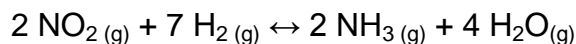


## The Equilibrium Shift

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Show each of these reactions and determine what the “shift” in equilibrium will be by drawing a diagram for each one showing how equilibrium has been “disturbed” and how it will restore the equilibrium giving rise to an increase in products or reactants and/or temperature, etc.

- For the following system at equilibrium:  $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \leftrightarrow 2 \text{HI}(\text{g})$ 
  - Predict the shift in equilibrium when more  $\text{HI}(\text{g})$  is added to the system.
  - How will the concentration of  $\text{I}_2$  change?
  - Predict the shift in equilibrium when  $\text{I}_2(\text{g})$  is removed.
  - How will the concentration of  $\text{H}_2$  change?
  - How will the equilibrium be disturbed when the volume of the container is increased?
- For the reaction below, predict the direction the equilibrium will shift given the following changes. Temperature and volume are held constant.



- addition of ammonia
  - removal of nitrogen dioxide
  - removal of water vapor
  - addition of hydrogen
  - a decrease in pressure
  - a decrease in volume
- Given the reaction at equilibrium:  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \leftrightarrow 2 \text{NH}_3(\text{g}) + \text{heat}$

Show what happens and how a shift will occur to reestablish equilibrium when:

- temperature is increased?
- the volume is increased?
- the pressure is increased?
- the temperature is decreased?
- more hydrogen is added?
- ammonia ( $\text{NH}_3$ ) is removed?
- nitrogen is removed?