

<b>Title of Unit</b>	Unit 3 – The Moon	<b>Grade Level</b>	11 & 12
<b>Curriculum Area</b>	Astronomy	<b>Time Frame</b>	3 weeks
<b>Developed By</b>	Shelly Gould Burgess		

### **Identify Desired Results (Stage 1)**

#### **Content Standards**

By the end of the unit, students will be able to...

1. Explain the source of moonlight.
2. Distinguish between the lunar synodic and sidereal periods and relate this deviation to lunar alignment in the celestial sphere.
3. Describe apogee and perigee.
4. Explain the synchronous rotation of the moon.
5. Identify and create models of the alignment of the moon, Earth, and Sun for the phases of the moon.
6. Determine the rise/set/visibility times for each phase of the moon.
7. Identify the moon's maria.
8. Explain how different types of lunar geographical features were created.
9. Explain how our moon may have formed.

<b>Understandings</b>	<b>Essential Questions</b>	
<b>Overarching Understanding</b>	<b>Overarching</b>	<b>Topical</b>
Students will understand how and why the moon appears in its phases. They will also understand the orbit and geography of the moon.	<ul style="list-style-type: none"> <li>• What is the effect of the difference between the lunar synodic and sidereal periods?</li> </ul>	<ul style="list-style-type: none"> <li>• What is the lunar synodic period?</li> <li>• What is the lunar sidereal period?</li> <li>• How does the moon's location in the celestial sphere change annually?</li> <li>• Why does the moon's location in the celestial sphere change annually?</li> <li>• What are apogee and perigee?</li> <li>• What is the synchronous rotation of the moon?</li> <li>• What is the effect of the synchronous rotation of the moon?</li> <li>• What is meant by lunar phase?</li> <li>• What is the appearance of the moon during each phase?</li> <li>• When does each lunar phase rise/set?</li> <li>• When is each lunar phase visible?</li> <li>• What is the alignment of the moon, Earth, and Sun during each phase of the moon?</li> <li>• During what phases would each of the key features of lunar geography be visible?</li> <li>• How did the key features of lunar geography form?</li> <li>• What is the pattern for naming maria?</li> <li>• What is the most commonly-accepted theory for how the moon formed?</li> <li>• What does this theory state?</li> </ul>
<b>Related Misconceptions</b>	<ul style="list-style-type: none"> <li>• What are the characteristics of the lunar orbit?</li> <li>• What are the phases of the moon?</li> <li>• Why do the phases of the moon occur?</li> <li>• What are the key features of lunar geography?</li> <li>• How did the moon form?</li> </ul>	
<ul style="list-style-type: none"> <li>• Many common misconceptions about lunar motion will be cleared up as a result of mastering this unit.</li> </ul>		

<b>Knowledge</b> Students will know...	<b>Skills</b> Students will be able to...
<ul style="list-style-type: none"> <li>• The lunar synodic and sidereal periods.</li> <li>• What is meant by apogee and perigee.</li> <li>• What is meant by the synchronous rotation of the moon.</li> <li>• What each lunar phase looks like.</li> <li>• When each lunar phase rises/sets.</li> <li>• When each lunar phase is visible.</li> <li>• The alignment of the moon, Earth, and Sun for each lunar phase.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain how the difference between the lunar synodic and sidereal periods affect the position of the moon in the celestial sphere.</li> <li>• Explain how the synchronous rotation of the moon affects the parts of the moon that are visible from Earth.</li> <li>• Identify each lunar phase and explain why it rises/sets/is visible at specific times.</li> <li>• Identify and create models showing the alignment of the moon, Earth, and Sun during each phase of the moon.</li> </ul>

### Lesson 1

I. Objectives: Students will be able to...

- Explain the source of moonlight.
- Distinguish between the lunar synodic and sidereal periods and relate this deviation to lunar alignment in the celestial sphere.
- Describe apogee and perigee.
- Explain the synchronous rotation of the moon.

II. Materials: Classroom with ActivBoard

III. Procedure:

- A. Predictions: Students in small groups take three balls and move them to simulate the way they think the Earth, Moon, and Sun move relative to each other. Then they sketch them on dry erase boards.
- B. Notes: pages 1 – 6 followed by ABC grouping
- C. Activity: Revisit the modeling from step A to revise. This time add in something to represent a distant star. Students must relate sidereal, solar, and synodic periods to the position of the moon relative to the background stars from one cycle to the next.
- D. Notes: pages 7-10

IV. Evaluation: Performance on activities, quiz

### Lesson 2

I. Objectives: Students will be able to...

- Identify and create models of the alignment of the moon, Earth, and Sun for the phases of the moon.
- Determine the rise/set/visibility times for each phase of the moon.

II. Materials: Classroom set of computers with ActivStudio; planetarium

III. Procedure: *While moving through this procedure, at strategic points students should stop and model the motion of the moon around the Earth for different phases.*

- A. Discovery activity: In the computer lab *Lunar Phasing Activity 1*
- B. Notes: pages 11 – 20
- C. Activity: *Lunar Phasing Activity 2*
- D. Activity: *Moon Phases Snowballing Activity* (Excel spreadsheet)
- E. Activity: *Lunar Phase Alignment Diagrams* (handout)
- F. Interactivity: page 21

IV. Evaluation: Performance on activities, quiz

### Lesson 3

I. Objectives: Students will be able to...

- Identify the moon's maria.
- Explain how different types of lunar geographical features were created.
- Explain how our moon may have formed.

II. Materials: Classroom set of computers with ActivStudio; planetarium

III. Procedure:

- A. Notes: pages 22 – 28
- B. Activity: Lunar features labeling page
- C. Notes: page 29

IV. Evaluation: Unit test

- Cumulative Project: Unit 3 Outdoor Astronomy Lab
- Unit Reading Assignment: Scanned reading document on student shared drive
- Unit 3 Homework