Experiment 18

Measurement and the SI System

Data Table: Reading Volumes

Cylinder Number	Units	Capacity	Volume of Liquid	Uncertainty
1				
2				
3				
4				
5				
6				

Data Table: Comparing Measuring Containers

Volume in 50 mL Beaker	Volume in 25 mL Graduated Cylinder	Volume in 100 mL Graduated Cylinder

Data Table: Measuring Coins

	Penny	Nickel
Diameter in Centimeters		
Diameter in Millimeters		
Number to Make 1 cm Stack		
Mass of 1cm Stack		

Data Table: Comparing Pennies

Mass of Pre 1982 Penny	
Mass of Post 1982 Penny	

Data Table: Effect of Salt on the Temperature of an Ice-Water Mixture

Temperature of Ice	
Temperature of Ice-Water-Salt	

Analysis and Conclusion

1. It is common to get different volume readings from each container in Part 2. What explanation can you offer for:

      a. an apparent decrease in volume?

      b. an apparent increase in volume?

2. Which container in Part 2 gave the most precise reading of the actual volume of water it held? Defend your choice.

3. The beaker you used in Part 2 probably carries the notation "+/-15%." What do you interpret this to mean?

4. Calculate the average thickness of a single penny using the data you obtained in Part 3 of the procedure. Show your calculations.

5. Explain how you could estimate the mass of a large stack containing an unknown number of pennies using only the date from Part 3.

6. Determine the number of pennies that could be laid edge-to-edge the full length of a meter stick. Repeat the calculation for nickels. (Hint: Have you ever seen a third of a penny? Do fractional coins exist?)

7. Compare the results from Part 4 with those of other teams. How do the masses of pennies minted before 1982 compare with the masses of newer ones? Try to explain the difference.

8. Errors or variations from expected results that *do not* results from carelessness or incorrect procedure are called *random experimental errors*. Random experimental errors are no one's fault; they are unavoidable and they must be taken into account any time we evaluate the results of an experiment. Suggest two sources of random experimental errors that might cause different teams to get different results in Part 4 of the procedure.

9. What effect does salt have on the temperature of an ice-water mixture? Did other groups observe the same effect?