



(1) Label the heating curve to show the phase(s) present in each region. Label the melting point and boiling point.

Between zero minutes and three minutes, the temperature of the solid ethanol is _____ which causes the molecules to move _____. Once the temperature reaches _____ °C, the ethanol begins to _____. When the ethanol melts, heat energy is used to _____ some of the hydrogen bonds between molecules. The ethanol is melting between _____ minutes and _____ minutes. Once enough hydrogen bonds have been broken, the ethanol is a liquid. Between seven minutes and nine minutes, the temperature of the liquid ethanol is _____ which causes the molecules to move _____. Once the temperature reaches _____ °C, the ethanol begins to _____. When the ethanol boils, heat energy is used to _____ hydrogen bonds between molecules. The ethanol is boiling between _____ minutes and _____ minutes. Once all the hydrogen bonds have been broken, the ethanol is a gas. Between fourteen minutes and sixteen minutes, the temperature of the gaseous ethanol is _____ which causes the molecules to move _____.

(2) Use the data given in the table to complete the following calculations.

(a) Determine the amount of energy required to increase the temperature of 50 g of solid ethanol from $-180\text{ }^{\circ}\text{C}$ to $-114\text{ }^{\circ}\text{C}$.

(b) Determine the amount of energy required to melt 50 g of ethanol.

(c) Determine the amount of energy required to increase the temperature of 50 g of liquid ethanol from $-114\text{ }^{\circ}\text{C}$ to $78\text{ }^{\circ}\text{C}$.

(d) Determine the amount of energy required to boil 50 g of ethanol.

(e) Determine the amount of energy required to increase the temperature of 50 g of ethanol gas from $78\text{ }^{\circ}\text{C}$ to $150\text{ }^{\circ}\text{C}$.

(3) Balance the equation for the combustion of ethanol:



(4) (a) Calculate the heat of reaction from the heats of formation of each chemical.

$\Delta H = \underline{\hspace{3cm}}$

(b) The reaction is thermic.

Add the enthalpy term to the appropriate side of the equation in question 3.

(c) Sketch a potential energy diagram for the reaction on the axes provided.

