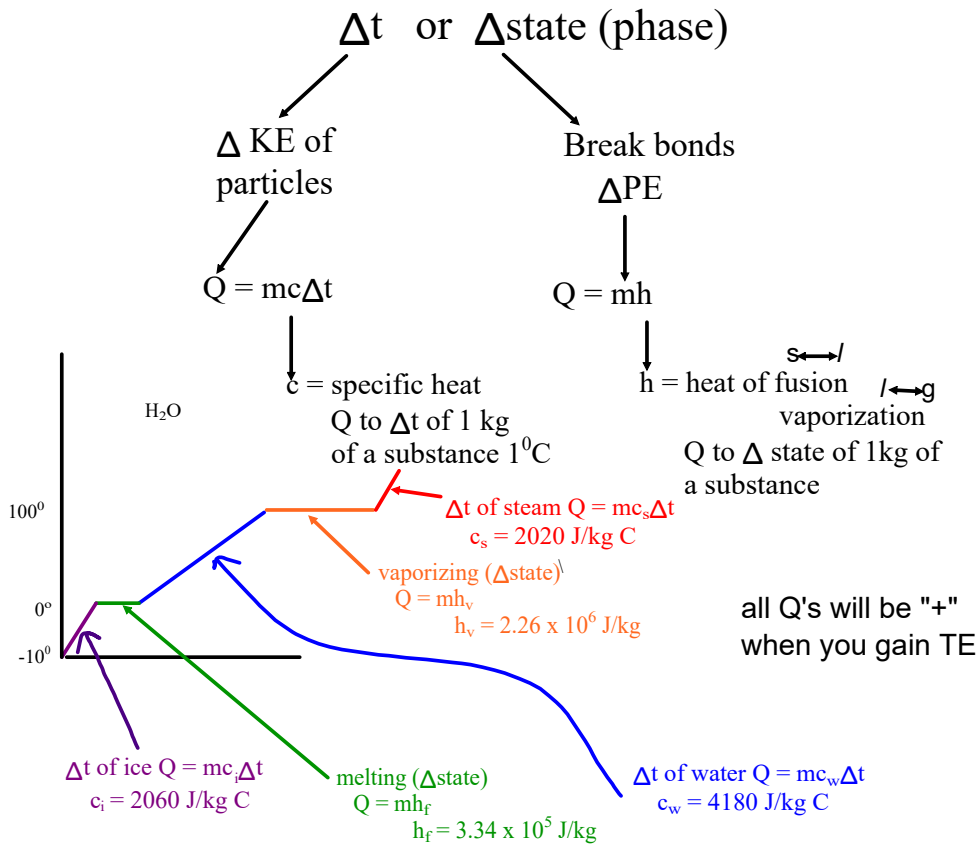
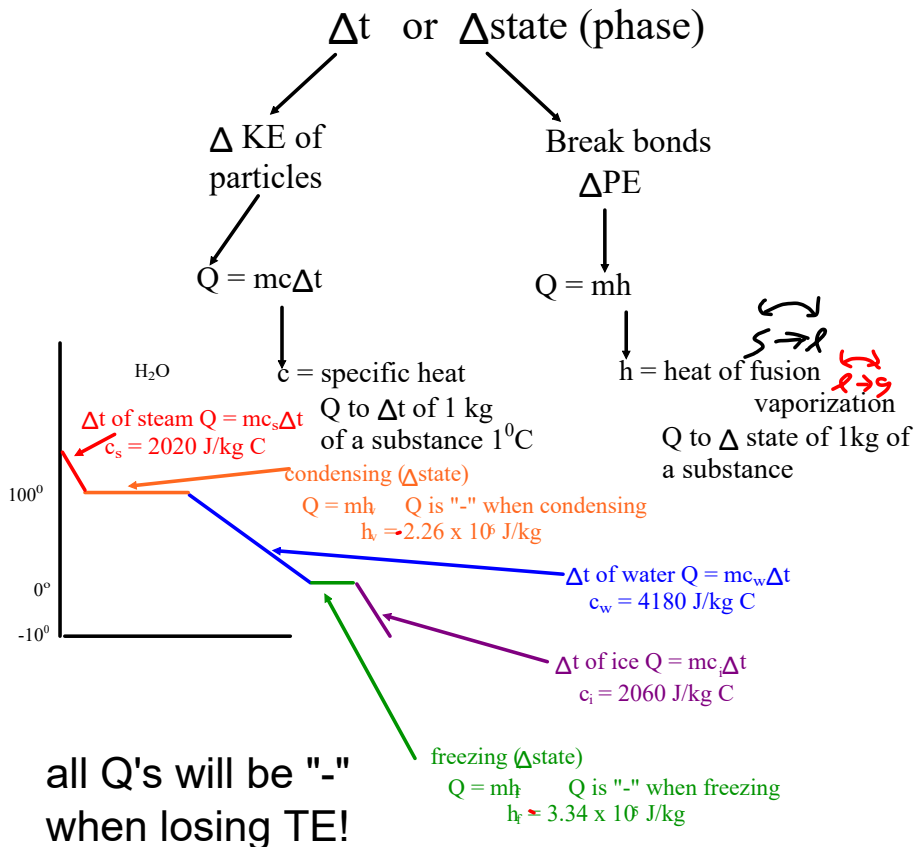
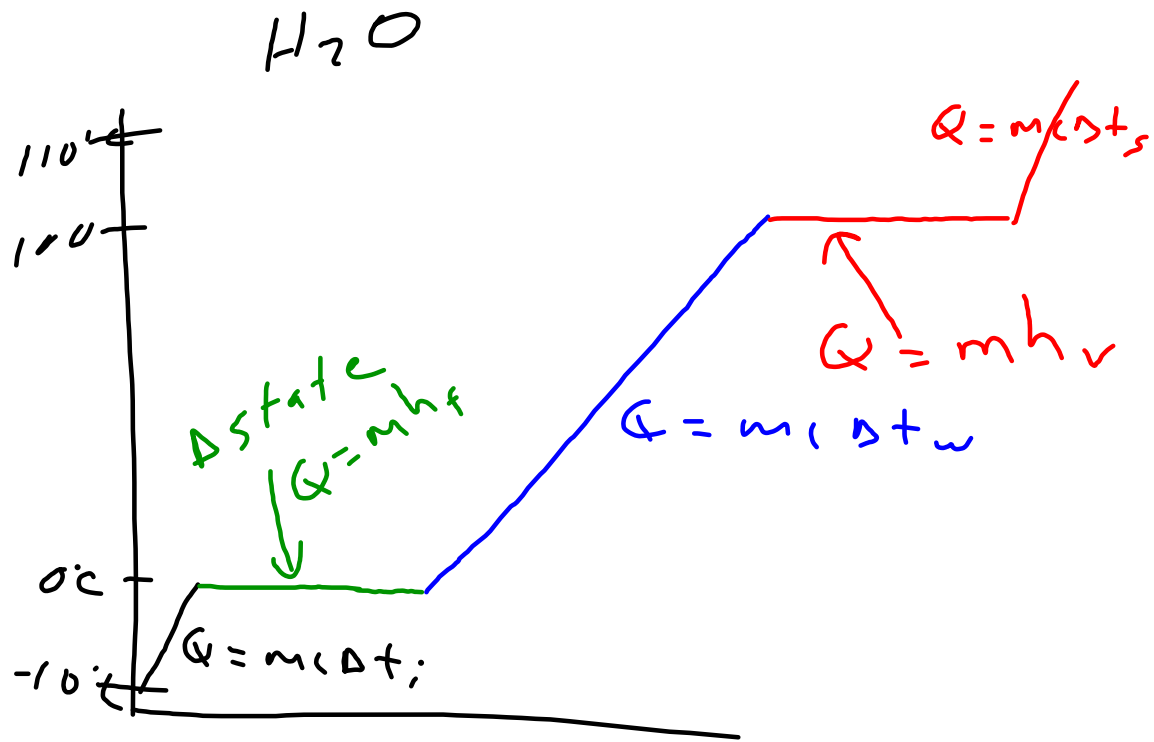


Q will either:



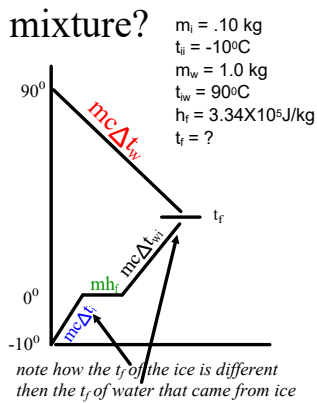
Q will either:





100.0 g of ice at $-10.0^\circ C$ is placed in 1.00 kg of water at $90.0^\circ C$. What is the final temperature of the mixture?

100.0 g of ice at -10.0°C is placed in 1.00 kg of water at 90.0°C . What is the final temperature of the mixture?



$t_f = 74.1^{\circ}\text{C}$

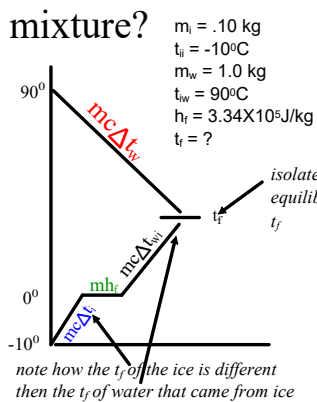
$Q_L = mc\Delta t_w = 1\text{kg}(4180\text{J/kgC})(74.1^{\circ} - 90^{\circ}\text{C}) = -66,500\text{J}$

$Q_g = mc\Delta t_i = .1\text{kg}(2060\text{J/kgC})[0 - (-10^{\circ}\text{C})] = +2060\text{J}$

$Q_g = mh_f = .10\text{ kg} (3.34 \times 10^5\text{ J/kg}) = 33,400$

$Q_g = mc\Delta t_{wi} = .1\text{kg}(4180\text{J/kgC})(74.1 - 0^{\circ}\text{C}) = +31000\text{J}$
 $Q_g = +66,500$

100.0 g of ice at -10.0°C is placed in 1.00 kg of water at 90.0°C . What is the final temperature of the mixture?



$mc\Delta t_w + mc\Delta t_i + mh_f + mc\Delta t_{wi} = 0$

$mc\Delta t_w + mc\Delta t_{wi} = -mc\Delta t_i - mh_f$

$mct_{fw} - mct_{iw} + mct_{fwi} - mct_{iwi} = -mc\Delta t_i - mh_f$

$mct_{fw} + mct_{fwi} = -mc\Delta t_i - mh_f + mct_{iw} + mct_{iwi}$

$t_f(mc_w + mc_{wi}) = -mc\Delta t_i - mh_f + mct_{iw} + mct_{iwi}$

$t_f = \frac{-mc\Delta t_i - mh_f + mct_{iw} + mct_{iwi}}{(mc_w + mc_{wi})}$

$t_f = \frac{-.10\text{ kg}(2060\text{ J/kgC})[0 - (-10^{\circ}\text{C})] - .10\text{ kg} (3.34 \times 10^5\text{ J/kg}) + 1\text{ kg}(4180\text{ J/kgC})90.0^{\circ}\text{C} + .10\text{ kg}(4180\text{ J/kgC})0^{\circ}\text{C}}{(1\text{ kg}(4180\text{ J/kgC}) + .10\text{ kg}(4180\text{ J/kgC}))}$



$t_f = 74.1^{\circ}\text{C}$

$Q_L = mc\Delta t_w = 1\text{kg}(4180\text{J/kgC})(74.1^{\circ} - 90^{\circ}\text{C}) = -66,500\text{J}$

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$Q_g = mh_f = .10\text{ kg} (3.34 \times 10^5\text{ J/kg}) = 33,400$

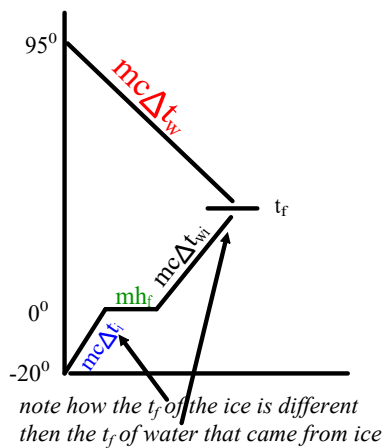
$Q_g = mc\Delta t_{wi} = .1\text{kg}(4180\text{J/kgC})(74.1 - 0^{\circ}\text{C}) = +31000\text{J}$
 $Q_g = +66,500$

A 150.0 g block of ice at -20.0°C is placed in 880.0 g of water at 95.0°C .

What is the final temperature of the mixture.

A 150.0 g block of ice at -20.0°C is placed in 880.0 g of water at 95.0°C .

What is the final temperature of the mixture.



$$Q_L + Q_g = 0$$

$$mc\Delta t_w + mc\Delta t_i + mh_f + mc\Delta t_{wi} = 0$$

$$mc\Delta t_w + mc\Delta t_{wi} = -mc\Delta t_i - mh_f$$

$$mct_{fw} - mct_{iw} + mct_{fwi} - mct_{iwi} = -mc\Delta t_i - mh_f$$

$$mct_{fw} + mct_{fwi} = -mc\Delta t_i - mh_f + mct_{iw} + mct_{iwi}$$

$$t_f(mc_w + mc_{wi}) = -mc\Delta t_i - mh_f + mct_{iw} + mct_{iwi}$$

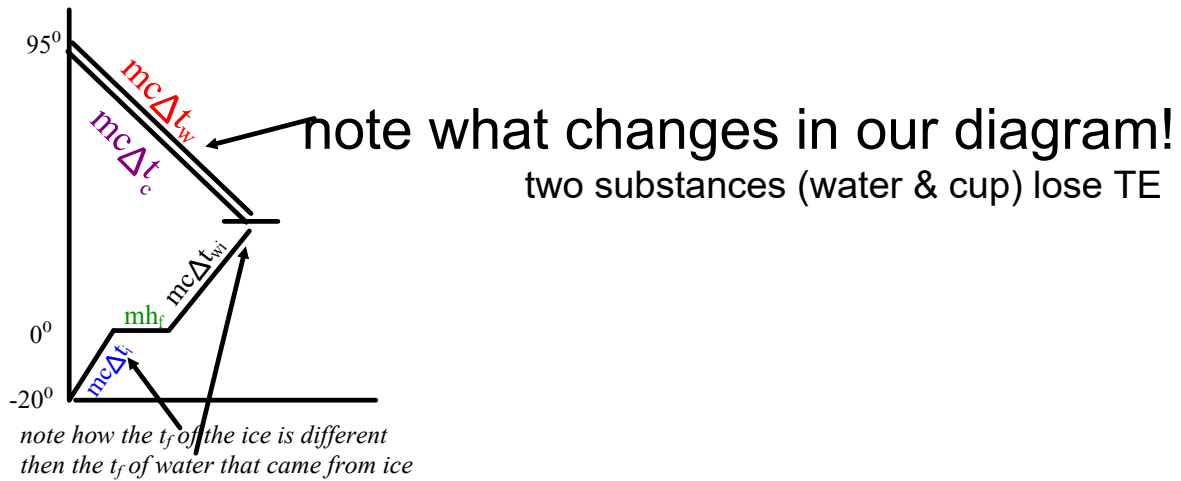
$$t_f = \frac{-mc\Delta t_i - mh_f + mct_{iw} + mct_{iwi}}{(mc_w + mc_{wi})}$$

$$t_f = \frac{-.15 \text{ kg}(2060 \text{ J/kgC})20^{\circ}\text{C} - .15 \text{ kg} (3.34 \times 10^5 \text{ J/kg}) + .88 \text{ kg}(4180 \text{ J/kgC})95^{\circ}\text{C} + .15 \text{ kg}(4180 \text{ J/kgC})0^{\circ}\text{C}}{(.88 \text{ kg}(4180 \text{ J/kgC}) + .15 \text{ kg}(4180 \text{ J/kgC}))}$$

$$t_f = 68.1^{\circ}\text{C}$$

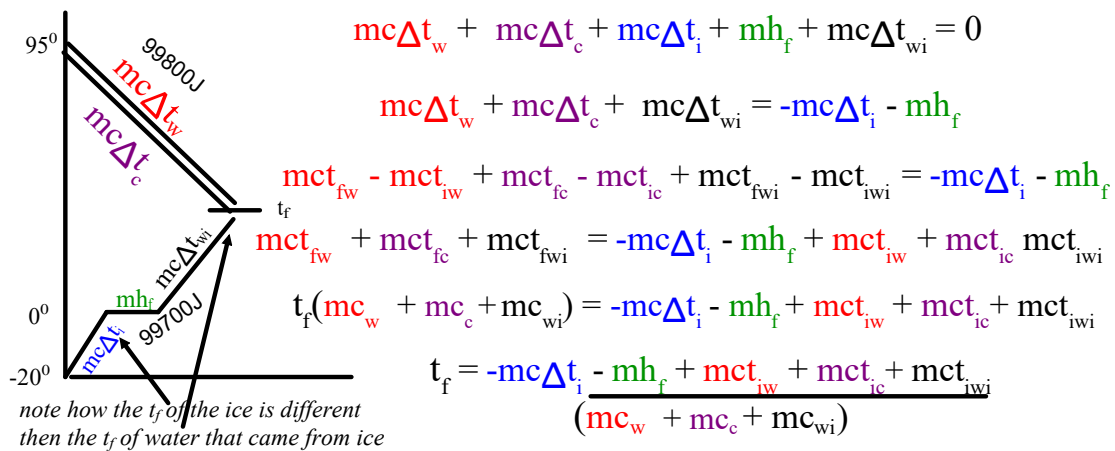
A 150.0 g block of ice at -20.0°C is placed in 880.0 g of water at 95.0°C. What is the final temperature of the mixture. Oh no, the water is in a 225 g aluminum cup!

$$Q_L + Q_g = 0$$



A 150.0 g block of ice at -20.0°C is placed in 880.0 g of water at 95.0°C. What is the final temperature of the mixture. Oh no, the water is in a 225 g aluminum cup!

$$Q_L + Q_g = 0$$



$$mc\Delta t_w + mc\Delta t_c + mc\Delta t_i + mh_f + mc\Delta t_{wi} = 0$$

$$mc\Delta t_w + mc\Delta t_c + mc\Delta t_{wi} = -mc\Delta t_i - mh_f$$

$$mct_{fw} - mct_{iw} + mct_{fc} - mct_{ic} + mct_{fwi} - mct_{iwi} = -mc\Delta t_i - mh_f$$

$$mct_{fw} + mct_{fc} + mct_{fwi} = -mc\Delta t_i - mh_f + mct_{iw} + mct_{ic} + mct_{iwi}$$

$$t_f(mc_w + mc_c + mc_{wi}) = -mc\Delta t_i - mh_f + mct_{iw} + mct_{ic} + mct_{iwi}$$

$$t_f = \frac{-mc\Delta t_i - mh_f + mct_{iw} + mct_{ic} + mct_{iwi}}{(mc_w + mc_c + mc_{wi})}$$

$$t_f = \frac{-.15 \text{ kg}(2060 \text{ J/kgC})20^\circ\text{C} - .15 \text{ kg} (3.34 \times 10^5 \text{ J/kg}) + .88 \text{ kg}(4180 \text{ J/kgC})95^\circ\text{C} + .225 \text{ kg}(903 \text{ J/kgC})95^\circ\text{C} + .15 \text{ kg}(4180 \text{ J/kgC})0^\circ\text{C}}{((.88 \text{ kg}(4180 \text{ J/kgC}) + .225 \text{ kg}(903 \text{ J/kgC}) + .15 \text{ kg}(4180 \text{ J/kgC}))}$$

$$t_f = 69.3^\circ\text{C}$$

$T E$ needed to change ^{1 kg} water
from $0^\circ C \rightarrow 100^\circ C$

$$Q = mc \Delta t$$

$$Q = mc (t_f - t_i)$$

$$Q = 1 \text{ kg} (4180 \text{ J/kg}^\circ\text{C}) (100^\circ\text{C} - 0^\circ\text{C})$$

$$Q = \cancel{1 \text{ kg}} (4180 \cancel{\text{ J/kg}^\circ\text{C}}) 100^\circ\text{C}$$

$$Q = 418,000 \text{ J}$$

$$P = \frac{Q}{t} \quad t = \frac{Q}{P} = \frac{mc \Delta t_c}{P}$$

$$t_i = 19^\circ\text{C}$$

$$t = \frac{.175 \text{ kg} (3870 \text{ J/kg}^\circ\text{C}) \Delta t}{25 \text{ W}}$$



$$t_f = 40^\circ\text{C}$$

$$P = 25 \text{ W}$$

$$t = ?$$

$$c_c = 3870 \text{ J/kg}^\circ\text{C}$$

$$m = 175 \text{ ml}$$

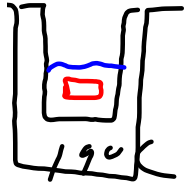
$$t = 5692$$

$$\rightarrow 9.48 \text{ min}$$

$$\rightarrow 175 \text{ g}$$

$$1 \text{ g} = 1 \text{ cm}^3 = 1 \text{ ml}$$

100°C



$$Q_L + Q_S = 0$$

$$m(\Delta t)_m + m(\Delta t)_w + m(\Delta t)_c = 0$$

$$m(\underbrace{t_f - t_i}_m) + m(\underbrace{t_f - t_i}_w) + m(\underbrace{t_f - t_i}_c)$$

