

General Physics
Physics 101
Test #1 – Fall 2017
Friday 9/22/17
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:

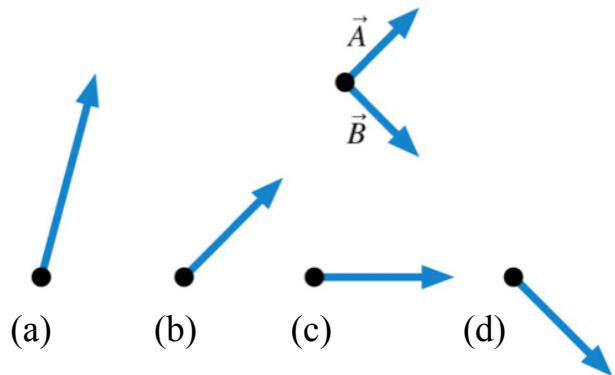
Please clearly circle one and only one answer for each of the following.
Show all of your work. Partial credit may be given if you include your work.

Questions:

1. A ball is rolling off a level table with a horizontal velocity of 2.0 m/s. If the ball falls a vertical distance of 1.0 m, how far did the ball travel in the x-direction?

- (a) 0.90 m
- (b) 2.2 m
- (c) 0.63 m
- (d) 0.41 m

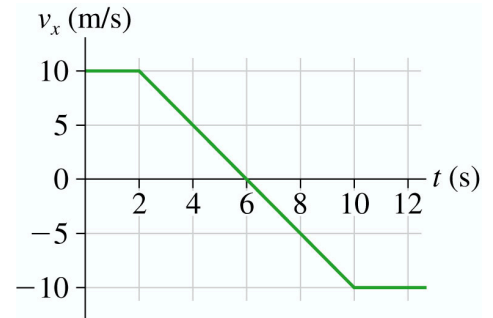
2. Which of the vectors shows $2\vec{A} - \vec{B}$?



3. While looking at Wookieepedia, I found the diameter of the Death Star to be 100 miles, which is a volume of 5.24×10^5 cubic miles. What is this volume in m^3 ?

- (a) 2,181,055 m^3
- (b) $8.42 \times 10^8 \text{ m}^3$
- (c) $2.18 \times 10^{15} \text{ m}^3$
- (d) $3.25 \times 10^2 \text{ m}$

4. For the following velocity versus time graph, which is a possible time when the particle is at 35 m?



- (a) 2.0 s
- (b) 4.0 s
- (c) 5.0 s
- (d) 6.0 s

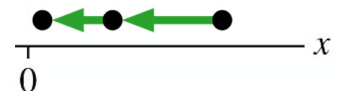
5. A photographer in a helicopter ascending vertically at a constant rate of 12.5 m/s accidentally lets go of a camera dangling out the window when the helicopter is 60.0 m above the ground. Ignoring air resistance, what will the camera's velocity right before it hits the ground?

- (a) 34.5 m/s²
- (b) -36.5 m/s
- (c) -31.9 m/s
- (d) 27.3 m/s

6. Which of the following statements is not false...

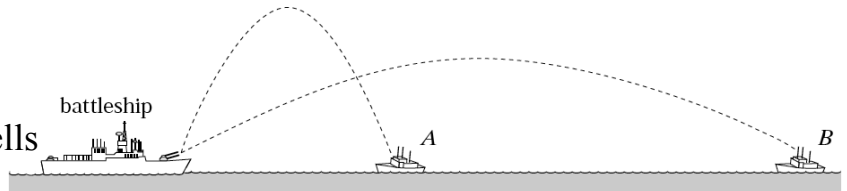
- (a) Celsius is not an SI base unit.
- (b) It is possible travel a smaller distance with a larger displacement.
- (c) A vector can have a zero mag. & have one of its components be nonzero.
- (d) In projectile motion at the turn around point the acceleration is zero.

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



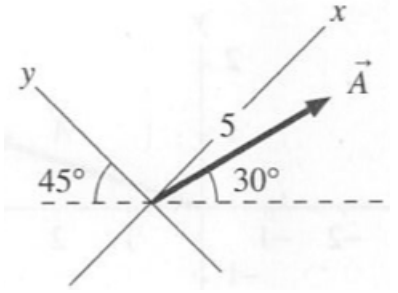
- (a) The acceleration is positive
- (b) The velocity is decreasing
- (c) The velocity is negative
- (d) The position is negative

8. A battleship simultaneously fires two shells at enemy ships. If the shells follow the parabolic trajectories shown, which ship gets hit last?



- (a) both are hit at the same time.
 - (b) A
 - (c) B
 - (d) Not enough information given.
9. A child riding his bike at 10.0 mph experiences a uniform acceleration for 10.0 s, and the child and bike travel a displacement of 10.0 m. What acceleration do the bike and child experience?
- (a) -1.10 m/s^2
 - (b) -0.70 m/s
 - (c) 0.477 m/s^2
 - (d) -0.694 m/s^2
10. You throw a ball straight-up from the ground to a second story window at 5.0 m/s. As the ball reaches the window, its velocity is zero. If you throw the ball with half of the initial velocity, the time it takes to reach the window is...
- (a) the same.
 - (b) twice as long.
 - (c) four times as long.
 - (d) The ball never makes it to the second story window.

11. For vector $\vec{A} = (5, 30^\circ \text{ above the horizontal})$ determine the component's A_x and A_y in the coordinate systems shown.



- (a) (+4.8, -1.3)
- (b) (4.3, 2.5)
- (c) (+1.3, -4.8)
- (d) (-2.5, +4.3)

12. A sailboat is traveling east at 5.0 m/s. A sudden gust of wind gives the boat an acceleration a (0.80 m/s^2 , 40° north of east). What is the boat's x-component of the velocity 6.0 s later when the gust subsides?

- (a) 9.8 m/s^2
- (b) 8.0 m/s
- (c) 8.7 m/s
- (d) 3.1 m/s

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)**

A car travels to the left at a steady speed of 15.0 m/s for 7.5 seconds then slows to a speed of 8.0 m/s over a 10 m distance to be under the speed limit.

(a) Draw a full motion diagram for the motion of the car during the entire motion. Be sure to clearly label the start and end of the motion in question.

(b) How far (mag + dir) did the car travel while traveling at a steady speed?

(c) What is the cars acceleration as it slows?

(d) How long did it take to slow?

Question 2. **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?

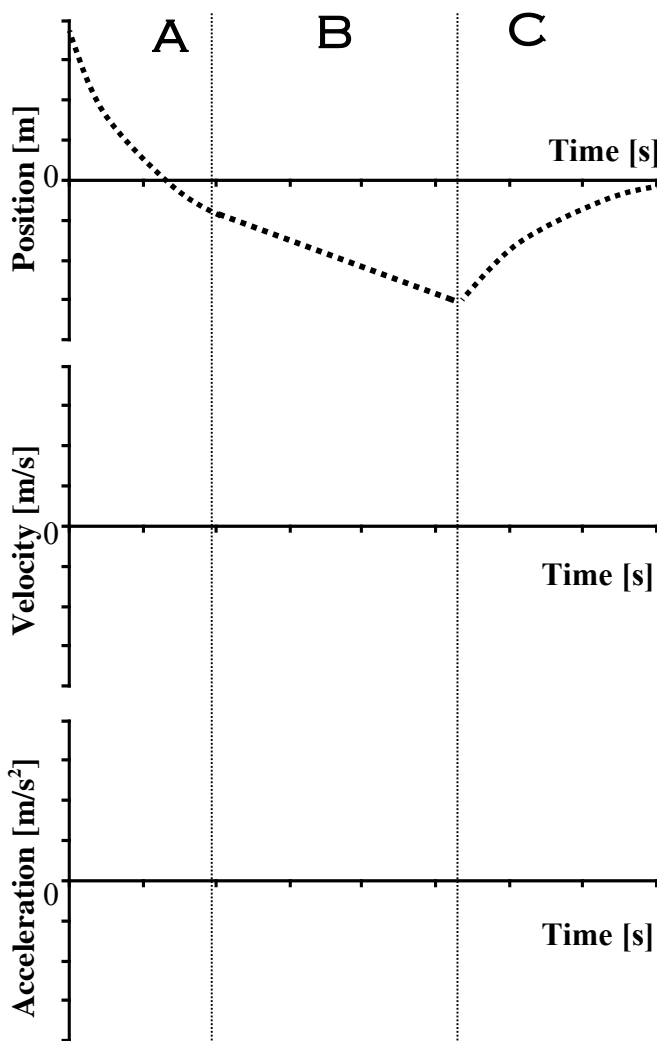
(b) Sketch the acceleration versus time.

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)

Question 3. **Grade this problem? Yes or No (circle one)**

Hannah throws a rock at an angle of 60 degrees above the horizontal. The initial speed is 40 m/s ($20 \hat{i}$ m/s + $35 \hat{j}$ m/s) and the rock impacts the ground 7.5 s later.

(a) What maximum vertical altitude above the launch point does the rock reach?

(b) What is the vertical component of velocity right before the rock impacts the ground?

(c) How far did the rock travel in the horizontal direction?

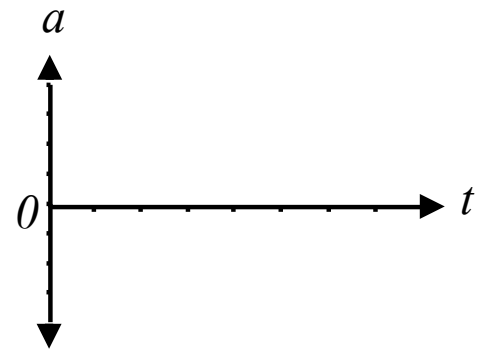
(d) Is the landing point higher or lower than the launch point? Explain your answer with words and possibly equation(s)/calculation(s).

Question 4.

Grade this problem? Yes or No (circle one)

A block of ice is launched up a long 15° ramp ($v +$) and reaches 10 m from release then slides back down the ramp.

(a) Sketch the acceleration vs time graph for the entire motion of the block. Please explain the shape & meaning of the graph as the block slides up and down the ramp.



(b) What is the launch velocity?

(c) How long after release until the block is traveling at -2.0 m/s?

(d) Where is the block with respect to the launch point when it is traveling -2.0 m/s?