| 21 | | |
| 24 | | |
| 27 | | |
| 30 | | |





## Heating Earth Materials Data

Materials in sunshine

| Elapsed time (minutes) | Soil temperature (°C) | Water temperature (°C) |
|---|---|---|
| 0 | | |
| 3 | | |
| 6 | | |
| 9 | | |
| 12 | | |
| 15 | | |

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Materials in shade

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|---|---|---|
| 18 | | |
| 21 | | |
| 24 | | |
| 27 | | |
| 30 | | |

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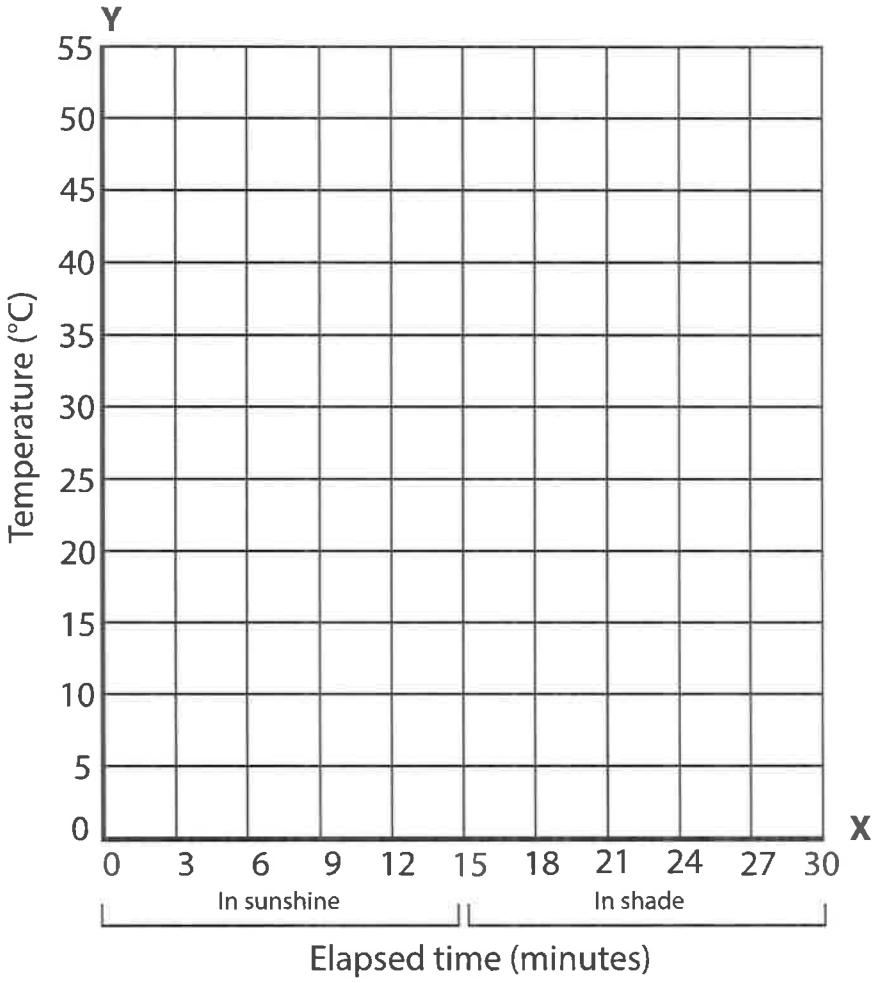
Earth and Sun Module
Investigation 4: Heating Earth
No. 16—Notebook Master

What happens to earth materials when they are exposed to sunlight?

What happens to earth materials when they are exposed to sunlight?

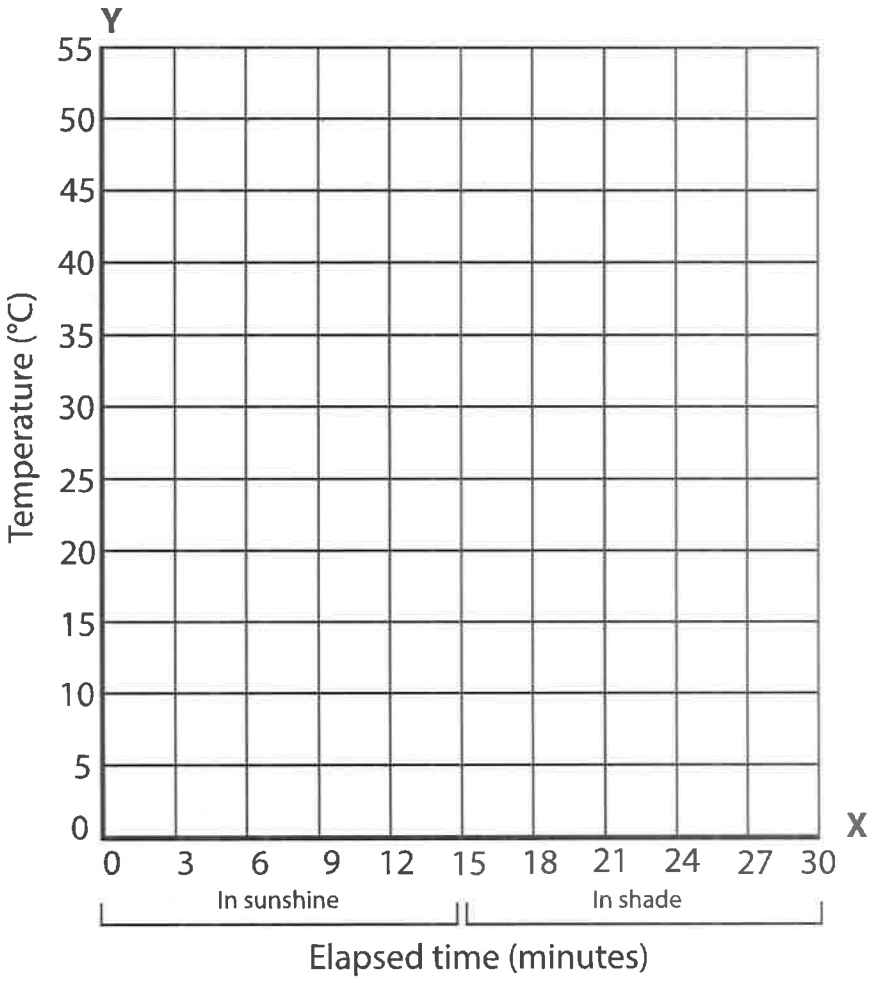
## Graph for Heating Earth Materials








## Graph for Heating Earth Materials

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Earth and Sun Module
Investigation 4: Heating Earth
No. 17—Notebook Master

## Heating Cold Water

a. Work in teams of two.

b. Get a vial, a cup, and two thermometers.

c. Fill the vial with cold clear water and the cup half full with hot red water.

Vial of cold clear water

1/2 cup of hot red water

d. Measure and record the temperature of both water samples.

e. Figure out how to warm the cold clear water without mixing it with the hot red water.

f. Try to warm the cold clear water to a temperature of 30°C.



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Earth and Sun Module
Investigation 4: Heating Earth
No. 18—Notebook Master

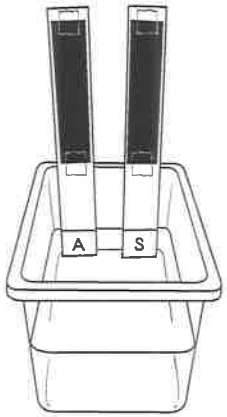
How does energy transfer to the air?

How does energy transfer to the air?

# Conduction through Metals

**Materials**

1 Steel bar
1 Aluminum bar
2 Temperature strips
- Tape
- Hot water bath
- Timer




**Setup**

- Each metal bar has a temperature strip taped on the top half of the bar.
- The basin contains hot water, about 55°C. This is the hot-water bath.
- The timer starts at 12:00.

**Observe and record.**

- What happened when the metal bars were placed in the hot water?
- How did heat transfer from the hot water to the temperature strip far above the water level?
- Did the metals conduct heat? Which metal is a better conductor? Why do you think so?





# Conduction through Metals

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- Tape
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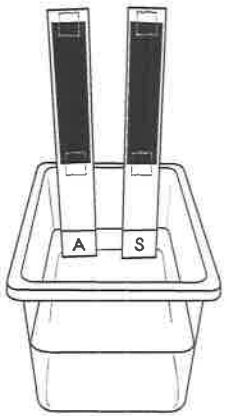


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- The timer starts at 12:00.

**Observe and record.**

- What happened when the metal bars were placed in the hot water?
- How did heat transfer from the hot water to the temperature strip far above the water level?
- Did the metals conduct heat? Which metal is a better conductor? Why do you think so?

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Investigation 4: Heating Earth
No. 19—Notebook Master

What happens when a volume of fluid is warmed at the bottom?

What happens when a volume of fluid is warmed at the bottom?

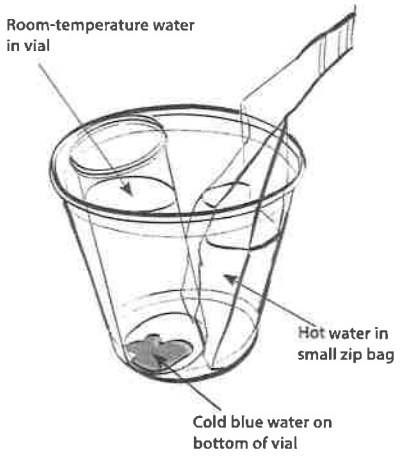
# Heating Procedure

## Materials

1 Vial with room-temperature water
1 Small zip bag
1 Syringe
1 Pipette
- Blue cold water
- Hot water

## Procedure

a. Carefully place a vial of room-temperature water with blue ice water on the bottom in an empty plastic cup.
b. Add 50 mL of hot water to the small zip bag, using a syringe.
c. Slowly lower the bag of hot water into the cup with the vial. The bag of hot water should touch the side of the vial.
d. Observe the blue water carefully for 4 minutes.








# Heating Procedure

## Materials

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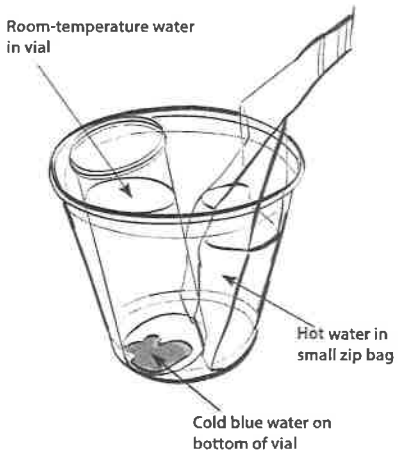


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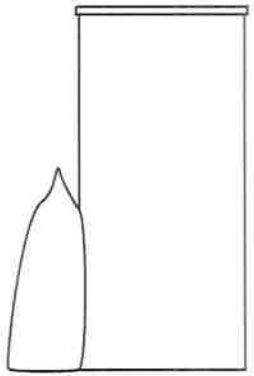
No. 20—Notebook Master

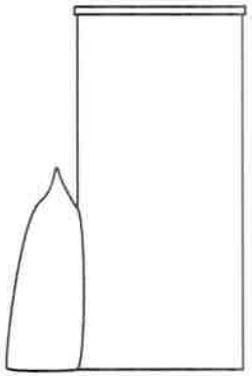
## Heating Ice Water

Draw four sequential pictures that show what happened when a bag of hot water was placed beside the vial with cold blue water on the bottom. Write a short description under each picture.

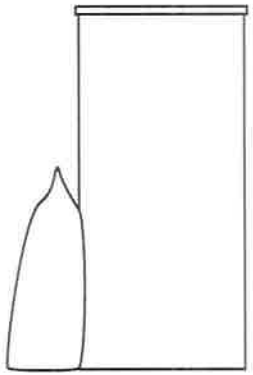
**1.**



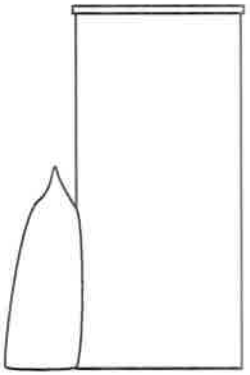
**2.**



**3.**



**4.**



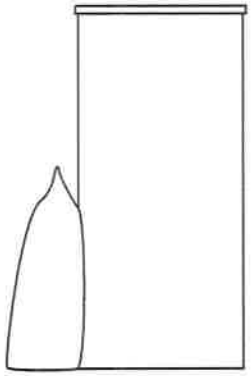




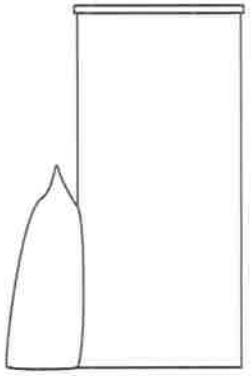
## Heating Ice Water

Draw four sequential pictures that show what happened when a bag of hot water was placed beside the vial with cold blue water on the bottom. Write a short description under each picture.

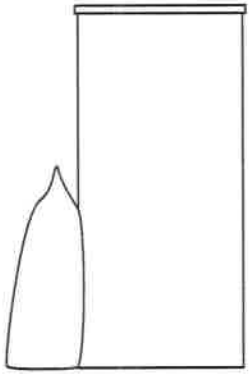
**1.**



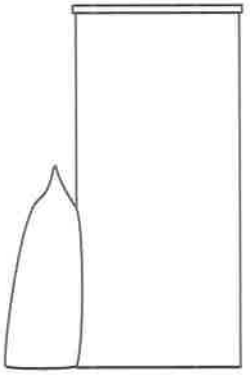
**2.**



**3.**



**4.**



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Investigation 4: Heating Earth
No. 21—Notebook Master

## Response Sheet—Investigation 4

Students in another class were having a debate.

Student A said, "You have to think about the hydrosphere when you explain how convection currents develop to make wind."

Student B said, "No, you have to think about the atmosphere when you explain wind."

Student C said, "You're both wrong. You have to think about the geosphere to explain convection currents."

Which of these students do you think is correct? Which Earth system or systems (spheres) have to be considered when you explain how convection currents or wind is created? Support your claim with evidence.





## Response Sheet—Investigation 4

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Student A said, "You have to think about the hydrosphere when you explain how convection currents develop to make wind."

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Which of these students do you think is correct? Which Earth system or systems (spheres) have to be considered when you explain how convection currents or wind is created? Support your claim with evidence.

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No. 22—Notebook Master

**What is the best design for a solar water heater?**

**What is the best design for a solar water heater?**

## Water-Heater Team Data

Date:

Start time:

Air temperature:

Observable weather:

Circle the setup that applies to your solar water heater.

Collector color: Black White

Water heater: Covered Uncovered

| Elapsed time (minutes) | Water temperature | Temperature change from starting temperature | Notes |
|---|---|---|---|
| 0 | | | |
| 5 | | | |
| 10 | | | |
| 15 | | | |
| 20 | | | |



## Water-Heater Team Data

Date:

Start time:

Air temperature:

Observable weather:

Circle the setup that applies to your solar water heater.

Collector color: Black White

Water heater: Covered Uncovered

| Elapsed time (minutes) | Water temperature | Temperature change from starting temperature | Notes |
|---|---|---|---|
| 0 | | | |
| 5 | | | |
| 10 | | | |
| 15 | | | |
| 20 | | | |

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Investigation 4: Heating Earth
No. 23—Notebook Master

# Water-Heater Class Data

| Black/Covered | |
|---|---|
| Elapsed time (minutes) | Average temperature change (from starting temperature) |
| 5 | |
| 10 | |
| 15 | |
| 20 | |

| White/Covered | |
|---|---|
| Elapsed time (minutes) | Average temperature change (from starting temperature) |
| 5 | |
| 10 | |
| 15 | |
| 20 | |

| Black/Uncovered | |
|---|---|
| Elapsed time (minutes) | Average temperature change (from starting temperature) |
| 5 | |
| 10 | |
| 15 | |
| 20 | |

| White/Uncovered | |
|---|---|
| Elapsed time (minutes) | Average temperature change (from starting temperature) |
| 5 | |
| 10 | |
| 15 | |
| 20 | |





# Water-Heater Class Data

| Black/Covered | |
|---|---|
| Elapsed time (minutes) | Average temperature change (from starting temperature) |
| 5 | |
| 10 | |
| 15 | |
| 20 | |

| White/Covered | |
|---|---|
| Elapsed time (minutes) | Average temperature change (from starting temperature) |
| 5 | |
| 10 | |
| 15 | |
| 20 | |

| Black/Uncovered | |
|---|---|
| Elapsed time (minutes) | Average temperature change (from starting temperature) |
| 5 | |
| 10 | |
| 15 | |
| 20 | |

| White/Uncovered | |
|---|---|
| Elapsed time (minutes) | Average temperature change (from starting temperature) |
| 5 | |
| 10 | |
| 15 | |
| 20 | |

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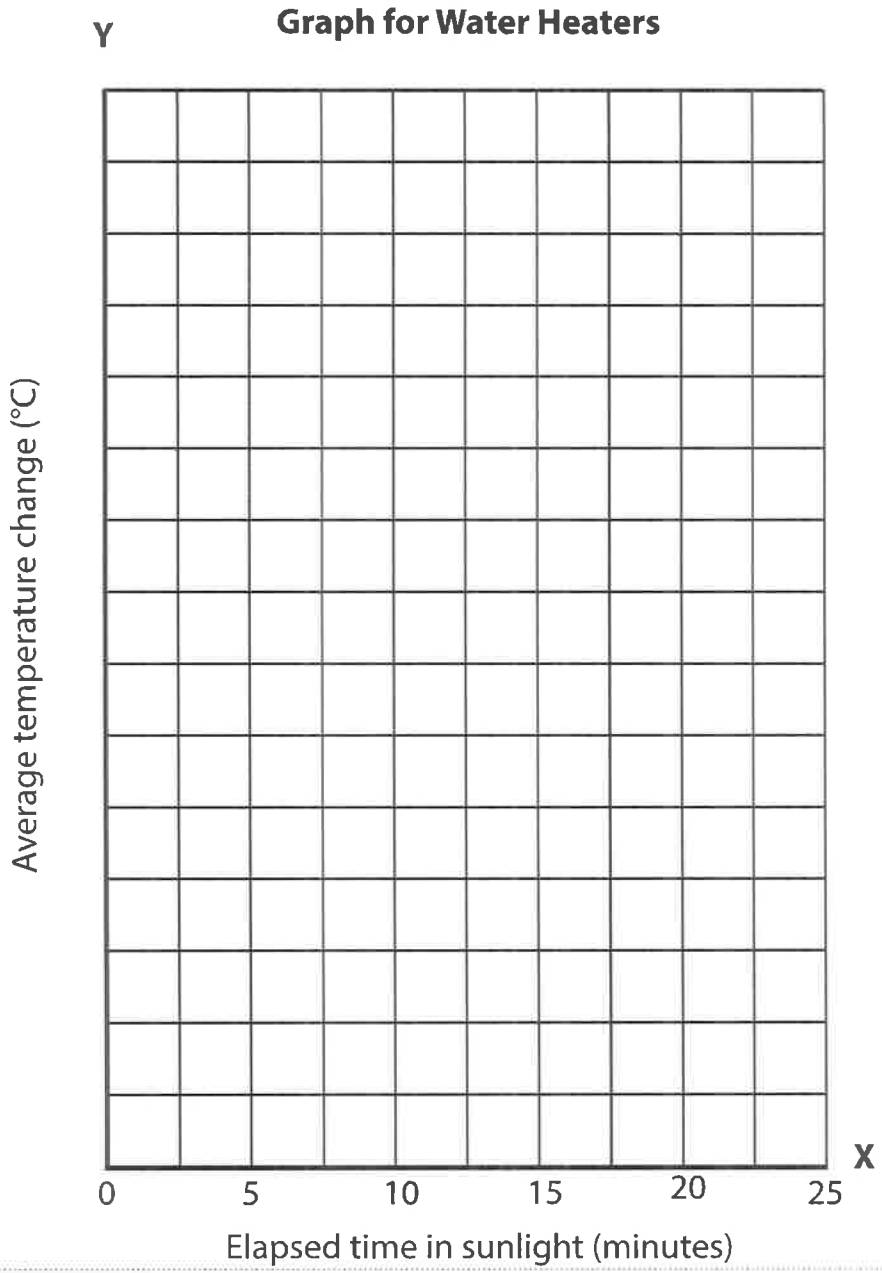
Investigation 4: Heating Earth
No. 24—Notebook Master

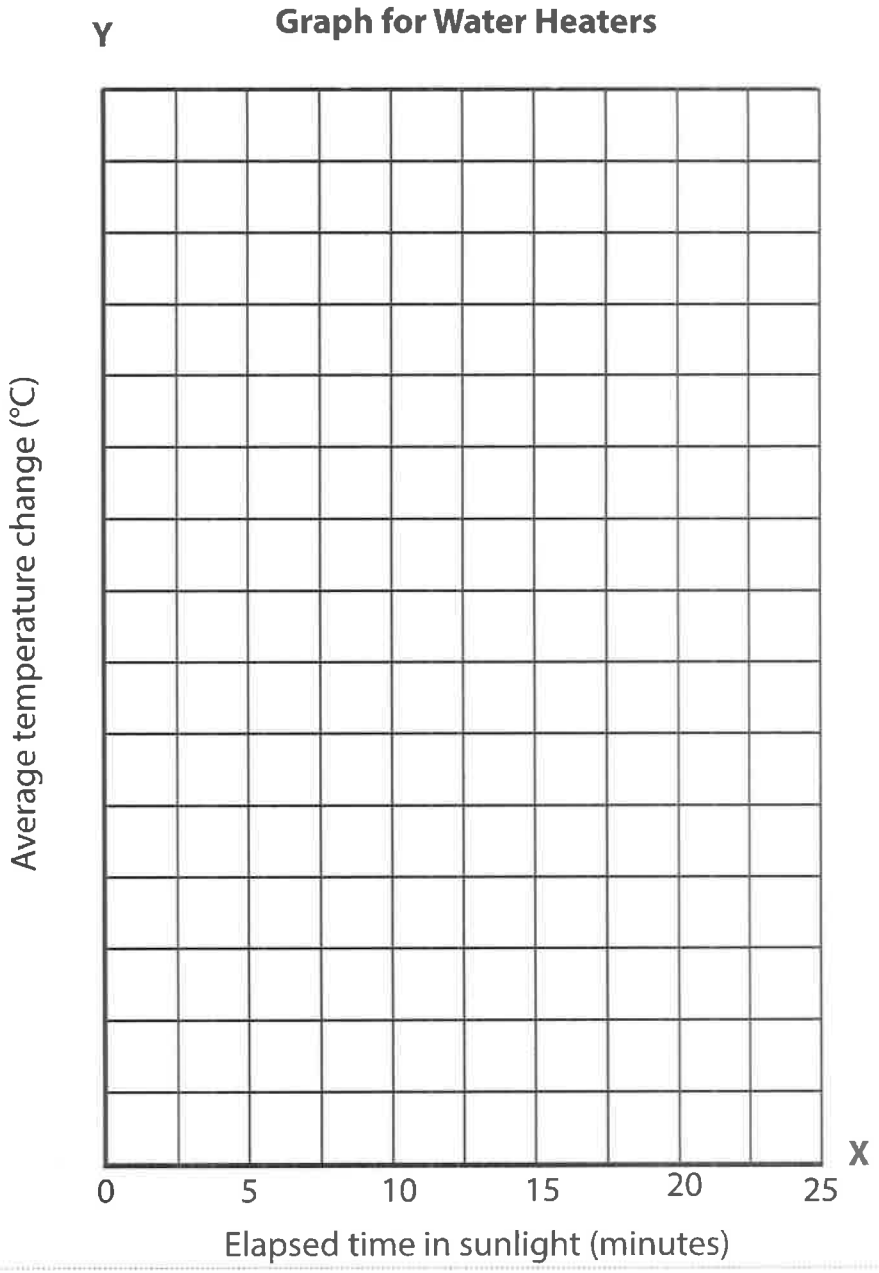
## Graph for Water Heaters








## Graph for Water Heaters

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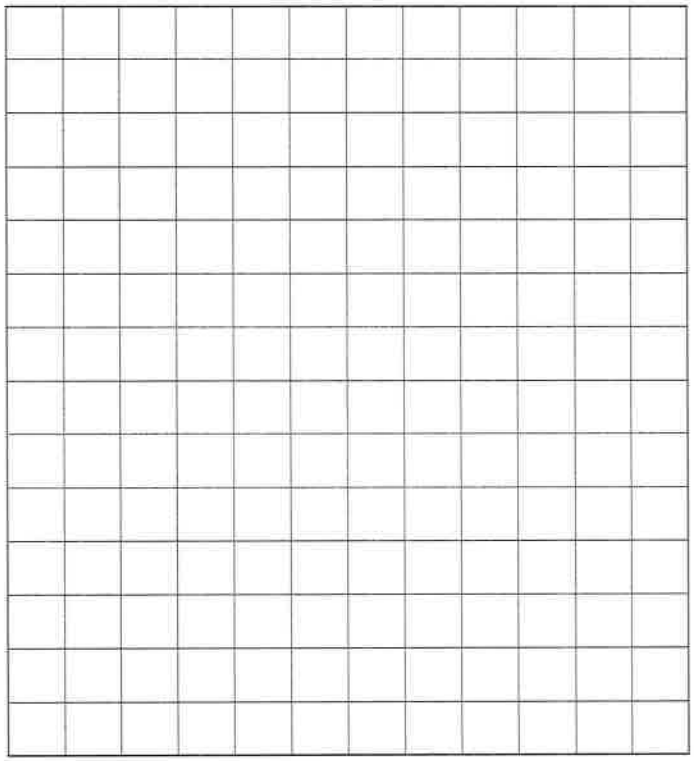
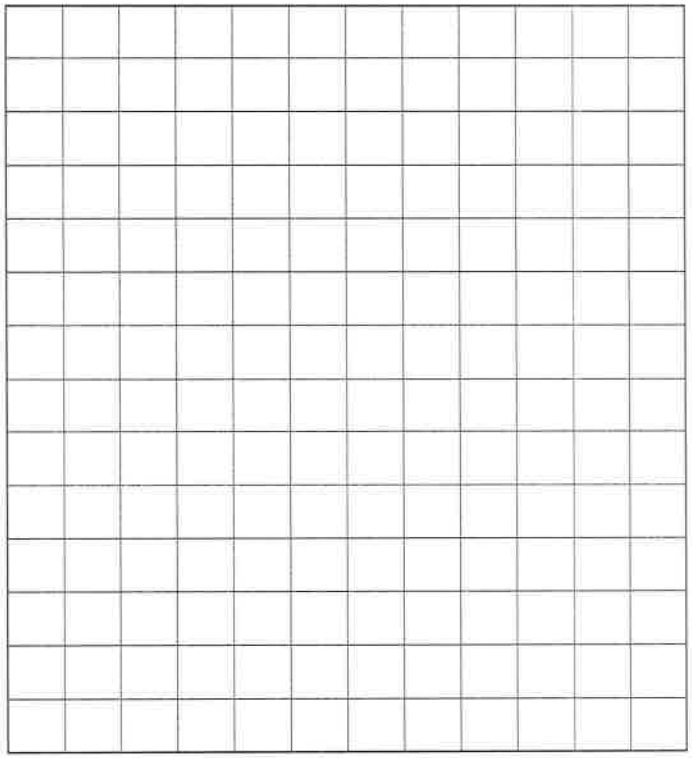
Investigation 4: Heating Earth
No. 25—Notebook Master

# Graph Paper





# Graph Paper



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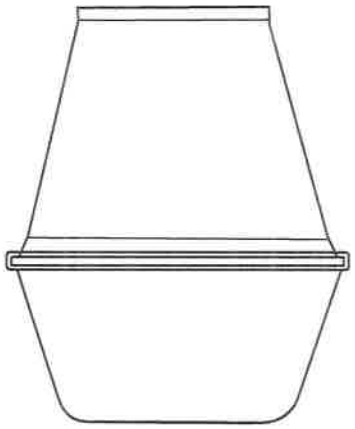
Earth and Sun Module
Investigation 4: Heating Earth
No. 26—Notebook Master

What causes condensation to form?

What causes condensation to form?

## Condensation Observations

1. Draw the experiment and label the picture to show what you observed.



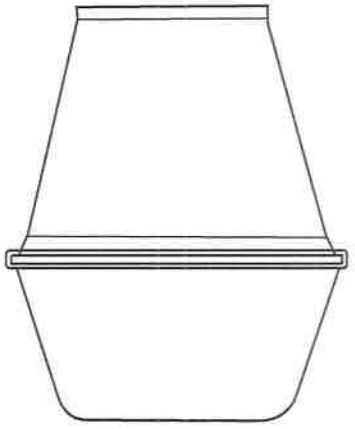
2. Why did condensation form on the inside surface of the chamber?
3. Where did the water that condensed on the side of the cup come from?





## Condensation Observations

1. Draw the experiment and label the picture to show what you observed.



2. Why did condensation form on the inside surface of the chamber?
3. Where did the water that condensed on the side of the cup come from?

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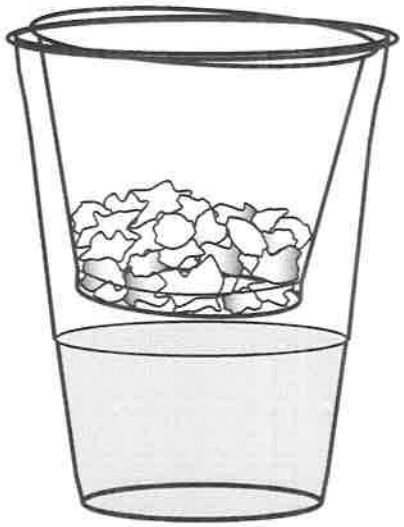
Earth and Sun Module
Investigation 5: Water Planet
No. 27—Notebook Master

## Water-and-Ice System

1. Label the system to show what you observed.



2. Write a description of the changes you observed when you placed a cup of ice over warm water.

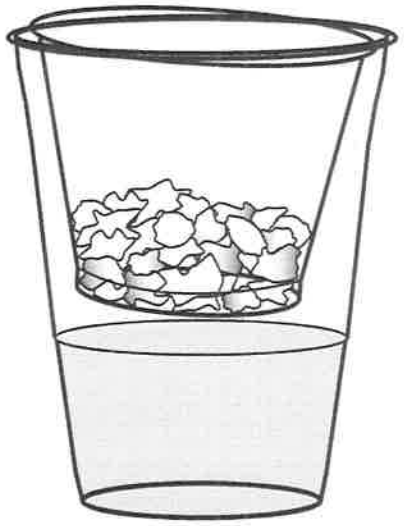
3. What happened when you added salt to the ice?





## Water-and-Ice System

1. Label the system to show what you observed.



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Earth and Sun Module
Investigation 5: Water Planet
No. 28—Notebook Master

How does water vapor get into the air?

How does water vapor get into the air?

## Response Sheet—Investigation 5

On a sunny day, a student poured a cup of water on the sidewalk to make a puddle. When he returned later, the puddle was gone. The student concluded that the puddle was gone because the water soaked into the sidewalk.

What would you say to this student about this conclusion?

What could you do to demonstrate your idea about where the water went?





## Response Sheet—Investigation 5

On a sunny day, a student poured a cup of water on the sidewalk to make a puddle. When he returned later, the puddle was gone. The student concluded that the puddle was gone because the water soaked into the sidewalk.

What would you say to this student about this conclusion?

What could you do to demonstrate your idea about where the water went?

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Investigation 5: Water Planet
No. 29—Notebook Master

## Distribution of Earth's Water

a. Fill the 1 L beaker with water exactly to the 1,000 mL level. This represents all of Earth's water, salt water and fresh water.

b. Transfer a tiny bit of water (less than a drop) to the graduated cylinder (use a pipette). This water represents all the water in Earth's atmosphere.

c. Transfer 2 drops of water to the graduated cylinder. These 2 drops represent all the water in Earth's lakes and rivers.

d. Transfer 6 drops of water to the graduated cylinder. These 6 drops represent all the moisture in Earth's soil and ground ice.

e. Transfer 9 mL of water to the graduated cylinder (use a syringe). These 9 mL represent all of Earth's groundwater.

f. Transfer 20.5 mL of water to the graduated cylinder. This represents all of Earth's frozen fresh water in ice caps and glaciers.

The volume of fresh water in the cylinder should total about 30 mL, or 3 percent of the 1,000 mL that represented all of Earth's water.

How much water is left in the 1 L beaker? _____

Is that water fresh water or salt water? _____





## Distribution of Earth's Water

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Earth and Sun Module
Investigation 5: Water Planet
No. 30—Notebook Master

What is the water cycle?

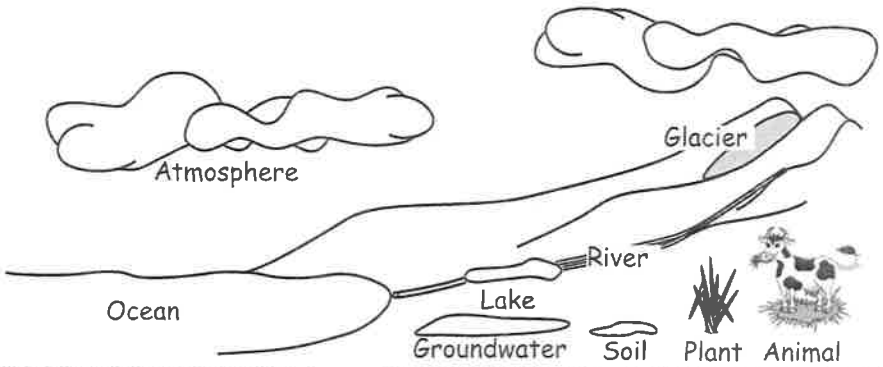
What is the water cycle?

## Water-Cycle Activity

| | Location |
|---|---|
| Start | |
| After roll 1 | |
| After roll 2 | |
| After roll 3 | |
| After roll 4 | |
| After roll 5 | |
| After roll 6 | |
| After roll 7 | |
| After roll 8 | |
| After roll 9 | |
| After roll 10 | |

| Location | Total |
|---|---|
| Animal | |
| Atmosphere | |
| Glacier | |
| Groundwater | |
| Lake | |
| Ocean | |
| Plant | |
| River | |
| Soil | |

1. Did your water drop travel in a full water cycle or only in part of a water cycle? Explain.
2. Draw the path taken by your water drop.








## Water-Cycle Activity

| | Location |
|---|---|
| Start | |
| After roll 1 | |
| After roll 2 | |
| After roll 3 | |
| After roll 4 | |
| After roll 5 | |
| After roll 6 | |
| After roll 7 | |
| After roll 8 | |
| After roll 9 | |
| After roll 10 | |

| Location | Total |
|---|---|
| Animal | |
| Atmosphere | |
| Glacier | |
| Groundwater | |
| Lake | |
| Ocean | |
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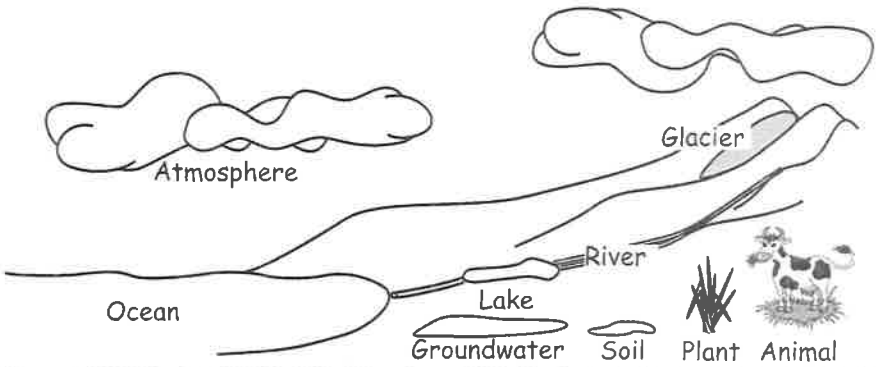


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Investigation 5: Water Planet
No. 31—Notebook Master

What is the difference between weather and climate?

What is the difference between weather and climate?

## Class Activity Tally

| Location | Total |
|---|---|
| Animal | |
| Atmosphere | |
| Glacier | |
| Ground water | |
| Lake | |
| Ocean | |
| Plant | |
| River | |
| Soil | |





## Class Activity Tally

| Location | Total |
|---|---|
| Animal | |
| Atmosphere | |
| Glacier | |
| Ground water | |
| Lake | |
| Ocean | |
| Plant | |
| River | |
| Soil | |

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