The Moon

The moon rises in the east and sets in the west. This motion is apparent - it is really the result of Earth's turning on its axis.

Moon's rotation = 27.33 days
Moon's revolution = 27.3 days
Moon is rotating and revolving at nearly the same speed. This is the reason we only see one side of the moon. The sun's rays are only illuminating one half of the moon.

As the moon revolves around earth it passes through a **cyclic** series of phases. As the moon revolves around earth, the Earth observer sees varying amounts of the illuminated portion of the Moon. Is the moon really changing? **NO!!! Half of the moon is always receiving light from the sun. The "lit" portion that is visible from earth varies as the moon REVOLVES around the earth. THIS IS WHAT CAUSES THE PHASES OF THE MOON.**

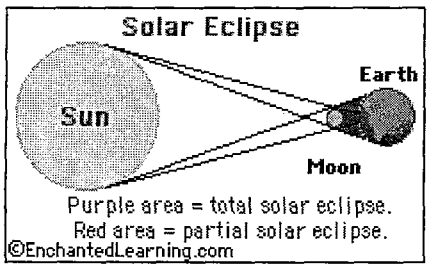
The moon makes a complete phase cycle around the earth in 27.3 days. However, as the moon revolves around the Earth, the Earth is moving in its orbit around the Sun, constantly changing the relative positions of the Earth, Sun, Moon.

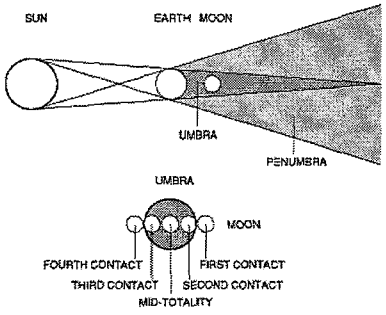
The moon travels 13° per day. (360° / 27.3° = 13°) The earth has moved 1° per day (360°/365.25° = 1°) so in that 27 days it has moved 27°. Moving at 13° per day, the moon takes about 2 days to catch up with earth and align with it and the sun in a new moon phase.

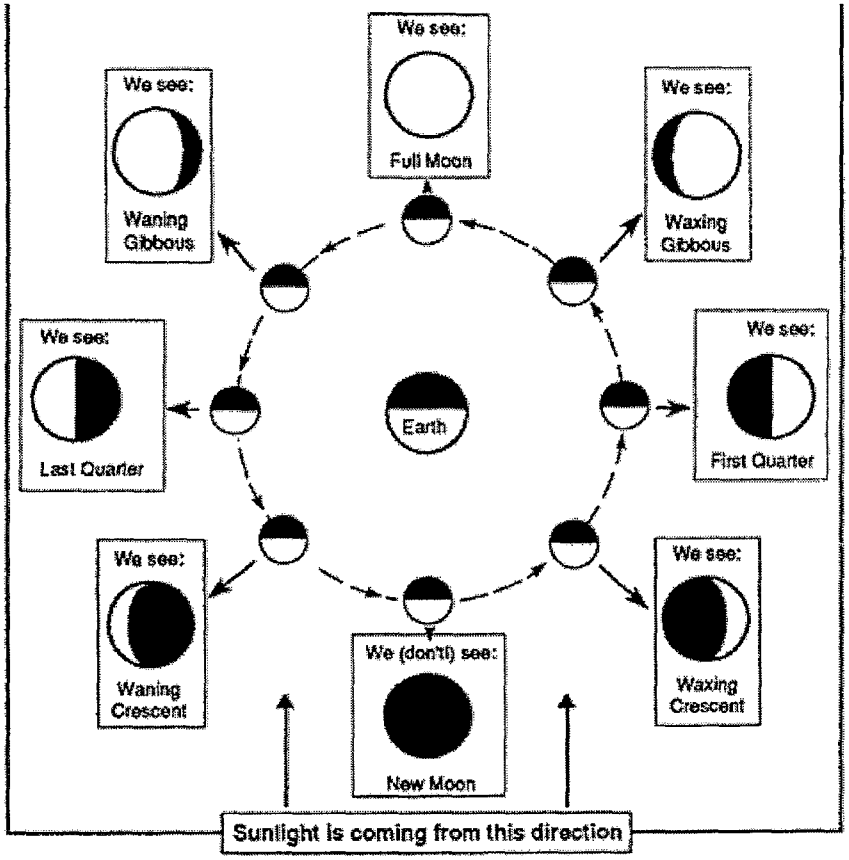
So because of earth's revolution of 1° per day, the cycle of lunar phases takes 29.5 days or about 4 weeks. Because this is shorter than most calendar months, there could be 2 full moons in one month (called a Blue Moon) Technically, there could be 13 full moons in one year.

The moon rises above the horizon at a different time each day (or night). This happens because every time Earth spins around once, the moon moves about 13° **EASTWARD** (yes the moon moves west to east) along its orbit. Thus, the earth must rotate an extra 13° more each day for a point on its surface to be roughly under the moon again. Since earth takes about 50 minutes to rotate (spin) 13°, the moon rises about 50 minutes later each day and set about 50 minutes later as well. So if the moon rose above the horizon last night at 9:00, tonight it would be about 9:50.

Eclipses
Objects like earth and moon cast shadows into space. When the entire moon passes into the Earth's shadow a **lunar eclipse occurs - only in the full moon phase.** When the moon passes directly between the earth and sun a **solar eclipse occurs - only in the new moon phase.** Eclipses do not occur twice a month due the 5° tilt of moon's orbital plane.



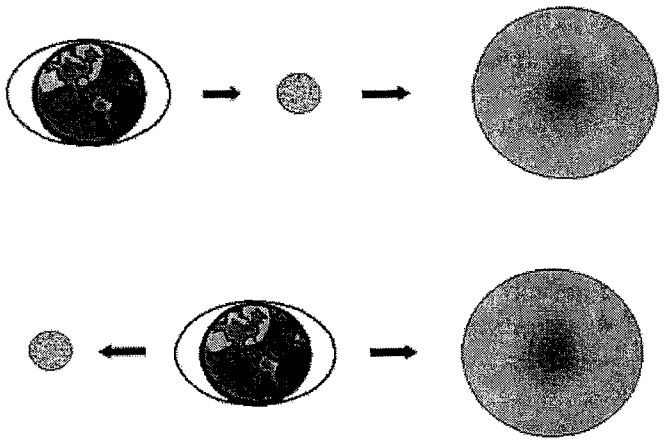




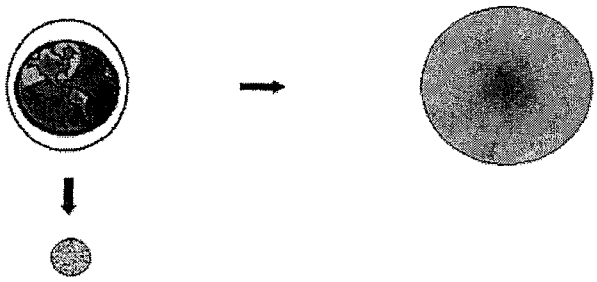
Tides

Earth's surface continually changes in response to the gravitational attraction of the Sun and the Moon. Although, the sun is much more massive than the moon, the moon is much closer. Its gravitation has a greater impact on the surface water causing tides. Most coastal locations experience a daily cycle of tides. As the earth rotates, the tides move around the Earth alternating between high and low tides approximately every 6 hours. At new and full moon phases when the sun, earth, moon are in alignment - we have a greater tidal range - called a spring tide. When the moon is in the quarter phases (sun is pulling at a right angle from the moon) - the tidal range is quite small - called a neap tide.

SPRING TIDE



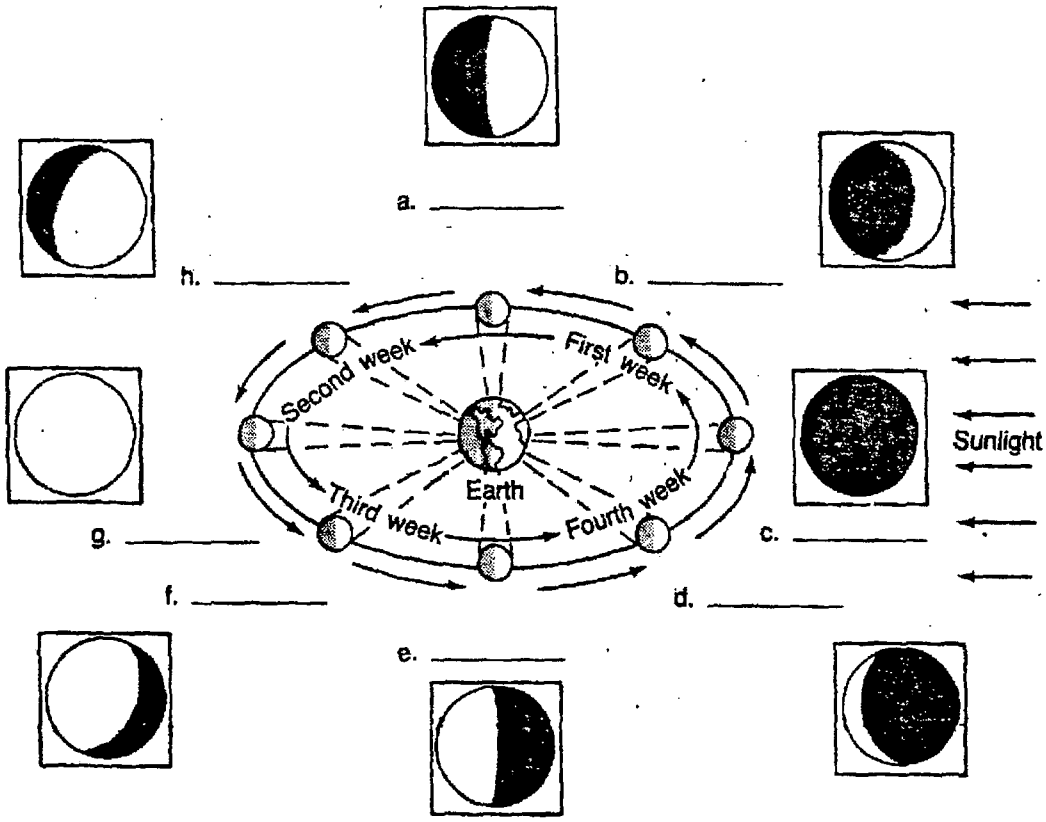
NEAP TIDE



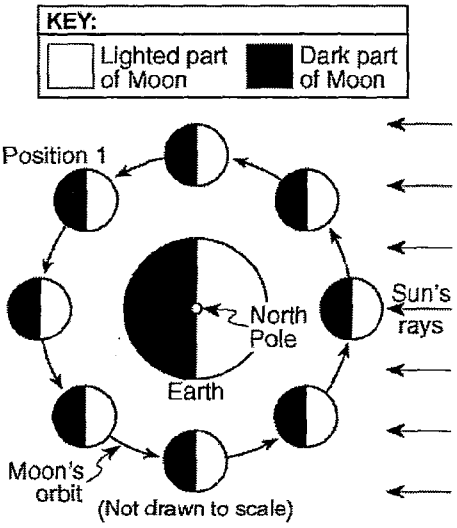
Name _____

MOON PHASE DIAGRAM

Name the phases of the moon.



The diagram below represents the Moon in its orbit, as viewed from above Earth's North Pole. Position 1 represents a specific location of the Moon in its orbit.



Which phase of the Moon will be seen from Earth when the Moon is at position 1?

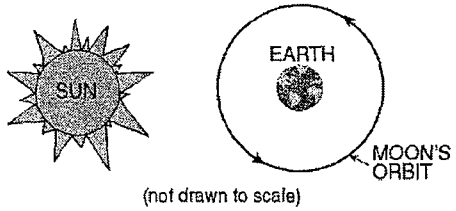
A) 

B) 

C) 

D) 

The diagram below shows the Sun, Earth, and the Moon's orbit around Earth as viewed from space.

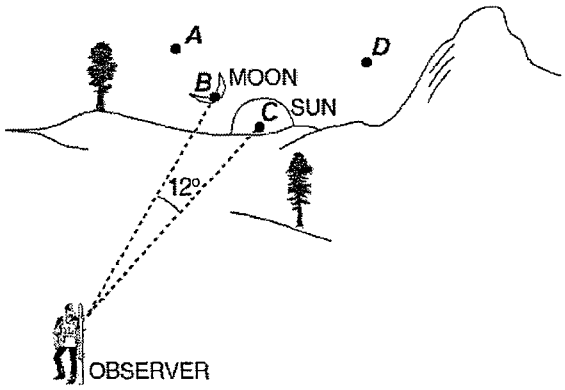


54) On the given diagram, draw a circle of approximately this size ◯ to represent the Moon's position in its orbit when a solar eclipse is viewed from Earth.

55) Approximately how many complete revolutions does the Moon make around Earth each month?

56) Explain why solar eclipses do *not* occur every time the Moon revolves around Earth.

The diagram below shows the positions of the Moon and the Sun at sunset during an evening in New York State. Points *A*, *B*, *C*, and *D* represent positions along the western horizon.



At sunset on the following evening, the Moon will be located at what position?

A) *A* B) *B* C) *C* D) *D*

The gravitational pull of the Moon has the greatest influence on the water levels of Earth's ocean tides. If the distance between the Moon and Earth were to *decrease* steadily for the week following the time shown on the graph, which water-level changes would be expected to occur?

A) Both high tides and low tides would get lower.
B) High tides would get higher and low tides would get lower.
C) High tides would get lower and low tides would get higher.
D) Both high tides and low tides would get higher.

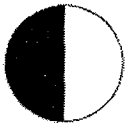
One complete cycle of the phases of the Moon takes approximately one

A) month B) week C) year D) day

Name: _____

Base your answers to questions 1 through 5 on the data table below, which shows the percentage of the lighted side of the Moon visible from Earth for the first fourteen days of July 2003.

Date	Percentage of Lighted Side of the Moon Visible From Earth (%)
July 1	1
July 2	5
July 3	10
July 4	17
July 5	26
July 6	37
July 7	48
July 8	59
July 9	70
July 10	80
July 11	89
July 12	95
July 13	98
July 14	100

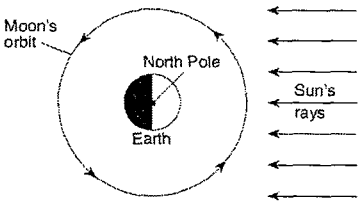


1. On what July date listed in the table did the Moon appear as shown to the right?

2. What motion of the Moon causes the percentage of the lighted side of the Moon visible from Earth to change from July 1 to July 14?

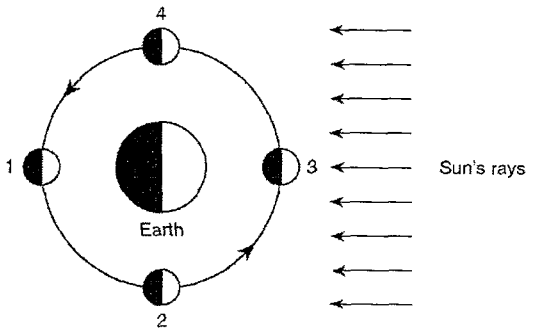
3. A full Moon phase was observed on July 14. On what day in August was the next full Moon phase observed?

4. The diagram to the right shows the orbit of the Moon around Earth. Place an **X** on the orbit to show where the Moon was in its orbit on July 14, 2003.



5. Why are the phases of the Moon considered to be cyclic?

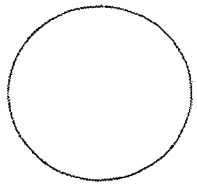
The diagram to the right represents the Sun's rays striking Earth and the Moon. Numbers 1 through 4 represent positions of the Moon in its orbit around Earth.

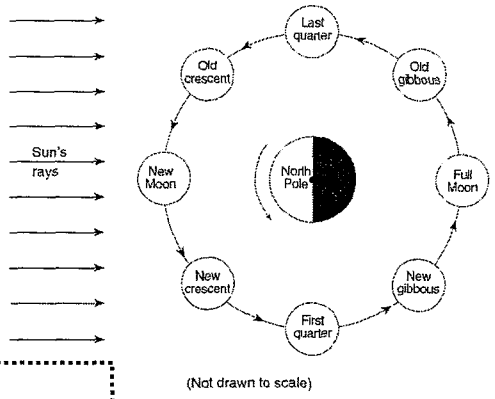


6. ____ The highest tides on Earth occur when the Moon is in positions
   (1) 1 and 3 (3) 3 and 2
   (2) 2 and 4 (4) 4 and 1

Base your answers to questions 7 through 10 on the diagram below, which shows Earth as viewed from above the North Pole. The nighttime side of Earth has been shaded. The Moon is shown at eight positions in its orbit around Earth. The name of each Moon phase is indicated at each Moon position. The dark portion of each Moon position has not been shaded.

7. On the diagram to the right, shade the portion of the Moon that is in darkness to show the last quarter phase as viewed from New York State.





(Not drawn to scale)

8. Explain what causes the Moon's phases when viewed from Earth.

9. Which Moon phase occurs approximately one week after the New Moon phase?

10. Explain why the same side of the Moon always faces Earth.