Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ date \_\_\_\_\_\_\_\_\_\_\_\_ hr. \_\_\_\_\_\_\_\_\_\_

Ch. 6 – Momentum

You can read about momentum in your book but you may remember how to do this because we discussed it briefly in our force unit and even did a lab on this idea. Give it a shot!

1. Define Momentum –
2. What is the equation for momentum? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. If the mass increases, what happens to the momentum of the object?
4. If the velocity increases, what happens to the momentum of the object?

**Math problems** – Remember momentum is a vector quantity so you must have a direction as part of your answer. Show your math and units.

1. A deer with a mass of 146kg is running head on towards you with a speed of 17m/s. You are going north. Find the momentum of the deer.
2. A 21kg child on a 5.9kg bike is riding with a velocity of 4.5m/s to the northwest.
3. What is the total momentum of the child and the bike together?
4. What is the momentum of the child?
5. What is the momentum of the bike?
6. What velocity must a 1210kg car have in order to have the same momentum as a pick-up truck with a momentum of 5600kg m/s?

**Law of Conservation of Momentum**. Remember the total Momentum of all interacting objects is conserved or remains constant. Therefore, the total initial momentum (i.e. before a collision) is equal to the total final momentum (i.e. after the collision).

Check out the data below: Momentum when ball A collides with ball B, which was initially at rest

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | ***Ball*** | ***A*** |  | ***Ball*** | ***B*** |  |
|  | mass | velocity | momentum | mass | velocity | momentum |
| Before collision | 0.16kg | 4.50 m/s | 0.72kg m/s | 0.16kg | 0m/s | 0kg m/s |
| After collision | 0.16kg | 0.11 m/s | 0.018kg m/s | 0.16kg | 4.39m/s | 0.70kg m/s |

1. Calculate the total initial momentum \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Calculate the total final momentum \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What might be a reason the numbers are not exactly the same, even though they are supposed to be? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Look at the table and describe the changes in velocity for both Ball A and Ball B