

Title of Unit	Unit 1 - The Celestial Sphere	Grade Level	11 & 12
Curriculum Area	Astronomy	Time Frame	3 – 4 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. Describe what astronomy is.
2. Utilize Right Ascension and Declination to map the sky.
3. Locate and identify stars using star map.
4. Examine the role constellations play in astronomy.
5. Examine various constellations in detail
6. Analyze and explain the diurnal motion of Earth
7. Analyze and explain the diurnal motion of the celestial sphere.
8. Analyze and explain the location of the celestial equator and relate it to latitude changes.
9. Analyze and explain the circumpolar star circle phenomenon and relate it to latitude changes.
10. Distinguish between the solar and sidereal day and relate these to the seasonal constellation phenomenon, including the stars of the zodiac.
11. Analyze and explain the annual motion of Earth.
12. Analyze and explain the annual motion of the celestial sphere.
13. Analyze and identify star magnitude (brightness.)

Understandings	Essential Questions	
Overarching Understanding	Overarching	Topical
Students will understand how and why the celestial sphere appears to move as it does when viewed from Earth's northern hemisphere.	<ul style="list-style-type: none"> • What is astronomy? • How do we map the celestial sphere? 	<ul style="list-style-type: none"> • Why do people study astronomy? • What is a zenith? • What is Right Ascension? <ul style="list-style-type: none"> ○ How is RA measured? • What is Declination? <ul style="list-style-type: none"> ○ How is DEC measured? • What is the celestial equator? • How does the celestial equator change with latitude? • How do we use RA and DEC to locate and identify stars? • What role do constellations play in astronomy? • What are some constellations in our sky? • How does Earth move diurnally? • How and why does the celestial sphere appear to move diurnally when viewed from Earth's northern hemisphere? • What is a solar day? • What is a sidereal day? • Why does the phenomenon of the seasonal constellation occur? (Relate to solar day/sidereal day discrepancy.) • What is the zodiac? • What is P_N? • What are circumpolar stars? • How do P_N, circumpolar stars, and seasonal constellations change with latitude? • How does the star magnitude scale work?
Related Misconceptions		
<ul style="list-style-type: none"> • Many common misconceptions about celestial motion will be cleared up as a result of mastering this unit. 	<ul style="list-style-type: none"> • What are constellations? • What is the diurnal motion of Earth and the celestial sphere when viewed from Earth? • What is the annual motion of Earth and the celestial sphere when viewed from Earth? • How do we measure star magnitude? 	

Knowledge Students will know...	Skills Students will be able to...
<ul style="list-style-type: none"> • What astronomy is. • What a zenith is. • What the celestial sphere is. • What RA and DEC are and how they're measured. • What the celestial equator is. • What role constellations play in astronomy. • How Earth moves diurnally. • How the celestial sphere appears to move diurnally when viewed from Earth. • The difference between a sidereal and solar day and how that creates the seasonal constellation phenomenon (example: the zodiac.) • What P_N is. • What the circumpolar star circle is. • What star magnitude is. 	<ul style="list-style-type: none"> • Use RA/DEC and a star map to identify and locate stars on the planetarium dome. • Locate the celestial equator at various latitudes. • Predict which constellations will be seasonal at various latitudes. • Locate the P_N at various latitudes. • Identify the range of the circumpolar star circle at various latitudes. • Predict which constellations will be circumpolar at various latitudes. • Identify the magnitude of a star given a measurement tool. • Given the magnitudes of a pair of stars, determine which star is brighter.

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...

- Describe what astronomy is.
- Utilize Right Ascension and Declination to map the sky.
- Locate and identify stars using star map.

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

III. Procedure:

A. What is astronomy?

1. Flipchart page 1: Open discussion
2. Flipchart page 2: Notes

B. Notes: Pages 3 – 6 using the ABC Groups strategy to break material into “digestible bites”: *At strategic points, students in triads must each add something they just learned to a dry erase board. Each person (A, B, and C) must list something different. Then they must identify anything they’re confused on. Finally, they must predict what they think will come next.*

C. **Planetarium** lab on page 6: Students in teams must find the coordinates of two stars and locate them on the dome.

IV. Evaluation: performance on planetarium lab, quiz

Lesson 2

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

- Examine the role constellations play in astronomy.
- Examine various constellations in detail

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

III. Procedure:

A. Notes and discussion: page 7

B. Activity: *Constellation Detective*

C. Cooperative Learning: Constellation Jigsaw (p. 8)

IV. Evaluation: Performance on activity and jigsaw activity, quiz

Lesson 3

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

- Analyze and explain the diurnal motion of Earth
- Analyze and explain the diurnal motion of the celestial sphere.
- Analyze and explain the location of the celestial equator and relate it to latitude changes.

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

III. Procedure:

A. Notes: pages 9-10 (**Must be done in planetarium**)

B. Activity: While progressing through pages 11-14, do meridian diagrams using *Meridian Diagram Blanks* and the Pair-Check strategy: *Partner A works on the first problem or question while Partner B coaches and praises Partner A’s work when complete. The partners switch roles and Partner B now works on the next question while Partner A coaches. The pair then checks their answers to both problems with the other pair in their group.*

IV. Evaluation: Performance on activity, quiz

Lesson 4

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

- Analyze and explain the circumpolar star circle phenomenon and relate it to latitude changes.

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

III. Procedure:

- A. Notes: page 15-18 using Pair-Check on *Meridian Diagram Blanks*
- B. ABC Groups break after page 18
- C. Continue Pair Check strategy through more practice diagrams up to page 22
- D. Stellarium lab

IV. Evaluation: Performance on activities, quiz

Lesson 5

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

- Distinguish between the solar and sidereal day and relate these to the seasonal constellation phenomenon, including the stars of the zodiac.

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

III. Procedure:

- A. Notes: pages 23-29 with ABC group breaks at strategic points
- B. Activity: In groups of four, two team members coach two other team members acting as the Sun and Earth to model sidereal and solar days.

IV. Evaluation: Performance on activities, quiz

Lesson 6

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

- Analyze and identify star magnitude (brightness.)

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

III. Procedure:

- A. Concept attainment activity: page 30
- B. Notes: page 31
- C. In the planetarium: View some of the stars from the concept attainment activity.

IV. Evaluation: Performance on group activity, quiz

- Cumulative Project: Unit 1 Outdoor Astronomy Lab
- Culminating Project: Celestial Travel Agency
- Unit Reading Assignment: Scanned reading document on student shared drive
- Unit 1 Homework