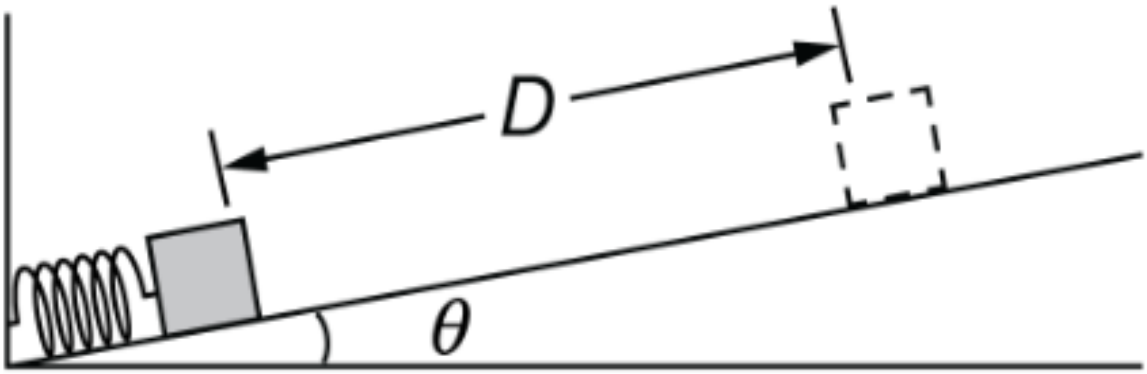
2023 AP Daily: Practice Sessions

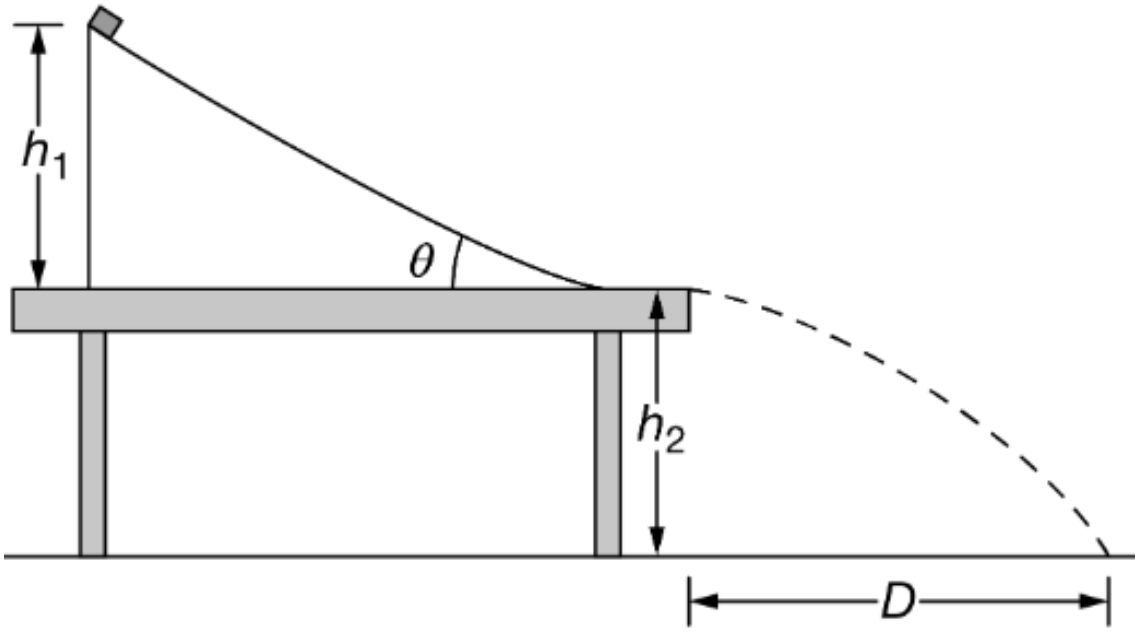
AP Physics 1

Session 1 – MCQ



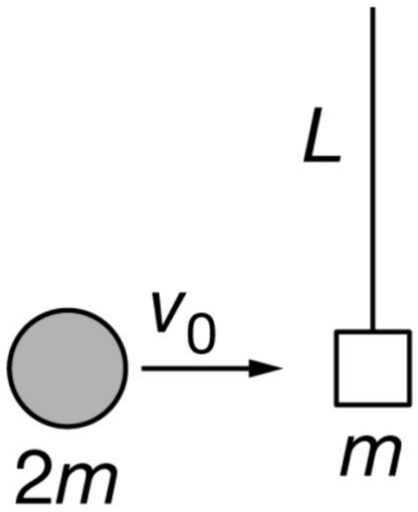
1. A Block of mass, M is at rest on a ramp that is inclined at an angle θ with respect to the horizontal. Frictional forces are considered to be nonnegligible. The block is pushed against a spring and then held in place. The spring is compressed a distance of $x1$, and the spring is not secured to the block. The block is then released from rest, travels up the incline, and comes to rest after traveling a distance D, as shown. Which of the following claims correctly describes the energy of the system under consideration from when the block compressed the spring and when the block has traveled a distance D along the incline? Select two answers.

   A. The mechanical energy of the system consisting of the spring increases by $\frac{1}{2}kx^2$.
   B. The mechanical energy of the system consisting of the block does not change.
   C. The mechanical energy of the system consisting of the block and Earth
   D. increases by more than zero but less than $\frac{1}{2}kx^2$.
   E. The mechanical energy of the system consisting of the spring, block, and Earth increases by $\frac{1}{2}kx^2$.



2. An inclined track is secured to a table. The height of the highest point of the track above the tabletop is h_1. The height from the tabletop to the floor is h_2. A block of mass *M* is released from rest and slides down the track such that all frictional forces are considered to be negligible. The block leaves the track horizontally and strikes the ground at a distance *D* from the edge of the track as shown.
   Which of the following statements is correct about the scenario? Select two answers.
   A. If the block is released from a height $2h_1$, the block will land at a distance $2D$ away from the end of the track.
   B. If the block's mass is increased to $2M$, the block will land at a distance $2D$ away from the edge of the track.
   C. The total mechanical energy of the system containing only the block increases from the moment of release to the moment it strikes the ground.
   D. The total mechanical energy of the block-Earth system remains constant.

Source: Topic Question; Taken from: AP Classroom



A clay ball of mass $2m$ is moving horizontally with speed v_0 just before colliding with a block of mass *m*, as shown above. The block is suspended from a light string with length L. The clay sticks to the block, and the block swings up to a maximum height h_0 above the block's initial position (where $h_0 < L$). The block then oscillates about its lowest position with period T_0.

Which of the following quantities is the same immediately after the collision and at the instant the block reaches height h_0?

A. Linear momentum of the clay-block system.
B. Angular momentum of the clay-block system about the top of the string.
C. Total mechanical energy of the clay-block system.
D. Total mechanical energy of the clay-block-Earth system.

Source: Topic Question; Taken from: AP Classroom