Chemical Equilibrium

Chemistry Name

1. Consider the following system at equilibrium:



(a) Is the reaction endothermic or exothermic? Explain.

(b) If HF is added, in which direction will the reaction shift in order to reestablish equilibrium?

(c) After the new equilibrium has been established, will the final molar concentrations of SiF4, H2O, SiO2 and HF increase, decrease, or remain the same?

(d) If heat is added, in which direction will the equilibrium shift?

2. Consider the following system at equilibrium:



Complete the table that follows. Indicate changes in moles by entering I, D, N, or “? “ in the table. (I increase, D decrease, N no change, “?” insufficient information to determine.)

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| --- | --- | --- |
| **Change or stress imposed on the system at equilibrium** | **Direction of reaction, left or right, to reestablish equilibrium** | **Change in number of moles** |
| **N2** | **H2** | **NH3** |
| (a) Add N2 |  |  |  |  |
| (b) Remove H2 |  |  |  |  |
| (c) Decreasevolume ofreaction vessel |  |  |  |  |
| (d) Increasetemperature |  |  |  |  |

5. Applying Le Châtelier’s principle, in which direction will the equilibrium shift, (if at all)?

*Answer “to the right”, “to the left” or “no change”.*



|  |  |
| --- | --- |
| (a) if the temperature is increased | (b) if a catalyst is added |
| (c) if CH4 is added | (d) if the volume of the reaction vessel is decreased |

6. Applying Le Châtelier’s principle, in which direction will the equilibrium shift, (if at all)?

*Answer “to the right”, “to the left” or “no change”.*



|  |  |
| --- | --- |
| (a) if the volume of the reaction vessel is increased | (b) if O2 is added |
| (c) if the temperature is increased  | (d) if the concentration of N2 is increased |

7 Write the equilibrium constant expression for these reactions:

|  |  |
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|  |  |
|  |  |

8 What is the equilibrium constant of the reaction:



if a 20.-L flask contains 0.10 mol PCl3,1.50 mol Cl2, and 0.22mol PCl5?

9 Calculate the Keq for the reaction:



when the equilibrium concentrations of the gases at 530°C are [SO3] = 11.0 *M*, [SO2] = 4.20 *M*, [O2] =0.60 x 10-3 *M*.