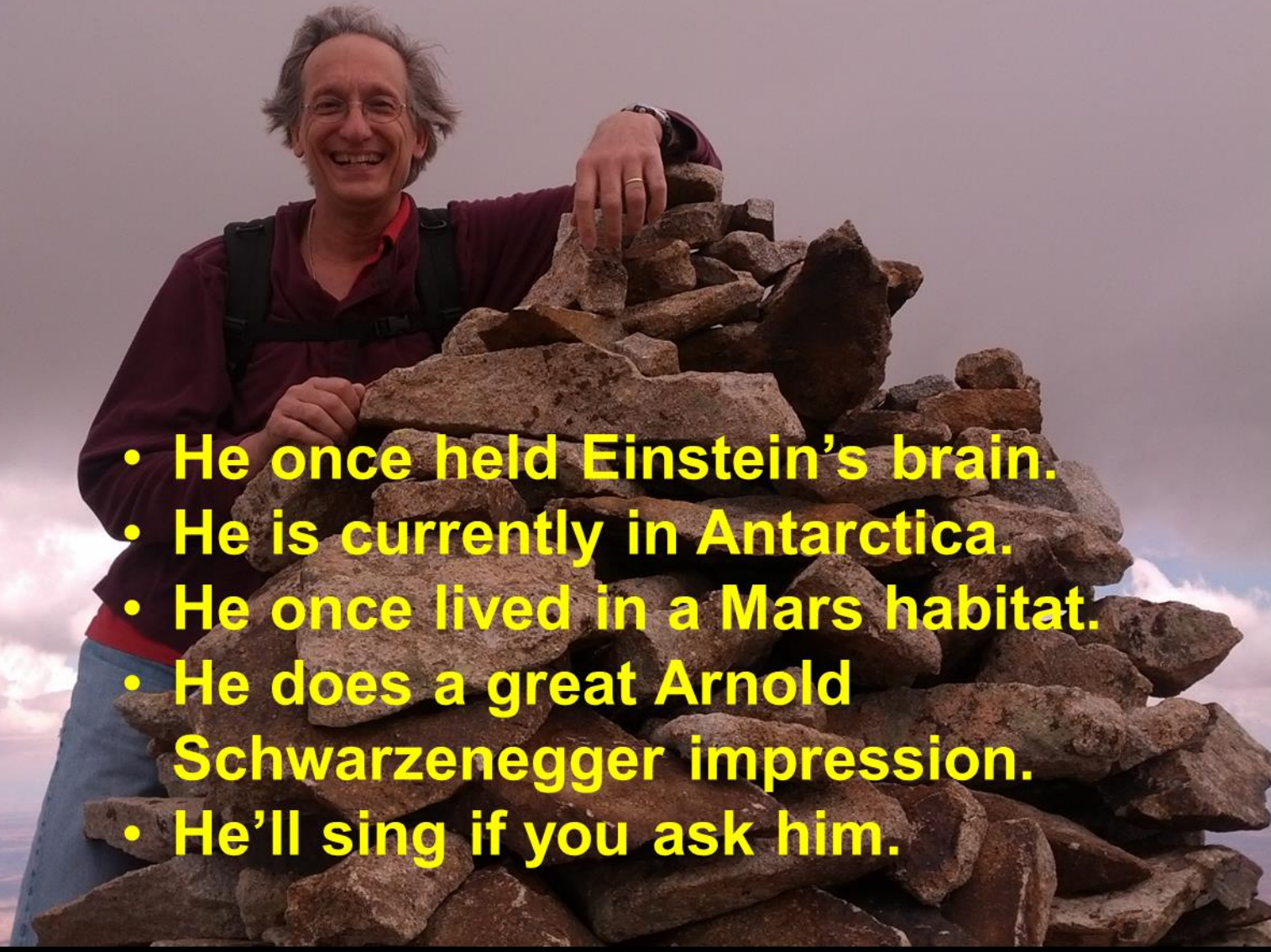


Session Two

Popular Misconceptions in Astronomy

Misconceptions about Mr. Becker



- He once held Einstein's brain.
- He is currently in Antarctica.
- He once lived in a Mars habitat.
- He does a great Arnold Schwarzenegger impression.
- He'll sing if you ask him.

SESSION TWO: POPULAR MISCONCEPTIONS IN ASTRONOMY

Name _____ Date _____ Moravian College

PROJECT STAR ACTIVITY-Harvard University/revised Moravian College Astronomy A Basic Test of Astronomical Facts and Concept

1. One night we looked at the moon and saw:



A few days later, we looked again and saw this:



What do you think best describes the reason for this change?

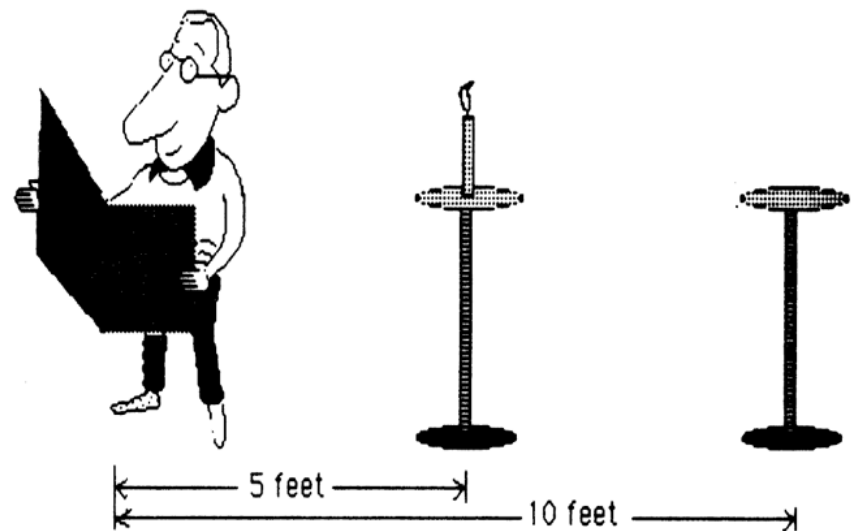
- a. Clouds block the moon.
 - b. The moon moves into the sun's shadow.
 - c. The moon moves around the Earth.
 - d. The moon passes the planets and goes in and out of their shadows.
 - e. The moon moves into the Earth's shadow.
 - f. The moon is black and white and rotates.
 - g. The Earth moves around the moon.
2. What causes night and day?
- a. The Earth spins on its axis.
 - b. The moon blocks out the sun's light.
 - c. The sun goes around the Earth.
 - d. The Earth moves around the sun.
 - e. The Earth moves into the sun's shadow.

3. True Story: On October 17, 1604, Johannes Kepler went outside, looked up, and saw a bright new star in the foot of the constellation of Ophiuchus the Serpent Holder, what astronomers call a supernova. When do you think the star exploded?

- a. Before October 17, 1604.
- b. On October 17, 1604.
- c. After October 17, 1604.

4. The man is reading a newspaper by the light of a single candle five feet away. Indicate the number of candles necessary to light up the paper to the same brightness, if the candleholder was moved to a distance of 10 feet from the newspaper.

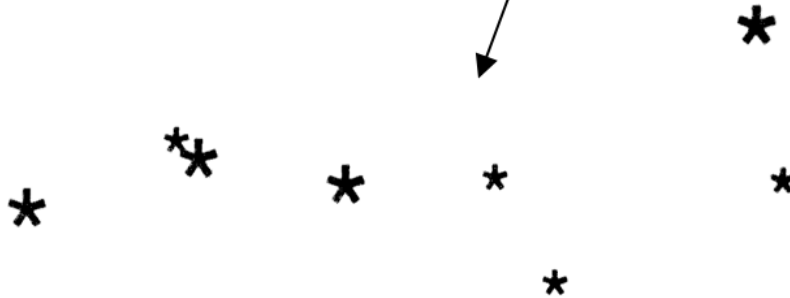
- a. 1 candle d. 4 candles
- b. 2 candles e. 5 candles
- c. 3 candles f. more than 5 candles



5. What causes the seasons?

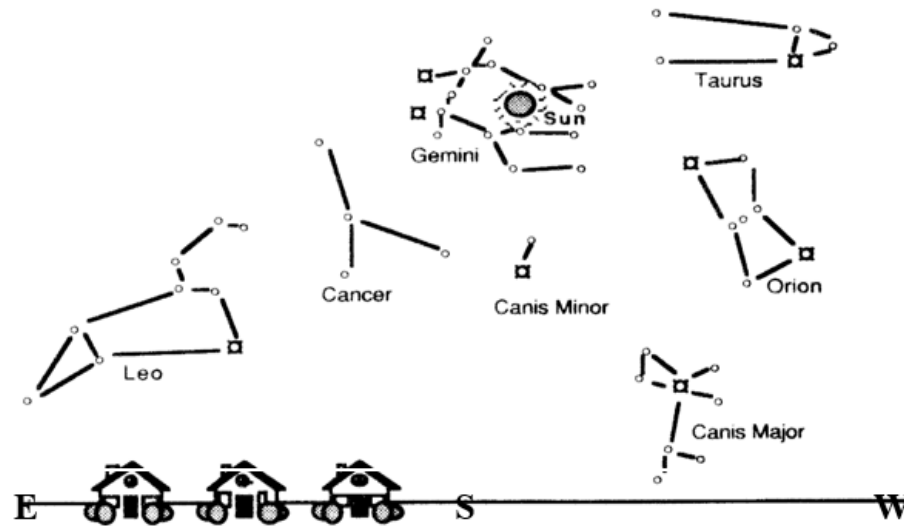
- a. The Earth's distance from the sun...
- b. The Earth's axis flipping back and forth as it travels around the sun...
- c. The sun's motion around the Earth...
- d. A tilted axis pointing in the same direction...
- e. The shifting seasons on the Earth...
- f. The change in the amount of daylight...

6. Which answer goes from smallest size to largest size?
- a. sun < Earth < moon
 - b. Earth < moon < sun
 - c. moon < sun < Earth
 - d. sun < moon < Earth
 - e. Earth < sun < moon
 - f. moon < Earth < sun
7. What time could it be if you saw a thin crescent moon near the western horizon?
- a. sunrise
 - b. noon
 - c. anytime of day or night
 - d. sunset
 - e. midnight
 - f. not possible
8. These stars are a part of what constellation?
- a. Orion
 - b. Ursa Major
 - c. North Star
 - d. Pleiades
 - e. Big Dipper



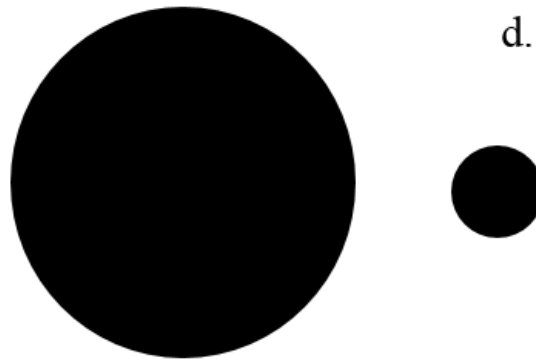
9. If you could see stars during the day, this is what the sky would look like at noon on a given day. The sun is in the constellation of Gemini. In what constellation would the sun be located at sunset?

- a. Leo
- b. Canis Major
- c. Gemini
- d. Cancer
- e. Taurus



10. Assume these circles represent two objects in the solar system with their diameters drawn to scale. Which objects could they represent?

- a. Earth and moon
- b. sun and Earth
- c. Jupiter and Earth
- d. sun and Jupiter

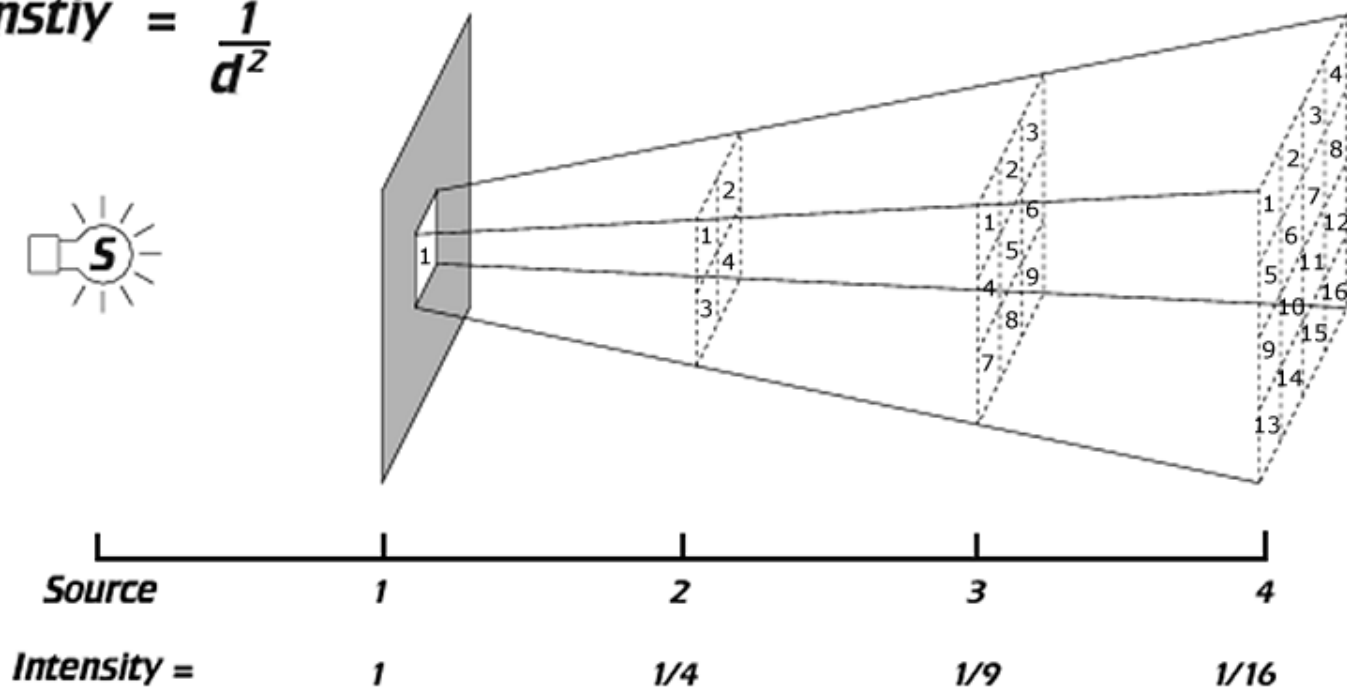


11. What is the brightest star of the nighttime sky?

- a. Venus
- b. Sirius
- c. North Star
- d. sun

Inverse Square Law

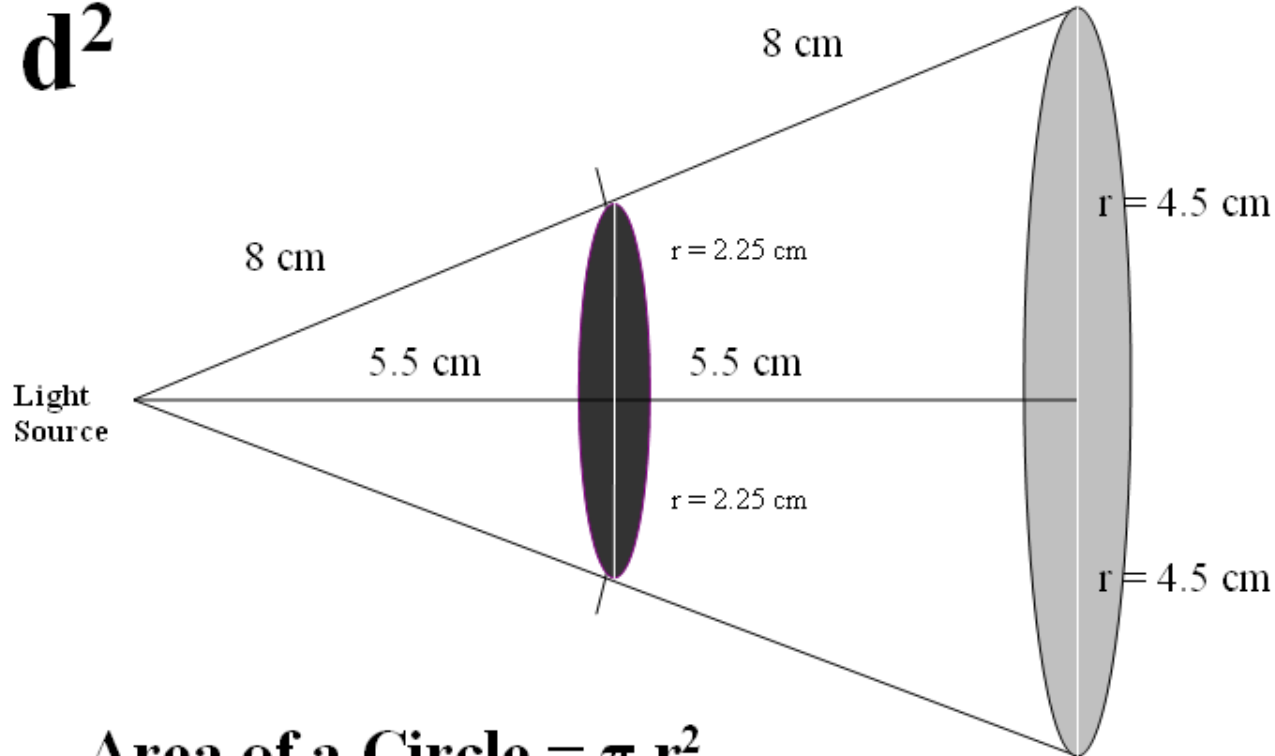
$$\text{Intensity} = \frac{1}{d^2}$$



Inverse Square Law

Electromagnetic Energy/Magnetism/Gravity

$$\frac{1}{d^2}$$



$$\text{Area of a Circle} = \pi r^2$$

Inverse Square Law

Area of a Circle = πr^2

$\pi = 3.14$

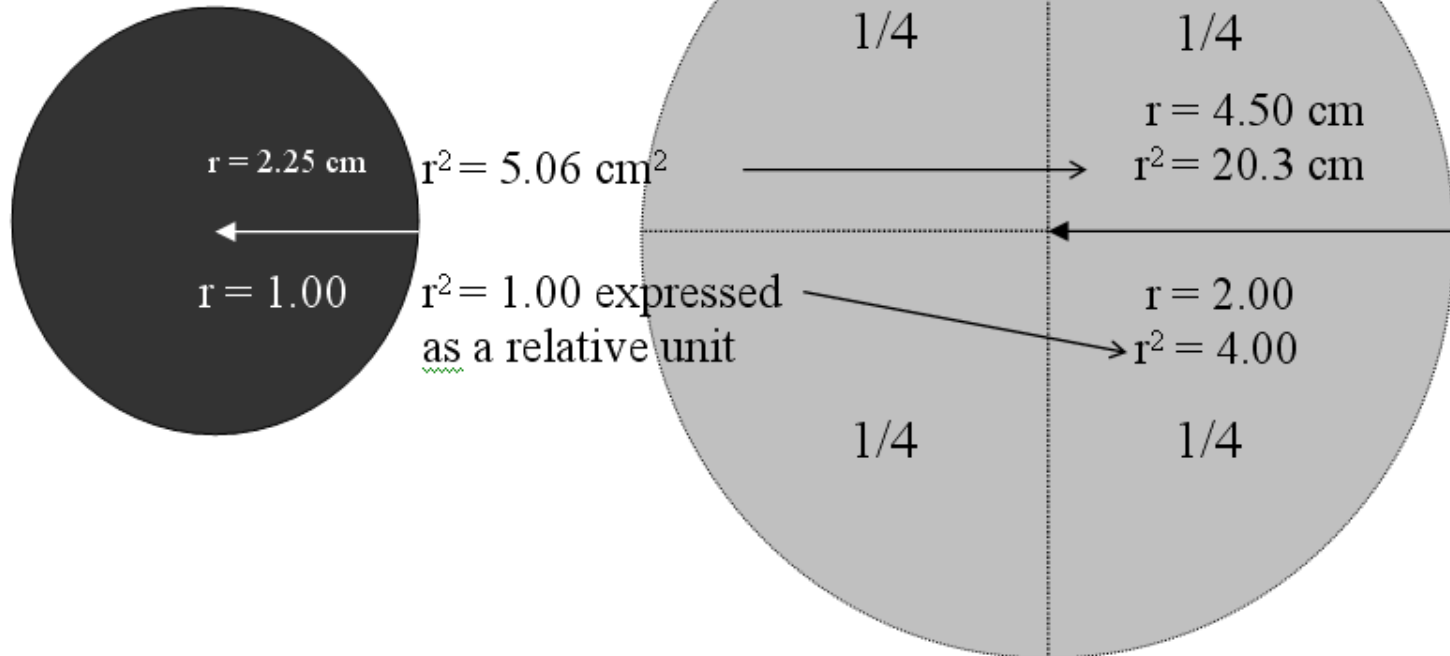
$$3.14 \times (2.00)^2 = 3.14 \times 4.00 = 12.6$$

Size of cone when the distance is doubled

$$3.14 \times (4.50 \text{ cm})^2 = 3.14 \times 20.3 \text{ cm}^2 = 63.7 \text{ cm}^2$$

$$3.14 \times (1.00)^2 = 3.14$$

$$3.14 \times (2.25 \text{ cm})^2 = 3.14 \times 5.06 \text{ cm}^2 = 15.9 \text{ cm}^2$$



How Does the Intensity of Light Decrease with Distance from the Source?

*Reference Image
1 candle/25 inches*



1 candle/50 inches



2 candles/50 inches



3 candles/50 inches



4 candles/50 inches



5 candles/50 inches



6 candles/50 inches



7 candles/50 inches



*All images 10 seconds,
F/11, ASA 1000,
Canon 60D, Nikkor 55 mm
Macro lens*



"Sophisticated Apparatus"

Name

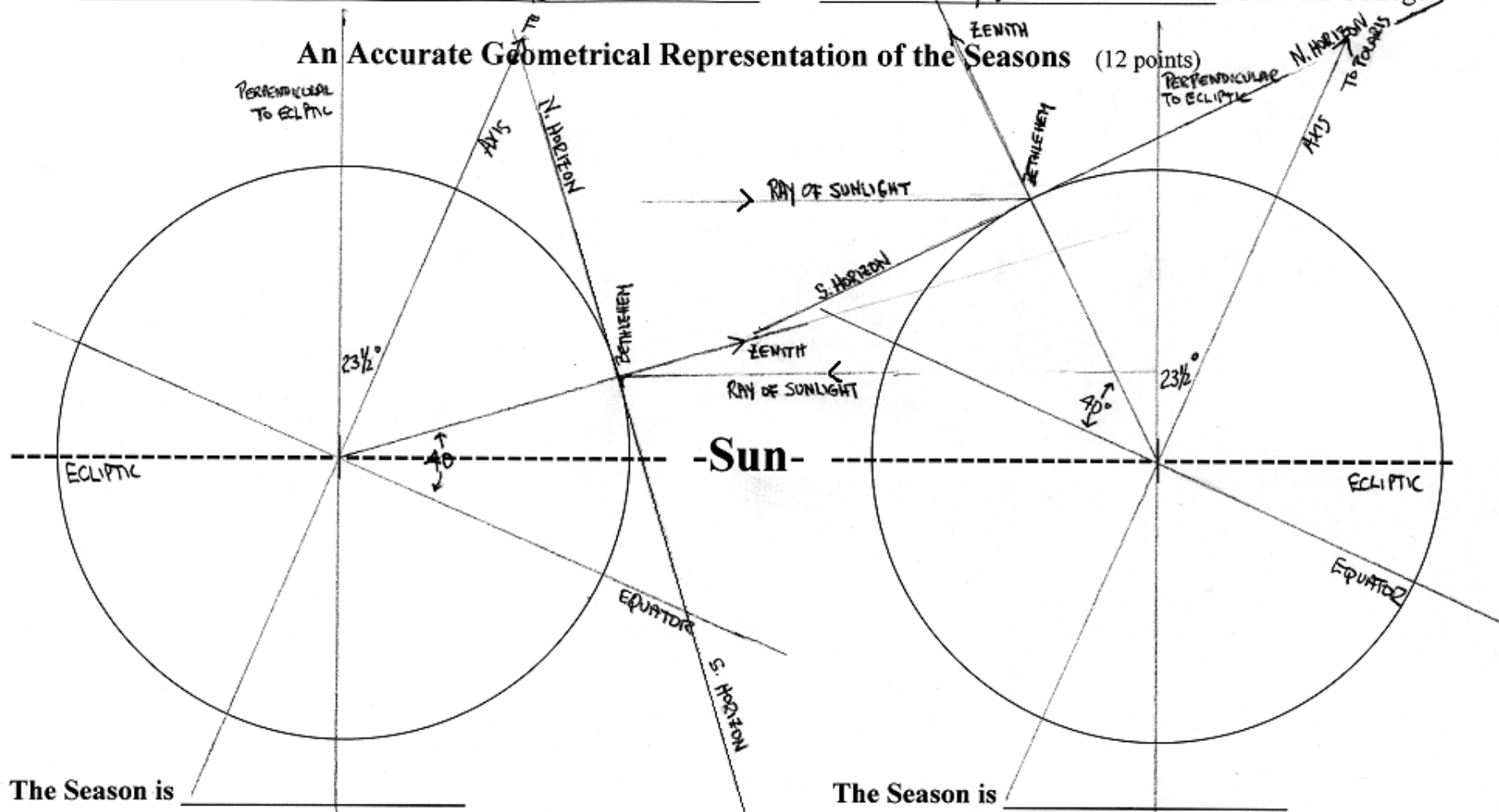
GARY A. BECKER

Date

JAN 31, 2013

Moravian College

An Accurate Geometrical Representation of the Seasons (12 points)



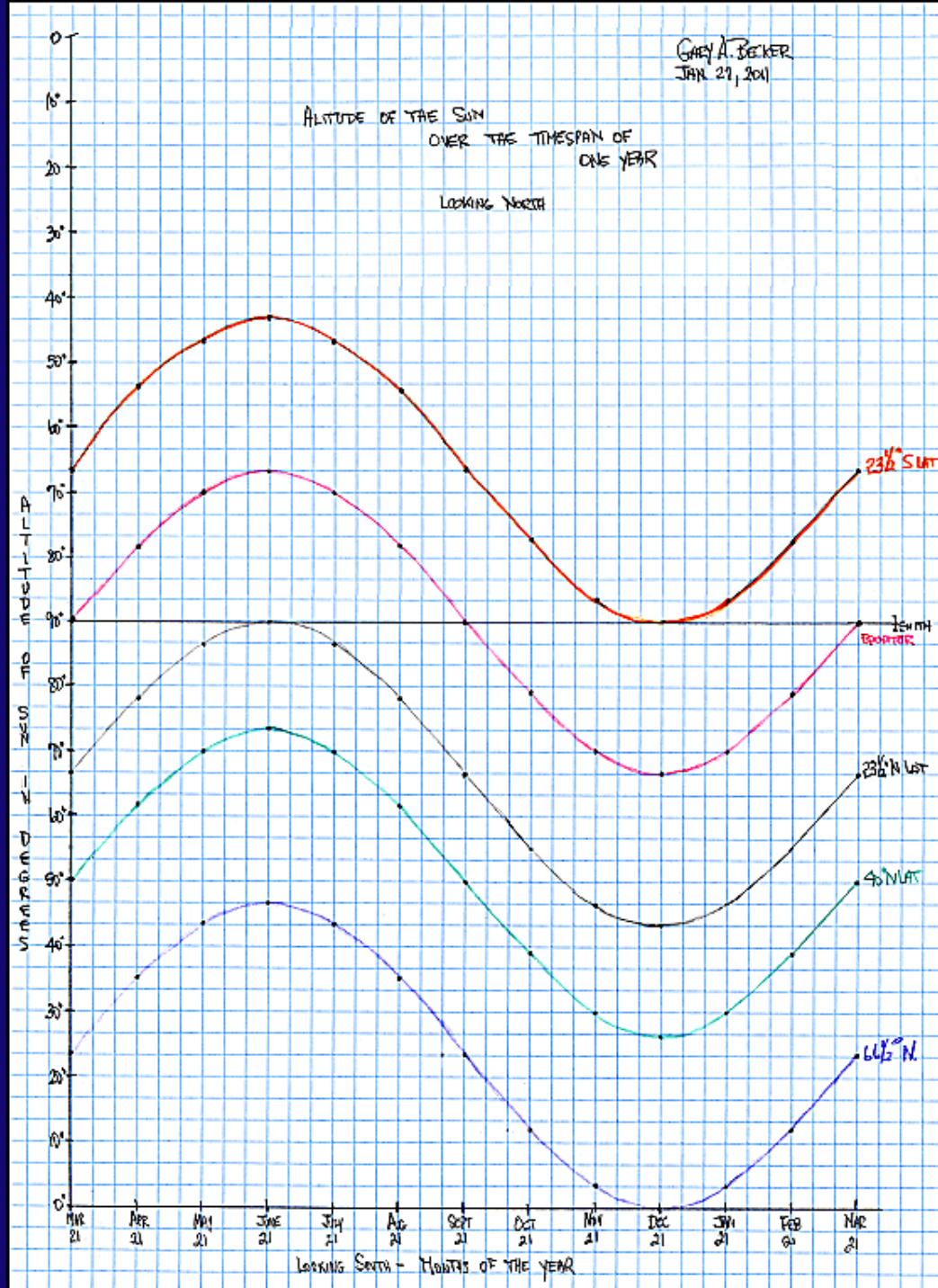
The Season is

The Season is

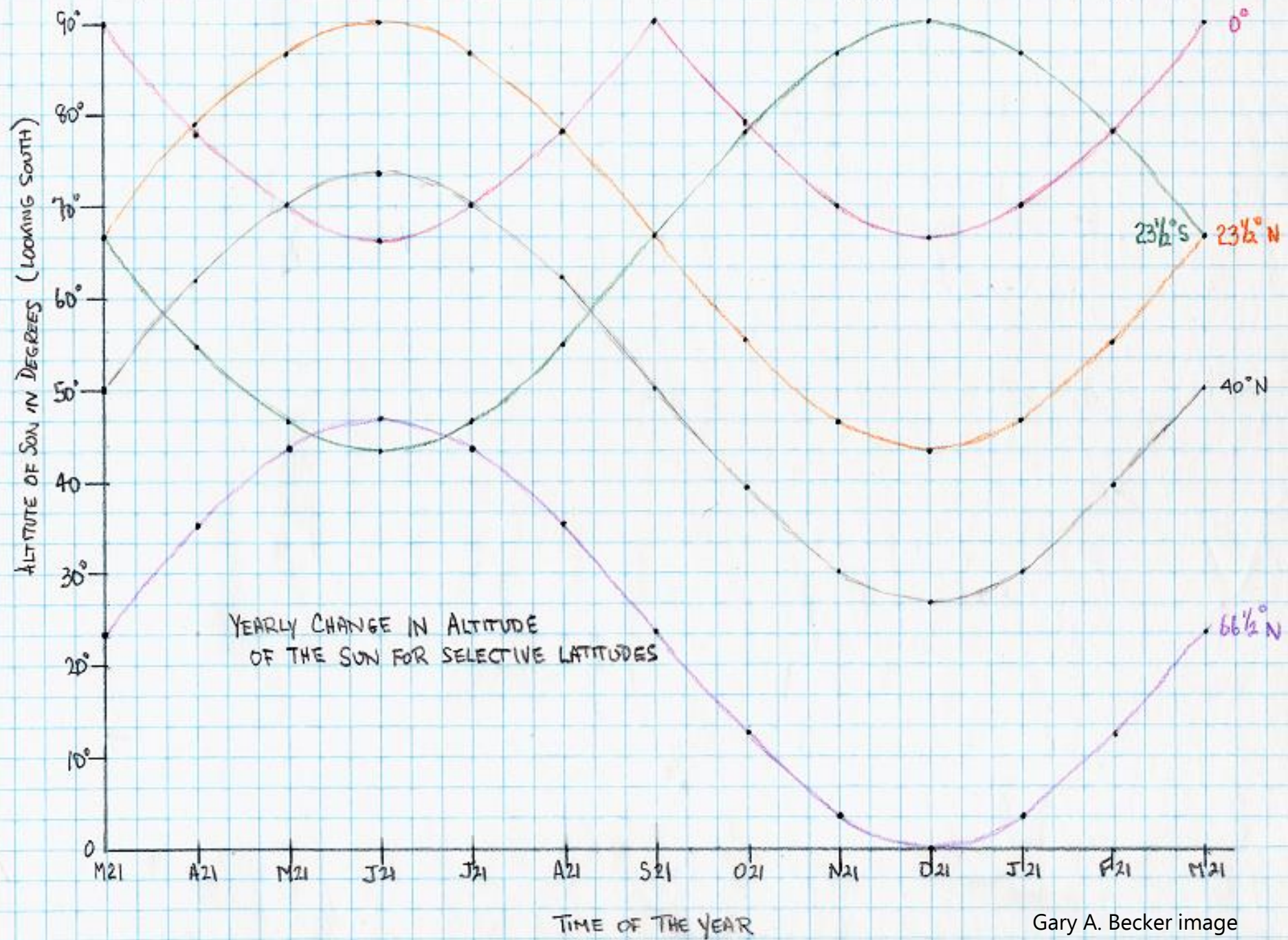
Complete this exercises by drawing, labeling, to both sides and/or answering the following statements/questions accurately.

1. Sketch/label the ecliptic and perpendicular to the ecliptic for each Earth. (2)	6. Sketch/label Bethlehem's zenith position for both Earths. (1)
2. Draw/label for each Earth, the axis, tilted 23.5° from the perpendicular to the ecliptic. Indicate the 23.5° angle at the appropriate locations. (1)	7. Draw and label Bethlehem's north and south horizon positions for both Earths. (1)
3. Label the direction to the North Star for each Earth. (1)	8. Draw/label incoming rays of the sun at noon for Bethlehem on both Earths. (1)
4. For both Earths, draw/label the equator which is located 90° away from the Earth's axis. (1)	LABEL WHICH EARTH REPRESENTS SUMMER/WINTER. (1)
5. Draw/label Bethlehem's 40° north latitude position to the equator for each Earth. (1)	9. _____ Measure the <u>WINTER</u> noontime sun angle for Bethlehem. (1)
	Note this angle at the appropriate location on the drawing.
	10. _____ Measure the <u>SUMMER</u> noontime sun angle for Bethlehem. (1)
	Note this angle at the appropriate location on the drawing.

Seasons Sun Altitude Graph



GARY A. BECKER NOV. 25, 201





LUNAR PHASE QUIZ

PICTURE SET ONE-PRACTICE QUIZ

New

Gibbous

Third

Any Questions?

Waning

Quarter

Crescent



Moon

First

Last

Full

Terminator

Waxing

1



2



3



4





6



7



8



9



10



THE END

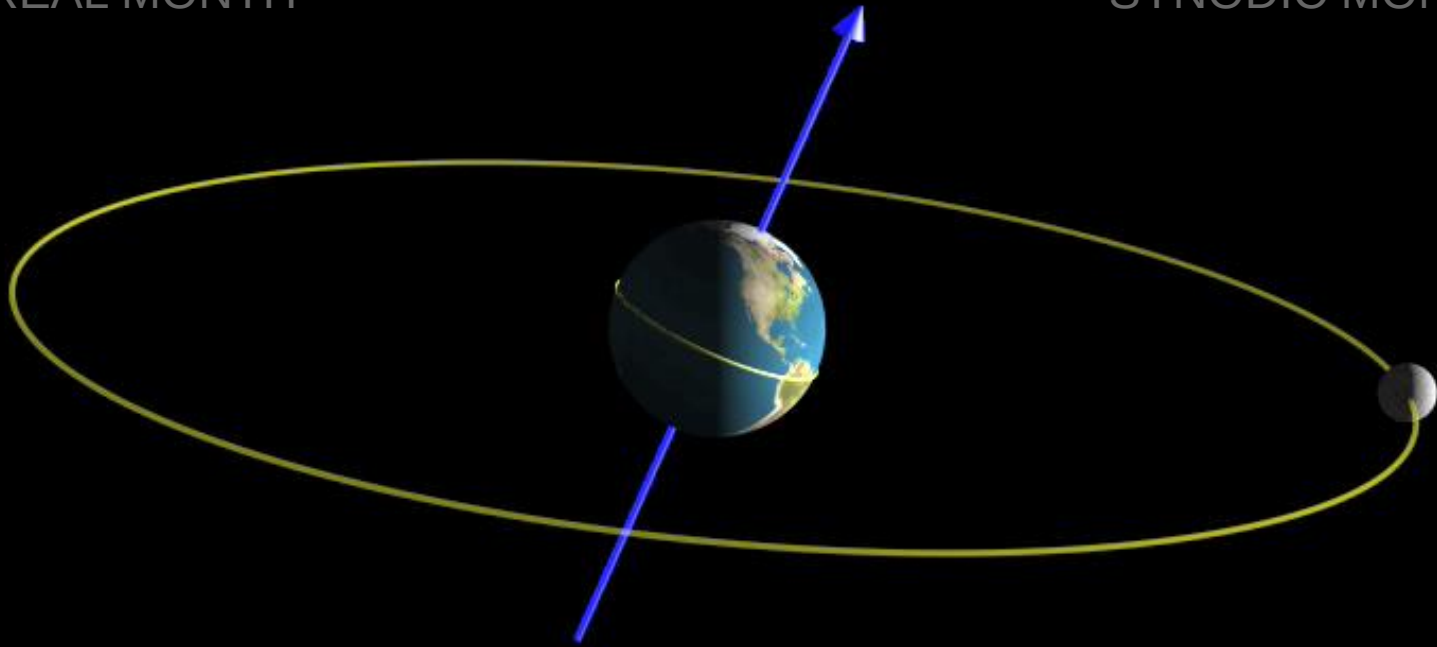
PICTURE SET ONE



The Moon does not produce any light of its own; its glow is due to the reflection of sunlight off its surface – *we only see the area of the Moon that is lit up by the Sun.*

SIDEREAL MONTH

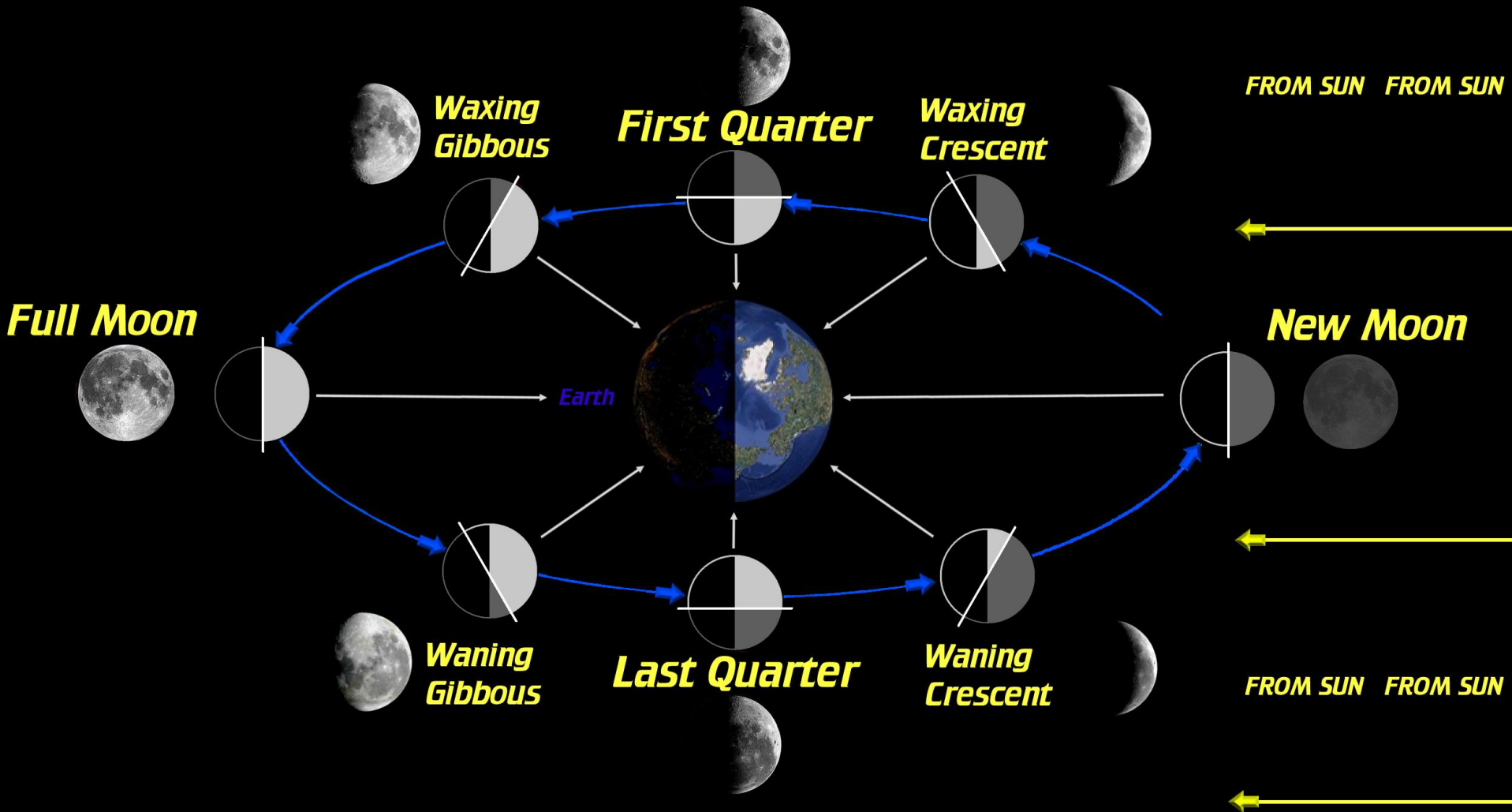
SYNODIC MONTH



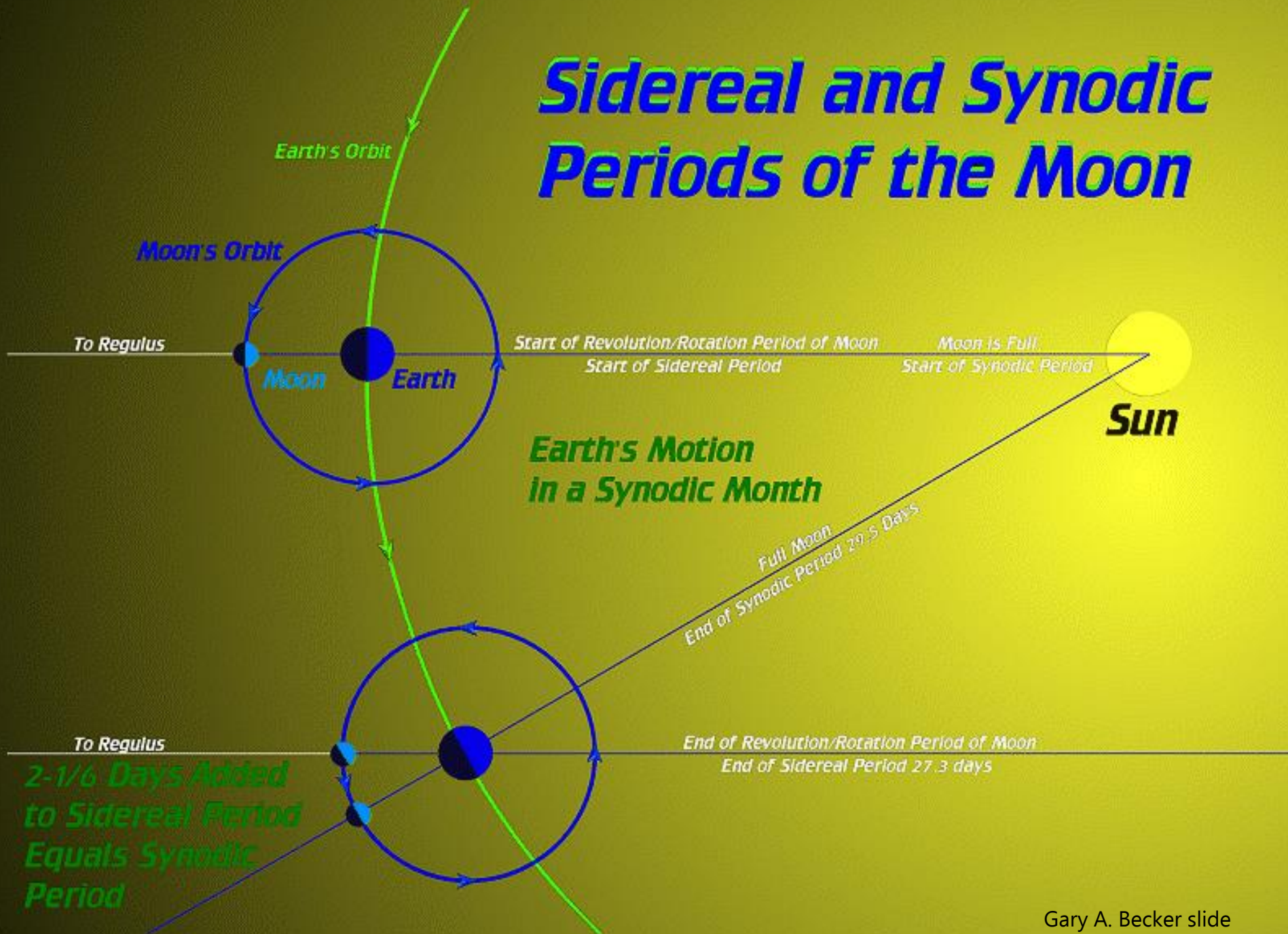
It takes 27.32 earth days for the moon to make one complete orbit around the Earth.

Phases of the Moon

Synodic Period of the Moon equals 29.53059 days



Sidereal and Synodic Periods of the Moon



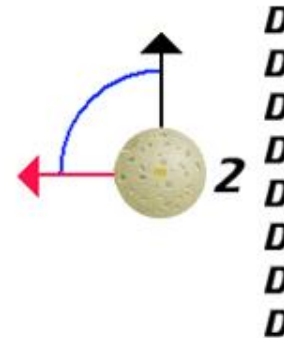
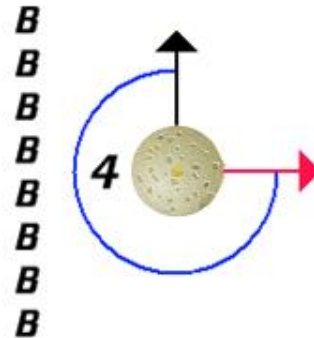
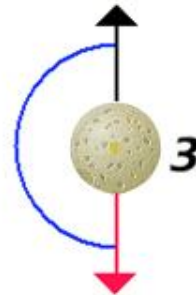
Variation in the Synodic Period of the Moon for 2026

Lunation	New Moon		First Quarter		Full Moon		Third Quarter		Duration
1274					Jan 3	5:02 am	Jan 10	10:48 am	29d 18h 09m
1275	Jan 18	2:51 pm	Jan 25	11:47 pm	Feb 1	5:09 pm	Feb 9	7:43 am	29d 16h 09m
1276	Feb 17	7:01 am	Feb 24	7:27 am	Mar 3	6:37 am	Mar 11	5:38 am	29d 13h 22m
1277	Mar 18	9:23 pm	Mar 25	3:17 pm	Apr 1	10:11 pm	Apr 10	12:51 am	29d 10h 28m
1278	Apr 17	7:51 am	Apr 23	10:31 pm	May 1	1:23 pm	May 9	5:10 pm	29d 8h 09m
1279	May 16	4:01 pm	May 23	7:10 am	May 31	4:45 am	Jun 8	6:00 am	29d 6h 53m
1280	Jun 14	10:54 pm	Jun 21	5:55 pm	Jun 29	7:56 pm	Jul 7	3:29 pm	29d 6h 50m
1281	Jul 14	5:43 am	Jul 21	7:05 am	Jul 29	10:35 am	Aug 5	10:21 pm	29d 7h 53m
1282	Aug 12	1:36 pm	Aug 19	10:46 pm	Aug 28	12:18 am	Sep 4	3:51 am	29d 9h 50m
1283	Sep 10	11:26 pm	Sep 18	4:43 pm	Sep 26	12:49 pm	Oct 3	9:25 am	29d 12h 23m
1284	Oct 10	11:50 am	Oct 18	12:12 pm	Oct 26	12:11 am	Nov 1	3:28 pm	29d 15h 12m
1285	Nov 9	2:02 am	Nov 17	6:47 am	Nov 24	9:53 am	Dec 1	1:08 am	29d 17h 50m
1286	Dec 8	7:51 pm	Dec 17	12:42 am	Dec 23	8:28 pm	Dec 30	1:59 pm	29d 19h 33m

Does the Moon Rotate?

AAAAAAAAAAAAAAAAAAAAA

The letters represent different parts of the sky that the moon would be seen against as it revolves around the Earth.



CCCCCCCCCCCCCCCCCCCCC

The moon always shows its same face towards the Earth.





Moon Illusion

StarWatch

Sky Watching from a Suburban Environment



OCTOBER 2020

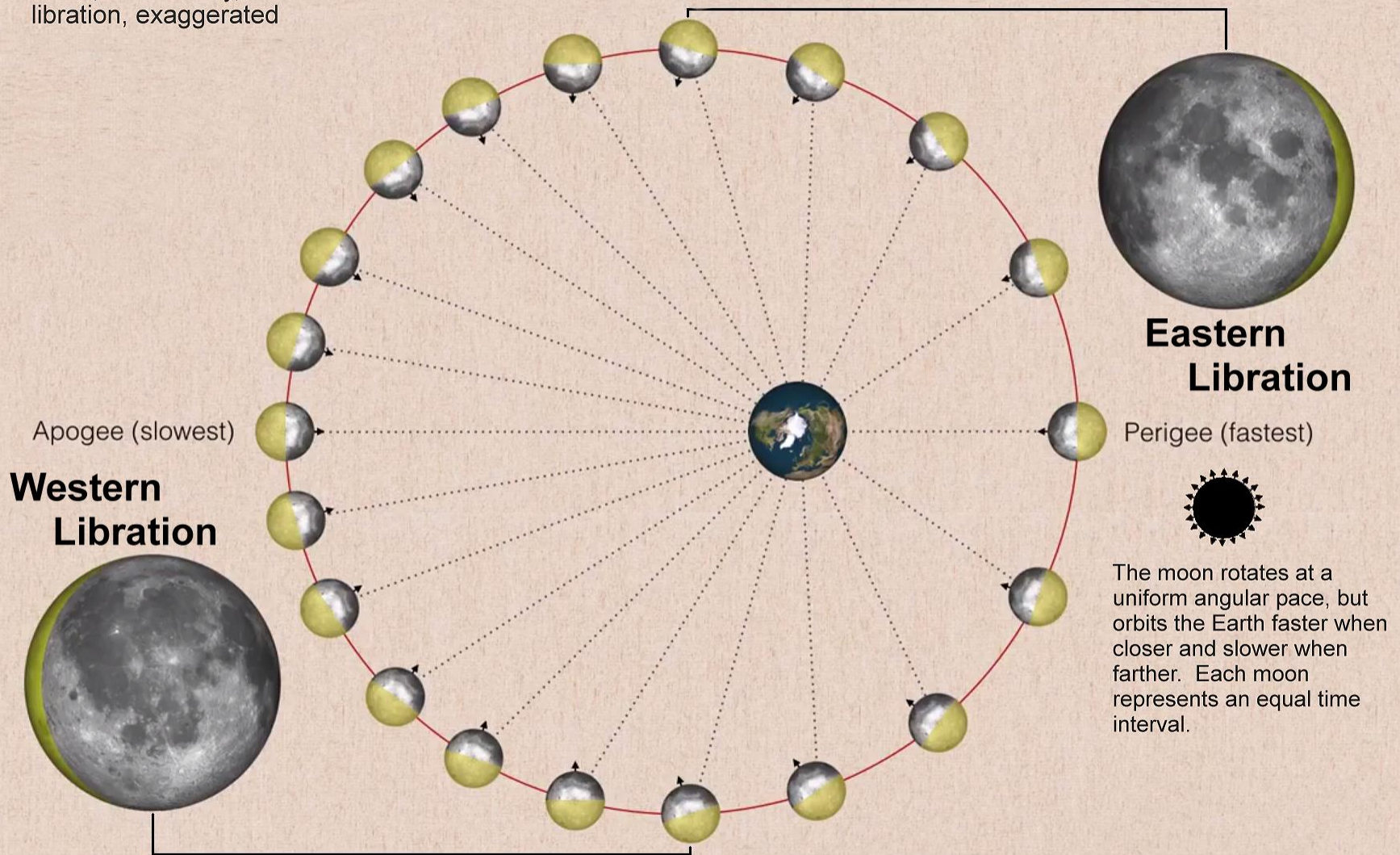
[OCTOBER STAR MAP](#) | [MOON PHASE CALENDAR](#) | [STARWATCH INDEX](#) | [NIGHT SKY NOTEBOOK](#)

Print Large Sky Charts For 10 p.m. EDT: [NORTH](#) | [EAST](#) | [SOUTH](#) | [WEST](#) | [ZENITH](#)



Libration in Longitude

scale, eccentricity,
libration, exaggerated



Libration in Latitude

scale, inclinations,
libration, exaggerated

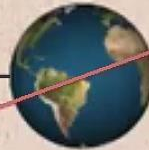
Northern Libration



*We see beyond
the lunar North Pole.*

1.5° Lunar axial tilt
Perpendicular to
lunar orbit

5.2°



5.2°

Ecliptic

*We can observe
beyond the lunar
South Pole.*

1.5° Lunar axial tilt
Perpendicular to
lunar orbit



Southern Libration

The total monthly libration in latitude is equal to 6.7 degrees, the sum of the lunar axial tilt plus the inclination of the moon's orbit to the plane of the ecliptic.

Lunar Phases, Changing Distances, and Librations

All slides are set for 12:01 a.m.
24 hours apart.

This series of phases was created when
Earth was near aphelion,
farthest from the sun

Moon Phases 2019 - Northern Hemisphere - 4K



Moon Phases 2019
Including Libration and Position Angle



Earth

Moon's distance from Earth
in Earth diameters



Angular diameter of the
moon in seconds of arc

Time	21 Apr 2019 08:00 UT
Phase	95.4% (15d 23h 09m)
Diameter	1902.6 arcseconds
Distance	376703 km (29.56 Earths)
Position	15h 35m 28s, 15° 01' 55"S
Subsolar	1.522°S 18.742°W
Sub-Earth	5.408°S 5.777°E
Pos. Angle	12.723°

Settings

▶ ▶▶ 🔊 1:28 / 5:00

**Western
Libration**

**Eastern
Libration**

Reference
Rimae Riccioli
(dark) —
Reference
Grimaldi —

Reference
Mare Crisium —

Librations

Day 01



Day 02



Day 03



Day 04



Day 05



Day 06



Day 07



Day 08



Day 09



Day 10



Day 11



Day 12



Day 13



Day 14



Day 15



Day 16



Day 17



Day 18



Day 19



Day 20



Day 21



Day 22



Day 23



Day 24



Day 25



Day 26



Day 27



Day 28



Day 29



Day 30



Day 31



Day 32



Day 33



Day 34



Day 35



Day 36



Day 37



Day 38



Day 39



Day 40



Day 41



Day 42



Day 43



Day 44



Day 45



Day 46



Day 47



Day 48



Day 49



Day 50



Day 51



Day 52



Day 53



Day 54



Day 55



Day 56



Day 57



Day 58



Day 59



Day 60



Day 61



Day 62



Day 63



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Day 66



Day 67



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Day 71



Day 72



Day 73



Day 74



Day 75



Day 76



Day 77



Day 78



Day 79



Day 80



Day 81



Day 82



Day 83



Day 84



Day 85



Day 86



Day 87



Day 88



Day 89



Day 90



Day 91



Day 92



Day 93



Day 94



Day 95



Day 96



Day 97



Day 98



Day 99



Stop

Lunar Phases, Changing Distances, and Librations

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Earth was near perihelion,
closest to the sun.

Moon Phases 2019 - Northern Hemisphere - 4K



Moon Phases 2019

Including Libration and Position Angle



Earth

Moon's distance from Earth
in Earth diameters



Angular diameter of the
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Settings

▶ ▶▶ 🔊 1:28 / 5:00

**Western
Libration**

**Eastern
Libration**

Reference
Rimae Riccioli
(dark) —
Reference
Grimaldi —

Reference
Mare Crisium —

Librations

Day 100



Day 101



Day 102



Day 103



Day 104



Day 105



Day 106



Day 107



Day 108



Day 109



Day 110



Day 111



Day 112



Day 113



Day 114



Day 115



Day 116



Day 117



Day 118



Day 119



Day 120



Day 121



Day 122



Day 123



Day 124



Day 125



Day 126



Day 127



Day 128



Day 129



Day 130



Day 131



Day 132



Day 133



Day 134



Day 135



Day 136



Day 137



Day 138



Day 139



Day 140



Day 141



Day 142



Day 143



Day 144



Day 145



Day 146



Day 147



Day 148



Day 149



Day 150



Day 151



Day 152



Day 153



Day 154



Day 155



Day 156



Day 157



Day 158



Day 159



Day 160



Day 161



Day 162



Day 163



Day 164



Day 165



Day 166



Day 167



Day 168



Day 169



Day 170



Day 171



Day 172



Day 173



Day 174



Day 175



Day 176



Day 177



Day 178



Day 179



Day 180



Day 181



Day 182



Day 183



Day 184



Day 185



Day 186



Day 187



Day 188



Day 189



Day 190



Day 191



Day 192



Day 193



Day 194



Day 195



Day 196



Day 197



Day 198



Day 199



Day 200



Day 201



Day 202



Day 203



Day 204



Day 205



Day 207



Day 208



Day 209



Day 210



The End