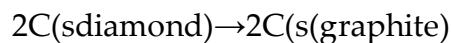


**Exercise 01 :**

Given the reaction of diamond converting to graphite



Determine  $\Delta G$  at 298 K and determine if this reaction is spontaneous or not.

What does  $\Delta G$  say about the rate of this reaction?

- $\Delta H^\circ f(\text{C(s)diamond}) = 1.9 \text{ kJ/mol}$
- $S^\circ(\text{C(s)diamond}) = 2.38 \text{ J/(molK)}$
- $S^\circ(\text{C(s)graphite}) = 5.74 \text{ J/(molK)}$

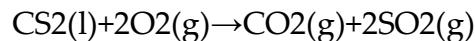
**Exercise 02 :**

Given these reactions reactions, determine whether the  $\Delta S$  increases or decreases or stays the same at 25 °C;

- a.  $\text{H}_2\text{SO}_4(\text{l,1atm}) \rightarrow \text{H}_2\text{SO}_4(\text{s})(1\text{atm})$
- b.  $\text{H}_2\text{O}(\text{l,1atm}) \rightarrow \text{H}_2\text{O}(\text{g,1atm})$
- c.  $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightleftharpoons \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$

**Exercise 03 :**

Calculate  $\Delta G^\circ$  for



using **only** the following  $\Delta G$  values for the reaction:

- $\text{C(s)} + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$  with  $\Delta G^\circ = -394.39 \text{ kJ/mol}$
- $\text{S(s)} + \text{O}_2(\text{g}) \rightarrow \text{SO}_2(\text{g})$  with  $\Delta G^\circ = -300.13 \text{ kJ/mol}$
- $\text{C(s)} + 2\text{S(s)} \rightarrow \text{CS}_2(\text{l})$  with  $\Delta G^\circ = 67.1 \text{ kJ/mol}$

**Exercise 04 :**

The density of an aqueous solution of methyl alcohol, containing 60% alcohol by mass, is equal to 0.8946 g/cm<sup>3</sup>, while the partial molar volume of the water it contains is equal to 16.8 cm<sup>3</sup> /mole.

Calculate the partial molar volume of the alcohol in this solution.

**Use the flowing equation :**  $V = n_1 V_1 + n_2 V_2$