Physics 100
Momentum and Impulse Practice

Formulas: $p = mv$ $Ft = \Delta p$ $Ft = m\Delta v$

Short Answer:

1.   Define momentum

2.   State the law of conservation of momentum.

3.   What are the units for momentum?

4.   What is the symbol for momentum?

5.   Define impulse.

5.   What are the units for impulse?

Problems:

6.   A 7kg object has a velocity of -4m/s. What is its momentum?

7.   0.65kg basketball is moving with a velocity of 3m/s. It collides with a stationary 0.05kg tennis ball, transferring half of its momentum to the tennis ball.

    a.   What is the basketball's velocity after the collision?

    b.   What is the tennis ball's velocity after the collision?

8.   An impulse of 6kgm/s is applied to a mouse.   What is the mouse's change in momentum?

9.   A 1,000kg car accelerates from 20m/s to 50m/s.

        a.   What is the car's Δp?

        b.   If this acceleration takes place over a 30 second time period, what force is being applied?

10.   Starting from rest, a 200kg motorcycle accelerates over a distance of 90m in a time of 4 seconds, reaching a velocity of 40m/s. Immediately after that, the motorcycle crashes into a series of cardboard boxes and comes to rest in a time of 3 seconds.

        a.   What is the motorcycle's Δp during its **acceleration** period?

        b.   What is the motorcycle's Δp during its **deceleration** period?

        c.   What average net force caused the motorcycle's acceleration?

        i.   What average net force caused the motorcycle's deceleration?

11.   Car A has a velocity of -10m/s and a mass of 500kg. Car B has a mass of 800kg and a velocity of 6m/s. If the two cars collide and stick together, what is their shared velocity after the collision?

12.   Suppose a 3kg steel sphere is moving with a velocity of 4m/s. The steel sphere strikes a second stationary sphere with a mass of 2kg and a velocity of 2m/s. After the collision, the 3kg sphere has a velocity of 3m/s.

        a.   What is the net momentum of this
             system before the collision?

        b.   What is the net momentum of this
             system after the collision?

        c.   What is the velocity of the 2kg
             steel sphere, after the collision?