Physics

Solutions to "old" test

Work/Energy / Impulse / Momentum

1. $\text{Power} = \frac{\text{work}}{\text{time}}$

$W = Fd$

$= (800 \cos 60)(17)$

$= 6800 \text{ J}$

$P = \frac{W}{t} = \frac{6800 \text{ J}}{12 \text{ sec}} = 567 \text{ watts}$

2.

$$\text{efficiency} = \frac{W_{output}}{W_{input}} \times 100\%$$

$$= \frac{200\,J}{265\,J} * 100\%$$

$$\text{eff} = 75\%$$

3.

$150\ w = 150\ J/s$

Energy is the number of joules used in the time of operation.

$E = 150\ J/s \times 24\ hours \times 60\ \frac{min}{hr} \times 60\ \frac{sec}{min}$

$E = 12\ 960\ 000\ J$

4.

① ②

PE = 250 J

KE = 900 J

TE 1150 J

height trides

∴ Pf → 3x

PE = mgh

PE = 250 × 3

= 750 J

↑

This value remains constant

TE 1150

PE - 750

KE 400 J

5.

$$F\Delta t = m(v_2 - v_1)$$

No change if crumple or not

Δt ↑

The force is what people in the car feel.

6.

$$j = \Delta p = m(v_2 - v_1) = F\Delta t$$

$$j = m(v_2 - v_1)$$

$$= 15\,(0 - 10)$$

$$\boxed{j = -150\ \text{kg}\cdot\text{m/s}}$$

7.

$$F\Delta t = m(v_2 - v_1)$$

$$F = \frac{m(v_2 - v_1)}{\Delta t}$$

$$F = \frac{0.8(-10-4)}{0.05}$$

$$\boxed{F = -224\ N}$$

opposite to the direction the ball was originally moving!

8. Momentum Before = Momentum After

Bullet + SM = Bullet + SM

$(0.01)(900) + 104(0) = (0.01)(-2) + 104\,v$

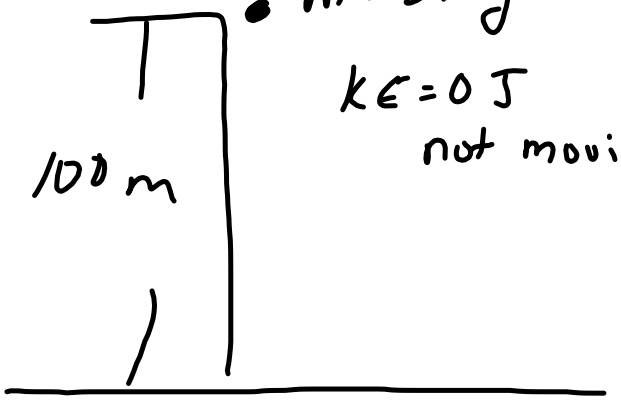
$9 + 0 = -0.02 + 104v$

$9.02 = 104\,v$

$+0.087\ m/s \approx v$

In the original direction of the bullet.

9.



$PE = mgh$

$= 2(9.81)(100)$

$= 1926\ J$

↑ Also, the Total Energy

$KE = \frac{1}{2}mv^2$

$1926 = \frac{1}{2}(2)v^2$

$44.3 = v$ m/s ↓

10. $F = 8.2\ N$
$m = 0.40\ kg$
$x = 0.43\ m$

$F = kx$

$k = \frac{F}{x} = \frac{8.2}{0.43}$

$k = 19\ N/m$

$E_e = \frac{1}{2} k x^2$
$= \frac{1}{2}(19)(0.43)^2$
$= 1.8\ J$

$PE = mgh$
$= 0.4(9.81)(18.43)$
$= 72\ J$

$TE = 73.8\ J$

$KE = \frac{1}{2}mv^2$

$73.8 = \frac{1}{2}(0.4)v^2$

$v = 19.2\ m/s \downarrow$