Name: Date: Class:

Momentum and Impulse

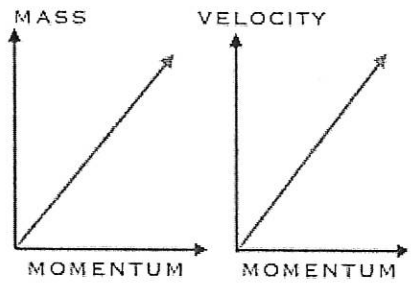
Standard units:

Mass: kilogram (kg) Distance: meter (m) Time: seconds (s)	Force: Newton (N) or (kg· m/s^2) Gravity: 9.8 m/s^2 Momentum: kg· m/s

Momentum

Momentum (p) is _____ in motion. Inertia is the tendency of an object to resist _____in motion. Momentum is the product of _____ and velocity.

Momentum (kg m/s) = m (kg) x v (m/s)



MOMENTUM INCREASES WHEN EITHER MASS OR VELOCITY INCREASE.

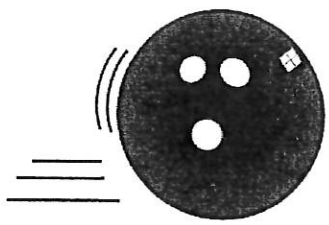
-> Which would have more momentum?

1. A car that is moving at 10 m/s or a car moving at 20 m/s? Explain.

2/ A car that is moving at 20 m/s or a car that is twice as massive that is moving at 10 m/s? Explain.

Impulse

->Which would you rather catch, a bowling ball that has fallen 1 m or a bowling ball that has fallen 10 m? Why?



Newton's 3rd Law and Momentum

EN ____

Ex. Roller skater throws a softball forwards

_____ : p=mv

What happens to colliding objects? Remember car crashes?

Conservation of momentum

The conservation of momentum can be seen in a _____. Take two pool balls with the same mass. When a moving ball hits a ball at rest, the moving ball will _____ its momentum to the ball at rest. Momentum is _____, it remains unchanged.

Net momentum _____ collision = net momentum _____ collision

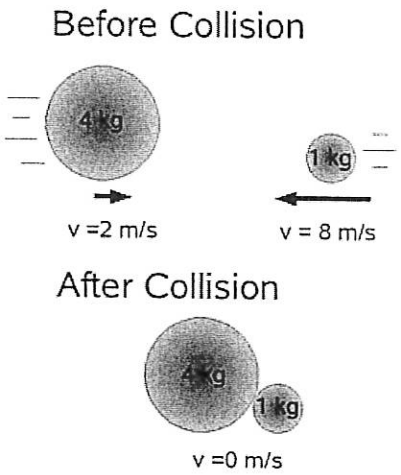
In an _____ collision, the objects will switch their momenta. In this case, when the moving ball (a) hits the resting ball (b), (a) will _____and (b) will move away at the same _____ as it was hit.

(Momentum of a + momentum of b)$_{before}$ = (Momentum of a + momentum of b)$_{after}$

p = mv p = ____ p = 0 p = mv

The collisions between _____molecules are perfectly elastic. Elastic collisions are characterized by the lack of deformation of the objects and the lack of _____ generation.

-> What would happen if ball (a) and ball (b) are both moving and have a head on collision?



In _____ collisions the colliding objects may _____ together. For example, if a moving car hits a resting car, the two cars together will have the same momentum as the moving car had before the collision.

-> Will the two cars together be moving faster or slower than the original moving car? Why?

->If you were a stunt actor, after jumping out of a window would you rather land on concrete or on an air mattress?

In order to change momentum (p) you must exert an external _____, and the longer the force is applied, the more the _____ will change. The change in p is called _____.

Impulse = force (N) x time (s)

Therefore, if we combine the equation for impulse and momentum we get:

$$Ft = \Delta mv$$

You can think of Ft as the impulse that reduces the momentum (to zero). The more time it takes to reduce the momentum, the _____ the force, while the less time it takes to reduce the momentum, the _____ the force.

$$F = \frac{\Delta mv}{T}$$

-> If you got punched, would it hurt more if you "rolled" with the punch or stood completely still? Why?

-> If you have the same momentum in a car crash whether you are wearing a seatbelt or not, then why is it a good idea to wear a seatbelt?

Bouncing one object off another will apply a _____ force on the object that is hit. When you bounce a ball on the floor, the floor must apply an impulse to stop the ball *and* to _____ it back up.

-> Breaking a stack of bricks with your bare hand.

1. Would you want your strike to last a long time or a short time? Why?

2. If your hand bounces upon impact, does the impulse increase or decrease? Why?