Physics 211, Fall 2008

Quiz 2, Form: $\boxed{\text{B}}$

Name: _____

Date: _____

For all projectile motion questions, assume *ideal* projectile motion, where air resistance is negligible.

Section 1. Multiple Choice

1. A shot has a weight of 71.17 N. What is its mass in kg?

   (a)   16.0 kg

   (b)   697 kg

   (c)   9.8 kg

   (d)   7.26 kg

   (e)   None of the above

2. A golf ball is hit horizontally off the roof of a 40.0-m tall building with an initial speed of 30.0 m/s. What is the **initial y-velocity** of the golf ball?

   (a)   −9.8 m/s

   (b)   −30 m/s

   (c)   40 m/s

   (d)   30 m/s

   (e)   zero

3. For the golf ball in the previous question, how long is it in the air?

   (a)   1.33 s

   (b)   2.86 s

   (c)   3.06 s

   (d)   4.08

   (e)   8.16

4. You stand on a bathroom scale in an elevator on the third floor. After initially speeding up, the elevator will reach a constant velocity. As it moves **downward** with a **constant velocity**, which is larger in magnitude, the force on you by the scale or your weight?

   (a)   the force on me by the scale

   (b)   my weight

   (c)   neither; because they are the same

5. A projectile is fired to the right and upward at an initial angle θ. When it is at the peak of its trajectory, the **net force** on the projectile is

   (a)   downward and to the right

   (b)   upward and to the right

   (c)   horizontal and to the right

   (d)   downward

   (e)   zero

6. For the projectile in the previous question, the **velocity** of the projectile when it is at its peak is

   (a)   downward and to the right

   (b)   upward and to the right

   (c)   horizontal and to the right

   (d)   downward

   (e)   zero

7. A 1.4-kg human brain sits on a tray which sits on a scale. The scale reads 15.0 N. What is the magnitude of the force on the tray by the scale?

   (a)   9.8 N

   (b)   1.4 N

   (c)   147 N

   (d)   15.0 N

   (e)   13.7 N

8. The path of a projectile is shown below.
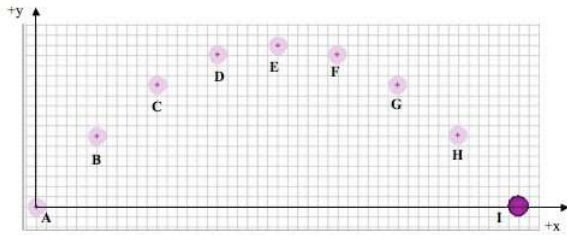
A graph of x vs. t for this projectile will show that the **x-motion** is described by

(a)   constant (non-zero) acceleration

(b)   constant velocity

(c)   non-constant acceleration

(d)   zero velocity

(e)   none of the above

9. For the projectile shown in the previous question, at point G, $v_x = 6.0$ m/s and $v_y = -3.0$ m/s. What is the **speed** of the projectile at point G?

(a)   9.0 m/s

(b)   6.7 m/s

(c)   45 m/s

(d)   18 m/s

(e)   3.0 m/s

10. On which of the objects in the picture below is the net force **not** equal to zero during the time interval shown?
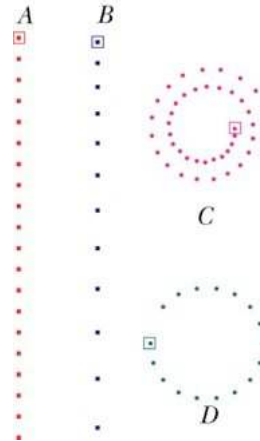
(a)   A only

(b)   A and B

(c)   C and D

(d)   A and D

(e)   B, C, and D

(f)   A, B, C, and D

11. A 115-kg linebacker running at full speed collides with a 80-lb punt returner who is standing still, waiting to catch a punt. Which force is larger in magnitude, the force on the punt returner by the linebacker or the force on the linebacker by the punt returner?

(a)   The force on the punt returner by the linebacker.

(b)   The force on the linebacker by the punt returner.

(c)   Neither, because these forces are equal in magnitude.

(d)   None of the above because it depends on the type of collision and their initial velocities.

12. For the collision between the linebacker and the punt returner in the previous question, which player has the largest magnitude acceleration during the collision?

(a)   the punt returner

(b)   the linebacker

(c)   Neither, because they have the same magnitude acceleration

(d)   None of the above because their accelerations depend on the type of collision and their initial velocities.

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13. An object has a zero net force exerted on it.

    (a)   The object must be at rest.

    (b)   The object must slow down.

    (c)   The object must have a constant velocity.

    (d)   The object must speed up.

    (e)   None of the above

14. In class, you operated a spaceship with four thrusters that fired to the right, to the left, up, and down. A thruster is firing, causing the spaceship to travel to the right (in the +x direction) and speed up. After the thruster *stops* firing, the spaceship

    (a)   will slow down and come to rest.

    (b)   will continue to speed up as it travels to the right.

    (c)   will slow down until it momentarily comes to rest; then it will speed up as it travels to the left.

    (d)   will instantly stop.

    (e)   will move with a constant velocity in the +x direction.

15. Two tennis balls have different masses. Ball A has a mass of 0.057 kg. Ball B has some steel balls inside of it which increases its mass to **twice the mass of Ball A**. If both balls are released from rest at the same instant, which one will hit the floor first?

    (a)   Ball A

    (b)   Ball B

    (c)   Neither; they will hit the floor at the same time.

16. For the two tennis balls in the previous question, on which ball is the gravitational force on the ball by Earth the *greatest*?

    (a)   Ball B

    (b)   Ball A

    (c)   Neither; the gravitational force on the ball by Earth is the same for each ball.

17. A shot (in the shot put event) is thrown with an initial speed of 14.0 m/s at an angle of 50° with respect to the +x axis. What is its initial **x-velocity**?

    (a)   10.7 m/s

    (b)   14.0 m/s

    (c)   9.00 m/s

    (d)   9.90 m/s

    (e)   None of the above.

18. For the shot in the previous question, what is its **x-velocity** at t=0.5 s?

    (a)   10.7 m/s

    (b)   4.50 m/s

    (c)   14.0 m/s

    (d)   9.00 m/s

    (e)   7.00 m/s

An olympic athlete is jumping on a trampoline. Questions 19–21 pertain to the motion of the person while she is in contact with the trampoline.

19. If the person is standing at rest and **remaining at rest**, in equilibrium, on the trampoline, the magnitude of the force of the trampoline on the person is ___ her weight.

    (a)   less than

    (b)   greater than

    (c)   equal to

20. If the person is landing on the trampoline, she **slows down while moving downward.** At this instant, the magnitude of the force of the trampoline on the person is ___ her weight.

    (a)   less than

    (b)   greater than

    (c)   equal to

21. If the person is jumping from the trampoline, she **speeds up while moving upward**. At this instant, the magnitude of the force of the trampoline on the person is ___ her weight.

    (a)   less than

    (b)   greater than

    (c)   equal to

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22. Earth exerts a gravitational force on Dr. Titus of 778 N, downward. Which of Newton's laws tell us that Dr. Titus exerts an upward force of 778 N on Earth?

    (a)   Newton's third law.

    (b)   Newton's second law.

    (c)   Newton's third law.

    (d)   Both the first and second laws.

    (e)   Both the second and third laws.

23. A basketball player shoots a basketball. What is the ball's **y-acceleration** at its peak?

    (a)   zero

    (b) -9.8 m/s^2

    (c)   None of the above.

24. Cart A has a mass of 2.0 kg and collides with Cart B that is at rest and has a mass of 1.0 kg. During the collision, Cart A slows down with an acceleration of -4.0 m/s^2. What is the magnitude of the acceleration of Cart B during the collision?

    (a)   2.0 m/s^2

    (b)   1.0 m/s^2

    (c)   9.8 m/s^2

    (d)   4.0 m/s^2

    (e)   8.0 m/s^2

25. A spaceship in a video game is *moving downward* with a constant velocity when its thruster is turned on as shown below. The thruster fires continuously.

The spaceship will

    (a)   immediately move upward and speed up.

    (b)   slow down until it comes to a stop and then remain stopped.

    (c)   continue to move downward with the same velocity as before the thruster is fired.

    (d)   immediately move upward with a constant velocity.

    (e)   slow down until it stops, change direction, and speed up while moving upward.

Section 2.   Problem Solving

A soccer ball is kicked at an angle of 20° and an initial speed of 15 m/s. Answer the following questions about the motion of the ball.

26. What is the height of the ball at its peak?

27. How far horizontally does the ball travel between where it is kicked and where it hits the ground?

28. A 70-kg waterskier is being pulled by a ski rope. A horizontal resistive force by the water (i.e. drag) opposes the motion of the waterskier. When the rope pulls to the right with a force of 300 N, the skier speeds up from 9.00 m/s to 18 m/s in 20 s. What is the resistive force (i.e. drag) on the skier by the water?