Unit 1.8: Earth and Space Science – Planets & Stars

Weekly Focus: Reading for Comprehension
Weekly Skill: Compare and Contrast

Lesson Summary: This week students will continue to learn about the makeup of the Cosmos, specifically the solar system. Students will also review using a Venn diagram to compare and contrast visual information.

Materials Needed:

- Reading on Our Solar System **Unit 1.8 handout 1**
- Compare and Contrast Visual Information **Unit 1.8 Handout 2**
- Homework **Unit 1.8 Handout 3** (6-Way Paragraphs, Middle Level, pages 26-27)

Objectives: Students will be able to…

- Understand key components or parts of the solar system
- Name the main differences in the "inner" and "outer" planets

College and Career Readiness Standards: RI, RST, WHST

ACES Skills Addressed: DFP, LS, AL, CT, SM, N

Notes: Explain to students the importance reading for comprehension. It is the reason for most reading we do at home, at work, and in college. Remind students that while they are reading new material, they need to comprehend what they are reading. If they do not understand a sentence or an idea, they should reread it. While they are reading for comprehension, they should also monitor their time. That is to say, they should skim and scan for information to answer the questions. Reading quickly for comprehension is a skill needed on many modules or portions of the GED test as well as a college skill.

Remind students that the next lesson, Unit 1.9, will have a review of material covered over the past 7 – 9 weeks in Earth and Space Science. Ask students to take some time to review handouts to prepare for the GED-like questions. Assure newer students that they will be able to gauge their knowledge with the review questions and determine what areas they may need to study further.

Also, please note that **Routine 4** is referenced in this lesson.

GED 2014 Science Test Overview – For Teachers and Students

The GED Science Test will be 90 minutes long and include approximately 34 questions with a total score value of 40. The questions will have focus on three content areas: life science (~40%), physical science (~40%), and Earth and space science (~20%). Students may be asked to read, analyze, understand, and extract information from a scientific reading, a news brief, a diagram, graph, table, or other material with scientific data and concepts or ideas.

The online test may consist of multiple choice, drop down menu, and fill-in-the-blank questions. There will also be a short answer portion (suggested 10 minutes) where students may have to summarize, find evidence (supporting details), and reason or make a conclusion from the information (data) presented.

The work students are doing in class will help them with the GED Science Test. They are also learning skills that will help in many other areas of their lives.

Activities:

Warm-Up: Quick Scan of Our Solar System	**Time: 10 minutes**
As students enter the class, have students write in their journals, on a piece of notebook paper, or discuss with small groups the following: "What do you know about the Solar System?" Note: write the question on the board or overhead. Circulate while students are writing. If students seems to be stuck with this question, try to prompt them with questions about what they already know about the Solar System from what they have studied as well as what they may have read or watch on television. Prompt students with questions such as: "How many planets are in the solar system and what are their names?" "What is the name of our galaxy?" etc.	

Activity 1: Reading for Comprehension: Our Solar System (Unit 1.8 Handout 1)	**Time: 40 - 50 minutes**
1) Distribute **Unit 1.8 Handout 1** a to students. **2)** discuss with students that when reading for comprehension, there are many strategies to use: read the title to predict what the reading is about; look at the words in bold and then search for their definitions; if there are images, look at them to get a better understanding; while reading remember to ask "What is this all about?" **3)** Have students read the passage and answer the questions independently. In the past this has been group work (presentations), however, now students are going to prepare to work independently. This is a way to prepare them for the Unit 1 review in which they will have to read and answer questions independently also. **4)** Circulate class while they are reading to make sure they understand the information presented and see if there are any questions **5)** review answers as a whole class. Ask students to point out what evidence or information led them to the answer they choose. If their answer is not correct, review the information to make sure they understand it correctly. **6)** If there is extra time, have students read passage in pairs to promote reading fluency.	

Break: 10 minutes

Activity 2: Compare and Contrast Planet Charts & Data with a Venn Diagram (Unit 1.8 Handout 2)	**Time: 40 minutes**
1) Hand out **(Unit 1.8 Handout 2)** to students. **2)** Explain how compare and contrast to students and how to use Venn diagram. **3)** Explain to students that they should examine the two charts (Inner Planets & Outer Planets) and use the Venn diagram to note what is the same and what is different in the charts. Students should work individually then share their Venn diagrams with pairs or table groups. Circulate the room to assist students with the activity, especially new students who may not have worked with a Venn diagram. **4)** When they are finished with the Venn diagram, students will have to examine the chart with planet data to answer questions that follow. Discuss with students that they may have to read charts on a GED Science or Social Studies test with a lot of information that is not needed in a response. They should practice skimming and scanning to find the requested information. **5)** Review answers as a whole class. Ask students to explain or discuss how they reached their answer. Ask them what evidence did they use to reach their conclusion. **6)** Ask for students to share their answers if they would like. Remind students that there can be different possible answers.	

Wrap-Up: Summarize	**Time: 5 - 10 minutes**
Have students turn to a partner (or write in their journals) about what they have learned today about our solar system, planets, and stars. Ask them to discuss one thing new they learned today. Another option is to have students come up with one question or wondering they still have about the subject that they could research and report back to the class. *Note: Use* ***Routine 4 Handout: Summarizing***	

Extra Work/Homework: Black Holes (Unit 1.8 Handout 3)	**Time: 20 minutes outside of class**
Students can read and answer questions: 6-way Paragraphs – Middle Level, pages 26 - 27) "Black Holes." This is an excellent opportunity for students to review some of today's material in an independent manner. It could also be used as a way to get new or absent students caught up with the lesson.	

Differentiated Instruction/ELL Accommodation Suggestions	**Activity**
If some student groups finish early, they can use the time to practice summarizing a multi-paragraph reading.	**Unit 1.8 Handout 1**
You may need to explicitly instruct on how to use a Venn diagram. One example is to have two students stand at the front of the room. Ask for what is the *same* (i.e.: students, study for GED, live in MN,) and what is *different* (i.e.: male, from Africa, married, etc.) and put the information in a Venn diagram on the board. Explain how this helps to organize information from passages in order to make a conclusion with evidence.	**Unit 1.8 Handout 2**

Online Resources:

NASA: http://solarsystem.nasa.gov/index.cfm

Suggested Teacher Readings:

- GED Testing Service – GED Science Item Sample (to get an idea of what the test *may* be like)

http://www.gedtestingservice.com/itemsamplerscience/

- Assessment Guide for Educators: A guide to the 2014 assessment content from GED Testing Service:

http://www.riaepdc.org/Documents/ALALBAASSESSMENT%20GUIDE%20CHAPTER%203.pdf

- Minnesota is getting ready for the 2014 GED test! – website with updated information on the professional development in Minnesota regarding the 2014 GED.

http://abe.mpls.k12.mn.us/ged_2014_2

- Essential Education's 2014 GED Test Curriculum Blueprint (PDF)

http://www.passged.com/media/pdf/educators/curriculum-blueprint.pdf

Unit 1.8 Handout 1 (4 pages total)

Our Solar System

Where are we? This is a question you have probably asked before, but a question that usually refers to a specific address or a location within a city or town. For some people, though, this question refers to where we are on earth, or even, where we are in the universe.

When considering time and size, humans are actually quite insignificant. We have only existed for about 5 million years. In comparison, cockroaches have lived for at least 300 million years. In terms of size, think about where you live and work. How far do you travel each day? Now, realize that the earth's diameter (the distance from one side to another) is about 7,900 miles, and its circumference (the distance all around the equator) is over 24,900 miles! To us, the earth is extremely large. In fact, we still have not even explored it in its entirety. Nevertheless, even Earth is insignificant when compared to the Universe. The Universe is so gigantic that its size is still unknown. To put things into perspective, here are some examples of what scientists know, or suspect, about our universe.

- The earth belongs to a solar system containing eight planets, a dwarf planet, and the Sun, and the Earth is considered one of the smaller planets in our solar system. Jupiter, for example, is so much larger than Earth that all of the other planets could fit inside of Jupiter.

- Our solar system is located on one of the outer arms, called the Orion arm, of the Milky Way Galaxy.

- There are approximately 200 billion stars within our galaxy.

- In the Universe, there are thought to be several billion galaxies.

Why have we not explored the entire universe, yet? Well, if you were to travel the speed of light, which is 186,000 miles per second, it would take you 100,000 years to cross our Milky Way. Just to get to the nearest galaxy would take you another 2 million years! So what fills all of this "space," and how was our small and seemingly irrelevant planet we live on formed? That is what Earth and Space Science is all about.

Earth's neighborhood, the solar system, consists of eight planets, a dwarf planet, several moons, thousands of asteroids, a few comets, and the Sun. They all move due to the gravitational pull of heavenly bodies, in other words anything in outer space that has weight. And, of course, the larger the body, the stronger the pull it will exert. Thus, moons circle the planets, and planets circle the sun. The following are some other objects that can be found in space.

Comets

Comets are small bodies orbiting the Sun in a predictable way, and are made up of a solid core of dust particles and frozen gas. They are one of the most spectacular sights you could see, even without the aid of a telescope, because as they draw closer to the Sun, their dust particles and frozen gas vaporize, forming large tails thousands of miles long. The most famous of these comets is Halley's Comet, which last passed Earth in 1986. Alas, we will not be able to see it again until 2061.

Asteroids

Asteroids are very similar to comets but are more like large rocks. They are found primarily between Mars and Jupiter in a field called the "asteroid belt." They typically will stay in that large belt, but if you have seen any apocalyptical movie, you will have discovered that some asteroids follow their own circulation around the Sun and do occasionally cross the paths of planets and moons. Earth, in fact, has been hit numerous times before. Luckily, our dense atmosphere causes the breakup of any small asteroid, and it can be seen at night as a bright flame in the sky raining down onto earth. These are called **meteors**. On a rare occasion, a larger "meteor" will not burn up entirely, but instead it will crash into the Earth. When this occurs, they are called **meteorites,** and it is hypothesized that it was a large meteorite that caused the extinction of the dinosaurs. Without an atmosphere, asteroids have a much greater impact. Looking at the moon, you should be able to see many impact craters asteroids have made.

Stars

If you have ever enjoyed a nice sunny day, you would appreciate how incredibly valuable our Sun is to us. Of course, the Sun does so much more than granting us a comfortable living temperature, its energy is also used by all green plants during photosynthesis.

The sobering news is that our Sun is not going to live forever. All stars have a set lifespan and will eventually explode into one of the most fantastic structures to have ever been seen. Luckily, stars often live for many billions of years, and our Sun still has many more left.

A star's most useful resource is its energy, yet, too much will cause an inhospitable environment; for example**,** the planet Mercury is only about 30 million miles away from the Sun and has a high temperature of 472**°**F**,** hot enough to melt lead. Its orbit is so close to the Sun, it only takes 88 days to complete a full cycle. So Mercury's year lasts only about 3 months! Too little of the Sun's energy will also create a planet without a possibility for life**;** for instance**,** all planets from Jupiter on are much too frozen. Pluto, usually the farthest dwarf planet from the Sun, gets as cold as -356**°F.** In truth, scientists believe that besides Earth, only Mars has a chance of having once supported primitive life, as evidenced by the possible presence of frozen water on Mars.

The Birth of a Star

How is a star born? Gases, most likely from the deaths of past stars, are collected, and as they pool into a cloud, their weight creates gravity, thus pulling in even more gas. As its own gravitational pull grows stronger, the gases contract, or draw in. Think about what keeps you held down on the ground, it is the Earth's gravity. As all of its gases pack tighter and tighter, its temperature begins to rise, finally reaching a few million degrees. Now, it is this extremely high temperature that allows a star to act as its own energy source. This is because the heat will transform hydrogen atoms into helium atoms by nuclear reactions. These nuclear reactions, similar to nuclear bombs exploding, produce the energy we need on Earth. As long as the star still has hydrogen left, it will keep producing this energy.

Star Types

The universe is filled with billions of stars, and they do come in different types and sizes. 90% of the stars in the universe are dwarf stars, which are young stars. They can be described as follows:

- **Yellow Dwarf** – our Sun
- **Red Dwarf** – the most common type of star, cooler than our Sun.

Some stars are older and are considered **Giant** or **Super Giant Stars**

- **Red Giant** – These stars are about 20 times larger than our Sun and red in color.
- **Blue Giant** – hotter and larger than Red Giants
- **Super Giant** – The largest of all stars, when these stars die, they form supernovas and leave black holes.

Eventually all stars will die out and form either of the following:

- **White Dwarf** – a small, dense star about the size of the Earth, but much heavier
- **Neutron Star** – a very small star, only about 5 miles across, composed of tightly-packed neutrons
- **Pulsar** – a neutron star that is spinning, releasing pulses of light energy
- **Black Hole** – a large area in space that is so dense that its own gravitational pull is so strong, light cannot escape it. It is believed that when giant stars eventually die, they explode, or supernova, then leave an area called a black hole.

MINNESOTA Literacy COUNCIL Sharing the Power of Learning

Unit 1.8: Earth and Space Science – Planets & Stars

Test Your Knowledge: Choose the best answer to the following questions from the reading passage:

1) How many miles per second is the speed of light?

a) 100,000 miles per second
c) 2 million miles per second
b) 186,000 miles per second
d) the distance that light travels in 1 year

2) What is the largest planet in our solar system?

a) Saturn
c) Neptune
b) Jupiter
d) Earth

3) According to the passage, there are approximately how many stars in the Milky Way?

a) 20,000
c) 200,000,000
b) 2,000,000
d) 20,000,000,000

Fill in the blank:

3) _____ are composed of dust and frozen gases.

4) _____ burn up before they hit the Earth's surface.

5) Most asteroids are found between the two planets, _____ and _____.

6) A Giant star that suddenly explodes is called a

a. black hole.
b. pulsar.
c. supernova.
d. red dwarf.

7) These stars are the largest and hottest:

a. red giants
b. super giants
c. red dwarfs
d. pulsars

8) These are the smallest of stars, only about 5 miles across:

a. white dwarfs
b. black holes
c. red dwarfs
d. neutron stars

ANSWER KEY (answers in bold)

1) How many miles per second is the speed of light?

a) 100,000 miles per second
c) 2 million miles per second
b) 186,000 miles per second
d) the distance that light travels in 1 year

2) What is the largest planet in our solar system?

a) Saturn
c) Neptune
b) Jupiter
d) Earth

3) According to the passage, there are approximately how many stars in the Milky Way?

a) 20,000
c) 200,000,000
b) 2,000,000
d) 20,000,000,000

Fill in the blank:

3) **Comets** are composed of dust and frozen gases.

4) **Asteroids** burn up before they hit the Earth's surface.

5) Most asteroids are found between the two planets, **Mars** and , **Jupiter** .

6) A Giant star that suddenly explodes is called a

a. black hole.
b. pulsar.
c. supernova.
d. red dwarf.

7) These stars are the largest and hottest:

a. red giants
b. super giants
c. red dwarfs
d. pulsars

8) These are the smallest of stars, only about 5 miles across:

a. white dwarfs
b. black holes
c. red dwarfs
d. neutron stars

Unit 1.8 Handout 2 (3 pages total)

The **Venn Diagram** is an organizational tool made of two overlapping circles for charting similarities and differences between characters, stories or other elements. Use the chart on the next page to fill in the Venn diagram.

Directions:

1. Write the characteristics of chart 1 in the first space on the left.

2. Write the characteristics of chart 2 in the last space on the right.

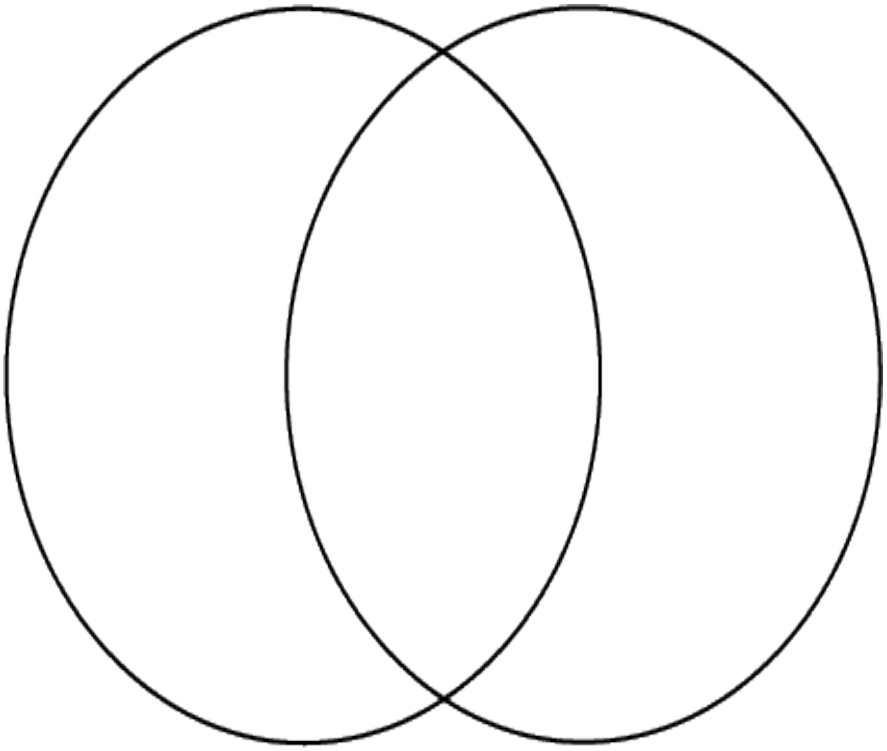
3. Write the characteristics that both chart have in common in the space in the center.

5. Analyze the data you have entered.

6. Write your conclusion in the space below.

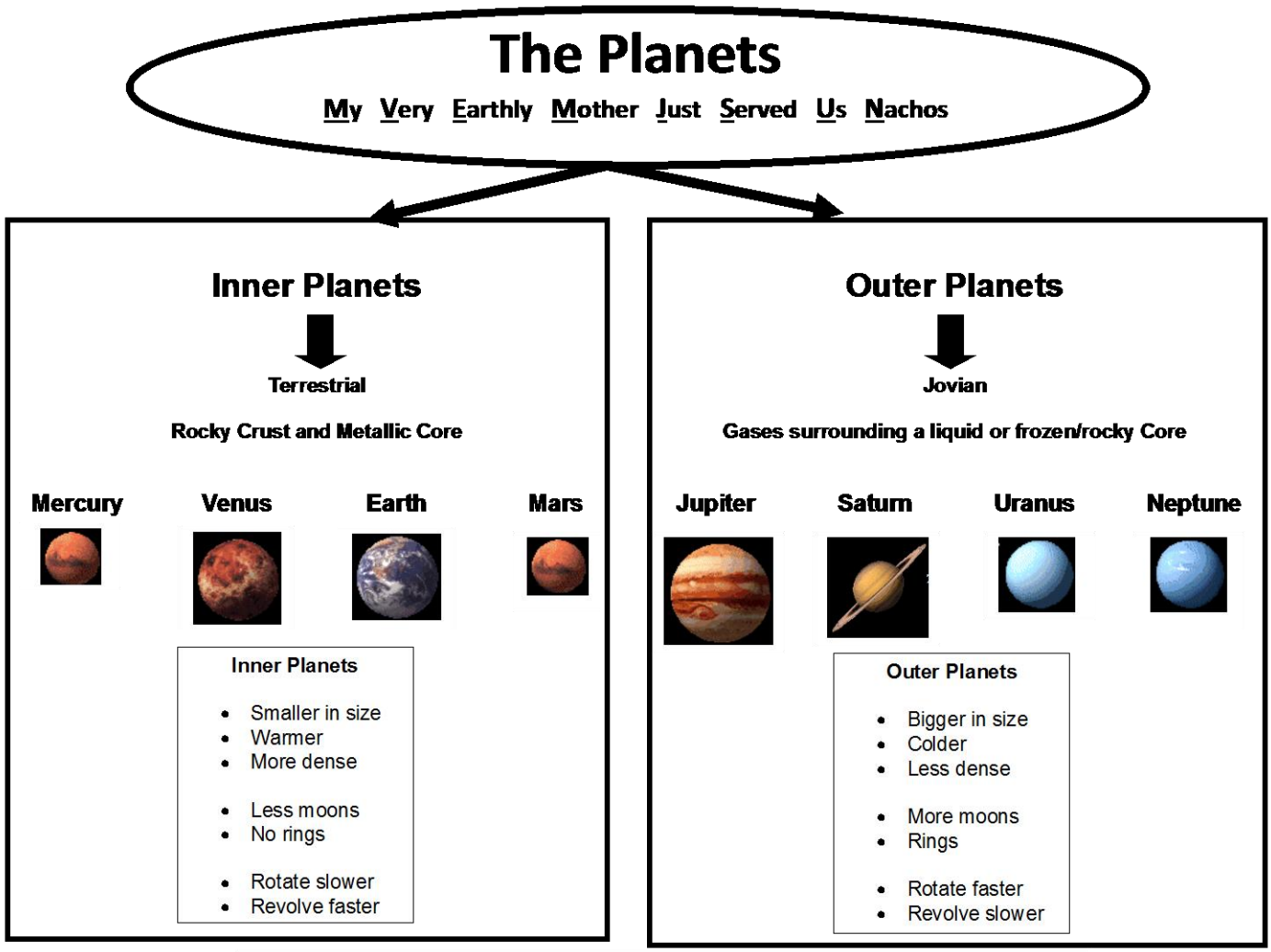
Inner Planets

Outer Planets



Unit 1.8 Handout 2 (3 pages total)

Use the chart below to fill in the Venn diagram on the previous page.



J. Hoffmann – Notes/J. Haugh – Visual Organizer/ Google Images/ X:Drive G.Org. Earth Science 2012

Unit 1.8 Handout 2 (3 pages total)

Use the chart to answer the questions below.

	Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune
diameter (Earth=1)	0.382	0.949	1	0.532	11.209	9.44	4.007	3.883
diameter (km)	4,878	12,104	12,756	6,787	142,800	120,000	51,118	49,528
mass (Earth=1)	0.055	0.815	1	0.107	318	95	15	17
mean distance from Sun (AU)	0.39	0.72	1	1.52	5.20	9.54	19.18	30.06
orbital period (Earth years)	0.24	0.62	1	1.88	11.86	29.46	84.01	164.8
orbital eccentricity	0.2056	0.0068	0.0167	0.0934	0.0483	0.0560	0.0461	0.0097
mean orbital velocity (km/sec)	47.89	35.03	29.79	24.13	13.06	9.64	6.81	5.43
rotation period (in Earth days)	58.65	-243*	1	1.03	0.41	0.44	-0.72*	0.72
inclination of axis (degrees)	0.0	177.4	23.45	23.98	3.08	26.73	97.92	28.8
mean temperature at surface (C)	-180 to 430	465	-89 to 58	-82 to 0	-150	-170	-200	-210
gravity at equator (Earth=1)	0.38	0.9	1	0.38	2.64	0.93	0.89	1.12
escape velocity (km/sec)	4.25	10.36	11.18	5.02	59.54	35.49	21.29	23.71
mean density (water=1)	5.43	5.25	5.52	3.93	1.33	0.71	1.24	1.67
atmospheric composition	none	CO_2	N_2 + O_2	CO_2	H_2+He	H_2+He	H_2+He	H_2+He
number of moons	0	0	1	2	63	62	27	13
rings?	no	no	no	no	yes	yes	yes	yes

1. According to the chart, which planet has the largest mass?

2. According to the chart, which planet has the most moons?

3. According to the chart, which planet has a diameter closest to that of Earth?

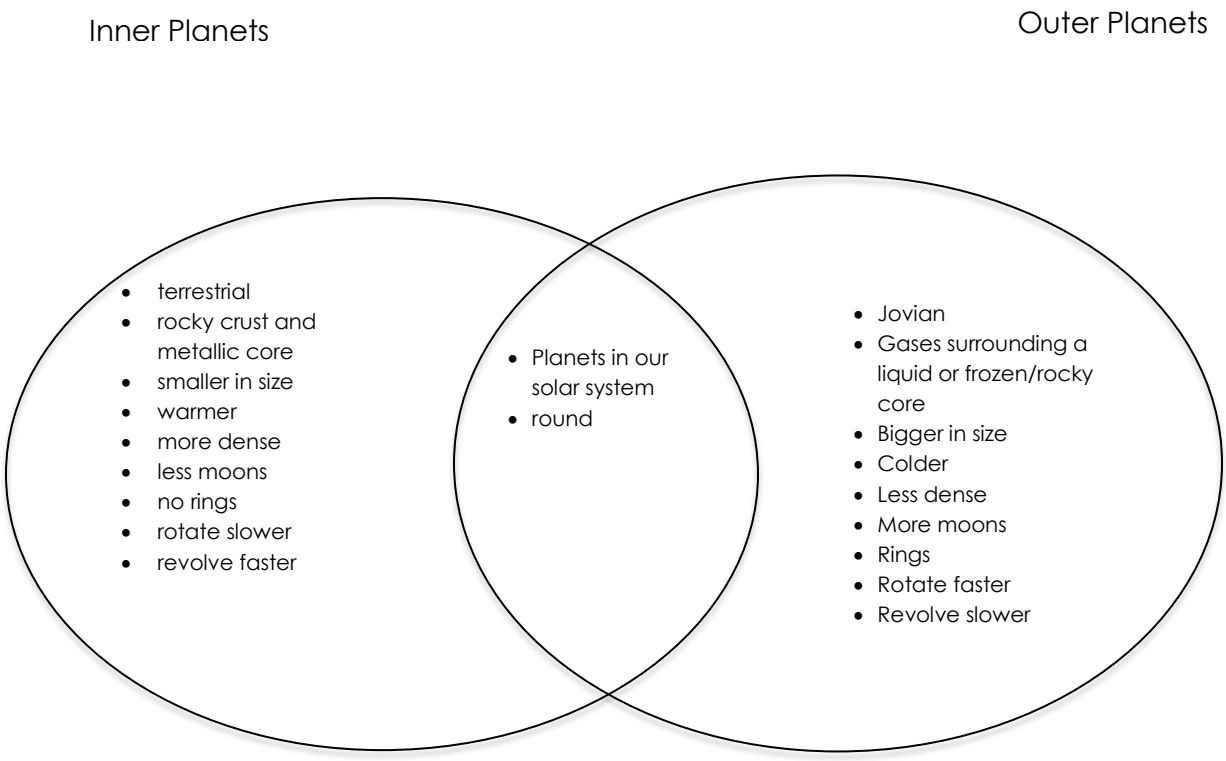
4. According to the chart, which planet has the longest orbit (in Earth years) around the sun?

Unit 1.8 Handout 2

TEACHER ANSWER KEY (Students' answers may vary)

The **Venn Diagram** is an organizational tool made of two overlapping circles for charting similarities and differences between characters, stories or other elements.

Directions:



1. According to the chart, which planet has the largest mass? **Jupiter**

2. According to the chart, which planet has the most moons? **Jupiter**

3. According to the chart, which planet has a diameter closest to that of Earth? **Venus**

4. According to the chart, which planet has the longest orbit (in Earth years) around the sun? **Neptune**

Unit 1.8 Handout 3 (or copy 6-way Paragraphs – Middle Level, pages 26 - 27)

Unit 1.8 Handout 3

ANSWER KEY

1. Main Idea
   a. B
   b. M
   c. N
2. B
3. B
4. B
5. A
6. D