

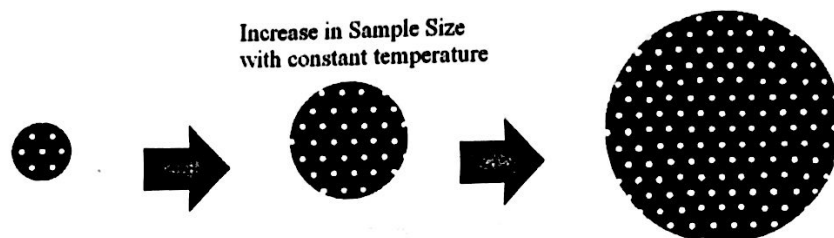
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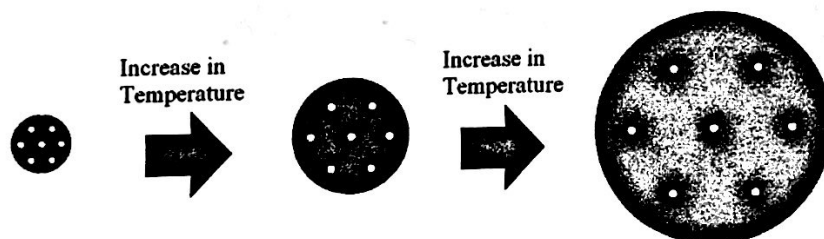
Density, Percent Error and Temperature Conversions

DENSITY

- ▶ Density is a measure of how close together particles are in a substance
- ▶ Density is an internal property that **DOES NOT CHANGE** with sample size.



- ▶ Density can be affected by a change in temperature because this changes the spacing between particles.
 - ▶ Increase in temperature – decrease in density
 - ▶ Increasing temperature causes molecules to spread apart.



The formula for density can be found on Table T in your Reference Tables. Write the formula for ~~percent error~~ below. Be sure to label the variables.

density

PERCENT ERROR

- ▶ **Percent error:** the percent that a measured value differs from the accepted value
- ▶ Used to show the difference between an accepted value and an experimental value at the end of a lab experiment

The formula for percent error can be found on Table T in your Reference Tables. Write the formula for percent error below:

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Density, Percent Error and Temperature Conversions

Questions:

1. A metal has a mass of 3.225 grams and a volume of 0.360 mL. What is the density of this metal? (Record your answer to the correct number of significant figures)

$$D = \frac{\text{mass}}{\text{volume}} = \frac{3.225\text{g}}{0.360\text{mL}} = 8.96\text{ g/mL}$$

2. Based on the above density value, what precious metal is this according to Reference Table S? (Hint: precious metals are either platinum, gold, silver or copper)

* match the density up in Table S *
Copper

3. Calculate the percent error comparing the measured value for density calculated in question 1 and compare it to the accepted value of density provided in Table S.

$$\frac{8.96 - 8.96}{8.96} \times 100 = 0\%$$

4. A graduated cylinder is filled with water to a level of 40.0 mL. When a piece of copper is lowered into the cylinder, the water level rises to 63.4 mL.

- a) What is the volume of the copper sample?

$$63.4\text{mL} - 40.0\text{mL} = 23.4\text{mL}$$

- b) If the density of the copper is 8.96 g/cm³, what is its mass?

$$D = \frac{m}{V} ; 8.96 \frac{\text{g}}{\text{cm}^3} = \frac{m}{23.4\text{cm}^3} ; m = (8.96)(23.4)$$

$$\boxed{m = 210.9\text{g}}$$

- Table S 5. What is the volume of a pure silver coin that has a mass of 14.0g? (Record your answer to the correct number of significant figures)

Ag density is 10.5 g/cm³

$$D = \frac{m}{V} ; 10.5 \frac{\text{g}}{\text{cm}^3} = \frac{14.0\text{g}}{V} ; \frac{10.5V}{10.5} = \frac{14.0}{10.5}$$

$$\boxed{V = 1.33\text{cm}^3}$$

6. Different kinds of wood have different densities. The density of oak wood is generally 0.70 g/mL. If a 35.0 mL piece of wood has a mass of 25.0 g, is the wood likely to be oak?

The Accepted density is 0.70 g/mL

$$D = \frac{m}{V} \rightarrow D = \frac{25.0\text{g}}{35.0\text{mL}} = 0.71\text{g/mL}$$

Yes, the wood is likely oak.

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Density, Percent Error and Temperature Conversions

7. A student measures the density of water to be 0.97 g/mL. The actual value is 1.00 g/mL. Calculate the student's percent error. (Record your answer to the correct number of significant figures)

$$\frac{mv - av}{av} \times 100 = \frac{0.97 \text{ g/mL} - 1.00 \text{ g/mL}}{1.00 \text{ g/mL}} \times 100 = -3\% \text{ OR } 3\%$$

8. The student obtains a specific heat value of 4.86. Knowing the accepted value for the specific heat of water is 4.18 calculate the student's percent error.

$$\frac{mv - av}{av} \times 100 = \frac{4.86 - 4.18}{4.18} \times 100 = 16.3\%$$

9. The freezing point of water is 273.2 K, but it was measured at 250.1 K. What is the percentage error?

$$\frac{250.1 \text{ K} - 273.2 \text{ K}}{273.2 \text{ K}} \times 100 = -8.455\% = 8.455\%$$

10. Convert the following temperatures using the formula from reference Table T.

a) 273 K = 0 °C

e) 75°C = 348 K

b) 373 K = 100 °C

f) -68°C = 205 K

c) 298 K = 25 °C

g) 5°C = 278 K

d) 0 K = -273 °C

h) 123°C = 396 K

-273

+273

Table T
 $K = ^\circ C + 273$