2008 Momentum 5

M. $p_{1B} + p_{2B} = p_{1A} + p_{2A}$

N. $p_B - I = p_A$

O. $p_{1+2B} = p_{1A} + p_{2A}$

P. $0 = p_{1A} + p_{2A}$

Q. $p_B - I = 0$

R. $p_B + I = p_A$

S. $p_{1B} + p_{2B} = p_{1+2A}$

T. $0 + I = p_A$

U. $p_{1B} + p_{2B} = 0$

1. Choose the Conservation of Momentum Equation at the left that matches the following situations. You will not use all of the equations.
   A. _____ A person moving on a rolling chair throws a medicine ball.
   B. _____ A car moving 15 m/s uses its brakes to slow down.
   C. _____ A moving object stops.
   D. _____ Pool balls collide and ricochet off each other.
   E. _____ A car starts to move.
   F. _____ A gun is fired.

   *There could be other possible equations, but these are all I could think of quickly. The following three questions will be solved with one of these equations.*

2. Slim Jim and Kim go ice skating. Standing amorously on the ice, they push off from each other. Jim is 60 kg and Kim is 40 kg. If Kim ends up moving to the right at 2 m/s. How fast is Jim moving?
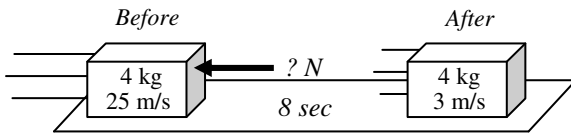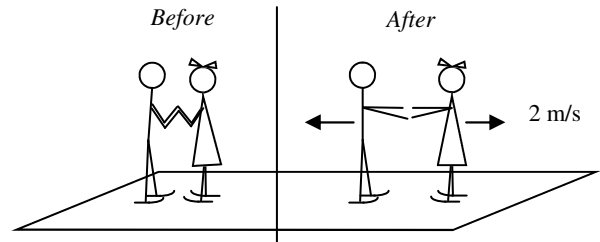
3. A 4 kg object moving 25 m/s slows down for 8 seconds to 3 m/s. Calculate the force.

4. Two objects collide as shown at the right.
   A. Calculate the final velocity of the 25 kg object.
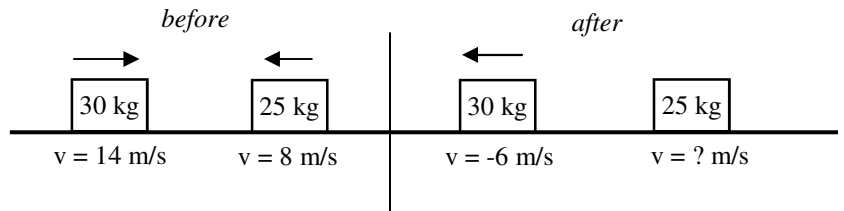
   B. Was the collision elastic or inelastic? (*Calculate the total kinetic energy before and after to decide*.)

   C. Was there a lot of sound or not during the collision?

5. Two 45 kg objects are moving 12 m/s. Object A stops by hitting a brick wall. Object B stops by running into sand.
   A. Which one felt the bigger force?
   B. Which one felt the bigger impulse?
   C. Why?

Force vs. Time
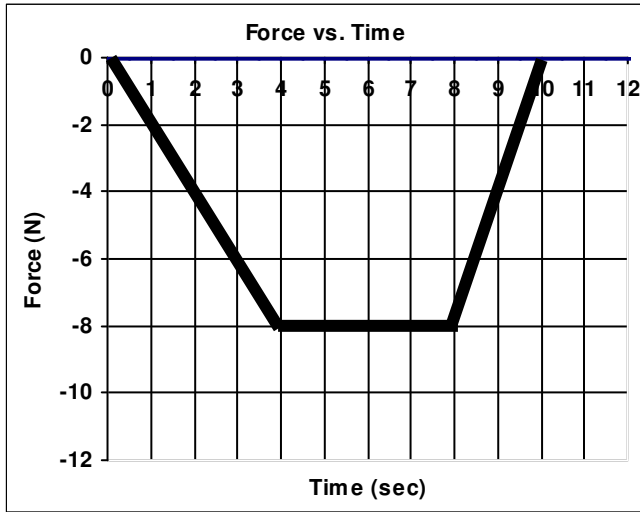
6. A. Calculate the impulse on the graph.

   B. If impulse = Δp and it ends with 220 kg m/s of momentum, how much momentum did it start with ($\Sigma p_B \pm I = \Sigma p_A$, remember)?

7. An object is launched 80 m/s at an angle of 60° from the ground to the ground. Fill in the variables for both the x and y-directions. Put "?" if unknown.

y-dir.
$a_y =$
$Vy_i =$
$Vy_f =$
$\Delta y =$
$t = 2.5$ sec

69.3 m/s
80 m/s
60°
40 m/s
?

x-dir.
$a_x =$
$Vx_i =$
$Vx_f =$
$\Delta x =$
$t =$
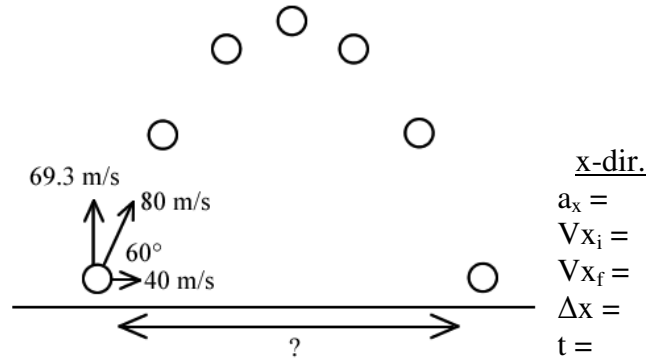
8. A 6 kg object is moving 3 m/s. It has 27 J and 18 kgm/s. After 12 N acts for 4.5 seconds and 33.75m, it is going 12 m/s. This takes 90 W and results in 2 m/s². Assign variables for the all of the above quantities.

   A. 6 kg =
   B. 3 m/s =
   C. 27 J =
   D. 18 kgm/s =

   E. 12 N =
   F. 4.5 sec =
   G. 33.75 m =
   H. 12 m/s =

   I. 90 W =
   J. 2 m/s² =

9. Slim Jim lifts a 3 kg rock 2 m above a cliff.
   A. Mark the type of energy it has at each position. (*Could be more than one.*)
   B. What kind of work or energy does Jim use to lift the object from A to B?
   C. What is the total height at B?
   D. How much energy does the 3 kg rock have at B (*label it*)?

3 kg

B

C

2 m

A

D

10 m

E

F

after
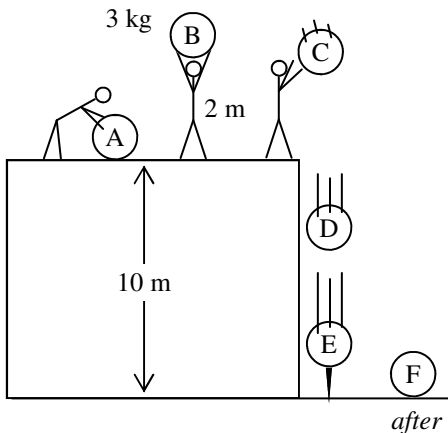
   E. How much total energy will it have at D (*label it*)?
   F. How much total energy will it have at E (*label it*)?
   G. How much total energy does it have at F (*label it*)?
   H. How much energy does it lose from E to F (*label it*)?
   I. How much work was done by the spike?
   J. If the spike is 0.4 m long, how much force did it exert on the spike?