Your Science Online

Cambridge IGCSE Chemistry 0620 style

RATES OF REACTION

Topic practice paper (exam style)

CANDIDATE NAME	
CLASS	
DATE	

50 minutes

You will need: a pen, a pencil, a ruler and a calculator.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes or in the margins.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 45.
- The number of marks for each question or part question is shown in brackets [ ].
- Questions or parts marked **[Extended]** are for Extended-tier candidates. Core candidates may leave them out (Core total: 34 marks).
- Topics: measuring rate, effect of concentration, temperature, surface area and catalysts, collision theory and activation energy.

For teacher's use	
Question	**Mark**
1	
2	
3	
4	
5	
Total	

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1 A student investigates the reaction between marble chips (calcium carbonate) and dilute hydrochloric acid. Fig. 1.1 shows the apparatus.

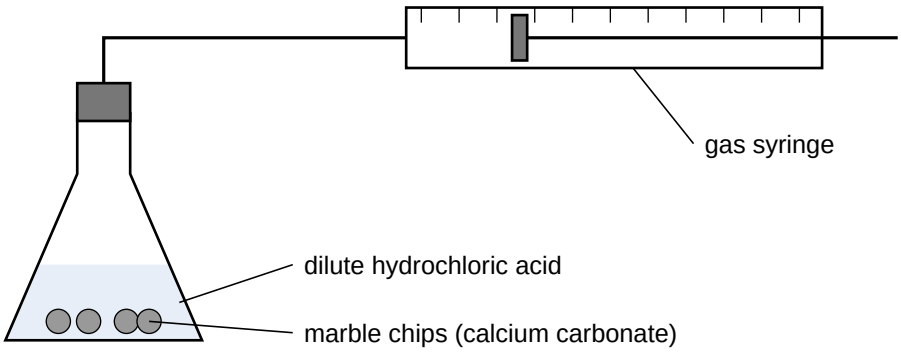


Fig. 1.1

(a) Name the gas collected in the gas syringe.

..... [1]

Table 1.1 shows the student's results.

time / s	0	30	60	90	120	150	180	210	240
volume of gas / cm^3	0	28	48	62	71	76	79	80	80

Table 1.1

(b) On the grid in Fig. 1.2, plot the results from Table 1.1 and draw a smooth curve of best fit.

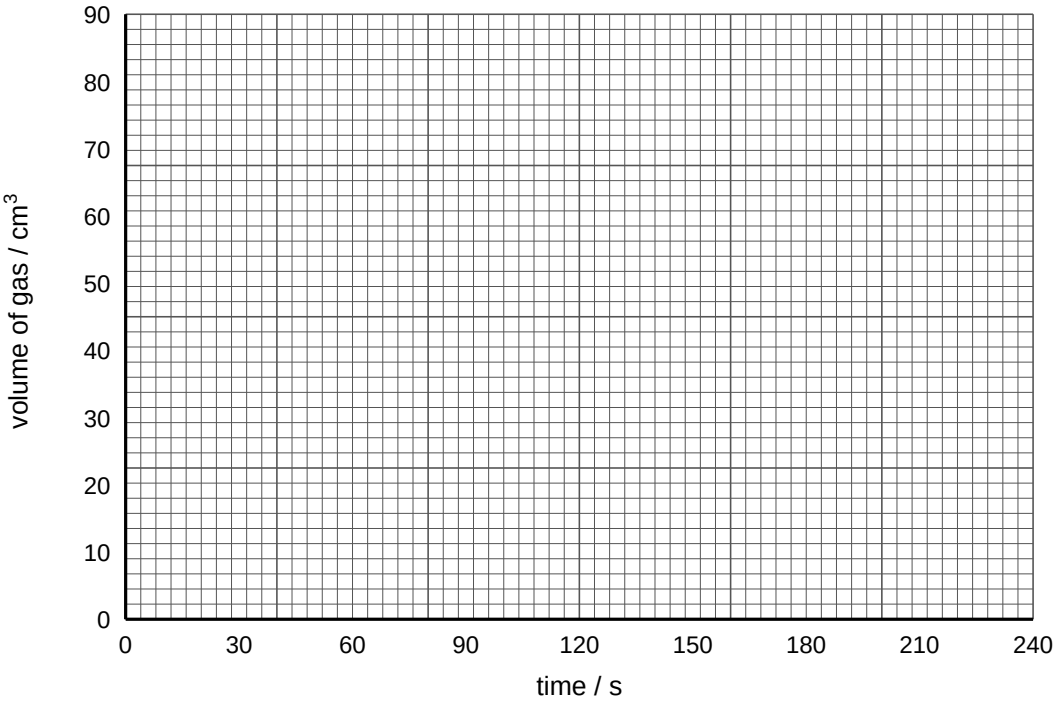


Fig. 1.2

[3]

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(c) Describe how the rate of reaction changes during the experiment. Explain why it changes, using ideas about particles.

.....

.....

..... [3]

(d) State the total volume of gas made, and explain why no more gas is made after 210 s. The acid is in excess.

.....

..... [2]

(e) The student repeats the experiment with the **same mass** of calcium carbonate as a **powder**. Everything else is the same. On Fig. 1.2, sketch the curve you would expect. Label it P.

[2]

(f) Suggest **one** other piece of apparatus that could be used to measure the volume of gas instead of a gas syringe.

..... [1]

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2 This question is about how the rate of a reaction can be changed.

(a) State **two** ways to increase the rate of the reaction between magnesium ribbon and dilute sulfuric acid, without using a catalyst.

1

.....

2

..... [2]

(b) Explain, in terms of particles, why increasing the concentration of the acid increases the rate of reaction.

.....

.....

..... [2]

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(c) ***[Extended]*** Explain, in terms of activation energy and collisions between particles, why increasing the temperature increases the rate of reaction.

.....

.....

.....

..... [3]

(d) Fine flour dust in the air of a flour mill can explode if there is a spark. A lump of flour only burns slowly. Explain why.

.....

.....

..... [2]

3 Hydrogen peroxide, H_2O_2, slowly decomposes to form water and oxygen. When a small amount of manganese(IV) oxide is added, oxygen is made much faster.

(a) Manganese(IV) oxide is a catalyst. State what is meant by a *catalyst*.

.....

..... [2]

(b) Complete the balanced symbol equation for the decomposition of hydrogen peroxide.

$$.....H_2O_2 \rightarrow .....H_2O + ...$$

[2]

(c) Describe a test for oxygen and give the result.

.....

..... [1]

(d) ***[Extended]*** Explain how a catalyst increases the rate of a reaction.

.....

..... [2]

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(e) Enzymes are also catalysts. The enzyme catalase in potato breaks down hydrogen peroxide.

(i) State what enzymes are.

..... [1]

(ii) Suggest why catalase works more slowly at 70 °C than at 35 °C.

..... [1]

4 A student reacts sodium thiosulfate solution with dilute hydrochloric acid. A yellow solid forms and slowly hides a cross drawn on paper under the beaker (Fig. 4.1). The student times how long it takes for the cross to disappear at different temperatures.

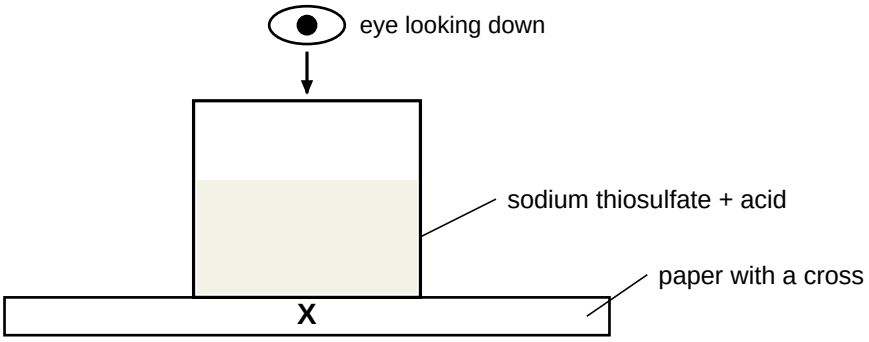


Fig. 4.1

(a) For this investigation, state:

(i) the independent variable

..... [1]

(ii) the dependent variable.

..... [1]

Table 4.1 shows the results. Rate is calculated as 1 / time.

temperature / °C	20	30	40	50	60
time / s	125	62	32	17	9
rate / s^{-1}	0.0080	0.016			0.11

Table 4.1

(b) Calculate the rate at 40 °C and at 50 °C. Write your answers in Table 4.1.

[2]

(c) Describe the effect of temperature on the rate of this reaction.

..... [1]

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(d) Suggest why the student uses the same volumes of both solutions and the same paper with the cross each time.

.....

..... [1]

(e) Different students may not agree on the exact moment the cross disappears. Suggest **two** ways to make the results more reliable.

.....

..... [2]

(f) The reaction also makes sulfur dioxide gas, which is toxic. State **one** safety precaution.

..... [1]

5 ***[Extended]*** Another student follows the reaction between marble chips and acid by measuring the loss in mass of the flask (Fig. 5.1).

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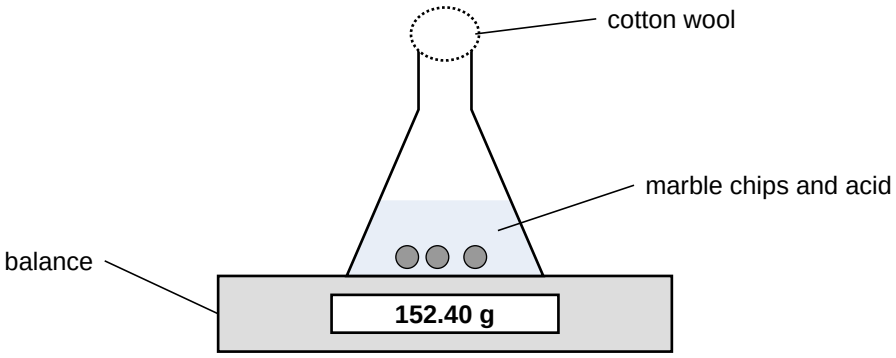


Fig. 5.1

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(a) Explain why the mass of the flask and its contents decreases.

..... [1]

(b) Suggest the purpose of the cotton wool.

..... [1]

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time / s	0	30	60	90	120
loss in mass / g	0	0.80	1.30	1.55	1.60

Table 5.1

(c) Use Table 5.1 to calculate the mean rate of reaction in the first 60 s. Give the unit.

.....

.....

mean rate = ... [2]

(d) Explain why the rate is fastest at the start of the reaction.

.....

..... [2]

END OF PAPER

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