1.3.6.1: Practice Heat to Melt or Boil

Exercise 1.3.6.1.1

How much heat does it take to melt 43.77 g of copper if the copper is already at its melting point? The heat of fusion of copper is 49 cal/g.

Answer

2100 cal (2144.73 rounded to 2 sig. dig.)

Exercise 1.3.6.1.1

How much heat does it take to boil 26.88 g of ethanol if the ethanol is already at its boiling point? The heat of vaporization of ethanol is 853 J/g.

Answer

22900 J

Exercise 1.3.6.1.1

What if you start with 85.5 g of ethanol that is only 18.5 °C? The boiling point of ethanol is 78.4 °C. The heat of vaporization of ethanol is 853 J/g. The specific heat of ethanol is 2.46 J/g°C.

Answer

85500 J (It takes 12600 J to heat it from 18.5°C to 78.4°C plus another 72900 J to boil it.)

Exercise 1.3.6.1.1

Starting with 245 g of ice that is –16.3°C, how much energy is needed to warm the ice, melt it, and warm the water to 27.2 °C?

The specific heat of ice is 0.488 cal/g°C, the specific heat of liquid water is 1.00 cal/g°C, and the heat of fusion of ice is 79.7 cal/g.

Answer

28100 cal (It takes 1950 cal to warm the ice to 0.0°C, plus 19500 cal to melt the ice, plus 6660 cal to warm the water to 27.2°C).

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