

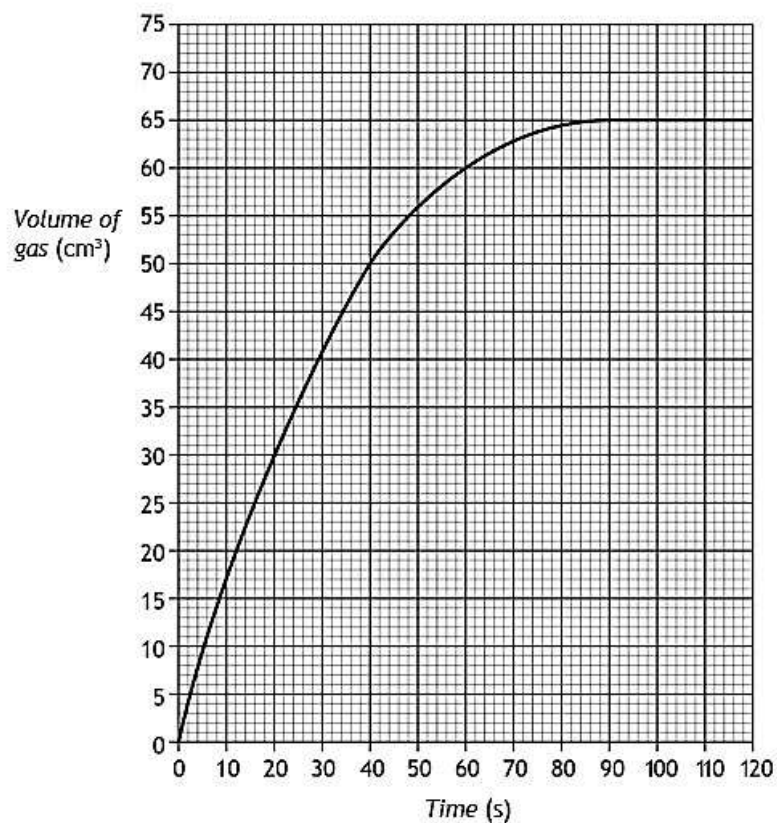
Rates of reaction

Past Paper Questions

National 5 Chemistry Specimen Paper

1. Graphs can be used to show the change in the rate of a reaction as the reaction proceeds.

The graph shows the volume of gas produced in an experiment over a period of time.



(a) State the time, in seconds, at which the reaction stopped.

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(b) Calculate the average rate of reaction, in $\text{cm}^3 \text{s}^{-1}$, for the first 20 seconds.

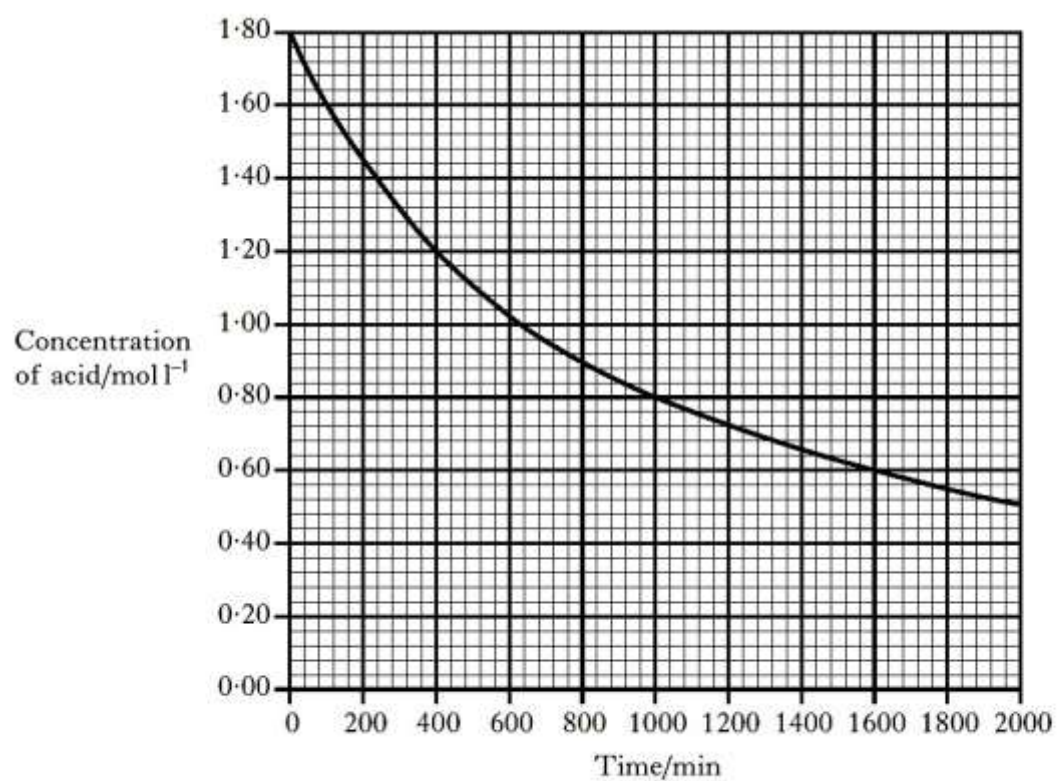
Show your working clearly.

1

(c) The graph shows that the rate of reaction decreases as the reaction proceeds.

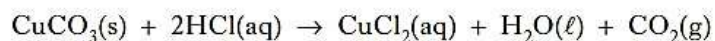
Suggest a reason for this. 1

- (b) The graph shows how the concentration of the hydrochloric acid changed over a period of time when the reaction was carried out at 20 °C.

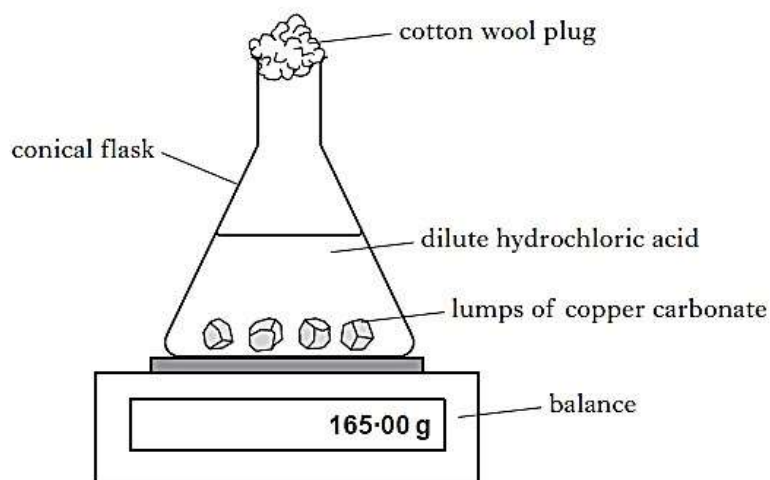


- (i) Calculate the average rate, in $\text{mol l}^{-1} \text{ min}^{-1}$, in the first 400 minutes.

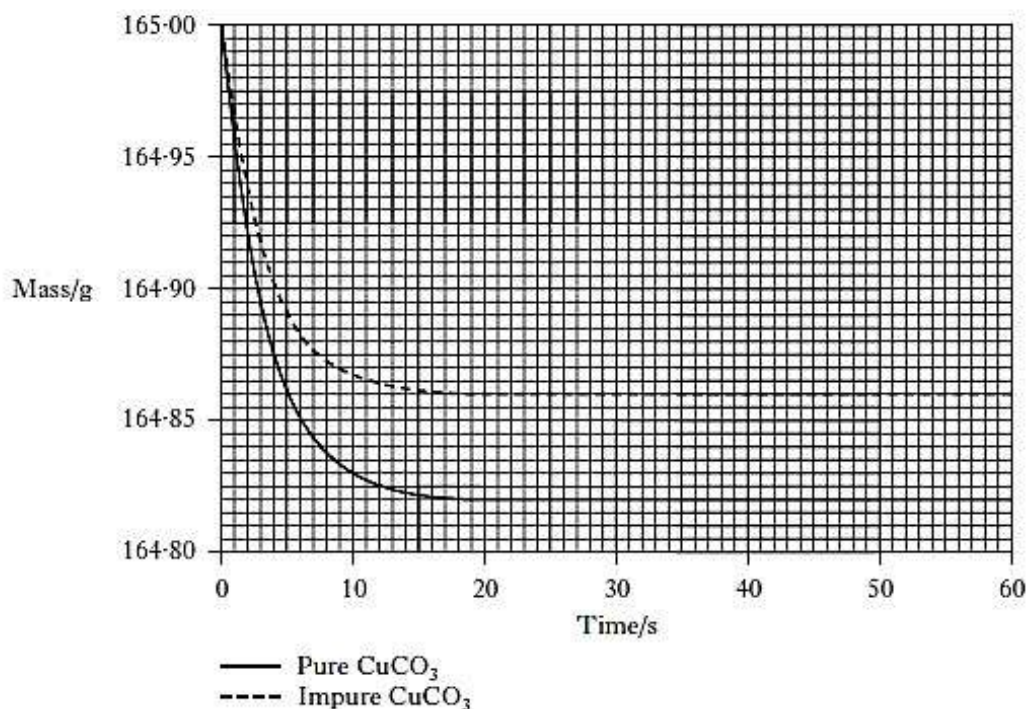
2. Copper(II) carbonate reacts with dilute hydrochloric acid as shown.



A student used the apparatus shown below to follow the progress of the reaction.



- (a) Suggest why a cotton wool plug is placed in the mouth of the conical flask.
- (b) The experiment was carried out using 0.50 g samples of both pure and impure copper(II) carbonate. The graph below shows the results obtained.



- (i) For the sample of pure copper(II) carbonate, calculate the average reaction rate, in g s^{-1} , over the first 10 seconds.

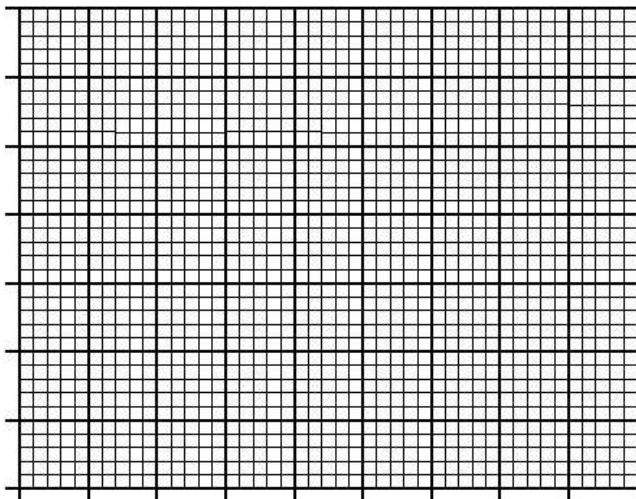
2011 Intermediate 2 Q.4

- (b) As the reaction proceeds the hydrogen is used up and the pressure decreases.

Time (min)	0	5	10	15	20	30	35	45
Decrease in pressure (bar)	0	0.6	1.2	1.7	2.2	2.9	3.1	3.1

- (i) Draw a line graph showing the decrease in pressure as time proceeds.

(Additional graph paper, if required, will be found on *Page twenty-six.*)



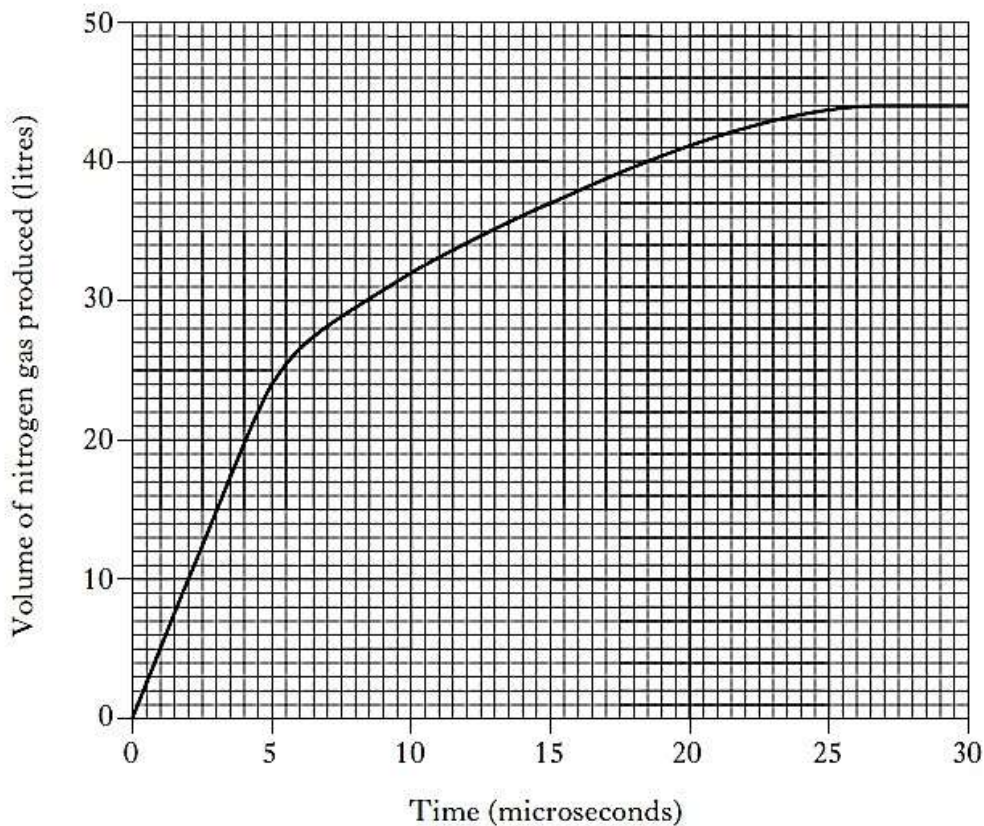
- (ii) Using your graph, at what time did the reaction finish?

2

- (iii) Calculate the average rate of the reaction, in bar min^{-1} , between 10 and 20 minutes.

1

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



- (a) (i) Calculate the average rate of reaction between 2 and 10 microseconds.

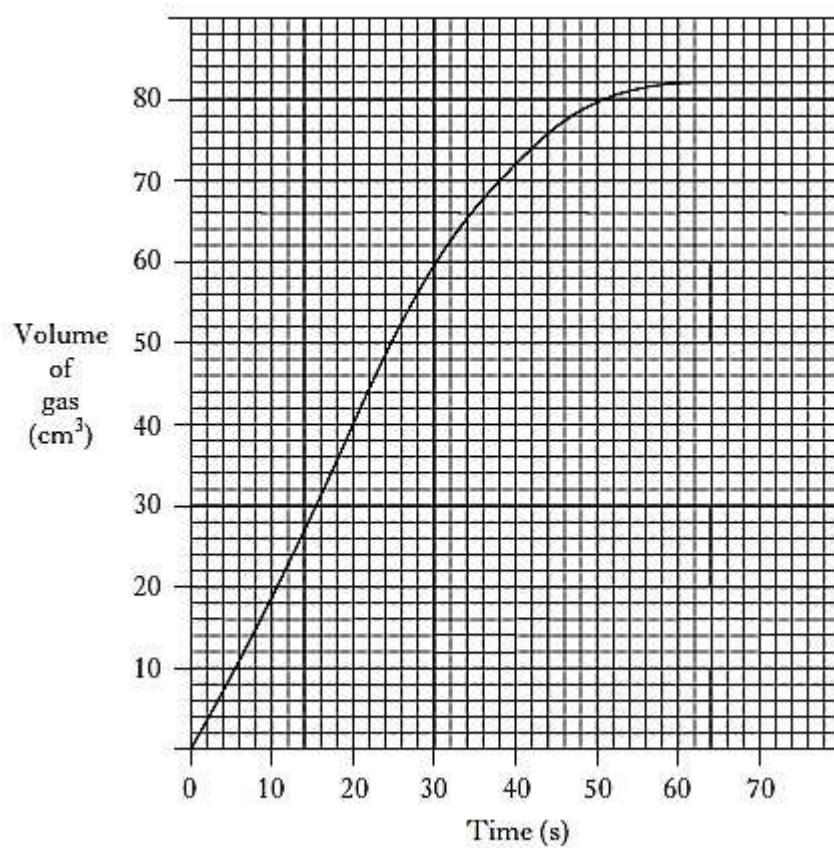
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- (ii) At what time has half of the final volume of nitrogen gas been produced?

1

2013 Intermediate 2 Q. 3

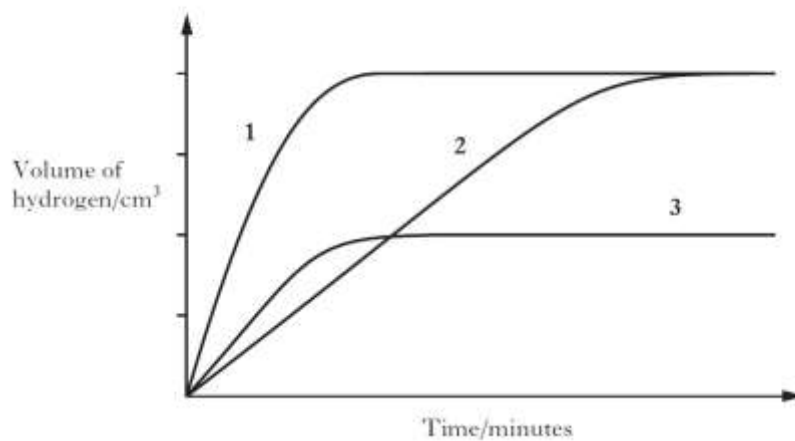
(b) A student carried out the experiment. A graph of the results was plotted.



Calculate the average rate of the reaction, in cm^3s^{-1} , for the first 40 seconds. 1

11. A student carried out some experiments between zinc and excess 1 mol/l hydrochloric acid.

The graph shows the results of each experiment.



- (a) In which experiment did the reaction take longest to finish, 1, 2 or 3?

1

- (b) In **all** three experiments she kept the temperature the same and used the same volume of 1 mol/l hydrochloric acid.

- (i) Suggest one factor that could have been changed from experiment 1 to produce the results in experiment 2.

1

- (ii) 1 g of zinc was used in experiment 1.

What mass of zinc was used in experiment 3?

_____ g 1

13. (b)

- (ii) The table shows the volume of hydrogen gas produced over fifty seconds.

Time/s	Volume of gas/cm ³
0	0
10	20
20	40
30	55
40	65
50	72

The average rate at which gas is produced can be calculated as shown.

$$\begin{aligned} \text{average rate between} &= \frac{\text{change in volume of gas during time period}}{\text{length of time period}} \\ \text{10 and 20 seconds} &= \frac{40-20}{20-10} = \frac{20}{10} \\ &= 2 \text{ cm}^3/\text{s} \end{aligned}$$

Calculate the average rate at which gas is produced between **20 seconds** and **30 seconds**.

_____ cm³/s **1**

2. During the first 20 seconds of a chemical reaction, 5.0 cm^3 of gas were given off.

The average rate of the reaction, in $\text{cm}^3 \text{ s}^{-1}$, during the first 20 seconds is

- A 20.0
- B 5.0
- C 4.0
- D 0.25.

