

THE OUTER PLANETS: GAS GIANTS

from

A Spin Around the Solar System Series

*Video Produced by...
Maslowski Wildlife Productions*

*Teacher's Guide by...
Lauren LaComb*

Published and Distributed by...



united learning

YOUR EDUCATIONAL PARTNER FOR A CHANGING WORLD


1560 Sherman Avenue, Suite 100
Evanston, IL 60201
800-323-9084
24-Hour FAX 847-328-6706
<http://www.unitedlearning.com>

This video is the exclusive property of the copyright holder. Copying, transmitting, or reproducing in any form, or by any means, without prior written permission from the copyright holder is prohibited (Title 17, U.S. Code Sections 501 and 506).

©MMI Maslowski Wildlife Productions

Table of Contents

Introduction	1
Links to Curriculum Standards	1
Summary of the Program	1
Vocabulary	4
Student Objectives	4
Instructional Notes	4
Student Preparation	5
Introducing the Program	5
Follow-Up Activities	6
Extended Learning Activities	7
Internet Sites	8
Reference Material	8
Answer Key	9
Script of Narration	13

 This video is closed captioned

The purchase of this program entitles the user to the right to reproduce or duplicate, in whole or in part, this teacher's guide and the blackline master handouts that accompany it for the purpose of teaching in conjunction with this program, **THE OUTER PLANETS: GAS GIANTS**. This right is restricted only for use with this program. Any reproduction or duplication in whole or in part of this guide and the blackline master handouts for any purpose other than for use with this program is prohibited.

**CLASSROOM/LIBRARY
CLEARANCE NOTICE**

This program is for instructional use. The cost of each program includes public performance rights as long as no admission charge is made. Public performance rights are defined as viewing of a video in the course of face-to-face teaching activities in a classroom, library, or similar setting devoted to instruction.

Closed Circuit Rights are included as a part of the public performance rights as long as closed-circuit transmission is restricted to a single campus. For multiple locations, call your United Learning representative.

Television/Cable/Satellite Rights are available. Call your United Learning representative for details.

Duplication Rights are available if requested in large quantities. Call your United Learning representative for details.

Quantity Discounts are available for large purchases. Call your United Learning representative for information and pricing. Discounts, and some special services, are not applicable outside the United States.

Your suggestions and recommendations are welcome. Feel free at any time to call United Learning at 1-800-323-9084.

THE OUTER PLANETS: GAS GIANTS

from A Spin Around the Solar System Series

Grades 5-8

Viewing Time: 15 minutes with a three-minute,
ten-question, Video Quiz

INTRODUCTION

This in-depth series covers a wide range of essential matters about the solar system. Such topics as planet formation, gravity, nuclear fusion, and the Big Bang theory are presented concisely with the help of specially designed graphics and animations. Each of the eight shows can be presented as a free-standing lesson on its own, but the shows also work together to reinforce important concepts and to add breadth and depth to a student's cumulative knowledge.

LINKS TO CURRICULUM STANDARDS

This lesson correlates to the following standards, outlined by the National Science Education Standards, for students in grades 5-8. Use individual state standard outlines to specify correlations to your state's guidelines.

Earth & Space Science (Content Standard D)

- Gravity is the force that keeps objects in the solar system in motion.
- Earth is the third planet from the sun in a system that includes eight other planets.
- Most objects in the solar system are in regular and predictable motion.

SUMMARY OF PROGRAM

The nine planets in our solar system are divided into three basic groups. Mercury, Venus, Earth, and Mars are all Inner Planets. These planets have hard rock crusts, and dense rock and metal cores. Density measures weight per volume. In general, the Inner Planets are over three

times denser than the Gas Giants. All planets become denser toward their middle because the weight of material packs everything tighter. After Mars, there is a huge gap of space before the next four planets are met. They are the Gas Giants, spheres of gas and swirling atmospheres. There is no clear dividing point between the surface and the atmosphere. If one could sink deep enough into a Gas Giant, they may find rock hard surfaces that are gases under intense cold and pressure. One may also find familiar rock and metal in the core.

The solar system developed 4.5 billion years ago from a nebula. The sun started the process, claiming about 99% of the solar system's matter. Planets formed from the left over bits of matter. While the sun grew, material was pulled in. Once it created light, the waves of heat pushed things away. The sun could not push away the heavy rocks and metal, but most gases got pushed further away. The gases floated like clouds, while gradually forming the Gas Giant planets.

Named after the mythical king of gods, Jupiter is the closest Gas Giant to Earth. It is the largest planet in the solar system. It has twice the mass than the other eight planets combined, and could fit 1400 Earths inside. Jupiter has wind currents in its upper level atmosphere, creating brown and tan bands. It is also known for its Red Spot, a gigantic hurricane that covers an area twice the size of Earth. With a modest telescope, nearly 20 moons can be seen. Jupiter rotates rapidly on its axis, once every ten hours. It orbits the sun once every twelve years.

Saturn is next, known for its colorful rings. They are nearly 42,000 miles/70,000 kilometers across, but only a few miles/kilometers thick. The rings are made of dust and ice, ranging in size. Astronomers think that the rings were either formed from left over materials, or contain the

remains of a crushed moon. Saturn has at least twenty moons. Saturn takes 30 years to revolve around the sun and is the last planet that can be seen without a strong telescope.

Uranus is 1/2 the diameter of Saturn and orbits twice as far from the sun. Uranus tilts on its axis 98 degrees and takes 84 years to orbit the sun. The pole leaning towards the sun gets daylight for 42 years, then darkness for 42 years. The upper atmosphere of Uranus is very cold, and deeper down, the temperatures increase. Pressure from above forces molecules and atoms closer together and this rubbing against one another creates the internal heat. Inside temperatures may reach several thousand degrees. The core is probably molten rock and metal. Uranus has a magnetic field surrounding it, created by certain layers rotating at different speeds.

Neptune is the last of the Gas Giants. It spins rapidly on its axis and takes 165 years to orbit the sun. Neptune probably has a rock and metal core, surrounded by various gases in ice. The atmosphere houses clouds of hydrogen and helium. Neptune affects Uranus' orbit. When Uranus approaches Neptune, it speeds up, and when it moves away from Neptune, it slows down. This perturbence is caused by gravity. The laws of gravity say that the gravitational pull of every object affects all other objects in the universe. The vast distance from the Earth makes Neptune a difficult planet to closely study.

Pluto is the last known planet in our solar system. It does not fit into either the Gas Giant or the Inner Planets category. It has no atmosphere and has a hard rock and ice surface.

Note:

Underlined words are identified vocabulary words to enhance student understanding.

VOCABULARY

density	weight	Gas Giant	atmosphere
gas	nebula	sun	planet
Jupiter		Saturn	Neptune
	mass	red spot	axis
	moons	rings	core
turbence			p e r -
gravity	Pluto	surface	Inner Planets

STUDENT OBJECTIVES

After viewing the program and completing the follow-up activities, students should be able to:

- Define key terminology and utilize context.
- Identify the similarities and differences between the four Gas Giants.
- Describe the different appearances of the four Gas Giants.
- Identify the difference between the Inner Planets and Gas Giants.
- Explain the different orbit speeds, surfaces, and rotation speeds of each planet.

INSTRUCTIONAL NOTES

Before presenting these lessons to your students, we suggest that you preview the program, review the guide, and the accompanying Blackline Master Activities in order to familiarize yourself with their content.

As you review the materials presented in this guide, you may find it necessary to make some changes, additions or deletions to meet the specific needs of your class. We encourage you to do so; for only by tailoring this program to your class will they obtain the maximum instructional benefits afforded by the materials.

STUDENT PREPARATION

You may want the students to view the vocabulary words addressed in the program prior to showing the program. This may be accomplished by implementing a **Word Splash**. A **Word Splash** is an active learning activity that introduces the students to vocabulary words in the program to which they will be exposed. By doing this activity, students are given the chance to show what words they know well, and become aware of the words they need to learn. This is a good pre- and post-activity. It excites the students and gets them thinking. Writing all of the vocabulary words on an overhead does this (see **Blackline Master 1, Word Splash**) or individually on pieces of paper. Have students create sentences using as many words as possible, making connections between the words. This may be done individually, in partners, or in small groups. Have the students share their sentences and post them. By exposing the students to vocabulary prior to viewing the program, students will be prepared to listen for these words in the program. Additionally, they will want to find the correct meaning.

Note:

Word Splash may be done at the conclusion of the entire lesson, to compare learning accomplished by students.

INTRODUCING THE PROGRAM

An optional activity to activate prior knowledge is provided on **Blackline Master 2, Anticipation Guide**. This will help you determine the level of student comprehension prior to participating in this lesson. Ask students to share what lies beyond Mars in the solar system; such as planets, other large space objects, etc. For example, they may answer the asteroid belt. Tell them that they will complete

the **Anticipation Guide** about the Gas Giants prior to viewing the program. Explain that they are not expected to get all answers correct, but they are expected to try their best. Go over the **Anticipation Guide** after viewing the program to discuss correct answers. An answer key begins on page 9 of this Teacher's Guide.

Present the program. The program length is 15 minutes and includes an optional, four-minute video quiz following the program.

FOLLOW-UP ACTIVITIES

The following Blackline Activity Masters are included with this guide. They correlate with the learning objectives and Standards outlined on page one of this guide. You may replicate and distribute them as needed.

Following the program, students may have additional questions. The facilitator may want to hold off questions until follow-up activities are completed. Students may write these questions down and the class may review them prior to the post-test. By doing so, the students may find the answers on their own.

This program concludes with a ten-question Video Quiz, which may be used to gauge student comprehension immediately after the presentation of the program. **Blackline Master 3, Video Quiz**, provides students with a printed copy of the Video Quiz.

As a class, you may wish to discuss questions that appear **on Blackline Master 4, Discussion Questions**. These questions should be copied onto an overhead or distributed to students, in order to meet the needs of your visual learners.

To utilize terminology in context and reinforce the concept of gravity, first review words from **Blackline Master 1, Word Splash** as a class. Then have students fill out **Blackline Master 5, Cloze Activity**.

To help students identify the differences between Gas Giants and Terrestrials, use **Blackline Master 6, Venn Diagram**. Students can work cooperatively or independently on this activity, depending on the teacher's preference.

To help students identify the motions and appearances of the Gas Giants, have students complete **Blackline Master 7, Graphic Organizer**. Students can work cooperatively or independently on this activity, depending on the teacher's preference. This activity provides students the opportunity to discover the differences between the four Gas Giants. This is a great opportunity for student observations. Have students share their explanations.

To conclude your study of *A Spin in the Solar System: The Outer Planets: Gas Giants*, use **Blackline Master 8, Post-Test**. This should be given to your students after viewing the program and completing additional activities to assess their knowledge of the topic.

EXTENDED LEARNING ACTIVITIES

SCIENCE EXTENSIONS: Have students study the different moons that orbit Gas Giants. Another extension is to conduct density investigations. Finally, the Red Spot is rather intriguing, have the class research the Great Red Spot.

ART CONNECTION: The Gas Giants are beautifully colored. Have students pick one planet and paint it. This would require some additional resources and materials.

MATH CONNECTION: The Gas Giants are huge compared to the Terrestrials. Have students compare the sizes of each planet. Provide students with some investigating questions such as; How many Earths would fit into each planet? How many Mercurys would fit into the four Gas Giants?

CREATIVE WRITING CONNECTION: Although we know some information about Gas Giants, they still have some mysteries to be solved. Have students pretend that they are on a Gas Giant planet doing a report on the life of a Gas Giant citizen.

SOCIAL STUDIES CONNECTION: Research the origin of each Gas Giant's name. Have students present their findings to the entire class.

TECHNOLOGY CONNECTION: Have students research the different types of technology used over the years to study the Gas Giants and outer space. Display information found throughout the room.

INTERNET SITES

<http://quest.arc.nasa.gov> (Nasa's K-12 internet initiative)

<http://www.nsta.org/> (National Science Teacher's Association)

<http://www.nasa.gov> (NASA)

<http://www.sln.org/> (Science Learning Network)

<http://ajkids.com> (Resource for students to use when searching the internet)

<http://K12.njin.net/educationlinks.html> (Collaborative projects throughout the United States)

<http://www.windows.ucar.edu> (Windows to the Universe)

REFERENCE MATERIALS

The Origin Of The Universe. Andres L. Ruiz. Sterling

Publishing Co., INC., NY. 1996. 0-8069-9744-3.

Merlin's Tour of the Universe. by Neil de Grasse Tyson. Doubleday, NY. 1989. 0-385-48835-1.

Jupiter. Seymour Simon. Mulberry Books, NY. 1985. 0-688-08403-6.

Uranus. Seymour Simon. William Morrow and Company, INC., NY. 1987. 0-688-06582-1.

Stars and Planets. The Nature Company Discoveries Library. Time-Life Books, Sydney, San Francisco, London. 1996. 0-8094-9246-6.

Stars and Planets. Robin Kerrod. Marshall Cavendish Corp., NY. 1991. 1-8543-5272-5.

101 Questions and Answers About the Universe. Roy A. Gallant. Macmillan Publishing Co. NY. 1984. 0-02-736750-9.

Saturn & Beyond. Isaac Asimov. Lothrop, Lee, & Shepard Books, NY. 1979. 0-68841876-7.

Neptune. Seymour Simon. Morrow Jr. Books, NY. 1991. 0688-09631-X.

Space and Planets. Time Life. Robert H. Smith. Alexandria, Virginia. 1990. 0-8094-9650-X.

Our Solar System. Seymour Simon. Morrow Jr. Books, NY. 1992. 0-688-09992-0.

ANSWER KEY

Blackline Master 1, Word Splash

Answers to the **Word Splash** will vary. When you use it before viewing the program, do not expect correct connections between words. After viewing the program and completion of Blackline Masters, expect correct connections.

Blackline Master 2, Anticipation Guide

1. F; Pluto is not a Gas Giant
2. F; There is no clear point of where the atmosphere ends and the surface begins.
3. T
4. F; 99% formed the sun.
5. T
6. T
7. F; The Great Red Spot is on Jupiter
8. F; Gas Giants revolve slower around the sun than Terrestrials.
9. T
10. F; Temperatures increase deep down in Gas Giants because of pressure.
11. T
12. T
13. T
14. F; Perturbence means disturbance.
15. F; There is a large gap between the Gas Giants and Terrestrials.

Blackline Master 3, Video Quiz

1. Jupiter, Saturn, Neptune
2. nebula
3. 99
4. Jupiter
5. Jupiter's
6. false
7. false
8. rings
9. Saturn

10. increases

Blackline Master 4, Discussion Questions

1. Jupiter, Saturn, Uranus, and Neptune. Answers will vary. Look for students describing their favorite planet accurately.
2. Answers will vary. Look for correct descriptions of planets.
3. Pluto doesn't fit into either category well. It has no atmosphere, and has a hard rock and ice surface.
4. The solar system developed from a nebula. The sun started condensing, eventually claiming 99% of the solar system's matter. Planets formed from leftover parts of nebula.
5. The sun's heat pushed the gases away from the sun. The gases floated like clouds in the sky gradually forming Gas Giants.
6. Answers may vary. Jupiter is the largest planet, it has brown and tan bands, the Great Red Spot, is closest to the Terrestrials, has 20 moons, rotates rapidly on its axis, and revolves slowly around the sun.
7. Answers may vary; has rings made of ice and rock, it is the least dense planet, rotates rapidly on its axis, and revolves slowly around the sun.
8. Answers may vary; half the size of Saturn, orbits very far from the sun, tilts on its axis 98 degrees, cold upper atmosphere, warmer interior, has a magnetic field, rotates rapidly on its axis, and revolves slowly around the sun.
9. Answers may vary; last of the Gas Giant planets, affects Uranus' orbit speed, has clouds of hydrogen and helium, rotates rapidly on its axis, and revolves slowly around the sun.
10. Answers may vary; farthest known planet in the solar system, small in size, lacks an atmosphere, has a hard rock and ice surface, and is in its own planet category.
11. Gas Giants rotate much faster, making the day much shorter.

12. They are so far from the sun.
13. Gravity from the sun keeps the Gas Giants orbiting the sun. Neptune also affects the orbit speed of Uranus. Gravity keeps moons near some Gas Giants.
14. The upper atmospheres of Gas Giants are cold because the sun's rays are so weak at this distance. Deeper down, pressure forces molecules and atoms closer together. They rub against one another creating heat.
15. Answers may vary; they are very far from Earth, they are made up of gases that are extremely toxic, they are extremely cold.

Blackline Master 5, Cloze Activity

- | | |
|------------|----------------|
| 1. Neptune | 6. astromers |
| 2. speeds | 7. orbit |
| 3. gravity | 8. perturbence |
| 4. Uranus | 9. laws |
| 5. slowed | 10. universe |

Blackline Master 6, Venn Diagram

Answers may vary. This is an excellent cooperative learning activity that encourages active participation. Make sure students are filling in the **Venn Diagram** correctly. Certain points to look for under Gas Giants: thick atmospheres, made of gas, far from the sun, cold on the outside and warmer on the inside, rotates quickly on an axis, revolves slowly around the sun. Certain points to look for under Terrestrials; dense planets, inner core, close to the sun, hard crusts, small, also known as Rockies and Inner Planets. The common points; part of same solar system, created from the same nebula, spheres, rotate on an axis, revolve around the sun, affected by the sun's gravitational pull.

Blackline Master 7, Gas Giant Graphic Organizer

Answers will vary. Make sure boxes are filled in with the correct information. Specific details may be found by reviewing the program, the program summary, or the pro-

gram script. This is a great opportunity for student observations.

Blackline Master 8, Post-Test

- | | |
|------|-------|
| 1. B | 6. A |
| 2. A | 7. D |
| 3. D | 8. B |
| 4. A | 9. C |
| 5. C | 10. A |

THE OUTER PLANETS: GAS GIANTS
Script Narration

The solar systems' nine planets can be divided into three basic groups.

The first group includes the four planets closest to the sun, including Earth. We call these the inner Planets, or Rockies, or the Terrestrials. Terrestrial means Earth-like. Mercury, Venus and Mars look somewhat like Earth. These four planets are small, have hard rock crusts, and dense rock and metal interiors.

Heading away from the sun, after Mars, there is a big gap of space before we meet the next group of four planets. This gap seems to take us into another world, because the planets beyond are so different from our own. They are giant spheres of gas, with swirling atmospheres thousands of miles, or kilometers thick, that gradually change into slushy oceans of frozen gases. There is no clear point where the atmosphere ends and the planet surface begins and it's even harder to find a solid surface on which to stand. Only if we sink deep enough, perhaps tens of thousands of miles or kilometers, might we find rock hard surfaces, that are not rock at all, but gases under intense cold and pressure. Only in the very heart of the planets, in the core, could we find familiar rock and metal. The four gas giants, Jupiter, Saturn, Uranus and

Neptune, are strange places indeed.

The third and last group of planets has a single member, Pluto. Pluto differs from the other planets in a number of ways.

Why are the first eight planets divided this way, rocky planets close to the sun, and gas giants farther away?

To find an explanation, let's look at how the solar system formed four and one-half billion years ago. The solar system developed from a huge cloud of space dust and gas called a nebula. The sun started the process by condensing most of the nebula into a single sphere, like a giant raindrop in a storm cloud. The sun claimed about 99 percent of the solar system's matter. Planets formed from the left over bits of nebula.

While the sun grew, it pulled material in. But once it began to shine, the sun also started gently pushing things away. This push came from waves of heat and tiny particles the sun casts out.

Dusts of rock and metal in the left-over nebula were little affected by the sun's push because they were too heavy. Most gases, on the other hand, got pushed away. Far away from the sun, the pull of the sun's gravity equaled the push of the heat, and the gases floated like clouds in the sky, while gradually forming the gas giant planets.

The closest gas giant to us is Jupiter. Named for the Roman mythical king of the gods, Jupiter is the king of planets. It has more than twice the mass, or weight, of the other eight planets combined. Fourteen hundred Earths could fit inside.

Seen through a telescope, Jupiter has striking brown and

tan bands. The bands result from wind currents in the upper level of Jupiter's atmosphere. These currents resemble wind patterns in our own upper atmosphere on Earth. The winds are created by a complex process that occurs to air surrounding a rotating sphere.

Jupiter's atmosphere also has an interesting place called the Great Red Spot. Located just south of the equator, the Great Red Spot is a gigantic hurricane covering an area about twice the size of Earth. The storm has been raging for centuries.

With even a modest telescope, four of Jupiter's nearly 20 moons can be seen. The largest, Ganymede is bigger than Mercury. Io is famous for active volcanoes.

Despite its immense size, Jupiter rotates rapidly on its axis, once every ten hours, compared to Earth's 24 hours. However, Jupiter's journey around the sun takes nearly 12 Earth years. All the gas giants rotate more rapidly than Earth, but take longer to orbit the sun.

Saturn, the next gas giant, has a 30 Earth year orbit. Saturn presents one of the most striking sights in the solar system because it is surrounded by a magnificent set of colorful rings. From the inner to outer edge, the rings measure nearly 42,000 miles, or 70,000 kilometers, across. But they are barely about one-half mile, or about a kilometer thick.

The rings are made of dust and ice. Ring particles range in size from microscopic up to as big as a house. Astronomers are not sure how the rings developed. Perhaps they formed from materials left over from the planet, or maybe they contain the remains of an exploded or crushed moon. At least 20 other moons have been found so far within the rings. Included is Titan, 2nd largest

in the solar system after Jupiter's Ganymede.

Of all the gas planets, Saturn is the least dense. Density measures weight per volume. For example, wood is much less dense than lead. With cubes of equal size, a wood cube will weigh much less than the lead one. Saturn is so light it would take more than five bucketfuls to equal the weight of one bucketful of Earth, which is the solar system's most dense planet. In general, the small, hard rocky planets are over three times denser than the gas giants. All planets, by the way, become denser towards their middle because the weight of material above packs everything tighter.

Beautiful Saturn is the last gas giant people can see without strong telescopes. The next gas giant, Uranus, is half the diameter of Saturn, and orbits twice as far from the sun. It's so distant that turning on a flashlight for one second produces more light than Uranus has reflected to Earth during the past two centuries.

Uranus seems to lay on its side. Its axis tilts 98 degrees, compared to the Earth's 23 degrees. Some astronomers wonder if Uranus was knocked over by a collision with an asteroid.

As Uranus makes its 84 year orbit, the pole closest to the sun is bathed in daylight for 42 years, then it gradually turns away from the sun and into darkness for the next 42 years.

Uranus shows a temperature pattern typical of gas giants. The upper atmosphere is very cold, not much warmer than deep space because the sun's rays are so weak at this distance. Deeper down, temperatures increase, mainly because of pressure. The pressure comes from the weight of material above.

Pressure forces molecules and atoms closer together, where they rub each other, creating heat like sticks rubbed together to make a fire. Inside temperatures may reach several thousand degrees. The core, like those of other gas giants, is probably rock and metal that is molten, or melted. The rock and metal settled out from the small amount of dust that remained in the planet's original gas clouds.

Like most planets, including Earth, Uranus has a magnetic field surrounding it. The field is generated inside the planet, where certain layers rotate at different speeds. This creates magnetism in somewhat the same way that an electric motor does. Interestingly, Uranus' magnetic poles are tilted 60 degrees from its geographic poles. Earth's magnetic poles are only 11 degrees different.

The last of the gas planets, Neptune, appears to be a twin of Uranus, though its axis still stands upright. Neptune probably has a similar small rock and metal core, which is surrounded by various gasses in ice form that gradually give way to dense atmospheric clouds of hydrogen and helium. Like other gas planets, it spins rapidly on its axis, but leisurely orbits the sun, once every 165 years.

Neptune and Uranus perform an interesting orbital ballet. As Uranus approaches Neptune, Uranus speeds up. Neptune's gravity helps pull it along faster. Similarly, after Uranus goes by, it is slowed down by drag from Neptune's gravity. Astronomers say Uranus' orbit is perturbed by Neptune's. To some degree, every planet perturbs the orbit of all others. Perturbence is caused by gravity, and the laws of gravity say that the gravitational pull of every object affects all other objects in the universe. However, as a practical matter, the affect is often far too small for us to measure.

Recent satellite visits have helped provide significant information about Neptune. However, at nearly 2.7 billion miles, or 4.5 billion kilometers, from the sun, the planet orbits in near darkness, and remains much a mystery.

Beyond Neptune is the final known planet of the solar system, Pluto. Pluto little resembles the gas giants. It is tiny, lacks an atmosphere, and has a hard rock and ice surface. We are not sure where Pluto came from, or why its there.

In a way, though, we may actually understand Pluto better than the gas giants. The endless depths of swirling gasses and slushy ice that make up Jupiter, Saturn, Uranus, Neptune, are so different from the hard surfaces we know on Earth. The Gas Giants could easily be science fiction, if they weren't real.

VIDEO QUIZ Gas Giants

Let's take a few mintes to review some of the things you learnined in this program. In the following quiz, fill in the blanks with the correct words when you hear this tone.

1. The four gas giants include _____, _____, _____ and Neptune.
2. The sun formed from a huge space cloud of gas and dust called a _____.
3. Planets formed from material left over from the sun. The sun claimed about ____ percent of the solar system's matter.
4. _____ is the gas giant closest to us. It is named for the

Roman mythical king of gods.

5. The Great Red Spot in _____'s atmosphere is caused by a gigantic hurricane that is twice the size of Earth.

6. True or False: The gas giants rotate on their axis more slowly than Earth.

7. True or False: The gas giants revolve around the sun more quickly than Earth.

8. Saturn's famous _____ are made of dust and ice.

9. It takes over five bucketfuls of the planet _____, which is the least dense of all planets, to equal the weight of one bucketful of Earth.

10. Deep inside planets, temperature _____ because of pressure from the weight of material above.

THE OUTER PLANETS: GAS GIANTS

Word Splash

density

WEIGHT

Gas Giant

gas**nebula****planet*****Jupiter***

Saturn

Neptune

Uranus

mass

Red Spot

orbit

moons

rings

core

perturbance

gravity

Pluto

surface

THE OUTER PLANETS: GAS GIANTS**Anticipation Guide**

Directions: Answer the following questions by circling the correct response. Do your best!

1. The four Gas Giants are Pluto, Neptune, Saturn, and Uranus. True False
2. There is an obvious point where the atmosphere ends and the surface begins on a Gas Giant. True False
3. The solar system formed from a nebula. True False
4. The sun claimed 50% of the solar system's matter when it formed. True False
5. Jupiter is named after a Roman mythical king. True False
6. Jupiter has tan and brown bands. True False
7. The Great Red Spot is located on Saturn. True False
8. Gas Giants revolve around the sun faster than Terrestrials. True False
9. Saturn's rings are made from dust and ice. True False
10. Uranus maintains the same temperature throughout the entire planet. True False
11. All planets become denser towards their middle. True False
12. Neptune rotates rapidly on its axis. True False
13. Neptune's gravitational pull affects the speed that Uranus moves. True False
14. Perturbence is a name for an asteroid. True False
15. There is a small gap in space between the Terrestrials and the Gas Giants. True False

After viewing the program, review your answers. See how many questions you answered correctly. Review the ones you answered incorrectly.

THE OUTER PLANETS: GAS GIANTS**Video Quiz**

Directions: Now that you have viewed the program, let's challenge your memory by answering some quiz questions. Fill in the blanks with the correct words. Good luck!

1. The four Gas Giants include _____ , _____ , _____ , and Neptune.
2. The sun formed from a huge space cloud of gas called a _____ .
3. Planets formed from material left over from the sun. The sun claimed about _____ percent of the solar system's matter.
4. _____ is the Gas Giant closest to us. It is named for the Roman mythical king of gods.
5. The Great Red Spot in _____ atmosphere is caused by a gigantic hurricane that is twice the size of Earth.
6. True or False: The Gas Giants rotate on their axis more slowly than Earth. _____
7. True or False: The Gas Giants revolve around the sun more quickly than Earth. _____
8. Saturn's famous _____ are made of dust and ice.
9. It takes over five bucketfuls of the planet _____ , which is the least dense of all planets, to equal the weight of one bucketful of Earth.
10. Deep inside planets, temperature _____ because of pressure from the weight of the material above.

THE OUTER PLANETS: GAS GIANTS**Discussion Questions**

Directions: Answer the following questions as directed by your teacher.

1. Name the four Gas Giants?
2. What is your favorite planet and why?
3. Why is Pluto alone in its own group?
4. How did the solar system form 4.5 billion years ago?
5. Why are the farther planets made of gas?
6. Describe Jupiter.
7. Describe Saturn.
8. Describe Uranus.
9. Describe Neptune.
10. Describe Pluto.
11. What is different about the Gas Giants rotation on their axis, compared to Terrestrials?
12. Why do Gas Giants take so long to orbit the sun?
13. How does gravity play a role in the Gas Giants?
14. The Gas Giants are extremely far from the sun. Explain why Gas Giants are cold on the surface, but warm towards the core.
15. Why are Gas Giants hard to investigate?

THE OUTER PLANETS: GAS GIANTS**Gravity and the Gas Giants Cloze Activity**

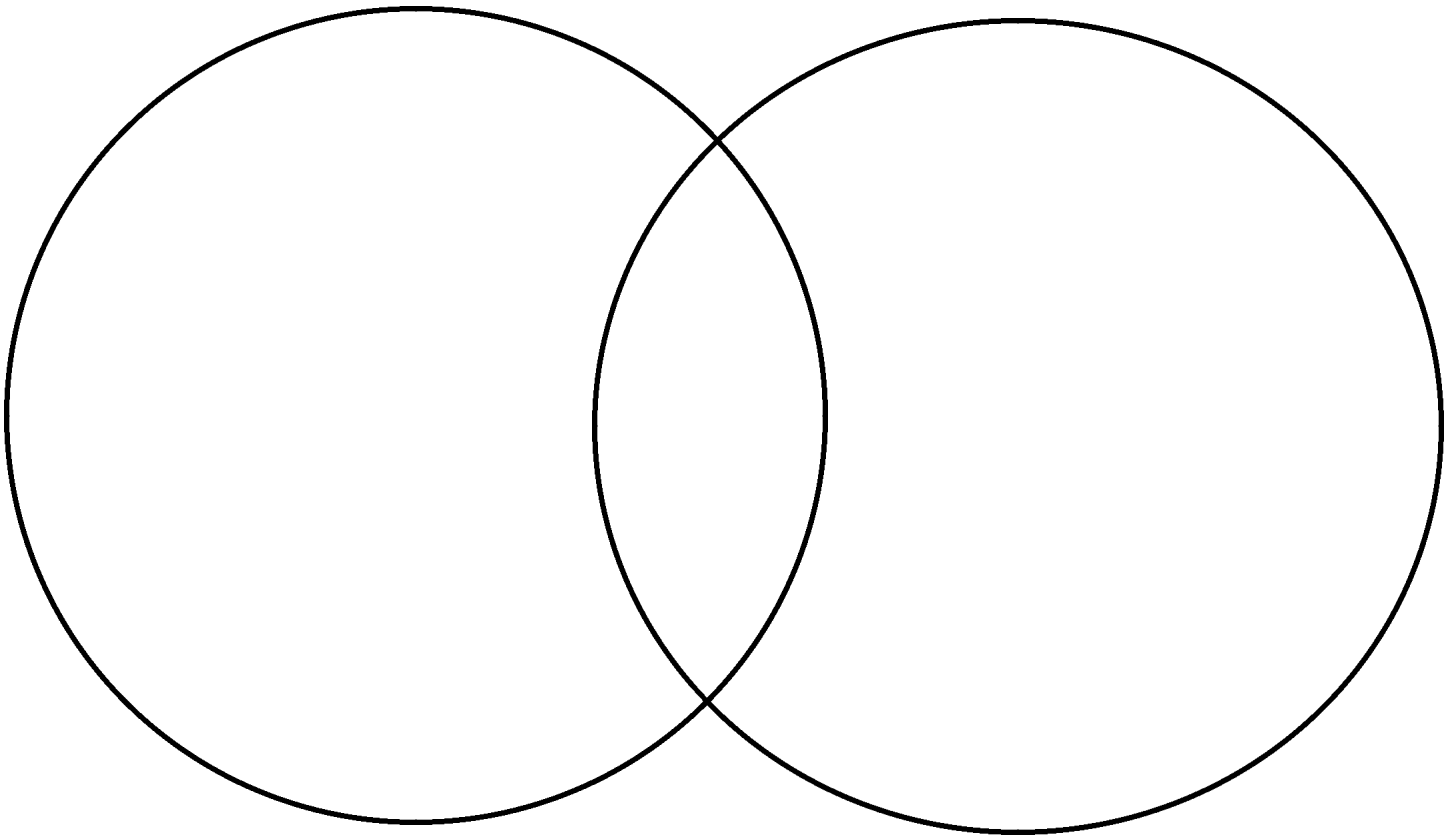
Directions: Choose the correct word from the word box to complete the paragraph below.

gravity	slowed	astronomers
Neptune	orbit	Uranus
universe	laws	perturbance
		speeds

Neptune and Uranus perform an interesting orbital ballet. As Uranus approaches (1.) _____, Uranus (2.) _____ up. Neptune's (3.) _____ helps pull it along faster. Similarly, after (4.) _____ goes by, it is (5.) _____ down by the drag from Neptune's gravity. (6.) _____ say that Uranus' (7.) _____ is perturbed by Neptune's. To some degree, every planet perturbs the orbit of all others. (8.) _____ is caused by gravity, and the (9.) _____ of gravity say that the gravitational pull of every object affects all other objects in the (10.) _____. However, as a practical matter, the effect is often too small for us to measure.

THE OUTER PLANETS: GAS GIANTS**Venn Diagram**

Directions: Fill in the Venn Diagram below. Under the circle labeled Rocky Planets, write in everything you know about Rocky Planets. Under the circle labeled Gas Giants, write in everything you know about Gas Giants. Where the two circles intersect, write any common qualities that Rocky Planets and Gas Giants share. Use scientific terminology!

Terrestrials**Gas Giants**

THE OUTER PLANETS: GAS GIANTS**Gas Giant Graphic Organizer**

Directions: Fill in the chart below with as much descriptive information as possible. Review the program and use additional materials if needed. Double-check your work for accuracy.

	Orbit around the sun time	Rotation on axis time	Describe the surface	Size of planet
Jupiter				
Saturn				
Uranus				
Neptune				

THE OUTER PLANETS: GAS GIANTS**Post-Test**

Directions: Answer the following questions by circling the correct answer. Remember to double-check your work for accuracy after you have completed the test. Do your best!

1. Which one is not a Gas Giant?
 - A. Neptune
 - B. Pluto
 - C. Uranus
 - D. Saturn

2. Which is not a characteristic of a Gas Giant?
 - A. A clear point where the atmosphere ends and the surface begins.
 - B. Rotates quickly around its axis.
 - C. Has an atmosphere.
 - D. Is cold on the surface and warmer towards the middle.

3. The solar system formed from what?
 - A. gases
 - B. rocks
 - C. metal
 - D. a nebula

4. Which planet is the largest of the nine planets?
 - A. Jupiter
 - B. Saturn
 - C. Uranus
 - D. Neptune

5. Neptune affects which planet's orbit the most?
 - A. Jupiter
 - B. Saturn
 - C. Uranus
 - D. Pluto

6. All planets are denser towards their middle?
 - A. True
 - B. False

7. Which does not describe the difference between Gas Giants and Terrestrials?
 - A. Terrestrials are closer to the sun than gas giants.
 - B. Terrestrials are denser than Gas Giants.
 - C. Gas Giants rotate faster on their axis than Terrestrials.
 - D. Terrestrials have rock and metal in their core and Gas Giants do not.

8. When the solar system was created, planets were formed from the ten percent of matter left over from a nebula.
 - A. True
 - B. False

9. Which Gas Giant is farthest from the sun?
 - A. Jupiter
 - B. Saturn
 - C. Neptune
 - D. Pluto

10. Gas Giants have atmospheres that are thousands of miles/kilometers thick.
 - A. True
 - B. False