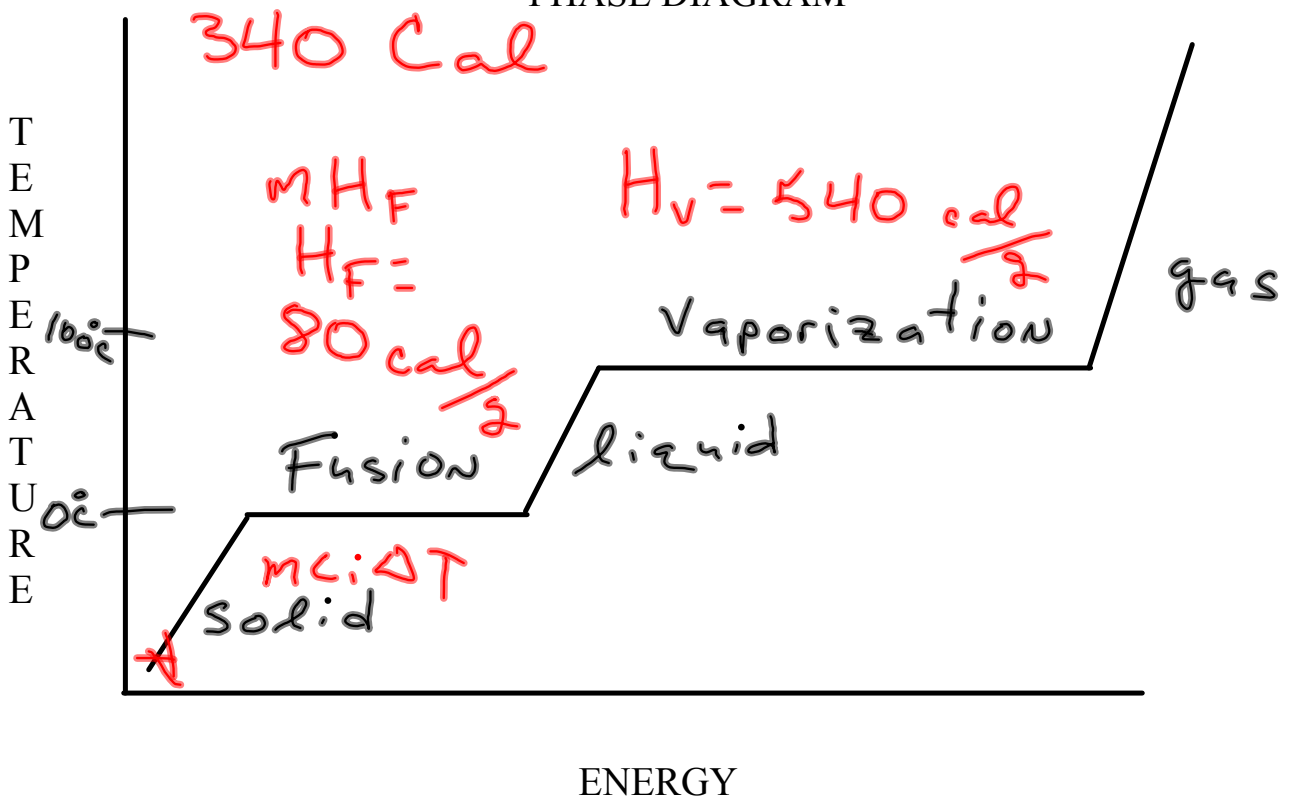


PHASE DIAGRAM



$$Q = m c_i \Delta T + m H_f + m c_w \Delta T + m H_v + m c_s \Delta T$$

m= mass

c= specific heat

T= temperature

$$H_f = 80 \text{ cal/g}$$

$$H_v = 540 \text{ cal/g}$$

$$c_i = .5 \text{ cal/g}^\circ\text{C}$$

$$c_w = 1.0 \text{ cal/g}^\circ\text{C}$$

$$c_s = .412 \text{ cal/g}^\circ\text{C}$$

$$\Delta T = T_F - T_i$$

Calculate the amount of heat needed to change 10.0 grams of ice at -10.0°C to steam at 110.0°C .

$$\begin{aligned} Q &= (10\text{g}) \left(\frac{.5 \text{ cal}}{\text{g}^\circ\text{C}} \right) (10^\circ) + 50 \\ &\quad (10\text{g}) \left(\frac{80 \text{ cal}}{\text{g}} \right) + 800 \\ &\quad (10\text{g}) \left(\frac{1 \text{ cal}}{\text{g}^\circ\text{C}} \right) (100^\circ) + 1000 \\ &\quad (10\text{g}) \left(\frac{540 \text{ cal}}{\text{g}} \right) + 5400 \\ &\quad (10\text{g}) \left(\frac{.412 \text{ cal}}{\text{g}^\circ\text{C}} \right) (10^\circ) + 41.2 \\ &\quad 7291.2 \text{ cal} \end{aligned}$$

How much heat does it take to cool 100.0 g of steam at 200.0°C to ice at -127°C???

-82,470 calories

A 10.0 gram ice cube at -10.0°C is dropped into 500 ml of water at 35.0°C .
What is the final temperature of the mixture?

$$Q_i = mc_i \Delta T + mH_f + mc_w \Delta T$$

$$Q_w = mc_w \Delta T$$

$$Q_i = (10 \text{ g}) \left(0.5 \frac{\text{cal}}{\text{g}^{\circ}\text{C}} \right) (10^{\circ}\text{C}) + (10)(80) +$$
$$(10 \text{ g}) \left(1 \frac{\text{cal}}{\text{g}^{\circ}\text{C}} \right) (T_F - 0)$$

$$Q_i = 50 + 800 + 10T_F$$

$$Q_i = 850 + 10T_F$$

$$Q_w = (500 \text{ g}) \left(1 \frac{\text{cal}}{\text{g}^{\circ}\text{C}} \right) (T_F - 35)$$

$$Q_w = 500T_F - 17,500$$

$$Q_i = -Q_w$$

$$850 + 10T_F = -(500T_F - 17,500)$$

$$850 + 10T_F = -500T_F + 17,500$$

$$510T_F = 16,650$$

$$T_F = 32.6^{\circ}\text{C}$$

