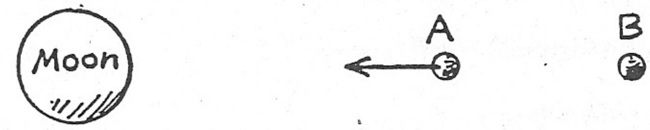
Name ~~Class Copy~~ per Date ____________

CONCEPTUAL Physics PRACTICE PAGE

Chapter 8 Gravity

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.



   a. Draw a force vector on B due to the moon's gravity.

   b. Is the force on B more or less than the force on A? ________

   c. Why?____

   d. The blobs accelerate toward the moon. Which has the greater acceleration? (A) (B)

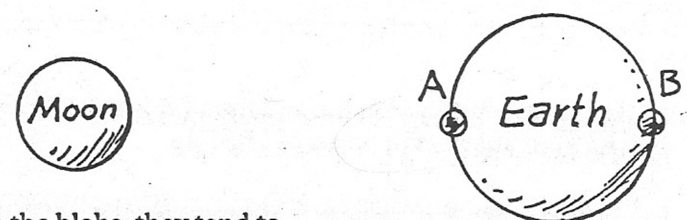
   e. Because of the different accelerations, with time (A gets farther ahead of B) (A and B gain identical speeds) and the distance between A and B (increases) (stays the same) (decreases).

   f. If A and B were connected by a rubber band, with time the rubber band would (stretch) (not stretch).

   g. This (stretching) (non-stretching) is due to the (difference) (non-difference) in the moon's gravitational pulls.

   h. The two blobs will eventually crash into the moon. To orbit around the moon instead of crashing into it, the blobs should move (away from the moon) (tangentially). Then their accelerations will consist of changes in (speed) (direction)

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).

   d. Because the earth's orbit about the sun is slightly elliptical, earth and sun are closer in December than in June. Taking the sun's tidal force into account, on a world average, ocean tides are greater in (December) (June) (no difference).

Hewitt Drew it!

Name ______________________________ Date ____________

CONCEPTUAL **Physics** PRACTICE PAGE

Mechanics Overview

1. The sketch shows the elliptical path described by a satellite about the earth. In which of the marked positions, A—D, (put S for "same everywhere") does the satellite experience the maximum . . .

   a. gravitational force?________

   b. speed? ________

   c. momentum?________

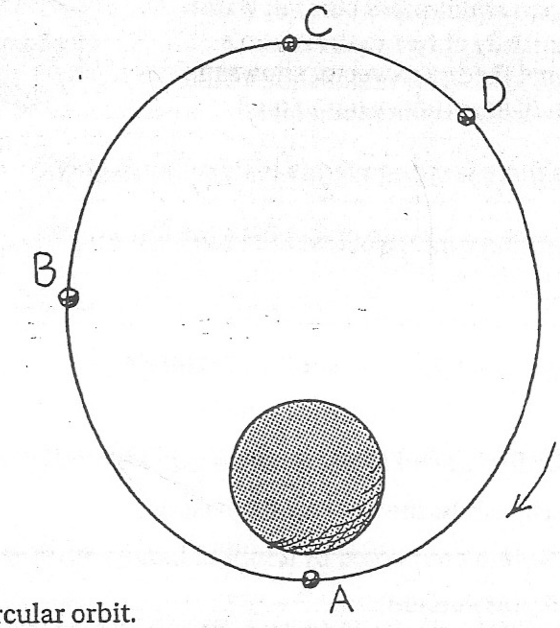
   d. kinetic energy?________

   e. gravitational potential energy?________

   f. total energy (KE + PE)?______

   g. acceleration?__________

   h. angular momentum?________



2. Answer the above questions for a satellite in circular orbit.

   a. _______ b._______ c._______ d._______ e._______ f. _______ g._______ h._______

3. In which position(s) is there momentarily no work being done on the satellite by the force of gravity? Why?

   ____

4. Work changes energy. Let the equation for work, $W = Fd$, guide your thinking on these: Defend your answers in terms of $W = Fd$.

   a. In which position will a several-minutes thrust of rocket engines pushing the satellite forward do the most work on the satellite and give it the greatest change in kinetic energy? (Hint: think about where the most distance will be traveled during the application of a several-minutes thrust?)

   ____

   b. In which position will a several-minutes thrust of rocket engines pushing the satellite forward do the least work on the satellite and give it the least boost in kinetic energy?

   ____

   c. In which positon will a several-minutes thrust of a retro-rocket (pushing opposite to the satellite's direction of motion) do the most work on the satellite and change its kinetic energy the most?

   ____

Hewitt Drew it!

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CONCEPTUAL Physics PRACTICE PAGE

Chapter 9 *Satellite Motion*

1. Figure A shows "Newton's Mountain," so high that its top is above the drag of the atmosphere. The cannonball is fired and hits the ground as shown.

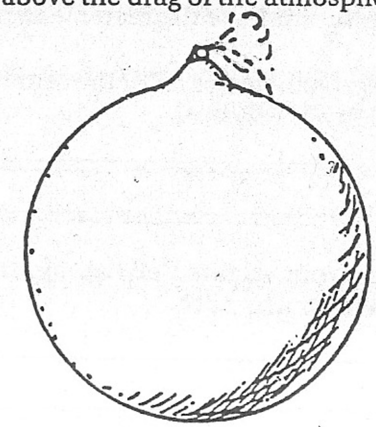

Figure A

   a. You draw the path the cannonball might take if it were fired a little bit faster.

   b. Repeat for a still greater speed, but still less than 8 km/s.

   c. Then draw the orbital path it would take if its speed were 8 km/s.

   d. What is the shape of the 8 km/s curve?

   ____

   e. What would be the shape of the orbital path if the cannonball were fired at a speed of about 9 km/s?

   ____

2. Figure B shows a satellite in circular orbit.

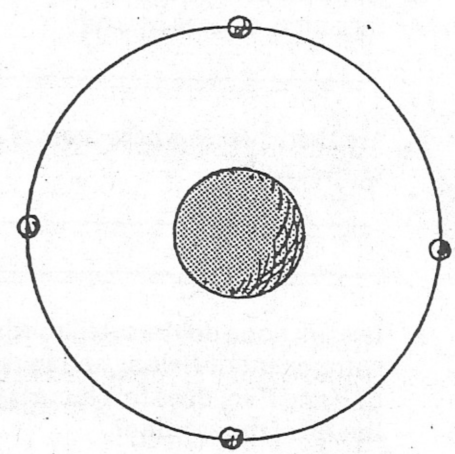

Figure B

   a. At each of the four positions draw a vector that represents the gravitational *force* exerted on the satellite.

   b. Label the force vectors *F*.

   c. Then draw at each position a vector to represent the *velocity* of the satellite at that position, and label it *V*.

   d. Are all four *F* vectors the same length? Why or why not?

   ____

   e. Are all four *V* vectors the same length? Why or why not?

   ____

   f. What is the angle between your *F* and *V* vectors? ______________

   g. Is there any component of *F* along *V*? ______________

   h. What does this tell you about the work the force of gravity does on the satellite?

   ____

   i. Does the KE of the satellite in Figure B remain constant, or does it vary? ______________

   j. Does the PE of the satellite remain constant, or does it vary?

   ____

Hewitt Drew it!

3. Figure C shows a satellite in elliptical orbit.

   a. Repeat the procedure you used for the circular orbit, drawing vectors *F* and *V* for each position, including proper labeling. Show equal magnitudes with equal lengths, and greater magnitudes with greater lengths, but don't bother making the scale accurate.

   b. Are your vectors *F* all the same magnitude?
   Why or why not?

   ____

   ____

   c. Are your vectors *V* all the same magnitude?
   Why or why not?

   ____

   ____

   ____

   ____

   d. Is the angle between vectors *F* and *V* everywhere the same, or does it vary?

   ____

   e. Are there places where there is a component of *F* along *V*?

   ____

   ____

   f. Is work done on the satellite when there is a component of *F* along and in the same direction of *V* and if so, does this increase or decrease the KE of the satellite?

   ____

   g. When there is a component of *F* along and opposite to the direction of *V*, does this increase or decrease the KE of the satellite?

   ____

   ____

   ____

   h. What can you say about the sum KE + PE along the orbit?

   ____

   ____

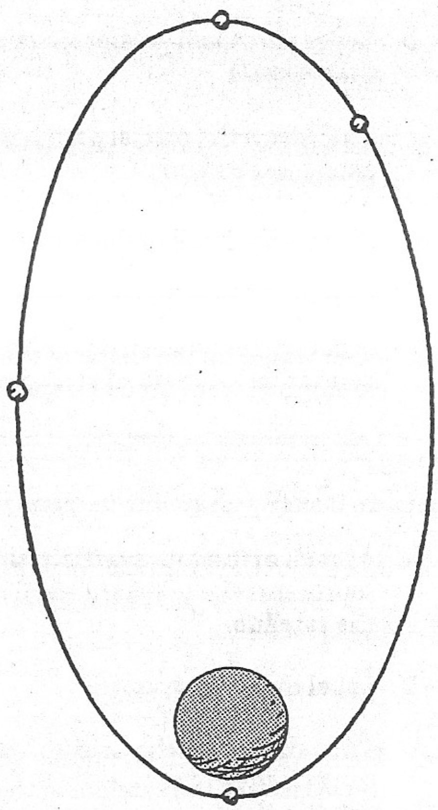

Figure C