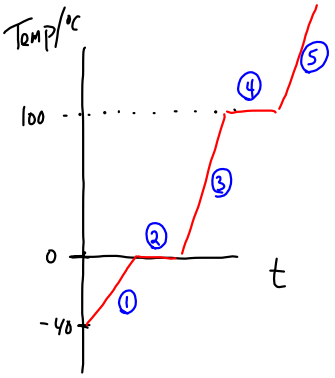
Change in Temperature Through Change of State

Consider heating ice from -40°C to steam at 200°C. (m of 50 g)



① heating ice $Q = mc\Delta T$ $\left(c = 2.08 \frac{J}{g°C}\right)$

② melting ice $Q = m\Delta H^\circ_{fus}$ $\left(333 J/g \; \Delta H^\circ_{fus}\right)$

③ heating water $Q = mc\Delta T$ $\left(c = 4.18 \frac{J}{g°C}\right)$

④ vaporization of water $Q = m\Delta H^\circ_{vap}$ $\left(2260 J/g \; \Delta H^\circ_{vap}\right)$

⑤ heating steam $Q = mc\Delta T$ $\left(c = 1.87 \frac{J}{g°C}\right)$

① heating ice $\Delta T = 40°C$

$Q = mc\Delta T$ (know this to 1 g)

$Q = (50\,g)\left(2.08 \frac{J}{g°C}\right)(40°C)$

$Q = 4160 J$

② melting ice

$Q = m\Delta H^\circ_{fus}$

$Q = (50\,g)(333 J/g)$

$Q = 16650 J$

③ heating water $\Delta T = 100°C$

$Q = mc\Delta T$

$Q = (50\,g)\left(4.18 \frac{J}{g°C}\right)(100°C)$

$Q = 20900 J$

④ vaporizing

$Q = m\Delta H^\circ_{vap}$

$Q = (50\,g)(2260 J/g)$

$Q = 113000 J$

⑤ heating steam $\Delta T = 100°C$

$Q = mc\Delta T$

$Q = (50\,g)\left(1.87 \frac{J}{g}\right)(100°C)$

$Q = 9350 J$

①	4160 J
②	16650 J
③	20900 J
④	113000 J
⑤ +	9350 J
	164 060 J → 1.6×10^5 J