As shown in the figure below, a box of mass $m = 31.0 \text{ kg}$ is sliding along a horizontal frictionless surface at a speed $v_i = 7.20 \text{ m/s}$ when it encounters a ramp inclined at an angle of $\theta = 27.6^\circ$. The coefficient of kinetic friction between the ramp and the box is $\mu = 0.0704$ and the box slides a distance $d$ up the ramp before coming momentarily to rest.

(a) Determine the distance the box slides up the ramp before coming momentarily to rest. 

(b) Determine which of the following statements is most correct about the box traveling up the ramp and coming momentarily to rest.

- $W_{\text{Net}} = \Delta KE$
- $W_g = -\Delta P E_g$
- $W_{\text{Net}} = W_{\text{cons}} + W_{\text{noncons}}$
- $\Delta E = W_{\text{noncons}}$
- $\Delta E = \Delta KE + \Delta PE$
- all of these
2. −/1 pointsOSColPhys1 7.P.036.WA.

A 67-kg boy is surfing and catches a wave which gives him an initial speed of 1.6 m/s. He then drops through a height of 1.58 m, and ends with a speed of 8.5 m/s. How much nonconservative work was done on the boy?

\[ \text{kJ} \]

**Supporting Materials**

- Physical Constants

**Additional Materials**

- Reading

3. −/1 pointsOSColPhys1 7.P.042.WA.

As shown in the figure, a 1.5-kg box is held at rest against a spring with a force constant \( k = 675 \) N/m that is compressed a distance \( d \). When the box is released, it slides across a surface that is frictionless, except for a rough patch that has a coefficient of kinetic friction \( \mu_k = 0.40 \) and is 6.0 cm in length. If the speed of the box is 3.0 m/s after sliding across the rough patch, determine the initial compression \( d \) of the spring.

\[ \text{cm} \]

**Supporting Materials**

- Physical Constants

**Additional Materials**

- Reading
4. --/2 pointsOSColPhys1 7.P.046.WA.

A 2.1-kg box is sliding along a frictionless horizontal surface with a speed of 1.8 m/s when it encounters a spring.

(a) Determine the force constant of the spring, if the box compresses the spring 4.8 cm before coming to rest.

\[ N/m \]

(b) Determine the initial speed the box would need in order to compress the spring by 1.2 cm.

\[ m/s \]

Supporting Materials

Physical Constants

Additional Materials

- Reading

5. --/1 pointsOSColPhys1 7.P.051.WA.

The specialty of an athlete on the women’s track team is the pole vault. She has a mass of 44 kg and her approach speed is 9.2 m/s. When she is directly above the bar, her speed is 1.9 m/s. Neglecting air resistance and any energy absorbed by the pole, determine the amount she has raised herself as she crosses the bar.

\[ m \]

Supporting Materials

Physical Constants

Additional Materials

- Reading
Children slide down a frictionless water slide that ends at a height of 1.80 m above the pool. If a child starts from rest at point A and lands in the water at point B, a horizontal distance $L = 2.55$ m from the base of the slide, determine the height $h$ of the water slide.

[Diagram of a child sliding down a frictionless water slide from point A to point B, with the height differences marked as 1.80 m and $h$.]