B-Day: Due Wed., Dec 8
A-Day: Due Thur., Dec 9

2010 PreAP Momentum 2

1) * A 6 kg object speeds up from 5 m/s to 20 m/s. Find Δp.

2) A 10 kg object slows down from 25 m/s to 5 m/s. Find Δp.

3) * What is the impulse for Q1 above: What is the impulse for Q2 above:

4) Can an object ever have a negative kinetic energy? Why or why not?

5) Can an object ever have a negative momentum? Why or why not?

6) If an object's kinetic energy is zero, what is its momentum?

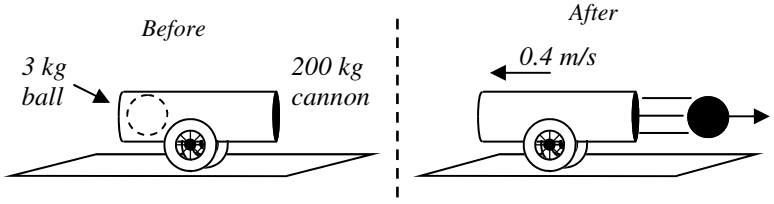
7) Use the equations at the right to answer the following questions.

A. ___ * Two objects at rest push off from each other.
B. ___ * Two people in moving bumper cars collide and bounce off.
C. ___ * A skateboarder is moving and throws something.
D. ___ A person pushes on a car that is already rolling.
E. ___ A football player catches a football.
F. ___ Two moving objects collide, stick together, and stop.

A) $p_B + I = p_A$
B) $p_{1B} + p_{2B} = p_{1A} + p_{2A}$
C) $p_{1B} + p_{2B} = p_{1+2A}$
D) $p_{1+2B} = p_{1A} + p_{2A}$
E) $p_{1B} + p_{2B} = 0$
F) $0 = p_{1A} + p_{2A}$

8) * If the net momentum before equals the net momentum after, is there an external impulse?

9) A 2 kg object going 30 m/s feels a −4 N force for 8 seconds, find the object's final velocity.
Conservation of Momentum Equation: Solve:



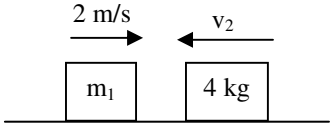
10) A 3 kg cannonball is shot from a 200 kg cannon. The cannon recoils backwards at 0.4 m/s backwards. What is the velocity of the ball after it is shot?

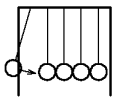
A. Since the ball is sitting in the cannon, beforehand, what is the initial velocity of the cannon and ball?

B. What is the net momentum before?

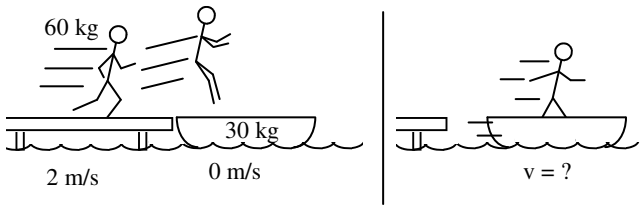
C. Since momentum MUST be conserved, how much total momentum must there be afterwards?
E. Is the final velocity of the cannon + or −?
F. * Under the diagram, solve for the final velocity of the ball.

11) What is the net momentum of the two objects shown? (*Your answer will have variables in it.*)

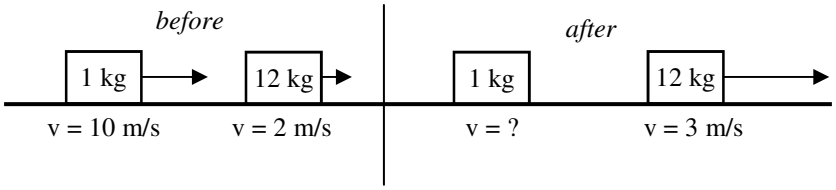




Type of Collision	Momentum	Kinetic Energy	Objects Combine?	Example
Elastic	Conserved	Conserved ($\Sigma KE_B = \Sigma KE_A$)	No	Pool balls/ Newton's Cradle (see above)
Inelastic	Conserved	Not conserved	No	Bullet goes something, cars hit each other, there is damage.
Perfectly Inelastic	Conserved	Not conserved	Yes	Catching a ball; arrow sticks into a target



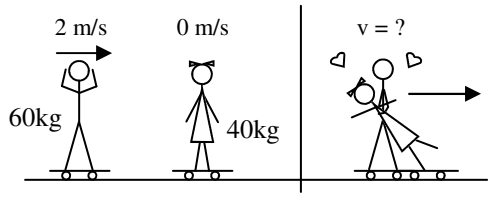
12) Slim Jim is running 2m/s on the dock and jumps into a boat. How fast is Jim and the boat moving afterwards?
A. How much momentum is there before?
B. How much momentum does there have to be afterwards?
C. What is the combined mass of Jim and the boat?
D. * What kind of collision is this?
E. * Under the diagram, write the conservation of momentum equation and solve for the final velocity.



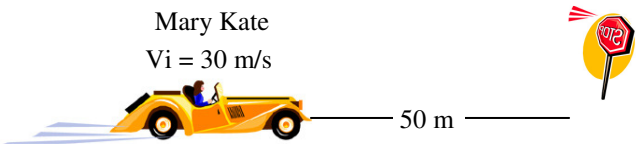
13) A 1 kg object moving 10 m/s to the right bumps into a 12 kg object moving 2 m/s to the right. Afterwards the 12 kg object is moving 3 m/s to the right.
A. * Under the diagram, calculate the final velocity of the 1 kg object.

B. Calculate the total kinetic energy before and afterwards and decide what kind of collision it was from the chart on p1.

ΣKE_{before} = ΣKE_{after} =

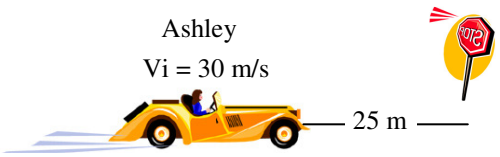


14) When Slim Jim started to learn to skate boarding, he learned very fast. On the first day, though, he lost control and "met" Slim Kim. We know Jim is 60 kg. Kim is only 40 kg. How fast are the two moving afterwards?



p_b = p_a =

Δp =

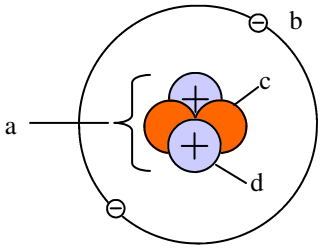


p_b = p_a =

Δp =

15) The Olsen Twins are driving identical 1,000 kg cars (*it's a twins thang*).
A. Calculate and label the initial momentum of each.
B. When they stop, what is their final momentum?
C. * Calculate and label Δp for each car.
D. Which one had a bigger change of momentum?
E. Which one took more time to stop?
F. Which one needed a bigger force to stop?
G. * Remembering that impulse (Ft) equals the change of momentum, which one had the bigger impulse?
H. * Using a kinematic equation, find the time for Mary Kate to stop.

I. * If Ashley's brakes apply 18,000 N of force in stopping, use conservation of momentum to calculate Ashley's stopping time.



Now, getting ahead…

16) From your chemistry days and the diagram at the left.

A. ___ A proton
B. ___ An electron
C. ___ A neutron
D. ___ The nucleus

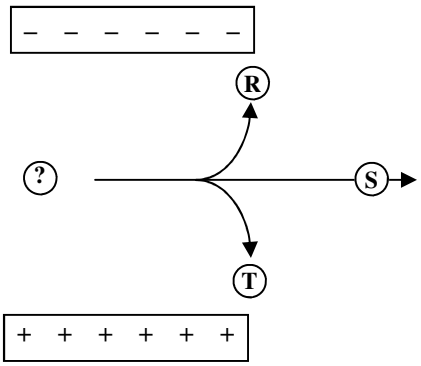
17) Opposites attract and like charges repel.
A) Two protons will:
B) Two electrons will:
C) An electron and a proton will:

18) For each of the pairs of charges, will they attract or repel each other:

A) ⊕ ⊕ Attract or Repel?

B) ⊖ ⊕ Attract or Repel?

C) ⊖ ⊖ Attract or Repel?



19) A particle is shot between two charged plates. The path the particle will take depends on its charge. Determine the charge for each path.
A. * Path R:

B. Path S:

C. Path T:

20) For the five situations below decide if they are positive (+), negative (−), or neutral (0)?

A) ____ B) ____ C) ____

D) ____ 2 protons and 4 electrons
E) ____ 18 protons and 16 electrons
F) ____ An object that loses electrons.
G) ____ An object that gains electrons.

21) A piece of rabbit fur is rubbed against a rubber rod. The rubber rod becomes negative. Did the rubber rod gain or lose electrons?

Q1: $\Delta p = p_f - p_i = 6(20) - 6(5) = 120 - 30 = 90$ kg m/s

Q3: 90 kgm/s = Impulse = Δp Q7A: F; Q7B: B; Q7C: D
Q8: No—internal impulses cancel out (= opp. forces). To Δ the net momentum it must come from outside the system: external impulse
10F: 26.7 m/s; Equation: 0 = 200(−4) + 3v
12D: Perfectly inelastic: they combine afterwards. 12E: 1.33 m/s
13A: −2m/s
15C: −30,000 kgm/s (final minus initial) 15G: same 15H: 3.33 sec 15I: Hint: $p_{before} - I = p_{after}$
19A: it is a positive charge to be attracted to the negative plate.