

# 1

## Measurements I: Density of a Liquid

# 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/cm<sup>3</sup>

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 cm <sup>3</sup>	40.7 cm <sup>3</sup>	40.5 cm <sup>3</sup>
DENSITY OF WATER	0.971 g/cm <sup>3</sup>	0.978 g/cm <sup>3</sup>	0.982 g/cm <sup>3</sup>
AVERAGE DENSITY OF WATER	0.997 g/cm <sup>3</sup>		
STANDARD DEVIATION	0.106 g/cm <sup>3</sup>		

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■ 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/cm <sup>3</sup>	0.996 g/cm <sup>3</sup>	0.993 g/cm <sup>3</sup>
AVERAGE DENSITY OF WATER	0.995 g/cm <sup>3</sup>		
STANDARD DEVIATION	0.01 g/cm <sup>3</sup>		
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/cm <sup>3</sup>	1.1 g/cm <sup>3</sup>	0.98 g/cm <sup>3</sup>
AVERAGE DENSITY OF WATER	0.69 g/cm <sup>3</sup>		
STANDARD DEVIATION	0.03 g/cm <sup>3</sup>		
PERCENT ERROR	43%		

Show your calculations on the following page.

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## Experiment 1

25.00 mL

## Calculations

$$\text{Density} = \text{mass/volume}$$

$$\text{Volume} = \text{mass/density}$$

$$\text{Percent error} =$$

$$\frac{\text{observed value} - \text{True value}}{\text{True value}} \cdot 100$$

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

$$0.997 + 0.997 + 0.997$$

Cylinder

$$(\text{mass of cylinder + water}) - (\text{mass of cylinder})$$

$$0.997$$

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

Pipet

$$(\text{Mass + stopper + water}) - (\text{mass of flask + stopper})$$

Buret

$$0.99059$$

$$\text{Final buret} - \text{Initial buret} = \text{volume of water}$$

$$0.30 \quad 0.59 \quad 0.42$$

$$(\text{Mass + stopper + water}) - (\text{Mass + stopper}) = \text{Mass of water}$$

■ Measurements I: Density of a Liquid

**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 volume.

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 E.) 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