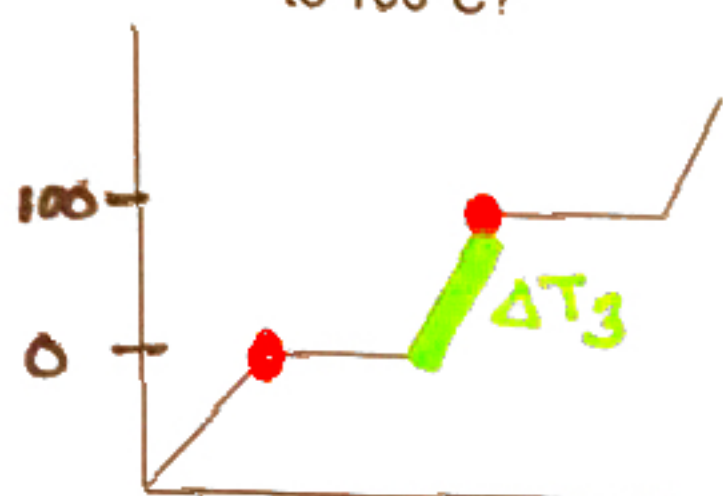


1. What is the energy needed to melt 326 grams of ice and heat it to 100°C?



- ② melt ice
③ heat liq.

$$Q_2 = mL = (326g)(334 \text{ J/g}) = 112144 \text{ J}$$

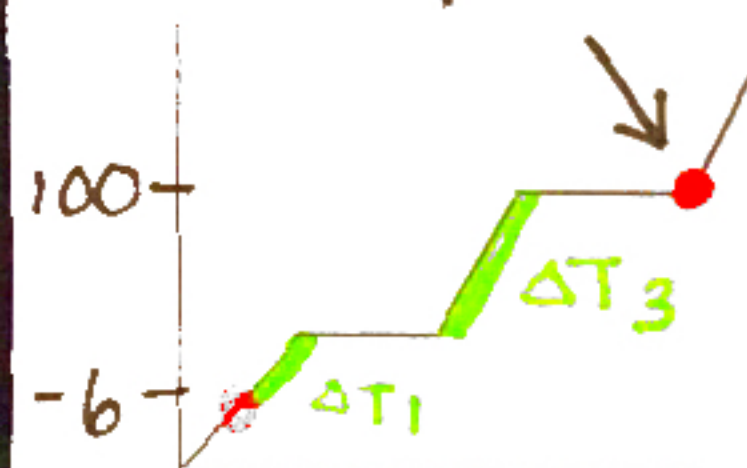
$$Q_3 = m\Delta T = (326g)(4.18 \text{ J/g}^\circ\text{C})(100^\circ - 0^\circ) = 136268 \text{ J}$$

$$Q_T = Q_2 + Q_3$$

$$= \boxed{248412 \text{ J}}$$

2. Determine the energy required to convert 21.1 grams of ice at -6°C to steam at 100°C

Steam @ 100°! Have to vaporize



- ① heat ice
② melt ice
③ heat liq.
④ vaporize

$$Q_1 = m\Delta T = (21.1g)(2.09 \text{ J/g}^\circ\text{C})(0^\circ - (-6^\circ)) = 264.59 \text{ J}$$

$$Q_2 = mL = (21.1g)(334 \text{ J/g}) = 7047.4 \text{ J}$$

double negative! be careful!

$$Q_3 = m\Delta T = (21.1g)(4.18 \text{ J/g}^\circ\text{C})(100^\circ - 0^\circ) = 8819.8 \text{ J}$$

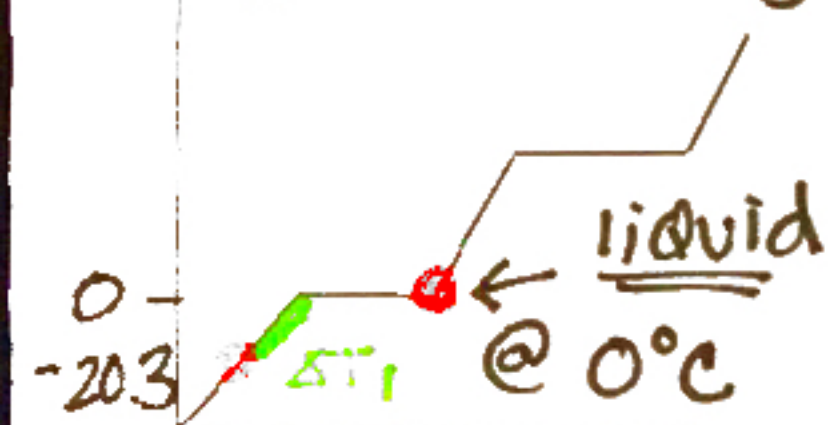
$$Q_4 = mL = (21.1g)(2260 \text{ J/g}) = 47686 \text{ J}$$

$$Q_T = Q_1 + Q_2 + Q_3 + Q_4$$

$$= \boxed{63817.79 \text{ J}}$$

3. What is the heat transfer involved when you convert 51 grams of water 0°C to ice at -20.3°C?

going backwards!
L will be negative!



- ② freezing
① cooling ice

$$Q_2 = mL = (51g)(-334 \text{ J/g}) = -17034 \text{ J}$$

$$Q_1 = m\Delta T = (51g)(2.09 \text{ J/g}^\circ\text{C})(-20.3^\circ - 0^\circ) = -2163.78 \text{ J}$$

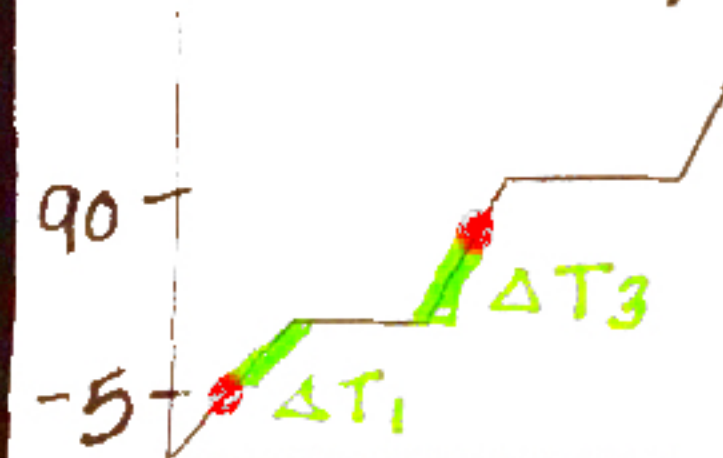
$$Q_T = Q_2 + Q_1$$

$$= \boxed{-19197.78 \text{ J}}$$

negative b/c energy is released!

4. What is the energy absorbed when you melt 75 grams of ice at -5°C to water at 90°C?

you aren't "finishing" line 3! Stop early!
careful w/ ΔT



- ① heat ice
② melt ice
③ heat liq.

$$Q_1 = m\Delta T = (75g)(2.09 \text{ J/g}^\circ\text{C})(0^\circ - (-5^\circ)) = 783.75 \text{ J}$$

$$Q_2 = mL = (75g)(334 \text{ J/g}) = 25050 \text{ J}$$

double negative!

$$Q_3 = m\Delta T = (75g)(4.18 \text{ J/g}^\circ\text{C})(90^\circ - 0^\circ) = 28215 \text{ J}$$

$$Q_T = Q_1 + Q_2 + Q_3$$

$$= \boxed{54048.75 \text{ J}}$$

only going to 90°C!