Planetary Order

Grade: 6

Curriculum Outcome: 104-8, 300-23 describe the physical characteristics of components of the solar system

INDEX:

Teacher's Guide
Planetary Order

Grade Level: 6

Unit: Space

Specific Curriculum Outcome (SCO): 104-8 and 300-23 describe the physical characteristics of components of the solar system

Objective: inform students about the new planetary order, including the minor planets Pluto, Ceres and Eris. They could use this to investigate the definition of a planet

Materials:

Pencil and Paper
Scissors
Colouring Pencils
Glue
Laminator

Introduction:

This lesson will have students investigating the new planetary order, the planet types (gaseous, rocky, dwarf planets etc) and the definition of a planet. This will be accomplished through the teacher's lecture. In this lecture, the teacher will have to provide students with a definition of what a planet is and the terminology astronomers use to discuss planets.

To begin this lesson, the teacher will define what planets are and present terminology to describe planetary differences. This information will include mass, diameter, average distance from the sun, rotation period, mean surface temperature, and surface material. If the students don't understand these terms they will not be able to do the activity. The table overleaf contains definitions of the terms that should be understood.

The teacher could explain these terms using Earth as the example and get the students to answer the questions based on what they already know about Earth.

Term	Definition
Mass	How much matter is in the planet? It can be measured in kilograms.
Average distance from the sun	How far away is the planet from the sun? It can be measured in kilometres
Diameter	What is the distance from one side of the planet straight through to the opposite side? It can be measure in kilometres.
Mean Surface Temperature	What is the average temperature of the planet? It can be measured degrees Kelvin.
Surface Materials	What can be found on the planet?

When the teacher and students are finished with the lecture portion of the lesson, the students can then start the activity which is creating the Planetary Playing Cards. The Planetary Playing Cards are a handout that the teacher must pass out to students. Students will be creating 11 cards, one for each planet. The students could work as collaborative groups to minimize the amount of time required for individual research.

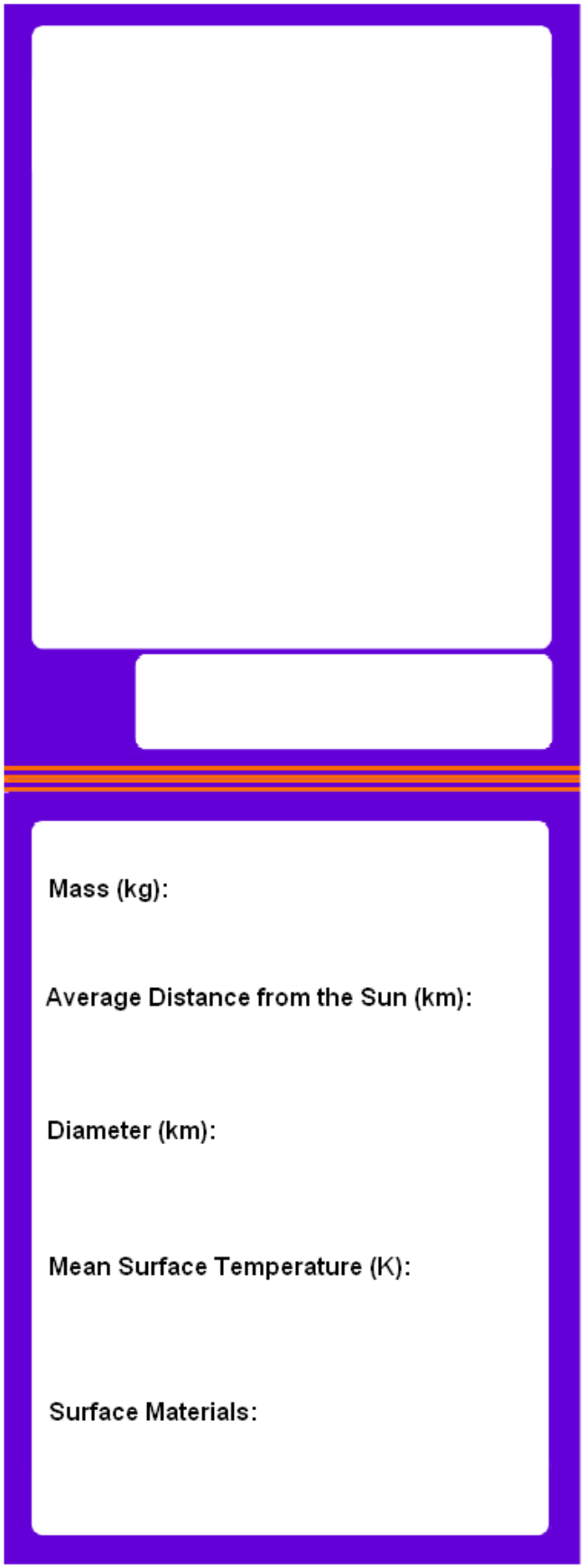
The teacher should prepare copies of the student's activity sheet found in the next section. Each student (or group) should receive 11 copies of the same sheet; one sheet per planet. The activity sheet is a template to make the Planetary Playing Cards. Following the directions on the sheets, the students will write the name of the planet in the space provided, then will research the planet either using their books or the internet to find the remaining information. After completing the card, then students will then have an opportunity to draw it the planet using found images, in the designated area.

When the students are finished making the Planetary Playing Cards, they will give them to their teacher. The teacher will check the playing cards and make sure the information for each planet is correct. Alternatively, if the students are working in groups, groups can compare data in the cards, and raise significant differences with the teacher. Once the teacher and students are satisfied with the playing cards, the student can fold the card in half and tape the sides together.

When the students have finished making their Planetary Playing Cards, they will be given the worksheet. The students can use the cards to complete the worksheet. The worksheets will be a good assessment of how well the students understood the outcome.

The purpose of this assignment is to have students practice their research skills and learn about the planetary order. It is also a fun activity for students and an excellent opportunity for students to be creative. When the students are finished their assignment, they can keep their playing cards.

Activity Sheet



Instructions

1. Fill in the descriptive details about the planet in the lower half of the card.
2. Draw the planet on the front of the card.
3. Write the name of the planet under its picture in the space provided.
4. Fold the card in half on the fold line, and tape or glue the card together.
5. Cut the card out along the edges.
6. Repeat the process for all 11 planets.

FOLD HERE

Activity Sheet

Name: _____ **Date:** _____

Directions: Complete the following table. Use your textbook, reference books, or the internet to find the missing information. Circle the planets with rings.

Planet	Mass (kg)	Average Distance from sun (km)	Diameter (km)	Mean Surface Temp. (K)	Surface Materials
Mercury		57,909,175			basaltic and anorthositic rocks and regolith
Venus	4.87×10^{24}		12,103.6		
Earth		149,597,890		281	
Mars			6,794		
Ceres	$9.43 \pm 0.07 \times 10^{20}$			167	icy
Jupiter		778,412,020	142,984		
Saturn	5.69×10^{26}				
Uranus			51,118	59	
Neptune					
Pluto		5,906,376,200			perhaps methane ice
Eris	$(1.67 \pm 0.02) \times 10^{22}$		2450		

Planetary Order Questions

Name: _____ **Date:** _____

1. In your own words, what is the definition of a planet?

_____

_____

_____

2. You will be drawing the planets overleaf, to scale. To calculate the scaled size of each planet relative to the sun, you must divide the planet's diameter into the sun's diameter and multiple everything by the scaling factor. The sun's diameter and scaling factor are constants.

Example, using the Earth

Earth's Diameter (12756.3 km) x scaling factor = 1.3 cm (the diameter of
Sun's Diameter (1,391,940km) 138.2 cm the Earth you
will draw overleaf)

Record the scaled diameters (in cm) for each planet here:

Mercury: _____ Saturn: _____ Neptune: _____

Eris: _____ Pluto: _____

Venus: _____ Uranus: _____

Jupiter: _____ Ceres: _____

Earth: ____1.3 cm_____ Mars: _____

3. Using the relative diameters you calculated in question 2, draw the planets to scale in order from the sun (if you use a compass, note the difference between diameter and radius!) On this diagram the sun's diameter would be 138.2 cm (too big to draw on the paper!)

4. List the order of the planets in our solar system:

Closest to the sun _____

_____

_____

_____ Furthest from the sun

5. Complete the following table, classifying the planets by size:

Dwarf	**Small**	**Giant**
1.	1.	1.
2.	2.	2.
3.	3.	3.
	4.	4.

6. List the planets that have rings:

_____

_____

7. Complete the following table, classifying the planets by their surface composition:

Rocky	**Gaseous**	**Icy**
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	

8. Choose a planet of your choice, other than the Earth, and describe what you think life would be like on that planet. Example: What is the temperature of the planet? What would you need to survive in this climate?

_____

_____

_____

_____

_____

_____

_____

Answer Key
Activity Sheet

Planets	Mass (kg)	Average Distance from sun (km)	Diameter (km)	Mean Surface Temp. (K)	Surface Materials
Mercury	3.3×10^{23}	57,909,175	4,880	452	rocks and regolith (regolith =shattered rock)
Venus	4.87×10^{24}	108,208,930	12,103.6	726	Mainly lava rock
Earth	5.98×10^{24}	149,597,890	12,756.3	281	Rock, sediment, water
Mars	6.42×10^{23}	227,936,640	6,794	310	rock and regolith
Ceres	$9.43 \pm 0.07 \times 10^{20}$	37350	950	167	Icy
Jupiter	1.90×10^{27}	778,412,020	142,984	120 (cloud tops)	Gas giant [has rings]
Saturn	5.69×10^{26}	1,426,725,400	120,536	88 K (1 bar level)	Gas giant [has rings]
Uranus	8.68×10^{25}	2,870,972,200	51,118	59	Gas giant [has rings!]
Neptune	1.02×10^{26}	4,498,252,900	49,532	48	Gas giant [has rings!]
Pluto	1.29×10^{22}	5,906,376,200	2274	37	perhaps methane ice
Eris	$(1.67 \pm 0.02) \times 10^{22}$	3X the distance of Pluto from the Sun	2450	42.5	Icy

Answer Key

Planetary Order Questions

Name: _____ **Date:** _____

1. In your own words, what is the definition of a planet?

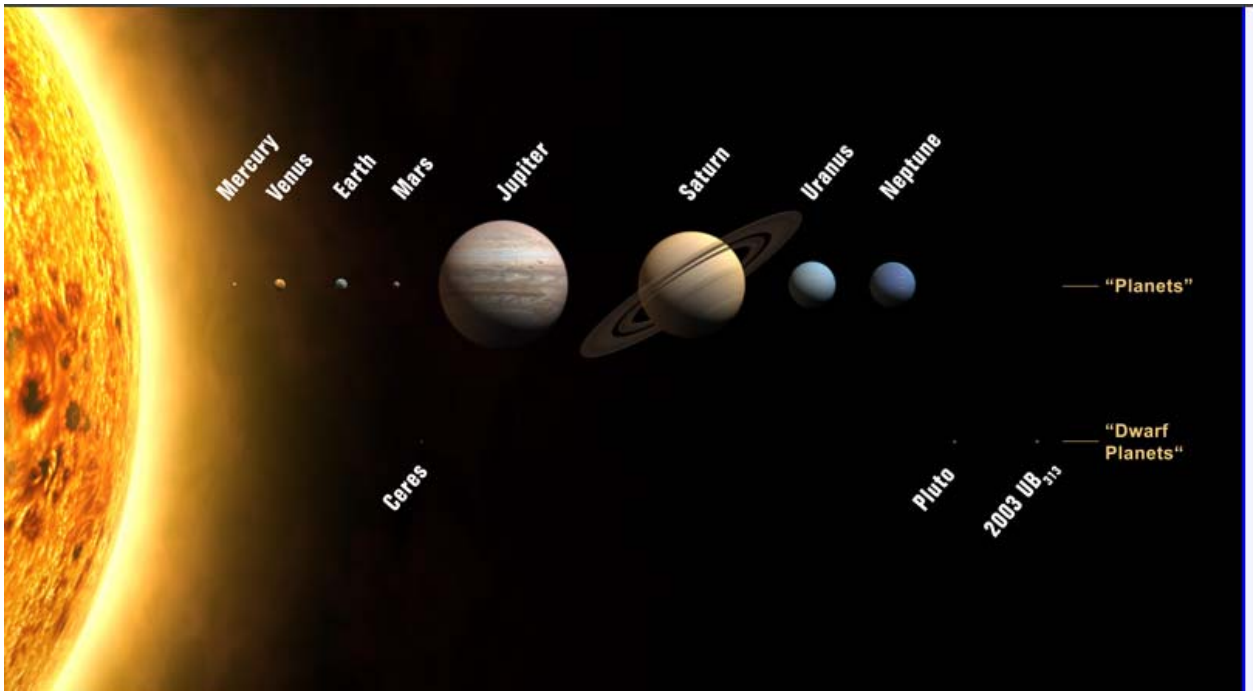
   A planet is a spherical ball of rock and/or gas that orbits a star with a nearly circular orbit that has cleared it's orbit of most other debris by gravity. The Earth is a planet. Our solar system has eight major planets, and three dwarf planets that haven't really cleared their orbits of other debris.

2. Calculate relative size of each planet to the sun. To find the relative sizes divide the planet's diameter into the sun's diameter and multiple everything by the model's dimensions. The Sun's Diameter and Model Dimension are constants.

   Example: Earth's Diameter (12756.3 km) x scaling factor = 1.3 cm
   Sun's Diameter (1,391,940km) 138.2

Size of Planets	
Planet	**Scaled Diameter**
Mercury	0.5 cm
Venus	1.2 cm
Earth	1.3 cm
Mars	0.7 cm
Ceres	0.01 cm
Jupiter	14.2 cm
Saturn	12.0 cm
Uranus	5.1 cm
Neptune	4.9 cm
Pluto	0.2 cm
Eris	0.2 cm

3. Using the ratios that you find in question 2, draw the planets in their relative size in order from the sun.



4. List the order of the planets in our solar system:

[Sun] Mercury, Venus, Earth, Mars, (Ceres), Jupiter, Saturn, Uranus, Neptune, (Pluto), (Eris) (dwarf planets are in parentheses)

5. Complete the following table, classifying the planets by size:

Dwarf	**Small**	**Giant**
1. Pluto	1. Mars	1. Jupiter
2. Eris	2. Earth	2. Saturn
3. Ceres	3. Mercury	3. Uranus
	4. Venus	4. Neptune

6. List the planets that have rings:

   Neptune, Saturn, Jupiter and Uranus have rings, i.e., ***All*** the gas giants, though Jupiter's and Saturn's are the only ones clearly visible with a telescope!)

7. Complete the following table, classifying the planets by their surface composition:

Rocky	**Gaseous**	**Icy**
1. Mars	1. Jupiter	1. Pluto
2. Earth	2. Saturn	2. Eris
3. Mercury	3. Uranus	3. Ceres
4. Venus	4. Neptune	

8. Choose a planet of your choice, excluding Earth, and describe what you think life would be like on that planet. Example: What is the temperature of the planet? What would you need to survive in this climate?

   Students are encouraged to be creative, but they must provide rationale for anything they write down.