



# ASTRONOMY

## Merit Badge Requirements

- 1) Describe the proper clothing and other precautions for safely making observations at night and in cold weather. Tell how to safely observe the Sun, objects near the sun, and the Moon. Explain first aid for injuries or illnesses, such as heat and cold reactions, dehydration, bites and stings, and damage to your eyes that could occur during observation.
- 2) Explain what light pollution is and how it and air pollution affect astronomy.
- 3) With the aid of diagrams (or real telescopes if available), do each of the following:
  - A) Explain why binoculars and telescopes are important astronomical tools. Demonstrate or explain how these tools are used.
  - B) Describe the similarities and differences of several types of astronomical telescopes.
  - C) Explain the purposes of at least three instruments use with astronomical telescopes.
- 4) Do the following:
  - A) Identify in the sky at least 10 constellations, at least four of which are in the Zodiac.
  - B) Identify at least eight conspicuous stars, five of which are of magnitude 1 or brighter.
  - C) Make two sketches of the Big Dipper. In one sketch, show the Big Dipper's orientation in the early evening sky. In another sketch, show its position several hours later. In both sketches, show the North Star and the horizon. Record the date and time each sketch was made.
  - D) Explain what we see when we look at the Milky Way.
- 5) Do the following:
  - A) List the names of the five most visible planets. Explain which ones can appear in phases similar to lunar phases and which ones cannot, and explain why.
  - B) Find out when each of the five most visible planets that you identified in requirement 5a will be observable in the evening sky during the next 12 months, then compile this information in the form of a chart or table. Update your chart monthly to show whether each planet will be visible during the early morning or in the evening sky.
- 6) At approximately weekly intervals, sketch the position of Venus, Mars or Jupiter in relation to the stars. Do this for at least four weeks and at the same time of night. On your sketch, record the date and time next to the planet's position. Use your sketch to explain how planets move.
- 7) Do the following:
  - A) Sketch the face of the moon and indicate at least five seas and five craters. Label these landmarks.
  - B) Sketch the phase and the daily position of the Moon at the same hour and place, for a week. Include landmarks on the horizon such as hills, trees, and buildings. Explain the changes you observe.
  - C) List the factors that keep the Moon in orbit around the Earth.
  - D) With the aid of diagrams, explain the relative positions of the Sun, Earth, and the Moon at the times of lunar and solar eclipses, and at the times of new, first-quarter, full, and last-quarter phases of the moon.
- 8) Do the following:
  - A) Describe the composition of the Sun, its relationship to other stars, and some effects of its radiation on Earth's weather. Define sunspots and describe some of the effects they may have on solar radiation.
  - B) Identify at least one red star, one blue star, and one yellow star (other than the Sun). Explain the meaning of these colors.
- 9) With your counselor's approval and guidance, do ONE of the following:
  - A) Visit a planetarium or astronomical observatory. Submit a written report, a scrapbook, or a video presentation afterward to your counselor that includes the following information:
    1. Activities occurring there
    2. Exhibits and displays you saw
    3. Telescopes and instruments being used
    4. Celestial objects you observed.

*Requirements continued on following page*

**B)** Plan and participate in a three-hour observation session that includes using binoculars or a telescope. List the celestial objects you want to observe, and find each on a star chart or in a guidebook. Prepare an observing log or notebook. Show your plan, charts, and log or notebook to your counselor before making your observations. Review your log or notebook with your counselor afterward.

**C)** Plan and host a star party for your Scout troop or other group such as your class at school. Use binoculars or a telescope to show and explain celestial objects to the group.

**D)** Help an astronomy club in your community hold a star party that is open to the public.

**E)** Personally take a series of photographs or digital images of the movement of the Moon, a planet, and asteroid or meteoroid, or a comet. In your visual display, label each image and include the date and time it was taken. Show all positions on a star chart or map. Show your display at school or at a troop meeting. Explain the changes you observed.

**10)** List at least three different career opportunities in astronomy. Pick the one in which you are most interested and explain how to prepare for such a career. Discuss with your counselor what courses might be useful for such a career.

### Requirement 1

Describe the proper clothing and other precautions for safely making observations at night and in cold weather: \_\_\_\_\_

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Tell how to safely observe the Sun, objects near the Sun, and the Moon: \_\_\_\_\_

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Explain first aid for the following injuries or illnesses that could occur during observation:

Heat & Cold Reactions: \_\_\_\_\_

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Dehydration: \_\_\_\_\_

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Bites & Stings: \_\_\_\_\_

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Damage to Eyes: \_\_\_\_\_

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### Requirement 2

What is light pollution? \_\_\_\_\_

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How can light pollution and air pollution affect astronomy? \_\_\_\_\_

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### Requirement 3

With the aid of diagrams or real telescopes if available, do each of the following:

Explain why binoculars and telescopes are important astronomical tools: \_\_\_\_\_

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Demonstrate or explain how these tools are used: \_\_\_\_\_

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Scout Name: \_\_\_\_\_ Unit #: \_\_\_\_\_ Date: \_\_\_\_\_

Describe the similarities and differences of several types of astronomical telescopes. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Explain the purposes of at least three instruments used with astronomical telescopes.

Instrument: \_\_\_\_\_

Purpose: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Instrument: \_\_\_\_\_

Purpose: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Instrument: \_\_\_\_\_

Purpose: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Requirement 4

Identify in the sky at least 10 constellations, four of which are in the Zodiac. List the constellations you identified. Circle the four that are in the Zodiac:

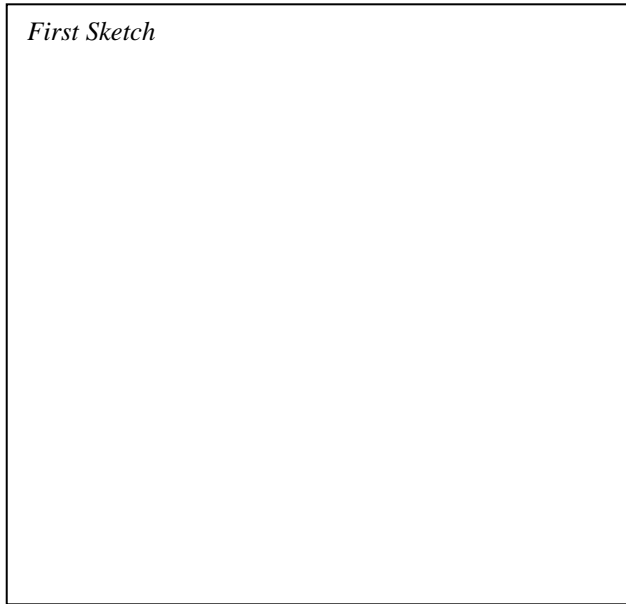
\_\_\_\_\_  
\_\_\_\_\_

Identify at least 8 conspicuous stars, five of which are of first magnitude. List the stars you identified. Circle the five that are of first magnitude. \*Extra mile (not required for badge): find two other stars and list them.

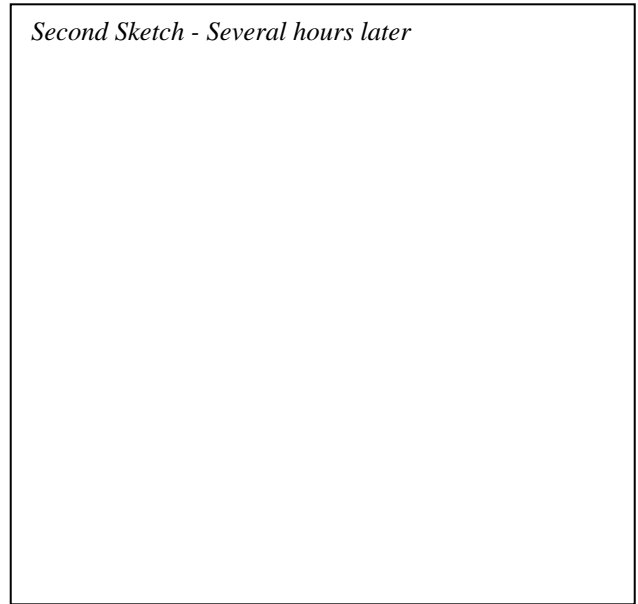
\_\_\_\_\_  
\_\_\_\_\_ \* \_\_\_\_\_ \*

Make two sketches of the Big Dipper. In one sketch, show the Big Dipper's orientation in the early evening sky. In another sketch, show its position several hours later. In both sketches, show the North Star and the horizon. Record the date and time each sketch was made. Use the spaces below for your sketches or use separate pieces of paper and attach them to this worksheet.

*First Sketch*



*Second Sketch - Several hours later*



Date: \_\_\_\_\_ Time: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Explain what we see when we look at the Milky Way: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Requirement 5

List the names of the five most visible planets.

Planet: \_\_\_\_\_

Can this planet appear in phases similar to lunar phases? YES NO

Explain Why: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Planet: \_\_\_\_\_

Can this planet appear in phases similar to lunar phases? YES NO

Explain Why: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Scout Name: \_\_\_\_\_ Unit #: \_\_\_\_\_ Date: \_\_\_\_\_

Planet: \_\_\_\_\_

Can this planet appear in phases similar to lunar phases? YES NO

Explain Why: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Planet: \_\_\_\_\_

Can this planet appear in phases similar to lunar phases? YES NO

Explain Why: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Planet: \_\_\_\_\_

Can this planet appear in phases similar to lunar phases? YES NO

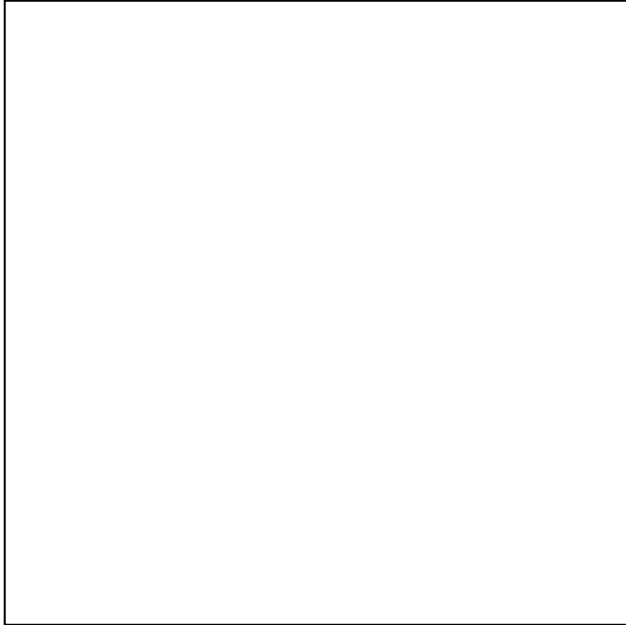
Explain Why: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Find out when each of the five most visible planets that you identified in requirement 5a will be observable in the evening sky during the next 12 months, then compile this information in the form of a chart or table. Update your chart monthly to show whether each planet will be visible during the early morning or in the evening sky. Use the chart below or make your own and attach it to the worksheet.

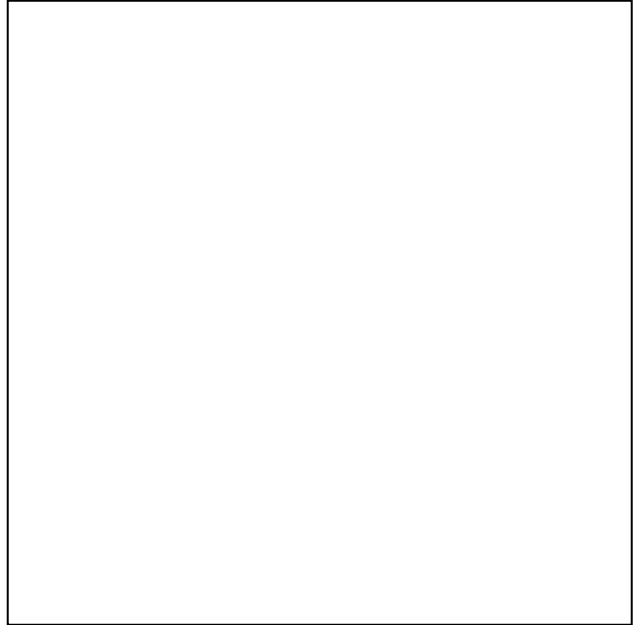
	PLANETS				
<b>January</b>					
<b>February</b>					
<b>March</b>					
<b>April</b>					
<b>May</b>					
<b>June</b>					
<b>July</b>					
<b>August</b>					
<b>September</b>					
<b>October</b>					
<b>November</b>					
<b>December</b>					

### Requirement 6

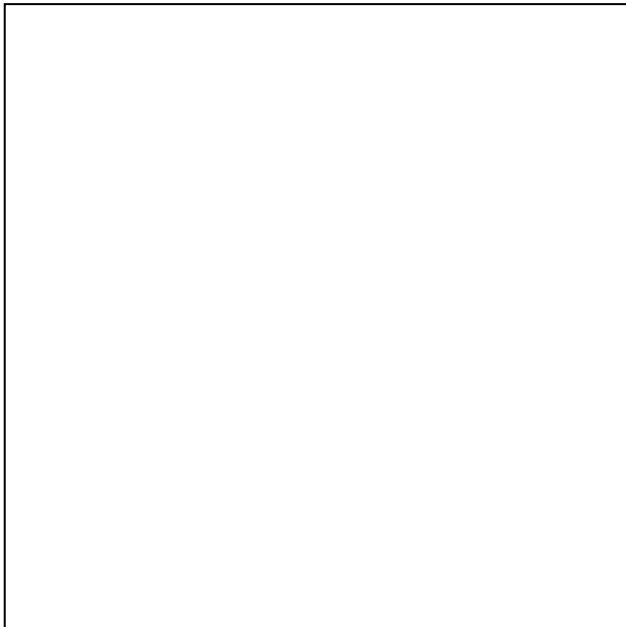
At approximately weekly intervals, sketch the position of Venus, Mars or Jupiter in relation to the stars. Do this for at least four weeks and at the same time of night. On your sketch, record the date and time next to the planet's position. Use your sketch to explain how planets move. Use the four areas below for your sketches or use your own paper and attach it to this worksheet when finished.



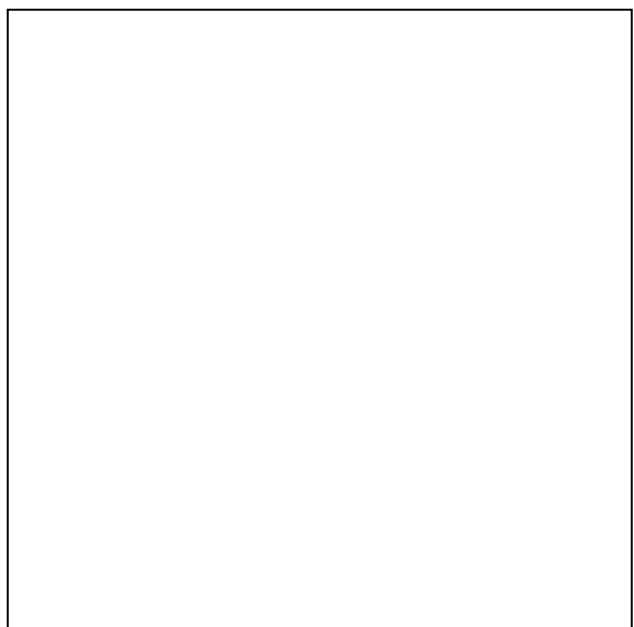
Planet: \_\_\_\_\_ Date: \_\_\_\_\_



Planet: \_\_\_\_\_ Date: \_\_\_\_\_



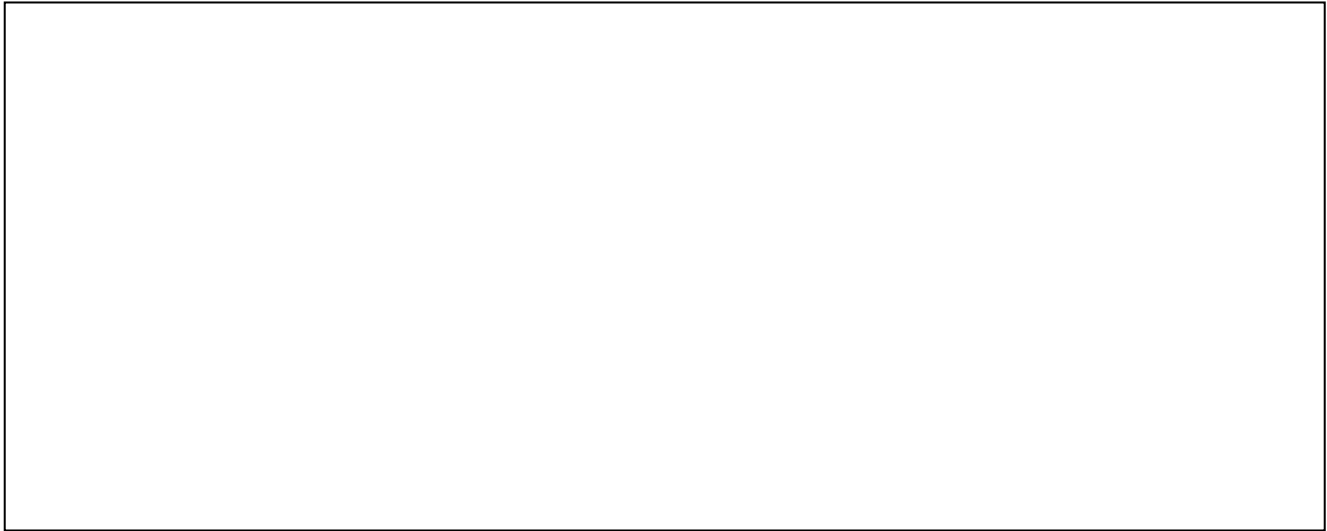
Planet: \_\_\_\_\_ Date: \_\_\_\_\_



Planet: \_\_\_\_\_ Date: \_\_\_\_\_

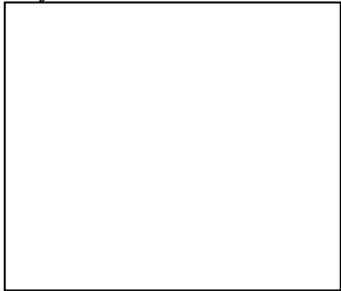
### Requirement 7

Use the area below to make a sketch of the face of the moon. On your sketch indicate the locations of at least five seas and five craters. Label these landmarks.

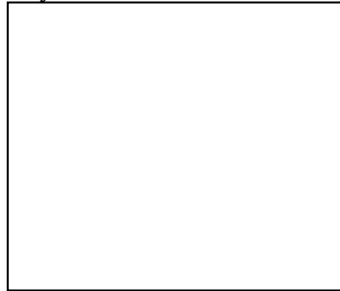


Use the space below to sketch the phase and the daily position of the Moon at the same hour and place, for a week. Include landmarks on the horizon such as hills, trees, and buildings. Use more paper if needed and attach it to this worksheet.

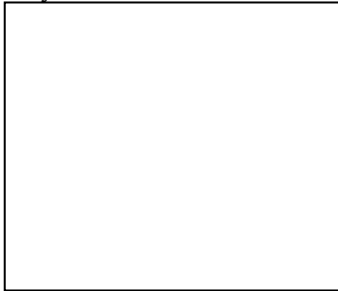
Day 1



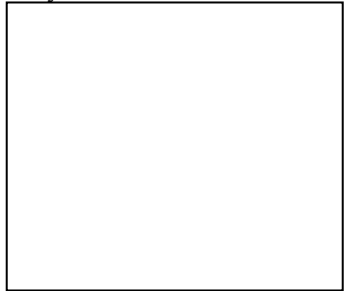
Day 2



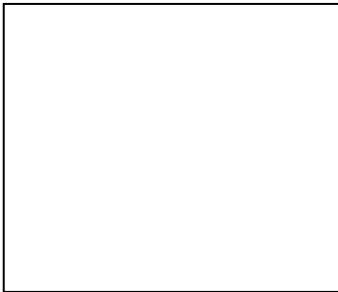
Day 3



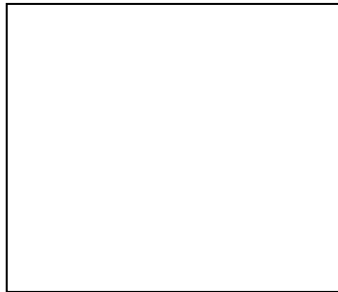
Day 4



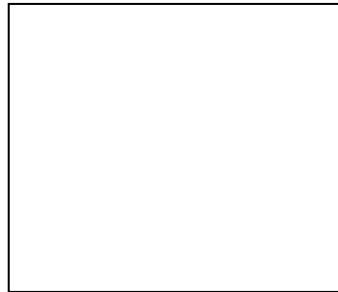
Day 5



Day 6



Day 7

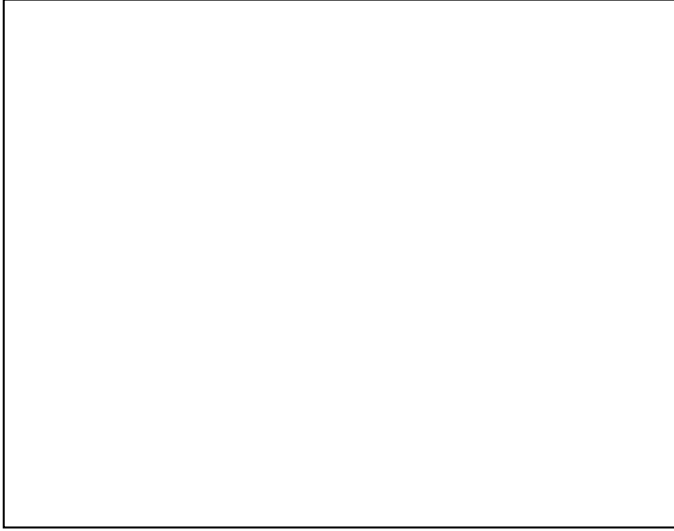


What changes did you observe? \_\_\_\_\_  
\_\_\_\_\_

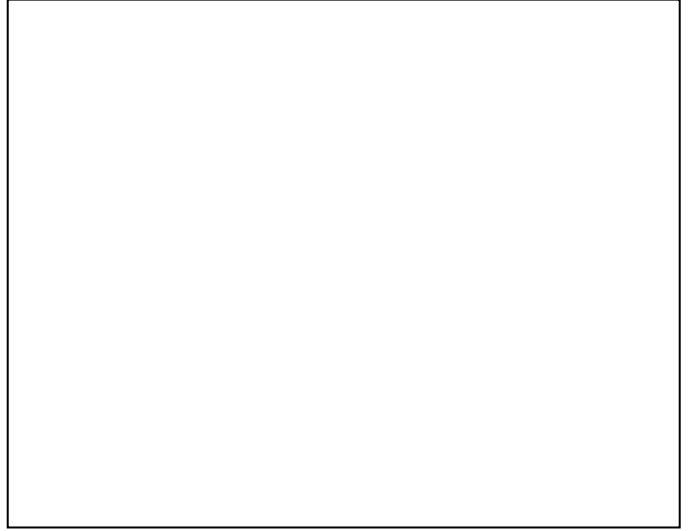
Tell what factors keep the moon in orbit around the earth: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Scout Name: \_\_\_\_\_ Unit #: \_\_\_\_\_ Date: \_\_\_\_\_

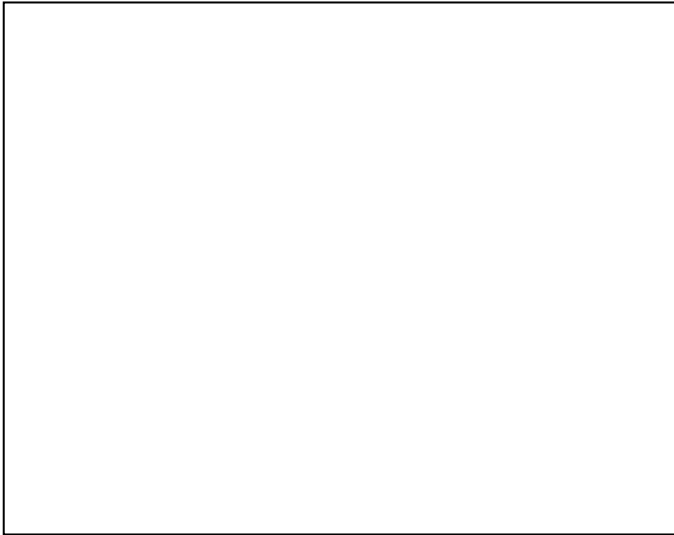
With the aid of diagrams, explain the relative positions of the Sun, Earth, and Moon at the times of lunar and solar eclipses and at the times of New, First Quarter, Full, and Last Quarter phases of the moon.



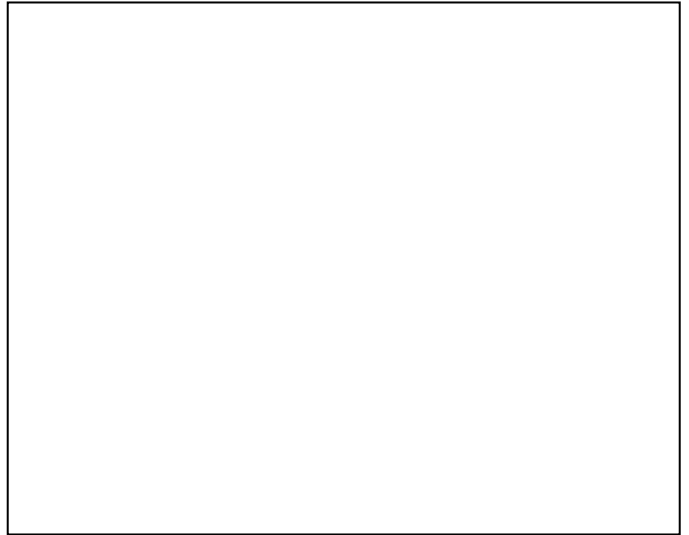
New Moon



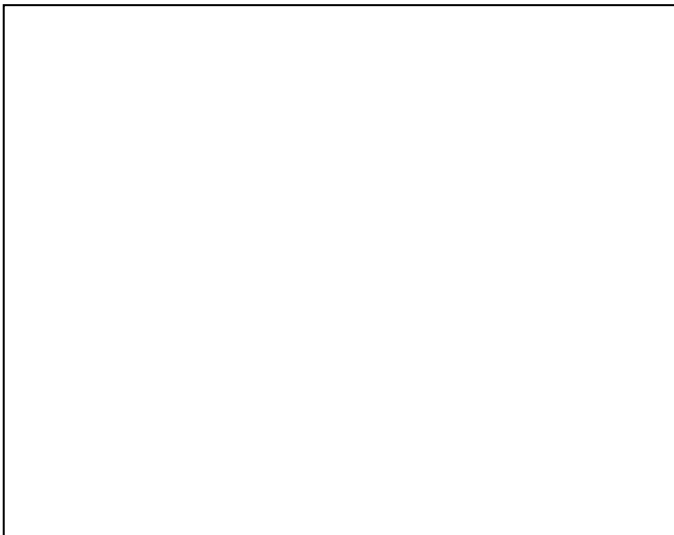
Full Moon



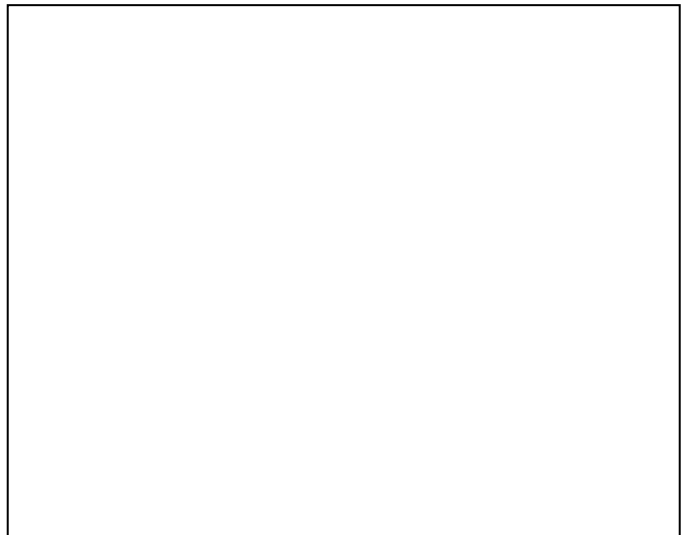
Lunar Eclipse



Solar Eclipse



First Quarter



Last Quarter

**Requirement 8**

Describe the composition of the sun: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe the suns relationship to other stars: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What effects does the suns radiation have on the Earth's weather? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Define sunspots: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe some of the effects sunspots may have on the radiation hitting the Earth: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Identify a red, blue, and yellow star. Explain the meaning of the colors. Use the area below to record your answers.

**Red Star:**

Name of Star (if known) or description of location: \_\_\_\_\_

What does the color mean? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Blue Star:**

Name of Star (if known) or description of location: \_\_\_\_\_

What does the color mean? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Yellow Star:**

Name of Star (if known) or description of location: \_\_\_\_\_

What does the color mean? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_





Scout Name: \_\_\_\_\_ Unit #: \_\_\_\_\_ Date: \_\_\_\_\_

**Requirement 10**

List at least three different career opportunities in astronomy:

\_\_\_\_\_

Pick the one in which you are most interested in and explain how you would prepare for such a career:

Career: \_\_\_\_\_

Preparation needed: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Discuss with your counselor what courses might be useful for such a career:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_