Efficiency Practice Problems

$$\% \text{ efficiency} = \frac{\text{output}}{\text{input}} \times 100\%$$

In-Class Examples

Example #1: A certain light bulb consumes 200J of electrical energy per second, but only emits 25J of light energy per second. Calculate the efficiency of this bulb.

$$\% \text{ eff} = \frac{\text{output}}{\text{input}} \times 100\% = \frac{25 \text{ J}}{200 \text{ J}} \times 100\% = 12.5\%$$

Example #2: A certain large wind turbine is able to transform 1,500,000J of mechanical energy into 1,000,000J of electrical energy every second.

a. How much thermal energy does this turbine 'waste' each second?

$$1,500,000\text{J} - 1,000,000\text{J} \quad \boxed{= 500,000 \text{ J}}$$

b. Calculate the efficiency of this turbine.

$$\% \text{ eff} = \frac{1,000,000 \text{ J}}{1,500,000 \text{ J}} = 0.6667 \times 100\% = 66.7\%$$

Example #3: A certain engine is filled with gasoline that contains chemical energy, and when the engine is started, it begins transforming that chemical energy into mechanical energy. Over the course of a few seconds, the engine transforms 7,000J of chemical energy, but 5,000J of that energy is 'wasted' in the form of thermal energy.

a. How much energy does the engine transform into useful mechanical energy during these few seconds?

$$7000 \text{ J} - 5000 \text{ J} = 2000 \text{ J}$$

b. Calculate the efficiency of this engine.

$$\% \text{ eff} = \frac{2000 \text{ J}}{7000 \text{ J}} \times 100\% = 28.5\%$$