PHYS 201 001 Sims 209 Fall 2014 Test #1 Name: Key

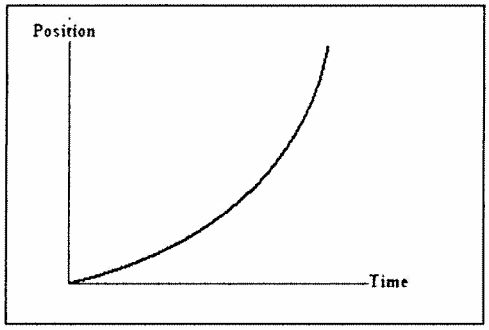
A. Select the correct answer for the following multiple choice questions and write your answer in the line next to the question number. (Each question is worth 3 points)

C 1. Today, the standard second is defined using the_____atomic clock.
a. Irridium b. Rubidium c. Cesium d. Platinum e. Radium f. Quartz

d 2. Speeding tickets are issued using the,
a. average speed b. average velocity c. average acceleration
d. instantaneous speed e. instantaneous velocity f. instantaneous acceleration

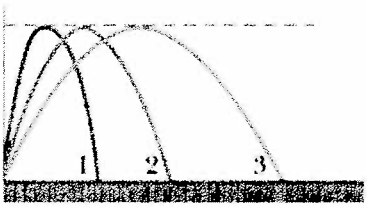
e 3. The slope of the position *versus* time graph gives,
a. time b. displacement c. acceleration d. position e. velocity

a 4. For the motion described in the graph, decide whether the moving object is
a) accelerating
b) decelerating or
c) moving at a constant velocity.

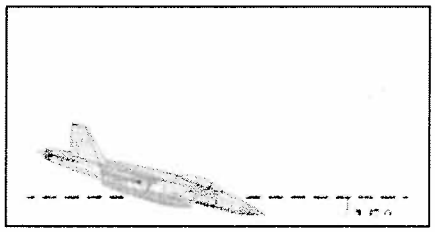


C 5. The figure below shows three paths for a football kicked from ground level. Ignoring the effects of air, rank the paths, according to initial horizontal velocity component, greatest first.

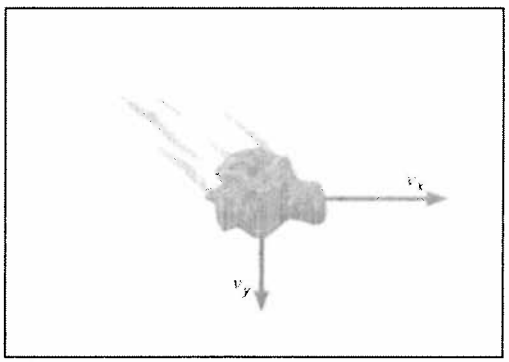
a. 1>2>3
b. 2>3>1
c. 3>2>1
d. All tie (1=2=3)



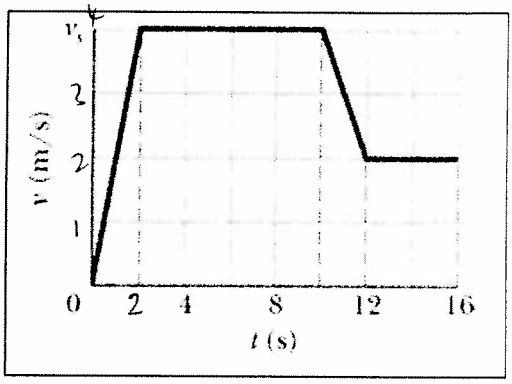
b 6. A plane is diving as shown below with a velocity of 120 m/s at an angle of 15^0 below horizontal. What is the vertical component of the plane's velocity?
a. 31 m/s, up
b. 31 m/s, down
c. 116 m/s, up
d. 116 m/s, down



C 7. A meteoroid is speeding through the atmosphere, traveling east at 18 km/s while descending at 12 km/s. What is its speed, in km/s?
a. 18 km/s b. 12 km/s
c. 22 km/s c. 468 km/s



8-13) Deal with the one-dimensional motion of an object, which is graphed below, where v_s= 4 m/s.



c 8. What is the time interval at which the object decelerates?
a. (0-2) s b. (2-10) s c. (10-12) s d. (12-16) s

e 9. What is the instantaneous velocity of the object at 4 s?
a. 0 m/s b. 1 m/s c. 2 m/s d. 3 m/s e. 4 m/s

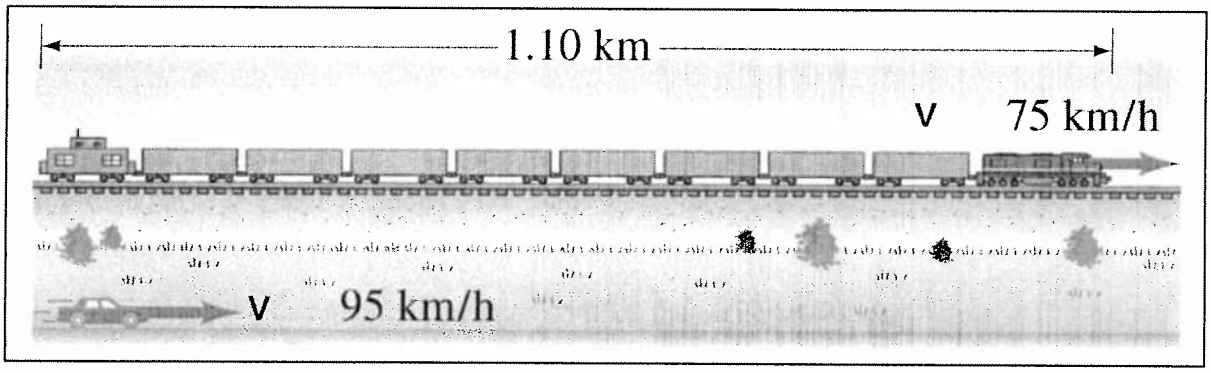
c 10. What is the instantaneous velocity of the object at 12 s?
a. 0 m/s b. 1 m/s c. 2 m/s d. 3 m/s e. 4 m/s

a 11. What is the instantaneous acceleration of the object at 4 s?
a. 0 m/s^2 b. 0.5 m/s^2 c. 1.0 m/s^2 d. 10 m/s^2 e. 25 m/s^2

d 12. What is the instantaneous acceleration of the object at 1 s?
a. 0 m/s^2 b. 0.5 m/s^2 c. 1.0 m/s^2 d. 2.0 m/s^2 e. 4.0 m/s^2

c 13. Approximately how far the object travels during the first 2 seconds?
a. 1 m b. 2 m c. 4 m d. 8 m e. 20 m

14-15) A car traveling at 95 km/h overtakes a 1.10 km long train traveling in the same direction on a track parallel to the road. The velocity of the train is 75 km/h, eastward.



c 14. What is the velocity of the car relative to the train?

a. 95 km/h eastward b. 75 km/h eastward c. 20 km/h eastward

d. 170 km/h eastward e. 20 km/h westward

e 15. How long does it take the car to pass the train?

a. 0.055 min b. 0.39 min c. 0.69 min d. 0.88 min e. 3.3 min

a 16. Which one of the following is a scalar?
a. Distance b. Displacement c. Velocity d. Force e. Weight

B. Equations of kinematics are given below: (Acceleration due to gravity = 9.8 m/s^2, down)

1.	2.	3.	4.
$v = v_0 + at$	$x = \frac{1}{2}(v + v_0)t$	$x = v_0 t + \frac{1}{2}at^2$	$v^2 = v_0^2 + 2ax$

1. Derive the third equation using the first two, starting with 2nd equation.

$$x = \frac{1}{2}(v + v_0)t$$

$$v = v_0 + at$$

$$x = \frac{1}{2}(v_0 + at + v_0)t$$

$$x = \frac{1}{2}(2v_0 + at)t = \left(v_0 + \frac{1}{2}at\right)t$$

$$x = v_0 t + \frac{1}{2}at^2$$

2. The brakes on your automobile are capable of creating a deceleration of 4.9 m/s^2. If you are going 39 m/s and suddenly see a state trooper,
a. what is the minimum time in which you can get your car under the 26 m/s speed limit?
b. How far you travel during this time?

a. $v_0 = 39$ m/s

$v = 26$ m/s

$a = -4.9$ m/s^2

$t = ?$

$v = v_0 + at$

$26 = 39 - 4.9t$

$-13 = -4.9t$

$t = \frac{13}{4.9} = 2.7$ sec

$t = 2.7$ s

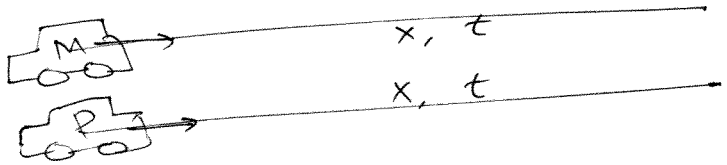
b. $x = \frac{1}{2}(v + v_0)t$

$= \frac{1}{2}(26 + 39) \times 2.7$

$x = 88$ m

$x = 88$ m

3. A speeding motorist passes a stopped police car. At the moment the car passes, the police car starts from rest with a constant acceleration of 3.3 m/s^2. The speeding motorist continues with the constant speed until caught by the police car 15 s later. How fast is the speeding car going?



Police car: $V_0 = 0$

$a = 3.3\ m/s^2$

$t = 15\ s$

$x = v_0 t + \frac{1}{2} a t^2$

$x = 0 + \frac{1}{2} \times 3.3 \times 15^2 = 371\ m$

Motorist: Constant speed

$V = \frac{x}{t} = \frac{371}{15} = 25\ m/s$

Speed of motorist = 25 m/s

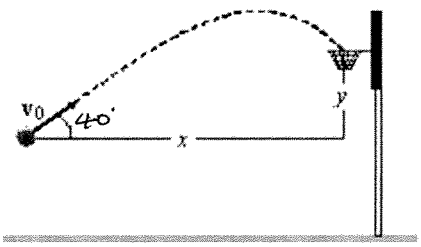
4. A basketball is shot with an initial velocity of 8.0 m/s and launch angle of 40^0, which follows the trajectory shown. The ball enters the basket 0.92 s after it is launched.

a. What are the horizontal and vertical components of the initial velocity?

b. What are the distances *x* and *y*?

a. $V_{ox} = V_0 \cos 40^\circ = 8 \cos 40^\circ = 6.1\ m/s$

$V_{oy} = V_0 \sin 40^\circ = 8 \sin 40^\circ = 5.1\ m/s$



→ $V_{ox} = 6.1\ m/s$

$t = 0.92\ s$

$a_x = 0$

$x = v_{ox} t + \frac{1}{2} a_x t^2$

$x = 6.1 \times 0.92 + 0$

$x = 5.6\ m$

↑ $V_{oy} = 5.1\ m/s$

$a_y = -9.8\ m/s^2$

$t = 0.92\ s$

$y = v_{oy} t + \frac{1}{2} a_y t^2$

$= 5.1 \times 0.92 - \frac{1}{2} \times 9.8 \times 0.92^2$

$= 4.69 - 4.15$

$y = 0.54\ m$

$x = 5.6\ m$

$y = 0.54\ m$