Exam 1--PHYS 201--F10--Chapters 1-3A

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

1. Which answer has the appropriate significant figures for this mathematical operation:

   \[
   \frac{1.0 \times 0.01}{3.4}
   \]

   a. 0.003  
   b. 0.0029  
   c. 0.00294  
   d. 0.002941

2. What is the area of the projection screen at the front of this room?

   a. 1 m\(^2\)  
   b. 10 m\(^2\)  
   c. 100 m\(^2\)  
   d. 1000 m\(^2\)

3. Which of these is a reason that a standard of measurement is not appropriate?

   I. The standard changes.
   II. The standard is not available to everyone.
   III. The standard is based on some obscure physical constant.
   IV. The standard smells really bad.

   a. IV only  
   b. I only  
   c. I & III  
   d. II & III  
   e. I & II

4. Is this equation dimensionally correct?

   \[
   \frac{xam}{t} = \frac{1}{2} \frac{mv^2}{v} \frac{a}{v}
   \]

   Units
   m: kg
   t: s
   x: m
   v: \frac{m}{s}
   a: \frac{m}{s^2}

   a. Yes  
   b. No
5. A house is 45 ft long and 32 ft wide and has 8.0-ft-high ceilings. What is the volume of the interior of the house in cubic centimeters? (1 meter=3.3 feet)

a. 11520 cm³  
b. 350,000 cm³  
c. 3.2x10⁸ cm³  
d. 320 cm³

6. Since 1983 the standard meter has been defined in terms of which of the following?

a. the distance light travels in 1/(3 x 10⁸) second  
b. distance from the Earth's equator to the north pole  
c. specific alloy bar housed at Sevres, France  
d. wavelength of light emitted by krypton-86

7. You drive 4 miles at 60 mi/hr and then another 4 miles at 40 mi/hr. What is your average speed for the whole 8-mile trip?

a. equal to 50 mi/hr  
b. more than 50 mi/hr  
c. less than 50 mi/hr  
d. not enough information

8. Describe the motion of the particle shown in this graph

a. constant, positive velocity  
b. decreasing, negative velocity  
c. increasing, positive velocity  
d. zero velocity  
e. decreasing, positive velocity
9. You throw a ball 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 just before you catch it?
10. In this graph, what is the instantaneous acceleration at point C?

\[ v(\text{m/s}) \]

\[ t(\text{s}) \]

A. -2 m/s²
B. 1 m/s²
C. 1 m/s²
D. 2 m/s²
E. 0.5 m/s²

11. You throw a ball upward with an initial speed of 10 m/s. Assuming that there is no air resistance, what is its speed when it returns to you?

A. less than 10 m/s
B. equal to 10 m/s
C. more than 10 m/s

12. Which of these statements about vectors is incorrect?

A. A vector can have a magnitude greater than one of its components.
B. A vector lies just above the x-axis in quadrant I. Both of its components are positive.
C. If \( |\vec{A}| + |\vec{B}| = |\vec{C}| \) and \( \vec{A} + \vec{B} = \vec{C} \), then the vectors \( \vec{A} \) and \( \vec{B} \) are parallel and in the same direction.
D. If \( |\vec{A}|^2 + |\vec{B}|^2 = |\vec{C}|^2 \), the vectors \( \vec{A} \) and \( \vec{B} \) are perpendicular to one another.
E. All of these are incorrect.
13. The following figure shows vectors $\vec{A}$ and $\vec{B}$. What is the result of the difference $\vec{A} - \vec{B}$?

![Diagram of vectors A and B]

a.  

b.  

c.  

d.  

14. The vector $\vec{A}$ is has components $A_x$ and $A_y$, which are both positive. If $|A_x| < |A_y|$, which of these is the possible direction for the vector $\vec{A}$?

a. 45° above the positive x-axis  

b. 64° above the positive x-axis  

c. 72° above the negative x-axis  

d. 43° above the negative x-axis  

e. 55° below the positive x-axis

15. If vector $\vec{A}$ has a magnitude of 12 m and vector $\vec{B}$ has a magnitude of 25 m, which of these is a possible solution for the sum $\vec{A} + \vec{B}$?

a. 32 m  

b. 9 m  

c. 38 m  

d. 55 m
Problem

16. (20 pts) The position of an object as a function of time is given \( r=(4t^3-2t^2)i+(3t-4t^2)j \) m, where \( t \) is the time in seconds. Answer the following questions about this object:

a) What is the acceleration, in vector notation, when \( t=3 \) s?

b) At what time is the acceleration in the x-direction equal to zero?

c) What is the magnitude and direction of the velocity when \( t=2s \)?
17. (10pts) Derive the two equations of motion:
18. (10 pts) Consider this plot of velocity versus time. Answer the following questions:

a) What distance does the particle travel between t=2 and t=6 seconds?

b) What is the acceleration at t=7 seconds?

c) What is the average acceleration between t=0 and t=8 seconds?

d) What is the velocity at t=5 seconds?
19. (15 pts) You walk east 120 m, 110 m at an angle of 45° north of east, and then north 150 m. What are the magnitude and direction of your displacement vector?
20. (15 pts) You throw a ball from the ground to a height of 10 m, and it returns to your hand. Answer the following questions regarding its motion. (Hint: Consider only half of the motion, letting the initial state be at the top of the trajectory.)

a) How much time is required for the ball to return to your hand?

\[ t = \underline{\quad} \text{s} \]

b) What is the velocity of the ball at the halfway point in its descent?

\[ v_f = \underline{\quad} \text{m/s} \]

c) What is the velocity of the ball at the bottom, just before it hits the ground?

\[ v = \underline{\quad} \text{m/s} \]
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Answer Section

MULTIPLE CHOICE

1. ANS: A  PTS: 1
2. ANS: B  PTS: 1
3. ANS: E  PTS: 1
4. ANS: A  PTS: 1
5. ANS: C  PTS: 1
6. ANS: A  PTS: 1
7. ANS: C  PTS: 1
8. ANS: C  PTS: 1
9. ANS: D  PTS: 1
10. ANS: A  PTS: 1
11. ANS: B  PTS: 1
12. ANS: A  PTS: 1
13. ANS: D  PTS: 1
14. ANS: B  PTS: 1
15. ANS: A  PTS: 1

PROBLEM

16. ANS:
   
   PTS: 1
17. ANS:
   
   PTS: 1
18. ANS:
   
   PTS: 1
19. ANS:
   
   PTS: 1
20. ANS:
   
   PTS: 1