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19/20

Unit C Unit Assignment pt. B: work & energy

1/1 1. $W = \vec{F}\vec{d}$ or $W = \vec{F}\vec{d}$

$W = (N)(d)$ $W = \vec{a}m\vec{d}$

$W = N \cdot d$ $W = (m/s^2)(kg)(m)$

$W = m^2/s^2 \cdot kg$

2/3 2. a) ✓

$E_p = m\vec{g}\vec{h}$

$E_p = (0.17\,kg)(9.81\,m/s^2)(0.65\,m)$

$E_p = 1.08\,J$ ✓

b) $E_p = m\vec{g}\vec{h}$

$E_p = (0.17\,kg)(9.81\,m/s^2)(1.12\,m + 0.65\,m)$

$E_p = 2.95$

c) ✗ LD is correct - Roger used the height from the top of table, when he should have used the height from the ground to the hockey puck to calculate the potential energy.

They are both correct. They are just using different reference points.

2/2 3. Ashley is correct - when talking about the energy that an object has when it is held above the earth's surface, it is called gravitational potential energy, as the energy is obtained / transferred from the energy it takes to resist the force of gravity. If it is not called gravitational potential, it could be mistaken ✓ for elastic potential energy, which is a different concept.

2/2 4. a) ✓ $E_k = \frac{1}{2}mv^2$

$E_k = \frac{1}{2}(2.6 \times 10^8\,kg)(2.0 \times 10^4\,m/s)^2$

✓ $E_k = 5.2 \times 10^{16}\,J$

b) $5.2 \times 10^{16}\,J / 4.6 \times 10^9\,J/t = t$

$1.1 \times 10^7 = t$

it has 1.1×10^7 tonnes of energy

3/3 5. $E_p = \frac{1}{2}kx^2$ ✓

$45.03 = \frac{1}{2}(750\,N/m)x^2$

2/2 8. a) ✓ $E_{mech} = mg\vec{h} + E_K$

$E_M = (2.0kg)(9.81m/s^2)(8.0m) + 0$

$E_M = 156.96J$

$E_m = E_p + E_k$

$(156.96J) = mg\vec{h} + E_K$

$(156.96J) = (2.0kg)(9.81m/s^2)(7.0m) + E_K$

$(156.96J) = (137.34J) + E_K$

$(156.96J) - (137.34J) = E_K$

$19.62J = E_K$

$19.62J = 1/2 mv^2$

$19.62J = 1/2(2.0kg)v^2$

$\sqrt{\frac{19.62J}{1/2(2.0kg)}} = v$

$4.4 m/s = v$

b) ✓ At both places, the mechanical energy will always be 1.6×10^2 J.

* Mechanical energy is the TOTAL energy present in a system ∴ does not change.

1/1 9. $P = \frac{W}{\Delta t}$

$P = \frac{\vec{F}\vec{d}}{\Delta t}$

$P = \vec{F}v$

$(9500 W) = \vec{F}(25.0m/s)$

$\frac{(9500W)}{(25.0m/s)} = \vec{F}$

$380N = \vec{F}$

4/4 10. a) $\Delta E_{pB} = \Delta E_{kB} + \Delta E_{kA} + \Delta E_{pA}$

$mg\vec{h} = 1/2mv^2 + 1/2mv^2 + E_{pA}$

$(5.50kg)(9.81m/s^2)(1.5m) = 1/2(5.50kg)(3.0m/s)^2 + 1/2(4.50kg)(3.00 m/s)^2 + E_{pA}$