Unit: Our Solar System

★ Subunit 1: The Sun and the Inner Planets
★ Subunit 2: The Outer Planets
★ Subunit 3: Famous People in Astronomy
★ Subunit 4: Literature and Astronomy

Charity Beals

ESL / FL 587

Dr. Clara Lee Brown
Unit: Our Solar System

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Classroom layout: Group discussion

Arrange desks into groups according to class size. For navigating activities, group students according to language so that their peers can help them in their native language, if possible. When doing group activities, spread students of similar languages out so that they can discuss using English only, if possible. Have students’ seating arrangements change every subunit so they can be exposed to as many diverse class members as possible.

This unit is designed for high school ELLs (9-12), intermediate to intermediate-high level.

The main textbook (but not limited to) is:

Unit: Our Solar System

★ Unit Objectives (UOs):

Students should be able to describe and understand characteristics about the Solar System and the way the Solar System works, be able to identify discoveries made by famous astronomers, and link astronomical bodies’ names to literature.

____________________________
Subunit 1: The Sun and Inner Planets

★ Content Objectives:

① Students should be able to construct a chart synthesizing information about the Inner planets. (TESOL 2.2; Grade 9-12).
② Students should be able to define, compare, and classify the Inner planets (e.g., according to number, shape, color, size, function, physical characteristics). (TESOL 2.2; Grade 9-12).
③ Students should be able to understand and produce technical vocabulary and text features according to content area. (TESOL 2.2; Grade 9-12).

★ Language Objectives:

① Students should be able to participate in full class, group, and pair discussions. (TESOL 2.1; Grade 9-12).
② Students should be able to explain actions. (TESOL 2.1; Grade 9-12).
③ Students should be able to request and provide clarification over materials. (TESOL 2.1; Grade 9-12).

★ Learning Strategies Objectives:

① Students should be able to apply basic reading comprehension skills such as skimming, scanning, previewing and reviewing texts. (TESOL 2.3; Grade 9-12).
② Students should be able to actively connect new information to information previously learned. (TESOL 2.1; Grade 9-12).

Classroom Objectives

★ Content Objectives:

① Be able to identify and describe the properties of the Inner planets and the Sun.

★ Language Objectives:

① Be able understand and use special vocabulary related to the Inner planets and the Sun.
② Be able to make and discuss questions about the material.
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<table>
<thead>
<tr>
<th>Subunit 1 Priming Activities</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Try to build background knowledge with “Writing Connections”--Find a book in the library</td>
<td>• LSO 2, LO 3</td>
</tr>
<tr>
<td>that would make a great introduction about the planets. Have them do a writing connection on</td>
<td>• Astronomy related picture book</td>
</tr>
<tr>
<td>post-it notes and share with the class.</td>
<td>• post-it notes</td>
</tr>
<tr>
<td><strong>2.</strong> Help them answer, “What do I know about the solar system?” by making a web chart with</td>
<td>• LSO 2</td>
</tr>
<tr>
<td>“solar system” in the middle (learning strategy).</td>
<td>• Example of a web chart</td>
</tr>
<tr>
<td></td>
<td>• Web chart worksheets for students (pg. 37)</td>
</tr>
<tr>
<td><strong>3.</strong> Use fruit of different sizes to represent the planets. After presenting them and</td>
<td>• LSO 2</td>
</tr>
<tr>
<td>having their size compare to the planets, line them up and darken the room, and shine a</td>
<td>• 9 fruits of various sizes</td>
</tr>
<tr>
<td>flashlight on the fruit planets. Ask them why are they able to see the fruit. (Light reflects</td>
<td>• Flashlight</td>
</tr>
<tr>
<td>from them) Then ask what the flashlight represents (the Sun) Now the students should know</td>
<td></td>
</tr>
<tr>
<td>why planets are visible in the night sky.</td>
<td></td>
</tr>
<tr>
<td><strong>4.</strong> Help students understand how big the sun is by taking a basketball and having it</td>
<td>• LSO 2</td>
</tr>
<tr>
<td>represent Earth. Explain that the sun would be about the size of a basketball court.</td>
<td>• Basketball</td>
</tr>
<tr>
<td><strong>5.</strong> Use a KWL chart divided into three columns with butcher paper. Have them tell what</td>
<td>• LSO 2</td>
</tr>
<tr>
<td>they know about the Solar System, then what they want to learn about the Solar System.</td>
<td>• Butcher paper</td>
</tr>
<tr>
<td>Continue to leave the chart up throughout the unit. At the end of each subunit, ask the class</td>
<td></td>
</tr>
<tr>
<td>what they learned and fill out the last section.</td>
<td></td>
</tr>
<tr>
<td><strong>6.</strong> Present class objectives.</td>
<td></td>
</tr>
</tbody>
</table>
# Unit: Our Solar System

## Subunit 1 Navigating Activities

|   | Vocabulary--pick out predictable ones, but also have students skim (learning strategy) each paragraph of a reading for difficult words. Have them write them in their vocabulary dictionary journal. They can write the word and then English explanation, as well as the definition in their language, provided that they have a dictionary (or they can find out in a dictionary at home). Also, have difficult words written on a “word wall”.
|   | Difference between “rotation” and “revolution”
|   | Ellipse, orbit (noun and verb)
|   | Think about nouns vs. verbs--rotate and rotation, revolve and revolution. What’s the difference between rotation and revolution?
|   | Before defining words, ask class if they can find out the meaning with context clues.
|   | Explain word roots, prefixes and suffixes. (astro--astronaut)
|   | Photosphere (photo = light in Greek), chromosphere (chromo = color in Greek)
|   | corona = crown in Latin
|   | solar = Latin for “sun”
|   | retrograde motion
|   | terrestrial (terra = Latin for “land”)
|   | Gravitate / gravitation
|   | Observe / observation
|   | Use an acronym to help students remember the order of the planets (My Very eager mother served us nine pizzas) (My very easy method: just stand under North Pole). Make an activity where students make their own acronym to help them remember.
|   | Making notes: make an “outline of an outline”--outline structure but empty parts. Have students fill in the information as notes as class goes, or have them read silently and fill in with information--have them look for topic sentences (main point)--do 1st paragraph as an example. Topics may be highlighted, in bold, or the heading of a paragraph.
|   | Show a video about the inner planets--show how planets rotate and also revolve around other planets. Have students watch 5-minute videos, hopefully ones with closed captioning or subtitles so that they can read along with what it is saying. Possibly show it twice—once for reading and second for watching.
|   | Illustrate the difference between “rotation” and “revolution”—have one student stand up in the middle of the room and slowly turn in a circle (rotating). Then have another student walk around the spinning student (revolving). Ask the class which student is revolving and which is rotating.
|   | When ideas become confusing, try to draw out ideas on butcher paper, dry erase board, or chalkboard. Also, have another student draw out the process visually.

### Materials

- CO 3, LO 3, LSO 3
- Dictionary Diary
- English Dictionary
- Word wall chart
- LO 3, LSO 3
- Outline on pg. 40
- LO 2
- Various videos about inner planets
- CO 3, LO 2
- 2 volunteers
- LO 2, 3
## Subunit 1 Amplifying Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have students read different paragraphs from textbooks and summarize</td>
<td>LSO 1, 3</td>
</tr>
<tr>
<td>information in a group (even distribution of low and high level students)--have student write this information and vocabulary in their outline.</td>
<td>Textbook</td>
</tr>
<tr>
<td>Print out the worksheet on page () for each student, as well as making a life-sized chart for the front of the room. Have students discuss properties of each planet in a group. Assign each group different planets (maybe pairs can have one planet; groups of four can have two planets). After group work, discuss the properties of the planet. Write the information each group presents in the big chart, and have other classmates write the information on their copy of the chart. Tell them to keep this chart because we will make another one later on. Discuss planet extremes (hottest, biggest, smallest, slowest rotation…etc.) Place a picture of the planet where it says “size” for the biggest one and smallest one. For example, if they say the sun is the biggest, place a picture of the sun on its size. Mercury would be placed on its size for being the smallest.</td>
<td>CO 1, 2, Inner planet chart, Inner planet chart worksheets for students (pg. 26), Small pictures of inner planets</td>
</tr>
<tr>
<td>Have students write a story using what they learned about what planets they could live on or not and why. Also, what would they need?</td>
<td>LSO 2</td>
</tr>
<tr>
<td>Have students identify and describe the parts of the Sun on a worksheet.</td>
<td>CO 1, 3, Worksheet on pg. 39</td>
</tr>
</tbody>
</table>
**Unit: Our Solar System**

### Subunit 1 Lab Activities

<table>
<thead>
<tr>
<th>Ellipse planet orbit activity:</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) put 2 pushpins about 10 cm apart on a foam poster board (paper side up). 2) Tie the ends of a 30 cm string together. Put the string around the pushpins. 3) Keeping the string tight, move your pencil around inside the string. 4) Now put the pushpins at 5 cm apart. How does the ellipse’s distance change when you change the distance between the pushpins? What shape would it be if you had just one pushpin?</td>
<td>2 pushpins for each student  Foam poster board  String</td>
</tr>
</tbody>
</table>

| Fill a glass container with some sand. Pour some vinegar on some steel wool. Cut the steel wool into small pieces and mix it into the sand. Pour enough water in the container to cover the sand. Let the container stand until the steel wool begins to rust. Explain that the steel wool has iron in it and that when it oxidizes, iron will have a red tint (rust). This rusting is kind of like the red soil on Mars, meaning that at some point water existed on Mars. | Glass container  Sand  Water  Vinegar  Steel wool  Scissors |

| Investigate stormy sunspots activity. | Worksheet pg. 38 |

### Subunit 1 Questions and Class Discussions (LO 1)

1. Is the Sun a planet? Why or why not?
2. Why do we only see one side of the moon? (The moon revolves around the Earth in the same amount of time the moon takes to rotate on its axis.)
3. What would your weight be on the Moon?
4. What is the difference between a lunar and solar eclipse?
5. If the moon doesn’t make light, how can we see it?
6. Why is it so hot and cold on Mercury? (It’s close to the sun in the day, but then the heat escapes the atmosphere at night, making it very cold.)
7. What causes the Greenhouse Effect (on Earth and Venus)?
8. Why is Venus so windy? (Because of its retrograde motion—it is spinning in the opposite direction of its orbit around the sun.)

Each subunit has a question and get into groups to discuss and answer the question in class. Have groups answer the question, and then present the question to another individual outside of the group.
## Unit: Our Solar System

<table>
<thead>
<tr>
<th>Types of Assessment</th>
<th>Materials</th>
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<tbody>
<tr>
<td><em>(For teacher)</em> Observe students’ participation based on speaking, listening</td>
<td>• Teacher’s checklist on pg 35</td>
</tr>
<tr>
<td><em>(through comprehension), writing and reading.</em></td>
<td></td>
</tr>
<tr>
<td><em>(For teacher and student)</em> After finishing subunit 1, interview students and give</td>
<td>• Note</td>
</tr>
<tr>
<td><em>them a note about the meeting. Have students keep this note in a special place so</em></td>
<td>• Class notebook</td>
</tr>
<tr>
<td><em>that they can see their improvement as subunits progress.</em></td>
<td></td>
</tr>
<tr>
<td><em>(For teacher and student)</em> Daily journal everyday for about 10 minutes at the end</td>
<td>• Daily journals</td>
</tr>
<tr>
<td><em>--answer “When I learned about… it made me think…“.</em> Have some of the share in*</td>
<td></td>
</tr>
<tr>
<td><em>class next time.</em></td>
<td></td>
</tr>
</tbody>
</table>
Unit: Our Solar System

Subunit 2: The Outer Planets

★ Content Objectives:
  ① Students should be able to construct a chart synthesizing information about the Outer planets. (TESOL 2.2; Grade 9-12).
  ② Students should be able to define, compare, and classify the Outer planets (e.g., according to number, shape, color, size, function, physical characteristics). (TESOL 2.2; Grade 9-12).
  ③ Students should be able to understand and produce technical vocabulary and text features according to content area. (TESOL 2.2; Grade 9-12).

★ Language Objectives:
  ① Students should be able to participate in full class, group, and pair discussions. (TESOL 2.1; Grade 9-12).
  ② Students should be able to explain actions. (TESOL 2.1; Grade 9-12).
  ③ Students should be able to request and provide clarification over materials. (TESOL 2.1; Grade 9-12).

★ Learning Strategies Objectives:
  ① Students should be able to apply basic reading comprehension skills such as skimming, scanning, previewing and reviewing texts. (TESOL 2.3; Grade 9-12).
  ② Students should be able to actively connect new information to information previously learned. (TESOL 2.1; Grade 9-12).

Classroom Objectives

★ Content Objectives:
  ① Be able to identify and describe the properties of the Outer planets and the asteroid belt.

★ Language Objectives:
  ① Be able understand and use special vocabulary related to the Outer planets and the asteroid belt.
  ② Be able to make and discuss questions about the material.
## Unit: Our Solar System

<table>
<thead>
<tr>
<th>Subunit 2 Priming Activities</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Compare satellite pictures of a hurricane on Earth with the spot on Jupiter. Ask the class what this might say about the spot on Jupiter (it’s a storm).</td>
<td>• LSO 2</td>
</tr>
<tr>
<td></td>
<td>• Satellite picture of hurricane and spot on Jupiter</td>
</tr>
<tr>
<td>2. Do you think Pluto is a hot or cold planet? How can you tell? (Far away from the Sun.)</td>
<td>• LSO 2</td>
</tr>
<tr>
<td>3. What do you think makes the planets different colors? (Chemical compositions of their atmospheres—Neptune is blue because of methane gas.)</td>
<td>• LSO 2</td>
</tr>
<tr>
<td>4. Present class objectives.</td>
<td></td>
</tr>
</tbody>
</table>
### Unit: Our Solar System

<table>
<thead>
<tr>
<th>Subunit 2 Navigating Activities</th>
<th>Materials</th>
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</thead>
</table>
| **1.** Vocabulary--pick out predictable ones, but also have students skim (learning strategy) each paragraph of a reading for difficult words. Have them write them in their vocabulary dictionary journal. They can write the word and then English explanation, as well as the definition in their language, provided that they have a dictionary (or they can find out in a dictionary at home). | **• CO 3, LO 3, LSO 3**  
• Dictionary Diary  
• Word wall |
| ★ “Comet” = “long hair” in Greek  
★ Planetesimals  
★ Gases: helium, methane | |
| **2.** Show a video about the outer planets--show how planets rotate and also revolve around other planets. Have students watch 5-minute videos, hopefully ones with closed captioning or subtitles so that they can read along with what it is saying. Possibly show it twice—one for reading and second for watching. | **• LO 2**  
• Video about Outer planets |
| **3.** Making notes: make an “outline of an outline”—outline structure but empty parts. Have students fill in the information as notes as class goes, or have them read silently and fill in with information—have them look for topic sentences (main point)—do 1st paragraph as an example. Topics may be highlighted, in bold, or the heading of a paragraph. | **• LO 3, LSO 3**  
• Outline on pg. 41-42 |
| **4.** When ideas become confusing, try to draw out ideas on butcher paper, dry erase board, or chalkboard. Also, have another student draw out the process visually. | **• LO 2, 3**  
• Butcher paper |
| **5.** **Zathura**: Zathura is a movie and a book about 2 kids playing a board game about the Universe. Have students read excerpts from the book, or watch the movie in class (with captioning). Have them write a small paper, or have a discussion, about what they saw in the move that relates to material learned in class about astronomy. | **• LO 3, LSO 1**  
• Zathura book or movie |
# Subunit 2 Amplifying Activities

<table>
<thead>
<tr>
<th></th>
<th>Materials</th>
</tr>
</thead>
</table>
| 1. **Math:** The orbit of Haley’s comet comes near Earth every 76 years. The last time this comet was visible from Earth was 1986. In what year will it come back near Earth? When was the last time it orbited near Earth before 1986? | • LO 2  
• Calculators |
| 2. **What are the differences between inner and outer planets?**  
Print out the worksheet on page () for each student, as well as making a life-sized chart for the front of the classroom. Have students discuss properties of each planet in a group. Assign each group different planets (maybe pairs can have one planet; groups of four can have two planets). After group work, discuss the properties of the planet. Write the information each group presents in the big chart, and have other classmates write the information on their copy of the chart. Discuss planet extremes (hottest, biggest, smallest, slowest rotation…etc.). Have students compare this chart with the previous chart. Now that both charts have been made, compare and contrast all the planets. | • CO 1, 2  
• Outer planet chart  
• Outer planet chart worksheets for students (pg. 27)  
• Small pictures of outer planets  
• Inner planet charts from last subunit |
| 3. **Travel guide to the outer planets:** Have students pretend it is 500 years in the future, and have them design and write a travel guide to encourage people to go to one of the outer planets (including moons). | • LSO 1, 2  
• Colored pencils  
• Construction paper  
• Scissors  
• Additional astronomy books for reference |
| 4. **Provide a number of books for your class—find at least one book about astronomy for each student. Have them read the book silently, and then after the reading time is over, have them write down one new thing they learned from the book that has not been covered in class so far. Have each student share the information with the class.** | • LO 1,2, LSO 1  
• Additional astronomy books for reference  
• Post-it notes |
| 5. **Balderdash!** Find some myths and urban legends about the planets and use info learned in class for students to prove them wrong. Pick myths that can be proved wrong with the information given in class only. | • LO 1, 2  
• Index cards with myths |
| 6. **Have students get into pairs (preferably of different languages). Give one each student a planet or other astronomical body. Have students play “guess that planet” by describing properties of the planet to their partner. The descriptions on page () can be used.** | • CO 3, LO 1  
• Index cards with planets |
| 7. **Have students read different paragraphs from textbooks and summarize information in a group (even distribution of low and high level students—have student write this information and vocabulary in their outline.** | • LO 1, LSO 1  
• Textbook |
| 8. **After watching or reading Zathura, have students create their own board game about the Solar System.** | • CO 2, LO 1  
• White poster board  
• Art supplies: colored pencils, paints, scissors, glue, glitter, etc. |
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### Subunit 2 Lab Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Materials</th>
</tr>
</thead>
</table>
| Do a gravity related experiment: Using each planets’ gravity equation, find out your weight on each planet. Compare and contrast. Why are you heavier on some planets than others? | • Scale  
• Equation sheet  
• Lab worksheet |
| Making a model of the planets--by size and color and distance (using the lab worksheet on page ( )). | • 9 foam balls of various sizes  
• Paints  
• Lab worksheet (for distance)  
• String |
| If possible, arrange a field trip to a local observatory. | • Permission slips |
| **Modeling Jupiter’s atmosphere:** | • Developing paper  
• Double-sided tape  
• Cardboard  
• Scissors  
• Lab worksheet |
| 1) Cut a shape in the middle of a piece of cardboard.                  |                                                                           |
| 2) In a dark room, tape the cardboard shape on to the glossy side of the photographic developing paper. |                                                                           |
| 3) Place the paper in the sunlight for one minute and return to the darkened room. |                                                                           |
| 4) Take the cardboard shape off of the paper and observe the result.   |                                                                           |
| The developing paper is designed to turn very dark when light hits its surface. The chemicals of the paper react to sunlight and darken, like getting a tan. Without the sun block, or the cardboard shape, the paper gets a sunburn. Since Jupiter's clouds are made of chemicals that also react to the light and heat of the Sun, they are different colors depending on what's blocking them or how deep they are. What does this say about the stripes of Jupiter? Or the Great Red Spot? What about storms on other planets? | [http://hea-www.harvard.edu/ECT/the_book/Chap5/Chapter5.html#sso](http://hea-www.harvard.edu/ECT/the_book/Chap5/Chapter5.html#sso) |
| **Modeling the Rings of the Outer planets:** | • Flashlight  
• Baby powder in a squeezebox  
• Ice cubes  
• 2 drinking glasses  
• Hot water  
• Lab worksheet |
| 1) In a dark room, put a flashlight at the edge of a desk or table.    |                                                                           |
| 2) Hold the squeezebox below the beam of light and then quickly squeeze the box to let a fast shot of powder come up through the beam. Write observations. |                                                                           |
| 3) Fill a glass with hot water and leave the other empty.              |                                                                           |
| 4) Drop an ice cube into the empty glass and observe its color.       |                                                                           |
| 5) Drop an ice cube into the hot water. It cracks. Observe the color.  |                                                                           |
| Before the powder is released, the beam of light is hard to see, like the rays of sunlight through empty space in the Solar System. Since the human eye can only see light if it bounces off of something and into the eye, the beam is hard to see until the powder particles are tossed into it. The particles fly around and bounce the light to the eye. The particles, although tiny, are mirrors for the eye to see reflected light from the Sun and are therefore quite bright. | [http://hea-www.harvard.edu/ECT/the_book/Chap5/Chapter5.html#sso](http://hea-www.harvard.edu/ECT/the_book/Chap5/Chapter5.html#sso) |
## Subunit 2 Questions and Class discussions (LO 1)

<p>| | |</p>
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>If the outer planets are made out of gas, why are their moons still made from rock? (They probably were asteroids pulled into the planet’s orbit.)</td>
</tr>
<tr>
<td>2.</td>
<td>What holds the objects in the Solar System together?</td>
</tr>
<tr>
<td>3.</td>
<td>How can you explain Uranus’ rotation on its side? (Possibly a large body hit the planet very hard)</td>
</tr>
<tr>
<td>4.</td>
<td>How can you explain the direction of the rings around Jupiter, Saturn, and Uranus?</td>
</tr>
<tr>
<td>5.</td>
<td>What’s the difference between Jupiter’s moons Io and Europa?</td>
</tr>
<tr>
<td>6.</td>
<td>What are the rings of Saturn made out of?</td>
</tr>
<tr>
<td>7.</td>
<td>Saturn has small moons inside its rings. How do you think the moons got there?</td>
</tr>
<tr>
<td>8.</td>
<td>Is there a correlation between a planet’s gravitation pull and number of moons?</td>
</tr>
<tr>
<td>9.</td>
<td>Pluto was discovered in the 1930’s before the Kuiper Belt was discovered. Now scientists think that maybe Pluto should not be counted as a planet. Divide into two groups and debate whether or not Pluto should be considered a planet of the Solar System, or just a large object of the Kuiper Belt.</td>
</tr>
<tr>
<td>10.</td>
<td>What about Pluto makes it so different from the other Outer Planets? (Answers could be used in the discussion question above.)</td>
</tr>
</tbody>
</table>

Each subunit has a question and get into groups to discuss and answer the question in class.
Have groups answer the question, and then present the question to another individual outside of the group.
## Types of Assessment

<table>
<thead>
<tr>
<th>Types of Assessment</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>(For teacher) Observe students’ participation based on speaking, listening (through comprehension), writing and reading.</td>
<td>• Teacher’s checklist on pg. 35</td>
</tr>
<tr>
<td>(For teacher and student) After finishing subunit 2, interview students and give them a note about the meeting. Have students keep this note in a special place so that they can see their improvement as subunits progress.</td>
<td>• Note • Class notebook</td>
</tr>
<tr>
<td>(For teacher and student) Daily journal everyday for about 10 minutes at the end--answer “When I learned about…it made me think…” Have some of them share in class next time.</td>
<td>• Daily journals</td>
</tr>
</tbody>
</table>
Unit: Our Solar System

Subunit 3: Famous People in Astronomy

★ Content Objectives:

① The student should be able to construct a chart or other graphic material. (TESOL 2.2; Grade 9-12).
② The student should be able to persuade, argue, negotiate, evaluate, and justify famous astronomer’s ideas and findings. (TESOL 2.2; Grade 9-12).
③ The student should be able to locate reference material about famous astronomers. (TESOL 2.2; Grade 9-12).

★ Language Objectives:

① The student should be able to elaborate and extend other people's ideas and words. (TESOL 2.1; Grade 9-12).
② The student should be able to join in a group response at the appropriate time. (TESOL 2.1; Grade 9-12).

★ Learning Strategies Objectives:

① Students will be able to verbalize relationships between new information and information previously learned in another setting. (TESOL 2.3; Grade 9-12).
② Students should be able to select materials from school resource collections to complete a project. (TESOL 2.3; Grade 9-12).

Classroom Objectives

★ Content Objectives:

① Be able to understand and discuss the discoveries and impact of famous astronomers in the past.
② Be able to notice the progression of astronomy throughout history with a timeline.

★ Language Objectives:

① Be able to share information about astronomers to the class and describe their contributions.
② Be able to debate about astronomers’ ideas.
# Unit: Our Solar System

## Subunit 3 Priming Activities

<table>
<thead>
<tr>
<th></th>
<th>Subunit 3 Priming Activities</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ask the class if they know any names of famous people in Astronomy (such as Galileo)</td>
<td>• Pictures of famous astronomers</td>
</tr>
<tr>
<td>2.</td>
<td>Read a book or chapter aloud about a famous astronomer. Have students write on post-it notes their “writing connection” and share with the class.</td>
<td>• LSO 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Books about famous astronomers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Textbook</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Post-it notes</td>
</tr>
<tr>
<td>3.</td>
<td>Ask the class if they know any famous astronomers from their culture.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Present class objectives.</td>
<td></td>
</tr>
</tbody>
</table>
**Unit: Our Solar System**

<table>
<thead>
<tr>
<th><strong>Class Project: Astronomy Timeline</strong></th>
<th><strong>Materials</strong></th>
</tr>
</thead>
</table>
| For this subunit, each class member will choose a famous person in astronomy and make a piece of a timeline. When the timeline is to be made, each student will present their person and attach them to a timeline in the classroom. As the timeline is being made, students will be able to see the progression of the study of astronomy. | •CO 1, 3  
•LO 1  
•LSO 2  
•Piece of paper with astronomer’s name  
•Art supplies for decorating piece  
•Additional astronomy books for reference  
•Word wall  
•Vocabulary diary |

1. **Assign each class member a famous person in astronomy.** Have a piece of paper folded in half, with one side showing the famous person’s name. They can decorate the front with the person’s picture or things related to what the person did. On the inside, have students write a list of contributions that the person made to the field of astronomy. This will be the information they present in class.  

2. **Allow students in-class time to read books about their person, ask teacher questions about difficult words and concepts in those books, and trips to the school library to look for information.**  
   **Vocabulary:**  
   Geocentric (geo = Greek for “earth”)  
   Heliocentric (helio = Greek for “sun”)

3. **Have students answer in their timeline piece: who, what, where, when, and why.** Have students focus on the flow of discoveries, and not specifically memorizing names or years.

4. **The famous people can be (but is not limited to):**
   - John Couch Adams
   - Neil Armstrong
   - Johann Bode
   - Tycho Brahe
   - Annie Jump Cannon
   - Giovanni Cassini
   - Copernicus
   - Galileo Galilei
   - Edmond Halley
   - William Hershel
   - Christiaan Huygens
   - Johannes Kepler
   - Gerard Kuiper
   - Ptolemy
   - Thales
   - Clyde Tombaugh
# Unit: Our Solar System

<table>
<thead>
<tr>
<th>Subunit 3 Amplifying Activities</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. If you were to become a famous astronomer, what would be your new discovery? How did you discover it? Write a short story about what you would discover.</td>
<td>•CO 2, LO 2, LSO 1</td>
</tr>
<tr>
<td>2. Who is your favorite person on the timeline? Why? Write a short response.</td>
<td>•LO 1</td>
</tr>
<tr>
<td>3. Have students read different paragraphs from textbooks and summarize information in a group (even distribution of low and high level students--have student write this information and vocabulary in their timeline.</td>
<td>•LSO 3</td>
</tr>
<tr>
<td>4. Historical role-playing: Divide the class into two groups—one that supports Ptolemy’s geocentric universe and the other that supports Copernicus’ heliocentric universe. Have them debate about which idea (at the time) is the most fit. This can be possible with other famous people and other ideas.</td>
<td>•CO 2, LO 1, 3</td>
</tr>
<tr>
<td>5. Read and discuss the advances that the Chinese, Egyptians and Arabic made in astronomy in ancient times.</td>
<td>•LO 1, LSO 1</td>
</tr>
<tr>
<td>6. Using the textbooks and related books in the classroom, find names in the index of people not discussed in the timeline. Investigate the text to see if they were major contributors to astronomy.</td>
<td>•CO 3</td>
</tr>
</tbody>
</table>

- **CO**: Content Objective
- **LO**: Learning Objective
- **LSO**: Learning Sub-Objective
Unit: Our Solar System

<table>
<thead>
<tr>
<th>Subunit 3 Questions and Class Discussions (CO 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is the difference between geocentric and heliocentric ideas?</td>
</tr>
<tr>
<td>2. What are some other conflicting ideas that other famous astronomers had?</td>
</tr>
<tr>
<td>3. Was anything found by accident by astronomers?</td>
</tr>
</tbody>
</table>

Each subunit has a question and get into groups to discuss and answer the question in class.
Have groups answer the question, and then present the question to another individual outside of the group.

Types of Assessment

| (For teacher) Observe students’ participation based on speaking, listening (through comprehension), writing and reading. | • Teacher’s checklist on pg. 35 |
| (For teacher and student) After finishing subunit 3, interview students and give them a note about the meeting. Have students keep this note in a special place so that they can see their improvement as subunits progress. | • Note  
• Class notebook |
| (For teacher and student) Daily journal everyday for about 10 minutes at the end--answer “When I learned about…it made me think…“. Have some of the share in class next time. | • Daily journals |
Unit: Our Solar System

Subunit 4: Literature and Astronomy

★ Content Objectives:
    ① Students should be able to listen to, speak, read, and write about mythological stories and folk stories. (TESOL 2.2; Grade 9-12).
    ② Students should be able to select, connect, and explain information about Roman mythology and folk stories about the Universe. (TESOL 2.2; Grade 9-12).
    ③ Students should be able to consult print and non-print resources in the native language about their own stories about the Universe. (TESOL 2.2; Grade 9-12).

★ Language Objectives:
    ① Students should be able to explain actions in mythological stories. (TESOL 2.1; Grade 9-12).
    ② Students should be able to ask and answer questions about mythological stories and their relation to the names of planets. (TESOL 2.1; Grade 9-12).

★ Learning Strategies Objectives:
    ① Students should be able to construct a chart or other graphic showing data about Roman mythology and astronomy. (TESOL 2.2; Grade 9-12).
    ② Students should be able to scan several resources to determine the appropriateness to the topic of study—mythological figures in astronomy. (TESOL 2.3; Grade 9-12).

Classroom Objectives

★ Content Objectives:
    ① Be able to make connections between Roman mythology and names of planets through character and planetary characteristics.
    ② Be aware of other cultures as well as your own cultures’ stories about planets and astronomy.

★ Language Objectives:
    ① Be able to compare and contrast Roman mythology with astronomy.
    ② Be able to discuss respectfully about your culture’s stories and comment about others’ stories.
## Unit: Our Solar System

### Subunit 4 Priming Activities

<table>
<thead>
<tr>
<th></th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How were you told how the universe was created?</td>
<td>• Chart of other planet names</td>
</tr>
<tr>
<td>2. Ask the students in the class what the planets are called in their language. Ask to give a rough English translation of the name if possible.</td>
<td>• CO 2 • Mythological stories</td>
</tr>
<tr>
<td>3. Read some Roman mythological stories (short ones) out loud, ones involving important gods that the planets are named after. Ask the class if they have similar folk stories in their culture.</td>
<td>• CO 1 • Native American stories</td>
</tr>
<tr>
<td>4. Read some Native American stories about “Mother Earth” and the heavens. Discuss the stories in class.</td>
<td></td>
</tr>
<tr>
<td>5. Present class objectives.</td>
<td></td>
</tr>
</tbody>
</table>

### Subunit 4 Navigating Activities

<table>
<thead>
<tr>
<th></th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tie in Greek / Roman mythology to planet names: Split students into groups and give them a planet or other astronomical body related to literature or Roman mythology. Have books that explain the relationship between astronomical names and mythology (such as the website <a href="http://www.nineplanets.org/">http://www.nineplanets.org/</a>--or you could schedule a trip to the school computer lab if that is possible to have a look at the website.) After research, have groups present their connections to the class. Print out handout on page 34 with a summary of that information.</td>
<td>• CO 1, 2, LO 2 • Roman mythology books</td>
</tr>
<tr>
<td>2. Print out short, famous Roman mythological stories that have a moral and have groups read them (and of course, related to names in astronomy). Have them summarize the stories and present them to the class. Ask the class what the moral of the story is.</td>
<td>• CO 1, 2 • Roman mythology short stories</td>
</tr>
<tr>
<td>3. In the sky are hundreds of constellations. Some of these are named after famous people in Roman mythology. Use a sky book that outlines the “people in the sky” and have read readings or information about the stories behind the people.</td>
<td>• CO 1, 2, LO 1, 2 • Sky book • Stories about people in the sky</td>
</tr>
</tbody>
</table>
Unit: Our Solar System

<table>
<thead>
<tr>
<th>Subunit 4 Amplifying Activities</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Have them write a creation story (if they know one) from their culture, or write a story about how they think the planets came to be.</td>
<td>•CO 1, LO 1, LSO 2</td>
</tr>
<tr>
<td><strong>2.</strong> Have them write stories they have heard about “the gods” in their culture.</td>
<td>•CO 1, LO 1, LSO 2</td>
</tr>
<tr>
<td><strong>3.</strong> Divide the class into groups and give them a planet and a moon. Have them draw the planet and moon given, and then a human representation of who the planet or moon is in Roman mythology. Have them label the picture as the person being “the son or daughter of”. When everyone is finished, have him or her present his or her art, and put it together like a “family tree”.</td>
<td>•CO 2, LSO 1&lt;br&gt;•Art supplies: Colored pencils, glue, construction paper, scissors, Etc.</td>
</tr>
<tr>
<td><strong>4.</strong> If there is a high percentage of Chinese, Japanese, and Korean students, have them describe the meanings of the characters in English, and with non-East Asian students, brainstorm how those meanings are related to Roman mythology (example: the character for “Jupiter” is “tree star”. This could be because the Roman god Jupiter’s symbol was the oak tree.) Also related to the 5 elements.</td>
<td>•CO 1-3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subunit 4 Questions (LO 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Are characteristics of planets related to Roman mythological characters?</td>
</tr>
<tr>
<td><strong>2.</strong> Why do you think they named planets after Roman gods?</td>
</tr>
<tr>
<td><strong>3.</strong> The moons of Uranus are named after characters in William Shakespeare’s works. Why do you think they chose this instead of Roman mythology?</td>
</tr>
</tbody>
</table>

Each subunit has a question and get into groups to discuss and answer the question in class.
Have groups answer the question, and then present the question to another individual outside of the group.
## Unit: Our Solar System

### Types of Assessment

<table>
<thead>
<tr>
<th>Types of Assessment</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(For teacher)</strong></td>
<td>• Teacher’s checklist on pg. 35</td>
</tr>
<tr>
<td>Observe students’ participation based on speaking, listening (through comprehension), writing and reading.</td>
<td></td>
</tr>
<tr>
<td><strong>(For student)</strong></td>
<td>• Checklist on pg. 36</td>
</tr>
<tr>
<td>Have the students do a checklist about what they know about the whole unit.</td>
<td></td>
</tr>
<tr>
<td><strong>(For teacher and student)</strong></td>
<td>• Note</td>
</tr>
<tr>
<td>After finishing subunit 4, interview students and give them a note about the meeting. Have students keep this note in a special place so that they can see their improvement as subunits progress.</td>
<td>• Class notebook</td>
</tr>
<tr>
<td><strong>(For teacher and student)</strong></td>
<td>• Daily journals</td>
</tr>
<tr>
<td>Daily journal everyday for about 10 minutes at the end--answer, “When I learned about…it made me think…” Have some of the share in class next time.</td>
<td></td>
</tr>
</tbody>
</table>
## Unit: Our Solar System

<table>
<thead>
<tr>
<th></th>
<th>The Sun</th>
<th>Mercury</th>
<th>Venus</th>
<th>Earth</th>
<th>Mars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Temperature</td>
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<td></td>
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<tr>
<td>Rotation rate</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Revolution rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of moons</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Year discovered</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
## Unit: Our Solar System

<table>
<thead>
<tr>
<th></th>
<th>Jupiter</th>
<th>Saturn</th>
<th>Uranus</th>
<th>Neptune</th>
<th>Pluto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Temperature</td>
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<td>Rotation rate</td>
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<td>Revolution rate</td>
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<tr>
<td>Number of moons</td>
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<td></td>
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<tr>
<td>Year discovered</td>
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</tbody>
</table>
Unit: Our Solar System

**INVESTIGATION**

**Distances in the Solar System** (p. 288)

**45 minutes**

**Purpose**
To use a scale to show the distance between each planet and the sun

**Process Skills**
Making models, Measuring

**Thinking Skills**
Sequencing, Recognizing patterns and relationships

**Teacher's Resource Library**
Lab Manual 51

**PREPARATIONS**

**Materials (per group):**
- one 12-m long piece of adding machine paper
- meterstick
- tape

**Advance Prep**
- Measure and cut a piece of adding machine paper for each group. You might want to cut some extra pieces or keep the roll on hand in case some strips are torn as students set up this investigation.
- Be sure to place work stations far enough apart so that the work of each group does not interfere with the work of other groups.
- Students may use Lab Manual 51 to record their data and answer the questions.

**PROCEDURES**

**Cooperative Groups (4 students/group)**
Assign one student to gather equipment. All students record results and clean up when finished.

- Student A tapes the paper to the floor and draws the sun.
- Student B measures and marks the positions of the inner planets.
- Student C measures and marks the positions of the outer planets.
- Student D labels each position with the name of the planet and its distance from the sun.

**Teaching Tips**
- Make sure that students measure accurately. Remind them to check that the 0 end of the meterstick points to the sun each time they measure.
- Ask students why the scale of 1 cm = 5 million km is a good one for this activity. Ask if a scale of 1 km = 5 million km would be a good scale to use for their models. Guide students to understand that the scale of 1 cm = 5 million km allows them to see the relationship between the planets. If they measured the distances using a scale in kilometers, their models would be 1,180 km (about 732 miles) long! While the bigger model would still accurately represent the relationships between the planets, it would not help them visualize the solar system as well because they could not see the whole model at once.
- Some students may need help deciding how to use the model's scale to find the planets' actual distances from the sun. Guide them through the calculation for Mercury, as follows: Mercury's distance from the sun on the model is 12 cm; if the scale of the model is 1 cm = 5 million km, then Mercury's actual distance from the sun is 12 x 5, or 60 million km.

**RESULTS**

Planet names and distances should be labeled on the tape as follows: Mercury: 60 million km; Venus: 110 million km; Earth: 150 million km; Mars: 230 million km; Jupiter: 780 million km; Saturn: 1,430 million km; Uranus: 2,870 million km; Neptune: 4,500 million km; Pluto: 5,900 million km.

**Answers to Questions**
1. 1 cm = 5 million km
2. Mercury, Venus, Earth, Mars
3. Uranus and Neptune

**EXPLORE FURTHER**

Tell students to consider the largest and smallest planets when choosing the scale. Using Earth as a standard, the relative sizes for the planets are: Mercury: 0.4; Venus: 1.0; Earth: 1.0; Mars: 0.5; Jupiter: 11.2; Saturn: 9.4; Uranus: 4.0; Neptune: 3.8; Pluto: 0.24. If the sun is added, its relative size would be 110.

**ASSESSMENT**

Check that students are measuring accurately. Be sure they understand the concept of scale—that each centimeter actually represents 5 million kilometers and that the model represents the relative distances of the planets from the sun. Make sure that students accurately translate their model data into answers to the questions. You might include the following items from this investigation in student portfolios:
- Adding machine paper with distances marked and planet names labeled
- Answers to Questions
- Scale models from Explore Further
# Classifying: The Solar System

**Directions:** Identify each part of the solar system in the diagram below. Write the answer on each line. Then place each planet in the categories to which it belongs. Several planets will be used in more than one category. The number of lines shown may be more than you need.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>F</td>
<td>G</td>
<td>H</td>
<td>I</td>
<td>J</td>
</tr>
</tbody>
</table>

1. Inner Planets
2. Outer Planets
3. Planets Without Moons
4. Planets Made Mostly of Frozen Gas
5. Planets with Two or More Moons
6. Planets with Five or More Moons

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General Science

Workbook Activity 63
## Compare and Contrast

**Directions:** When you compare and contrast things or ideas, you tell how they are alike and how they are different. Compare and contrast each pair below.

1. **STAR—PLANET**
   a. How they are alike
   b. How they are different

2. **INNER PLANETS—OUTER PLANETS**
   a. How they are alike
   b. How they are different

3. **COMET—ASTEROID**
   a. How they are alike
   b. How they are different

4. **MERCURY—PLUTO**
   a. How they are alike

5. **SATURN—JUPITER**
   a. How they are alike
   b. How they are different
Distances in the Solar System

Use with Investigation 17, page 288

**Purpose:** To use a scale to show the distance between each planet and the sun

<table>
<thead>
<tr>
<th>Planet on model</th>
<th>Distance from sun on model (cm)</th>
<th>Planet on model</th>
<th>Distance from sun on model (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>12</td>
<td>Saturn</td>
<td>286</td>
</tr>
<tr>
<td>Venus</td>
<td>22</td>
<td>Uranus</td>
<td>574</td>
</tr>
<tr>
<td>Earth</td>
<td>30</td>
<td>Neptune</td>
<td>900</td>
</tr>
<tr>
<td>Mars</td>
<td>46</td>
<td>Pluto</td>
<td>1,180</td>
</tr>
<tr>
<td>Jupiter</td>
<td>156</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Questions**

1. What is the scale of this model?

2. Which four planets are closest together?

3. Which two planets have the greatest distance between their orbits?
Unit: Our Solar System

Chapter 17

Part A Read each description of a planet. Write the name of the planet that fits the description. Then write IP if it is an inner planet or OP if it is an outer planet.

<table>
<thead>
<tr>
<th>Planet</th>
<th>IP/OP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Largest planet, colorful bands, rotates once in 10 hours, Great Red Spot, at least 16 moons</td>
</tr>
<tr>
<td></td>
<td>2. Very bright, rotates in opposite direction from other planets, day lasts 243 Earth days, much carbon dioxide in atmosphere, greenhouse effect, very hot, rolling plains, towering highlands, no moons</td>
</tr>
<tr>
<td></td>
<td>3. Seen only with a telescope, greenish blue, year lasts 165 Earth years, rotates once in 16 hours, two moons, ring system</td>
</tr>
<tr>
<td></td>
<td>4. Rotates on its side, ring system, 15 moons, year lasts 84 Earth years, rotates once in 17 hours</td>
</tr>
<tr>
<td></td>
<td>5. One moon, rotates once in 24 hours, year lasts 365 Earth days, mild surface temperature, dense atmosphere, much water, supports life</td>
</tr>
<tr>
<td></td>
<td>6. Fastest moving, rotates once every 59 Earth days, year lasts 88 Earth days, craters and flat areas, no atmosphere, no moons, closest to the sun</td>
</tr>
<tr>
<td></td>
<td>7. No thick atmosphere, one known moon, year lasts 248 Earth years, rotates once every 6 Earth days, outermost planet</td>
</tr>
<tr>
<td></td>
<td>8. Thin rings of ice particles and dust, rotates once in 10 hours, 17 known moons, one moon has an atmosphere, stormy bands of clouds, second largest planet, tilted on its axis</td>
</tr>
<tr>
<td></td>
<td>9. Iron in rock and sand, two moons, rotates once every 24 hours 38 minutes, year lasts 687 Earth days, thin atmosphere of mostly carbon dioxide, windy, dry riverbeds</td>
</tr>
</tbody>
</table>
Unit: Our Solar System

Where did the planets and their moons get their names?

- **Mercury:** In Roman mythology Mercury is the god of commerce, travel and thievery, the Roman counterpart of the Greek god Hermes, the messenger of the Gods. The planet probably received this name because it moves so quickly across the sky.
- **Venus:** In Roman mythology Mercury is the god of commerce, travel and thievery, the Roman counterpart of the Greek god Hermes, the messenger of the Gods. The planet probably received this name because it moves so quickly across the sky.
- **Earth:** Earth is the only planet whose English name does not derive from Greek/Roman mythology. The name derives from Old English and Germanic. There are, of course, hundreds of other names for the planet in other languages.
- **Mars:** Mars (Greek: Ares) is the god of War and fire. The planet probably got this name due to its red color; Mars is sometimes referred to as the Red Planet.
- **Phobos:** In Greek mythology, Phobos is one of the sons of Ares (Mars) and Aphrodite (Venus). "phobos" is Greek for "fear" (the root of "phobia").
- **Deimos:** In Greek mythology, Deimos is one of the sons of Ares (Mars) and Aphrodite (Venus); "deimos" is Greek for "panic".
- **Jupiter:** Jupiter (a.k.a. Jove; Greek Zeus) was the King of the Gods, the ruler of Olympus and the patron of the Roman state. Zeus was the son of Cronus (Saturn). It is probably called "Jupiter" because it is the biggest planet.
- **Jupiter’s moons are named after famous lovers and daughters of Jupiter.**
- **Saturn:** In Roman mythology, Saturn is the god of agriculture. The associated Greek god, Cronus, was the son of Uranus and Gaia and the father of Zeus (Jupiter). Saturn is the root of the English word "Saturday".
- **The moons of Saturn are mostly named after famous Titans. In Greek mythology the Titans were a family of giants, the children of Uranus and Gaia, who sought to rule the heavens but were overthrown and supplanted by the family of Zeus.**
- **Uranus:** Uranus is the ancient Greek deity of the Heavens, the earliest supreme god. Uranus was the son and mate of Gaia the father of Cronus (Saturn) and of the Cyclopes and Titans (predecessors of the Olympian gods).
- **The moons of Uranus are all named after characters in William Shakespeare’s works, most of them being women.**
- **Neptune:** In Roman mythology Neptune (Greek: Poseidon) was the god of the Sea. This name was probably given because of Neptune’s blue color.
- **Neptune’s moons are named after sea nymphs and daughters of Neptune. Triton is a god of the sea, the son of Poseidon (Neptune); usually portrayed as having the head and trunk of a man and the tail of a fish.**
- **Pluto:** In Roman mythology, Pluto (Greek: Hades) is the god of the underworld. The planet received this name perhaps because it's so far from the Sun that it is in perpetual darkness.
- **Pluto’s one moon, Charon is named for the mythological figure who ferried the dead across the River Acheron into Hades (the underworld).**
<table>
<thead>
<tr>
<th>Name</th>
<th>Concepts: 1)</th>
<th>Comments</th>
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</table>
## Unit: Our Solar System

Name: ___________________________________________

<table>
<thead>
<tr>
<th>#</th>
<th>What do I know?</th>
<th>I know it well</th>
<th>I know a little</th>
<th>I need some help</th>
<th>I don’t know at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I know all 9 planets and what makes each unique.</td>
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<td>2.</td>
<td>I know the differences between the Inner and Outer Planets.</td>
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<td>3.</td>
<td>I know famous astronomers and their contributions to science.</td>
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<td>4.</td>
<td>I know Roman mythology stories that are related to astronomy.</td>
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<td>5.</td>
<td>I know stories about my culture and others connected to astronomy.</td>
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<td>6.</td>
<td>I know, understand, and can use special vocabulary related to astronomy.</td>
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<td>7.</td>
<td>I know how to debate ideas with classmates effectively and respectfully.</td>
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<td>8.</td>
<td>I know how to speak about my culture and comment on others’ respectfully.</td>
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Unit: Our Solar System

You and Your Environment

STORMY SUNSPOTS

Problem
How are magnetic storms on Earth related to sunspot activity?

Skills Focus
graphing, interpreting data

Materials
graph paper, pencil, straightedge

Procedure
1. Use the data in the table to make a line graph of sunspot activity between 1967 and 1997.
2. On the graph, label the x-axis "Year." Use a scale with 2-year intervals, from 1967 to 1997.
3. Label the y-axis "Sunspot Number." Use a scale of 0 through 100 in intervals of 10.
4. Graph a point for the Sunspot Number for each year.
5. Complete your graph by drawing lines to connect the points.

Analyse and Conclude
1. Based on your graph, which years had the highest Sunspot Number? The lowest Sunspot Number?
2. How often does the cycle of maximum and minimum activity repeat?
3. When was the most recent maximum sunspot activity? The most recent minimum sunspot activity?
4. Compare your sunspot graph with the magnetic storms graph. What relationship can you infer between periods of high sunspot activity and magnetic storms? Explain.
5. Apply During which years do you think electrical disturbances on Earth were most common?

Sunspots

<table>
<thead>
<tr>
<th>Year</th>
<th>Sunspot Number</th>
<th>Year</th>
<th>Sunspot Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>93.8</td>
<td>1983</td>
<td>66.6</td>
</tr>
<tr>
<td>1969</td>
<td>105.0</td>
<td>1985</td>
<td>17.9</td>
</tr>
<tr>
<td>1971</td>
<td>66.6</td>
<td>1987</td>
<td>29.4</td>
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<tr>
<td>1973</td>
<td>38.0</td>
<td>1989</td>
<td>157.6</td>
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<td>1975</td>
<td>15.5</td>
<td>1991</td>
<td>145.7</td>
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<tr>
<td>1977</td>
<td>27.5</td>
<td>1993</td>
<td>54.6</td>
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<tr>
<td>1979</td>
<td>155.4</td>
<td>1995</td>
<td>17.5</td>
</tr>
<tr>
<td>1981</td>
<td>140.4</td>
<td>1997</td>
<td>23.4</td>
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</tbody>
</table>

Magnetic Storm Days

Number of Days with Magnetic Storms

More to Explore
Using the pattern of sunspot activity you found, predict the number of peaks you would expect in the next 30 years. Around which years would you expect the peaks to occur?
Unit: Our Solar System

EXPLORING the Sun

The diameter of the sun (not including the chromosphere and the corona) is 1.4 million kilometers.

- Corona
- Sunspots
- Chromosphere
- Prominence
- Photosphere
- Core
Unit: Our Solar System

1) Inner Planets
   a) Mercury
      i) Atmosphere:____________________________________________________
         _______________________________________________________________
      ii) Orbit:________________________________________________________
         _______________________________________________________________
      iii) _____________________________________________________________
         _______________________________________________________________
      iv) _____________________________________________________________
   b) Venus
      i) Atmosphere:____________________________________________________
         _______________________________________________________________
      ii) Orbit:________________________________________________________
         _______________________________________________________________
      iii) _____________________________________________________________
         _______________________________________________________________
      iv) _____________________________________________________________
   c) Earth
      i) The Moon
         (1) ___________________________________________________________
         (2) ___________________________________________________________
         (3) ___________________________________________________________
         (4) ___________________________________________________________
      ii) Atmosphere:____________________________________________________
          _______________________________________________________________
      iii) Orbit:________________________________________________________
          _______________________________________________________________
      iv) _____________________________________________________________
         _______________________________________________________________
      v) ______________________________________________________________
   d) Mars
      i) Atmosphere:____________________________________________________
      ii) Orbit:________________________________________________________
      iii) Moons:
         (1) ____________________________
         (2) ____________________________
         (3) ____________________________
         (4) ____________________________
2) **Outer Planets**
   a) **Jupiter**
      i) **Atmosphere:**
         __________________________________________________________
      ii) **Orbit:**
         __________________________________________________________
      iii) **Moons:**
         (1) _______________________________________________________
         (2) _______________________________________________________
         (3) _______________________________________________________
         (4) _______________________________________________________
      iv) _________________________________________________________
      v) _________________________________________________________
   b) **Saturn**
      i) **Atmosphere:**
         __________________________________________________________
      ii) **Orbit:**
         __________________________________________________________
      iii) **Moons:**
         (1) _______________________________________________________
         (2) _______________________________________________________
      iv) _________________________________________________________
      v) _________________________________________________________
Unit: Our Solar System

c) Uranus
 i) Atmosphere:

 ii) Orbit:

 iii) Moons:
 (1) ________________________________

 (2) ________________________________

 iv) ________________________________

 v) ________________________________

d) Neptune
 i) Atmosphere:

 ii) Orbit:

 iii) Moons:
 (1) ________________________________

 (2) ________________________________

 iv) ________________________________

 v) ________________________________

e) Pluto
 i) Atmosphere:

 ii) Orbit:

 iii) Moon:
 (1) ________________________________

 iv) ________________________________

 v) ________________________________
Unit: Our Solar System

Illustrations:

Figure 1  Earth rotates on its axis and revolves around the sun.
Applying Concepts  What is one full rotation called? What is one complete revolution called?

Figure 7  During a solar eclipse, right, the moon blocks light from the sun, preventing the light from reaching Earth's surface. The solar corona surrounding the dark disk of the moon, above, is visible during a solar eclipse.
Figure 8  A. During a lunar eclipse, Earth blocks sunlight from reaching the moon’s surface.  
B. This photo of the moon was taken during a total lunar eclipse.  
C. This photo was taken during a partial lunar eclipse.  Interpreting Diagrams: What is the difference between Earth’s umbra and penumbra?
Unit: Our Solar System

Resources:


