

# Satellite Motion

Pre-Class Questions

Problem Set (due next time)

Ch 6 – 26, 29, 37, 41

Lecture Outline

1. Gravitation and Tides
2. Satellite Orbits

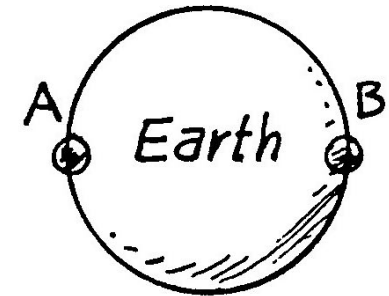
## Our Ocean Tides

1. Consider two equal-mass blobs of water, A and B, initially at rest in the moon's gravitational field. The vector shows the gravitational force of the moon on A.



- Draw a force vector on B due to the moon's gravity.
- Is the force on B more or less than the force on A? \_\_\_\_\_
- Why? \_\_\_\_\_
- The blobs accelerate toward the moon. Which has the greater acceleration? (A) (B)
- Because of the different accelerations, with time  
 (A gets farther ahead of B) (A and B gain identical speeds) and the distance between A and B  
 (increases) (stays the same) (decreases).
- If A and B were connected by a rubber band, with time the rubber band would  
 (stretch) (not stretch).
- This (stretching) (non-stretching) is due to the (difference) (non-difference) in the moon's gravitational pulls.

2. Now consider the same two blobs located on opposite sides of the earth.



a. Because of differences in the moon's pull on the blobs, they tend to

(spread away from each other) (approach each other).

b. Does this spreading produce ocean tides? (Yes) (No)

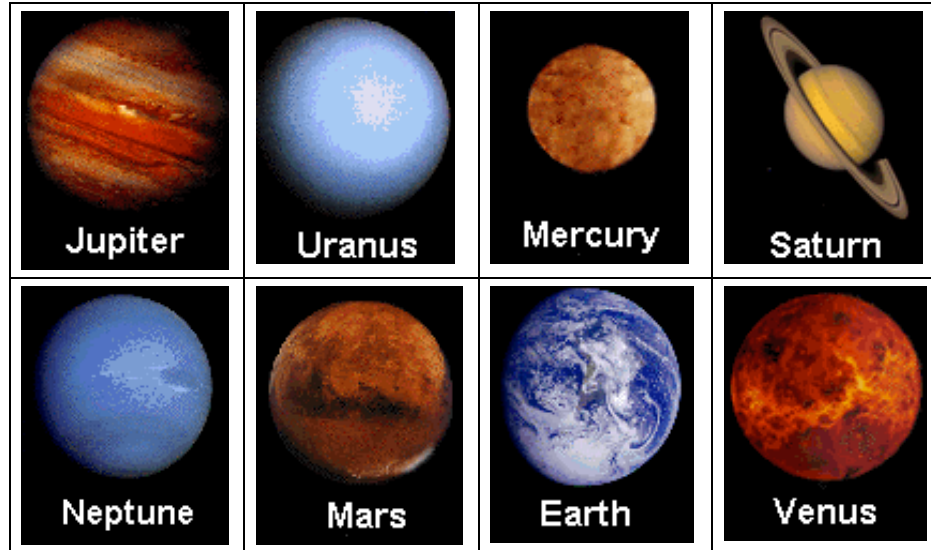
c. If earth and moon were closer, gravitational force between them would be

(more) (the same) (less), and the difference in gravitational forces on the near and far parts of the ocean would be (more) (the same) (less).

*Example 1: (a) Compare the force exerted on Earth by the sun and by the moon. (b) Find the difference between the force exerted on 1.00kg of seawater by the moon on each side of Earth. (c) Find the difference between the force exerted on 1.00kg of seawater by the sun on each side of Earth. (d) Explain why the tides are more strongly associated with the moon than the sun even though the sun exerts more force on Earth than the moon.*

*Example 2: Find the time for Earth to complete an orbit of the sun using the Law of Gravitation.*

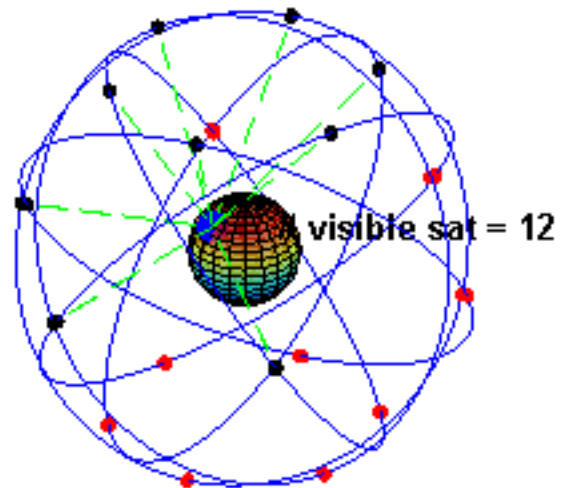
# Put The Planets In Order



1. Without looking it up, put the planets in order by distance from closest to the farthest away.
2. Put the planets in order by orbital speed from slowest to fastest.

closest	slowest
farthest	fastest

# Global Positioning System Satellites



*Example 3: GPS satellites each complete two orbits in a day. Find (a) the radius of orbit and (b) their altitude.*





# Lecture 14- Summary

Using the Law of Gravitation and our knowledge of circular motion we can understand satellite motion.

