Reaching dynamic equilibrium: storyboard

Learning objectives

1 State what a reversible reaction is.

2 Describe how a reversible chemical reaction reaches dynamic equilibrium.

Introduction

Most chemical reactions you have studied so far are **irreversible**, where the reaction only takes place in one direction.

However, many chemical reactions are **reversible**: the products can react together to reform the original reactants. The **forwards reaction** and the **reverse reaction** are both occurring.

In **dynamic equilibrium**, the forwards reaction and reverse reaction occur at **the same rate** in a **closed system**. The **concentrations** of substances at equilibrium are **constant**, they are not changing.

Equilibrium is an important process in industry. To make reversible reactions as **efficient and sustainable** as possible, manufacturers need to understand equilibrium. Because the **equilibrium position** – the concentrations of substances present at equilibrium – affects the **yield** of the product.

True or false? Checking understanding

Q.	Statement	True or false?
1.	Combustion is an example of an irreversible reaction.	
2.	The symbol for a reversible reaction is →.	
3.	Products must be allowed to leave the flask in a reversible reaction.	
4.	A reversible reaction can only reach dynamic equilibrium in a closed system.	
5.	A reaction at equilibrium has stopped.	
6.	At equilibrium, the rate of the forwards reaction is equal to the rate of the reverse reaction.	
7.	If a reaction is at equilibrium, it means that all reactants have been fully converted into products.	
8.	A system at equilibrium will show measurable changes in the concentrations of reactants and products over time.	
9.	If the forwards reaction is exothermic, then the reverse reaction will be endothermic.	

Instructions

Create a storyboard to describe how a chemical reaction reaches dynamic equilibrium. A storyboard contains an illustration and a short section of text underneath to describe what is happening in the picture. The storyboard shows a sequence of events.

What does a storyboard look like?

Use the table to show how the stages progress:

1	2	3	4
5	6	7	8

Complete the activity on the storyboard sheet. Follow the instructions below to write a short description beneath each illustration.

1. Describe a common example of an irreversible reaction.
2. Explain what a reversible reaction is.
3. Describe what is meant by the forwards and reverse reaction.
4. State the conditions needed for equilibrium to be reached.
5. Discuss the concentrations of substances and rate of the forwards reaction at the beginning.
6. Discuss how the concentrations of substances and the rates of the forwards and reverse reaction change during the reaction.
7. Describe what happens to the rates of the forwards and backwards reaction when equilibrium is reached.
8. Describe what happens to the concentrations of substances as equilibrium is reached.

Suggested keywords

☐ carbon dioxide	☐ closed	☐ combustion
☐ concentrations	☐ decrease	☐ equal
☐ equilibrium	☐ forwards	☐ increase
☐ irreversible	☐ leave	☐ oxygen
☐ product	☐ rate	☐ reacting
☐ reversible	☐ products	☐ time

Complete the storyboard to show how equilibrium is reached. You can use the numbered prompts and the keywords for support.

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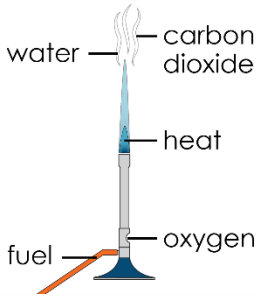
<td> 
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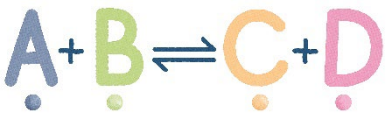
<td> 
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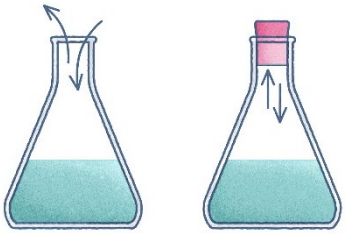
<td>Forwards reaction:
A + B → C + D

Reverse reaction:
C + D → A + B</td>
<td>  </td>
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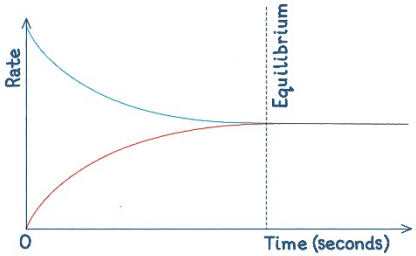
<td> 
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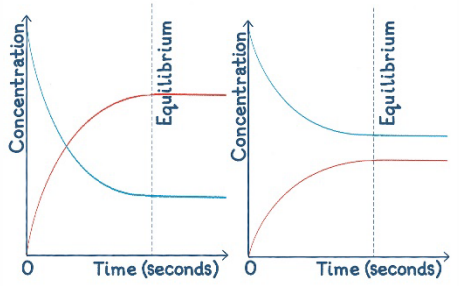
<td> 
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