

General Physics
Physics 101
Test #1 – Spring 2022
Friday 2/11/22
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.

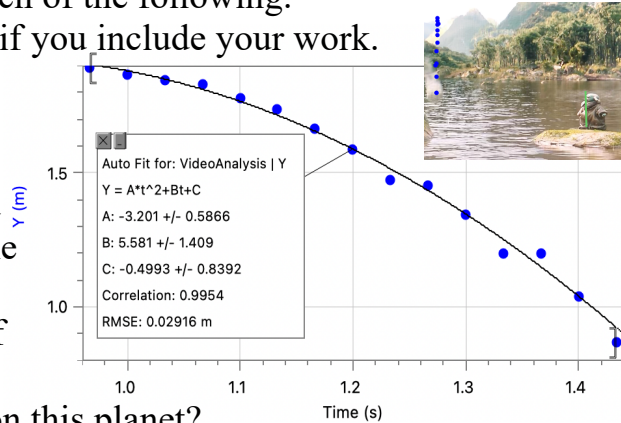
Signature: _____

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. In an episode of “The Book of Boba Fett”, Grogu  is being trained on an unspecified planet. He uses the Force to destroy a training remote that then falls to the water below. I scaled the clip using the height of Grogu (0.34 m) from Wookipedia, and found the fit as shown. What is the acceleration due to gravity on this planet?

- (a) 9.8 m/s
- (b) 3.2 m/s²
- (c) 6.4 m/s²
- (d) 1.7 m/s²

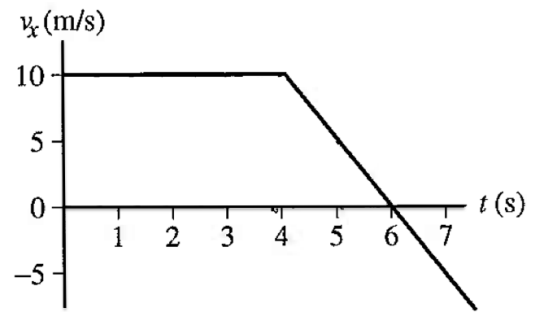
2. What are the combined SI base units for this equation? $\frac{v^2}{a}$.

- (a) $\frac{m^3}{s^4}$
- (b) $\frac{1}{ms}$
- (c) m
- (d) s

3. A 1.0 kg puck is launched up a 30° frictionless ramp traveling 2.0 m along the ramp attaining a speed of 4.0 m/s as it leaves the top of the ramp. What was the launch speed of the puck?

- (a) 7.4 m/s
- (b) 6.0 m/s
- (c) 4.9 m/s
- (d) 1.9 m/s

4. For the following velocity versus time graph, find the object's position at 6.0 seconds. Assume the initial start position of the object is 10 m.



- (a) 70 m
- (b) 60 m
- (c) 50 m
- (d) 40 m

5. A golf ball is hit on level ground with an initial velocity of 100 m/s at an angle of 30° above the horizontal. How long is the ball in the air before it lands?

- (a) 5.0 s
- (b) 20 s
- (c) 18 s
- (d) 10 s

6. An object moves from A to B to C. What is the direction of the acceleration vector?

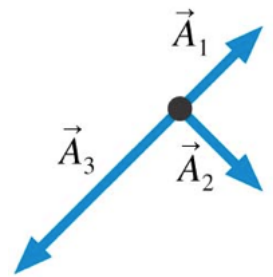


- (a) South-East
- (b) South-West
- (c) North-East
- (d) North-West

7. A bus traveling at 10.0 mi/hr and must stop to pick up more passengers. If it takes 10.0 seconds to stop, what is its acceleration?

- (a) -2.24 m/s^2
- (b) -0.447 m/s^2
- (c) -1.00 m/s^2
- (d) -0.5 m/s^2

8. Which of the following vectors represents the superposition of vectors A_1 , A_2 and A_3 .



(a)



(b)

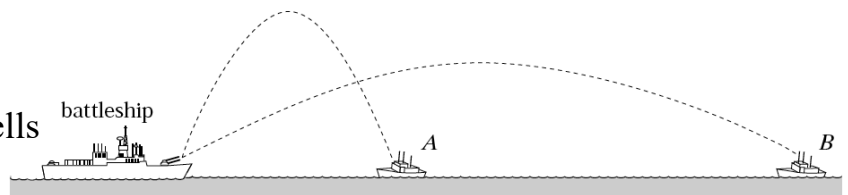


(c)



(d)

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

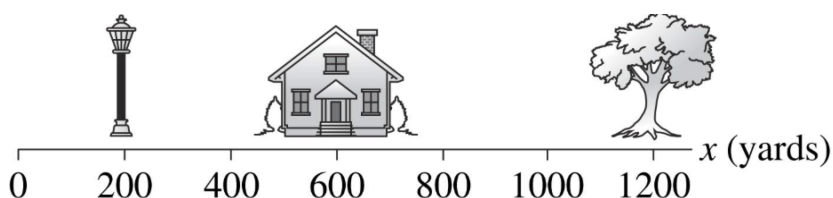


- (a) A
- (b) B
- (c) both are hit at the same time.
- (d) Not enough information given.

10. A steel block is pushed from rest with a small constant acceleration across a level, well-oiled (frictionless) surface. If this experiment is repeated but the acceleration is doubled. What is a correct description of the block's subsequent motion?

- (a) The block moves with a constant speed bigger than the original speed.
- (b) The block's speed increases to a constant value greater than the original.
- (c) The final speed of the block is the same in either situation.
- (d) The speed of the block constantly increases.

11. Larry leaves home at 9:05 and runs at a constant speed to the tree. He reaches the tree at 9:07, immediately turns around and runs to the lamppost. Larry arrives at the lamppost at 9:10. What is Larry's average velocity for the entire run to three significant figures?



- (a) -80.0 yd/min
- (b) -320 yd/min
- (c) 317 yd/min
- (d) 120 yd/min

12. A rifle is aimed horizontally at a target 45.0 m away. The bullet hits the target 2.3 cm below the aim point. What was the bullet's speed as it left the barrel?

- (a) 656.8 m/s
- (b) 1.3×10^3 m/s
- (c) 66 m/s
- (d) 0.66 km/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)**

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?

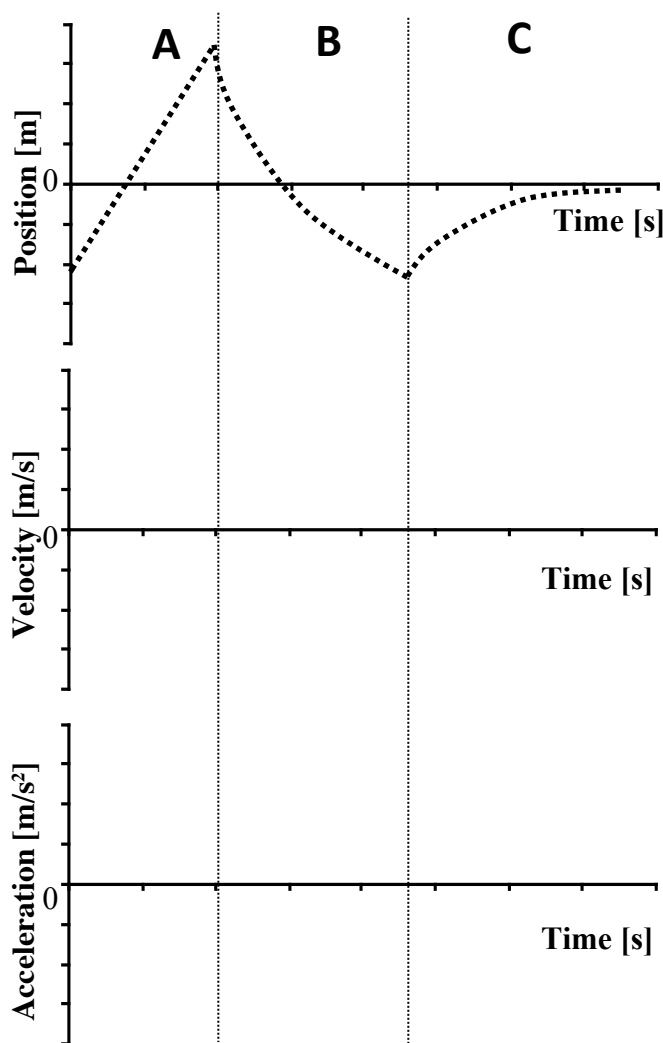
(b) Sketch the acceleration versus time.

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 2.

Grade this problem? Yes or No (circle one)

In the fall during one of my “brilliant” lectures, I threw a marker towards the whiteboard, and it landed in the board rail. Not to be outdone, I demonstrated a marker throw over the shoulder that also landed on the rail. No cap. I was 3.5 m horizontally from the rail when the marker was released, and the release was 2.0 m vertically from the floor from the floor. I estimated that the velocity of the marker at launch was 5.0 m/s at an angle of 60° above horizontal.

(a) How long did it take the marker to reach the rail from release?

(b) What is the y-component of the velocity when the marker impacts the rail?

(c) What is the impact velocity (mag + angle) as the marker impacts the rail?

(d) At the top of the marker’s motion, explain whether the velocity AND acceleration are zero or not. Be sure to use words/theory in your answer.

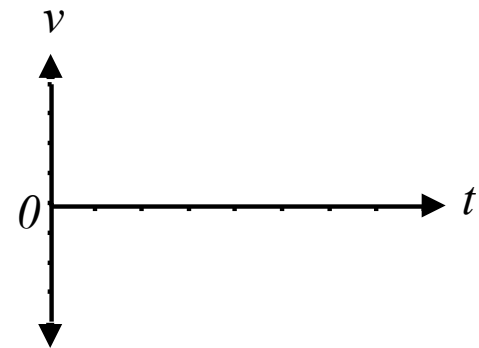
Question 3. Grade this problem? Yes or No (circle one)

A rock is launched straight up from ground level. It takes 4.53 seconds for it to complete its motion by landing a hole that is 10 m below the launch point.

(a) What is the launch velocity of the rock?

(b) What is the final velocity of the rock?

(c) Sketch a velocity vs time graph for the motion of the rock after release. Please explain the shape & meaning of the graph.



(d) What is the maximum height the rock reaches from the launch point?

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

A rocket powered hockey-puck has a constant acceleration of 2.0 m/s^2 when fired. It is released from rest on a large frictionless table. After traveling 4.0 m the rocket stops firing, but the puck continues to coast for another 2.0 m.

(a) Draw a full motion diagram for the motion of the puck for the entire motion (acceleration + coast). Be sure to clearly label the start and end of the motion in question.

(b) What is the speed of the puck after traveling the 4.0 m?

(c) How long was the rocket firing from release to the 4.0 m mark?

(d) What is the total time from release of the puck to the end of the coast?