Question #81803, Chemistry, Other

Question

Calculate the final temperature of 38 mL of ethanol initially at 19°C upon absorption of 552 J of heat. (density of ethanol =0.789 g/mL)

Splution:

According to the conditions:

Volume V(ethanol) = 38 ml

Initial temperature T_0(ethanol) = 19°C

Absorbed heat Q = 552 J

Ethanol density ρ(ethanol) = 0.789 g/mL

Ethanol specific heat c (ethanol) = 2.46 J/g°C

The absorbed heat can be described using the equation:

$$Q = cm\Delta T = cm(T_1 - T_0)$$

where Q – absorbed heat, c – specific heat, mass, ΔT – change in temperature, T_1 – final temperature, T_0 – initial temperature

Next, ethanol mass can be represented as $m = \rho \times V$.

Therefore:

$$T_1 = \frac{Q + cmT_0}{cm} = \frac{Q + c\rho VT_0}{c\rho V} = \frac{552\ J + 2.46J/g°C \times 0.789g/ml \times 38\ ml \times 19°C}{2.46J/g°C \times 0.789g/ml \times 38\ ml} = 26.5°C$$

Answer:

The final temperature is 26.5°C

Answer provided by www.AssignmentExpert.com