

AQA - Reversible reactions and dynamic equilibrium – GCSE Chemistry

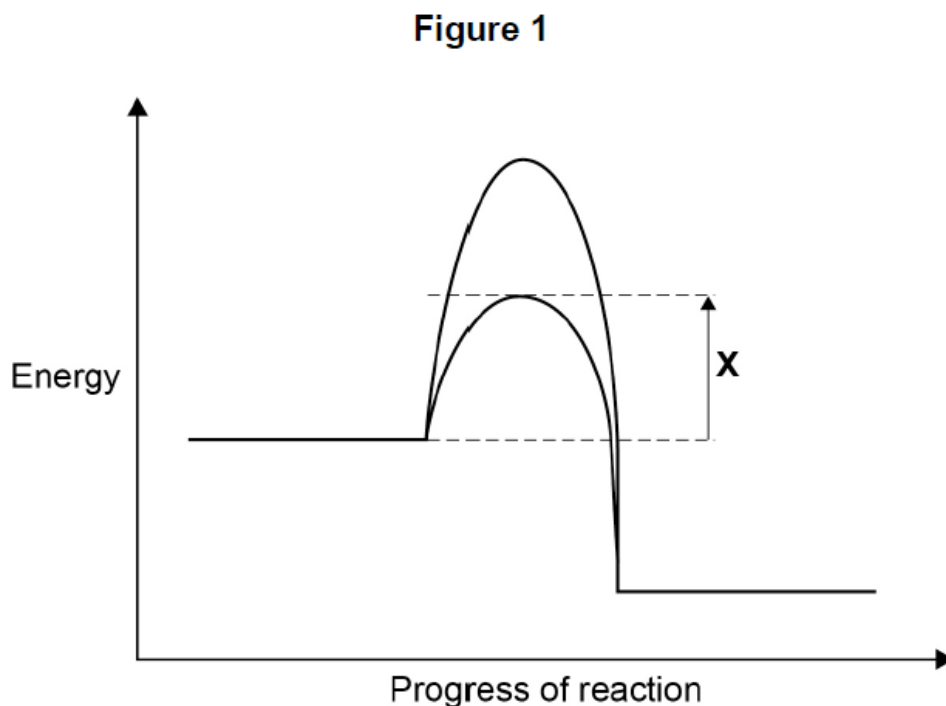
1. [May/2020/Paper_8462/2F/No.1.1](#)

What does the symbol \rightleftharpoons show about the reaction?

[1 mark]

2. May/2020/Paper_8462/2F/No.1.3

Figure 1 shows the reaction profile for the production of ammonia both with a catalyst and without a catalyst.



What is represented by label **X**?

[1 mark]

Tick (✓) **one** box.

Activation energy with a catalyst

Activation energy without a catalyst

Overall energy change with a catalyst

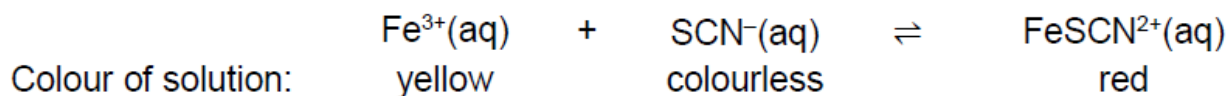
Overall energy change without a catalyst

3. **May/2020/Paper_8462/2F/No.10**

This question is about a reversible reaction.

The reaction between solutions of iron(III) ions (Fe^{3+}) and thiocyanate ions (SCN^-) is reversible.

The ionic equation for the reaction is:



The colour of the equilibrium mixture is orange at room temperature.

Give the name of the solvent used to dissolve the ions in this reaction.

[1 mark]

A few drops of a colourless solution containing a high concentration of thiocyanate ions (SCN^-) are added to the orange equilibrium mixture.

Explain the colour change observed.

[3 marks]

A water bath is set up at a temperature above room temperature.

When a test tube containing the orange equilibrium mixture is placed in the water bath, the mixture becomes more yellow.

Explain what this shows about the energy change for the forward reaction.

[3 marks]

Explain why a change in pressure does **not** affect the colour of the equilibrium mixture.

[2 marks]

Other metal ions form coloured equilibrium mixtures with thiocyanate ions.

Which metal ion could form a coloured equilibrium mixture with thiocyanate ions?

[1 mark]

Tick (✓) **one** box.

Al³⁺

Co²⁺

Mg²⁺

Na⁺

4. [May/2019/Paper_8462/2H/No.4](#)

This question is about the corrosion of metals.

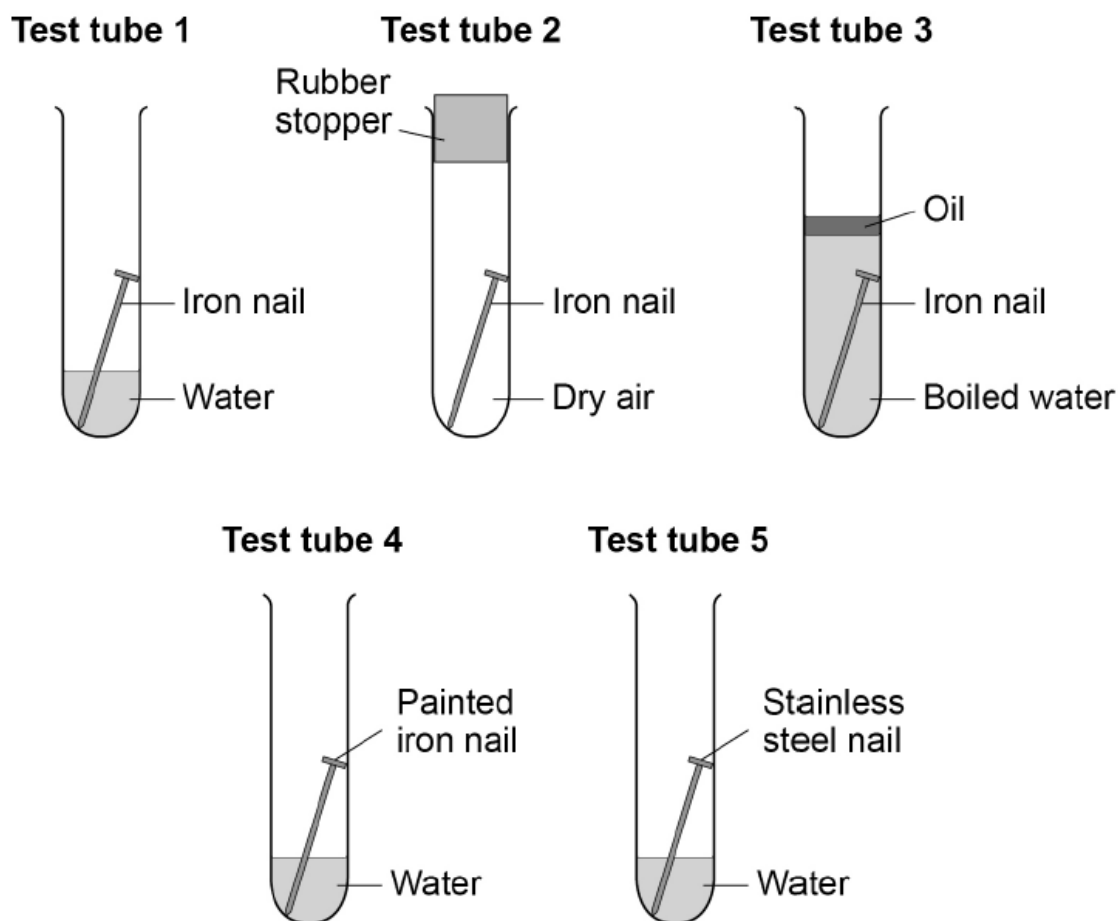
The corrosion of iron is called rusting.

A student investigated the rusting of iron.

This is the method used.

1. Set up the test tubes as shown in **Figure 4**.
2. Leave the test tubes for 1 week.
3. Examine the nails for signs of rust.

Figure 4



Magnesium is fixed to some steel ships.

Explain how this prevents the steel from rusting.

[2 marks]

Explain why aluminium window frames do **not** corrode after they are made.

[2 marks]

5. [May/2019/Paper_8462/2H/No.10](#)

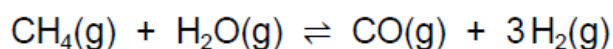
This question is about reversible reactions and equilibrium.

Hydrogen is used to produce ammonia in the Haber process.

The hydrogen is made in two stages.

Stage 1 is the reaction of methane and steam to produce carbon monoxide and hydrogen.

The equation for the reaction is:



Calculate the atom economy for the formation of hydrogen in **stage 1**.

Relative atomic masses (A_r): H = 1 C = 12 O = 16

[2 marks]

Atom economy = _____ %

Explain why a low pressure is used in **stage 1**.

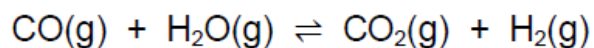
Give your answer in terms of equilibrium.

[2 marks]

Stage 2 uses the carbon monoxide produced in **stage 1**.

The carbon monoxide is reacted with more steam to produce carbon dioxide and more hydrogen.

The equation for the reaction in **stage 2** is:

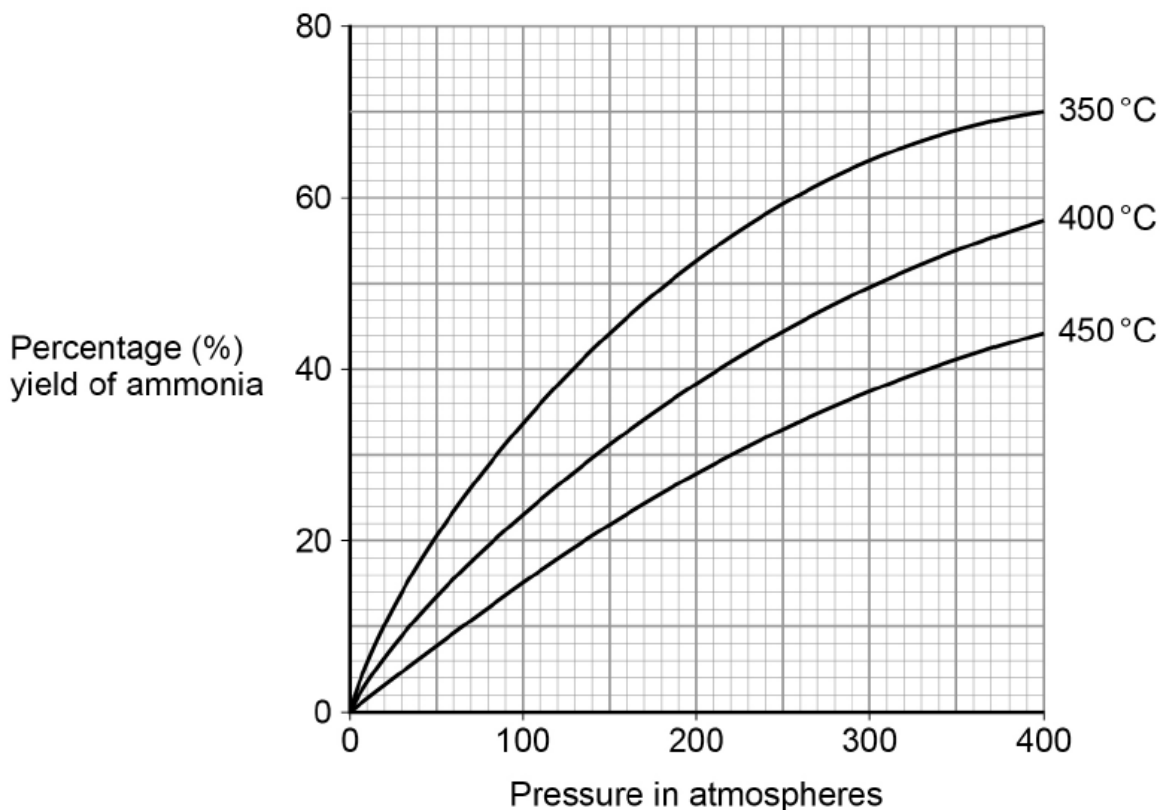


What is the effect of increasing the pressure on the equilibrium yield of hydrogen in **stage 2**?

[1 mark]

Figure 10 shows the percentage yield of ammonia produced at different temperatures and pressures in the Haber process.

Figure 10



A temperature of 450 °C and a pressure of 200 atmospheres are used in the Haber process.

A student suggested that a temperature of 350 °C and a pressure of 285 atmospheres could be used instead of those used in the Haber process.

Determine how many times greater the percentage yield of ammonia obtained would be.

Use **Figure 10**.

[3 marks]

Percentage yield = _____ times greater

A pressure of 285 atmospheres is **not** used in the Haber process instead of 200 atmospheres.

Give **one** reason why.

[1 mark]

How does **Figure 10** show that the forward reaction in the Haber process is exothermic?

[1 mark]

World production of ammonia is now about 30 times greater than it was in 1950.

Suggest why the demand for ammonia has increased.

[2 marks]
