PSC 1121 Celebration of Knowledge 1   Name:_____

Dr. Jeff Saul   Group:_____

Fall 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

- **Make use of observations from class activities and homework in your explanations.**

- 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!"

- 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	10	
3	10	
4	10	
5	15	
6	15	
Total	100	

Problem 1. (15 points)

To help his teammates finish up an activity after class, Jorge agrees to find the mass (in grams) of the last four objects himself. The fours sets of measurements are shown below.

a. Known value: 32.0
    Measured values: 29.7, 33.9, 32.1, 32.3

c. Known value: 158
    Measured values: 102, 176, 201, 84

b. Known value: 9.8
    Measured values: 9.8, 7.2, 13.8, 8.4

d. Known value: 0.43
    Measured values: 0.20, 0.21, 0.20, 0.19

A. For each set, indicate if the measurements are accurate, precise, both or neither and explain why.

B. For each object, what mass measurement should Jorge report to his teammates and what is the uncertainty in his measurements?

Problem 2 (10 points)

For each of the balance situations below, indicate what you could do so that the two sides will balance. Explain your reasoning. If nothing needs to be done, say that and explain why.

(a)   (b)
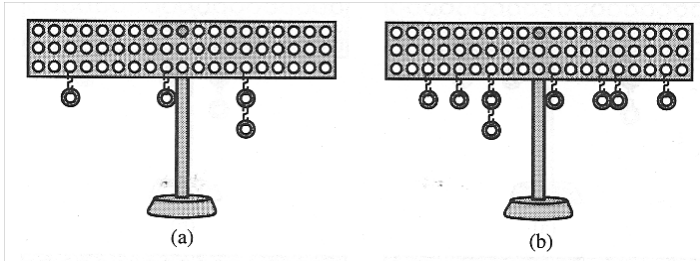
Problem 3 (10 points)

You would like to determine the mass of your new puppy, but you don't have a scale or a balance. While poking around the pantry for a snack you find a 1 kg bag of sugar and a meter stick. Explain carefully how you could use these objects to determine the mass of your puppy.

Problem 4 (10 points)

One cubic centimeter of copper has a mass of 8.9 g.

What is the volume of a piece of copper with a mass of 1.23 kg.? Explain your reasoning

For full credit, do not use algebra.

Problem 5 (20 points)

A tank truck is used to haul a certain liquid. The truck has different masses depending on how full the tank is. The trucker is more concerned with the total mass of the truck and load than the mass of the liquid alone. Below is a graph of the mass of the loaded truck versus volume of liquid in the tank. The points represent the tank being one-quarter full, half-full, three-quarters full, and full.

a. What does the single point P tell you?
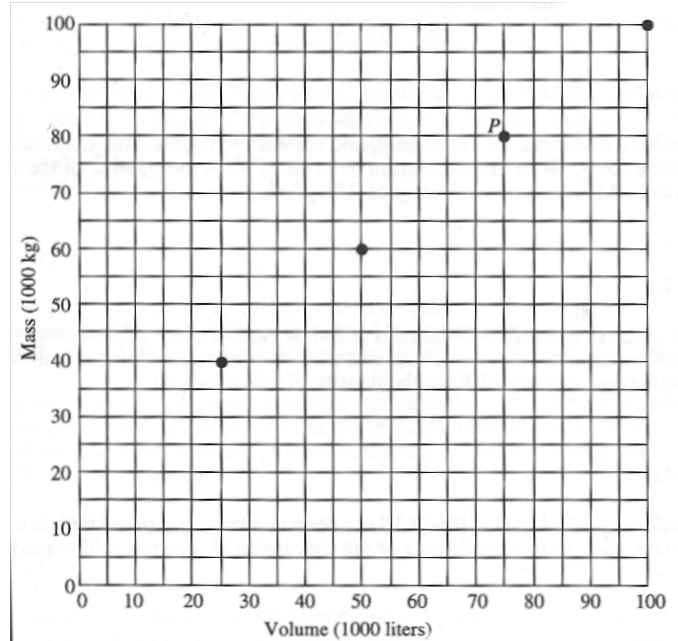
b. What is the density of the liquid when the truck is three-quarters full? Explain how you can tell.

c. What is the mass of the empty truck? Explain how you found your answer.

d. Suppose you just looked at the graph without knowing what the object is. Could you tell whether or not the object was of uniform density? Explain.

Problem 6 (15 points)

An instructor gives a painted piece of metal to 2 students and asks: "This is one of the metals listed in the table of densities. What metal do you think it is?"

The students measure the object and find that the mass is 139.2 +/-- 0.1g and the volume is 16.0 +/-- 0.5 cm^3.

Student 1 says: "It must be nickel."

Student 2 says: "Don't forget the uncertainty. It might be silver."

Table of densities

Substance	Density
Tungsten	19 g/cm^3
Lead	11.3 g/cm^3
Silver	10.5 g/cm^3
Copper	8.9 g/cm^3
Nickel	8.7 g/cm^3
Brass	8.5 g/cm^3
Iron	7.9 g/cm^3

A. What would you conclude from the data?

B. Do you agree with student 1, student 2, or neither? Explain your reasoning.

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Group Celebration:

Do the Following
- With your group, come up with a detailed procedure for determining the density of an unknown liquid.
- After you have a procedure, make a list of any equipment/supplies that you will need to carry out the investigation. Obtain the equipment from the instructor and carry out your investigation. If you find it necessary to alter your procedure once you have started, you should indicate what change was made and why.

Your response to this question should include the detailed procedure, equipment list, measurements taken, any calculations done, and the value of the density you obtained. To demonstrate acceptance of the solution, all members of the group must sign the sheet to be turned in.

Bonus: Determine the uncertainty in the value of density that you report.
This must include an explanation and calculations to show how you determined the uncertainty.