PART 1

$$2\ KClO_3\ (s) \rightarrow 2\ KCl\ (s) + 3\ O_2\ (g)$$

Substance	Heats of Formation (kJ/mol)
$KClO_3$	-391 kJ/mol
KCl	-436 kJ/mol
O_2	0 kJ/mol

Refer to the table of thermodynamic data above for the decomposition of potassium chlorate, $KClO_3$, to answer the following questions.

1) Using the heats of formation given above, calculate the enthaply for the reaction, ΔH rxn.
   (A) +90 kJ/mol
   (B) -90 kJ/mol
   (C) +1654 kJ/mol
   (D) -1654 kJ/mol

2) What is the sign of delta S and what is the reason for this sign?
   (A) + due to the fact that the reaction releases heat.
   (B) – due to the fact that the reaction absorbs heat.
   (C) + due to the fact that the reaction goes from a solid to a solid and a gas.
   (D) – due to the fact that the reaction goes from a solid to a solid and a gas.

3) If the delta G is negative which means the reaction is spontaneous or thermodynamically favorable, what would be a reason why the reaction would not readily occur?
   (A) The reaction does not readily occur because of the coulombic forces of attraction of $KClO_3$ (s).
   (B) The reaction does not readily occur because oxygen gas has a heat of formation of 0 kJ/mol.
   (C) The reaction does not readily occur because of the magnitude of the enthalpy for the reaction.
   (D) The reaction does not readily occur because the activation energy must first be reached to have a reaction occur.

PART 2

CH_4 (g) + 2 O_2 (g) → CO_2 (g) + 2 H2O (l)	ΔH = -890 kJ/mol
H_2 (g) + ½ O_2 (g) → H_2O (l)	ΔH = -286 kJ/mol
C (s) + O_2 (g) → CO_2 (g)	ΔH = -394 kJ/mol

Refer to the three combustion reactions shown above to answer the following questions.

4) Calculate the enthalpy of reaction, ΔHrxn, based on the information above for the reaction:

C (s) + 2 H_2 (g) → CH_4 (g)

(A) +76 kJ/mol
(B) -76 kJ/mol
(C) -210 kJ/mol
(D) +210 kJ/mol

5) If 36 grams of carbon was used in the reaction in part (a), how much heat was absorbed or released?
(A) +25.3 kJ
(B) -25.3 kJ
(C) +228 kJ
(D) -228 kJ

PART 3

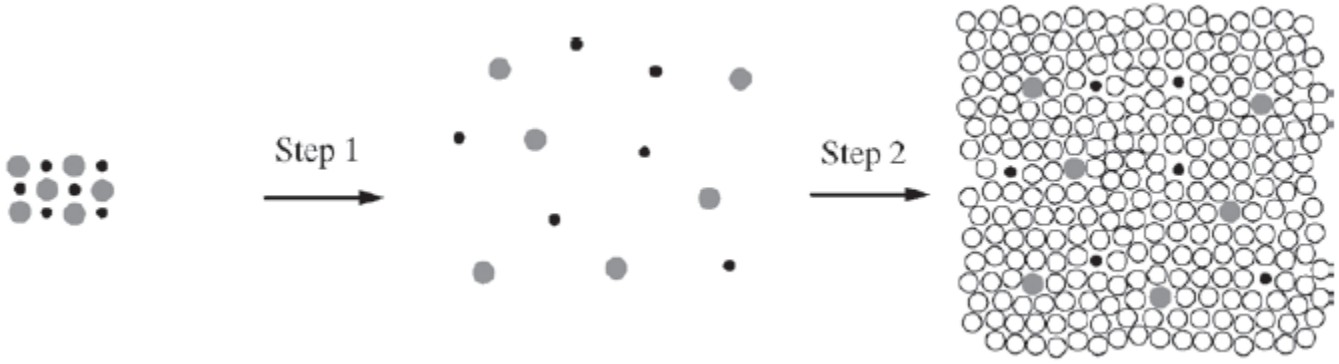
Bond	Bond Dissociation Energy (kJ/mol)
C-H	415 kJ/mol
O=O	495 kJ/mol
C=O	799 kJ/mol
O-H	463 kJ/mol

6) Calculate the enthapy of reaction, ΔHrxn, based on the information above for the reaction:

$$CH_4\ (g) + 2\ O_2\ (g) \rightarrow CO_2\ (g) + 2\ H_2O\ (g)$$

(A) +320 kJ/mol
(B) -320 kJ/mol
(C) +800 kJ/mol
(D) -800 kJ/mol

7) If the delta S = 186 J/mol-K at 298 K, then calculate the delta G value for this reaction you used in part (a).
(A) +265 kJ/mol
(B) -375 kJ/mol
(C) +745 kJ/mol
(D) -855 kJ/mol



8) The particulate diagram above shows an ionic compound being separated into ions during step 1. It then shows those ions being dissolved in a polar solvent such as water during step 2. Which of the following best describes the enthalpy change, ΔH, for each step using your knowledge of bond enthalpies?
(A) Step 1 is endothermic and Step 2 is exothermic.
(B) Step 1 is exothermic and Step 2 is endothermic.
(C) Step 1 and 2 are both endothermic.
(D) Step 1 and 2 are both exothermic.