Ay 10 - Section Worksheet 2
Earth - Moon - Sun

Tides and Tidal Forces

1. Soon in class you will hear about the cause of the tides on Earth. Let's briefly discuss (and write down) the key causes and effects. Also, draw a diagram of what's going on.

2. One of Jupiter's moons, Io, almost always keeps one face towards Jupiter and is famous for its extreme volcanic activity. However, it is only about the size of our moon, and we will see in class that the interior of the moon has cooled since its birth. Using tides caused by Jupiter and its largest moons, explain how Io's interior temperature is hot enough to produce the observed volcanism. (HINT: When you stretch a rubber band, you're transferring the energy that it takes to stretch the rubber band into the atoms and molecules that make up the rubber band. This in turn heats the rubber band slightly.)

Phases of the Moon

1. For the following, give what direction you need to look to see the given phase of the moon at the given time (*i.e.* North, South, East, or West, and high overhead, near the horizon, *etc.*). Also, draw a diagram depicting the relative positions of Earth, the Moon, the Sun, and the location of the observer (you) on Earth for each case (the view from above is probably easiest to draw).

   For simplicity pretend that the Moon's orbit is in the same plane as Earth's equator, and that you are on the equator.

   (a) The full Moon during sunset
      Direction:

   (b) The new Moon during sunrise
      Direction:

(c) The first quarter Moon at noon
   Direction:

(d) The third quarter Moon at noon
   Direction:

More Moon Mania

1. Io, Jupiter's moon mentioned above, almost always keeps one face towards Jupiter. When a planet's moon does this we say that it is **tidally locked** to its planet. Using what you've learned in class so far, how does a moon become tidally locked to its planet? (HINT: we use the term "tidally locked" for a reason.)

2. Hopefully you've all noticed that our Moon pretty much always keeps the exact same face towards us on Earth. Thus, we say that our Moon is tidally locked to Earth. This fact also leads many people to call the side that faces away from Earth the *Dark Side of the Moon* (a little Pink Floyd anyone?). Given your knowledge of the Earth-Sun-Moon system, what's wrong with this nickname?

3. The Earth takes about 365 days to orbit the sun. About how long does it take for the Moon to orbit the Earth?

4. The Earth takes about 24 hours to make a full rotation. Does the moon rotate like the Earth? If so, how long does it take?

5. Given the above information:

   (a) About how long does daytime last on the Moon?
   (b) For any tidally locked object, how are the **orbital period** (*i.e.* how long it takes to complete an orbit) and the **rotation period** (*i.e.* how long it takes to complete a rotation) related?