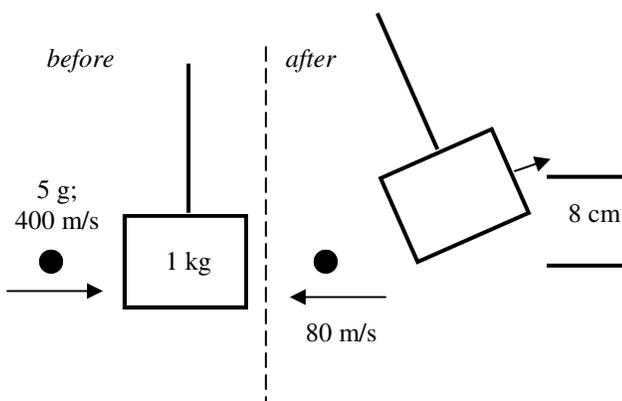
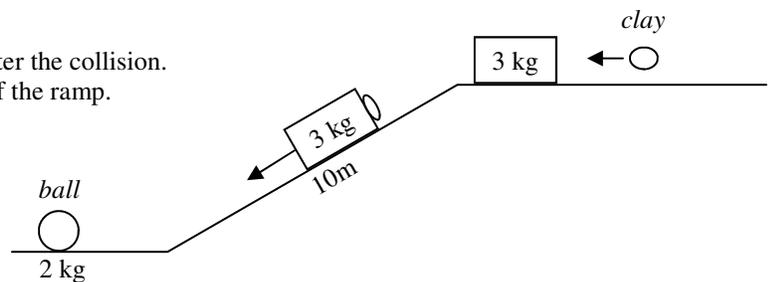


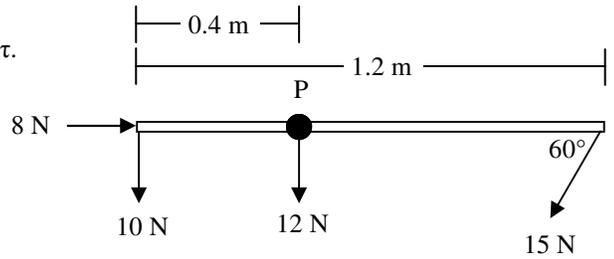
**PreAP: Due 12\_3** Do your work on another piece of paper, if necessary.

- 1) What kind of collision: elastic, inelastic, perfectly inelastic?
  - A) \_\_\_ The two objects stick together.
  - B) \_\_\_ The two objects don't stick together.
  - C) \_\_\_ Kinetic energy is conserved.
  - D) \_\_\_ The experiment cars with the Velcro sides towards each other.
  - E) \_\_\_ The experiment cars with the magnets towards each other.
  - F) \_\_\_ Some  $E_k$  is lost.
  
- 2) Yes, No, or Maybe? (And give reasons why.)
  - A) \_\_\_ In a noisy collision  $E_k$  is conserved.
  - B) \_\_\_ A small force can produce the same change of momentum as a large force.
  - C) \_\_\_ If an object is thrown by a person momentum is conserved.
  - D) \_\_\_ Two moving objects have a net momentum of zero.
  
- 3) Book Ch6: #8, 9, 20,
  
- 4) Give an example of momentum NOT being conserved.
  
- 5) Give an example of there being MORE kinetic energy after a collision than before.
  
- 6) A 12 kg object going 4 m/s strikes a wall and bounces back going 3 m/s. If the wall exerts a 120 N force,
  - A) How long was the object in contact with the wall?
  - B) How much kinetic energy was lost?
  - C) Where did this lost energy go?
  - D) What kind of collision was it?
  
- 7) An 85 kg person fires a 5 g bullet from a gun. The bullet is shot with an initial velocity of 425 m/s.
  - A) If the person is standing on roller blades, how fast does the person move backwards?
  - B) If the bullet hits an 85 kg stuntman (also on roller blades [wearing a bullet proof, Kevlar vest, of course]), how fast does the 85 kg stuntman move backwards?
  - C) In movies people are shot with bullets and fly backwards from the bullet striking them. How does this happen?
  
- 8) A 3 kg block of wood is at rest at the top of a frictionless, 10 m long ramp inclined at  $30^\circ$ . The block is struck by a 1 kg piece of clay going 5 m/s. The clay sticks to the block. The block slides down the ramp.
  - A) What kind of collision is this?
  - B) Find the velocity of the block and clay combination after the collision.
  - C) Find the velocity of the block and clay at the bottom of the ramp.
  - D) At the bottom of the ramp the block hits a 2 kg ball. After striking the ball the block is still going 0.5 m/s. How fast is the ball going?



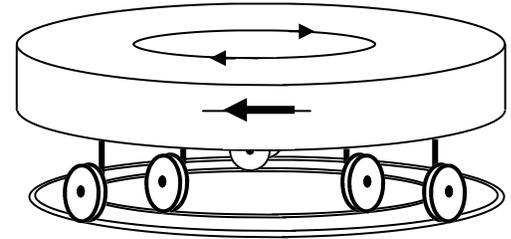
- 9) A 5 g bullet is moving 400 m/s (smokin!). It strikes a stationary 1 kg metal ballistic pendulum and is ricochets backwards going 80 m/s.
  - A) How fast is the pendulum moving after the collision?
  - B) How fast is the pendulum moving when it has raised up 8 cm?
  - C) Is the collision elastic, inelastic, or perfectly inelastic (give proof).
  
- 10) For the ballistic pendulum problem above, how does the total momentum before compare with the total momentum afterwards?

- 11) From the diagram at the right, the pivot point is at letter "P".
- Which forces give no  $\tau$ ?
  - 100% of this force gives  $\tau$ .
  - Which force gives positive  $\tau$ ?
  - Which give negative  $\tau$ ?
  - Find the net  $\tau$ .



- 12) Given:  $\omega$ ;  $v_t$ ;  $\alpha$ ;  $s$ ;  $\theta$ ;  $a_t$ .
- Which ones are radius dependent?
  - Which ones are radius independent?
  - Has units of m/s.
  - Has units of radians.
  - Has units of  $\text{rad}/\text{sec}^2$
  - Has units of m
  - Has units of  $\text{rad}/\text{sec}$
  - Has units of  $\text{m}/\text{s}^2$

- 13) Use the graphic of the rotating platform at the right to answer the following .  
Answer: I (Inside wheels); O (outside wheels); N (neither or both).



*A platform turning clockwise,  
when viewed from above.*

- Which has the greatest radius?
- Which have the fastest tangential speed?
- If it comes to rest, which have the fastest angular acceleration?
- Which travels the least arc length?
- Which has the smallest radius?
- Which have the fastest angular speed?
- As it starts rotating, which has the slowest tangential acceleration?
- Which have the slowest tangential speed?
- Which travel the greatest angular displacement?
- Which have the slowest angular velocity?
- When it slows, which have the greatest tangential acceleration?
- Which travel the largest arc length?

14) A) Convert 3 revolutions to radians.

B) Convert 20 rpm (rev per min) to  $\text{rad}/\text{sec}$ .

*The following two columns are designed to help you see the correlations between linear and rotational quantities and equations. Remember that **all angles in the equations must be in radians!** Calculate out all numbers (don't leave as fractions).*

15) A car travels 240 meters in 12 seconds. Find the velocity of the car.

16) A car going 300 m/s slows to 100 m/s in 10 seconds. Find the acceleration of the car.

17) A car going 20 m/s stops in 80 meters. How long did it take to stop?

18) A box sliding down a hill going 3 m/s accelerates at  $2 \text{ m}/\text{s}^2$ . How fast is going after 4 seconds?

19) A wheel rotates 2 revolutions in 3 seconds. Find the angular velocity of the wheel.

20) A wheel spinning 8  $\text{rad}/\text{sec}$  slows to 2  $\text{rad}/\text{sec}$  in 3 seconds. Find the angular acceleration of the wheel.

21) A wheel turning 3 rev per second stops in 6 revolutions. How long did it take to stop?

22) A wheel turning 2  $\text{rad}/\text{sec}$  accelerates at  $3 \text{ rad}/\text{sec}^2$ . How fast is it spinning after 5 seconds?