Name: _____ Period: _____

Instructor: Mr. Rodriguez Course: Conceptual Physics A

Term: Winter 2024

Score:_____/10

Lab 1: Estimation and Measurement

"If you cannot measure it, you cannot improve it."

—Lord Kelvin

Laboratory Etiquette

- Students may work in groups of 2-3. Make sure to include all group members—collaboration is key!
- Students should have the same data as their group members, but responses to Pre-lab Questions and Analysis Questions must be unique between all members.
- Students between different labs groups should have unique datasets, *i.e.*, the sharing of data between groups is not permitted.
- In the event of a lost lab packet, additional copies are available for download on Schoology or Google Classroom.

Objective:

Estimate the number of softballs that can fit in the classroom.

Pre-lab Question

1. (1 point) Before taking any measurements, make a guess as to how many softballs you think would fit in the classroom:

N_{guess} =_____

Materials

- A softball
- A meterstick
- A reel tape measure

Procedure

2. (2 points) Measure the volume of the ball. Recall that the volume V of a sphere of radius r is given by

$$V_{sphere} = \frac{4}{3}\pi r^3.$$

What is your measurement of the radius r of the ball? Write your answer on the line below.

$$r_{ball} = \_\_\_\_\_ \text{cm}$$

What is your calculated volume of the ball?

$$V_{ball} = \_\_\_\_\_ \text{cm}^3$$

3. (2 points) Measure the volume of the classroom. Recall that the volume of a rectangular prism with width w, length l, and height h has a volume of

$$V_{rect} = w \times l \times h.$$

What is your measurement of the width of the room? Write your answer on the line below.

$$w_{room} = \_\_\_\_\_ \text{cm}$$

What is your measurement of the length of the room?

$$l_{room} = \_\_\_\_\_ \text{cm}$$

What is your measurement of the height of the room?

$$h_{room} = \_\_\_\_\_ \text{cm}$$

What is your calculated volume of the classroom?

$$V_{room} = \_\_\_\_\_ \text{cm}^3$$

4. (3 points) What about the other objects in the room (tables, equipment, etc.)? How would you account for the volume of these objects in your calculations?

   (a) Use the space below to list each type of object, the volume of the object, and the number of those objects.

   (b) By multiplying each object type by the number of that object, add up the total volume of the objects:

$$V_{objects} = \_\_\_\_\_ \text{cm}^3$$

5. (2 points) Finally, devise a method incorporating your calculated volumes V_{ball}, V_{room}, and $V_{objects}$ to calculate the number of softballs that would fit in the classroom along with the objects currently inside of it.

   (a) Describe your reasoning for your calculation and outline your calculation of the number of softballs N.

   (b) What is your final calculated estimate of N?

$$N = \_\_\_\_\_$$