Name: Key

Chapter 8 Practice Test

I. MULTIPLE CHOICE: Choose the one best answer each. Assume g = 10 m/s^2.

1. The momentum of an object is proportional to its
   A. Velocity
   B. Mass
   C. Mass x Velocity
   D. All of the above
   E. None of the above

2. Impulse is equal to the change of
   A. Velocity
   B. Mass
   C. Force
   D. Momentum
   E. Force x Velocity

3. In order to double the momentum of an object, its velocity must change by a factor:
   A. x 2 B. x 1/2 C. x 4 D. x 1/4

4. When a force F is applied to an object on a frictionless surface over a time interval, a change in velocity is created. If the time interval the force is applied increases by a factor of 2, what applied force below would yield the same change in velocity for the object?
   A. 2F B. F/2 C. 4F D. F/4

5. One egg is thrown against a solid wall, while a second egg is thrown against a hanging bed sheet. Both eggs have the same initial velocity (35 miles per hour) and the same final velocity (zero miles per hour). Which egg experiences a greater <u>change in momentum</u>?
   A. The egg stopped by the wall.
   B. The egg stopped by the hanging sheet.
   C. Both eggs experience the same change in momentum.

6. One egg is thrown against a solid wall, while a second egg is thrown against a hanging bed sheet. Both eggs have the same initial velocity (35 miles per hour) and the same final velocity (zero miles per hour). Which egg experiences a greater <u>force</u>?
   A. The egg stopped by the wall.
   B. The egg stopped by the hanging sheet.
   C. Both eggs experience the same force.

7. Which has the most momentum below?
   A. a mass of 5.0 kg moving at 0.0 m/s
   B. a mass of 2000 g moving at 500.0 cm/s
   C. a weight of 30 N moving at 4.0 m/s
   D. a mass of 1.5 kg moving at 6.0 m/s

$2\,kg \times 5\,\frac{m}{s} = 10$
$3\,kg \times 4\,\frac{m}{s} = 12$

8. Mass M_1 moving with a speed v_i collides with stationary mass M_2. After the collision, the masses are interlocked and moving with a speed of $v_i/3$. Which equation below correctly describes the relationship between M_1 and M_2?
   A. $M_2 = 2M_1$ B. $M_1 = 2M_2$ C. $M_2 = 3M_1$ D. $M_1 = 3M_2$

$m_1 v_i = (m_1 + m_2) v_f \leftarrow \frac{v_i}{3} \Rightarrow 3m_1 = m_1 + m_2 \Rightarrow 2m_1 = m_2$

9. A ball moving to the left strikes a wall at a speed of 4 m/s and rebounds to the right at a speed of 2 m/s. What is the change in velocity Δv of the ball?
   A. 0 m/s B. 2 m/s C. 4 m/s D. 6 m/s E. 8 m/s

10. A 1,200-kilogram car traveling at 10.0 meters per second hits a tree and is brought to rest in 0.10 second. What is the magnitude of the average force acting on the car to bring it to rest?
   A. 1.2×10^2 N
   B. 1.2×10^3 N
   C. 1.2×10^4 N
   D. 1.2×10^5 N
   E. 1.2×10^6 N

$F = \frac{\Delta p}{t} = \frac{1200\,kg \times 10\,\frac{m}{s}}{0.10\,s} = 1.2 \times 10^5\,\frac{kg\,m}{s^2}$

II. **PROBLEMS: On a separate sheet of paper, show your starting equation(s), show your work and box your answer.**

1. Calculate the momentum of a 2250-kg elephant charging a hunter at a speed of 7.00 m/s.

2. A hockey puck has a mass of 0.122 kg and is at rest. A hockey player makes a shot, exerting a constant force of 25.0 N on the puck for 0.180 s. With what speed does the puck head toward the goal?

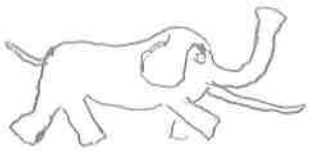
3. How long must a 12.0 N force be applied to a 4.00 kg block sitting at rest on a frictionless surface to increase its velocity to 4.40 m/s?

4. A 65.0-g arrow leaves a bowstring at a velocity of 54 m/s.
   A. What is the impulse on the arrow?

   B. What is the average force that the string exerts on the arrow if the string is in contact with the arrow for 9.0×10^{-3} s?

5. A 1.90-kg falcon catches a 0.600-kg dove from behind in midair. What is their velocity after impact if the falcon's velocity is initially 26.0 m/s and the dove's velocity is 6.00 m/s in the same direction?

Ch 8 Practice



(1) $p = mv$

$= (2250\,kg)\left(7.00\,\frac{m}{s}\right)$

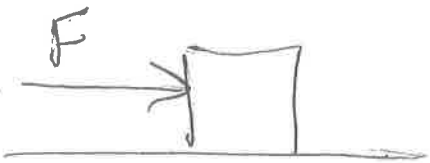
$= \boxed{1.58 \times 10^4\,\frac{kg\,m}{s}}$

(2) $Ft = \Delta p = \Delta mv$ $\qquad v_i = 0$

$\Rightarrow \Delta v = \frac{Ft}{m}$

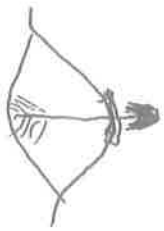
$v_f = \frac{(25.0\,N)(0.180\,s)}{0.122\,kg} = \boxed{36.9\,\frac{m}{s}}$

(3) $Ft = \Delta p \Rightarrow t = \frac{\Delta p}{F}$



$t = \frac{(4.00\,kg)\left(4.40\,\frac{m}{s}\right) - 0}{12.0\,N} = \boxed{1.47\,s}$

(4) (A) $Ft = \Delta p = m\Delta V$



$= \left(65.0\times10^{-3}\,kg\right)\left(54\frac{m}{s} - 0\right)$

$= \boxed{3.51\,\frac{kg\,m}{s}}$

(B) $Ft = \Delta p \Rightarrow F_{AVG} = \frac{\Delta p}{t}$

$F_{AVG} = \frac{3.51\,\frac{kg\,m}{s}}{9.0\times10^{-3}\,s} = \boxed{3.90\times10^{2}\,N}$

(5) $p_i = p_f$

$m_1 v_{1i} + m_2 v_{2i} = (m_1 + m_2) v_f$

$v_f = \frac{m_1 v_{1i} + m_2 v_{2i}}{m_1 + m_2}$

$= \frac{\left(1.90\,kg\right)\left(26.0\frac{m}{s}\right) + \left(0.600\,kg\right)\left(6.00\frac{m}{s}\right)}{\left(1.90 + 0.600\,kg\right)}$

$= \boxed{21.2\,\frac{m}{s}}$