Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Physics 11

**Worksheet 6.3**

**Collisions and Explosions**

1. In an isolated system, a 30 kg angry bird moving to the right at a velocity of 1 m/s collides with a 20 kg pig moving to the left with a velocity of 5 m/s. If the pig continues to move to the left at a velocity of 1.25 m/s, what is the final velocity of the bird? Draw a diagram. Is the collision elastic or inelastic?

1. A 5 kg object traveling at 10 m/s collides with a 7 kg object traveling at 4 m/s in the same direction. A little while after the collision the 5 kg object is moving at 9 m/s and the 7 kg object is moving at 8 m/s (still in the same direction). Draw a diagram. Is momentum conserved? What does this tell you about the system? What does this tell you about the external forces on the system?

1. A 925 kg car moving at a velocity of 18 m/s right collides with a stationary truck of unknown mass. The two vehicles lock together and move off at a velocity of 6.5 m/s. If friction is negligible, what is the mass of the truck? Draw a diagram. Is the collision elastic or inelastic?

1. A 50 g bullet strikes a 7 kg wooden block. If the bullet becomes imbedded in the block and they both move off at a velocity of 5 m/s, what was the initial speed of the bullet? Draw a diagram. Is the collision elastic or inelastic?
2. A 40 g hot dog moving with a velocity of 9 m/s to the right collides with a 55 g hot dog bun with a velocity of 6 m/s to the left. If the two objects stick together upon collision, making a delicious sandwich, what is the velocity of the combined masses? Draw a diagram. Is the collision elastic or inelastic?

1. A 76 kg student, standing at rest on a frictionless surface throws a 0.2 kg cream pie horizontally at 22 m/s at Mr. Q who is standing to the student’s left. What is the velocity of the student after they throw the pie? Draw a diagram. Why is it important that the surface is frictionless?
2. A 25 kg turkey is fired from a 1100 kg turkey launcher on wheels. If the horizontal velocity of the turkey is 1170 km/h east, what is the recoil velocity of the launcher? Draw a diagram. Would conservation of momentum still apply to this problem if the launcher’s wheels were removed?

1. A 110 kg astronaut is stuck 30 m away from the international space station during a spacewalk and her rocket boosters are depleted. In an effort to get back to the station, she throws her 0.6 kg camera away from the space station (yes, this will actually work in real life) at 11 m/s. How long after she throws the camera will she get back to the station?

Answers: 1) 1.5 m/s left, elastic 2) No, the system is not isolated, the external forces on the system don’t add to zero (maybe one of them is gravity?) 3) 1636.5 kg, inelastic 4) 705 m/s, inelastic

5) 0.316 m/s right

6) 0.058 m/s right, if there was friction then the system wouldn’t be isolated and we couldn’t use conservation of momentum to solve the problem. 7) 7.4 m/s west 8) 8.3 minutes