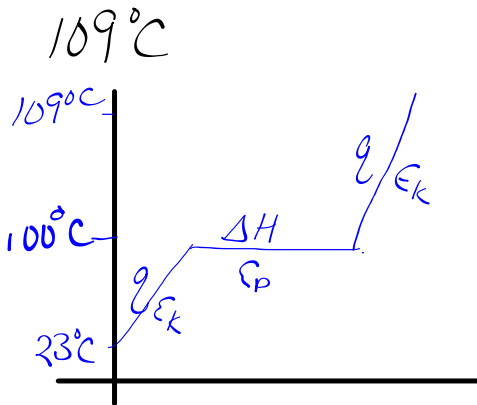


Calculate the total energy change when 500g of H₂O is heated from 23°C to 109°C



$$\begin{aligned}
 & 23^\circ\text{C} - 100^\circ\text{C} \\
 q &= mc\Delta T \\
 &= 500\text{g} \times 4.18 \frac{\text{J}}{\text{g}^\circ\text{C}} \times 77^\circ\text{C} \\
 &= 160930 \text{ J} \\
 & \quad 160.93 \text{ kJ}
 \end{aligned}$$

Bonds

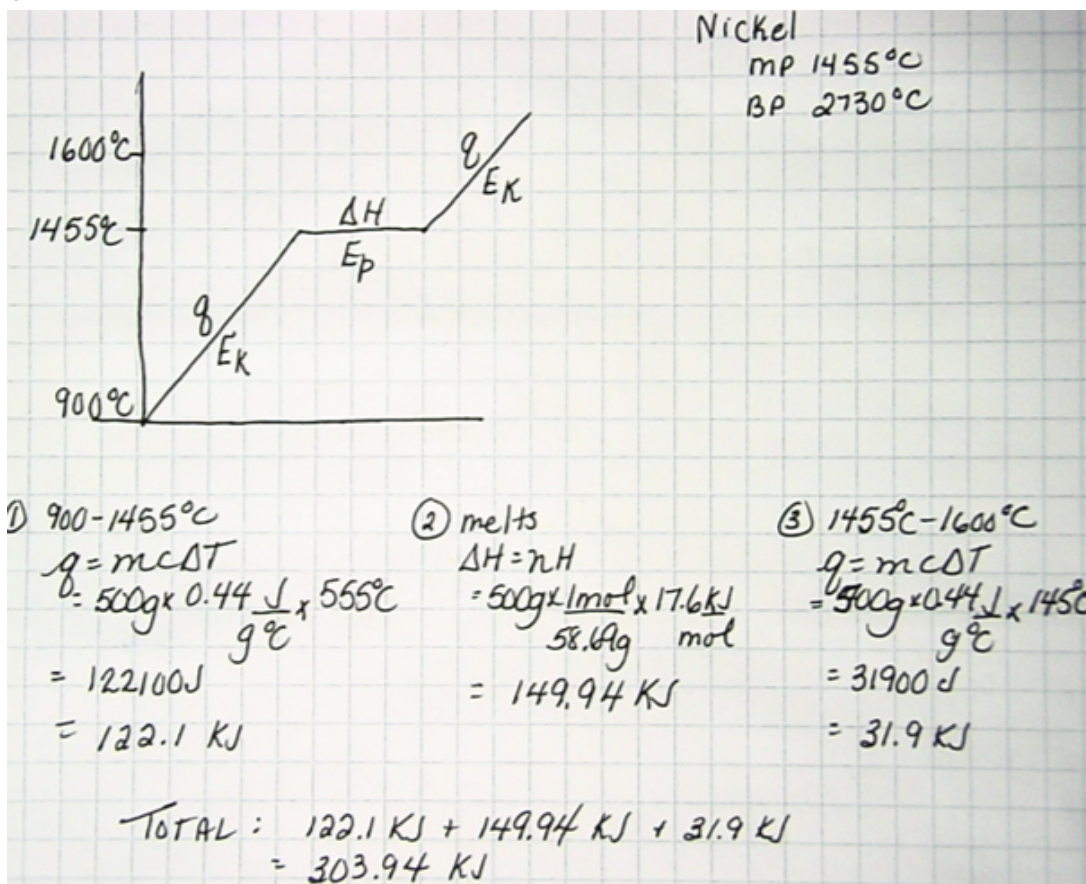
$$\begin{aligned}
 \Delta H &= nH \\
 &= 500\text{g} \times \frac{1 \text{ mol}}{18.02 \text{ g}} \times 40.7 \frac{\text{kJ}}{\text{mol}} \\
 &= 1129.30 \text{ kJ}
 \end{aligned}$$

$$\begin{aligned}
 & 100^\circ\text{C} - 109^\circ\text{C} \\
 q &= mc\Delta T \\
 &= 500\text{g} \times 1.7 \frac{\text{J}}{\text{g}^\circ\text{C}} \times 9^\circ\text{C} \\
 &= 7650 \text{ J} \\
 & \quad 7.65 \text{ kJ}
 \end{aligned}$$

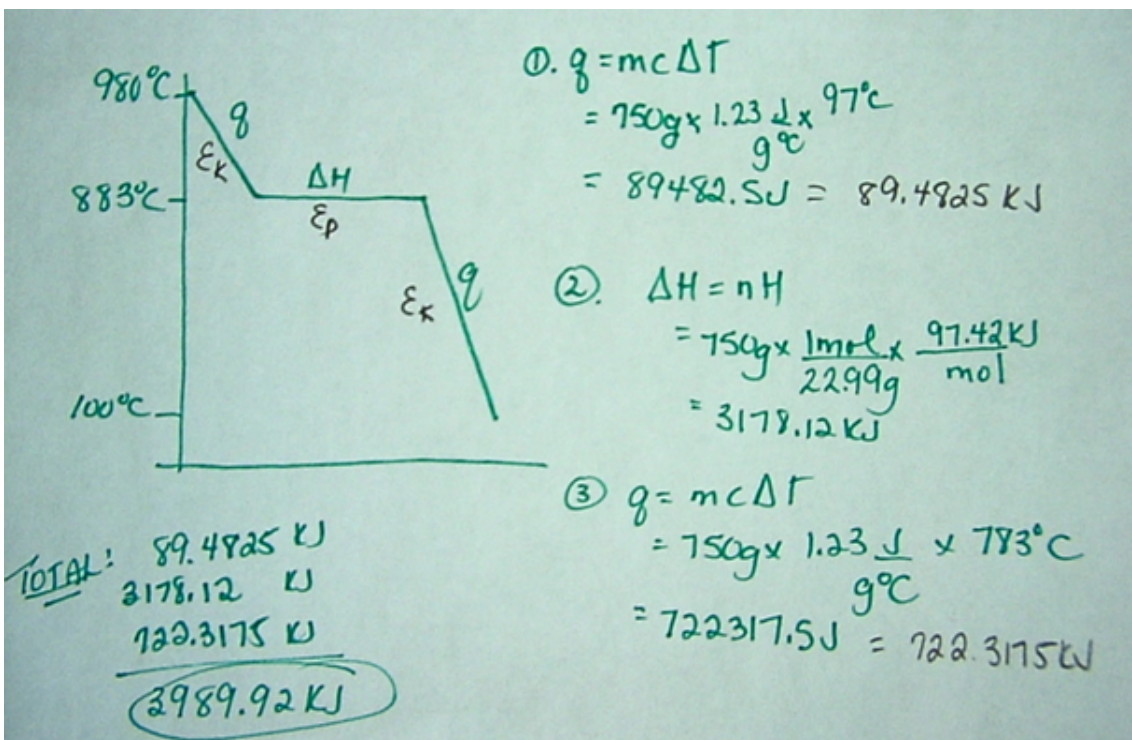
TOTAL:

$$\begin{aligned}
 & 160.93 \text{ kJ} \\
 & 1129.30 \text{ kJ} \\
 & 7.65 \text{ kJ} \\
 & \underline{\underline{1297.88 \text{ kJ}}}
 \end{aligned}$$

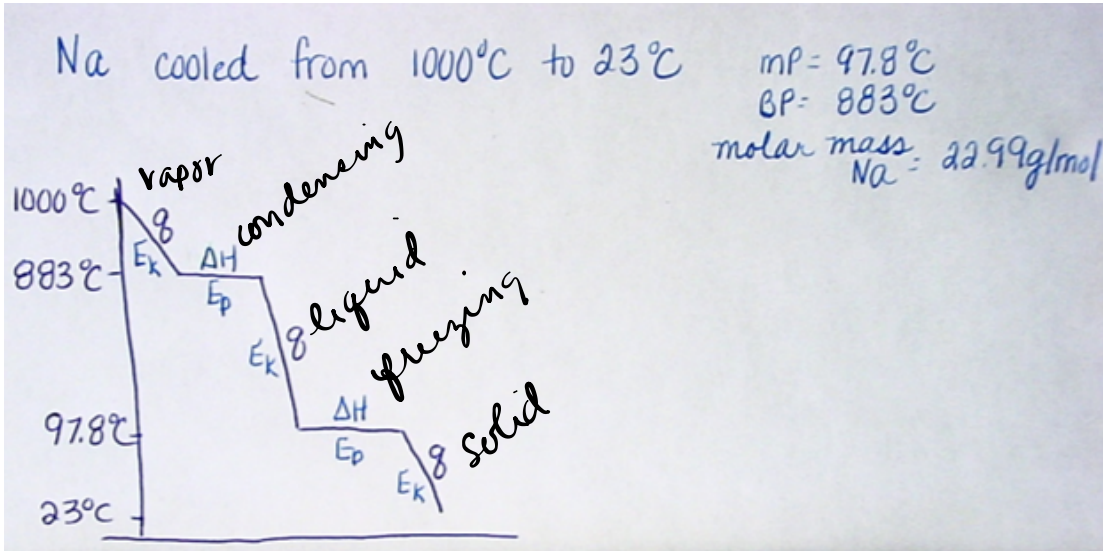
Calculate the total energy change as 500g of Nickel is heated from 900°C to 1600°C



Calculate the total energy change when 750g of Na is cooled from 980°C to 100°C. (Sodium: $mP = 97.8^\circ\text{C}$
 $Bp = 883^\circ\text{C}$)



Calculate the total energy change when 120g of sodium is cooled from 1000°C to 23°C



1000-883

$$q = mc\Delta T$$

$$= 120g \times 1.23 \frac{J}{g^\circ C} \times 117^\circ C$$

$$= 17269.2J$$

$$= 17.2 \text{ KJ}$$

BP Condense

$$\Delta H = nH$$

$$= 120g \times \frac{1 \text{ mol}}{22.99g} \times 97.42 \frac{kJ}{\text{mol}}$$

$$= 508.499 \text{ KJ}$$

883°C-97.8°C

$$q = mc\Delta T$$

$$= 120g \times 1.23 \frac{J}{g^\circ C} \times 785.2^\circ C$$

$$= 115895.52J$$

$$= 115.896 \text{ KJ}$$

97.8°C freeze (mp)

$$\Delta H = nH$$

$$= 120g \times \frac{1 \text{ mol}}{22.99g} \times 2.60 \frac{kJ}{\text{mol}}$$

$$= 13.571 \text{ KJ}$$

97.8°C-23°C

$$q = mc\Delta T$$

$$= 120g \times 1.23 \frac{J}{g^\circ C} \times 74.8^\circ C$$

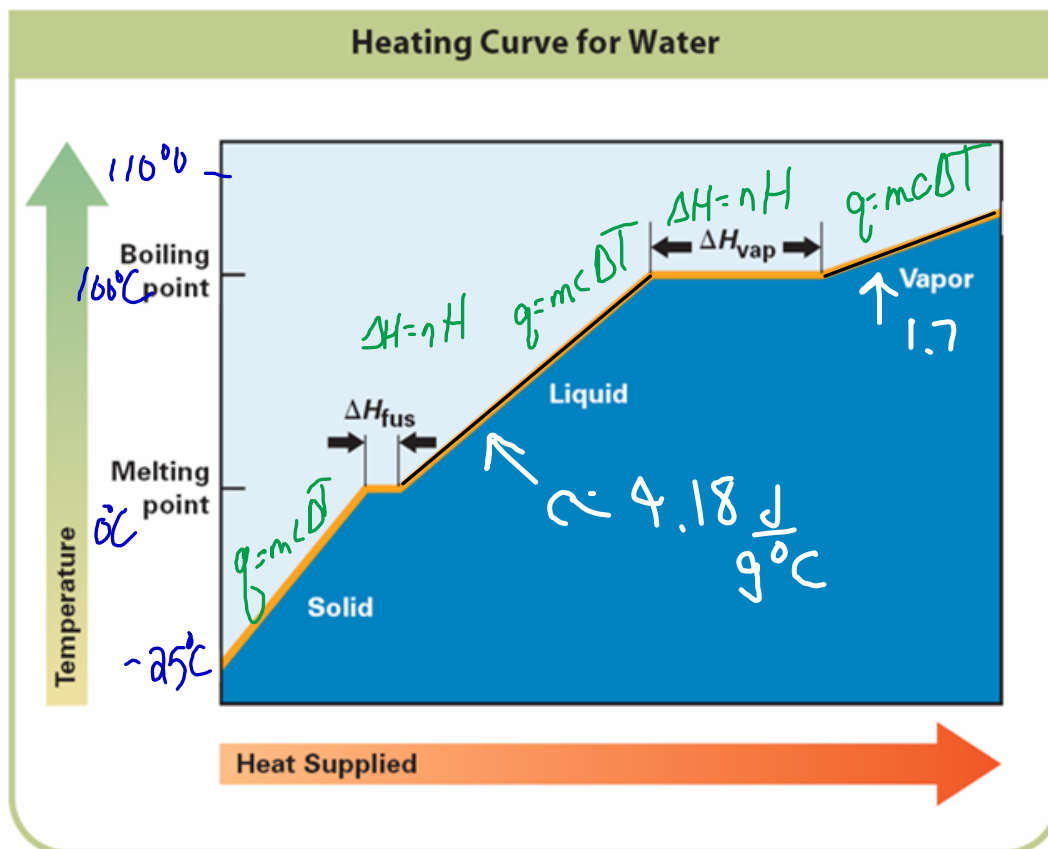
$$= 11040.48J$$

$$= 11.040 \text{ KJ}$$

TOTAL:

17.269 KJ	} TOTAL Energy
508.499 KJ	
115.896 KJ	
13.571 KJ	
11.040 KJ	

666.275 KJ



A heating curve graphically describes the enthalpy changes that take place during phase changes.

INTERPRETING GRAPHS

- Identify** In which region(s) of the graph is temperature constant?
- Describe** How does the amount of energy required to melt a given mass of ice compare to the energy required to vaporize the same mass of water? Explain.
- Apply Concepts** Which region of the graph represents the coexistence of solid and liquid? Liquid and vapor?

HOMEWORK

1. Determine the energy required to heat 175g of sodium from 23°C to 70°C
2. How much energy is required to raise the temperature of 250g of water from 15°C to 103°C
3. 1.2 kg nickel is heated from 1100°C to 1700°C
4. Determine the energy released when 1 kg of water vapor is cooled from 109°C to ice at -5°C

10.11675 kJ