Chemical Equilibria

Answer Key

1. B

Explanation: When ΔH° is written like this in the reaction, it pertains to the forward reaction. Since ΔH° > 0, then the forward reaction is endothermic, while the reverse reaction is exothermic. Therefore, the reaction can be rewritten as:

$$\text{heat} + PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$$

The magnitude of that heat is 92.5 kJ/mol.

2. B

Explanation: If the system undergoes compression, there will be an increase in pressure accompanied by a reduction of the volume occupied by the gas. Due to the smaller volume, the reaction which leads to the formation of fewer moles of gas will be favored. Therefore, the reaction will shift towards the formation of PCl_5 until a new equilibrium position is reached. Option D is incorrect because the endothermic process in the above equilibrium is the forward reaction.

3. C

Explanation: All the species are gaseous, so it is more appropriate to express the K_{eq} expression in terms of partial pressures of the gas.

4. C

Explanation: Lowering the temperature is the same as removing heat from the system. This will shift the reaction to the left, favoring the formation of PCl_5 until a new equilibrium position is reached.

5. A

Explanation: By removing Cl_2 the moment it was formed, the system will continuously compensate for the missing Cl_2 by shifting the reaction forward. This compensation will happen until all the PCl_5 was converted to PCl_3, driving the reaction to completion. All the remaining options will change the equilibrium position of the system, but none of them will cause the reaction to go to completion.