[Reversible reactions and dynamic equilibrium]

Q1.(2018)

Look at the equation for the reaction between sulfur dioxide and oxygen to make sulfur trioxide.

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

The reaction forms a **dynamic equilibrium**.

Which of the following describes dynamic equilibrium?

A All the reactants and products are gases.

B The rate of the backward reaction is greater than the rate of the forward reaction.

C The rate of the forward and backward reactions are equal.

D The rate of the forward reaction is greater than the rate of the backward reaction.

Your answer ☐

Q2.(2019)

Reversible reactions in a closed system reach a dynamic equilibrium.

At equilibrium, which statement is correct?

A rate of reverse reaction = 0

B rate of forward reaction = 0

C rate of forward reaction > rate of reverse reaction

D rate of forward reaction = rate of reverse reaction

Your answer ☐

Q3.a).(2021)

When a reversible reaction is left in a closed system, an equilibrium is reached.

Look at the equation.

$2NO_2(g) \rightleftharpoons N_2O_4(g)$

It shows the equilibrium between $NO_2(g)$ and $N_2O_4(g)$.

Fig. 17.1 shows how the reaction rate of the forward and backward reactions change as the equilibrium is reached.

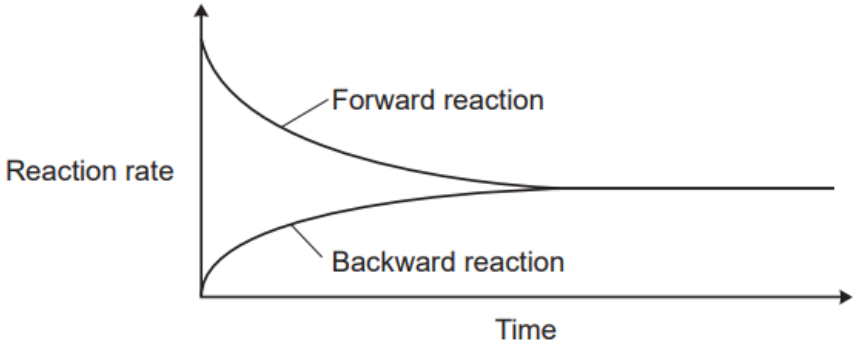

Fig. 17.1

Describe how **Fig. 17.1** shows that the equilibrium has been reached.

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Q3.b).(2021)

Fig. 17.2 shows how the concentrations of $NO_2(g)$ and $N_2O_4(g)$ change as the equilibrium is reached.

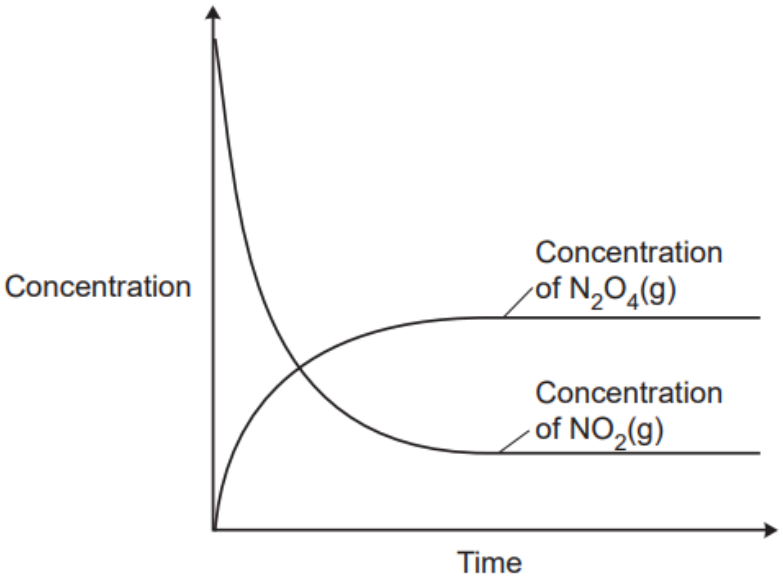

Fig. 17.2

Describe how **Fig. 17.2** shows that the equilibrium has been reached.

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Q4.(2022)

Sulfur dioxide, SO_2, reacts with oxygen, O_2, to make sulfur trioxide, SO_3, to form a dynamic equilibrium.

$$2SO_2 + O_2 \rightleftharpoons 2SO_3$$

Which statement describes the reaction at equilibrium?

A Rate of forward reaction < rate of backward reaction

B Rate of forward reaction > rate of backward reaction

C Rate of forward reaction = rate of backward reaction

D Rate of forward reaction ~ rate of backward reaction

Your answer ☐

Q5.a).(2023)

When a solution of yellow $Fe^{3+}(aq)$ ions is mixed with a solution of colourless $SCN^{-}(aq)$ ions they react to form a solution of red $FeSCN^{2+}(aq)$ ions.

This is an example of a **dynamic equilibrium**.

Complete the equation for this reaction.

$$\underset{\text{yellow}}{Fe^{3+}(aq)} + \underset{\text{colourless}}{SCN^{-}(aq)} \quad \cdots\cdots\cdots \quad \underset{\text{red}}{FeSCN^{2+}(aq)}$$

Q5.b).i).(2023)

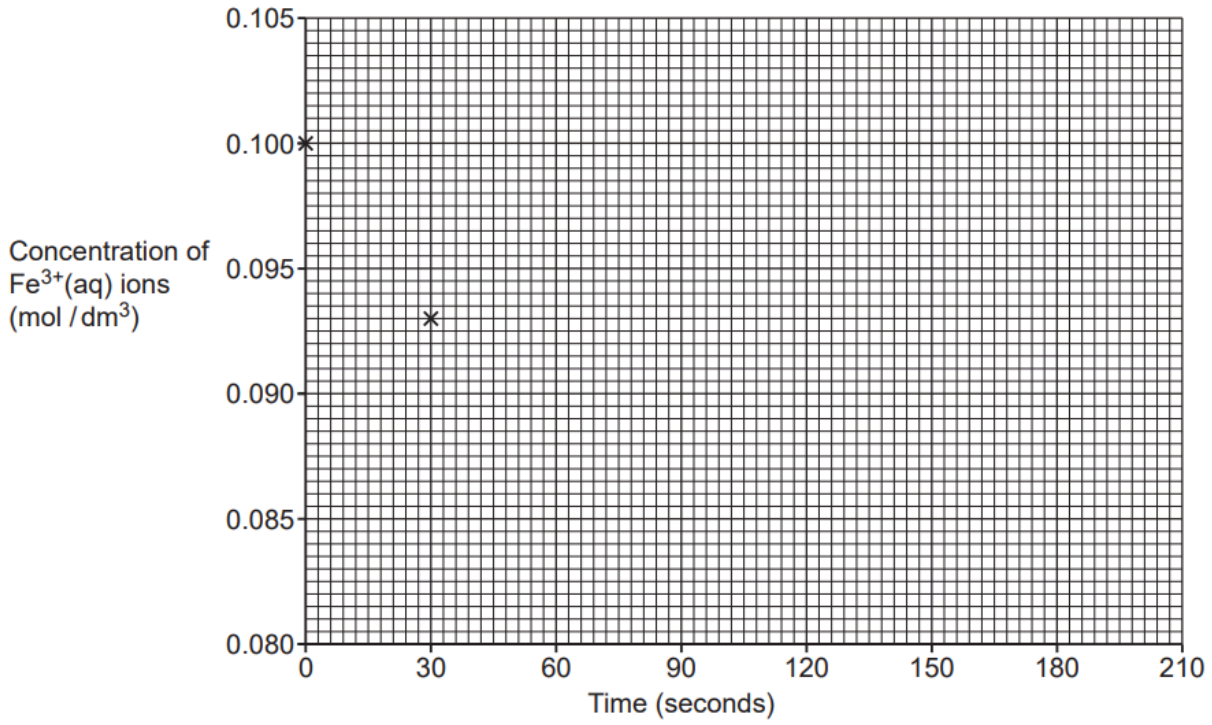
The table shows how the concentration of $Fe^{3+}(aq)$ ions change when solutions of $Fe^{3+}(aq)$ ions and $SCN^{-}(aq)$ ions are mixed together.

Time (seconds)	0	30	60	90	120	150	180
Concentration of $Fe^{3+}(aq)$ ions (mol/dm^3)	0.100	0.093	0.087	0.083	0.081	0.081	0.081

Plot the results from the table on the graph. Two points have already been plotted fo you.

Q5.b).ii).(2023)

Draw a line of best fit.



Q5.b).iii).(2023)

What is the time it takes for the reaction to reach equilibrium?

Give a reason for your answer.

Time to reach equilibrium = ... seconds

Reason .....

Q5.c).(2023)

A student increases the concentration of SCN^-(aq) ions in the mixture.

The mixture turns **darker red**.

Use Le Chatelier's principle to explain the change in colour.

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Q5.d).(2023)

The student thinks that the forward reaction shown in **(a)** for the equilibrium is **exothermic**.

Describe what the student should do to the equilibrium mixture to show that the forward reaction is exothermic.

Predict the student's observations.

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