CP Physics Exam #1 – PRACTICE – 2008-2009 **Name: _____**

Section 1 – Definitions (2 pts. Each)

1. Speed –
2. Velocity –
3. Acceleration –
4. Vector –
5. Scalar –

Section 2 – True/False (2 pts each) – Circle the correct letter – For each of these, assume that to the right is positive, and up is positive.

T F 1. An object thrown straight up has a negative acceleration on the way up and a positive acceleration on the way down.

T F 2. At the top of its path, a ball's speed is zero, but its velocity is not.

T F 3. A quantity that has both a magnitude and direction is called a scalar.

T F 4. An object with negative velocity and negative acceleration is speeding up.

T F 5. An object moving to the left has negative velocity.

T F 6. If a position vs. time graph of an object's motion has a negative slope, then the speed of the object is decreasing.

T F 7. If a hammer and a feather were dropped above the surface of the moon, they would accelerate at the same rate.

T F 8. A car, racing around a circular racetrack at constant speed, has zero acceleration.

T F 9. The velocity vs. time graph of a ball in free fall is linear (straight).

T F 10. An object with an acceleration of $5 m/s^2$ is moving faster than an object with an acceleration of $2 m/s^2$.

Section 3 -- Graphs of Motion (6 pts each) -- Sketch the required graphs on a separate piece of paper. Be sure that your vel- and accel-vs-time graphs show whether velocity and/or acceleration is positive or negative.

1. A car starts from rest, and moves to the left with increasing speed. Graph the pos-, vel-, and accel-vs-time graphs in the x direction.

2. A block starts with an initial velocity to the left on a horizontal surface, but, because of friction, slows to a stop. Graph the pos-, vel-, and accel-vs-time graphs in the x direction.

3. A block slides with constant velocity to the right on a horizontal, frictionless surface. Graph the pos-, vel-, and accel-vs-time graphs in the x direction.

4. A ball falls from rest *without* air resistance. Graph the pos-, vel-, and accel-vs-time graphs in the y direction.

5. A ball is thrown straight *up* with some initial velocity. Graph the pos-, vel-, and accel-vs-time graphs in the y direction until the ball comes back down to its original height.

Section 4 – 1D Motion Problems (5 pts each) – For each problem, start by writing the symbolic equation. Then plug in numbers, including units. Then, solve the problem, making sure you include correct units in your answer.

1. A car accelerates from rest at a rate of 9 m/s^2. What is the car's speed after 6 seconds?

2. A car accelerates from rest at a rate of 9 m/s^2. How far does the car travel in 6 seconds?

3. A ball is dropped from rest, and falls freely from a height of 80 m above the ground. How long does it take the ball to reach the ground?

4. A student throws a ball vertically, and catches it 4 seconds later. How fast was the ball thrown? (assume no air resistance)

Section 4 – 2D Motion Problem (10 pts)

1. A marble launcher is set to launch a marble 60 degrees above horizontal at a speed of 12m/s. First, find the horizontal and vertical components of velocity, and then calculate where the marble will land (assume no air resistance, and that the landing height is the same as the launch height).

Section 5 – Open Response (10 pts)

You have been hired by the Mythbusters crew to help them with a myth involving the terminal velocity of a baseball. You want to find out how much damage a baseball would do to a car if it fell from a great height at its terminal velocity. You run some wind tunnel tests, and find out that the terminal velocity of a baseball is about 160ft/s. Adam and Jamie build a baseball launcher that can launch a baseball vertically. They fire a ball, and it returns to the ground 9.0 seconds later, but they are not sure if the baseball went high enough to ensure that it would be falling at its terminal velocity on the way down. Please perform the necessary calculations, and ***clearly explain to them*** whether you think their launcher is sufficient.