

LABORATORY MEASUREMENT

Name: _____

Partners Name: _____

Objectives: To gain proficiency in using laboratory equipment. To make measurements of mass, volume and density.

A. Use of a laboratory Balance.

Objective: To determine the proper use of a laboratory balance and record the measurement with the correct number of significant figures.

The instructor will demonstrate the proper technique in the use of the balance being used. An object being weighed should never be placed directly on the pan of the balance. It should be placed in a weighing boat or on weighing paper.

Procedure:

1. Measure the length and diameter of a metal cylinder. You will use a ruler graduated in 1mm increments. The data will be recorded to the nearest .5mm.

ID of rod: AL

Height, $h =$ 4.70 cm.

Diameter, $d =$ 1.10 cm.

Radius, $r = d/2 =$.550 cm.

Volume $= \pi r^2 h =$ 4.50 cm³

Determine the mass of the metal rod = 17.2040 gm.

Calculate the density of the metal rod.

Density = Mass/Volume = 17.2040 / 4.50 = 3.82 g/mL

2. Obtain a cube of metal, determine its weight and then based on the type of substance determine the number of moles in the cube and the number of atoms.

Mass = 17.938 g.

Type of metal: Fe

55.85 g/mol

Moles = mass / molar mass 2.284 moles.

Number of atoms = moles * 6.022×10^{23} 1.375×10^{24} atoms

3
actual = $2.79 / \text{cm}^3$

3. Quarter fill a 50 ml beaker with sodium chloride. Weigh a piece of weighing paper on the balance. Using a micro-spatula estimate what you think is one gram of sodium chloride. Place the NaCl on the weighing paper. Weigh the NaCl sample and the weighing paper.

Weighing paper and NaCl 1.4 gm.

Weighing paper 0.40 gm.

NaCl 1.0 gm.

Moles of NaCl in 1.000g of NaCl = .0171 moles

$$1.000 \text{ g} \cdot \frac{1 \text{ mol}}{58.443 \text{ g}} = .0171 \text{ mol}$$

B. Use of Graduated Cylinders

Objective: To learn the proper use of a graduated cylinder,

A graduated cylinder is used to measure the volume of a fluid. When liquid is placed in a graduated cylinder a meniscus is formed on top of the liquid. The bottom of the meniscus is read to determine the volume of the fluid.



The volume is read to .5 units of the smallest division on the graduated cylinder. A 50 ml graduated cylinder is graduated in 1 ml increments. This allows estimation of the nearest 0.5ml. This gives an uncertainty of +/- 0.5ml.

Procedure:

Obtain a prefilled 50 mL grad cylinder. Record the ID of the cylinder and the volume of the liquid in the cylinder

ID of grad cylinder: D

Volume of cylinder: 45 mL

13.5

5

Questions

1. Define density: $d = \frac{m}{V}$ *in words* -1

2. Calculate the density of a medal cylinder that weighs 100.0 grams.

Length = 5.00 cm.

Diameter = 1.00 cm.

$$V = 3.93 \text{ cm}^3$$

$$d = \frac{100.0 \text{ g}}{3.93 \text{ cm}^3} = 25.4 \text{ g/mL}$$

3. Change 25°C to degrees Fahrenheit.

$$F^{\circ} = \frac{9}{5}(25^{\circ}\text{C}) + 32 \rightarrow F = 77^{\circ}\text{F}$$

4. Determine the number of significant figures.

a. 100.1mm 4

b. 0.0078g 2

c. 1000m ambiguous (1)

d. 1000.kg 4

5. Do the following calculations giving the correct number of significant figures.

a. $798.1 \times 12 = 9600$

b. $(675 \times 23.1) / 12 = 1300$

c. $64.7231 + 51.1 = 115.8$

6. What is the difference between precision and accuracy?

Precision is measurement and accuracy is the number of digits in a measurement. *closeness of each measurement*
closeness to exact value