Title of Unit	Unit 4 - Eclipses	Grade Level	11 & 12
Curriculum Area	Astronomy	Time Frame	3 weeks
Developed By	Shelly Gould Burgess		

Identify Desired Results (Stage 1)

Content Standards

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

1. Distinguish between umbras and penumbras.
2. Determine how a viewer in an umbra or penumbra would perceive an eclipsed object.
3. Explain what a solar eclipse is.
4. Explain why Earth experiences between 2-5 solar eclipses annually.
5. Explain the characteristics and requirements of the four types of solar eclipses.
6. Explain why Earth experiences between 2-5 lunar eclipses annually.
7. Explain the characteristics and requirements of the three types of lunar eclipses.

Understandings	Essential Questions	
Overarching Understanding	**Overarching**	**Topical**
Students will understand	• How do umbras and penumbras relate to eclipses?	• What's an umbra, and how is an umbra created? • What's a penumbra, and how is a penumbra created?
	• How would a viewer in an umbra or penumbra perceive an eclipsed object?	• What would the view of an eclipsed object be for an observer in an umbra? In a penumbra?
Related Misconceptions		
• Many common misconceptions about eclipses motion will be cleared up as a result of mastering this unit.	• What is an eclipse? • What is a solar eclipse?	• How do we name eclipses? • What is the alignment of the sun, Earth, and Moon during a solar eclipse? • Why don't we have a solar eclipse every month? • Does all of Earth experience a solar eclipse when one occurs? Justify your answer. • How is it possible that something as small as the moon can block something as large as the sun? • What is a lunar node? • What is the tilt of the moon's orbit relative to the Earth-Sun plane? How does this relate to solar eclipses? • What is an eclipse season?
	• What are the types of solar eclipses?	• What are the characteristics of a total solar eclipse? • How do Earth, the sun, and the moon align during the stages and sub-stages of a total eclipse? Relate these to the moon's umbra/penumbra. • What is the Path of Totality? • Where is the moon (apogee or perigee) when a total solar eclipse occurs? • What are the stages and sub-stages of a total eclipse? What does the eclipse look like during these stages/sub-stages? • What are the characteristics of a partial solar eclipse? • How do Earth, the sun, and the moon align during a partial eclipse? Relate these to the

	• What is a lunar eclipse? • What are the types of lunar eclipses?	moon's umbra/penumbra. • Where is the moon (apogee or perigee) when a partial solar eclipse occurs? • What are the characteristics of an annular eclipse? • How do Earth, the sun, and the moon align during an annular eclipse? Relate these to the moon's umbra/penumbra. • Where is the moon (apogee or perigee) when an annular solar eclipse occurs? • What is the alignment of the sun, Earth, and Moon during a solar eclipse? • Why don't we have a solar eclipse every month? • Does all of Earth experience a solar eclipse when one occurs? Justify your answer. • How do Earth, the sun, and the moon align during a penumbral lunar eclipse? Relate these to Earth's umbra/penumbra. • What are the characteristics of a penumbral lunar eclipse? • How do Earth, the sun, and the moon align during a penumbral lunar eclipse? Relate these to Earth's umbra/penumbra. • How do Earth, the sun, and the moon align during a partial lunar eclipse? Relate these to Earth's umbra/penumbra. • What are the characteristics of a partial lunar eclipse? • How do Earth, the sun, and the moon align during a partial lunar eclipse? Relate these to Earth's umbra/penumbra. • How do Earth, the sun, and the moon align during a total lunar eclipse? Relate these to Earth's umbra/penumbra. • What are the characteristics of a total lunar eclipse? • How do Earth, the sun, and the moon align during a total lunar eclipse? Relate these to Earth's umbra/penumbra for each stage of the total lunar eclipse.

		• What are the stages of a total lunar eclipse? What does the eclipse look like during these stages/sub-stages? • Why does the moon look red during the totality phase of a total lunar eclipse?

Knowledge Students will know…	**Skills** Students will be able to…
• The parts of shadows. • The types and stages of solar and lunar eclipses. • What these eclipses and their stages look like to an Earth observer. • The alignment of Earth, the sun, and the moon during all types of eclipses.	• Draw the alignment of the sun, Earth, and the moon for any type of eclipse. • Draw and describe what any type of eclipse looks like to an Earth observer. • Sing and dance. Ha ha. Just trying to lighten the mood after over two pages of essential questions.

From: Wiggins, Grant and J. Mc Tighe. (1998). *Understanding by Design*, Association for Supervision and Curriculum Development ISBN # 0-87120-313-8 (ppk)

Lesson 1

I. Objectives: Students will be able to…

- Distinguish between umbras and penumbras.
- Determine how a viewer in an umbra or penumbra would perceive an eclipsed object.
- Explain what a solar eclipse is.
- Explain why Earth experiences between 2-5 solar eclipses annually.

II. Materials: Classroom with ActivBoard

III. Procedure:

A. Notes: pages 1 – 8 (page 8: NO ARROWS OR WEBSITE YET) followed by ABC grouping activity to break new content input into small "bites"
B. Snowballing activity: "Eclipse Seasons" – Pass out A & B first…then do C & D
C. Notes: pages 8-9, including website on page 9

IV. Evaluation: Performance on activities and assignments, quiz, test

Lesson 2

I. Objective: Students will be able to…

- Explain the characteristics and requirements of the four types of solar eclipses.

II. Materials: Classroom with ActivBoard, large poster paper, markers/colored pencils

III. Procedure:

A. Discovery/Cooperative Learning Activity: Jigsaw - Types of eclipses
B. Notes: pages 10-27 with Pair Check activity for every eclipse type
C. "Solar Eclipses" project: In teams of four, each person must work on one quadrant/task. Every 5 minutes the paper rotates so each person must now contribute to a different quadrant until all four tasks are completed.

IV. Evaluation: Performance on activities and assignments, quiz, test

Lesson 3

I. Objectives: Students will be able to…

- Explain why Earth experiences between 2-5 lunar eclipses annually.
- Explain the characteristics and requirements of the three types of lunar eclipses.

II. Materials: Classroom with ActivBoard

III. Procedure:

A. Discovery/Cooperative Learning Activity: *Lunar Eclipse: A King & Queen Game* (using the Internet and the class notes)
B. Notes: page 28 – end with Pair Check activity for every eclipse type followed by ABC grouping at end

IV. Evaluation: Performance on cooperative learning activity, quiz

- Unit Reading Assignment: Scanned reading document on student shared drive
- Unit 4 Homework