

Number of Aluminum Atoms Lab

NAME: _____ DATE: _____ PERIOD: _____

Background:

Democritus, fourth century B.C. Greece, first suggested the idea of atoms. The belief was that the atom was the indestructible, indivisible fundamental unit of matter. Atoms became more meaningful when English schoolteacher John Dalton published his atomic theory (1803-1807). According to Dalton an element was a collection of indivisible atoms of the same type, which can chemically combine to form compounds. In a chemical reaction atoms can be re-arranged to form new compounds, but they cannot be changed into atoms of another element. The model of the atom changed as scientists made new discoveries. Dalton's Solid Sphere model was changed when J.J. Thomson discovered the electron and proposed the Plum Pudding model. Ernest Rutherford's Gold Leaf Experiment led to the discovery of a small dense nucleus where he proposed a Nuclear model for the atom. Bohr modified the model to reflect electrons in orbit around the nucleus providing a Planetary model. Many scientists contributed to what is now called the Quantum Mechanical Model. Today scientists "see" atoms with the use of a scanning tunneling microscope, STM, which uses electron current to map out the surfaces of atoms.

In this lab you will calculate the number of atoms in the height of a thin sheet of regular aluminum foil and heavy duty aluminum foil. The height of the aluminum foil may seem small but since the size of an aluminum atom is extremely small the height will contain a very large number of atoms.

Procedure:

- 1) Find the density of aluminum by obtaining the mass and volume of an aluminum cylinder. Obtain the mass of the aluminum cylinder by using an analytical balance. To obtain the volume by water displacement, obtain a 100-mL plastic graduated cylinder and fill to the 50-mL line with water. Tilt the graduated cylinder and carefully allow the aluminum cylinder to slide down into the water. Record the change in water level.
- 2) Using a ruler, cut a square piece of aluminum foil 10 cm by 10 cm. Measure the exact length and width of the foil and record the data.
- 3) Crumple the 10 cm by 10 cm piece of aluminum foil into a ball and place on an analytical balance. Record the mass below.
- 4) Repeat steps #2 and #3 for heavy duty aluminum foil.

Data:

Mass of aluminum cylinder	grams
Volume of aluminum cylinder	milliliters
Regular Aluminum Foil	Heavy Duty Aluminum foil
Width centimeters	Width centimeters
Length centimeters	Length centimeters
Mass grams	Mass grams

Calculations:**Remember to show all formulas, work and units!****See data table for appropriate units.**

1) Using the mass and volume of the cylinder, calculate the density of aluminum.

2) Using the density of aluminum and the mass of the foil, calculate the volume of the aluminum foil.

Regular Foil**Heavy Duty Foil**3) Using the length, width and volume of the aluminum foil, solve for the height using the formula $V = l \times w \times h$. Remember: 1-mL is equal to 1 cm^3 .**Regular Foil****Heavy Duty Foil**4) Using 2.5×10^{-8} centimeters as the diameter of one aluminum atom, solve for the number of atoms in the height of the aluminum foil.**Regular Foil****Heavy Duty Foil****Conclusion:**

1) Who first suggested the idea of atoms? _____

2) Who proposed the atomic theory? _____

3) J.J. Thomson discovered the _____ and proposed the _____ model for the atom.

4) _____ conducted the gold foil experiment and proposed the _____ model for the atom.

5) Bohr suggested that _____ are in orbit around the nucleus and proposed the _____ model for the atom.

6) Today scientists "see" atoms using a _____.