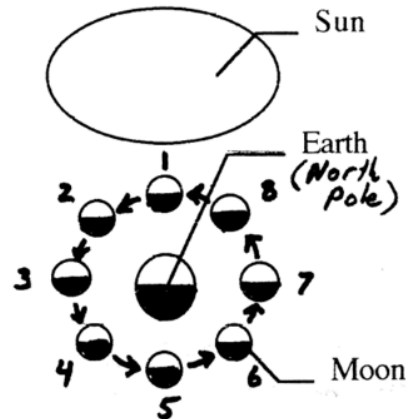


System of the Earth, Moon, and Sun  
Part 2: Moon Phases and Tides

**Simulate The Moon Phases**

Be like the diagram on the right. Your head is the Earth. Your tennis ball is the moon. Stretch out your arm and hold the tennis ball away from your head. Imagine that the sun is in the front of the room -- this means you will need to make sure the sunny side of the moon is facing the front of the room. Hold the moon in position 1, then move it to positions 2, 3,...



*Not To Scale!  
Out Of Proportion*

**Draw the moon Phases**

For each position on the diagram above, draw what you saw.

1.  Name: _____	2.  Name: _____	3.  Name: _____	4.  Name: _____
5.  Name: _____	6.  Name: _____	7.  Name: _____	8.  Name: _____

**Name The Moon Phases**

Use the terms below to come up with names for the moon phases you drew in the boxes above.

Waxing: Becoming more full. (When the \_\_\_\_\_ side of the moon is lit, it is waxing.)

Waning: Becoming less full. (When the \_\_\_\_\_ side of the moon is lit, it is waning.)

Crescent Moon: A thin, curved moon.

Gibbous Moon: A moon which is almost full, but it's not quite round.

Quarter Moon: A moon which is half light and half dark.

Full Moon: A complete, fully lit moon.

New Moon: A completely dark, invisible moon.

9-16. A moon's name has two parts. Part 1: tells whether it is growing or shrinking. Part 2: describes the shape. For example, an almost full moon which is growing is a waxing gibbous. Full moons and new moons are neither waxing nor gibbous. Label the each of the boxes above with the full, correct name.

17. A solar eclipse occurs when the moon's shadow covers us. A lunar eclipse occurs when the Earth's shadow falls on the moon.

- a) During which moon phase can we have a solar eclipse?
- b) During which moon phase can there be a lunar eclipse?

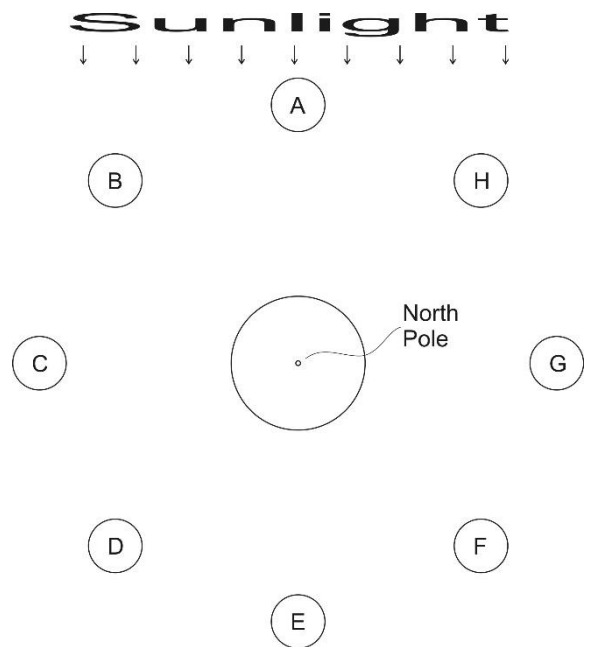
**Helpful Information:**

- **Synodic Month** (29.5 days; **about 4 weeks**): The time it takes for the Moon to go through one full lunar cycle (e.g. New Moon to the next New Moon).
- **Sidereal Month** (27 1/3 days): the time it takes for the Moon to make one complete revolution around the Earth.
- **Lunar Eclipse:** The Earth’s shadow falls on the Moon.
- **Solar Eclipse:** The Moon’s shadow falls on the Earth.
- **Direction of the Moon’s revolution (looking down on Earth’s North Pole):** \_\_\_\_\_
- **Zenith:** the highest point in the sky reached by a celestial object (like the Sun or Moon)
- **When viewed from above the Earth’s North Pole, all rotations and revolution of the Earth and Moon are in a \_\_\_\_\_ direction.**

**Moon travel time questions:**

Answer choices:      0      0.5      1      1.5      2      2.5      3      4

- \_\_\_\_\_ Approximately how many weeks does it take the Moon to travel from position A, around the Earth, and back to position A?
- \_\_\_\_\_ Approximately how many weeks does it take the Moon to travel from position A to position E?
- \_\_\_\_\_ Approximately how many weeks does it take the Moon to travel from position A to position D?
- \_\_\_\_\_ Approximately how many weeks does it take the Moon to travel from position H to position A?
- \_\_\_\_\_ Approximately how many weeks does it take the Moon to travel from position B to position G?
- \_\_\_\_\_ Approximately how many weeks does it take the Moon to travel from position D to position F?

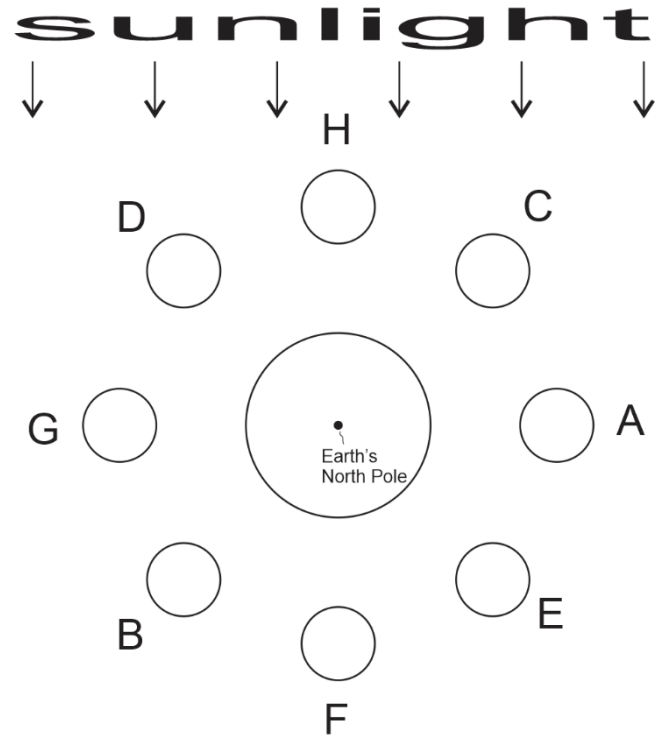


**Moonrise and Moonset:** [\*\*note that all of these times are approximate]

- Shade the appropriate half of the Earth.
- Label the Earth’s equator, and label these times on the Earth’s equator (3, 6, 9, and 12; AM and PM)
- Moon A rises at \_\_\_\_\_, sets at \_\_\_\_\_, and is at it zenith at \_\_\_\_\_.
- Moon G rises at \_\_\_\_\_, sets at \_\_\_\_\_, and is at it zenith at \_\_\_\_\_.
- Moon D rises at \_\_\_\_\_, sets at \_\_\_\_\_, and is at it zenith at \_\_\_\_\_.
- Moon B rises at \_\_\_\_\_, sets at \_\_\_\_\_, and is at it zenith at \_\_\_\_\_.

**Moon Phases Practice:**

1. Correctly shade the Earth and all of the Moons in the diagram.
2. Add arrows to show the directions of the Earth's rotation and the Moon's revolution.
3. Fill out the chart.



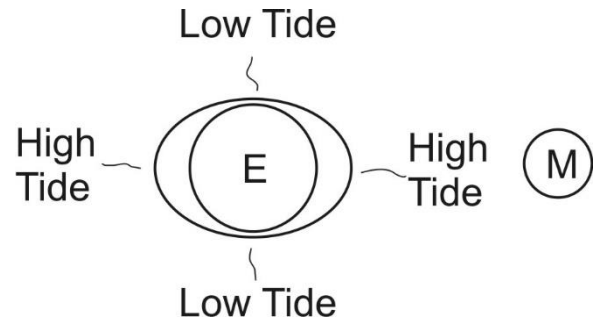
Letter	Name of Moon Phase	Drawing (appearance of Moon from Earth's Northern Hemisphere)	Approximate time of moonrise	Approximate time of moon set	Weeks until the next possibility of an eclipse	Type of possible eclipse (from the previous column)
A						
B						
C						
D						
E						
F						
G						

**Tides :**

**More Helpful Information:**

- **Spring Tide:** an especially strong tide that is produced when the Sun and Moon are “working together.”
- **Neap Tide:** An especially weak tide that is produced when the Sun and Moon are working against one another.

1. The Moon and Sun cause tides by the same process that a black hole would *spagettify* someone being pulled into the black hole. Explain.



2. Which celestial body exerts more gravitational force on our oceans -- the Moon or the Sun? Why?

3. Why does the moon cause more extreme tidal effects than the sun?

4. In each of the diagrams, write a capital H where the moon makes high tides, and write a capital L where it makes low tides. Since the Sun’s effects on tides are weaker, write a lowercase h wherever the Sun creates a high tide, and write a lowercase l where it makes a low tide.

5. Spring tides are especially strong tides that are caused by the Moon and Sun “working together.” Label the diagrams that show spring tides.

6. Neap tides are especially weak tides that are caused by the Moon and Sun “working against one another.” Label the diagrams that show neap tides.

7. Label each diagram with its moon phase

