Physics 2048 Test 1 Name:_____
Dr. Jeff Saul Group:_____
Spring 2002 Date:_____

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

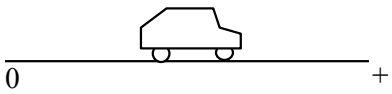
  Partial credit will be given for correct steps shown, even if the final answer is wrong.
- Write clearly and logically so that I can understand what you are doing and can give you as much partial credit as you deserve. I cannot give credit for what you are thinking, only for what you show on your paper.
- 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	

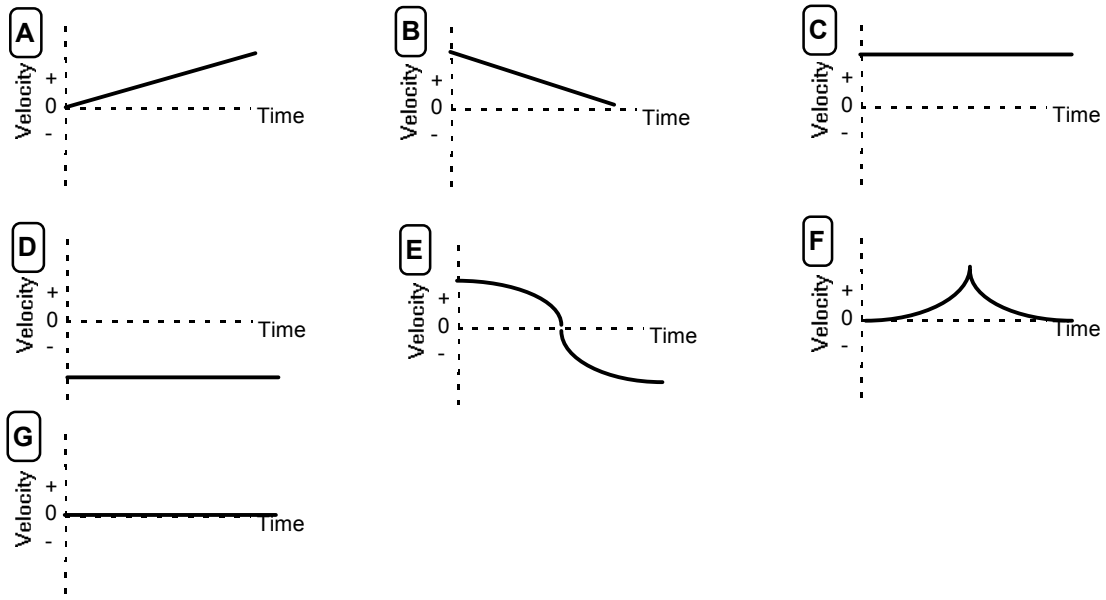
Name_____

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

Questions below refer to a toy car which can move to the right or left along a horizontal line (the positive portion of the distance axis). The positive direction is to the right.



Answer each of the questions below by selecting the **velocity graph** below that is the best choice to describe the answer. You may use a graph more than once or not at all. Answer **N** if no graph shown shows the motion described.



a. Which velocity graph shows the car going away from the origin at a steady velocity?

b. Which velocity graph shows the car standing still?

c. Which velocity graph shows the car moving toward the origin at a steady velocity?

d. Which velocity graph shows the car changing direction?

e. Which velocity graph shows the car steadily increasing its speed?

Name_____

Problem 2 (Estimation Problem: 15 points)

You and a friend are planning a two-week vacation out to the West Coast for a wedding in San Francisco next summer. However you're both on a tight budget. Your friend thinks it would be cheaper to drive his car than fly. A cheap plane fare from Orlando International Airport to San Francisco is $400 round-trip. Realistically estimate your travel expenses to and from the West Coast to see if your friend is right. What would your average speed be going from Orlando to San Francisco if you drove? Assume you will have free room and board at a relative's house once you arrive. Be sure to explicitly state all assumptions.

Name_____

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.

Two carts roll toward each other on a level table. The vectors represent the velocities of the carts just before and just after they collide.

before **after**

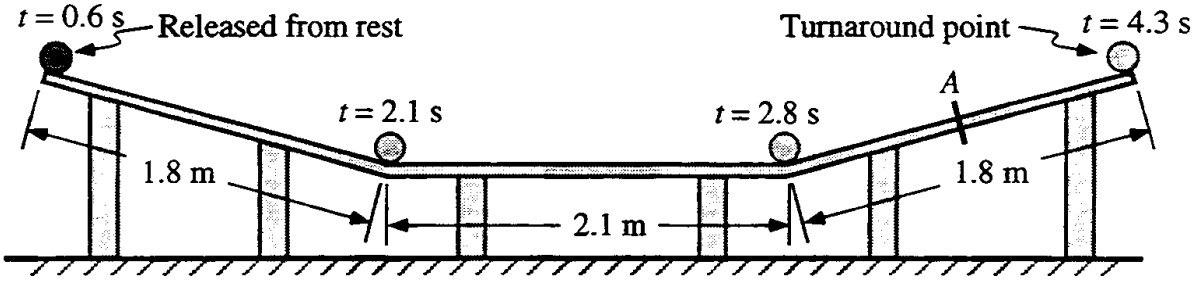
A. Draw and label a vector for <u>each cart</u> to represent the *change in velocity* from before to after the collision. Make your vectors consistent with the vectors drawn above.

B. How do the magnitude and direction of Cart A's average acceleration compare with Cart B's average acceleration over the time interval shown? Explain your reasoning well enough to convince a classmate who disagrees with you.

Name_____

Problem 4 (16 points)

A ball is released from rest at the point shown on the incline. It then rolls onto a level section of track, and then onto a second incline with the same slope as the first. The diagram below shows the location of the ball at several instants in time. The ball's velocity appears to be constant on the flat section of track.
NOTE: THIS IS NOT A STROBE PHOTOGRAPH OR MOTION DIAGRAM.



A. Determine the speed of the ball at t = 2.1 s. Show your work.

B. Determine the magnitude of the acceleration of the ball at point A (halfway up the second incline). Show your work.

C. On the diagram above, draw an arrow indicating the direction of the acceleration of the ball at point A. Explain why you drew the arrow the way you did.

D. On the diagram above, draw an arrow indicating the direction of the acceleration of the ball at t = 4.3 s (the turnaround point). If the acceleration at the turnaround point is zero, state that explicitly. Explain why you drew the arrow the way you did.

Name_____

Problem 5 (18 points)

One day in the early 1960's, at 11 AM the eye of hurricane David passed over Orlando heading due North at a speed of 40.0 km/h. Three hours later, the course of the hurricane shifted to Northeast towards the Florida Atlantic coast and its speed decreased to 30.0 km/h. David continued on this course at this speed for eight hours before turning due north again.

A. How far from Orlando was the hurricane at 7 PM on the same day?

B. What was David's average speed during this time?

C. What was David's average velocity during this time?

D. Sketch a vector representing hurricane David's average acceleration during this time.

Name_____

Group Problem (30 points) Physics 2048

You and your friend run outdoors at least 10 miles every day no matter what the weather (well almost). Today the temperature is at a brisk 30 degrees with a -20 degree wind chill. Your friend, a real running fanatic, insists that it is OK to run. You agree to this madness as long as you both begin at your house and end the run at her nice warm house in a way that neither of you has to wait in the cold. You know that she runs at a very consistent pace with an average speed of 3.0 m/s, while your average speed is a consistent 4.0 m/s. Your friend finishes warming up first so she can get a head start. The plan is that she will arrive at her house first so that she can unlock the door before you arrive. Five minutes later, you notice that she dropped her keys. If she finishes her run first she will have to stand around in the cold and will not be happy. How far from your house will you be when you catch up to her if you leave immediately, run at your usual pace, and don't forget to take her keys

- 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
- 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, NEWTON'S SENCOND LAW, ETC.**