KEY

Energy Review Problems Worksheet

show all calculations with units

$1/R = \frac{\text{Energy (BTUs)}}{\text{area (ft}^2\text{)time (hr)}\Delta T(^\circ F)}$

Power(watts) = current(amps) x voltage(volts)

BTU = energy needed to raise the temp. of 1 pound of water 1°F

1 gallon weights 8 pounds

1 cubic foot of gas contains 1031 BTUs

1 kWh = 3413 BTU

1 ton of coal contains 2.5×10^7 BTUs

1. How many kWhs of energy could be generated by a coal burning power plant that burned 250 tons of coal and was 40% efficient?

$$250 \text{ tons} \times \frac{2.5\times10^7 \text{ BTUs}}{1 \text{ ton}} \times \frac{1 \text{ Kwh}}{3413 \text{ BTU}} \times .4 \text{ (efficiency)} = 7.3\times10^5 \text{ Kwh}$$

2. How much natural gas must be burned in order to produce 5.2×10^4 kWhs of electricity if the power plant was 65% efficient?

$$5.2\times10^4 \text{ Kwhs} \times \frac{3413 \text{ BTU}}{1 \text{ Kwh}} \times \frac{1 \text{ ft}^3 \text{ gas}}{1031 \text{ BTU}} \times .65 \text{ (efficiency)}$$

3. How many pounds of water could raise in temperature 20°F by the 90% efficient burning of 30 cubic feet of natural gas?

$$30 \text{ ft}^3 \times \frac{1 \text{ lb}}{1 \text{ BTU}} \times \frac{^\circ F}{} \times \frac{1}{20^\circ F} \times \frac{1031 \text{ BTU}}{1 \text{ ft}^3} \times .9 \text{ (efficiency)} = 1.39\times10^3 \text{ lb}$$

4. a. The R-value of a hot water heater insulation blanket is 6.7 and covers an area of 25 square feet. How many BTUs will it save for every hour that it prevents 1°F of temperature change?_____

$$\frac{1}{R} \quad \frac{1}{6.7} = \frac{\text{BTUs}}{25 \text{ ft}^2 \cdot 1 \text{ h} \cdot 1 \text{ F}} \qquad \text{BTUs} = \frac{25}{6.7} = 3.73$$

b. How many cubic feet of gas will that save in one year?

5. What is the efficiency of a gas-burning furnace that heats 5,000 lbs of water 25°F by burning 210 cubic feet of natural gas?

$$210 \text{ ft}^3 \times \frac{1031 \text{ BTU}}{\text{ft}^3} = 2.2\times10^5 \text{ BTU}$$

$$5000 \text{ lb} \times 25^\circ F = 1.25\times10^5$$