Name: _____ Phys 12

Worksheet 4.4 Conservation of Momentum in 2D

1. A 1.4 x 10^3 kg car is westbound at a velocity of 37.0 km/h when it collides with a 2.0 x 10^3 kg truck northbound at a velocity of 35 km/h. If these two vehicles lock together upon collision, what is the initial velocity of the vehicles after collision? (7.2 m/s 37° W of N)

2. A 6.2 kg object heading north at 3.0 m/s collides with an 8.0 kg object heading west at 3.5 m/s. If these two masses stick together upon collision, what is their velocity after collision? (2.4 m/s 56° W of N)

3. A 4.0 x 10^4 N Truck moving west at a velocity of 8.0 m/s collides with a 3.0x10^4 N truck heading south at a velocity of 5.0 m/s. If these two vehicles lock together upon impact, what is their velocity?(5.0 m/s 25° S of W)

4. A 50.0 kg object is moving east at an unknown velocity when it collides with a 60.0 kg stationary object. After collision, the 50.0 kg object is traveling at a velocity of 6.0 m/s 50.0° N of E and the 60.0 kg object is traveling at a velocity of 6.3 m/s 38° S of E.

a. What was the velocity of the 50.0 kg object before collision? (9.86 m/s due east)

b. Determine whether this collision was elastic or inelastic. (Ek loss of 340 J, so inelastic)

5. A 15.0 kg penguin waddling east at a velocity of 7.0 m/s collides with a stationary 10.0 kg penguin. After the collision the 15.0 kg penguin is traveling at a velocity of 4.2 m/s 20.0° S of E.

a. What is the velocity of the 10.0 kg penguin after collision? (5.1 m/s 25° N of E)

b. is this collision elastic or inelastic? (Inelastic, E_k loss of 110J)

6. A watermelon explodes into three equal masses. One mass moves east at 15.0 m/s. If a second mass moves at a velocity of 10.0 m/s 45.0° S of E, what is the velocity of the third mass? (Hint: the total momentum is zero, so how will your vector arrows add up?)

<u>Bonus</u>

A 15.0 kg plate head explodes into three pieces A 6.0 kg chunk flies off at 12.0 m/s 15° N of W and a 5.0 kg chunk sails at 8.0 m/s 35° E of S. What is the velocity of the final piece?