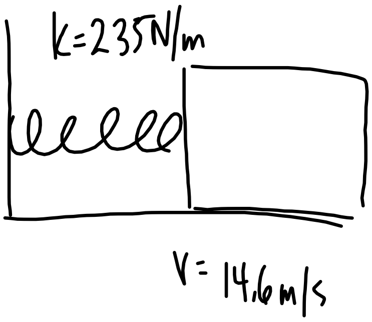
PP|296



a) If you do 50.0J of work to stretch the spring, then the max elastic potential energy is 50.0J and the maximum kinetic energy is 50.0J.

$W = 50.0J$

a) $m = ?$

b) $x_{max} = ?$

c) $x = ?$ when $v = 5.00 m/s$

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

$$50.0J = \frac{1}{2}m\left(14.6\frac{m}{s}\right)^2$$

$$100J = m\left(14.6\frac{m}{s}\right)^2$$

$$m = \frac{100J}{\left(14.6\frac{m}{s}\right)^2}$$

$$\boxed{m = 0.469\ kg}$$

b)

$$E_e = \frac{1}{2}kx^2$$

$$50.0J = \frac{1}{2}\left(235\frac{N}{m}\right)x^2$$

$$100J = \left(235\frac{N}{m}\right)x^2$$

$$x^2 = \frac{100J}{235N/m}$$

$$x = \pm 0.652m$$

$\therefore$ the amplitude is 65.2cm

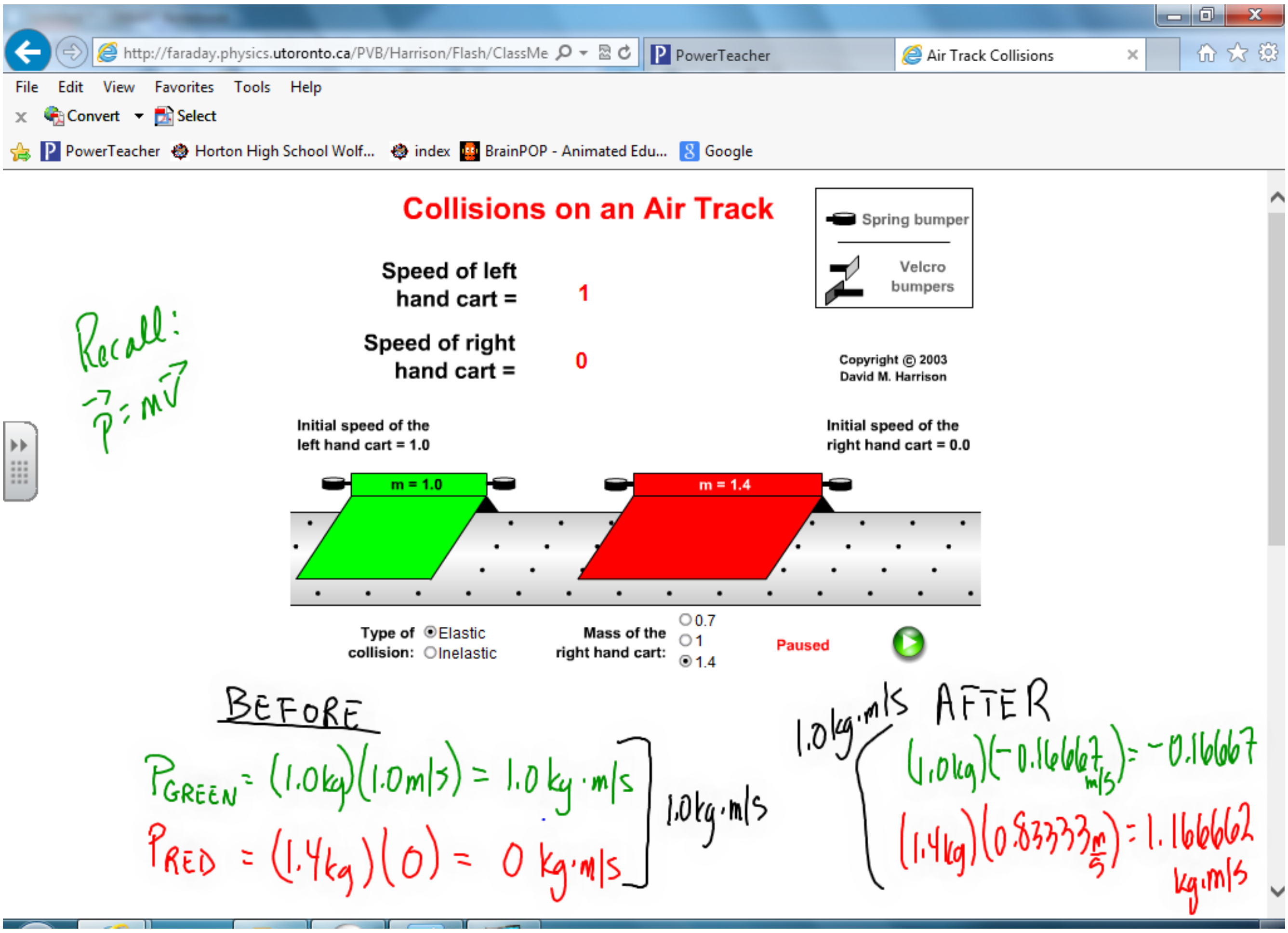
c)

$$E_{TOTAL} = E_e + E_k$$

$$50.0J = \frac{1}{2}kx^2 + \frac{1}{2}mv^2$$

⋮

v



Recall: $\vec{p} = m\vec{v}$

BEFORE

$p_{GREEN} = (1.0\,kg)(1.0\,m/s) = 1.0\,kg \cdot m/s$

$p_{RED} = (1.4\,kg)(0) = 0\,kg \cdot m/s$

$1.0\,kg \cdot m/s$

AFTER

$1.0\,kg \cdot m/s$

$(1.0\,kg)(-0.166667\,m/s) = -0.166667$

$(1.4\,kg)(0.833333\,\frac{m}{s}) = 1.166662\,kg \cdot m/s$

§7-3 Conservation of Momentum

Recall Newton's 3rd Law:

$$\vec{F}_A = -\vec{F}_B$$

$$\vec{F}_A \Delta t = -\vec{F}_B \Delta t$$

$$\Delta\vec{P}_A = -\vec{P}_B$$

} Recall Impulse momentum theorem.

$$\vec{P}_A' - \vec{P}_A = -(\vec{P}_B' - \vec{P}_B)$$

$$\vec{P}_A' - \vec{P}_A = -\vec{P}_B' + \vec{P}_B$$

$$\vec{P}_A' + \vec{P}_B' = \vec{P}_A + \vec{P}_B$$

$$\vec{P}_{TOTAL} = \vec{P}_{TOTAL}'$$

← Law of Conservation of Momentum. (neglecting frictional forces)

MP|313

east +
west −

	BEFORE		AFTER
	Car 1	Car 2	Car 1+2
m	1.75×10^4 kg	2.00×10^4 kg	3.75×10^4 kg
v	+5.45 m/s	0	v
p	95375 kg·m/s	0	$(3.75\times10^4\ kg)v$

$\vec{P}_{TOTAL}$ $\qquad$ $\vec{P}'_{TOTAL}$

$$\vec{P}_{TOTAL} = \vec{P}'_{TOTAL}$$

$$95375\ kg\cdot m/s + 0 = (3.75\times10^4\ kg)v$$

$$v = +2.54\ m/s$$

$$\vec{v} = 2.54\ m/s\ [east]$$

MP|316

+ forward

	BEFORE	AFTER	
	you + canoe	you	canoe
m	180kg	65kg	115kg
v	0	+0.75m/s	v
p	0	+48.75 kg·m/s	(115kg)v

$\vec{p}_{TOTAL}$ (before) $\quad \vec{p}\,'_{TOTAL}$ (after)

$$\vec{p}_{TOTAL} = \vec{p}\,'_{TOTAL}$$

$$0 = +48.75\,kg \cdot m/s + (115\,kg)v$$

$$-48.75\,kg \cdot m/s = (115\,kg)v$$

$$v = \frac{-48.75\,kg \cdot m/s}{115\,kg}$$

$$v = -0.42\,m/s$$

$$\vec{v} = 0.42\,m/s\ [backwards]$$

TO DO

1. PP|315
2. PP|317