Momentum-Impulse Theorem

Name: _____

Date: _____

- 1. A net force of 6.0 N acts on a 2.0 kg mass for 4.0 s. If the initial velocity of the mass is 3.0 m/s:
 - a) What is the impulse on the mass?
 - b) What is the final momentum of the mass?
 - c) What is the final velocity of the mass?

- 2. A 5 kg object is moving with an initial speed of 20 m/s. It is acted upon by a constant net force for 6 seconds which results in the object slowing to a speed of 13 m/s.
 - a) Calculate the impulse on the object.
 - b) Calculate the average net force acting on the object.

- 3. An object of mass, 5.0 kg, and an initial velocity of 4.0 m/s, is acted upon by a force shown in the graph.
 - a) Determine the final velocity.
 - b) Determine the average force.



- 4. An object of mass, 4.0 kg, and initial velocity, 10 m/s, is acted upon by a force as shown in the graph
 - a) Determine the final velocity.
 - b) Determine the average force.



The average accelerating force exerted on a 5.0 kg shell in a gun barrel is 5.0 x 10⁴ N, and the muzzle velocity is 200 m/s. Calculate (a) the impulse on the shell, and (b) the length of time it takes to move up the heavy gun barrel.
[Ans: 1.0x10³ Ns; 2.0x10⁻² s]

- 6. A hockey puck of mass 0.20 kg is sliding along a smooth, flat section of ice at 18 m/s when it encounters some snow. After 2.5 s of sliding through the snow, it returns to smooth ice, continuing to slide at a speed of 10 m/s.
 - a) What is the change in momentum of the puck?
 - b) What impulse does the snow exert on the puck?
 - c) What average frictional force does the snow exert on the puck?
 - [Ans: -1.6 kg m/s (forward), 1.6 kg m/s (backward), 0.64 N (backward)]

7. A 2.0 kg skateboard is rolling across a smooth, flat floor when a small girl kicks it, causing it to speed up to 4.5 m/s in 0.50 s without changing direction. If the average force exerted by the girl on the skateboard in its direction of motion was 6.0 N, with what initial velocity was it moving? [Ans: 3.0 m/s (forward)]

- 8. A 200 kg shot is discharged horizontally from a cannon, of mass 2.0x10⁴ kg, with a speed of 250 m/s relative to the ground.
 - a) Find the steady force which, acting on the cannon, will stop its recoil in 2.0 s.
 - b) How far will the cannon recoil?
 - [Ans: 2.5x10⁴ N; 2.5 m]