***College Physics: A Strategic Approach, 3e* (Knight)**

**Chapter 9 Momentum Test Review**

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9.1 Conceptual Questions

1) A rubber ball and a lump of clay have equal mass. They are thrown with equal speed against a wall. The ball bounces back with nearly the same speed with which it hit. The clay sticks to the wall. Which one of these objects experiences the greater momentum change?

A) the ball

B) the clay

C) Both of them experience the same non-zero momentum change.

D) Both of them experience zero momentum change.

2) Which of the following quantities are units of momentum? (There could be more than one correct choice.)

A) N ∙ m B) kg ∙ s/m C) kg ∙ m/s D) N ∙ s E) kg ∙ m2/s2

3) A tiger is running in a straight line. If we double both the mass and speed of the tiger, the magnitude of its momentum will increase by what factor?

A)  B) 2 C) 4 D) 8 E) 16

4) A very elastic rubber ball is dropped from a certain height and hits the floor with a downward speed *v.* Since it is so elastic, the ball bounces back with the same speed *v* going upward. Which of the following statements about the bounce are correct? (There could be more than one correct choice.)

A) The ball had the same momentum just before and just after the bounce.

B) The magnitude of the ball's momentum was the same just before and just after the bounce.

C) The ball's momentum was conserved during the bounce.

D) None of the above statements are correct.

5) The momentum of an isolated system is conserved

A) only in inelastic collisions. B) only in elastic collisions. C) in both elastic and inelastic collisions.

6) Two friends are standing on opposite ends of a canoe that is initially at rest with respect to a frictionless lake. The person in the front throws a very massive ball toward the back, and the person in the back catches it. After the ball is caught, the canoe is

A) moving backward. B) stationary. C) moving forward.

7) A small car meshes with a large truck in a head-on collision. Which of the following statements concerning the momentum during the collision are correct? (There could be more than one correct choice.)

A) The momentum of the truck is conserved.

B) The momentum of tHe car is conserved.

C) The car and the truck must undergo the same change in speed.

D) The momentum of the car and the momentum of the truck are each conserved.

E) The momentum of the car-truck system is conserved, but the momentum of each one separately is not conserved.

8) A rocket explodes into two fragments, one 25 times heavier than the other. The magnitude of the momentum change of the lighter fragment is

A) 25 times as great as the momentum change of the heavier fragment.

B) The same as the momentum change of the heavier fragment.

C) 1/25 as great as the momentum change of the heavier fragment.

D) 5 times as great as the momentum change of the heavier fragment.

E) 1/4 as great as the momentum change of the heavier fragment.

9) Which of the following quantities are units of impulse? (There could be more than one correct choice.)

A) N ∙ m B) kg ∙ s/m C) kg ∙ m/s D) N ∙ s E) kg ∙ m2/s2

10) Three cars, car X, car Y, and car Z, begin accelerating from rest at the same time. Car X is more massive than car Y, which is more massive than car Z. The net accelerating force exerted on each car is identical. After 10 seconds, which car has the most amount of momentum?

A) They all have the same amount of momentum. B) Car X C) Car Y D) Car Z

11) In a collision between two unequal masses, which mass receives a greater magnitude impulse?

A) the larger mass B) the smaller mass C) They receive equal impulses.

12) Identical forces act for the same length of time on two different objects. The magnitude of the change in momentum of the lighter object is

A) smaller than the magnitude of the change in momentum of the larger mass, but not zero.

B) larger than the magnitude of the change in momentum of the larger mass.

C) exactly equal to the magnitude of the change in momentum of the larger mass.

D) zero.

E) There is not enough information to answer the question.

13) A very light ping-pong ball moving east at a speed of 4 m/s collides with a very heavy stationary bowling ball. The Ping-Pong ball bounces back to the west, and the bowling ball moves very slowly to the east. Which object experiences the greater magnitude impulse during the collision?

A) Neither; both experienced the same magnitude impulse.

B) the Ping-Pong ball

C) the bowling ball

D) It is impossible to tell since the actual mass values are not given.

E) It is impossible to tell since the velocities after the collision are unknown.

14) A 5-kg ball collides inelastically head-on with a 10-kg ball, which is initially stationary. Which of the following statements is true? (There could be more than one correct choice.)

A) The magnitude of the change of velocity the 5-kg ball experiences is greater than that of the 10-kg ball.

B) The magnitude of the change of velocity the 5-kg ball experiences is less than that of the 10-kg ball.

C) The magnitude of the change of velocity the 5-kg ball experiences is equal to that of the 10-kg ball.

D) The magnitude of the change of the momentum of the 5-kg ball is equal to the magnitude of the change of momentum of the 10-kg ball.

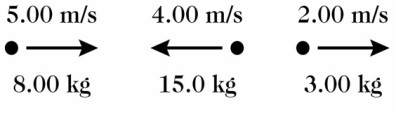
E) Both balls lose all their momentum since the collision is inelastic.

15) A 2.0-kg ball moving eastward at 3.0 m/s suddenly collides with and sticks to a 4.0-kg ball moving northward at 2.0 m/s. What is the magnitude of the momentum of this system just after the collision?

A) 14 kg ∙ m/s B) 2.0 kg ∙ m/s C) 10 kg ∙ m/s D) 6.0 kg ∙ m/s E) 8.0 kg ∙ m/s

**PROBLEMS**

16) Three objects are moving along a straight line as shown in the figure. Taking the positive direction to be to the right, what is the total momentum of this system?



A) +106 kg ∙ m/s B) -106 kg ∙ m/s C) +14.0 kg ∙ m/s D) -14.0 kg ∙ m/s E) 0.00 kg ∙ m/s

17) A 0.140-kg baseball is dropped and reaches a speed of 1.20 m/s just before it hits the ground and bounces. It rebounds with an upward velocity of 1.00 m/s. What is the change of the ball's momentum during the bounce?

A) 0.0280 kg ∙ m/s upwards B) 0.0280 kg ∙ m/s downwards C) 0.308 kg ∙ m/s upwards

D) 0.308 kg ∙ m/s downwards E) 0.000 kg ∙ m/s

18) A 60-kg swimmer suddenly dives horizontally from a 150-kg raft with a speed of 1.5 m/s. The raft is initially at rest. What is the speed of the raft immediately after the diver jumps if the water has negligible effect on the raft?

19) A 1500-kg car traveling at 90 km/h toward the east suddenly collides with a 3000-kg car traveling at 60 km/h toward the south. The two cars stick together after the collision. What is the speed of the cars after collision?

A) 8.3 m/s B) 14 m/s C) 17 m/s D) 22 m/s

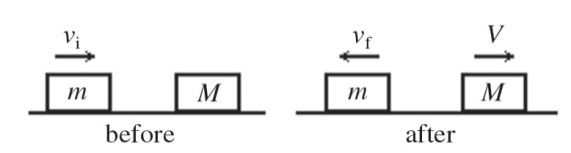
20) A car heading north suddenly collides at an intersection with a truck of the same mass heading east. If they lock together and travel at  at 15° north of east just after the collision, how fast was the car initially traveling?

A) 14 m/s B) 7 m/s C) 28 m/s D) 11 m/s

21) A 1000-kg whale swims horizontally to the right at a speed of 6.0 m/s. It suddenly collides directly with a stationary seal of mass 200 kg. The seal grabs onto the whale and holds fast. What is the speed of these two sea creatures just after their collision? You can neglect any drag effects of the water during the collision.

A) 0.00 m/s B) 3.0 m/s C) 4.0 m/s D) 5.0 m/s E) 6.0 m/s

22) A block of mass *m* = 5.6 kg, moving on a frictionless surface with a velocity of  to the right, collides with a block of mass *M* at rest, as shown in the figure. After the collision, the 5.6-kg block recoils with a velocity of  to the left. If the blocks are in contact for 0.20 s, what is the magnitude of the average force on the 5.6-kg block, while the two blocks are in contact?



A) 202 N B) 192 N C) 182 N D) 0 N E) 0 N

23) A 0.140-kg baseball is dropped from rest. It has a speed of 1.20 m/s just before it hits the ground, and it rebounds with an upward speed of 1.00 m/s. The ball is in contact with the ground for 0.0140 s. What is the average force exerted by the ground on the ball during the time of contact?

A) 2.00 N upwards B) 2.00 N downwards C) 22.0 N upwards D) 22.0 N downwards E) 0.00 N

24) A batter hits a foul ball. The 0.14-kg baseball that was approaching him at 40 m/s leaves the bat at 30 m/s in a direction perpendicular to the line between the batter and the pitcher. What is the magnitude of the impulse delivered to the baseball?

A) 9.8 N ∙ s B) 1.4 N ∙ s C) 3.5 N ∙ s D) 5.6 N ∙ s E) 7.0 N ∙ s

25) A 0.24 kg blob of clay is thrown at a wall with an initial horizontal velocity of  If the clay comes to a stop in  what is the average horizontal force on the clay due to the wall?

A) 42 N B) 26 N C) 35 N D) 51

**1)A 2) C,D 3) C 4) B 5) C 6) B 7) E 8)B 9)C,D 10) A 11) C 12) C 13) A 14) A,D 15) C 16) D 17) C 18) 0.60 m/s 19) B 20) A 21) D 22) A 23) C 24) E 25)A**