

Name _____ Hour _____

Momentum Notes/Problems

Momentum:

_____ : Measure of the motion of an object equal to its mass x velocity. (How hard it is to _____ something)

m= _____ in _____

v= _____ in _____

Momentum is abbreviated with the letter _____ Units = _____

(In latin, momentum is **impetus**...m and l were already taken)

Which has more momentum:

you walking down the hall or semi-truck parked outside

Ex: Calculate your momentum if you are driving down the freeway at 36 m/s and you and your car have a mass of 945.5 kg.

Force and Impulse:

In order to change an object's momentum, we need to _____

Newton's 2nd law can be used to calculate the force:

So:

or

or

F =

F Δ t =

Δ t =

M =

m Δ v =

Δ v =

When something hits with a force, we can change the _____ by cradling it to lessen the impact. (Ex. Air bag, catching someone falling with a blanket)

Ex: Calculate the impulse needed to stop a 1.7 kg water balloon if it is initially traveling at 8 m/s. (-13.6 kg m/s)

Name _____ Hour _____

1. What is the unit for momentum? _____ Impulse? _____
2. What happens to the momentum if you move faster? _____
3. If your velocity triples (and mass remains constant), what happens to your momentum? _____
4. If your mass triples (and velocity remains constant) what happens to your momentum? _____
5. Explain how an egg falling on a pillow has less force exerted on its shell than one falling on the table if they fall with the same momentum. (Think about the variables in impulse equation)

6. You (85 kg) are cruising down the freeway at 55 mph (24.6 m/s).
 - a. Calculate the force it would take to stop if you crashed and slammed into your airbag over 1.2 sec. (-1743 N)

 - b. How many g's would you experience in this crash? (2.09 g's)

 - c. Calculate the force it would take to stop if you crashed and slammed into the dashboard taking 0.018 sec to stop. (-116167 N)

 - d. How many g's would you experience in this crash? (139 g's)

7. A 0.42 kg soccer ball is moving downfield with a velocity of 12 m/s. A player kicks the ball so that it has a final velocity of 18 m/s downfield.
 - a. What is the change in the ball's momentum? (2.52 kg m/s)

 - b. Find the force exerted by the player's foot if they are in contact for 0.02 sec. (126 N)

 - c. What is the impulse on the ball? (2.52 kg m/s)

 - d. What would be the unit of impulse? _____ or _____
(There are 2 versions of this equation, so there are 2 different units that are equivalent)

8. An 82 kg man drops from rest from a diving board that is 3 m above the water and comes to rest in 0.55 sec after hitting the water. What **FORCE** did the water exert on him? (Find v first!) (1143.5 N)