

Boy Scout Astronomy Merit Badge Workbook

Requirement:

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.

Activity:

- Discuss and complete requirement before or after leaving the Adler Planetarium

Requirement:

2. Explain what light pollution is and how it and air pollution affects astronomy.

Activity:

- Visit the following website to learn more about light pollution: <http://www.darksky.org/>
- Discuss this question with a volunteer on the telescopes terrace (Please note that telescopes volunteers are only present during select times).

How does light pollution, along with air pollution, affect astronomy?

Requirement:

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 used with astronomical telescopes.

Potential Activities:

- Discuss these questions with a volunteer on the telescope terrace. (Please note that telescope volunteers are only present during select times.)
- Visit the **Telescopes: Through the Looking Glass** gallery.
- Research the information on the Internet.

Why are binoculars and telescopes important?

Explain how telescopes are used:

Explain the similarities and differences of 2 types of telescopes (reflectors & refractors):

List three other instruments used with a telescope and their use:

Requirement:

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.

Potential Activities:

- Watch a **Night Sky Live** show
- Visit the **Atwood Sphere**
- Night sky viewing
- Internet research

4a. List ten constellations:

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.

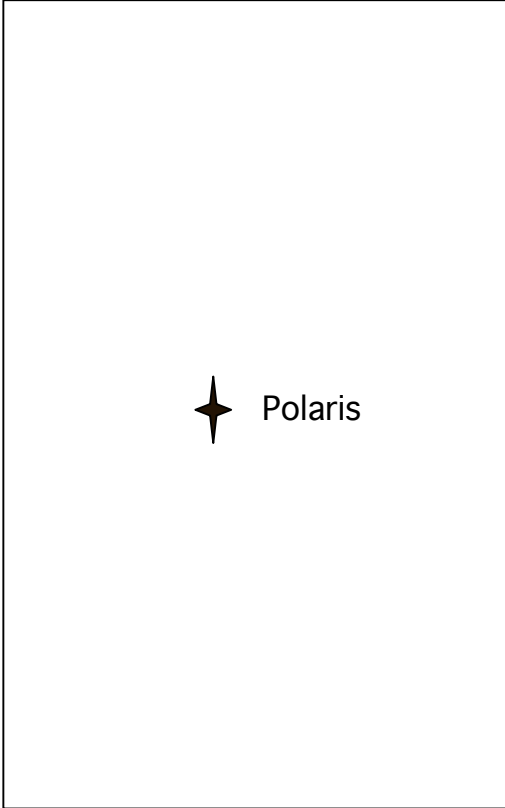
4b. Eight visible stars and their magnitudes:

Star	Magnitude	Constellation
Sirius	-1.46	Canis Major
Arcturus	-0.06	Bootes
Vega	0.04	Lyra
Capella	0.05	Auriga
Rigel	0.14	Orion
Procyon	0.37	Canis Minor
Betelgeuse	0.41	Orion

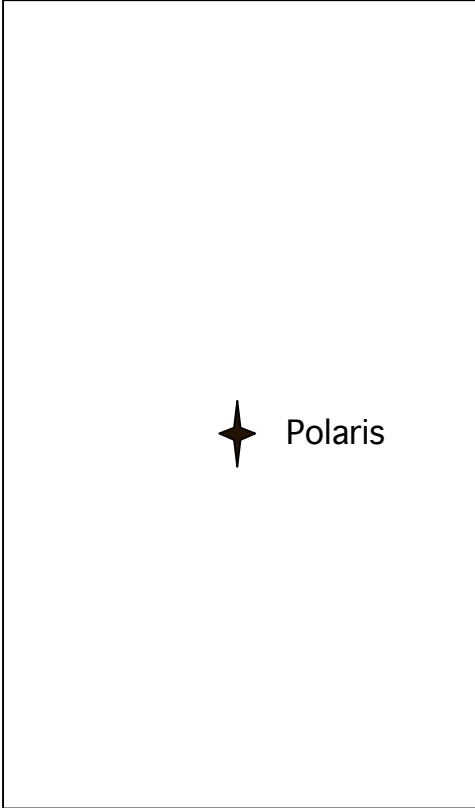
Aldebaran	0.86	Taurus
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4c. Go outside and sketch the location of the Big Dipper at these two times tonight:

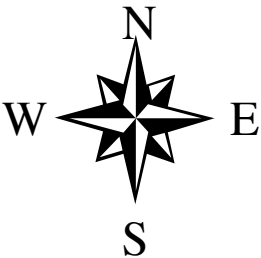
Today's Date: _____



7 pm



10 pm



4d. What do we see when we look at the Milky Way Galaxy?

Requirement:

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.

Activity:

- Research and chart this information at home.
- Visit: <http://skyandtelescope.com>. Click on "Observing" and open the "Interactive Sky Chart" feature and/or "This Week's Sky at a Glance."
- Visit: <http://astronomy.com>. Click on "News and Observing" and "The Sky this Week" to learn about the night sky on a particular night.

Name the five most visible planets:

1.
2.
3.
4.
5.

Create a chart detailing when each of the five most visible planets are observable in the evening night sky.

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.

Activity:

- Research the position of Venus, Mars and Jupiter on <http://skyandtelescope.com>
- Night sky viewing

Over four weeks, sketch the information below.

Planet: _____ Time: _____

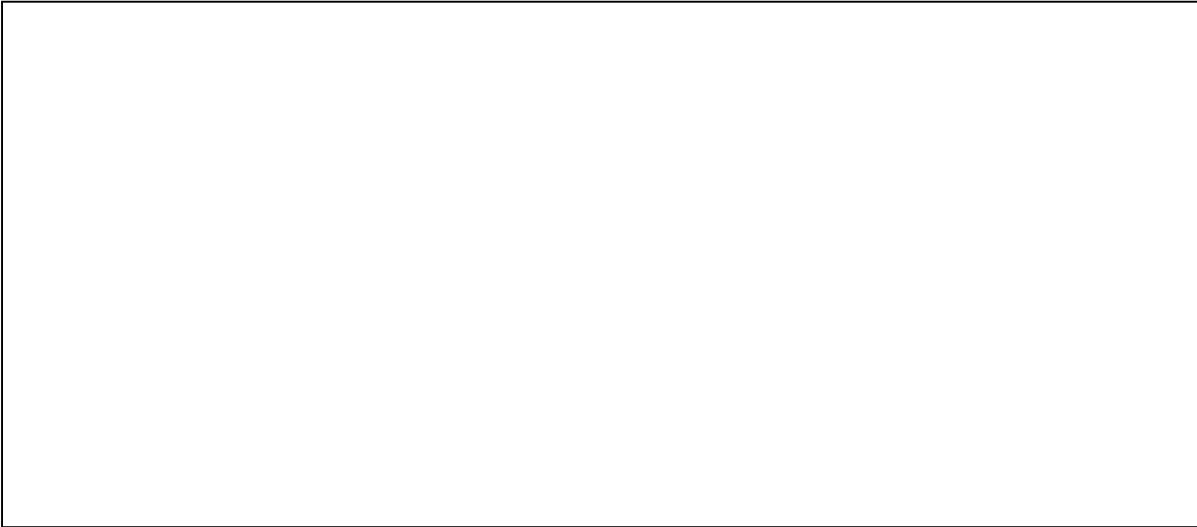
Week One:



Week Two:



Week Three:



Week Four:



What changed over time and why?

Requirement:

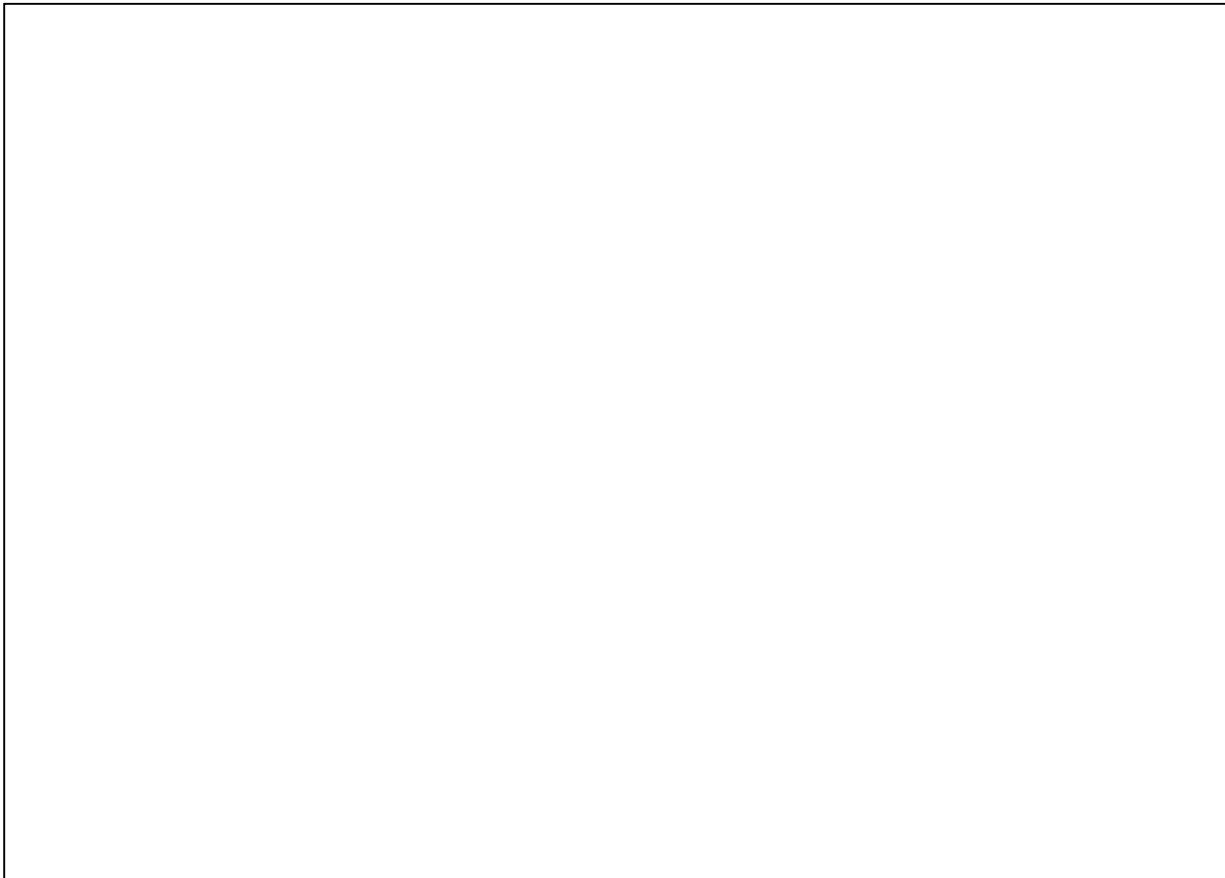
7. Do the following:

- 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.

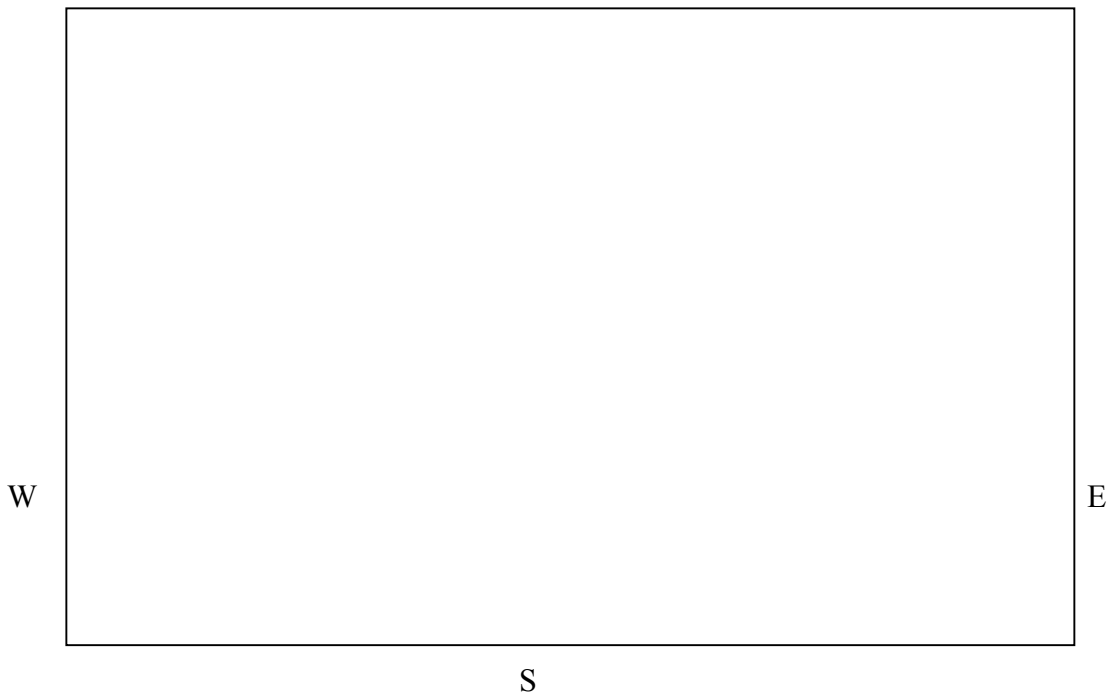
Activity:

- Explore the **Shoot for the Moon** Gallery
- Internet research
- Night sky viewing

7a. Visit the **Shoot for the Moon** Gallery. Sketch the face of the moon below. Be sure to indicate the location of at least five “seas” and craters!



7b. Go outside and sketch the phase & daily position of the Moon at the same hour and place, for a week.

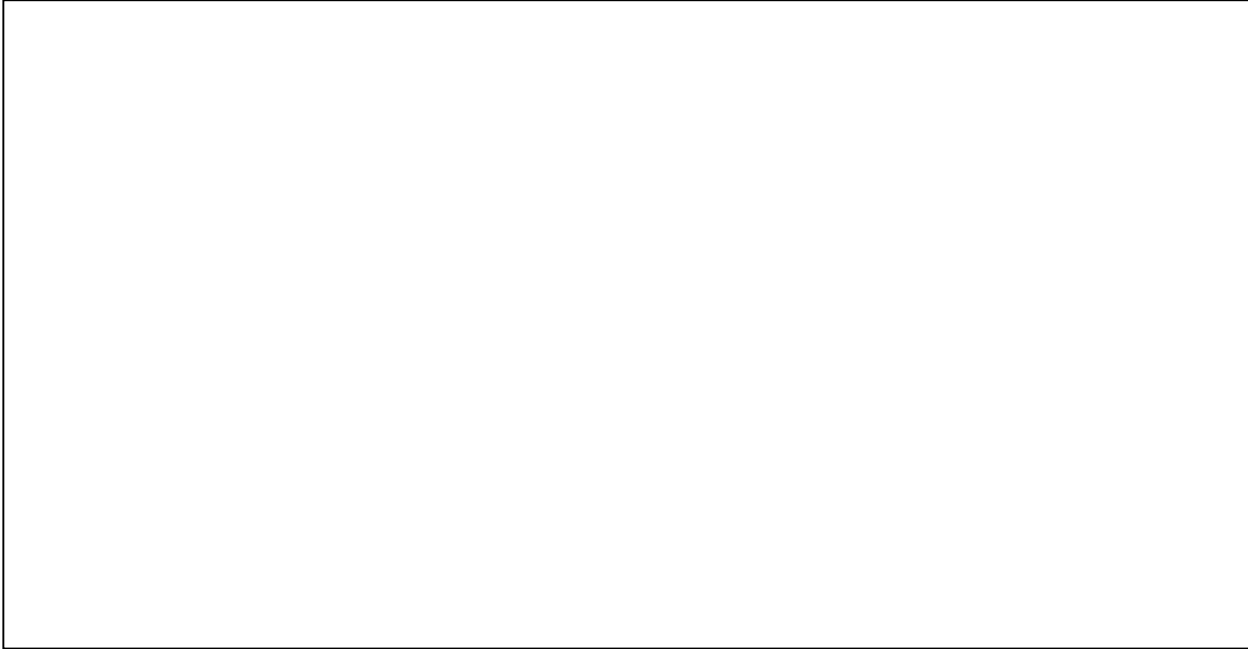


What changed and why?

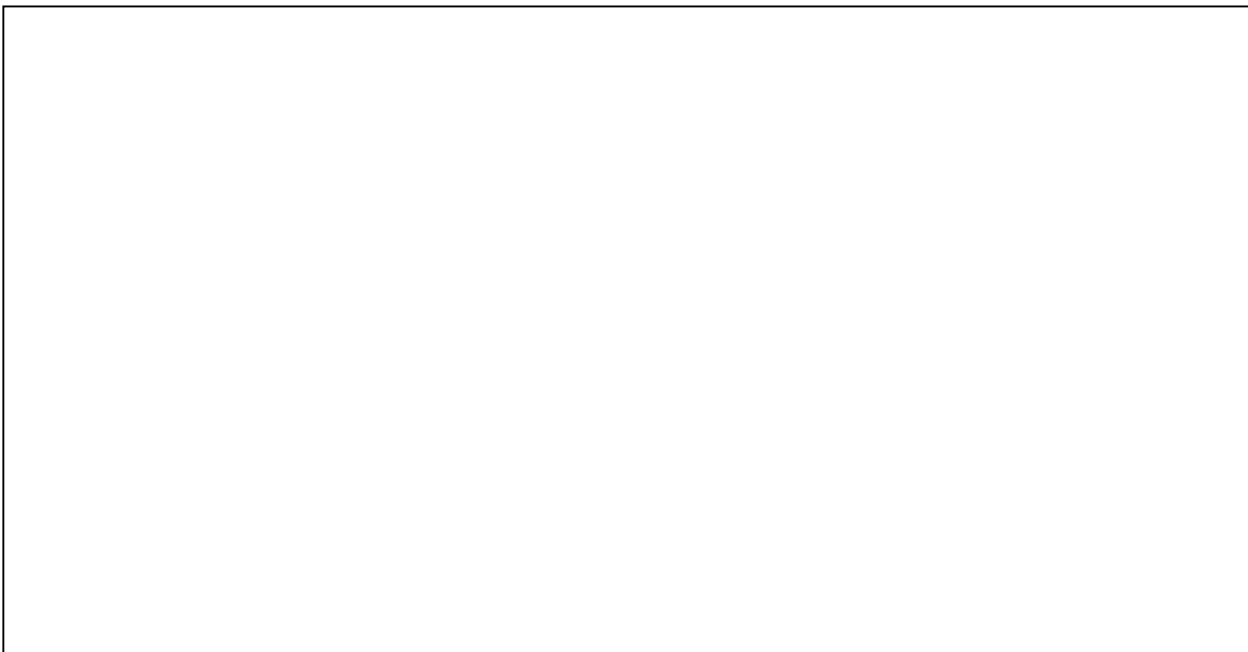
7c. Use the Internet to research and list the factors that keep the Moon in orbit around the Earth.

7d. Use the Internet to research and sketch the positions of the Sun, Earth and Moon during these eclipses.

Lunar Eclipse

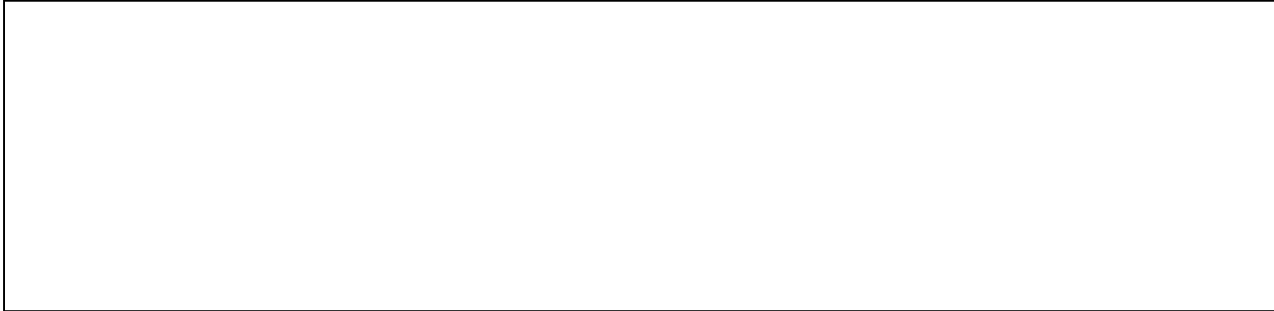


Solar Eclipse

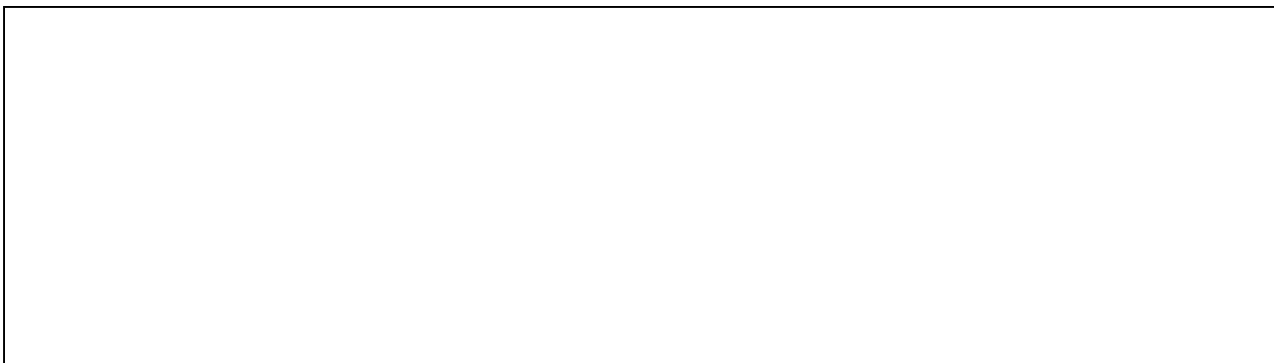


7d. Use the Internet to research and sketch the positions of the Sun, Earth and Moon during these moon phases.

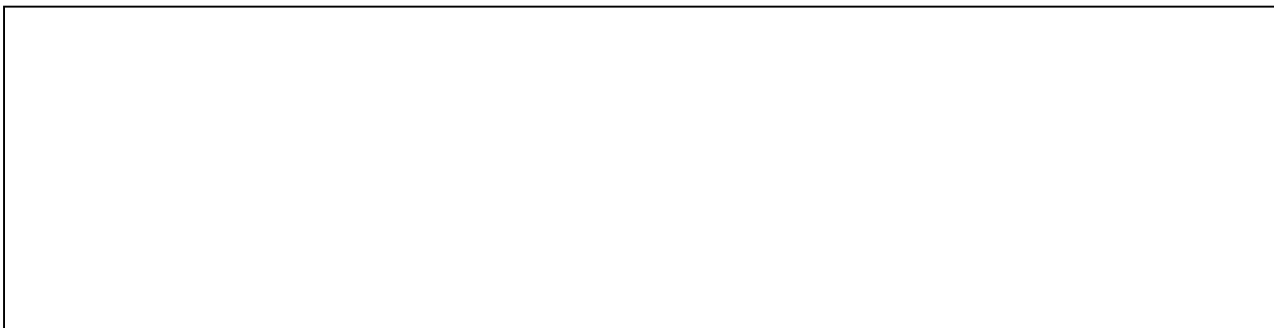
New Moon



First Quarter



Full Moon



Third (or last) Quarter



Requirement:

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.

Activity:

- Visit the Adler Planetarium website to learn more about the Sun.
<http://www.adlerplanetarium.org/investigate/explore/solarsystem>

Which two elements is the Sun mostly comprised of?

1. _____

2. _____

What is a sunspot?

How does the sun compare to other stars?

How does the Sun affect the earth?

8b. Use the Internet to research and identify at least one red star, one blue star, and one yellow star (other than the Sun). Explain the meaning of these colors.

Red star

Characteristics: _____

Example: _____

Yellow Star

Characteristics: _____

Example: _____

White Star

Characteristics: _____

Example: _____

Blue Star

Characteristics: _____

Example: _____

Which one is the hottest? _____

Which one is the coolest? _____

Requirement:

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

Activity:

- Explore the Adler Planetarium

Use this space to make notes about what you're learning, seeing, and doing at the Planetarium; they will help you to write your report.

Requirement:

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.

Activity:

- Explore planetarium and think about possible career opportunities. After returning home research possibilities on your own.
- Visit the Space Visualization Lab between the hours of 2:00 pm to 3:00 pm Monday through Friday to talk to an astronomer (1:00-3:00 pm on Saturdays).

Visit the American Astronomical Society's Education Office web page for more information on astronomy related careers.

<http://www.aas.org/education/education.htm>

List three different career opportunities in astronomy

1. _____
2. _____
3. _____

Describe the preparation needed for one of the careers above.
