

All questions are for separate science students only**Q1.**

This question is about sulfuric acid.

- (a) Sulfuric acid contains sulfate ions.

Describe the test for the presence of sulfate ions in sulfuric acid.

Give the result of the test. **(chemistry only)**

Test _____

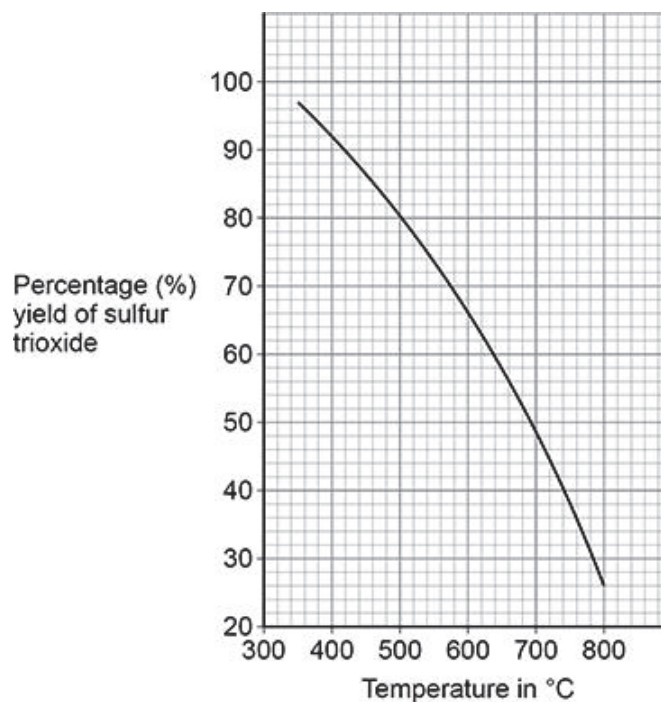
Result _____

(2)

One stage in the industrial production of sulfuric acid is the reaction of sulfur dioxide with oxygen to produce sulfur trioxide.

This reversible reaction reaches dynamic equilibrium.

The figure below shows the percentage yield of sulfur trioxide in this reaction at different temperatures.



- (b) Which statement about the forward reaction is correct?

Use the above figure.

Tick (✓) **one** box.

The yield is greater at higher temperatures
because the reaction is exothermic.

☐

The yield is greater at higher temperatures
because the reaction is endothermic.

☐

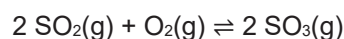
The yield is smaller at higher temperatures
because the reaction is exothermic.

☐

The yield is smaller at higher temperatures
because the reaction is endothermic.

☐

The equation for the reaction is:



(1)

- (c) Explain why the percentage yield of sulfur trioxide in this reaction is greater if the pressure is higher. **(HT only)**

(2)

- (d) In industry, the reaction is done at 450 °C and atmospheric pressure.

Under these conditions the yield of sulfur trioxide is 86%.

Suggest **two** reasons why a higher pressure is **not** used.

1

2

(2)

- (e) This reaction uses a catalyst to increase the rate of the reaction.

The catalyst is a metal oxide.

Which is the most likely metal in the metal oxide catalyst? **(chemistry only)**

Use the periodic table.

Tick (✓) **one** box.

Aluminium (Al)

☐

Barium (Ba)

☐

Potassium (K)

☐

Vanadium (V)

☐

(1)

(Total 8 marks)