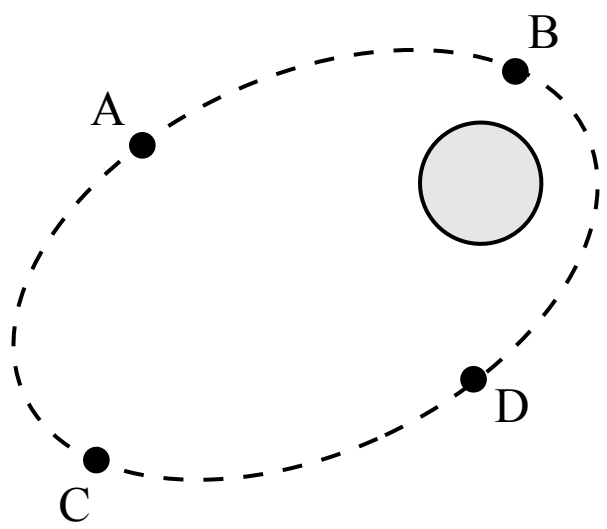
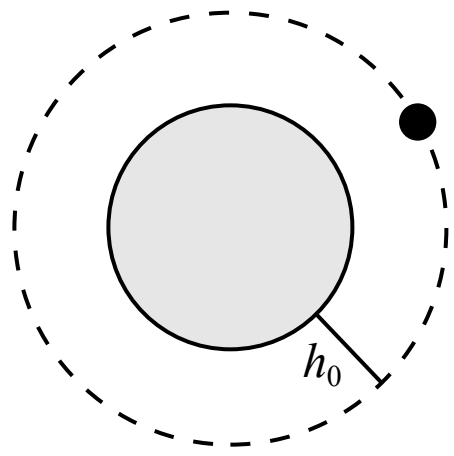
ORBITAL MOTION ENERGY



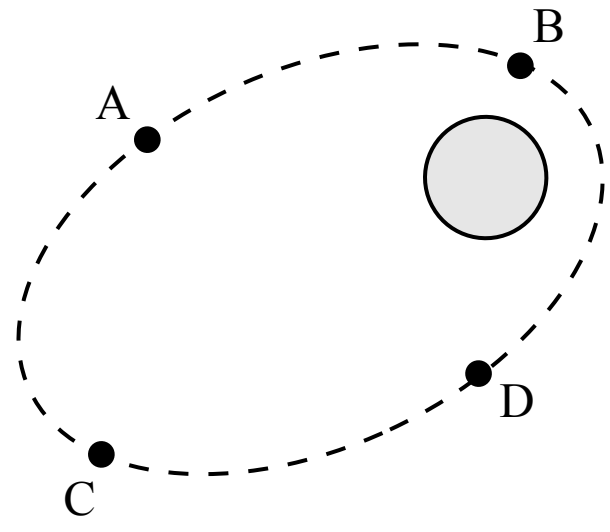
1. A satellite is orbiting a planet as shown in the figure above. At which of the points shown does the satellite have the greatest speed?

   (A) Point A
   (B) Point B
   (C) Point C
   (D) Point D



2. A satellite is in a circular orbit around the earth and moves at a constant speed. If the height of the orbit above the surface of the earth increased (and the orbit remained circular) the kinetic energy of the satellite would

   (A) decrease
   (B) increase
   (C) not change
   (D) a change in the kinetic energy cannot be determined



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(D) Point D

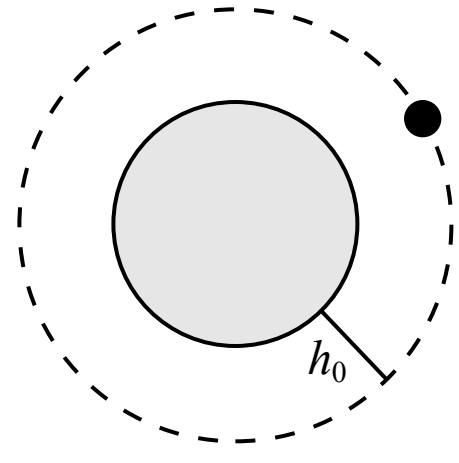
A Incorrect

B Correct

The speed of a satellite in orbit is greater when the satellite is closer to the planet that it's orbiting because the total amount of energy in the satellite-planet system is conserved. The satellite has kinetic energy and the system has gravitational potential energy. As the satellite moves closer to the planet the gravitational potential energy decreases so the kinetic energy increases and the speed of the satellite increases.

C Incorrect

D Incorrect



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A **Correct**

The satellite is in uniform circular motion around the earth and the gravitational force is acting as the centripetal force. The kinetic energy of the satellite is inversely proportional to the orbital radius.

$$F_c = F_g \qquad \frac{mv^2}{r} = \frac{GMm}{r^2} \qquad v = \sqrt{\frac{GM}{r}}$$

$$K = \frac{1}{2}mv^2 = \frac{GMm}{2r}$$

B Incorrect

C Incorrect

D Incorrect