

(Catalysts)

Q1.(2019)

A nickel catalyst is used in this reaction.

Why is a catalyst used in this reaction?

[2 marks]

Tick (✓) **two** boxes.

To increase the temperature

☐

To produce less carbon monoxide

☐

To reduce costs

☐

To use less energy

☐

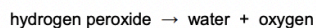
To use less methane

☐

Q2.a)(2019)

Some students investigated the rate of decomposition of hydrogen peroxide.

The equation for the reaction is:



Complete the sentence.

Choose an answer from the box.

[1 mark]

a burning splint

a glowing splint

damp litmus paper

limewater

The students tested the gas produced to show that it was oxygen.

The students used _____.

Student **A** investigated the effect of the particle size of a manganese dioxide catalyst on the rate of the reaction.

This is the method used.

1. Measure 25 cm³ hydrogen peroxide solution into a conical flask.
2. Add some fine manganese dioxide powder to the conical flask.
3. Measure the volume of oxygen produced every 30 seconds for 10 minutes.
4. Repeat steps 1 to 3 two more times.
5. Repeat steps 1 to 4 with coarse manganese dioxide lumps.

Q2.b)(2019)

The method student **A** used did **not** give repeatable results.

How could student **A** make the results repeatable?

[1 mark]

Tick (✓) **one** box.

Student **A** should make measurements every 2 minutes.

☐

Student **A** should measure the mass of manganese dioxide.

☐

Student **A** should use 50 cm³ hydrogen peroxide.

☐

Student **A** should use a beaker instead of a conical flask.

☐

Q2.c)(2019)

Student **B** used a method which gave repeatable results.

How could student **B** improve the accuracy of these results?

[1 mark]

Tick (✓) **one** box.

Calculate a mean but do not include any anomalous results.

☐

Calculate a mean but do not include the first set of results.

☐

Record the results in a table and plot the results on a bar chart.

☐

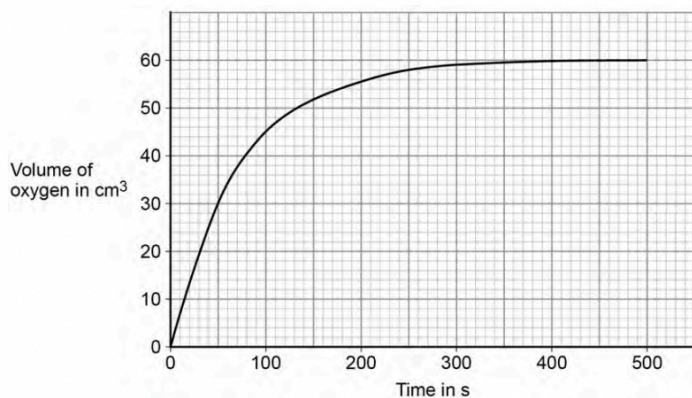
Record the results in a table and plot the results on a line graph.

☐

Q2.d)(2019)

Figure 5 shows student B's results for coarse manganese dioxide lumps.

Figure 5



Calculate the mean rate of reaction between 30 and 250 seconds for coarse manganese dioxide lumps.

Use Figure 5 and the equation:

$$\text{Mean rate of reaction} = \frac{\text{Volume of oxygen formed}}{\text{Time taken}}$$

Give your answer to 3 significant figures.

[4 marks]

Volume of oxygen formed _____

Time taken _____

Mean rate of reaction = _____ cm³/s

Q2.e)(2019)

Fine manganese dioxide powder produces a higher rate of reaction than coarse manganese dioxide lumps.

Sketch on Figure 5 the results you would expect for student B's experiment with fine manganese dioxide powder.

[2 marks]

Q2.f)(2019)

Hydrogen peroxide molecules collide with manganese dioxide particles during the reaction.

Why does fine manganese dioxide powder produce a higher rate of reaction than coarse manganese dioxide lumps?

[1 mark]

Tick (✓) **one** box.

Fine manganese dioxide powder has a larger surface area.

☐

Fine manganese dioxide powder has larger particles.

☐

Fine manganese dioxide powder produces less frequent collisions.

☐