

Two Challenge Problems with a “Theme” Around Aluminum Foil

1. You have a sample of aluminum that weighs 25.0 pounds, and you roll it into a sheet with the dimensions: 3.45 feet by 18.5 inches.

(A) What is the thickness of this sheet?

(B) If you then press the sheet a second time until the thickness is 0.00115 inch, what is the area of the new sheet?

(C) What will be the dimensions (in feet) of the new sheet if it was a perfect square?

(D) If a roll of aluminum foil measures 1.00 ft by 75.0 ft, how many rolls of aluminum foil may be manufactured by the 25.0 pounds of aluminum?

2. Aluminum is mined from the earth in the form of bauxite, a mineral containing mostly aluminum oxide. The aluminum can be extracted from the ore by the reaction of solid aluminum oxide with hydrogen gas to form solid aluminum metal and water.

(A) You own a company, MyFoil, which produces aluminum foil for household use. Your current supplier of bauxite is the Amalgamated Refinery and Foundry (ARF.) How many grams of aluminum can be extracted from 1.55×10^3 US tons (1 truck load) of bauxite, if 78.4 % (by mass) of the bauxite consists of aluminum oxide?

(B) If you are producing a roll of aluminum foil with the dimensions of 18.0 inches by 25.0 ft by 0.00115 inch, how many rolls of aluminum foil will be produced from this truckload of bauxite?

(C) How many atoms, placed end to end would make a piece of aluminum foil have a thickness of 0.00115 inch? (Just because you are curious.)

(D) An investor from Yosemite Enterprises Property (YEP) comes to you with an offer to mine bauxite from his property. He gives you a sample of bauxite and you analyze it for aluminum. A sample of ore weighing 3.279 grams is found to contain 1.579 gram of aluminum. Compared to the bauxite ore cited in (1) above (78.4% aluminum oxide, by mass), would you switch your supplier of bauxite from ARF to YEP? Justify your answer.