

AP[®] PHYSICS C: MECHANICS
2012 SCORING GUIDELINES

Question 2

15 points total

Distribution
of points

(a) 1 point

For choosing the meterstick and stopwatch, regardless of what else is checked

1 point

(b) 4 points

For a procedure that indicates the height needed to calculate gravitational potential energy

1 point

For a procedure that indicates distance and time measurements to calculate velocity

1 point

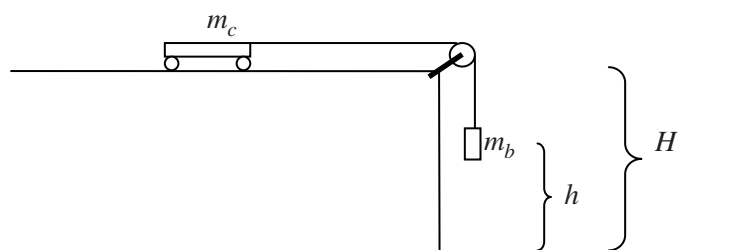
For a diagram and a clear indication of the height measurement

1 point

For a diagram and a clear indication of the distance measurement

1 point

Example #1



- Use the electronic balance to determine the mass m_c of the cart and the mass m_b of one object.
- Attach the object to the cart using the string.
- Place the cart on the track and hang the object so that the string passes through the pulley.
- Allow the object to fall a distance h from its initial position to the floor, using the meterstick to measure the distance fallen.
- Use the stopwatch to measure the time t it takes the object to fall the distance h .
- Measure the height H of the table.

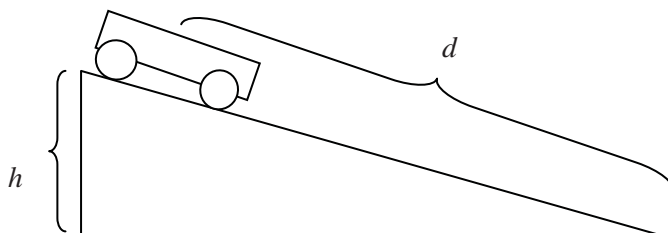
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Question 2 (continued)

Distribution
of points

(b) continued

Example #2



- Use the electronic balance to determine the mass m of the cart.
- Set the track at an incline, and measure the height h of the incline.
- Place the cart at the top of the incline, and release from rest.
- Using the stopwatch, measure the time t it takes for the cart to move down the incline.
- Measure the distance d that the cart moves down the incline.

(c) 6 points

For a clear indication of the initial potential energy of the system	1 point
For a clear indication of the final potential energy of the system	1 point
For a clear indication of the initial kinetic energy of the system	1 point
For a clear indication of the final kinetic energy of the system	1 point
For a correct calculation of the instantaneous velocity of the system	2 points

Example #1

Initial gravitational potential energy: $U_{g0} = m_c gH + m_b gh$

Final gravitational potential energy: $U_{gf} = m_c gH$

Initial kinetic energy: $K_0 = 0$

Final kinetic energy: $K_f = \frac{1}{2}(m_c + m_b)v_f^2$

Acceleration is constant, so $d = \frac{1}{2}(v_0 + v_f)t$, where d is the distance along the track.

$$v_f = \frac{2h}{t}$$

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Question 2 (continued)

**Distribution
of points**

(c) continued

Example #2

Initial gravitational potential energy: $U_{g0} = mgh$

Final gravitational potential energy $U_{gf} = 0$

Initial kinetic energy $K_0 = 0$

Final kinetic energy $K_f = \frac{1}{2}mv_f^2$

Acceleration is constant, so $d = \frac{1}{2}(v_0 + v_f)t$.

$$v_f = \frac{2d}{t}$$

(d) 2 points

For identifying a reasonable cause for the increase in energy 1 point

For a reasonable explanation related to the cause identified 1 point

Example

An unintentional push was applied to the cart, thus increasing the initial energy.

(e) 2 points

For identifying a reasonable cause for the decrease in energy related to the nonconservative forces acting on the system 1 point

For a reasonable explanation related to the cause identified 1 point

Example

Friction acting on the object decreases the speed, thereby decreasing the energy.