

General Physics
Physics 101
Test #1 – Fall 2014
Friday 9/26/14
Prof. Bob Ekey

Name (print): _____

I hereby declare upon my word of honor that
I have neither given nor received unauthorized
help on this work.

Signature: _____

Part I. Multiple Choice (3 pts each)

Instructions:

Please clearly circle one and only one answer for each of the following.
Show all of your work. Partial credit may be given if you include your work.

Questions:

1. A baseball is thrown from the upper deck at Progressive Field in the horizontal direction with a velocity of 10 m/s. If the ball falls 30 m vertically into the field below, how far did the ball travel horizontally during its motion?

- (a) 25 m
- (b) 61 m
- (c) 49 m
- (d) 30 m

2. A student derives an equation of the form $\frac{t^2}{2v^2}$.

What are the combined SI base units for this equation?

(a) $\frac{s^4}{m^2}$

(b) $\frac{m^2}{s^4}$

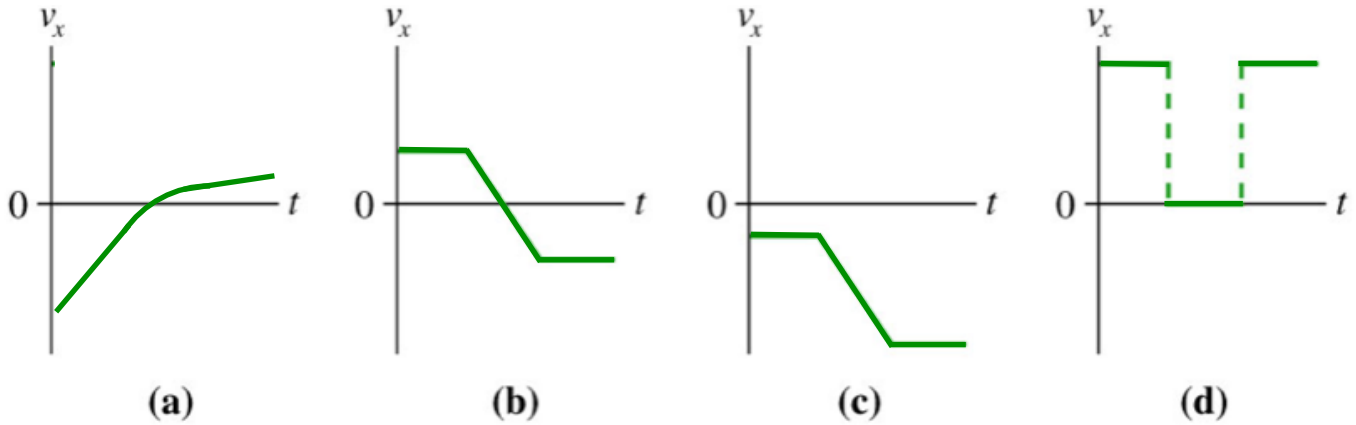
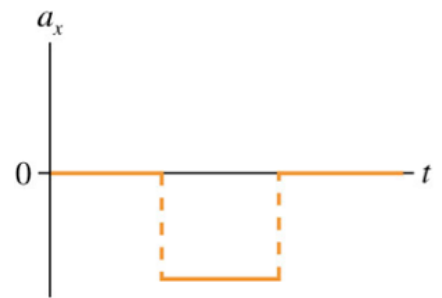
(c) $m^{-2}s^{-2}$

(d) m^2

3. A skier is gliding along at 3.0 m/s on a horizontal, frictionless snow. He suddenly starts down a 10° incline. If his speed at the bottom is 15 m/s, how long is the incline?

- (a) 63 m
- (b) 7.4 m
- (c) 42 m
- (d) 11 m

4. Which velocity versus time graph could go with the acceleration versus time graph? The particle is initially moving to the right.



5. What are the x and y components of this vector?

$$a = (100 \frac{m}{s^2}, 36.9^\circ \text{ clockwise from negative } y\text{-axis})$$

- (a) $(-80.0\hat{i} - 60.0\hat{j})$
- (b) $a_x = 60.0 \text{ m/s}^2$ & $a_y = -80.0 \text{ m/s}^2$
- (c) $(-60.0 \text{ m/s}^2, 80.0 \text{ m/s}^2)$
- (d) 80.0 m/s^2 in the $-y$ -direction & 60.0 m/s^2 in the $-x$ -direction.

6. A balloon is flying with a speed of 2.0 m/s to the West and 1.0 m/s to the North. It experiences a steady wind that causes an acceleration of 1.0 m/s² to the East. If this wind acted on the balloon for 10 seconds, what is the displacement of the balloon in the East-West direction during the wind?

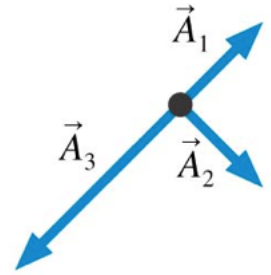
- (a) 50 m to the East
- (b) 30 m to the East
- (c) 70 m to the West
- (d) 60 m to the West

7. Which of the following is not possible to determine based off the motion diagram shown?



- (a) The acceleration is positive
 - (b) The velocity is decreasing
 - (c) The velocity is negative
 - (d) The position is negative
8. A rocket ship in deep space is traveling at -10 m/s and is caught in a tractor beam which causes the ship to slow. If the ship has a displacement of $+10$ m after 1.0 minute, what is the acceleration of the ship?
- (a) 40 m/s
 - (b) 0.67 m/s²
 - (c) -0.33 m/s²
 - (d) 0.34 m/s²
9. In the morning, I drive from my house to daycare, which is 1.0 mile west of my house. I then drive to Mount, which is 1.0 mile east of my house. The trip from my house to daycare takes 3.0 minutes, and the trip from daycare to Mount takes 6.0 minutes. What is my average velocity during my entire trip? Assume all 1D motion.
- (a) 0.17 miles/min
 - (b) 0.11 miles/min
 - (c) 0.00 miles/min
 - (d) 0.33 miles/min
10. A ball is thrown upward with an initial vertical velocity of 10 m/s. If it falls into a hole 4.8 m below the launch point. What is the velocity of the ball when it lands?
- (a) 2.0×10^2 m/s downward
 - (b) 13.93 m/s
 - (c) -14 m/s
 - (d) -2.4 m/s

11. For the vectors shown, which of the following vectors represents $\vec{A}_1 + \vec{A}_2 + \vec{A}_3$?



(a)



(b)

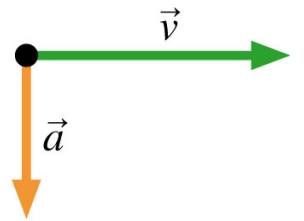


(c)



(d)

12. The particle in the figure experiences the acceleration shown. At this instance in time, the particle is...



- (a) Slowing down
- (b) Curving upward
- (c) Traveling at constant speed
- (d) Not possible to determine with the information given

Part II. Short answer problems (12 pts each)

Instructions:

Solve three of the following four problems. If you try to solve all four problems, please clearly indicate which problems you wish to have graded. If you do not indicate this, I will assume you want me to grade problems one, two and three.

Please show all of your work, including equations without numbers.

Please provide units with all answers.

Partial credit may be given if you include your work.

Question 1.

Grade this problem? Yes or No (circle one)

You're driving down the highway late one night at 20 m/s when a deer steps onto the road 35 m in front of you. Your reaction time before stepping on the brakes is 0.50 s, and the maximum acceleration to slow your car is 10 m/s^2 .

(a) Draw a full motion diagram for the motion of the car from the instant you see the deer to when you come to rest. Be sure to clearly label the start and end of the motion in question.

(b) How far did the car travel before you applied the brakes?

(c) How far did the car travel during the braking?

(d) Determine the distance between you and the deer once you come to a stop. Also, state whether you hit the deer or not (assume it doesn't move, unless you hit it).

Question 2.

Grade this problem? Yes or No (circle one)

In lab last week, you launched a ball a horizontal distance of 9.40 m in 1.40 seconds. The launcher was set at a launch angle of 45.0° above the horizontal and we can assume the initial and final vertical positions are 1.00 m from the floor.

(a) What is the horizontal velocity of the ball, right before it lands?

(b) What is the initial x and y-component of the ball's velocity immediately after launch? For both components, explain your reasoning and/or show your calculations.

(c) What is the maximum vertical displacement from the floor that the ball reaches during its motion?

(d) If you reconfigured the system and the ball now spends 1.0 seconds longer in the air, does the ball travel a higher, a lower or the same vertical distance in the air? Words are necessary in your justification, but no calculations are required. If it is impossible to tell, please explain why.

Question 3.

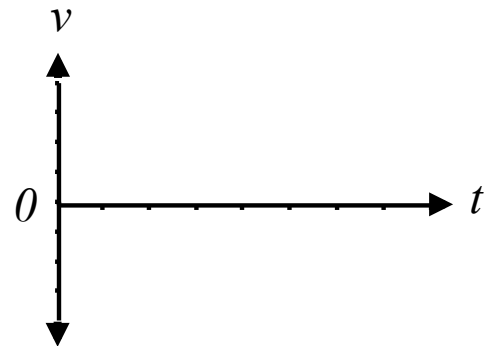
Grade this problem? Yes or No (circle one)

You would like to stick a 10.0 g wet spit wad on the ceiling, so you toss it straight-up with a speed of 10.0 m/s and it takes 0.10 s for the spit wad to hit the ceiling.

(a) What is the velocity of the spit wad right before it hits the ceiling?

(b) How far did the spit wad travel vertically between release and hitting the ceiling?

(c) Sketch a velocity vs time plot that could represent the motion of the spit wad as it travels towards the ceiling?
Please explain the shape & meaning of the graph.



(d) As the spit wad comes to rest on the ceiling in 9.0 ms, what acceleration does it experience as it impacts the ceiling? Be sure to explicitly state in words the direction the acceleration acts.

Question 4. **Grade this problem? Yes or No (circle one)**

For the following position versus time graph do the following,

(a) Sketch the velocity versus time.

What knowledge/definition are you using to make this sketch?

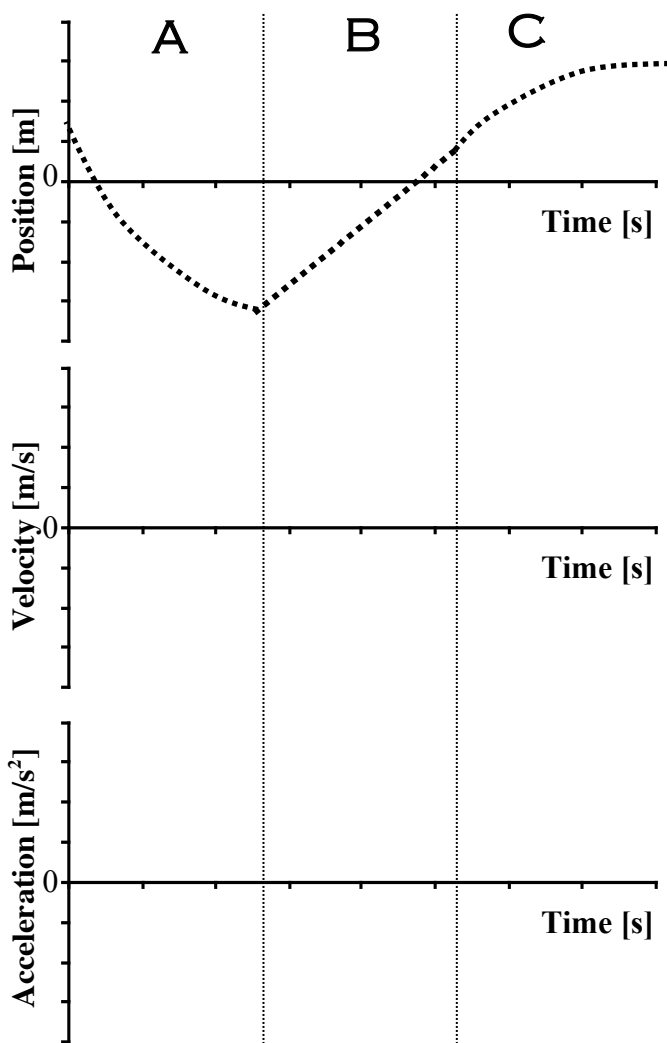
(b) Sketch the acceleration versus time.

What knowledge/definition are you using to make this sketch?

Note: You do not need to provide any numbers in your answers.

Note: On the velocity vs. time graph all lines should be straight - sloped or horizontal

Note: Your sketches and description will be graded independently.



(c) In each section (A-C) describe the motion.
(x, v and a)