Answer on Question #65011, Physics / Molecular Physics | Thermodynamics

Question:

Determine the amount of heat required to convert 20 gram of ice at –17°C to 20 gram water at 80°C.

Solution:

There are three processes requiring heat:
1) heating the ice from -17°C to 0°C;
2) melting (= fusion) at 0°C;
3) heating the water from 0°C to 80°C.

So, we need to use these constants:
1) heat capacity of ice $C_i = 2.05 \frac{J}{g \cdot K}$
2) heat of fusion $H = 334 \frac{J}{g}$
3) heat capacity of ice $C_w = 4.18 \frac{J}{g \cdot K}$

Total amount of heat may be calculated this way:

$$H_{tot} = 20g \cdot C_i \cdot \big(0℃ - (-17℃)\big) + 20g \cdot H + 20g \cdot C_w(80℃ - 0℃) =$$
$$= 20 \cdot 2.05 \cdot 17 + 20 \cdot 334 + 20 \cdot 4.18 \cdot 80 = 14065\, J$$

Answer:

$14065\, J$