

Answer Key

1. E $(4.52\text{kg})v = (.020\text{kg})(960\text{m/s}) \quad v = 4.25\text{m/s}$
2. C momentum and kinetic energy conservation
3. E $\{.11\text{kg}[40 - (-27)]\text{m/s}\} / 3 \cdot 10^{-3}\text{s} = 2.46 \cdot 10^3\text{N}$
4. C $2\pi \text{ rad} / (\pi/20)\text{s} = 40 \text{ rad/s}$
5. E $.65\text{m}(4\text{rev/s})(2\pi\text{rad/rev}) = 16.3\text{m/s}$ tangential
6. C $mv^2/2 + \frac{1}{2} \cdot (mR^2/2)(v/R)^2 = 3mv^2/4$
7. C $mL^2/3 = I_{\text{cm}} + m(L/2)^2 \quad I_{\text{cm}} = mL^2/12 = (.24\text{kg})(1\text{m})^2/12 = .02\text{kg} \cdot \text{m}^2$
8. E $.11(24/30)(228/150) = .134$
9. B radius decrease \rightarrow moment of inertia decrease, thus angular speed increase ($L = \text{const.}$)
10. C right hand rule
11.
 - a) $40\text{kg} \cdot \text{m}^2(-2.0\text{rad/s}) = -80\text{kg} \cdot \text{m}^2/\text{s}$
 - b) $60\text{kg} \cdot \text{m}^2(6.0\text{rad/s}) = 360\text{kg} \cdot \text{m}^2/\text{s}$
 - c) $360\text{kg} \cdot \text{m}^2/\text{s} - 80\text{kg} \cdot \text{m}^2/\text{s} = (60+40)\text{kg} \cdot \text{m}^2 \cdot \omega \quad \omega = 2.8\text{rad/s}$
 - d) $40\text{kg} \cdot \text{m}^2(-2.0\text{rad/s})^2/2 + 60\text{kg} \cdot \text{m}^2(6.0\text{rad/s})^2/2 - 100\text{kg} \cdot \text{m}^2(2.8\text{rad/s})^2/2 = 768\text{J}$
12.
 - a) $90.5\text{kg} \cdot \mathbf{v}_A = .200\text{kg}(-21.5\text{m/s})\mathbf{i} = -4.30\text{kg} \cdot \text{m/s} \cdot \mathbf{i} \quad \mathbf{v}_A = -.0475\text{m/s} \cdot \mathbf{i}$
 - b) $(90.5 + .200)\text{kg} \cdot \mathbf{v}_B = 4.30\text{kg} \cdot \text{m/s} \cdot \mathbf{i} \quad \mathbf{v}_B = .0474\text{m/s} \cdot \mathbf{i}$
 - c) $4.30\text{kg} \cdot \text{m/s} \cdot \mathbf{i} = 90.5\text{kg} \cdot \mathbf{v}_{B'} - 4.30\text{kg} \cdot \text{m/s} \cdot \mathbf{i} \quad \mathbf{v}_{B'} = .0950\text{m/s} \cdot \mathbf{i}$
 - d) $-4.30\text{kg} \cdot \text{m/s} \cdot \mathbf{i} - 4.30\text{kg} \cdot \text{m/s} \cdot \mathbf{i} = 90.7\text{kg} \cdot \mathbf{v}_{A'} \quad \mathbf{v}_{A'} = -.0948\text{m/s} \cdot \mathbf{i}$