Logo, company name

Description automatically generated**Year 11 ATAR Chemistry**

Task 14: Decomposition of hydrogen peroxide

Reference: Exploring Chemistry Year 11 ATAR page 98

Weighting 7.5% of Year Total **MARK: / 44**

NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

WORKED WITH: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Background:**

Some contact lenses are sterilised with hydrogen peroxide. A metal disc acts as a catalyst to speed up the reaction in which the hydrogen peroxide sterilises the contact lenses. The catalyst also ensures that all of the hydrogen peroxide has decomposed to form oxygen gas and water before the contact lenses wearer inserts the clear lens into their eye. Several metal compounds also speed up the rate at which hydrogen peroxide decomposes to form oxygen gas and water. The equation for the reaction is:

2H2O2(aq) 🡪 O2(g) + 2H2O(l)

The rate of this reaction can be measured in terms of the rate at which oxygen gas is released and collected in a plastic syringe.

**TASK:**

To investigate factors that affect the rate at which hydrogen peroxide reacts to form oxygen gas and water.

**AVAILABLE EQUIPMENT:**

* Test tube rack, plastic syringe (30-50mL), dropper, stop clock, electronic balance, test tubes, stopper with plastic tube fitted.
* Hydrogen peroxide (H2O2): 100 mL
* Potassium iodide (KI): approximately 1 gram.
* 10 mL measuring cylinder.
* Groups investigating **the amount of catalyst** require another 2 grams of potassium iodide.
* Groups investigating **the type of catalyst** require about 1 gram of manganese dioxide and about 1 gram of yeast.
* Groups investigating **the effect of temperature** require eight test tubes, four 250 mL beakers, 100 g of ice and a kettle to produce hot water.
* Thermometer.

**INITIAL TRIAL TO ENSURE EQUIPMENT VIABILITY:**

Test the equipment by performing the following trial:

1. Weigh 0.3 grams of potassium iodide onto a filter paper.
2. Attach the end of the plastic tubing to the plastic syringe so it makes a good seal.
3. Transfer the potassium iodide into the test tube.
4. Use the measuring cylinder to transfer 5 mL of hydrogen peroxide to the test tube.
5. Immediately place the stopper into the test tube, sealing the chemicals inside and start a stopwatch. Swirl the mixture.
6. Observe and record the rate at which oxygen gas is collected in the syringe.

**PLANNING STAGE OF INVESTIGATION:**

**Choose one of the three following experiments to base your investigation on:**

1. How the amount of potassium iodide catalyst affects the rate at which hydrogen peroxide decomposes.
2. How the type of catalyst affects the rate at which hydrogen peroxide decomposes.
3. How temperature affects the rate at which hydrogen peroxide decomposes.

**For your choice, identify the following:**

INDEPENDENT VARIABLE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 mark)

DEPENDENT VARIABLE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 mark)

CONTROLLED VARIABLES: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Write a hypothesis for your investigation. (1 mark)

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**OHS Considerations:**

What hazards are involved with conducting your investigation? (2 marks)

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What strategies will you put into place to control these hazards? (3 marks)

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**Method:**

Outline the steps involved in conducting each test. (8 marks)

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**Labelled diagram of equipment set-up:** (3 marks)

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***SAFETY NOTE: Manganese dioxide is a more effective catalyst than potassium iodide. Use a smaller mass to avoid too rapid a production of oxygen.***

**CONDUCTING THE INVESTIGATION:**

Draw up a suitable table below to display your results: (5 marks)

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Write down three potential issues you experienced whilst conducting your tests. (3 marks)

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**PROCESSING OF INVESTIGATION RESULTS:**

Using graph paper, draw a graph to display your investigation data. (6 marks)

From your graph, describe any trends that occur and discuss whether or not your data proves or disproves your hypothesis. (4 marks)

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What is an improvement you would make to the procedure? How would it make it better? (2 marks)

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How are the results of your investigation relevant to the sterilisation of contact lenses? (2 marks)

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**END OF INVESTIGATION**