

GCSE Combined Science: Trilogy

Worksheet: Equilibrium

TIME 20 min	TOTAL 18 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Equilibrium

NAME _____

CLASS _____

DATE _____

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

0 1 . 1

Complete the sentence.

Equilibrium is reached when the forward and reverse reactions happen at the same _____.

.....

.....

.....

.....
[1 mark]

0 1 . 2

Equilibrium can only be reached in a closed system.

What is meant by a closed system?

.....

.....

.....
[1 mark]

0 1 . 3

Which statement about a reaction at equilibrium is correct?

Tick (✓) **one** box.

The forward and reverse reactions have stopped.

☐

The concentrations of the reactants and products are equal.

☐

The concentrations of the reactants and products do not change.

☐

Only the forward reaction is happening.

☐

[1 mark]

0 1 . 4

Explain why this type of equilibrium is described as dynamic.

.....

.....

[1 mark]

0 2

0 2 . 1

Which of these is an example of a closed system?

Tick (✓) **one** box.

A saucepan of water boiling with the lid off

☐

A sealed, stoppered gas jar

☐

An open beaker on a bench

☐

A bonfire burning outdoors

☐

[1 mark]

0 2 . 2

Explain why equilibrium can only be reached in a closed system.

.....

.....

[1 mark]

0 3

A student says:

'A reversible reaction at equilibrium always has equal amounts of reactants and products.'

0 3 . 1

Explain why the student is wrong.

.....

.....

.....

.....

[2 marks]

0 4

A student is monitoring a reversible reaction in which the reactant is colourless and the product is orange.

0 4 . 1

Describe how the student could tell, just by observing the colour of the mixture, that the reaction has reached equilibrium.

.....

.....

[1 mark]

0 4 . 2

Suggest why using a colorimeter, rather than judging the colour by eye, might give more reliable evidence for when equilibrium is reached.

.....

.....

.....

.....

[2 marks]

0 5

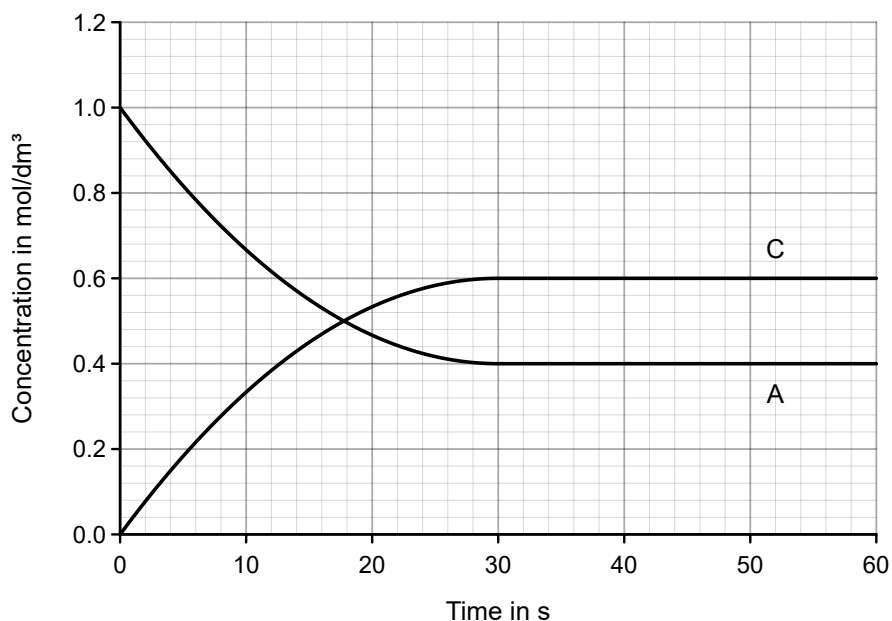
Substances A and B react in a sealed flask to form substance C:



At the start, the concentrations of A and B were both 1.0 mol/dm^3 and there was no C.

Figure 1 shows how the concentrations of A and C changed. The concentration of B changed in the same way as A.

Figure 1



0 5 . 1

Use Figure 1 to find the time when equilibrium was first reached.

.....

.....

.....

Time = s

[1 mark]

0 5 . 2

How does Figure 1 show that the reaction is at equilibrium after this time?

.....

.....

[1 mark]

0 5 . 3

A student says:
'After 30 s, the reaction has stopped.'
Explain why the student is wrong.

.....

.....

.....

.....

[2 marks]

0 5 . 4

Explain why the rate of the forward reaction decreased during the first 30 s.

.....

.....

.....

.....

[2 marks]

0 5 . 5

Explain why the rate of the reverse reaction increased during the first 30 s.

.....

.....

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Equilibrium · 18 marks

Question 1 (4 marks)

01.1 [1 mark]

Answer: rate

- rate (1)
-

01.2 [1 mark]

Answer: Apparatus that stops reactants and products escaping.

- apparatus that prevents reactants and products escaping (1)
-

01.3 [1 mark]

Correct: The concentrations of the reactants and products do not change.

01.4 [1 mark]

Answer: The forward and reverse reactions are both still happening.

- the forward and reverse reactions are both still happening (1)
-

Question 2 (2 marks)

02.1 [1 mark]

Correct: A sealed, stoppered gas jar

02.2 [1 mark]

Answer: In an open system, reactants or products can escape, so their concentrations cannot settle at constant, unchanging values.

- in an open system, reactants or products can escape, so a constant balance between the forward and reverse reactions cannot be maintained (1)
-

Question 3 (2 marks)

03.1 [2 marks]

Answer: At equilibrium it is the rates of the forward and reverse reactions that are equal. The amounts of reactants and products then stay constant, but they are not usually equal.

- at equilibrium the forward and reverse reactions happen at the same rate (it is the rates that are equal) (1)
- so the amounts (concentrations) of reactants and products stay constant, but they are not necessarily equal (1)

Notes: Allow 'the position of equilibrium can lie towards the reactants or towards the products' for the second mark.

Question 4 (3 marks)

04.1 [1 mark]

Answer: The colour of the mixture stops changing (becomes constant).

- the colour of the mixture stops changing / stays constant (1)

04.2 [2 marks]

Answer: A colorimeter gives a precise numerical reading, so very small ongoing changes in colour (which the eye might miss) can still be detected, giving a more reliable indication of when the colour has truly stopped changing.

- a colorimeter gives a precise numerical reading of colour/absorbance, rather than a subjective judgement by eye (1)
 - so it can detect very small ongoing changes that the eye might not notice, giving stronger evidence that a constant value (equilibrium) has been reached (1)
-

Question 5 (7 marks)

05.1 [1 mark]

Answer: 30 s

- 30 (s) (1)
-

05.2 [1 mark]

Answer: The concentrations stay constant (the lines are horizontal).

- the concentrations stay constant / the lines are horizontal (1)
-

05.3 [2 marks]

Answer: The forward and reverse reactions are still happening, at the same rate, so the concentrations do not change.

- the forward and reverse reactions are both still happening (1)
 - at the same rate, so the concentrations do not change (1)
-

05.4 [2 marks]

Answer: The concentrations of A and B decreased, so there were fewer collisions per second.

- the concentrations of A and B decreased (1)
 - so there were fewer collisions per second (1)
-

05.5 [1 mark]

Answer: The concentration of C increased.

- the concentration of C increased (1)
-