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A.P. Environmental Science

Date _____
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Sample AP Problem: Heating the House!

Answer the questions below regarding the heating of a house in the Midwestern United States. Use the assumptions in the table below to perform the calculations that follow.

The house has 2,000 square feet of living space.
80,000 BTUs of heat per square foot are required to heat the house for the winter.
Natural gas is available at a cost of \$5.00 per thousand cubic feet.
One cubic foot of natural gas supplies 1,000 BTUs of heat energy.
The furnace in the house is 80 percent efficient.

(a) Calculate number of cubic feet of natural gas required to heat the house for one winter if the furnace was 100% efficient. Show all the steps of your calculations, including units.

(b) Calculate the cost of heating the house for one winter if the furnace was 100% efficient.

(c) Determine the number of cubic feet of natural gas and cost of heating with a furnace at 80% efficiency.

Energy efficiency is simply the ratio of work output to work input.

$$\text{percent efficiency} = \frac{\text{work}_{\text{out}}}{\text{work}_{\text{in}}} \times 100$$

So, with this in mind, when you are given an efficiency rating that is less than 100%, then you would manipulate the formula so it looks like this:

$$\text{work}_{\text{in}} = \frac{\text{work}_{\text{out}}}{\text{percent efficiency}} \times 100$$

The energy output must be *divided by* the stated efficiency to determine how much energy input is *really* needed to perform the work.