Department of Mathematics and General Sciences

Physics 1 (PHY105)
First Major Exam

First Semester, Term 141
Date: Sunday 26/10/2013

Name: 
ID number: 
Section number (or time): 
Instructor’s name: 

Important instructions:
1. Examination time: 60 minutes.
2. Write your name before starting with the questions.
3. Switch off your mobile phone and put any books and notes away.
4. You should have 5 pages in total.
5. You may not borrow a calculator.
6. Use \( g = 9.8 \, \text{m/s}^2 \).

Good Luck!

<table>
<thead>
<tr>
<th>Part</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 1</td>
<td></td>
</tr>
<tr>
<td>Part 2</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>
1. Which one of the choices below represents the preferred practice regarding significant figures when adding the following: 12.3 + 12 + 88.16 + 2.218?
   a) 114.7    b) 115    c) 114.678    d) 114.6780

2. The slope of the tangent line to the the velocity vs. time curve at a given time represents:
   a) the instantaneous acceleration at that time.    b) the instantaneous velocity at that time
   c) the average velocity.    d) the average acceleration.

3. Omar throws a rock down with speed 13 m/s from the top of a tower. The rock hits the ground after 2 s. What is the height of the tower? (air resistance is negligible)
   a) 23 m    b) 83 m    c) 37 m    d) 46 m

4. A ball is thrown. At what point is the magnitude of the acceleration at a minimum? (air resistance is negligible)
   a) acceleration is constant    b) just before hitting
   c) just after leaving the thrower's hand    d) at the top of the path during entire path

5. Which of the following is not a vector quantity?
   a) acceleration    b) velocity    c) displacement    d) speed

6. A jogger runs halfway around a circular path with a radius of 52 m. What is the magnitude of his displacement?
   a) 104 m    b) 52 m    c) 163 m    d) 0 m

7. If \( a \) is acceleration, \( v \) is velocity, \( x \) is position, and \( t \) is time, then which equation is not dimensionally correct?
   a) \( t = x/v \)    b) \( t^2 = 2x/a \)    c) \( a = v^2/x \)    d) \( v = a/t \)

8. A railroad train travels forward along a straight track at 90 m/s for 1000 m and then travels at 60 m/s for the next 1000 m (in the same direction). What is its overall average velocity?
   a) 77.0 m/s    b) 72.5 m/s    c) 72.0 m/s    d) 75 m/s

9. An Ant travels 30 cm eastward, then 30 cm northward, and finally 5 cm westward. What is the Ant's direction of displacement with respect to its original position?
   a) 50° North of East    b) 45° North of West    c) 40° North of West    d) 130° North of East

10. A European sports car dealer claims that his product will accelerate at a constant rate from rest to a speed of 100 km/hr in 6 s. What distance will the sports car travel during the 6 s acceleration period?
    a) 41.5 m    b) 166 m    c) 58.1 m    d) 83 m
Part 2 (5 points):
Solve the following two problems in the provided space. *Show your steps and include the appropriate units.*

Q1. (2 points) A car starting from rest accelerates at a constant rate of 2 m/s² for 100 meters. The driver then applies the brakes, causing the car to decelerate at a constant rate. The car stops completely 4 seconds after applying the brakes.
   a) Calculate the velocity of the car just before the brakes were applied.
   b) What is the total distance the car has traveled?
Q2. (3 points) A ball is kicked from the ground at an angle of $\theta_0 = 45^\circ$ from the horizontal towards a wall located $x = 20$ m away, as shown in the figure. The ball hits the wall 2 seconds later. Calculate:

a) the initial speed of the ball $v_0$

b) the height at which the ball hits the wall $h$

c) the speed and direction of the ball just before hitting the wall
Scratch sheet. Keep attached