

Le Chatelier's Principle



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Le Chatelier's Principle states: *If a stress is applied to a system at equilibrium, the system will act to relieve that stress.*

At equilibrium



Le Chatelier's Principle

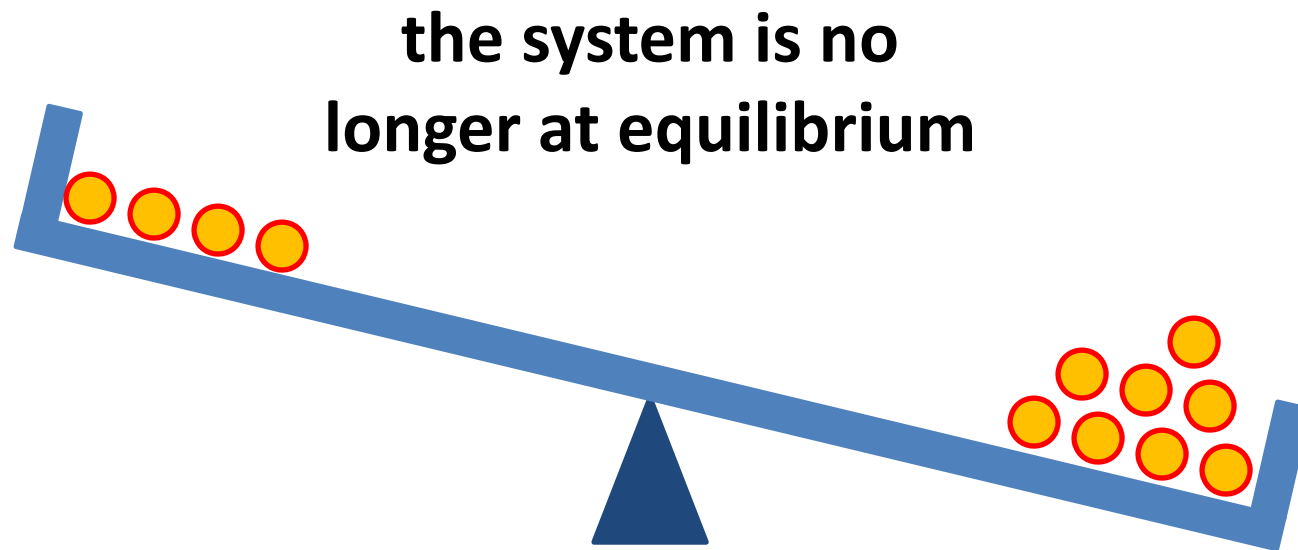
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**If more is added to
one side**



Le Chatelier's Principle

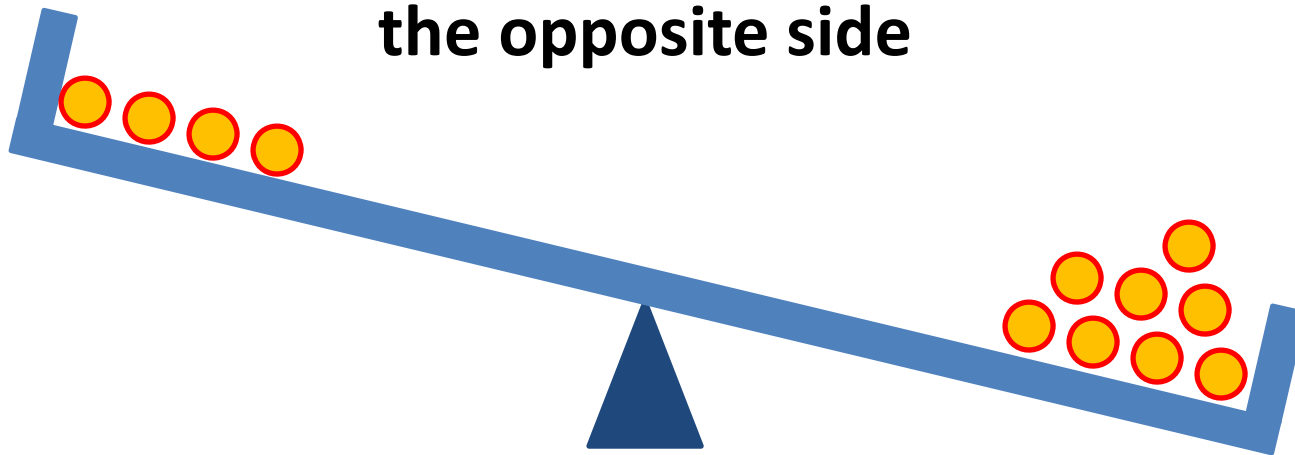
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**and must shift toward
the opposite side**



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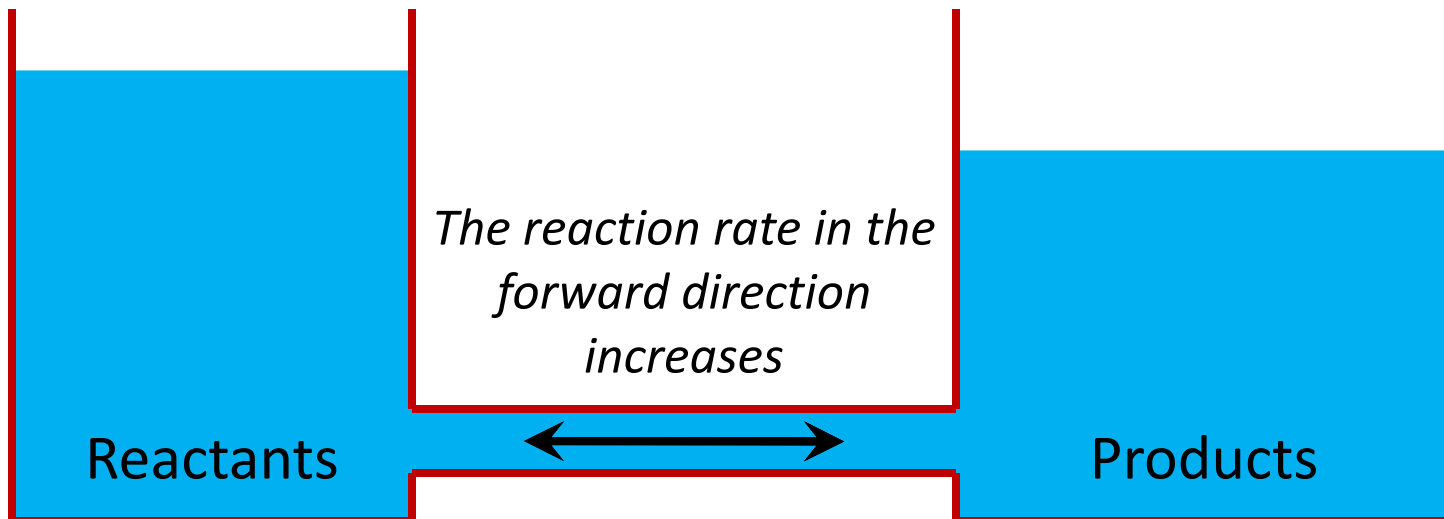
to restore equilibrium



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Adding to one side of a reaction makes the equilibrium position shift toward the other side of the reaction.

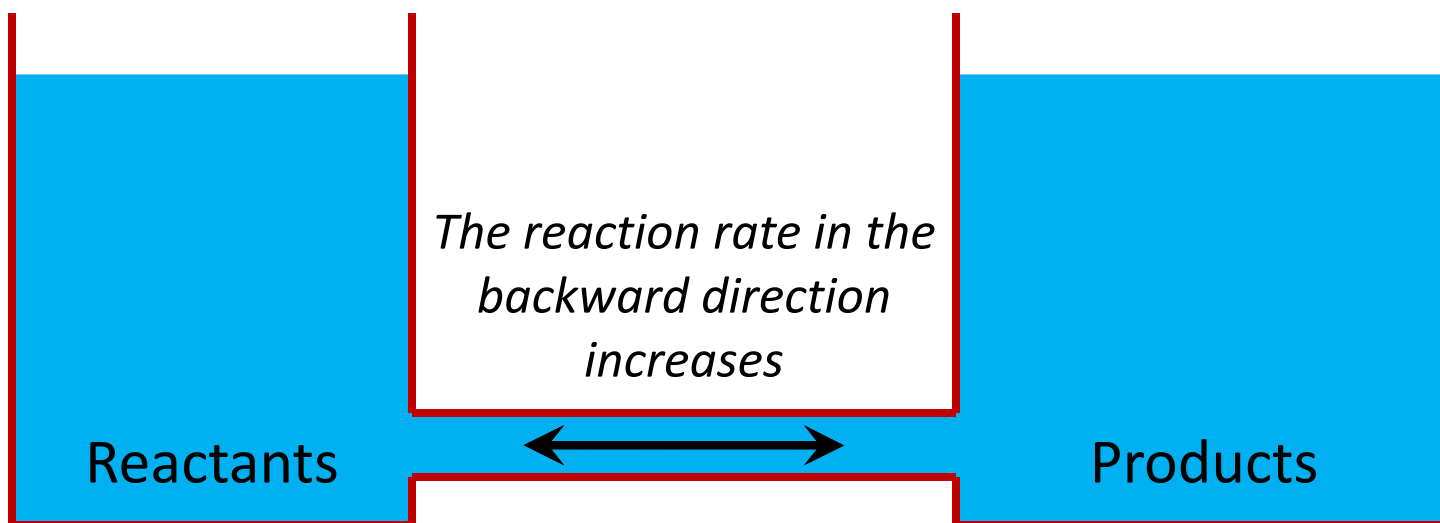
If the concentration of reactants increases



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Removing from one side of a reaction makes the equilibrium position shift toward the same side.

If the concentration of reactants decreases



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For exothermic and endothermic reactions, changing the *temperature* of the system has an effect on the equilibrium position.

Example:



or



Adding or removing heat is the same as adding or removing a reactant/product.

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Example:



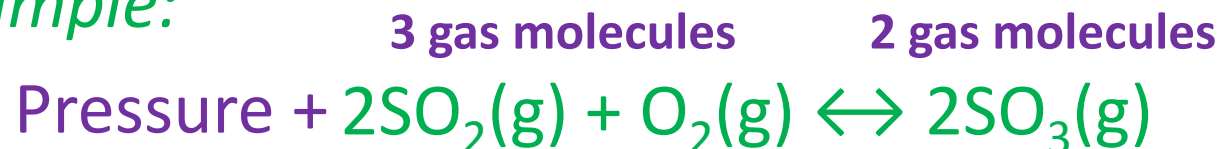
In which direction is the equilibrium position shifted as a result of the following changes?

- a) Lowering the temperature *Backward*
- b) Removing hydrogen gas *Forward*
- c) Adding water vapor *Forward*

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For any reaction that involves one or more gases, *pressure* can also have an effect on the equilibrium position.

Example:



First, count the number of moles of gas on each side (including the coefficients!). Write the word “pressure” on the side with more gas molecules. This makes the effects of changing the pressure more obvious.

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Example:

For each reaction below, determine whether an increase in pressure would shift the equilibrium position towards the reactants or towards the products.

