Physics 11

Assignment # 5 – Impulse and Momentum – Multiple Choice

Due Tuesiday, April 15th,2014 Your answers for the multiple choice must be in 2 columns (1-6, 7-12)

1. A gun fires a 0.25 kg projectile which acquires a velocity of 300 m/s. If the projectile takes 0.0050 seconds to travel the length of the barrel, what is the force exerted by the gun on the projectile? (Use impulse–momentum theorem)

      a)   0.375N   b) 15000N   c) 1.5×10^7 N   d) none of the previous

2. A baseball has a weight of 5oz and is pitched to the batter at 90mph and hit back by the batter at 100mph. If the ball and bat were in contact for 0.004 seconds, what force was exerted by the bat on the ball? (Use impulse–momentum theorem)

      a)   12500N   b) 142.23N   c) 2972.55N   d) none of the previous

3. A braking force is applied to a 355 kg motorcycle to reduce its speed from 108 km/h to 34.2 km/h in 3.00 sec. (a) The impulse is:

      a)   –7277.5Ns   b) –2425.83Ns   c)– 26199Ns   d) all of the previous

4. A shell having a mass of 4.0 kg is fired horizontally eastward from a cannon with a velocity of 180 m/s. If the mass of the cannon is 800 kg, what is the size and direction of the velocity of the recoil of the cannon?

      a)   –0.9m/s   b) –3.24km/h   c) –2.01mph   d) all of the previous

5. A bomb, sitting at rest, having a mass of 15.0 kg explodes into two pieces that fly out horizontally in opposite directions. One piece was found to have a mass of 3.00 kg and flew to the west with a speed of 80 m/s. What is the velocity of the other piece?

      a)   20m/s   b) –20m/s   c) 16m/s   d) –16m/s

6. A toy railroad engine having a mass of 3.50 kg and moving along a straight track at a speed of 0.20 m/s collides with a similar engine (different color, same mass) ahead of it moving in the same direction at 0.10 m/s. On colliding the engines lock and remain together. What is the velocity of the pair of engines after the collision?

      a)   1.08km/h   b) 0.3m/s   c) 0.54km/h   d) none of the previous

7. Harriet and Joey are at Crystal Palace on bumper cars. The bumper cars have a mass of 100kg and Harry has a mass of 70kg. Harriet is travelling at 1.5m/s when he runs into Joey who is stopped. Immediately after the collision Harry is stopped and Joey has a velocity of 1.16m/s. What is Joey's mass?

      a)   219.83kg   b) 319.83kg   c) 119.83kg   d) 100kg

8. A measurement of the momentum of a proton yields a value of 5.1×10^{-21} kg-m/s. If the mass of a proton is 1.7×10^{-27} kg, find the speed of this proton?

      a) 3×10^6km/h   b) 8.67×10^{-48}m/s   c) 3.33×10^{-7} m/s   d) none of the previous

9. A 60 kg woman is riding on a 8kg cart at 5m/s eastward. She jumps of f the cart and continues going eastward at 7m/s. What is the velocity of the cart after she jumps off?

      a)   10m/s   b) –10m/s   c) 6m/s   d) –6m/s

10. A bullet of mass of 15.0 g strikes a wooden block of mass 5.00 kg. The bullet becomes embedded in the block. The block with the bullet in it then flies off at 1.50 m/s. If the bullet was fired from a 4kg rifle what was the velocity of the rifle's recoil?

      a)   501.5m/s   b) –501.5m/s   c) 1.88m/s   d) –1.88m/s

Questions 11 and 12 use the graphs below – which are position time graphs
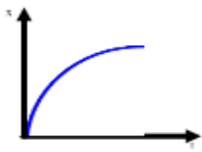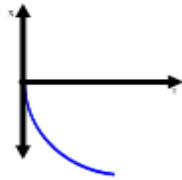

Figure 1   Figure 2   Figure 3   Figure 4
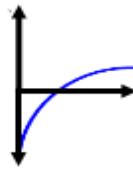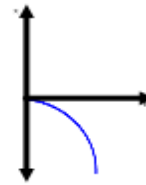
11. Which of the following graphs show an object heading east and slowing down?
   a. Figure 1   b. Figure 2 and 3   c. figure 1 and 3   d. figure 1, 2 and 3

12. Which of the graphs below represents an object moving west and speeding up
   a. Figure 1   b. Figure 2   c. Figure 3   d. Figure 4

Open Response (Show your work)

13. A 1500kg truck, travelling at 50km/h, runs into the back of a small car that is parked at a stop sign. After the collision the truck's velocity is 5km/h and the car's velocity is 75km/h. a) What is the mass of the car? b) What is the impulse on the truck? c) What is the impulse on the car? d) What is the acceleration felt by each vehicle?

14. Sketch Position–time, velocity time and acceleration- time graphs for the following scenarios
a. Hank starts in the north from rest and heads to the south
b. Frank is travelling north at a constant velocity when he passes his local grocery store which is south of his house. Upon passing the grocery store he slows down to a stop. (yes, this has two parts)