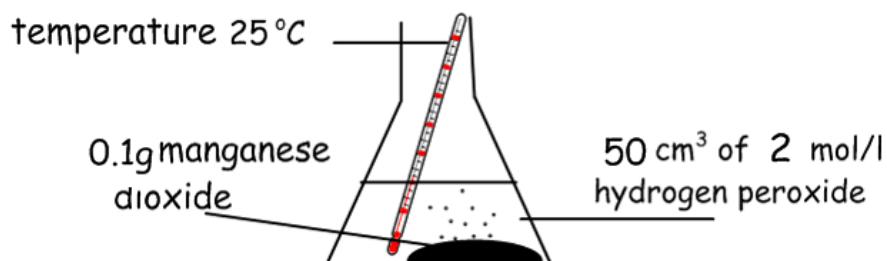


Homework 2 – Rates of Reaction

- 1) When Matthew added manganese dioxide to hydrogen peroxide solution, oxygen was produced. Manganese dioxide is a catalyst.



- What is the purpose of adding a catalyst to a chemical reaction?
- What mass of catalyst would be left at the end of the reaction?
- If Matthew wanted to investigate how temperature affects the rate of reaction, what factors would be his control variables?

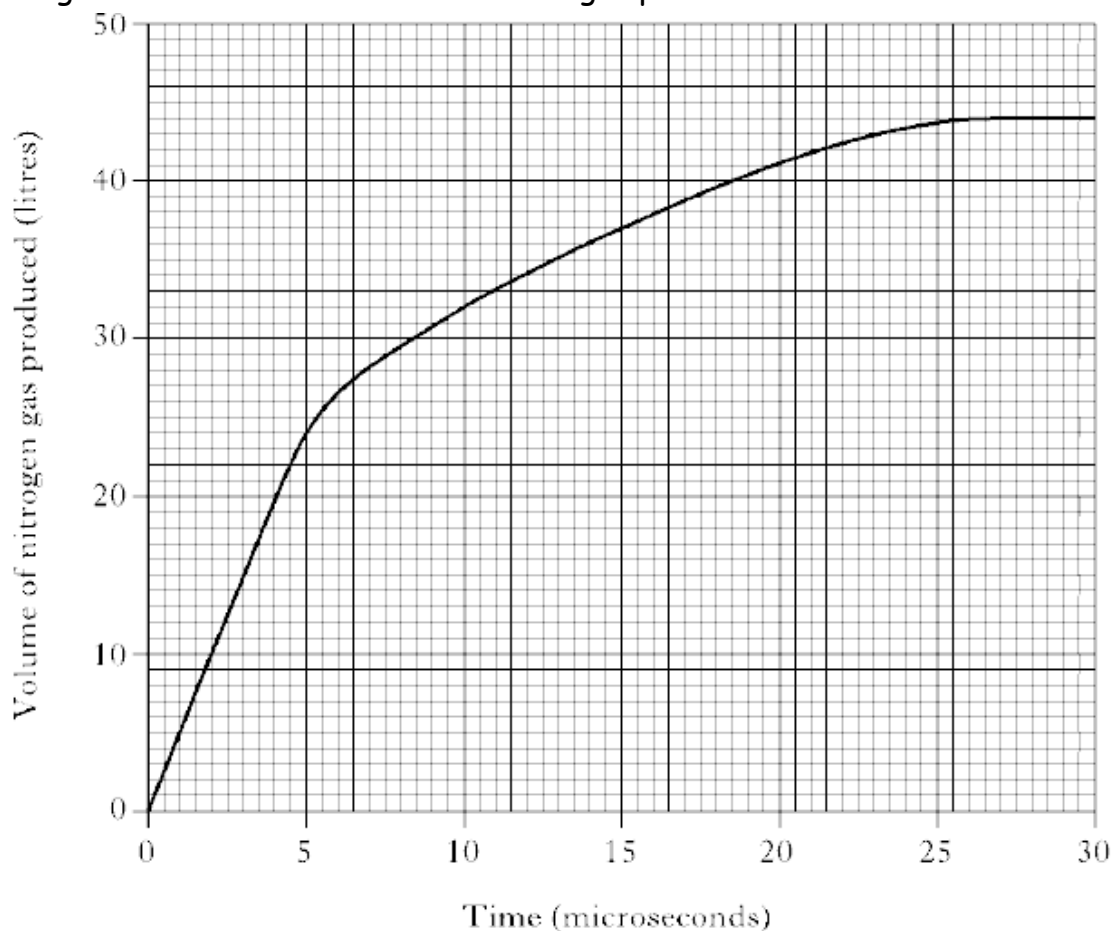
- 2) Some students carried out the following reactions:

A 1 mol/l HCl 20 °C iron lump	B 2 mol/l HCl 20 °C magnesium lump	C 2 mol/l HCl 30 °C magnesium lump
D 1 mol/l HCl 30 °C iron powder	E 2 mol/l HCl 40 °C magnesium powder	F 2 mol/l HCl 40 °C iron lump

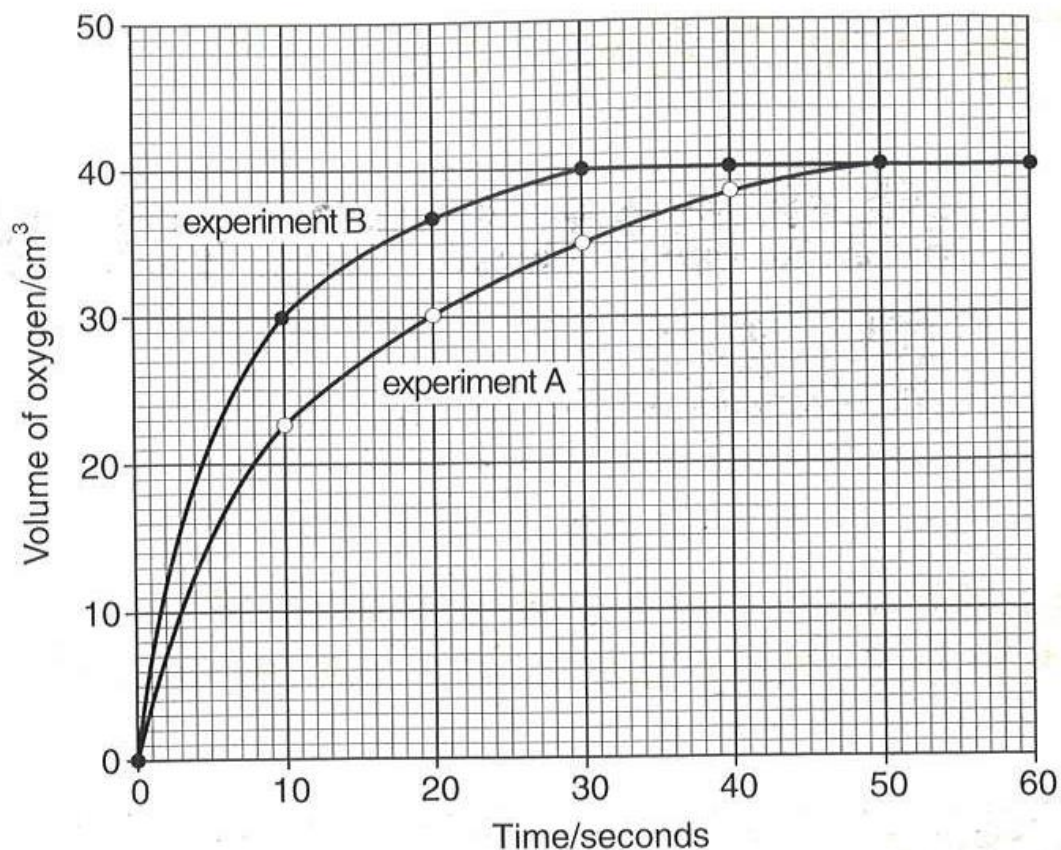
- Identify the 2 experiments which should be compared to show the effect of temperature on the reaction rate.
 - Explain why experiments A and F could not be used to study the effect of concentration on reaction rate.
- 3) Use your knowledge of the factors that affect reaction rate to explain the following:
- Why do powders that neutralize acid indigestion in your stomach work faster than tablets?
 - Explain why food is kept fresher for longer if stored in a refrigerator.
 - Explain why car exhausts rust faster than the underside of cars.

National 5 Extension

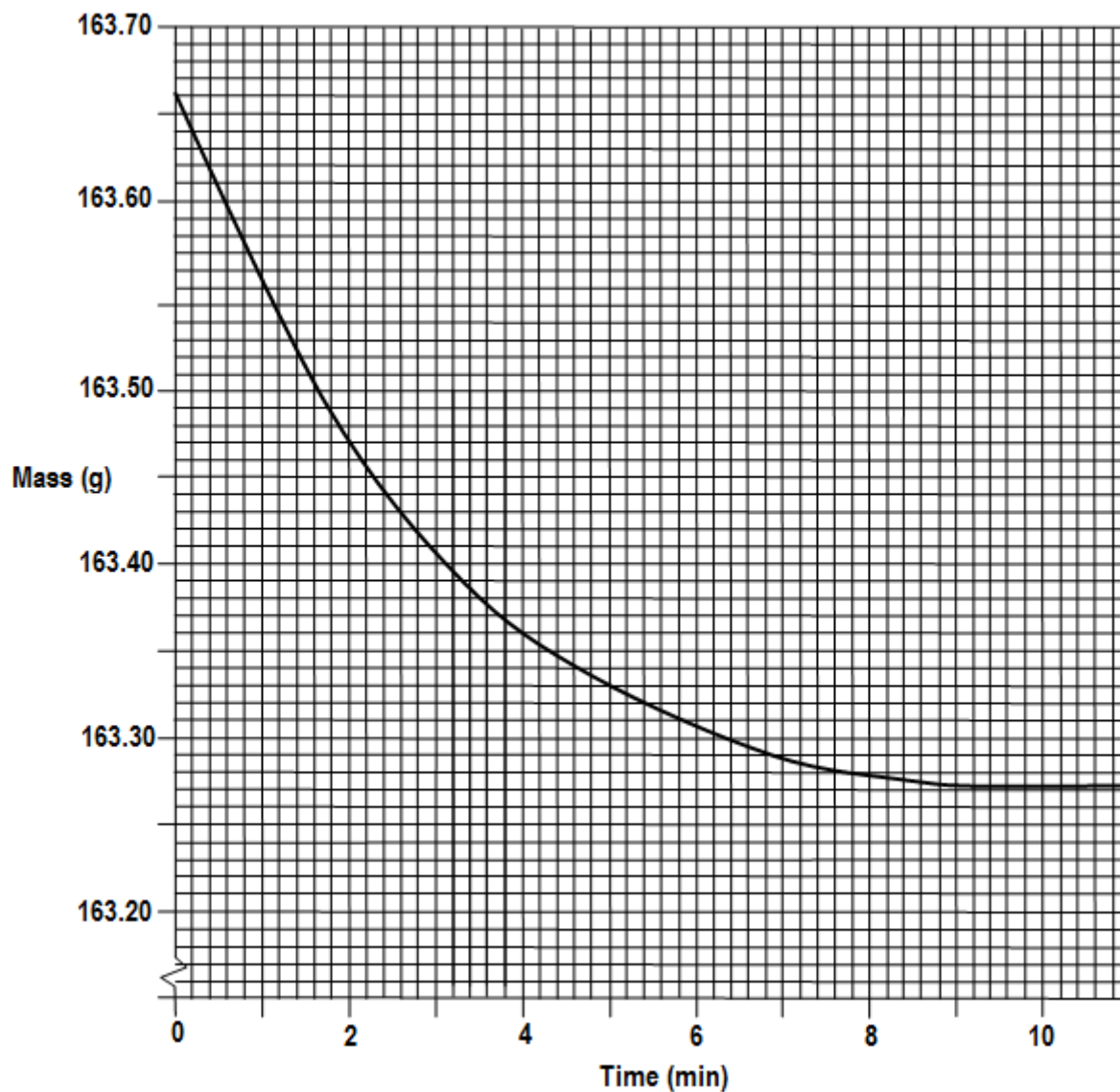
- 1) Rapid inflation of airbags in cars is caused by the production of nitrogen gas. The graph below gives information on the volume of gas produced over 30 microseconds.



- a) Calculate the average rate of reaction between 2 and 10 microseconds.
- 2) Sam added manganese dioxide to hydrogen peroxide solution and measured the volume of oxygen produced. Her results for two experiments at different temperatures are shown in the graph below:



- What volume of oxygen was collected in experiment A?
 - How can you tell from the graph that experiment B was faster than experiment A?
 - Calculate the average rate of reaction over the first 30 seconds for both experiments A and B.
- 3) When calcium metal reacts with water the products of the reaction are calcium hydroxide solution and hydrogen gas. The progress of the reaction was followed by measuring the mass of the reaction at two minute intervals. The graph below was plotted:



- Calculate the average rate in the first 2 minutes of the reaction.
- Calculate the average rate between 3 and 6 minutes.
- Calculate the total mass of hydrogen lost from the reaction
- Explain why the mass of the reaction decreases during the reaction.