Answer on Question #54746 – Chemistry – Other

Question:

1. How many calories of heat are required to raise the temperature of 23.4 kg of glass from 31ºc to 65ºc?
2. How many joules of energy are required to raise the temperature of exactly eight fluid ounces of pure water from room temperature?

Answer:

1. The specific heat capacity of glass equals 0.84 J/(g ^{o}C). Therefore the heat required to raise the temperature by 34 ^{o}C (ΔT = 65 ^{o}C – 31 ^{o}C = 34 ^{o}C) is:

Q = CmΔT, where C –the specific heat, m – the mass.

Q = 0.84 J/(g ^{o}C) × 23400 g × 34 ^{o}C = 668304 J

If 1 kcal = 4184 J, then Q = 668304/4184 kcal = 159.73 kcal = 159730 calories

2. Eight fluid ounces equals 236.5882 ml. This corresponds to 236.5882 g of water (the density of water is 1 g/ml). 1 cal is the energy required to heat 1 g of water by 1 ^{o}C.
   Thus, the heat needed to raise the temperature from 25 ^{o}C (room temperature) to 65 ^{o}C id determined by the equation:
   Q = mΔT, m – the mass of water and ΔT = 65 ^{o}C – 25 ^{o}C = 40 ^{o}C.
   Q = 236.5882 g × 40 ^{o}C = 9.464 kcal
   The same value in Joules is: Q = 4.184 kJ × 9.464 kcal = 39.595 kJ = 39595 Joules