Name:_____ ID:_____ Lab (day/time)_____

Physics 201
Midterm Exam 1
6/28/2016

Collaboration is not allowed. Allowed on your desk are: up to ten 8.5 x 11 inch doubled sided sheets of notes that are bound together, non-communicating/graphing scientific calculator, 1 page of scratch paper, writing utensils, and the exam. You will have 50 minutes to complete this exam.

1. (10 points) An unidentified flying object maintains a constant acceleration for 2.50 s. The acceleration during this time is 10 m/s² in the eastern direction and 4 m/s² in the southern direction. The final velocity of the object is 15 m/s in the eastern direction and 10 m/s in the southern direction. (a) What was the initial velocity of the object? (b) Draw a physical representation of the initial, final, and change in velocity.

For questions 2 through 4 circle all correct answers, a given problem may have more than one correct answer. Each correctly circled answer will receive two points. There are **5** correct answers in this section and only the first **5** circled answers will be graded. There is no partial credit.

2. An object moving along a straight line has it's velocity pointing in the opposite direction of it's position. Which *one* of the following statements concerning the object is *necessarily* true?
    (a) The value of the acceleration is negative.
    (b) The direction of the acceleration is in the opposite direction as the displacement.
    (c) The direction of the acceleration is in the direction opposite to that of the velocity.
    (d) The object is moving towards the origin.
    (e) The object is slowing down.

3. An amoeba travels at a constant speed along a curved path as shown. Considering between the points P and Q, which of the following statements are true regarding this situation.
    (a) The distance traveled is the same as the magnitude of the displacement.
    (b) The magnitude of the average velocity is greater than the amoeba's constant speed.
    (c) The magnitude of the average velocity is less than the amoeba's constant speed.
    (d) The magnitude of the average velocity is equal to the amoeba's constant speed.
    (e) The amoeba experienced zero acceleration the entire trip.
    (f) The amoeba experienced both periods of zero and non-zero acceleration.
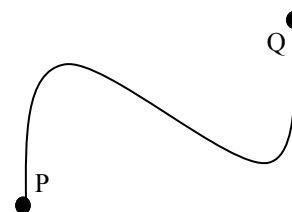
4. The table lists four variables along with their units. These variables appear in the below equations, along with a few numbers that have no units. Which of the equations are *not* dimensionally valid?

Variable	Units
x	Meters (m)
v	Meters per second (m/s)
t	Seconds (s)
a	Meters per second squared (m/s²)

(a) $x = vt$

(b) $x = vt + \frac{1}{2}at^2$

(c) $v = at$

(d) $v = at + \frac{1}{2}at^3$

(e) $v^3 = 2ax^2$

(f) $t = \sqrt{\dfrac{2x}{a}}$

5. (4 points) Pressure is a physical quantity that describes a force per area. The International System of Units (SI) unit for pressure is called a Pascal (Pa), which is equal to a Newton (N) per meter squared. The atmospheric pressure on top of Mt. Everest is 33.7 kilopascals. Knowing that a pound (lb) is equal to 4.45 N and that 1 inch is equal to 2.54x10⁻⁵ kilometers, determine the pressure on top of Mt. Everest in pounds per square inch (psi).

6. (10 points) A goalie kicks a soccer ball straight vertically into the air. It takes 5.00 s for the ball to reach its maximum height *and* come back down to the level of the crossbar. Assume the crossbar of a soccer goal is 2.44 m above the ground. (a) How fast was the ball originally moving when it was kicked. (b) How much longer would it take the ball to reach the ground?

Scores:

Problems

1	2-4	5	6

Exam Total