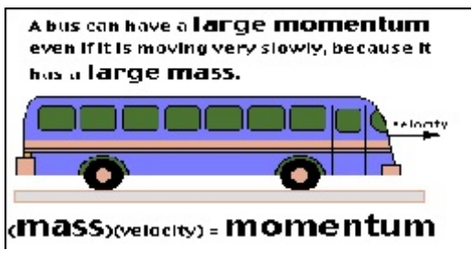
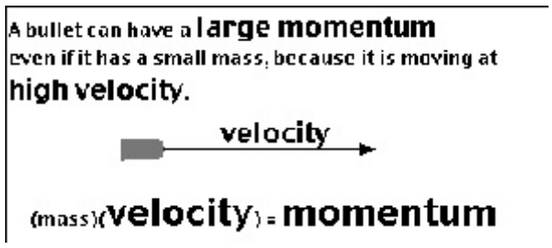
Physics 2204
Unit 2: Dynamics
Worksheet 10: Introduction to Momentum

Student Name:_____

Momentum can be defined as "mass in motion."

- dependent upon two variables:

Mass of the object (kg)	How fast the object is moving (m /s).
	

- The equation for momentum is:

Momentum = Mass (kg) x Velocity (m/s)

Or

$$\vec{p} = m \bullet \vec{v}$$

- The unit for momentum is kg*m/s
- It is a vector quantity

Example 1:

What is the momentum of a 2000 kg car that has a velocity of 12.8 m/s [E]

Example 2:

What is the velocity of a 50.0 g bullet that has a momentum of 24.74kg m/s [N]?

Example 3:

Which has the greater momentum: a 5000 kg truck traveling at 85 km/hr, or a 25 g bullet traveling at 325 m/s?

Example 4:

What must be the velocity of a 1200 kg car (in km/hr) in order that it have the same momentum as a 15 kg meteor traveling at 1000 m/s? (Both motions are directed to the right).

PART A: MULTIPLE CHOICE

Instructions: Shade the letter of the correct answer on the computer scorable answer sheet provided

1. What are the units for momentum?

(A) kg
(B) kg • m/s
(C) kg/m/s
(D) m/s

2. Which formula is correct to calculate momentum?

(A) $\vec{p} = m\vec{v}$

(B) $\vec{p} = \frac{m}{\vec{v}}$

(C) $\vec{p} = \frac{\vec{v}}{m}$

(D) $m = \vec{p} \bullet \vec{v}$

3. What is the relationship between the momentum of an object and its mass? The quantities are...

(A) Not related
(B) Equal
(C) Directly proportional
(D) Inversely proportional

4. What is the relationship between the momentum of an object and its velocity? The quantities are...

(A) Not related
(B) Equal
(C) Directly proportional
(D) Inversely proportional

5. What is the momentum of a car with a mass of 1000 kg moving to the East at 2.0 m/s?

(A) 0.002 kg m/s
(B) 1002 kg m/s
(C) 2000 kg m/s
(D) 4000 kg m/s

6. A ball moving at 20.0 m/s has a momentum of 0.2 kg m/s. What is its mass?

(A) 0.01 kg
(B) 4 kg
(C) 40 kg
(D) 100 kg

7. Which object has the greatest momentum?

(A) 1.0 kg mass moving at 6.0 m/s
(B) 2.0 kg mass moving at 4.0 m/s
(C) 5.0 kg mass moving at 2.0 m/s
(D) 7.0 kg mass moving at 1.0 m/s

8. What is the mass of a shopping cart moving at a velocity of 2.60 m/s [W] if its momentum is 35.1 kg•m/s [W]?

(A) 2.60 kg
(B) 10.4 kg
(C) 13.5 kg
(D) 91.3 kg

9. What happens to the momentum of an object if it's velocity and mass are tripled?

(A) Increases 3 times as much
(B) Increases 6 times as much
(C) Increase 9 times as much
(D) No change

10. What is the momentum of a 20.0 kg coyote running at 4.00 m/s?

(A) 5.00 kg•·m/s
(B) 16.0 kg•m/s
(C) 24.0 kg•m/s
(D) 80.0 kg•m/s

PART B: WRITTEN RESPONSE

1. Determine the momentum of a 1000-kg car moving northward at:

   A) 20 m/s

   B) 12 km/hr

2. A car possesses 20 000 kg •m/s in a particular direction. What would be the car's new momentum if:

   (A) its velocity were doubled?

   (B) its velocity were tripled?

   (C) its mass were doubled (by adding more passengers and a greater load)

   (D) both its velocity were doubled and its mass were doubled?

3. If the momentum of a 7.0 kg bowling ball is 15.0 kg m/s [left] what is its velocity?

4. A bullet travelling at 1100.0 m/s has a momentum of 4.5 kg m/s. What is its mass?