

READ THESE INSTRUCTIONS BEFORE YOU BEGIN

- Before you start the test, **WRITE YOUR NAME ON EVERY PAGE OF THE EXAM.**
- Calculators are permitted, but no notes or books are allowed
- If you have ANY questions while taking the test, please be sure to ask me. The purpose of the test is not to give you trick problems to catch you in an error. The purpose is to give you an opportunity to "show what you know!"
- On problems 2, 4, & 5 your answers will be evaluated on how you got them. Remember that to get full credit on a problem you will need to
 - Make a list of given information and indicate what you are trying to find
 - Start from general principles
 - Solve for the unknown quantity in symbols before plugging in numbers
 - Substitute numbers with units
 - Include units with all numeric quantities

Partial credit will be given for correct steps shown, even if the final answer is wrong.

- Write clearly and logically so that I can understand what you are doing and can give you as much partial credit as you deserve. I cannot give credit for what you are thinking, only for what you show on your paper.
- If on a multistep problem you can't do a particular part, don't give up. Go on to the next part anyway. If necessary, define a variable name for the quantity you couldn't find and express your answer in terms of it.

| Problem | Points Possible | Score |
|---------------|-----------------|-------|
| Group Problem | 25 | |
| 1 | 15 | |
| 2 | 15 | |
| 3 | 11 | |
| 4 | 16 | |
| 5 | 18 | |
| Total | 100 | |

Name _____

Problem 1 (Short Answer: 15 points): no explanation required, but no partial credit either.

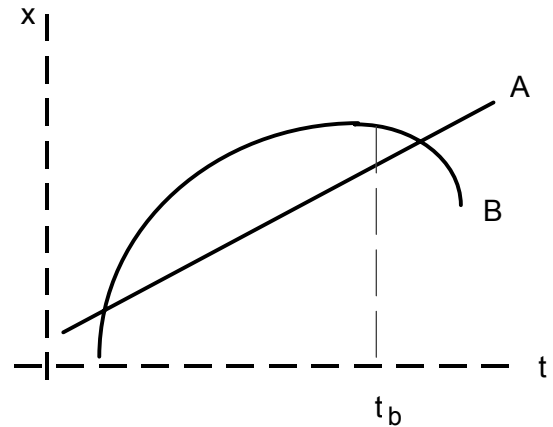
The figure below represents the position vs. clock reading of the motion of two balls, A and B, moving on parallel tracks.

Answer the following questions:

(a) Mark with the symbol t_a along the t-axis any instant or instants at which one ball is passing the other.

(b) Which ball is moving faster at clock reading t_b ?

(c) Mark with the symbol t_c along the t-axis any instant or instants at which the balls have the same velocity.



(d) Over the period of time shown in the diagram, which of the following is true of ball B? Explain your answer.

- (1) It is speeding up all the time.
- (2) It is slowing down all the time.
- (3) It is speeding up part of the time and slowing down part of the time.

(e) Sketch the velocity-time graph (no numbers, one graph) for balls A and B below. Be sure to mark the times t_a , t_b , and t_c on the time axis at the appropriate instants.

Name _____

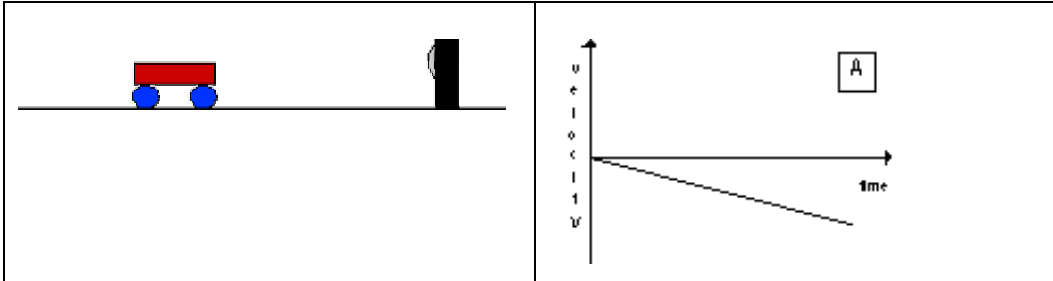
Problem 2 (Estimation Problem: 15 points)

In the Race across America, bicycle racers start riding in Los Angeles and the first one to reach the finish line in New York wins. How long would it take you to ride from LA to New York? What would your average speed be?

Problem 3 (Essay 11 points)

You may use diagrams and equations but no calculations in your response for this problem. USE WHAT YOU'VE LEARNED FROM CLASS SO FAR TO GIVE A CONVINCING EXPLANATION OF YOUR ANSWER.

A cart can move to the right or left along a horizontal track (the positive part of the x axis) as shown in the figure below. Assume that friction is small enough that it can be ignored. A sonic ranger is used (as shown) to measure the position, velocity, and acceleration of the cart. The track is not necessarily flat or horizontal. In addition, the track may be tipped or the cart may be pulled or pushed.



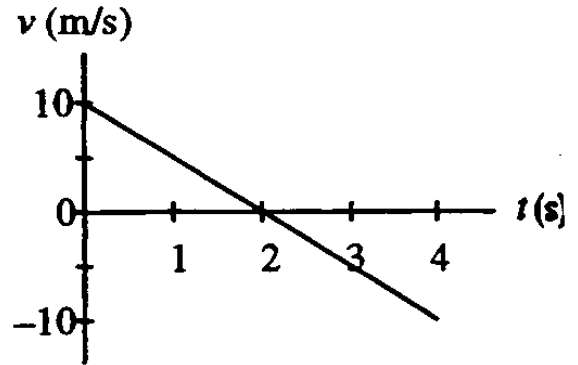
For the first run, the sonic ranger displays a graph of the velocity that looks like the graph labeled A shown at the right.

- (i) Draw graphs showing what the sonic ranger would display for the cart's position and the cart's acceleration.
- (ii) Describe the motion of the cart in words and explain how you drew the graphs.

Name _____

Problem 4 (18 points)

You are going through your teammates notes after missing a day of class and notice the graph to the right in the notes without any comments. You decide to try and figure it out the motion of the object just from the graph.



a.) Describe the object's motion in words.

b.) Draw a motion diagram for the object from $t = 0$ to $t = 4$ seconds

c.) Draw a pictorial model for the object assuming you are asked to find its position at $t = 3$ seconds

d.) Find the object's displacement and distance traveled in the time interval from $t = 0$ seconds to $t = 3$ seconds assuming it starts at $x = 2$ m

e.) What is the object's acceleration at $t = 2$ sec? Explain how you know.

Name _____

Problem 5 (16 points)

You are driving in a road rally race in the desert where you are judged on how close you arrive at the finish line to a specific time. At the last pit stop, you are given the following directions for the last leg of the race:

- Drive East at 60 MPH for 90 minutes and
- then go 30 degrees East of North for 45 minutes at 45 MPH.

A. What would be your average speed from the pit stop to the finish line?

B. What would be your average velocity?

C. Sketch a vector to show your average acceleration during the first hour of driving after the pit stop.

Group Test 1 (25 points)

Physics 2048 Fall 2002

You have a summer job working for the UCF police department studying traffic flow on campus. There have been several complaints concerning the signal on Gemini drive by the water tower. The complaints claim that the yellow light is too short. If most cars decelerate at 20 m/s^2 while braking, how long should the light be so that people who can't stop before they get to the signal after it turns yellow have time to go through the 10.0 m wide intersection?

- USE THE GOAL PROTOCOL AND GROUP ROLES TO SOLVE THIS PROBLEM
- Make sure everyone's name and their group role on the GOAL Answer sheets
- YOU MAY USE 1 WHITE BOARD PER GROUP
- Work only with your group members
- NO BOOKS OR NOTES ALLOWED
- You will be graded on your reasoning and how well you used the Goal protocol in addition to the correctness of your answer.
- YOU MUST START FROM GENERAL PHYSICS PRINCIPLES, I.E. KINEMATIC EQUATIONS, MOTION DEFINITIONS, ETC.
- Your group manager may buy an equation, if you need it, at a cost of 3 points.