Exam 1, PHYS 101, 08F

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

1. Which of these is the standard for the kilogram?
   a. the mass of $3 \times 10^8$ photons
e. a fraction of the mass of the Earth
   b. the mass of a billion billion Cesium atoms
d. the mass of a particular platinum-iridium cylinder

2. The volume of a room is 1000 m$^3$. What is the volume in cubic centimeters?
   a. $1 \times 10^5$ cm$^3$
e. $1 \times 10^{-3}$ cm$^3$
   d. $1 \times 10^{12}$ cm$^3$
   b. $1 \times 10^9$ cm$^3$
c. $10$ cm$^3$

3. Consider these equations. Which is/are dimensionally correct? (The units of the variables are as follows: $x$: meters; $v$: meters/second; $a$: meters/second$^2$; $m$: kilograms)
   I. $x = x + \frac{x^2}{vt} + t^2 \sqrt{a^2}$
   II. $x = x + at + vt^2$
   III. $amx = \frac{1}{2} mv^2 + \frac{mvx}{t}$
   IV. $v^2 = xa + \frac{2}{3} v_0 at + xva$
   a. I
e. IV & I
d. I & III
   b. II
e. IV & I
c. III

4. In this operation of arithmetic, which is the appropriate answer:

   $(4.50 \times 10^2)(3510)(0.014)(0.1543) = 3412.0359$
   a. 3412.0359
d. 3400
   b. 3412
e. 3410
c. 3412.036
5. With your fingers together, what is the area of your hand (from your wrist to fingertips)?

a. 0.02 m$^2$

b. 0.0002 m$^2$

c. 2 m$^2$

d. 0.002 m$^2$

e. 0.2 m$^2$

6. The mass (kg) of an object is related to its acceleration (m/s$^2$) and displacement (m) by this relationship:

\[ m = \frac{(B)(a)}{x} \]

What are the units of the constant $B$?

a. kg s$^2$

c. m kg s$^2$

b. s$^2$/m$^2$

d. kg/m

e. m/s$^2$

d. s$^2$/m$^2$

c. kg/m

7. In this figure, the coordinates are given for the point; these coordinates are in the Cartesian coordinate system. If you wanted to express the polar coordinates ($r$, $\theta$), what would those values be?

a. ($r=6.00$, $\theta=216^\circ$)

c. ($r=4.30$, $\theta=216^\circ$)

b. ($r=4.30$, $\theta=180^\circ$)

d. ($r=4.30$, $\theta=36^\circ$)

8. Which of these quantities is/are scalar quantities?

I. mass
II. acceleration
III. speed
IV. velocity

a. I
d. II & III
b. II & IV
e. I & II
c. I & III
9. You throw a ball up into the air and it returns to your hand. Which of these plots best describes the motion of the ball from the moment you release it to the moment you catch it?
10. In this graph, what is the instantaneous acceleration at point C?

- a. 2 m/s²
- b. 1 m/s²
- c. -1 m/s²
- d. -2 m/s²
- e. none of these

11. In the previous graph, what is the average velocity between points A and C?

- a. -2 m/s²
- b. 0.33 m/s²
- c. 1 m/s²
- d. 0.4 m/s²
- e. Not enough information

12. A guy throws a ball up into the air at a speed of 20 m/s. Neglect air resistance. What is the maximum height that the ball reaches?

- a. 10 m
- b. -10 m
- c. 20 m
- d. 5 m
13. When throwing a ball straight up, which of the following is true about its velocity and acceleration at the highest point in its path?

a. \( v \neq 0 \), but \( a = 0 \)  

b. \( v = 0 \) and \( a = 0 \)  

c. both \( v \neq 0 \) and \( a \neq 0 \)  

d. \( v = 0 \), but \( a \neq 0 \)  

e. not enough information

14. Which of these best describe the motion in the instant at point A (at the cross) in this graph?

\[ x \]

\[ t \]

a. continuously increasing position  

b. decreasing velocity  

c. positive, increasing velocity  

d. constantly increasing acceleration  

e. negative velocity

15. A car initially travels at 10 m/s. The driver sees a traffic light ahead and steps on the brake so that he slows down at a rate of 2 m/s\(^2\). If it requires 5 seconds for the car to stop, what distance does the guy cover in this time?

a. 50 m  

b. 30 m  

c. 80 m  

d. 100 m

16. You drop a ball from 12 m above the floor. How long does it take the ball to hit the ground?

a. 1.2 s  

b. 120 s  

c. 4.5 s  

d. 1.6 s
17. Which of these statements represent the motion represented in this plot?

- increasing, positive velocity
- decreasing, negative velocity
- increasing, negative velocity
- decreasing, positive velocity

18. This graph represents the position of a particle over a time of five seconds. What is the particle’s instantaneous velocity at t=3.5 seconds?

- 2 m/s
- 0.5 m/s
- -4 m/s
- 0 m/s
19. While exploring a cave a spelunker starts at the entrance and moves the following distances: 30.0 m west, 20.0 m at an angle 40.0° north of east, and 100. m south. What is the magnitude of his resultant displacement?

a. 102 m  
   b. 88.3 m  
   c. 122 m  
   d. 150. m

20. This figure shows the vectors A and B. What is the resultant vector of B-A?

a.  
   b.  
   c.  
   d.  
21. An artillery shell is fired with an initial velocity of 300 m/s at 45 degrees above the horizontal. To clear an avalanche, it explodes on a mountainside 31 seconds later. At what height, relative to the firing position, does the shell explode?

a. 6,300 m  
b. 9,000 m  
c. 13,000 m  
d. 11,000 m  
e. 1,900 m

22. Which of these statements about the motion of a projectile is/are true?

I. The x-component of the velocity does not change.
II. The y-component of the velocity increases throughout the trajectory.
III. The x-component of the acceleration is zero.
IV. The maximum height is dependent on the x-component of the velocity.
V. The maximum range is dependent only on the x-component of the velocity.

a. I, III, & V  
b. III  
c. I & III  
d. II & IV  
e. All are true

23. The vector $\vec{A}$ has components $A_x$ and $A_y$. If $|A_x| > |A_y|$ (that is, the magnitude of the x-component is greater than the magnitude of the y-component), which of these is a possible angle for $\vec{A}$?

I. 60° above the positive x-axis
II. 30° above the positive x-axis
III. 40° below the negative x-axis
IV. 45° below the positive x-axis

a. II, III, & IV  
b. I  
c. IV  
d. II  
e. II & III
24. You fire a pistol, which gives the bullet an initial velocity of 300 m/s, at a certain angle above the horizontal. The bullet is airborne for 2.0 s. If the bullet lands 300 m from the shooter, at what angle was the gun fired?

a. 1°
b. 60°
c. 20°
d. 45°

25. A cart is accelerating along a flat surface. A cannon on the cart fires a ball directly overhead. Where does the ball land when it comes back down?

a. in the cart
b. in front of the cart
c. behind the cart
d. it depends on the speed of the cart at the time of firing

26. You drop a package from a plane flying at a constant speed. Without air resistance, the package will:

a. quickly lag behind the plane while falling
b. remain vertically under the plane while falling
c. move ahead of the plane while falling
d. not enough information

27. The answer to this question is “A.”

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

MULTIPLE CHOICE

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