

12. Elastic collision
 $E_i = E_f$

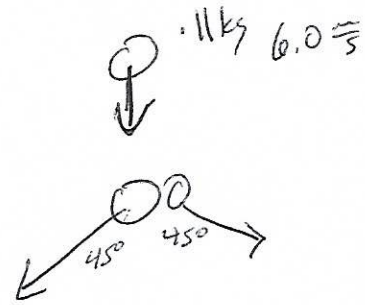
a) $\frac{1}{2} kx^2 = \frac{1}{2} mv^2$

$$\frac{1}{2} \left(\frac{1600 \text{ N}}{\text{m}} \right) (0.05 \text{ m})^2 = \frac{1}{2} (.11 \text{ kg}) v^2$$

$$v = \sqrt{\frac{1600 (0.05 \text{ m})^2}{.11 \text{ kg}}}$$

$$v = \sqrt{36.36} = \boxed{6.0 \frac{\text{m}}{\text{s}}}$$

b)



$$P_{Si} = P_{Sf}$$

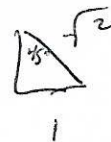
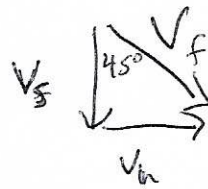
$$P_{ni} = P_{nf} \quad 0 \frac{\text{m}}{\text{s}} = 0 \frac{\text{m}}{\text{s}}$$

$$(.11 \text{ kg}) (6.0 \frac{\text{m}}{\text{s}}) = 2 (.11 \text{ kg}) v_s$$

$$\frac{(.11 \text{ kg}) (6.0 \frac{\text{m}}{\text{s}})}{2 (.11 \text{ kg})} = v_s$$

$$v_s = 3.0 \frac{\text{m}}{\text{s}}$$

$$v_f = \frac{3.0 \frac{\text{m}}{\text{s}}}{.707} = 4.26 \Rightarrow \boxed{4.3 \frac{\text{m}}{\text{s}}}$$



13. $P = \Gamma \omega$

$$\alpha = \omega^2 r$$

$$\Gamma = I \alpha$$

$$I = \frac{1}{2} m r^2$$

$$r = 0.15 \text{ m}$$

$$f = \frac{3600 \text{ rpm}}{60} = (60 \frac{\text{rev}}{\text{s}}) (2\pi) \Rightarrow 12\pi = \omega$$

$$m = 40 \text{ kg}$$

$$P = \Gamma \omega = \left(\frac{1}{2} m r^2 \right) (\omega^2 r) (\omega)$$

$$= \frac{1}{2} M r^3 \omega^3$$

$$= \frac{1}{2} (40 \text{ kg}) (.15 \text{ m})^3 (12\pi \frac{\text{rad}}{\text{s}})^3$$

$$P = 3616.57 \text{ W}$$

$$\boxed{P = 3600 \text{ W}}$$