hhh.schaums.18.19_18.25

18.19 The heat required to raise the temperature of a substance 1 degree C per gram is equal to its specific heat *c*

Or in terms of a formula

$$Q_{heat} = mc\Delta T$$

where the triangle (delta) means "change in."

In this problem notice that the specific heats are given in terms of calories and grams. Always check to see if the specific heats are given in joules and kilograms instead.

18.20 Find the amount of heat need to raise the temperature of 1000 mL (1000 grams) of water 37° C. Divide this by 5 grams to get the heat produced per gram of coal (divide this by 1000 to get the answer in kcal)

18.21 44 MJ (mega-joules) is equal 44 x 10^6 joules. Convert this to calories with the conversion factor 1 cal = 4.184 joules.
Multiply by 0.7 to account for efficiency.

To determine the amount of water that can be heated by 79° you must know the specific heat for water in terms of kilograms (1000 calories/kilogram/degree C)

18.22 heat gained by cold water = heat lost by warm water

$$mc\Delta T_{cold} = mc\Delta T_{cold}$$

$$50g(1)(T_{final} - 0) = 250g(1)\left(90 - T_f\right)$$

solve for T_{final}

18.23 heat gained by cold water = heat lost by metal

$$mc_{water}\Delta T = mc_{metal}\Delta T$$

$$250g(1)(19.4 - 17.0) = 50g \cdot c_{metal}(95.0 - 19.4)$$

Solve for c_{metal}

18.24 The heat it takes to "boil" away the helium is equal to the "*L*atent heat of vaporization (L_V)" times the mass.

Heat (energy) = $L_V m$

be sure to convert this heat to joules form calories

Now since power is equal to energy per second, *energy* is equal to *power times time*

Thus

$$Heat\_required = power \cdot time$$

$$L_v \cdot mass = power \cdot time$$

Solve for the time

18.25 heat absorbed by water and calorimeter = heat lost by alloy

$$mc\Delta T_{calorimeter} + mc\Delta T_{water} = mc\Delta T_{alloy}$$

All the variables are given (the initial temperature of the calorimeter can be assumed to be the same as the water)

Solve for specific heat *c* of the alloy.