

## Science Concept:

Planets in our solar system have unique properties. (NOTE: This lesson may require more than one class period.)

## Objectives:

The student will:

- define “planet”; and
- identify the unique properties of planets in our solar system.

## GLEs Addressed:

### *Science*

[3-4] SD4.2 The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by recognizing that objects have properties, locations, and movements that can be observed and described

[5] SD4.1 The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by distinguishing among stars, planets, moons, comets, and meteors.

[5] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

### *Writing*

[5] W2.2.2 The student writes for a variety of purposes and audiences by writing in a variety of nonfiction forms using appropriate information and structure (i.e., step-by-step directions, description, observations, or report writing).

## Vocabulary:

**comet** – a bright heavenly body that develops a cloudy tail as it moves closer to the sun in its orbit

**meteor** – one of the small bodies of matter in the solar system observable when it falls into Earth’s atmosphere where the heat of friction may cause it to glow brightly for a short time

**moon** – Earth’s natural satellite that shines by reflecting light from the sun and revolves around earth in about 29½ days

**planet** – a heavenly body other than a comet, asteroid, or satellite that travels in orbit around the sun

**star** – a celestial body that produces its own light and consists of a mass of gas held together by its own gravity

## Materials:

- Desk lamp
- Meter sticks
- Thermometers
- String (at least 1 meter long)
- Washer
- Flashlight
- Baby powder in bottle
- Eye dropper
- Pipette or other stirring implement
- Clear drinking glass or beaker
- Pitcher of water
- Milk (small carton)
- Paper towels
- Glass jar with lid

- Safety goggles
- Marker
- Student notebooks (or journals)
- STUDENT WORKSHEET: "Vocabulary Words"
- STUDENT INFORMATION SHEET: "Distance from the sun affects planet temperature"
- STUDENT INFORMATION SHEET: "Distance from the sun affects a planet's orbit speed and revolution period"
- STUDENT INFORMATION SHEET: "Material orbiting Jupiter appears as visible rings around the planet"
- STUDENT INFORMATION SHEET: "Earth is called the blue planet because light entering its atmosphere reflects the blue light waves"
- STUDENT INFORMATION SHEET: "Venus is a very hot planet because its atmosphere traps heat from the sun"

## Activity Preparation:

Read through the instructions on each STUDENT INFORMATION SHEET carefully. Consider how best to manage student rotation through the stations so order is maintained in the classroom. For the station with the STUDENT INFORMATION SHEET: "Distance from the sun affects a planet's orbit speed and revolution period," tie a washer to the end of a string at least 1 meter long. Make a mark on the string 25 centimeters from the washer, 50 centimeters from the washer, and 1 meter from the washer. Set up the five stations. Each station should be stocked with the materials listed on one of the five STUDENT INFORMATION SHEETS. Place the corresponding STUDENT INFORMATION SHEET at the station containing the materials for that activity.

NOTE: Depending on class size, it may be helpful to divide students into groups to rotate among the stations. However, teachers should consider logistics carefully. Two of the activities must be performed in a darkened room; each activity requires a different amount of time, so rotating groups may require more than one room and/or extra supplies.

## Activity Procedure:

### Gear Up

#### *Process Skills: observing and communicating*

1. Distribute the STUDENT WORKSHEET: "Vocabulary Words." Instruct students to work together to define and draw a picture that illustrates the meaning of each word. Encourage students to learn as much as they can about the planets in our solar system, using Internet or library resources.
2. Ask students to brainstorm planet facts for one minute. Challenge students to come up with the longest list possible.
3. Review student lists as a class. Respond to student preconceptions as needed, particularly to inaccuracies that stem from science fiction or fantasy.

### Explore

#### *Process Skills: observing, inferring, and communicating*

4. Distribute student notebooks (or journals). Discuss with the class the correct way to record observations. Write the following questions on the board: What did I observe? What did I infer, or conclude, about planets based on the evidence of the activity? What did this make me wonder about?
5. Instruct students to rotate among the five stations, following instructions on the STUDENT INFORMATION SHEET at each station. Ask students to list their observations, inferences, and questions in their student notebooks (or journals). Remind students their observations should include answers to the questions on the board.

### Generalize

#### *Process Skill: communicating*

6. Discuss student observations and inferences from the Explore section. Consider the following when discussing each corresponding exploration:

# PLANET PROPERTIES

## INSTRUCTIONS



- a. ***Distance from the sun affects planet temperature.*** Planets farther from the sun receive less heat and are cooler than those closer. Additional variables to a planet's atmospheric temperature include density and pressure.
  - b. ***Distance from the sun affects a planet's orbit speed and orbital revolution.*** Planets in long orbits around the sun, like washers on long strings, circle more slowly than those at short distances and in smaller orbits. The greater the distance from the sun, the greater the orbit, and consequently, the greater the period of time it takes a planet to circle the sun.
  - c. ***Material orbiting Jupiter appears as visible rings around the planet.*** Particles reflect light.
  - d. ***Earth is called the blue planet because light entering its atmosphere reflects the blue light waves.*** Waves of color in white light each have a different size. Just as particles of milk reflect blue light waves making a glass of water appear blue-gray, nitrogen and oxygen molecules in Earth's atmosphere spread blue light waves giving the sky its blue color.
  - e. ***Venus is a very hot planet because its atmosphere traps heat from the sun.*** Venus' atmosphere contains 100,000 times more carbon dioxide than Earth's, and traps the infrared waves from the sun, warming the planet's surface to more than 800 degrees Fahrenheit.
7. Ask students the following questions:
- a. What properties do all planets share?
  - b. In what ways can planets be different?
  - c. Why do these differences between planets exist?

### Apply/Assess

#### ***Process Skill: communicating***

8. Instruct students to choose one of the following writing opportunities and complete the assignment.
  - a. Write a single expository paragraph identifying the science concept from the lesson and at least two unique properties of planets within our solar system.
  - b. Write a short science fiction story with our solar system as its setting. Include at least two unique properties of planets within your story.

### Extension Ideas:

#### ***Process skill: communicating***

1. Give students 20 minutes to identify all the characteristics (or properties) of a given planet in our solar system that they can find by performing research online.
2. Illustrate or simulate a property of a planet not explored in this lesson.

# PLANET PROPERTIES

# RUBRIC

Objective	GLE	Emergent	Developing	Proficient	Advanced
The student defines 'planet' and identifies facts about the planets in our solar system during the Gear Up Activity.	[5] SD4.1	The student does not define 'planet' or describe any facts.	The student defines 'planet' and describes at least one fact about planets in our solar system (e.g. Mercury's orbit is fast & short).	The student defines 'planet' and describes at least two unique facts about planets in our solar system (e.g. Mercury's orbit is fast & short; Venus' atmosphere traps heat).	The student defines 'planet' and describes at least three facts about planets in our solar system.
The student observes and communicates at least two unique properties of planets from our solar system when writing a story.	[5] SA1.1 [5] W2.2.2	The student does not communicate definition or properties of planets.	The student writes an incomplete paragraph that fails to properly define "planet" or discuss two unique planet properties.	The student writes a coherent paragraph that defines 'planet' and discusses two unique properties.	The student writes a coherent paragraph that defines 'planet' and discusses more than two unique properties using clear illustrations.

## Distance from the Sun Affects Planet Temperature

### Materials:

- Meter stick
- Thermometer

### Instructions:

1. Place a desk lamp at the “zero” end of a meter stick.
2. Place a thermometer at the 10 centimeter mark.
3. Place another thermometer at the 100 centimeter mark.
4. Turn on the lamp.
5. Illustrate and record the temperatures on each thermometer after 10 minutes.
6. Record observations, inferences, and questions in student notebooks (or journals).

## Distance from the Sun Affects a Planet's Orbit Speed and Revolution Period

### Materials:

- Safety goggles
- String with a washer attached to one end

### Instructions:

1. SAFETY GOGGLES MUST BE USED DURING THIS ACTIVITY.
2. Stand clear of other students.
3. Take the string with the washer tied to one end, holding it at the mark farthest from the washer (1 meter).
4. Move your arm so the washer rotates in a circle as slowly as possible while keeping the string taut.
5. Hold the string at the at the next mark closer to the washer (50 centimeters) and repeat the activity. Observe how long it takes for the washer to make one full rotation compared to the previous attempt.
6. Repeat the same process while holding the string at the mark closest to the washer. Observe and compare the speed of the washer's rotation with the previous two attempts.
7. Record observations, inferences, and questions in student notebooks (or journals).

## Material Orbiting Jupiter appears as Visible Rings around the Planet

### Materials:

- Flashlight
- Baby powder

### Instructions:

1. Close shades and turn off light to darken the room.
2. Turn the flashlight on.
3. Place the flashlight on its side so the beam is directed past the edge of the surface on which it rests.
4. Hold a bottle of baby powder beneath the flashlight's beam. Squeeze the bottle so the powder is expelled into the path of the beam.
5. Record observations, inferences, and questions in student notebooks (or journals).

## Earth is Called the Blue Planet because Light Entering its Atmosphere Reflects the Blue Light Waves

### Materials:

- Flashlight
- Eye dropper
- Milk
- Pipette or other stirring implement
- Pitcher of water
- Paper towels (to clean up spills)

### Instructions:

1. Close shades and turn off light to darken the room.
2. Turn the flashlight on.
3. Shine the flashlight's beam through a glass or beaker of water.
4. Use the eye dropper to add a drop of milk to the water. Stir.
5. Shine the flashlight's beam through the water again.
6. Record observations, inferences, and questions in student notebooks (or journals).



## Venus is a Very Hot Planet Because its Atmosphere Traps Heat from the Sun

### Materials:

- Glass jar, with lid
- Thermometers

### Instructions:

1. Place a thermometer inside a glass jar. Put the lid on the jar.
2. Place the jar near a window in direct sunlight.
3. Place a thermometer next to the jar, also in direct sunlight.
4. Record the temperature of both thermometers after 20 minutes have passed.
5. Record other observations, inferences, and questions in student notebooks (or journals).

# PLANET PROPERTIES VOCABULARY WORDS

## STUDENT WORKSHEET



**Directions:** Define and draw a picture that illustrates the meaning of each word.

1. planet: \_\_\_\_\_

2. star: \_\_\_\_\_

3. moon: \_\_\_\_\_

4. comet: \_\_\_\_\_

5. meteor: \_\_\_\_\_