Exam 1
Phys 220
Fall 2012

Name: _____ Lab group: _____

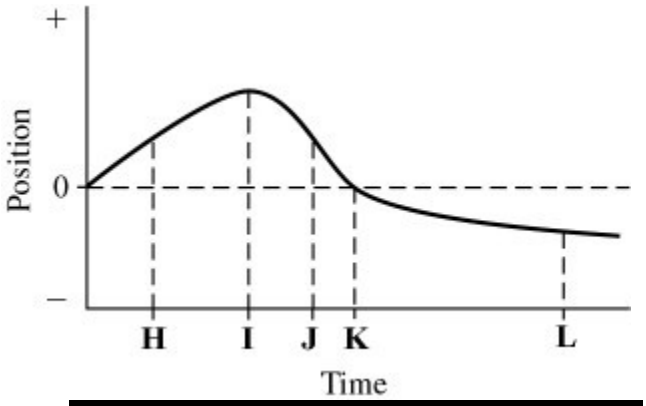
Note: There will be more multiple choice questions on the 2013 exam. Last year, people felt that each problem counted for too much. Expect closer to 20 multiple choice and 2 or 3 problems to work out.

1. Rank in order, from the most to the fewest, the number of significant figures in the following numbers: A. 0.43 B. 0.0052 C. 0.430 D. 4.321×10^{-10}
    a. B>C = A>D
    b. D>C>B=A
    c. D=B>C>A
    d. B>D=C>A

2. If an object has a positive velocity and a negative acceleration, it means the object will
    a. slow to a stop.
    b. speed up.
    c. slow down, turn around and speed up in the other direction
    d. remain at a constant speed

3. When a ball is thrown up into the air, what is its acceleration at the top of its flight?
    a. $a = 0\ m/s^2$
    b. $a = -9.8\ m/s^2$
    c. $a = 9.8\ m/s^2$
    d. Not enough information is given.

4. What does the slope of this graph represent?
    a. Position
    b. Velocity
    c. Acceleration



Questions 5 - 7 The plot to the right shows the position of an object as a function of time. The letters H-L represent particular moments of time.

5. At which moment in time is the speed of the object the highest?
    a. H
    b. I
    c. J
    d. K
    e. L

6. At which moment in time is the speed of the object equal to zero?
    a. H
    b. I
    c. J
    d. K
    e. L

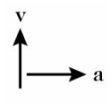
7. Sketch the corresponding velocity vs. time and acceleration vs. time graphs for the graph in #4.

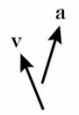
[redacted]

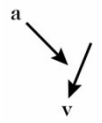
[redacted]

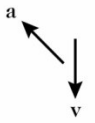
8. Which of the following quantities does NOT include direction?
    a. acceleration
    b. displacement
    c. speed
    d. velocity
    e. none of the above

9. Shown here are the velocity and acceleration vectors for an object in several different types of motion. In which case is the object slowing down and turning to its right?

A) 

B) 

C) 

D) 

E) 

10. Two bullets are fired simultaneously parallel to the ground from the same height. The bullets have different masses and different initial velocities. Which one will strike the ground first?
    a. the fastest one
    b. the slowest one
    c. the heaviest one
    d. the lightest one
    e. They strike the ground at the same time.
    f. Not enough information

11. A lion can reach a speed of 9.5 m/s in 1.0 s. A trout can reach a speed of 2.8 m/s in 0.12 s. (show all work on the back of this page)
    a. Which animal has the largest acceleration?
    b. How many g's does each undergo?
    c. If a trout accelerated for 1.5 seconds, what would its final speed be?
    d. Is your answer in c reasonable? Why or why not?

12. A cat leaps to catch a bird. If the cat's jump was at 60.0° off the ground and its initial velocity was 5.0 m/s, will it catch the bird if the bird is 1.0 meter above the ground? (Show all work on the back of this page)

13. A bus is moving at -17.0 m/s relative to the Earth. A passenger throws a ball to his friend. If the ball is thrown with a horizontal velocity of -4.0 meters per second relative to the bus, what is its velocity relative to the Earth? Use the symbolic notation for relative velocity to solve this problem.

$v_x = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{\Delta t}$ $a_x = \frac{\Delta v_x}{\Delta t} = \frac{v_{xf} - v_{xi}}{\Delta t}$ $a = \frac{v^2}{r}$ $f = \frac{1}{T}$

$x_f = x_i + v_{xi}\Delta t + \frac{1}{2} a_x(\Delta t)^2$ $v_{xf} = v_{xi} + a_x\Delta t$ $v_{xf}^2 = v_{xi}^2 + 2a_x(\Delta x)$

$\sin\theta$ = opp/hyp $\cos\theta$ = adj/hyp $\tan\theta$ = opp/adj

$a^2 + b^2 = c^2$ 1609 meters = 1 mile 3600 seconds = 1 hour