5. Use the data regarding the standard enthalpies of formation to calculate $\Delta H°_{comb}$ for the following reaction:

$$2\ C_3H_6(g) + 9\ O_2(g) \rightarrow 6\ CO_2(g) + 6\ H_2O(l)$$

Substance	$\Delta H°_f$(kJ/mol)
$C_3H_6(g)$	20.9 kJ/mol
$CO_2(g)$	−393.5 kJ/mol
$H_2O(l)$	−286 kJ/mol

$$\Delta H°_{comb} = \Sigma n\,\Delta H_f°(pr) - \Sigma n\,\Delta H_f°(re)$$
$$= [6CO_2 + 6H_2O] - [2C_3H_6 + 9O_2]$$
$$= [6(-393.5) + 6(-286)] - [2(20.9) + 9(\emptyset)]$$
$$= -4077 - 41.8 = \boxed{-4119\ kJ/mol_{rxn}}$$

6. Describe in words what process you would follow to calculate the enthalpy of combustion for butane, C_4H_{10}. What information would you need? What would you need to do before you could complete the calculation?

1st, write + balance the chemical equation. 2nd, you would need to find the $\Delta H_f°$ of each non-elemental reactant and product. 3rd, you would multiply each $\Delta H_f°$ by the stoichiometric coefficient. Finally, sum all the reactants $\Delta H_f°$'s and subtract them from the sum of product $\Delta H_f°$'s.

$$H_2(g) + F_2(g) \rightarrow 2\ HF(g)$$

7. Gaseous hydrogen and fluorine combine in the reaction above to form hydrogen fluoride with an enthalpy change of −540 kJ. What is the value of the heat of formation of HF(g)?

a. −1,080 kJ/mol (b.) −270 kJ/mol c. +270 kJ/mol d. +540 kJ/mol

$$\Delta H°_{rxn} = 2HF - (H_2 + F_2)$$
$$-540 = 2HF - \emptyset \Rightarrow \Delta H_f°(HF) = \frac{-540}{2} = -270$$

8. If the standard enthalpies of formation of HBr(g) and $Br_2(g)$ are −36 kJ mol^{-1} and +31 kJ mol^{-1} (at 298 K) respectively, what is $\Delta H°_{rxn}$ for the following reaction?

$$H_2(g) + Br_2(g) \rightarrow 2\ HBr(g)$$

(a.) −103 kJ/mol b. −67 kJ/mol c. +67 kJ/mol d. +103 kJ/mol

$$\Delta H°_{rxn} = 2HBr - (H_2 + Br_2)$$
$$= 2(-36) - (\emptyset + 31) = -72 - 31 = -103$$