Momentum & Energy Conservation Review – Select Problems

Name: _____ Date: _____

1. Explain the difference between and inelastic and elastic collision. (Discuss in terms of momentum and kinetic energy)

2. Calculate the speed of an 1800 kg car with a momentum of 30,000 kg m/s. [17 m/s]

3. A 1500 kg car accelerates from rest at 4.0 m/s/s for 6.0 s. Calculate the change in momentum and impulse acting on the car. [3.6×10^4 kg m/s]

4. A golf club exerts an average net force of 7200 N on a ball for the 0.0005 s they are in contact.
   a) Calculate the impulse of the impact on the ball. [3.6 Ns]
   b) If the ball has a mass of 45 g, what velocity will it have as it leaves the club face? [80 m/s]

5. A puck (m = 0.115 kg) slides along frictionless ice at 16 m/s. It encounters a rough patch of ice that is 3 m in distance and slows down to a speed of 12 m/s. Calculate the change in momentum as well as the time it takes to travel through the rough patch and the average force acting on the puck.

6. A 45 kg boy is running at 4.0 m/s when he jumps onto a new 15 kg sled, at rest on a frozen lake. Calculate the velocity of the boy and sled, if he hangs on. [3.0 m/s]

7. A 2000 kg car travelling east at 24 m/s enters an icy intersection and collides with a 3600 kg truck travelling south at 10 m/s. If they become coupled together in the collision, calculate their velocity immediately after impact. [11 m/s [E37^{o}S]]

8. A steel ball of mass 0.50 kg, moving with a velocity of 2.0 m/s, strikes a second ball of mass 0.30 kg, initially at rest. The collision is a glancing one, causing the first ball to be deflected at an angle of 30^o, with a speed of 1.50 m/s. Determine the velocity of the second ball after the collision, giving both its speed and direction. [1.7 m/s [R47^{o}D]]

9. Two bumper cars are moving towards each other. Bumper car one is moving at 5 m/s to the right and has a mass of 120 kg. Bumper car two is moving at 8 m/s to the left and has a mass of 45 kg. Predict the final state then calculate the final speeds of both cars if the collision is completely elastic. Which car would you rather be in an explain why! [Solve using which ever method you wish] – compare your prediction to the calculation. [-2.1 m/s and 10.9 m/s for car 1 and 2 respectively]