



Name:

Lab Partners:

Materials: Tennis Ball

The Earth and the Sun: Diurnal (Daily) Motion.

Pretend your head is the Earth. Your eyes are you looking up into the sky. The bright light in the front of the room represents the Sun. To represent the Earth spinning on its axis stand up and turn around. The Earth spins toward the EAST. For you, that is to the left or if the top of your head represents the North Pole that is counter-clockwise. Observe where the your eyes enter and leave the light representing the Sun.

1. Sketch the Earth, the light rays from the Sun, and clearly showing your locations (your eyes) at sunrise, sunset, noon and midnight. The viewpoint for the sketch is looking down from the North Pole. Show the direction in which the Earth is spinning.

The Sun, Earth and Moon System: Motion and Phases of the Moon

Now pretend that the tennis ball is the Moon.

The Scale Model of the Earth-Moon System: We selected your head and a tennis ball because: $R_{\text{Earth}} = 6.4 \times 10^3 \text{ km}$ and the $R_{\text{Moon}} = 1.7 \times 10^3 \text{ km}$ and this ratio, 3.8:1, is about the same as the ratio of the radius of your head to a tennis

ball. To scale the distance between the Earth and the Moon in units of the Moon's radius, divide the distance between the two, 3.84×10^5 km, by the radius of the Moon. This = 226. So, if the radius of the tennis ball is 1.4 inches, about how far away should you hold the tennis ball for it to be to scale? Multiplying 1.4 in times 226 is about 316 inches or 26 ft.

2. Place the Earth (your head) and the Moon (tennis ball) in the proper relative positions to the Sun so that the Moon's phase is full.

(a) Sketch the relative positions of the Earth, Moon and the Sun. Show with an arrow the direction in which the Earth is spinning and the Moon orbiting. The Moon orbits the Earth in the same direction that the Earth spins. If the top of your head is the North pole, they orbit and spin to the left (counter-clockwise).

(b) What time is it for you when the Full Moon is highest in the sky (that is, you are looking straight at it)?

_____ am/pm (circle one)

Now have your partner hold the tennis ball representing the Moon in the same place and turn yourself to the left until the ball is just about to disappear from view, that is the Moon is about to set. Where is the light representing the Sun?

(c) What time is it for you when the Full Moon sets?

_____ am/pm (circle one)

3. Now, move the ball representing the Moon so that the Moon is at third quarter.

(a) Sketch the relative positions of the Earth, Moon and the Sun. Show with an arrow the direction in which the Earth is spinning and the Moon orbiting.

(b) What time is it for you when the Third Quarter Moon is highest in the sky (you are looking straight at it)?

_____am/pm (circle one)

Have your partner hold the Moon in the same place. Turn yourself to the left until you can just see the ball representing the Moon.

(c) What time is it for you when the Third Quarter Moon rises?

_____am/pm (circle one)

The Sun, Earth and Moon System: Lunar Eclipses

4. An eclipse of the Moon occurs when the shadow of the Earth falls on the Moon. Again use your head and the tennis ball to represent the Earth and the Moon respectively and orient them so the shadow of the your head (the Earth) falls on the tennis ball (the Moon).

What is the phase of the Moon when there is a lunar eclipse?

When your group is done, the class as a whole will discuss the answers. Correct your answers if necessary, and then hand in your work as one final activity sheet for credit. (Staplers are available to assemble your cleanest set of answers.)