

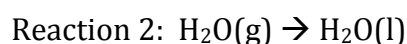
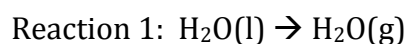
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|-----------------|---|--------------|--|
| Topic | Dynamic equilibrium | Level | GCSE/A Level (or any other course for students aged 14-18) |
| Outcomes | 1. To understand what happens to the rates of the forward and reverse reactions and concentrations of reactants and products at dynamic equilibrium | | |

Understanding Chemical Equilibria: a simple but powerful model

This simple model will help you to understand the key concepts involved in equilibria. We will be using a physical process to explain the key points first; once understood, these ideas can be applied to chemical equilibria.

The model: A small beaker of water is placed in a large upturned beaker. The edges of the large beaker are sealed with plasticine so that a closed system is made, where no water can escape or enter. After a period of time a state called **dynamic equilibrium** is reached.

Two changes are happening in this system:



Questions about the model

1. Using the equations above, describe what happens to the water particles when (i) the beaker is **first placed** inside the jar and (ii) what happens **after a period of time**. Annotate the diagram above to show what is happening.
2. At dynamic equilibrium, the rate of reaction 1 and reaction 2 become equal. How would you know, from observing $\text{H}_2\text{O}(\text{l})$ in the beaker, when dynamic equilibrium has been reached?
3. At dynamic equilibrium, what can you say about the amounts of $\text{H}_2\text{O}(\text{l})$ and $\text{H}_2\text{O}(\text{g})$ inside the system?
4. For both reactions, state and explain whether they are exothermic or endothermic.
5. Describe and explain the effect on the position of equilibrium of increasing the temperature. What would you observe?
6. What is the relationship between the level of $\text{H}_2\text{O}(\text{l})$ in the small beaker and the position of equilibrium?
7. Sketch a graph to show what happens to the rate of reaction 1 and reaction 2 overtime. Mark on this graph when you think dynamic equilibrium has been reached.

Progress: further resources on equilibria are available here:
<http://www.thescienceteacher.co.uk/equilibria/>