

## Homework #2 - Heat Transfer and Change of State

1. How much heat is needed to change 50g of ice at 0°C to water at 0°C?

$$(50g) \left( \frac{1 \text{ mol}}{18.02g} \right) \cdot (2.7746 \dots \text{ mol H}_2\text{O}) \left( \frac{1.44 \text{ kcal}}{\text{mol}} \right) = 3.9958 \text{ kcal} = 4.0 \text{ kcal}$$

2. How much heat is needed to heat 50g of water at 0°C to water at 100°C?

$$Q = m c \Delta T = 50g \left( \frac{1 \text{ cal}}{1g} \right) (100^\circ) = 5000 \text{ cal} = 5 \text{ kcal}$$

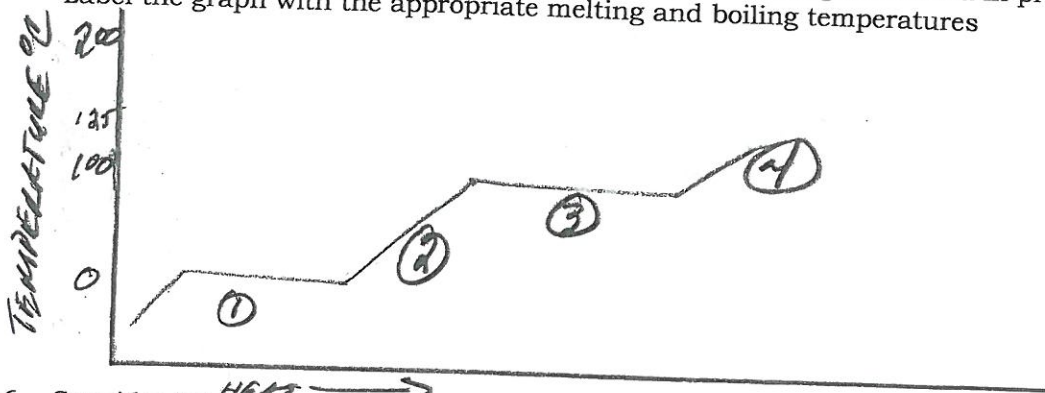
3. How much heat is needed to change 50g of water at 100°C to steam at 100°C?

$$(50g) \left( \frac{1 \text{ mol}}{18.02g} \right) = (2.7746 \dots \text{ mol H}_2\text{O}) \left( 9.7 \frac{\text{kcal}}{\text{mol}} \right) = 26.91 \text{ kcal}$$

4. Assuming that the specific heat of steam is the same as water, how much energy is needed to heat 50g of steam from 100°C to 125°C?

$$Q = m c \Delta T = 50g \left( 1 \frac{\text{cal}}{g} \right) (25^\circ) = 1250 \text{ cal} = 1.25 \text{ kcal}$$

5. Draw a heating curve for the temperature and phase changes outlined in problems 1-4. Label the graph with the appropriate melting and boiling temperatures



6. Consider 75 grams of solid sodium at its freezing point. How much heat would have to be absorbed by the sodium to melt, warm up to the boiling point and then completely vaporize? ( $c = 0.32 \text{ cal/g}^\circ\text{C}$   $H_v = 1048 \text{ cal/g}$   $H_f = 27.4 \text{ cal/g}$  Melting point = 98°C Boiling point = 889°C) careful... this is a three step problem!

7. Draw the heating curve for the heating process in problem 6. Label the graph with the appropriate melting and boiling temperatures.