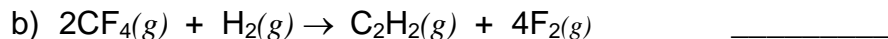
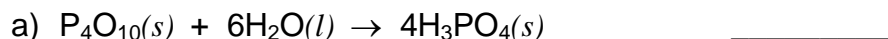


1. Predict whether  $\Delta S^\circ > 0$  (+ $\Delta S$ ) or  $\Delta S^\circ < 0$  (- $\Delta S$ ) for each of the following reactions. (6 pt)



**Multiple Choice.** (12 pt; 3 pts each)

\_\_\_ 2. Which of these elements does **not** have  $\Delta H_f^\circ = 0$ ?:

- A.  $\text{Br}_2(l)$     B.  $\text{Cl}(g)$     C.  $\text{Ar}(g)$     D.  $\text{Ba}(s)$     E.  $\Delta H_f^\circ = 0$  for all of these

\_\_\_ 3. Which of the following processes would have a negative value of  $\Delta S$ ?:

- A. boiling water to form steam                      B. dissolving  $\text{KCl}(s)$  in water  
C. detonating a stick of dynamite                D. Freezing water to form ice

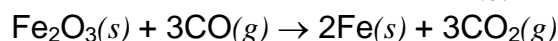
\_\_\_ 4. Select the equation that represents the standard enthalpy of formation,  $\Delta H_f^\circ$ , for the product:

- A.  $\text{CO}(g) + \frac{1}{2} \text{O}_2(g) \rightarrow \text{CO}_2(g)$                       B.  $\text{Al}(s) + 3\text{Br}(l) \rightarrow \text{AlBr}_3(s)$   
C.  $2\text{H}_2(g) + \text{O}_2(g) \rightarrow 2\text{H}_2\text{O}(l)$                       D.  $3\text{Mg}(s) + \text{N}_2(g) \rightarrow \text{Mg}_3\text{N}_2(s)$

\_\_\_ 5. Which of these substances should have the **lowest** entropy?

- A.  $\text{Mg}(s)$     B.  $\text{C}_6\text{H}_{12}\text{O}_6(s)$     C.  $\text{CH}_3\text{OH}(l)$     D.  $\text{Ne}(g)$     E.  $\text{C}_3\text{H}_8(g)$

6. For the following reaction,  $\Delta H_{rxn}^\circ = -24.8 \frac{\text{kJ}}{\text{mol}}$  and  $\Delta S_{rxn}^\circ = 15.0 \frac{\text{J}}{\text{K} \cdot \text{mol}}$ :



a. Calculate the value of  $\Delta G_{rxn}^\circ$  at 25 °C. (Provided equation:  $\Delta G = \Delta H - T\Delta S$ ) (4 pts)

b. Is the reaction **spontaneous or nonspontaneous** at 25 °C? (2 pts)

7. Calculate the **entropy change**,  $\Delta S^\circ$ , for the following reaction (6 pts):

