10.3 Work Done By Nonconservative Forces

**Announcements and Upcoming Events**

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<td>Practice Problems (1-10)</td>
<td>Power Stair labs are in PowerSchool</td>
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**Work Done By Nonconservative Forces**

<table>
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<th>Learning Target</th>
<th>Description</th>
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<td>10.3</td>
<td>I can analyze and solve problems involving the Law of Conservation of Energy and the work done by nonconservative forces.</td>
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**MAPPING IT OUT!**

**VOCABULARY**
- Conservative forces
- Energy
- Gravitational potential energy
- Kinetic energy
- Law of conservation of energy
- Nonconservative forces
- Power
- Spring potential energy
- Work
- Work-energy theorem

**EQUATIONS**
- \( K = \frac{1}{2} mv^2 \)
- \( P = \frac{\Delta E}{\Delta t} \)
- \( \Delta E = W = Fd \cos \theta \)
- \( \Delta U_g = mg \Delta y \)
- \( \Delta U = \frac{1}{2} kv^2 \)

**Working Relationships**

\[
W_{\text{total}} = W_c + W_{nc}
\]

\[
W_{\text{total}} - W_c = W_{nc}
\]

\[
W_{\text{total}} = \Delta K
\]

\[
W_c = -\Delta U
\]

\[
\Delta K + \Delta U = W_{nc} = \Delta E
\]

**Conservation of Energy**

- Height: 0.0 m
- Speed: 0.0 m/s
10.3 Work Done by Nonconservative Forces

Deep in the forest, a 17.0-g leaf falls from a tree and drops straight to the ground. If its initial height was 5.30 m and its speed on landing was 1.3 m/s, how much nonconservative work was done on the leaf?

\[
W = mg\Delta h + W_{nc}
\]

\[
mgh + W_{nc} = \frac{1}{2}mv^2 - mgh
\]

\[
W = -0.87\text{ J} = Fd\cos180
\]

A block of mass \(m_1 = 2.40\text{ kg}\) is connected to a second block of mass \(m_2 = 1.80\text{ kg}\), as shown here. When the blocks are released from rest, they move through a distance \(d = 0.500\text{ m}\), at which point \(m_2\) hits the floor. Given that the coefficient of kinetic friction between \(m_1\) and the horizontal surface is \(\mu_k = 0.450\), find the speed of the block just before \(m_2\) lands.

9. A 95.0-kg diver steps off a diving board and drops in the water 3.00 m below. At some depth \(d\) below the water’s surface, the diver comes to rest. If the nonconservative work done on the diver is \(W_{nc} = -5120\text{ J}\), what is the depth, \(d\)?

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11. A block of mass \(m_1 = 2.40\text{ kg}\) is connected to a second block of mass \(m_2 = 1.80\text{ kg}\), as shown here. When the blocks are released from rest, they move through a distance \(d = 0.500\text{ m}\), at which point \(m_2\) hits the floor. Given that the coefficient of kinetic friction between \(m_1\) and the horizontal surface is \(\mu_k = 0.450\), find the speed of the block just before \(m_2\) lands.