Impulse Problem Set: Solutions

Physics 11

Complete the following problems on a separate piece of paper. At least one of these problems will be the quiz problem for tomorrow.

(1) A 0.50-kg cart (#1) is pulled with a 1.0-N force for 1 second; another 0.50 kg cart (#2) is pulled with a 2.0 N-force for 0.50 seconds. Which cart (#1 or #2) has the greatest acceleration? Explain.

Cart #2 has the greater acceleration because it has a greater force with the same mass.

The time here does not make a difference.

(2) Zdeno Chara has the record for the fastest slap shot at 175.1 km/h. A hockey puck has a mass of 0.17 kg. Assuming that the puck starts from rest and that the slap shot takes Chara 0.1 seconds, what force does he exert on the puck?

80N

(3) Jennifer, who has a mass of 50.0 kg, is riding at 80km/hr in her red sports car when she must suddenly slam on the brakes to avoid hitting a deer crossing the road. She strikes the air bag, while wearing a seatbelt, that brings her body to a stop in 0.500 s. What average force does the seat belt exert on her?

2.22×10^3N

If Jennifer had not been wearing her seat belt and not had an air bag, then the windshield would have stopped her head in 0.002 s. What average force would the windshield have exerted on her?

6×10^5N

(4) The following data are for a three-stage Saturn rocket launched in 1971 for a trip to the moon. The first-stage fuel burn of liquid oxygen and hydrogen lasted for 165 sec. The initial velocity was zero. The initial total mass of rocket and fuel was 2.91 $\times 10^6$kg. The mass of the rocket and its velocity at the end of the burn were 8.36 $\times 10^5$kg and 2.32 $\times 10^3$m/sec. What is the average net force applied to the rocket ship?

1.18×10^7N