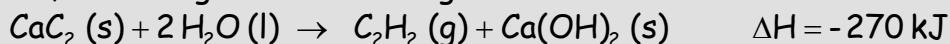


LIZARDI BHI 2009-10	Topics: Thermochemistry Chemical Equilibrium	Marks
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1st term		
2009-11-16		

EXERCISE #1

Last century, the use of a tool called "carbide lamp" was very common. Inside that lamp a two-step process happened. First, calcium carbide was produced, according to the following reaction:



and, finally, acetylene (C_2H_2) was burned and the result was a very bright light.

- Write the formation enthalpy of acetylene and determine the formation enthalpy change of acetylene.
- Write the combustion equation of acetylene. Determine its combustion enthalpy change and draw the corresponding enthalpy diagram.

DATA:	$\text{Ca}(\text{OH})_2(\text{s})$	$\text{H}_2\text{O}(\text{l})$	$\text{CaC}_2(\text{s})$	$\text{CO}_2(\text{g})$
$\Delta H_f^\circ(\text{kJ/mol})$	-986	-286	+83	-395

2 Points

EXERCISE #2

Here you have the formation equation of water at standard conditions (298K and 1 atm):



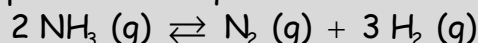
Determine and reason:

- If the reaction is endothermic or exothermic.
- Why the entropy change is negative.
- If the reaction is spontaneous or not at these standard conditions.
- Study the spontaneity of the reaction (the T interval at which it will be spontaneous). Suppose that ΔH and ΔS remain constant. Build a ΔG -T diagram.

2 Points

EXERCISE #3

At 400 °C ammonia is 40% dissociated when 4 moles are initially introduced. The total pressure at equilibrium is 710 mmHg.



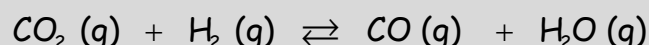
Determine:

- The molar fraction and partial pressure (in atmospheres) of each component at equilibrium
- K_p
- Knowing that the formation enthalpy of ammonia is exothermic, determine how the reaction shifts if the equilibrium is disturbed by:
 - adding more ammonia
 - decreasing the pressure
 - increasing the temperature

2 Points

EXERCISE #4

A 10 L-vessel is charged with, 0.61 mol CO₂ and 0.39 mol H₂. The equilibrium is reached at 1250°C:



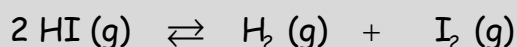
At equilibrium 0.35 mol CO₂ is found. Determine:

- K_c.
- The concentrations at equilibrium.
- The equilibrium is disturbed by adding 0.22 mol H₂. Determine the concentrations at the new equilibrium.

2 Points

EXERCISE #5

A 1 L vessel is charged with 0.1 mol HI. At 350°C equilibrium is reached according to this equation:



At that temperature, the value of K_c is 0.019. Determine:

- The dissociation percent of HI.
- The concentrations at equilibrium.
- The equilibrium constant K_c for the following equation
 $\text{HI} (\text{g}) \rightleftharpoons \frac{1}{2} \text{H}_2 (\text{g}) + \frac{1}{2} \text{I}_2 (\text{g})$ at the same temperature.

2 Points