

Physics 11

Assignment # 7 - Impulse and Momentum - Multiple Choice

Due Wednesday, December 20th, 2017

Your answers for the multiple choice must be in 2 columns (1-5, 6-10)

1. 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
2. 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
3. A baseball has a weight of 142g and is pitched to the batter at 144km/h and hit back by the batter at 160km/h. 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) 10792N b) 43.17N c) 2998N d) 157.78N
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) 3×10^6 m/s 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 an 8kg bicycle at 5m/s westward. She jumps off the bicycle and continues going westward 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

Problem

11. A squid uses the principle of jet repulsion to get around (it isn't a fish). A squid with a mass of 1.5kg drifting in water at 1m/s suddenly expels 0.1kg of water backward to make himself move forward at 2.5m/s. If resistance of the water is neglected, determine the velocity of the water as it leaves the squid. (Note: the water that is expelled was initially in the squid). (Borrowed from UNB online quiz)
12. A small military attack vehicle is travelling at 20m/s with a missile on board. The operator fires the missile with an initial velocity of 200m/s. If the attack vehicle slows to 17.5m/s what is the mass of the missile if the mass of the vehicle is 1200kg?