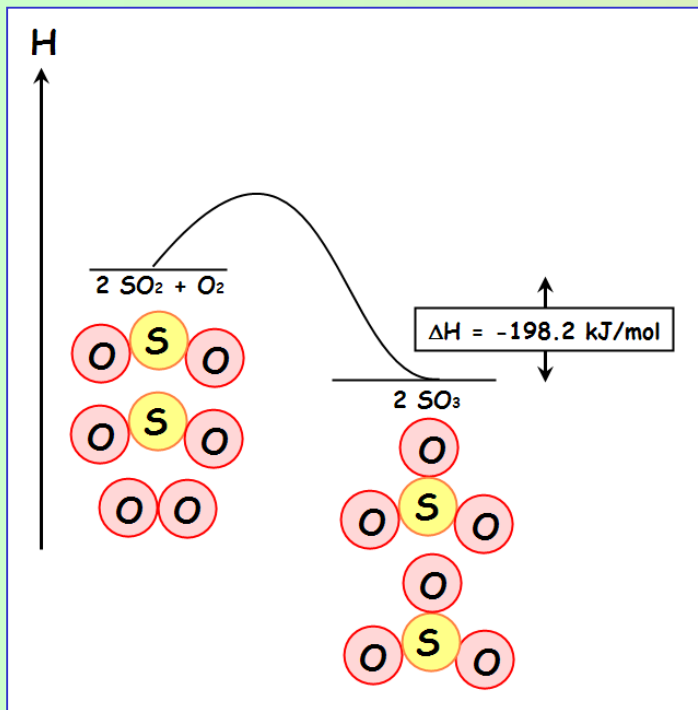
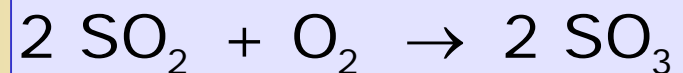


# Dynamic equilibrium



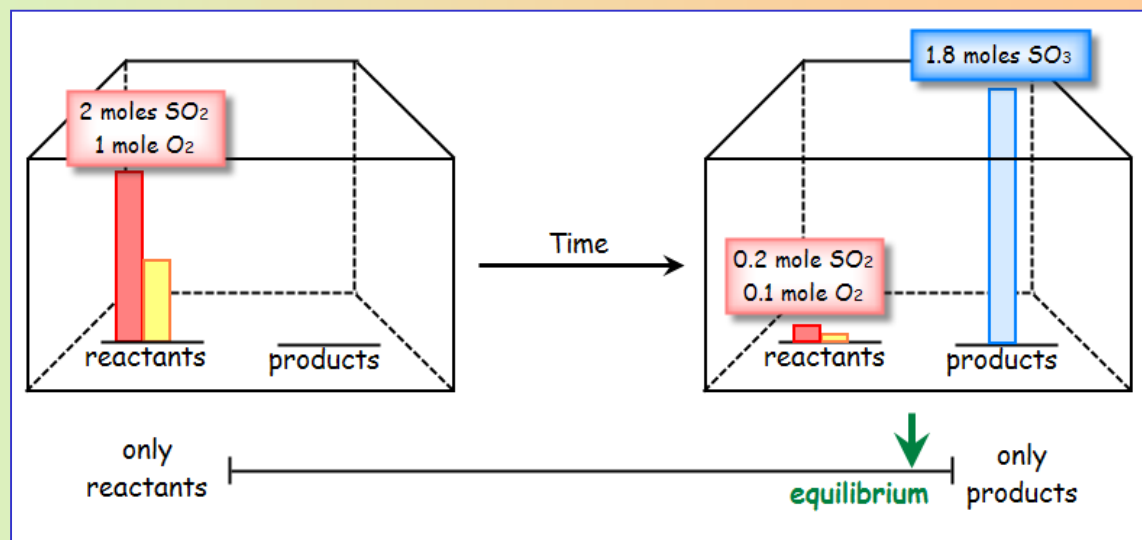
## Example of a dynamic equilibrium

Let's study the following chemical reaction:

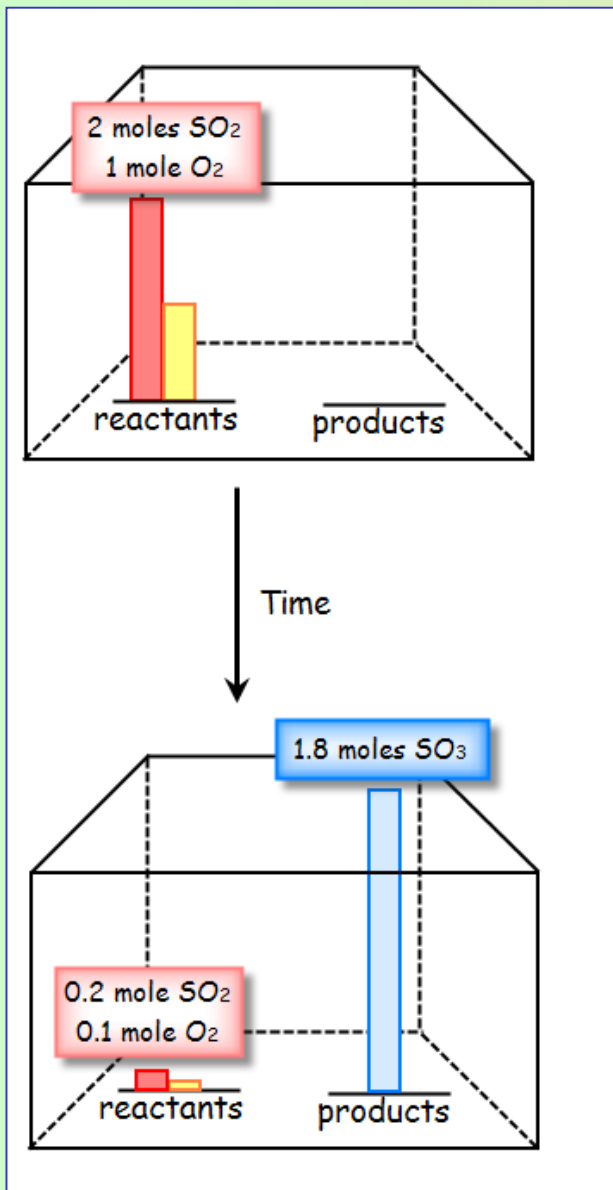


when 2 moles of  $\text{SO}_2$  and 1 mole of  $\text{O}_2$  are placed in a flask at a given temperature in order to react, we find that after a long period of time the reaction don't progress and the results of the reaction are:

0.2 mole of  $\text{SO}_2$ , 0.1 mole of  $\text{O}_2$  and 1.8 moles of  $\text{SO}_3$

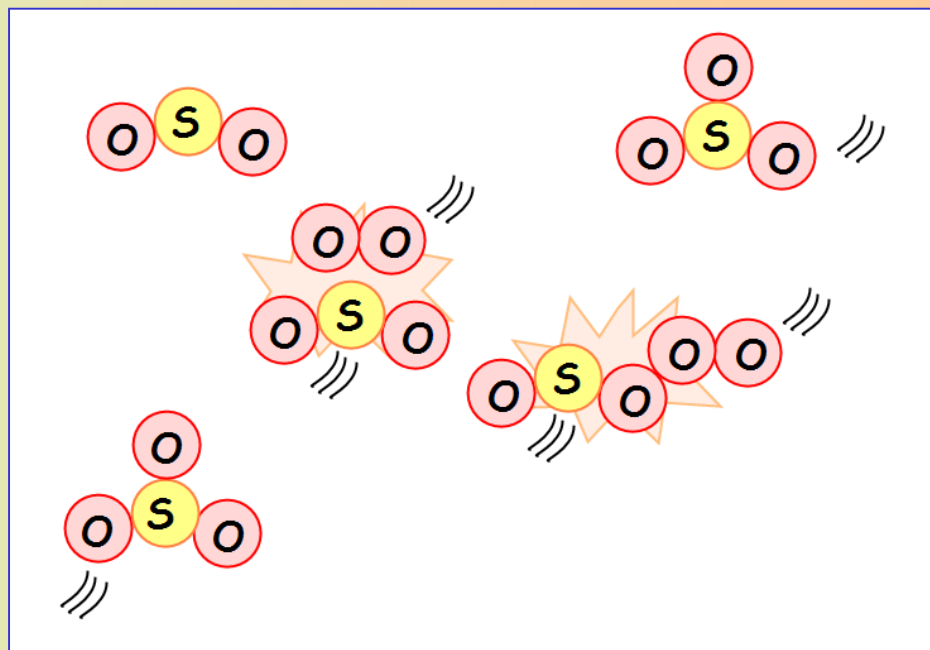
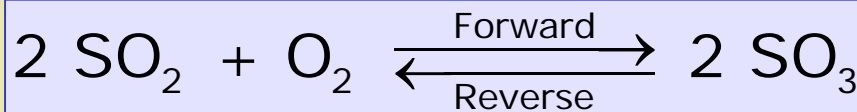


# Dynamic equilibrium

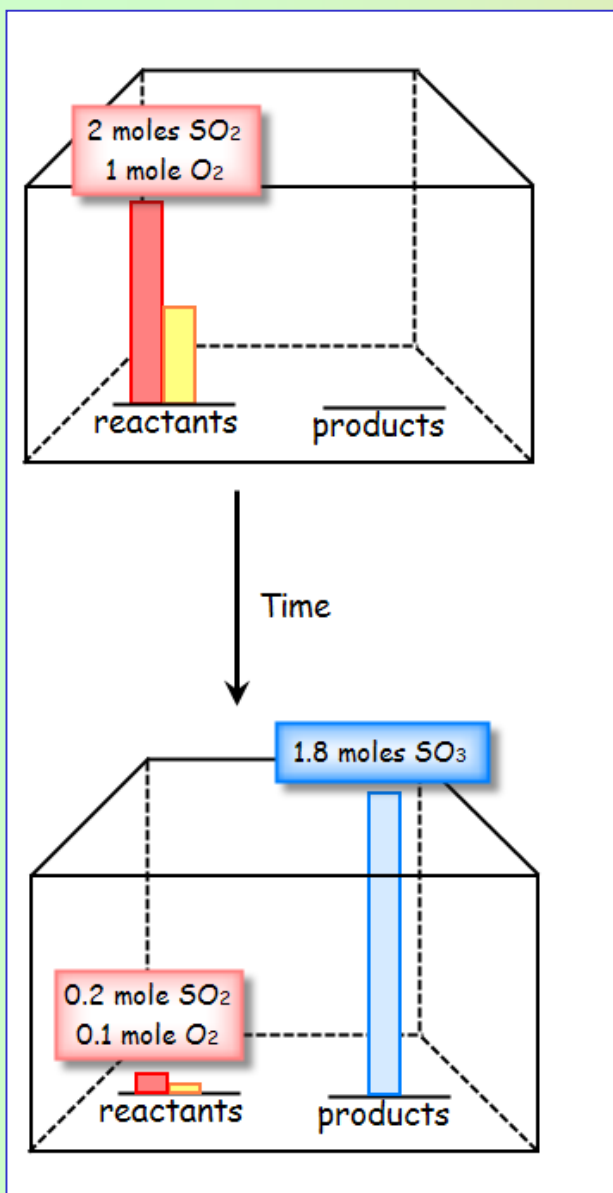


## Example of a dynamic equilibrium

In a chemical reaction, dynamic equilibrium occurs when the rate of the forward reaction becomes precisely equal to the rate of the reverse reaction.



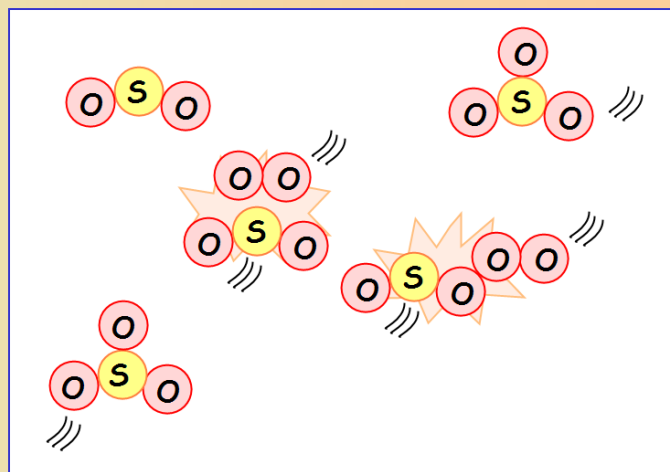
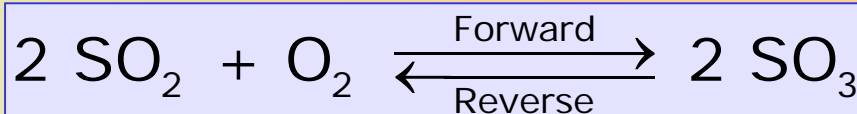
# Dynamic equilibrium



## Example of a dynamic equilibrium

When the forward rate (the rate at which reactants become products) exactly equals the reverse rate (the rate of converting products back into reactants), the reaction will appear to have stopped because the amounts of reactant and product present will no longer change with time.

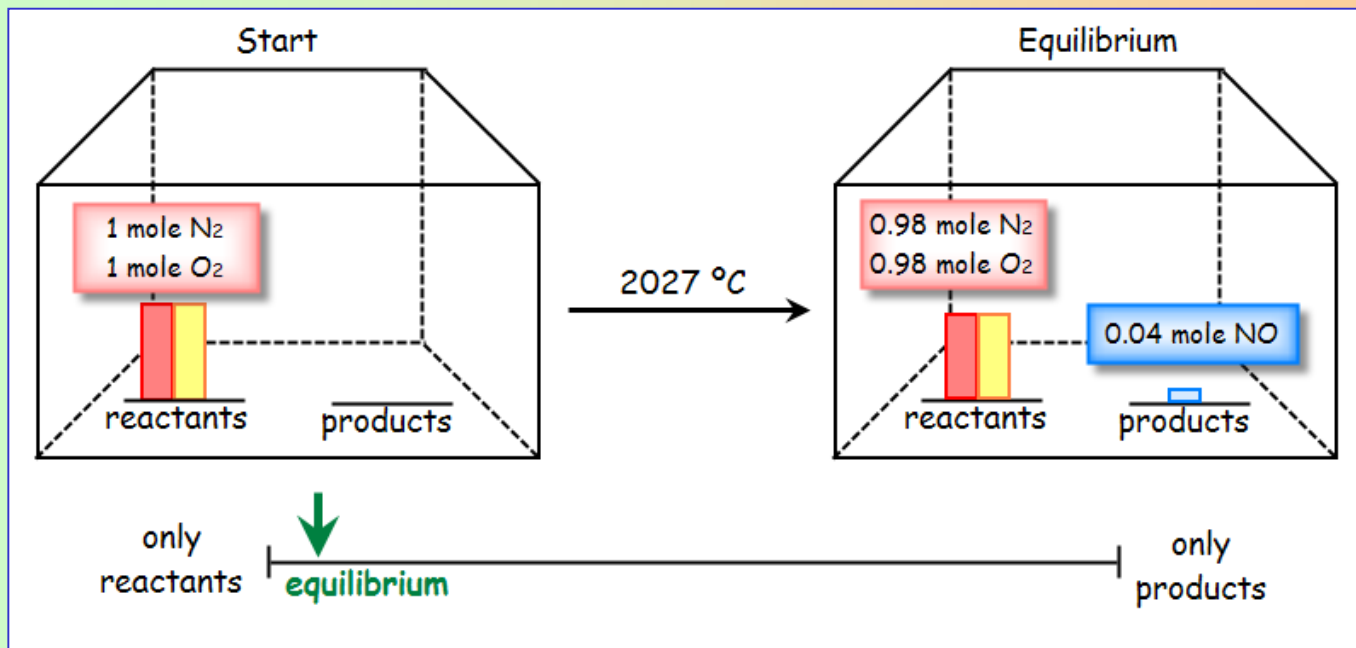
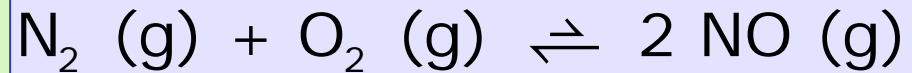
But **the reaction is still going on**. It's just that **the reverse reaction is now proceeding at the same rate as the forward reaction**.



# Dynamic equilibrium

## Another example

If we load a vessel with 1 mole each of N<sub>2</sub> and O<sub>2</sub> and adjust the temperature to 2027 °C we find that the reaction appears to stop when only a small amount of product has formed. In that case we say that **the reaction lies to (extreme) left**.

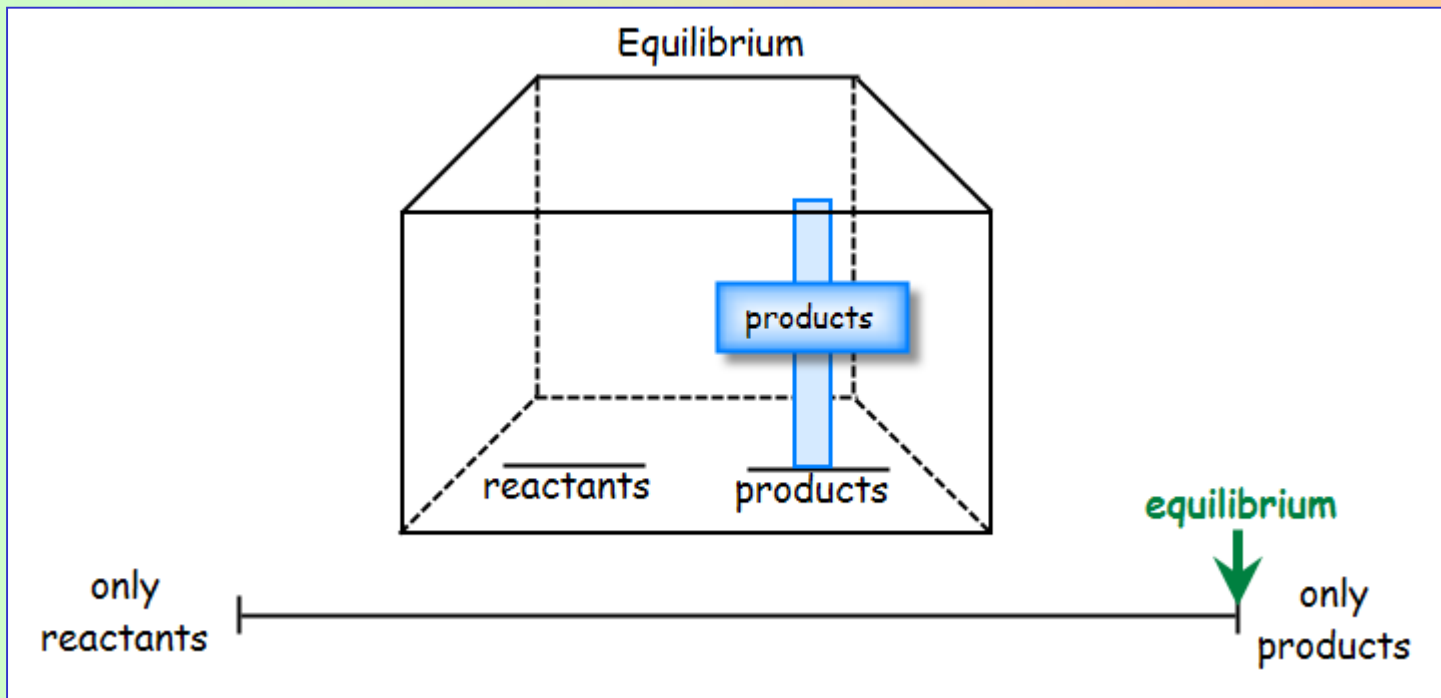


# Dynamic equilibrium

## Another example

The other special case is when the equilibrium is so close to the end (the extreme of products) that practically no reactant remains. For this special case we only use one arrow and say that the reaction goes to completion (even though that expression is an oversimplification)

Reactants  $\rightarrow$  Products



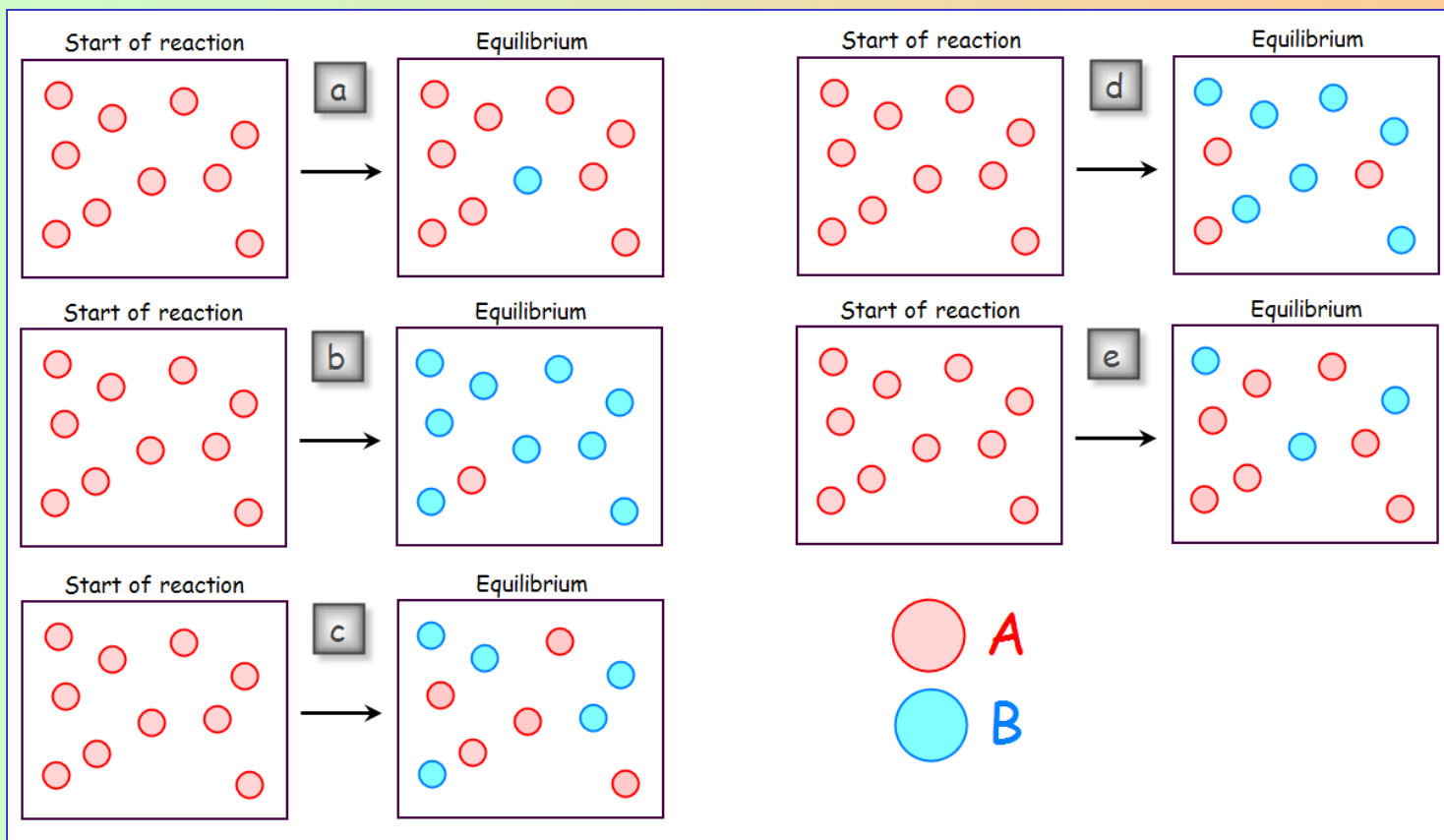
# Dynamic equilibrium

## Exercise

Below are five possibilities for the hypothetical reaction  $A \rightarrow B$

Which of the following best describes each of these possibilities?

1. the equilibrium lies to the left
2. the equilibrium lies to the right
3. the equilibrium lies in the middle
4. the reaction essentially doesn't occur
5. the reaction essentially goes to completion



# Dynamic equilibrium

## Solutions

1. the equilibrium lies to the left → **e**
2. the equilibrium lies to the right → **d**
3. the equilibrium lies in the middle → **c**
4. the reaction essentially doesn't occur → **a**
5. the reaction essentially goes to completion → **b**

