PHYSICS IN MOTION
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Unit 4F
Work-Energy Theorem
Impact of Friction on a Sliding Block Lab

Name:

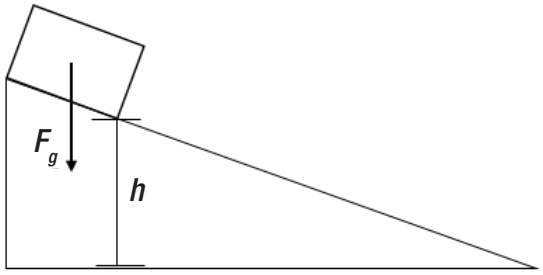
Date:

The work-energy theorem states that the amount of work done on an object is equal to the change in its kinetic energy.

$$W = \Delta KE$$
$$W = KE_f - KE_i$$
$$W = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

The force of gravity does positive work on an object moving down an inclined plane.

$$W_G = F_G d$$
$$W_G = F_G h$$



The force of friction does negative work on a sliding object, thereby reducing its kinetic energy. The work-energy theorem equation for this situation is:

$$W_G - W_f = KE_f - KE_i$$

In this lab, you will determine the amount of negative work done by friction as a wood block slides down an incline.

Materials:

- wood block
- incline
- balance
- meter stick
- timer

Procedure:

1. Find the mass of the wood block.
2. Create an incline using enough books that the block will slide to the bottom of the incline without assistance.
3. Measure the initial height of the block from the bottom of the incline.
4. Calculate the amount of work done by gravity on the block as it slides down the incline.

5. Measure the distance that the block slides along the incline.
6. Determine the time it takes for the block to reach the bottom of the incline.

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7. Calculate the final velocity of the block as it reaches the bottom of the incline, using:

$$v_{avg} = \frac{\Delta x}{t} = \frac{1}{2}(v_i + v_f)$$

8. Calculate the kinetic energy of the block as it reaches the bottom of the incline.

9. Calculate the work done by the force of friction.

Data Table:

Mass of block (kg)	
Initial velocity of block (m/s)	
Initial kinetic energy of block (J)	
Height above bottom of incline (m)	
Work done by force of gravity (J)	
Distance along incline (m)	
Time to reach bottom of incline (s)	
Final velocity of block (m/s)	
Final kinetic energy of block (J)	

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Questions to consider:

1. **Based on what you know about work, why does the force of gravity do positive work on the block?**

2. **Based on what you know about work, why does the force of friction do negative work on the block?**

3. **How does the block's amount of kinetic energy at the bottom of the incline compare to the amount of work done on the block by gravity? Explain.**

4. **If the angle of incline increases, will the amount of work done by friction increase or decrease? Explain. You may repeat the experimental procedure to gather further evidence.**

5. **If the angle of incline remains constant but the length of the incline increases, will the amount of work done by friction increase or decrease? Explain. You may repeat the experimental procedure to gather further evidence.**