Name _____Answer Key_____ Date _____
Honors Physics Momentum WS #2
Period _____ Mrs. Nadworny

# Impulse

**Directions***:* Solve the following problems using the GUESS method and proper significant figures. Be sure to show ALL work.

1. A student drops two eggs of equal mass simultaneously from the same height. Egg A lands on the tile floor and breaks. Egg B lands intact, without bouncing, on a foam pad lying on the floor. Compared to the magnitude of the impulse on egg A as it lands, the magnitude of the impulse on egg B as it lands is

   A) greater B) less C) the same

2. A constant force can act on an object for different lengths of time. As the length of time the force acts increases, the impulse imparted to the object

   A) increases B) decreases C) remains the same

3. An airbag is used to safely decrease the momentum of a driver in a car accident. The air bag reduces the magnitude of the force acting on the drive by

A) increasing the length of time the force acts on the driver
B) decreasing the distance over which the force acts on the driver
C) increasing the rate of acceleration of the driver
D) decreasing the mass of the driver

4. A 5.2 kilogram object is moving at 9.1 meters per second east.
   a. What is the impulse needed to bring the object to rest?

$$J = m\triangle v = 5.2kg(0\tfrac{m}{s} - 9.1\tfrac{m}{s}) = 47N\bullet s \text{ west}$$

   b. If you want it to stop in 3.0 seconds, what force must you exert on it?

$$F = \frac{J}{t} = \frac{-47N\bullet s}{3.0s} = 16N \text{ west}$$

5. An unbalanced force of 3.3 Newtons acts on a 4.6 kg object for 6.1 seconds. What is the magnitude of the object's change in velocity?

$$Ft = m\triangle v$$

$$\triangle v = \frac{Ft}{m} = \frac{(3.3N)(6.1s)}{(4.6kg)} = 4.4\tfrac{m}{s}$$

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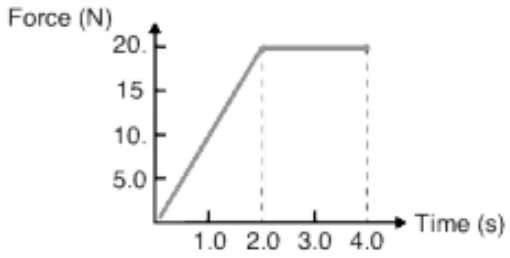
6. Consider the force versus time graph below.




a. Calculate the magnitude of the impulse acting on the object between 0 second and 2.0 seconds.

$$J = Ft \quad \text{Area} = \tfrac{1}{2}bh = \tfrac{1}{2}(2.0s)(20.N) = 20.N \bullet s$$

b. Calculate the magnitude of the change in momentum between 2.0 seconds and 4.0 seconds.

$$\Delta p = Ft \quad \text{Area} = bh = (2.0s)(20.N) = 40.N \bullet s$$

c. If the mass of the object is 10. kilograms and is initially at rest, calculate its speed at 2.0 seconds.

$$J = m\Delta v$$

$$v_f = \frac{J}{m} = \frac{20.N \bullet s}{10.kg} = 2.0\,\tfrac{m}{s}$$

7. A mass moving with a momentum of 47.6 kg·m/s receives an impulse of 24.9 N·s in the direction of motion. The final momentum of the mass is?

$$J = p_f - p_i$$

$$p_f = J + p_i = (24.9N \bullet s) + (47.6\,\tfrac{kg \cdot m}{s}) = 72.5\,\tfrac{kg \cdot m}{s} \text{ forward}$$

Answers in size order: 2.0, 4.4, 16, 20., 40., 47, 72.5