Exam 2--PHYS 101--F10

Multiple Choice

Identify the choice that best completes the statement or answers the question.

___ 1. A soccer ball is kicked at an angle of 30º. If the ball requires 1 second to reach the goal, what is its initial velocity?

a. 5 m/s  
b. 0.5 m/s  
c. 20 m/s  
d. 10 m/s

___ 2. Which of these statements about projectile motion is true:

a. The y-component of the velocity is zero at the top of the trajectory  
b. The acceleration in the y-direction is 0.  
c. The x-component of the velocity is largest at the beginning of the motion  
d. The y-component of the velocity is constant

___ 3. You drop a package from a plane flying at constant speed in a straight line. Without air resistance, the package will:

a. move ahead of the plane while falling  
b. not fall at all  
c. quickly lag behind the plane while falling  
d. remain vertically under the plane while falling
4. You fire a projectile from a table as in this figure. If the y-displacement is 1.0 m and the initial speed is 5.0 m/s, how far does the projectile travel in the x-direction?

\[ \Delta x \quad \Delta y \]

a. 3.4 m  
b. 5.0 m  
c. 2.3 m  
d. 1.2 m

5. Which of these punts has the longest hang time?

a. a  
b. b  
c. c  
d. all the same
6. This figure shows an inclined plane with a block; the block is accelerating up the inclined plane. The 3 forces—normal force, weight, and an applied force $\vec{F}$—are labeled. Which of the following is an appropriate equation that follows from the application of Newton’s second law of motion?

- $\vec{F}_N - \vec{F} = 0$
- $\vec{F}_N - \vec{F}_w \sin 30^\circ = \vec{F}_a$
- $\vec{F}_w \sin 60^\circ = \vec{F}_N$
- $\vec{F}_N = \vec{F}_w$

7. This figure shows an elevator that is accelerating downward at 2 m/s$^2$. A 10 kg mass hangs by a rope inside the elevator. What is the tension in the rope?

- 120 N
- 20 N
- 80 N
- 100 N
8. A dockworker loading crates on a ship finds that a 100-kg crate, initially at rest on a horizontal surface, requires a 400-N horizontal force to set it in motion. However, after the crate is in motion, a horizontal force of 300 N is required to keep it moving with a constant speed. What is the coefficient of kinetic friction between crate and floor?

a. 0.3  
b. 1.2  
c. 0.1  
d. 0.4

9. Antilock breaks keep the car wheels from locking up when you stop your car. Why does this help slow the car down?

a. $\mu_k > \mu_s$ so static friction is better  
b. $\mu_s > \mu_k$ so sliding friction is better  
c. $\mu_k > \mu_s$ so sliding friction is better  
d. $\mu_s > \mu_k$ so static friction is better

10. A cart is on a horizontal frictionless table. Once the cart has been pushed and released, what will happen to it?

a. it will immediately come to a stop  
b. it will continue at constant velocity  
c. it will gradually slow down  
d. it will continue at constant acceleration

11. A block of mass $m$ rests on the floor of an elevator that is accelerating upward at 12 m/s$^2$. What is the relationship between the force due to gravity (mg) and the normal force (N) on the block?

a. $N=mg$  
b. $N<mg$  
c. $N>mg$  
d. $N=0$  
e. depends on the speed of the elevator
12. This figure shows a cheerleader thrown into the air. If she reaches a maximum height of 6 meters, what is her initial speed?

a. 11 m/s  
b. 120 m/s  
c. 5.4 m/s  
d. 18 m/s

13. In the previous figure, what is the cheerleader’s speed when she goes through the basketball hoop, which is at a height of 3 meters?

a. 2.7 m/s  
b. 9.0 m/s  
c. 5.5 m/s  
d. 7.7 m/s
14. A shopper in a supermarket pushes a cart with a force of 40.0 N directed at an angle of 60.0° downward from the horizontal. Find the work done by the shopper as she moves down a 25-m length of aisle.

a. 1000 J  
   b. 500 J  
   c. 1.6 J  
   d. 870 J

15. A 7.0-kg bowling ball moves at 2.00 m/s. How fast must a 0.030-kg tennis ball move so that the two balls have the same kinetic energy?

a. 5.4 m/s  
   b. 930 m/s  
   c. 0.42 m/s  
   d. 31 m/s

16. A box is being pulled across a rough floor at a constant speed. What can you say about the work done by friction?

a. friction does negative work  
   b. friction does positive work  
   c. friction does no work

17. A ball tied to a string is being whirled around in a circle. What can you say about the work done by tension?

a. tension does positive work  
   b. tension does negative work  
   c. tension does no work

18. A car starts from rest and accelerates to 30 mph. Later, it gets on a highway and accelerates to 60 mph. Which takes more energy, the 0⇒30 mph, or the 30⇒60 mph?

a. 0⇒30 mph  
   b. not enough information to tell  
   c. each requires the same energy  
   d. 30⇒60 mph
19. Peter Lafleur throws a ball with a velocity of \( v_{\text{ball}} = 10 \text{ m/s} \). The ball has a mass of 0.5 kg; it strikes White Goodmann (\( m_{\text{White}} = 100 \text{ kg} \)). What is the final velocity of White Goodman?

   a. 5 m/s  
   b. 0.05 m/s  
   c. 500 m/s  
   d. 0.5 m/s

20. Which of these is best approximated as an inelastic collision?

   I. Collision of two cars  
   II. Collision between particles of gas  
   III. Collision between baseball & bat

   a. I  
   b. II & III  
   c. I & III  
   d. II  
   e. None of these

21. A collection of particles has a total kinetic energy of zero. What can we say about the momentum of the system?

   a. the momentum is positive  
   b. the momentum is negative  
   c. the momentum is zero  
   d. the momentum is either positive or negative, but not zero  
   e. not enough information
22. A uranium nucleus is at rest and undergoes fission and splits into two fragments, one heavy and one light. Which of these statements is true?

a. the lighter fragment has more momentum than the heavier fragment
b. the heavier fragment has more momentum than the lighter fragment
c. the lighter fragment has a higher speed than the heavier fragment
d. both particles have the same speed

23. A 0.500 kg football is thrown toward the east with a speed of 10.0 m/s. A stationary receiver, whose mass is 100 kg, catches the ball and brings it to rest in 0.040 s. During this time period, what is the magnitude of the acceleration of the football?

a. 5.4 m/s²  
b. 0.2 m/s²  
c. 130 m/s²  
d. 250 m/s²

24. Complete this statement.

A net force of 300 N acts on a 200-kg boulder, and a force of the same magnitude acts on a 120-g pebble. The rate of change of the boulder’s momentum is...

a. equal to the rate of change of the pebble’s momentum  
b. greater than the rate of change of the pebble’s momentum  
c. less than the rate of change of the pebble’s momentum
25. Amy (100 lbs) and Gwen (50 lbs) are standing on slippery ice and push off each other. If Amy slides at 4 m/s, what speed does Gwen have?

a. 6 m/s  
   b. 8 m/s  
   c. 2 m/s  
   d. 4 m/s

26. The answer to this question is “B.” Bubble “B” for this question.

a. A  
   b. B  
   c. C  
   d. D
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Answer Section

MULTIPLE CHOICE

1. ANS: D PTS: 1
2. ANS: A  PTS: 1
3. ANS: D  PTS: 1
4. ANS: C  PTS: 1
5. ANS: D  PTS: 1
6. ANS: C  PTS: 1
7. ANS: C  PTS: 1
8. ANS: A  PTS: 1
9. ANS: D  PTS: 1
10. ANS: B  CT  PTS: 1
11. ANS: C  CT  PTS: 1
12. ANS: A  PTS: 1
13. ANS: D  PTS: 1
14. ANS: B  PTS: 1
15. ANS: D  PTS: 1
16. ANS: A  PTS: 1
17. ANS: C  PTS: 1
18. ANS: D  PTS: 1
19. ANS: B  PTS: 1
20. ANS: C  PTS: 1
21. ANS: C  PTS: 1
22. ANS: C  PTS: 1
23. ANS: D  PTS: 1
24. ANS: A  PTS: 1
25. ANS: B  PTS: 1
26. ANS: B  PTS: 1