Measurements I: Density of a Liquid

1 Lab Report

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Name

Time

M T W R F

PART A. Use of Analytical Balances

Mass of coin #1 2.474 g Mass of coin #2 2.539 g

Mass of coins #1 and #2 weighed together 5.012 g

PART B. Density of Water

Temperature of water: 24 °C

Density of water: 0.9973 g/cm³

Use of a Graduated Cylinder	Trial 1	Trial 2	Trial 3
Mass of graduated cylinder	64.167 g	64.063 g	64.079 g
Mass of graduated cylinder + water	103.105 g	103.877 g	103.877 g
Mass of water	38.938 g	39.814 g	39.798 g
Volume of water	40.1 cm³	40.7 cm³	40.5 cm³
DENSITY OF WATER	0.971 g/cm³	0.978 g/cm³	0.982 g/cm³
AVERAGE DENSITY OF WATER	0.997 g/cm³		
STANDARD DEVIATION	0.106 g/cm³		

■ Measurements I: Density of a Liquid

Use of a Pipet	Trial 1	Trial 2	Trial 3
Mass of flask + stopper	29.487 g	29.488 g	29.471 g
Mass of flask + stopper + water	54.411 g	54.403 g	54.316 g
Mass of water	24.924 g	24.915 g	24.845 g
DENSITY OF WATER	0.996 g/cm³	0.996 g/cm³	0.993 g/cm³
AVERAGE DENSITY OF WATER	0.995 g/cm³		
STANDARD DEVIATION	0.01 g/cm³		
PERCENT ERROR	0.1 %		

Use of a Buret	Trial 1	Trial 2	Trial 3
Initial buret reading	0.16 mL	0.10 mL	0.16 mL
Final buret reading	25.00 mL	25.49 mL	24.93 mL
Volume of water	24.84 mL	25.39 mL	24.77 mL
Mass of flask + stopper	29.489 g	25.49 g	29.489 g
Mass of flask + stopper + water	54.249 g	54.704 g	53.953 g
Mass of water	24.76 g	29.214 g	24.464 g
DENSITY OF WATER	0.99 g/cm³	1.1 g/cm³	0.98 g/cm³
AVERAGE DENSITY OF WATER	0.69 g/cm³		
STANDARD DEVIATION	0.03 g/cm³		
PERCENT ERROR	43%		

Show your calculations on the following page.

25.00mL

Calculations

Density = mass/volume

Volume = mass/density

$$S = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

0.997 + 0.997 + 0.997

0.997

$= (0.026)^2 + (0.019)^2 + (0.014)^2$

0.99 0.59

0.30 0.59 0.42

Percent error = $\frac{\text{observed value} - \text{True Value}}{\text{True Value}} \cdot 100$

Cylinder

(mass of cylinder + water) − (mass of cylinder)

Pipet

(Mass + stopper + water) − (mass of flask + stopper)

Buret

Final buret − Initial buret = volume of water

(mass + stopper + water) − (Mass + Stopper) = Mass of water

Questions

1. If your pipet was calibrated incorrectly so that it transferred 5% too much solution, the calculated density of the liquid would be larger than (larger than/smaller than/the same as) the correct value. Explain your answer.
   ↳ 5% of a solution would make the density of the liquid greater because it would most likely change
2. The data for Part A illustrates which general law? the mass and or volum...
   Law of Conservation of Mass
3. You determined the density of water by three methods (using a graduated cylinder, a pipet, and a buret). Using the standard deviation as your guide, which method resulted in the highest precision? (Hint: Read Appendix F.) Which method resulted in the best accuracy (lower percent error)? Which method gave the least accurate result?
   highest precision: Cylinder
   best accuracy: Pipet
   least accurate: Buret