

Rate of Reaction

Question Paper

Level	O Level
Subject	Chemistry
Exam Board	Cambridge International Examinations
Topic	Chemical Reactions
Sub-Topic	Rate of Reaction
Booklet	Question Paper

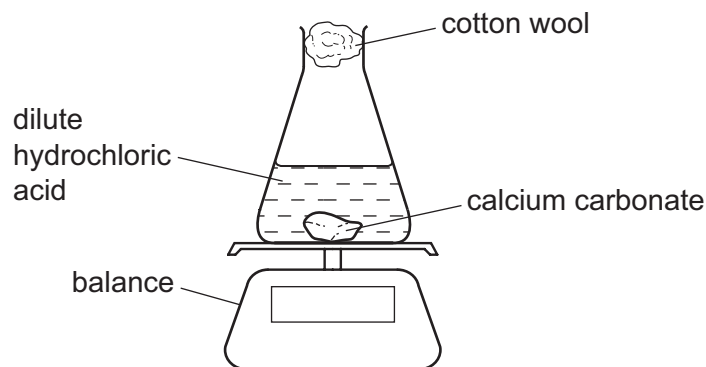
Time Allowed: 38 minutes

Score: /32

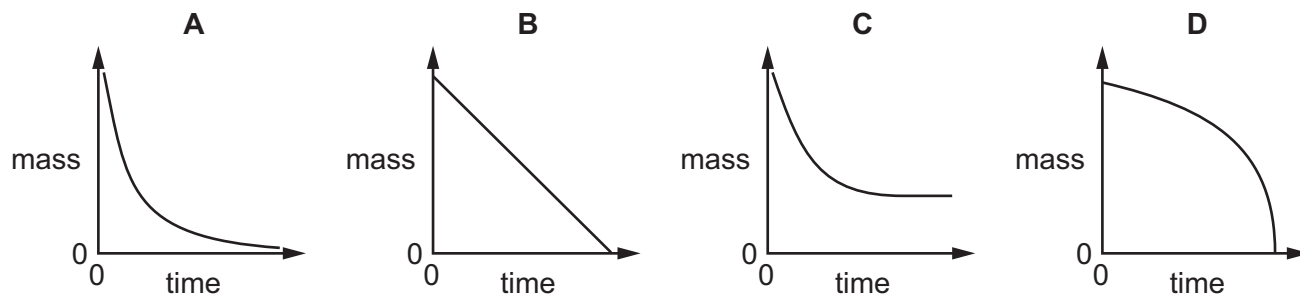
Percentage: /100

- 1 The diagram shows the apparatus used to measure the rate of the reaction between calcium carbonate and dilute hydrochloric acid.

The mass of the flask and the contents is measured at regular intervals of time.



Which graph correctly shows how the mass of the flask and contents changes with time?



- 2 Limestone reacts with hydrochloric acid.

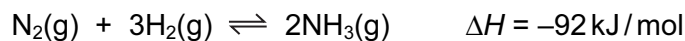
Changing which reaction condition does **not** affect the rate of reaction?

- A** concentration of the acid
- B** limestone particle size
- C** pressure
- D** temperature

- 3 Which element is **most** likely to be used as an industrial catalyst?

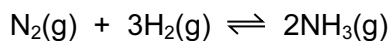
- A** Na
- B** Ni
- C** Pb
- D** Sr

- 4 Ammonia is made by a reversible reaction between nitrogen and hydrogen.



What is the effect of increasing the pressure in this process?

- A Less heat is produced.
 - B More ammonia is formed.
 - C More nitrogen is present at equilibrium.
 - D The reaction slows down.
- 5 The equation shows the reaction for the manufacture of ammonia.



Which change will decrease the activation energy of the reaction?

- A addition of a catalyst
 - B decrease in temperature
 - C increase in concentration
 - D increase in pressure
- 6 The usual conditions for the Haber process are 250 atm pressure, 450 °C and an iron catalyst.
- Which change in conditions would give the reactants more energy?
- A addition of more catalyst
 - B a decrease in pressure
 - C an increase in concentration of the reactants
 - D an increase in temperature

7 How does a catalyst increase the speed of a reaction?

- A by increasing the collision frequency of particles
- B by increasing the speed of the particles
- C by increasing the temperature of the reaction
- D by lowering the activation energy

8 Which industrial reaction does **not** involve a catalyst?

- A the cracking of hydrocarbons
- B the extraction of iron from haematite in a blast furnace
- C the production of ammonia from nitrogen and hydrogen
- D the redox reaction involving the removal of combustion pollutants from car exhausts

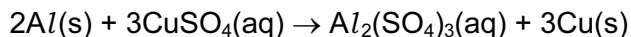
9 The following changes could be made to the conditions in the reaction between zinc and hydrochloric acid.

- 1 increase in concentration of the acid
- 2 increase in particle size of the zinc
- 3 increase in pressure on the system
- 4 increase in temperature of the system

Which pair of changes will increase the rate of reaction?

- A 1 and 2 B 1 and 4 C 2 and 3 D 3 and 4

10 Aluminium is higher than copper in the reactivity series so the following displacement reaction should be feasible.



The reaction does not take place at room temperature.

What is the reason for this?

- A Aluminium has an inert coating all over it.
- B The compound aluminium sulfate does not exist.
- C The reaction is exothermic.
- D The reaction needs to be warmed to take place.

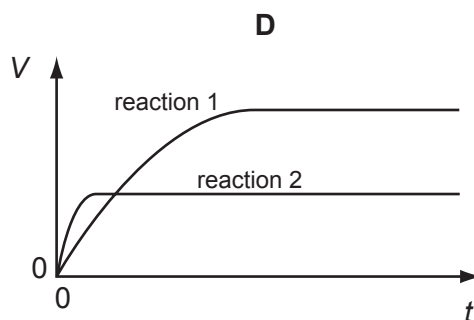
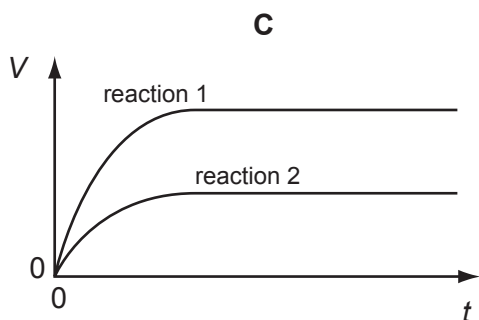
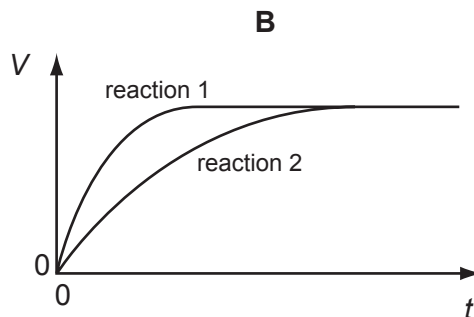
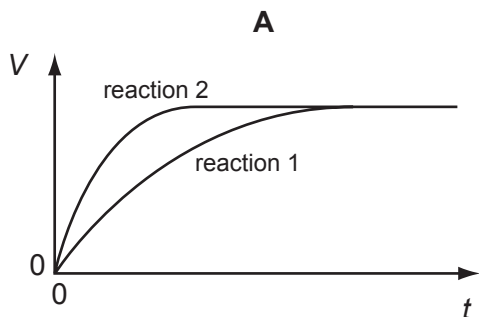
11 A student performs two reactions.

reaction 1 10 g of magnesium ribbon with excess 2.0 mol / dm³ dilute hydrochloric acid

reaction 2 5 g of magnesium powder with excess 2.0 mol / dm³ dilute hydrochloric acid

In both experiments, the volume of hydrogen produced, V, is measured against time, t, and the results plotted graphically.

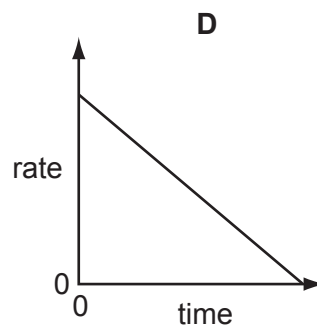
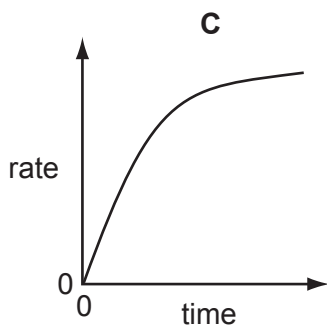
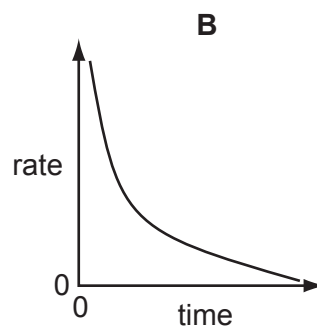
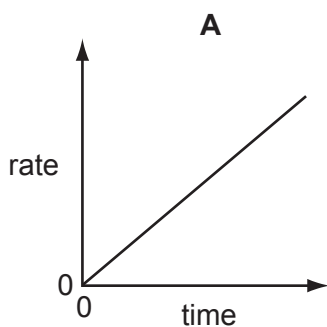
Which set of graphs is correct?



12 Which statement about catalysts is correct for a typical equilibrium reaction?

- A A catalyst can be either an inorganic or an organic species.
- B A catalyst does not take part in the reaction.
- C A catalyst only speeds up the forward reaction.
- D A catalyst provides the energy required to start a reaction.

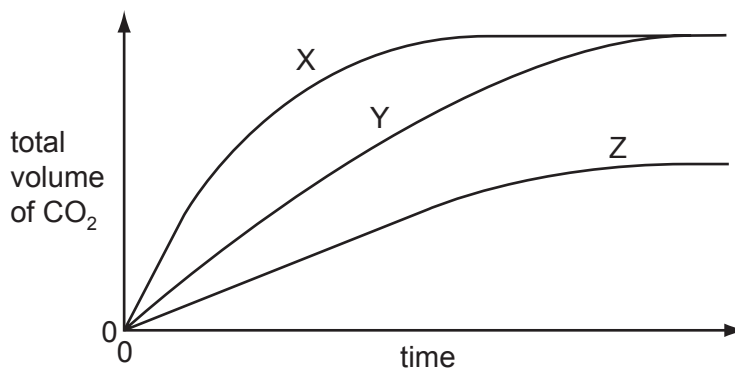
13 Which graph represents how the rate of reaction varies with time when an excess of calcium carbonate reacts with dilute hydrochloric acid?



14 In experiment 1, an excess of finely powdered marble is added to 20 cm^3 of dilute hydrochloric acid.

In experiment 2, carried out under the same conditions of temperature and pressure, an excess of marble chips is added to 20 cm^3 of dilute hydrochloric acid of the same concentration.

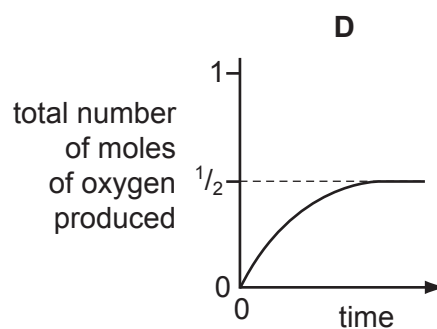
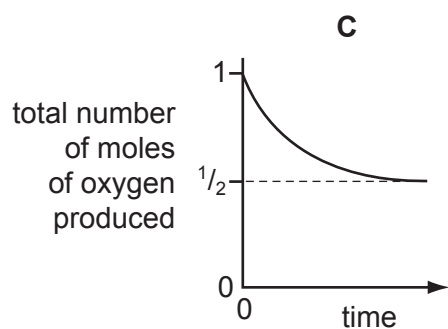
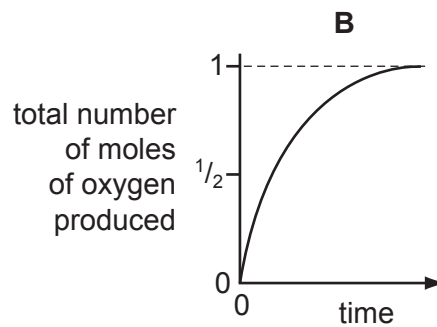
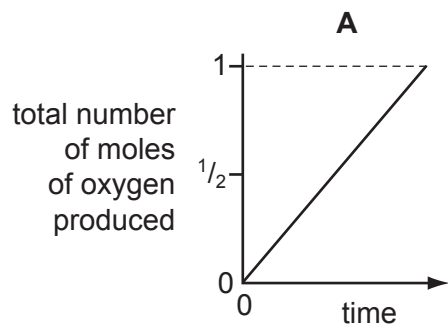
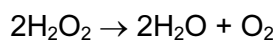
The total volumes of carbon dioxide given off are determined at intervals and plotted against time.



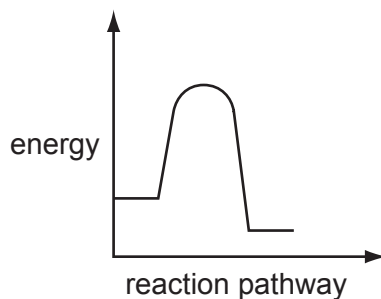
Which pair of curves is obtained in the two experiments?

	experiment 1	experiment 2
A	X	Z
B	X	Y
C	Y	Z
D	Y	X

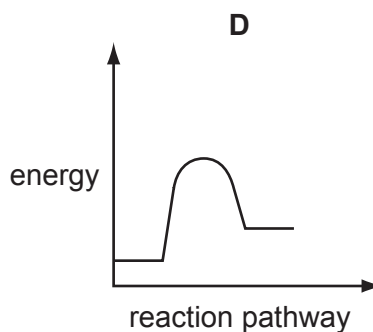
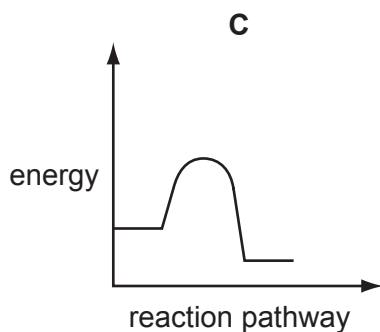
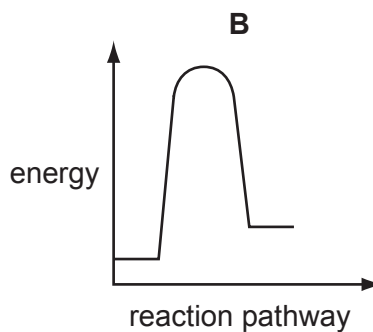
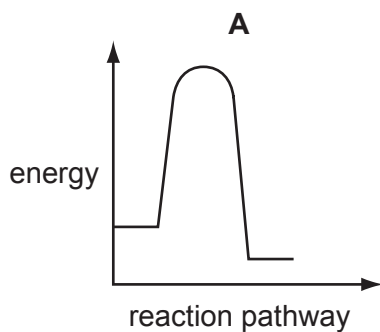
15 Which graph corresponds to the catalytic decomposition of 1 mole of hydrogen peroxide?



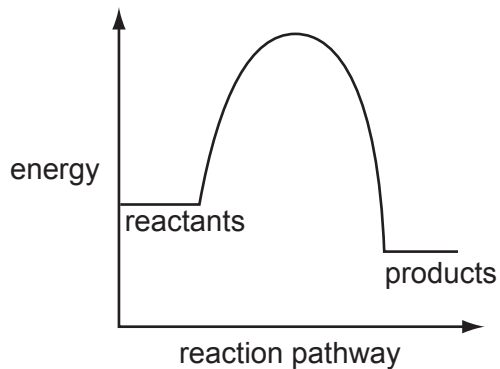
16 The diagram shows the reaction pathway for a reaction without a catalyst.



Which diagram shows the addition of a catalyst which speeds up the reaction?



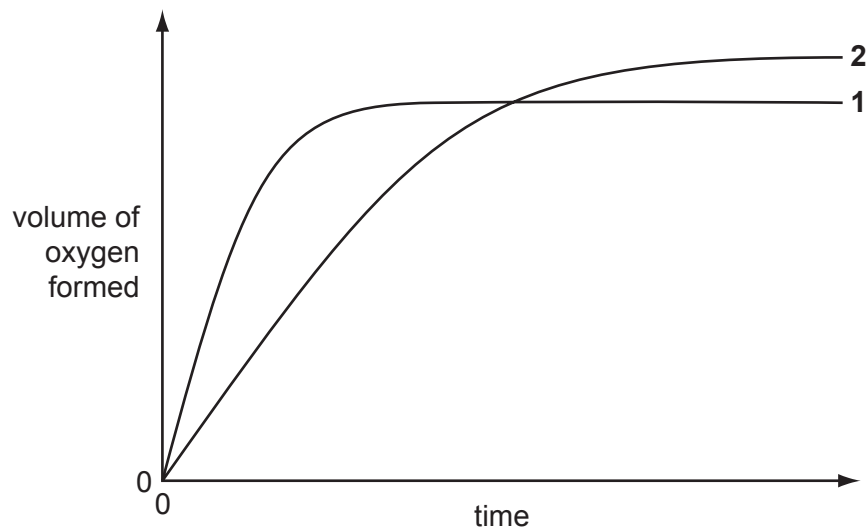
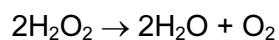
17 The diagram shows the reaction pathway for a given reaction without the use of a catalyst.



Which information correctly describes the effect of the catalyst on the activation energy and enthalpy change for the reaction?

	activation energy	enthalpy change
A	decrease	decrease
B	increase	no change
C	increase	increase
D	decrease	no change

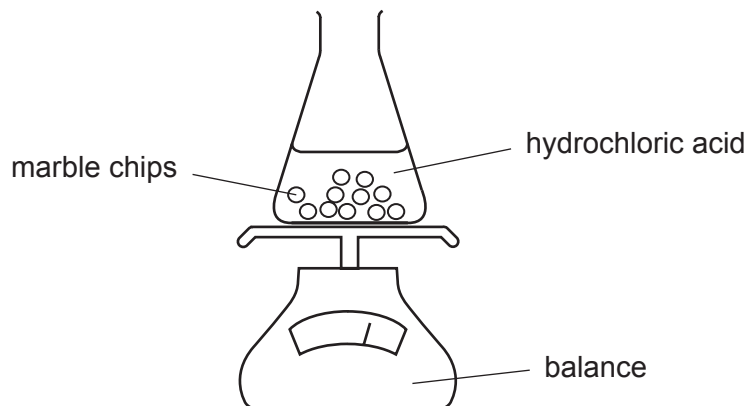
- 18 In the graph, curve **1** was obtained by observing the decomposition of 100 cm^3 of 1.0 mol/dm^3 hydrogen peroxide solution, catalysed by manganese(IV) oxide.



Which alteration to the original experimental conditions would produce curve **2**?

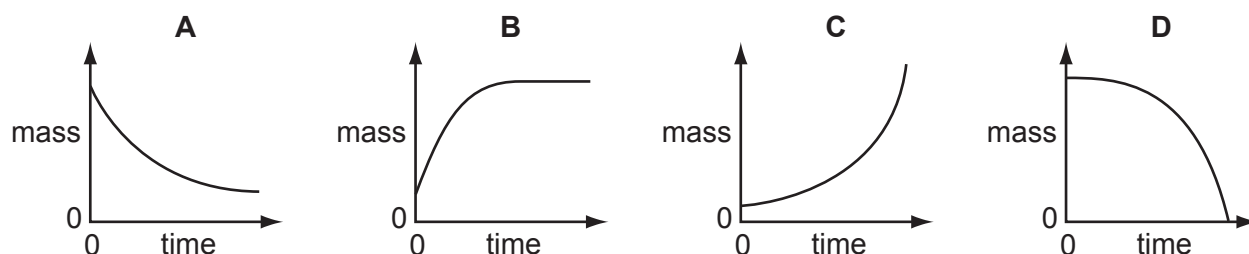
- A lowering the temperature
- B adding some 0.1 mol/dm^3 hydrogen peroxide solution
- C using less manganese(IV) oxide
- D using a different catalyst

19 A student adds marble chips to hydrochloric acid.



The mass of flask and contents is measured at regular time intervals.

Which graph shows the result?



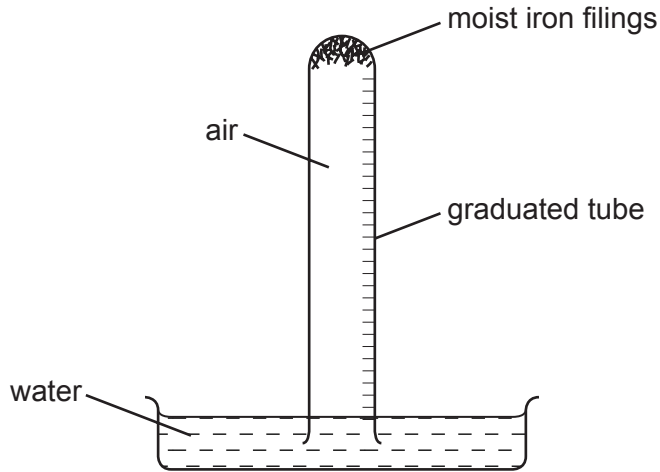
20 Carbon dioxide was produced when a given mass of zinc carbonate reacted with excess hydrochloric acid.

Which result shows what would happen if the reaction were repeated at a higher temperature?

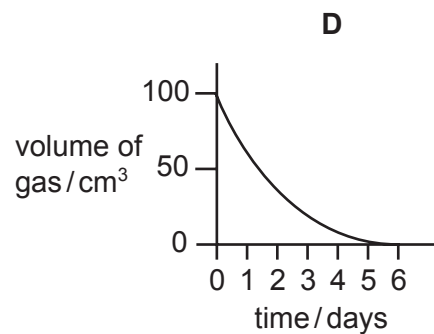
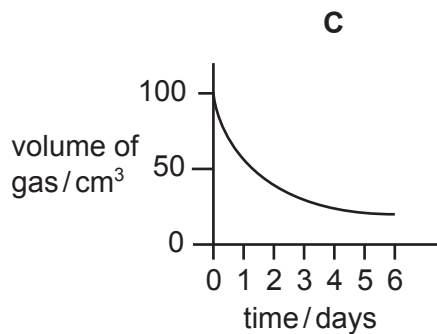
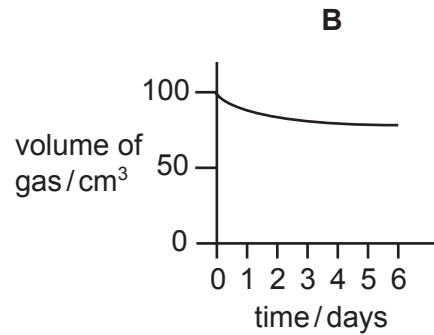
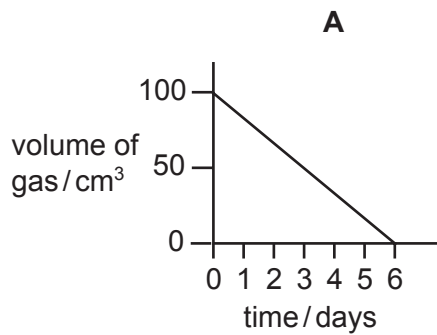
	volume of carbon dioxide	rate of reaction
A	same	faster
B	same	slower
C	greater	same
D	greater	faster

21 The apparatus shown was set up with 100 cm^3 volume of air in the tube.

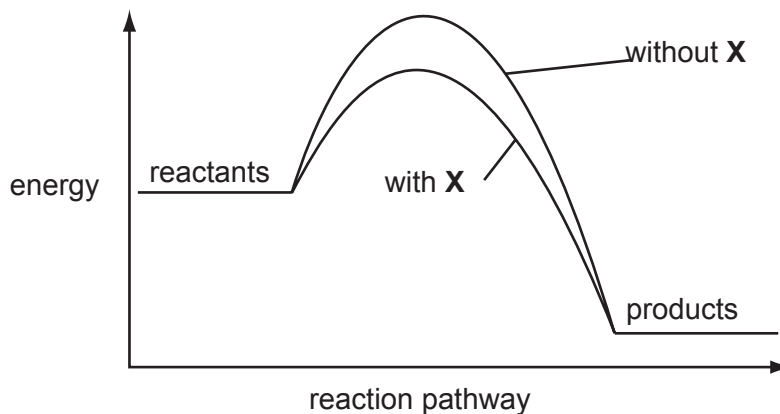
The volume of gas in the tube was measured at intervals for six days.



Which graph best represents how the volume of gas changes with time?



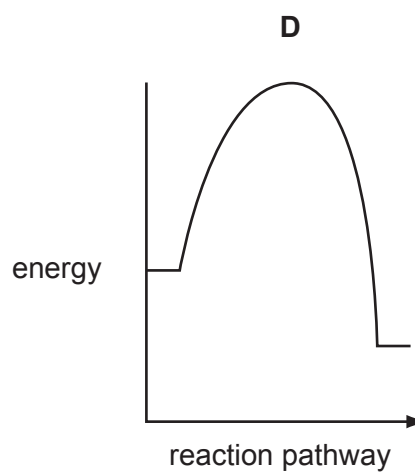
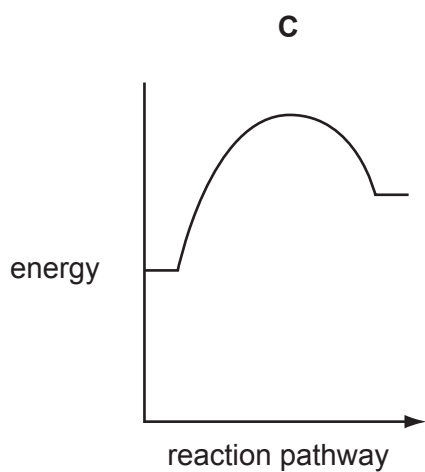
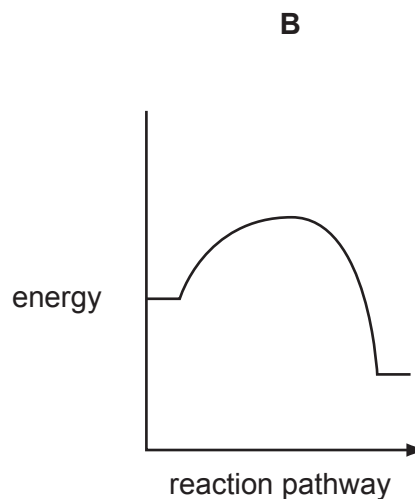
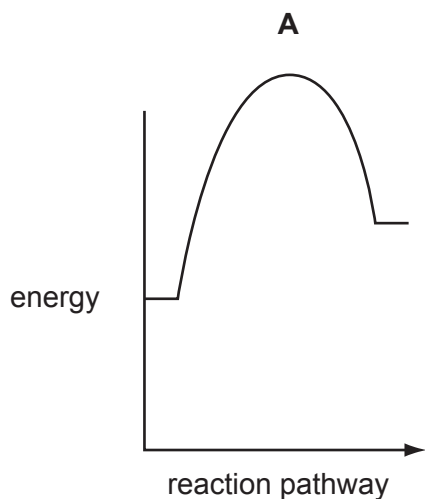
- 22 The energy profile diagrams show how adding a substance **X** to a reaction mixture changes the reaction pathway.



Which change occurs when **X** is added to the reaction mixture?

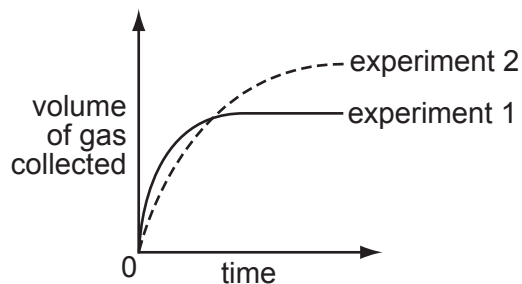
- A The rate of reaction decreases.
- B The rate of reaction increases.
- C The reaction becomes less exothermic.
- D The reaction becomes more exothermic.

23 Which reaction profile shows the fastest exothermic reaction?

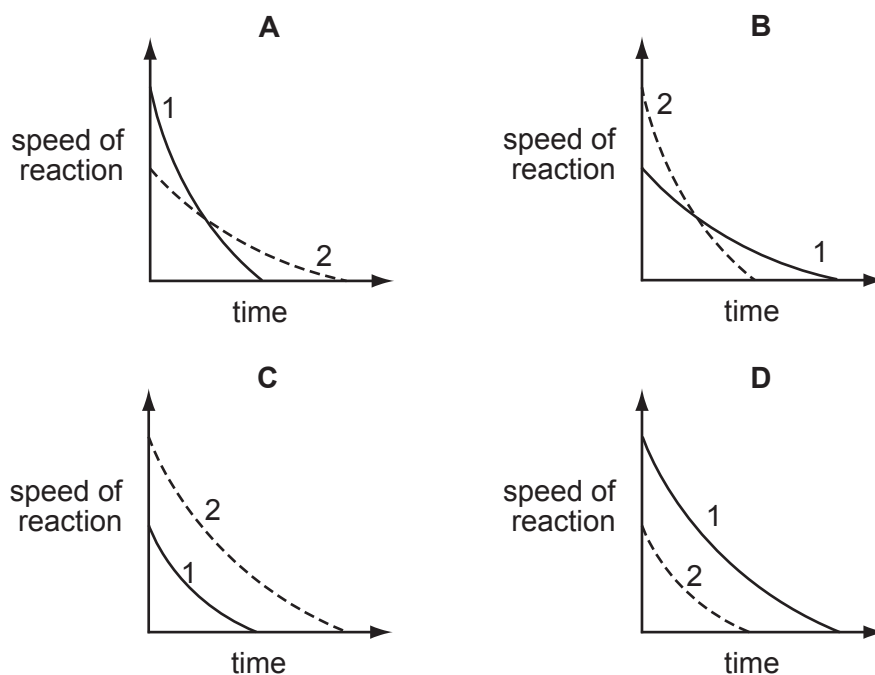


24 In two separate experiments, a substance is decomposed and the gas evolved is collected.

The graph shows the total volume of gas collected against time for each experiment.



Which graph shows how the speed of reaction varies with time in each experiment?

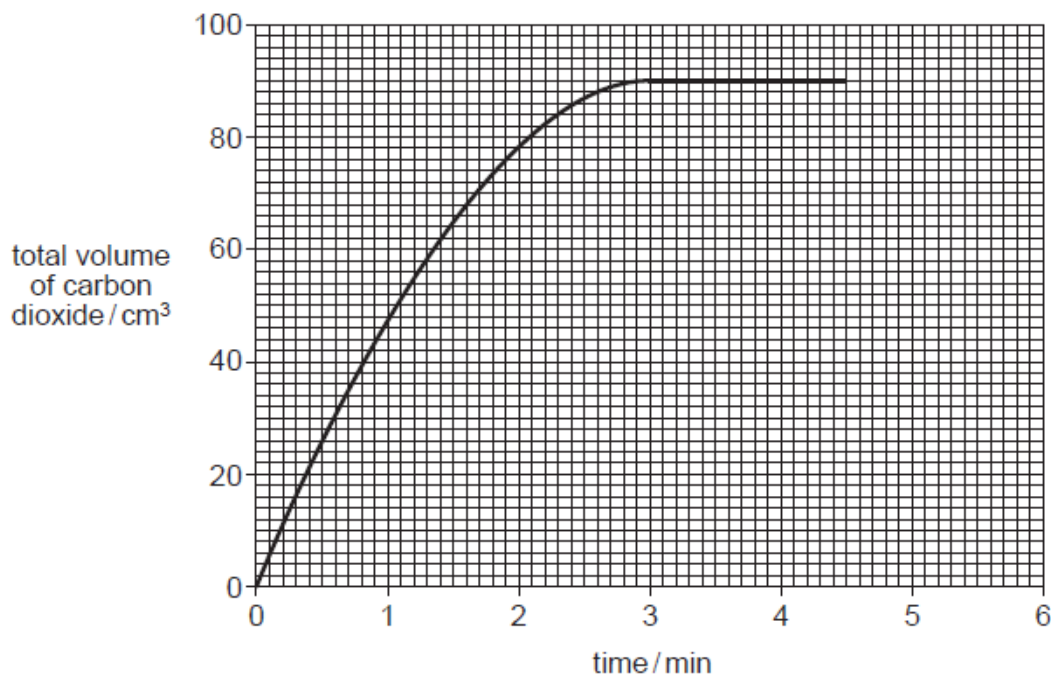


25 Which statement about catalysts is correct?

- A Catalysts are used in industry to reduce energy costs.
- B Catalysts are used up during a reaction.
- C Iron is used as a catalyst in the Contact Process.
- D Transition metals do not make good catalysts.

- 26 The rate of the reaction between a given mass of calcium carbonate and an excess of hydrochloric acid is studied by collecting the carbon dioxide in a graduated syringe.

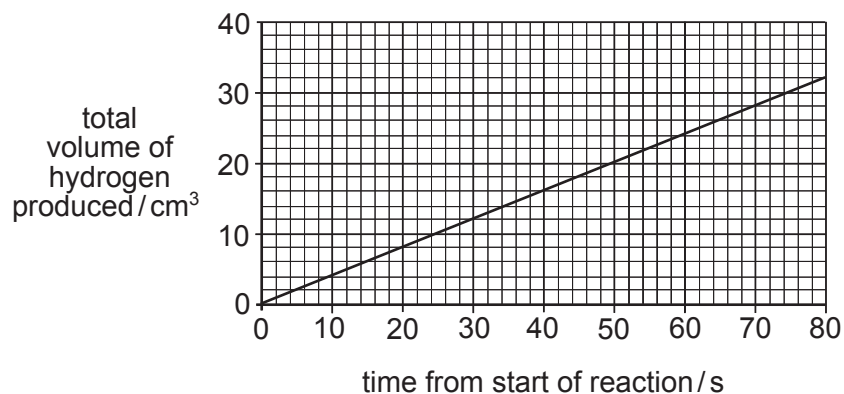
The results are shown in the graph.



How much time is required for half the calcium carbonate to react?

- A** 0.95 min **B** 1.5 min **C** 2.0 min **D** 3.0 min
- 27 Which change will increase the speed of the reaction between 1 mol of each of the gases, X and Y?
- A** a decrease in surface area of the catalyst
- B** a decrease in temperature
- C** a decrease in the volume of the reaction flask
- D** an increase in the volume of the reaction flask

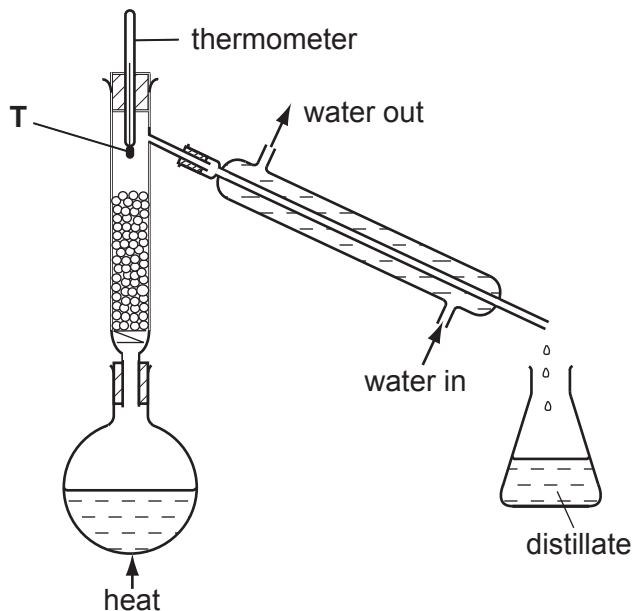
- 28 Dilute hydrochloric acid was reacted with magnesium ribbon and the volume of hydrogen gas evolved was measured for the first 80 s.



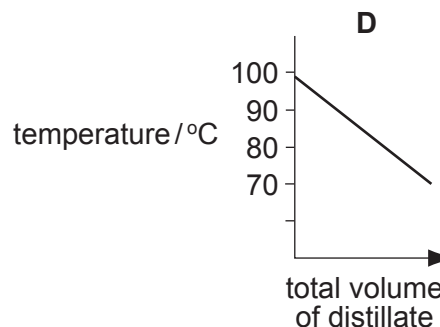
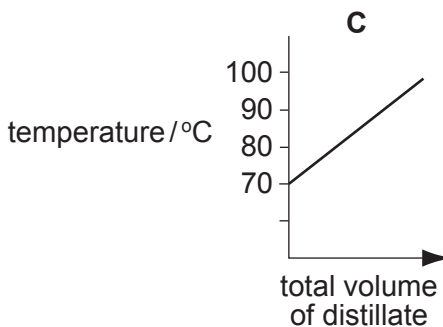
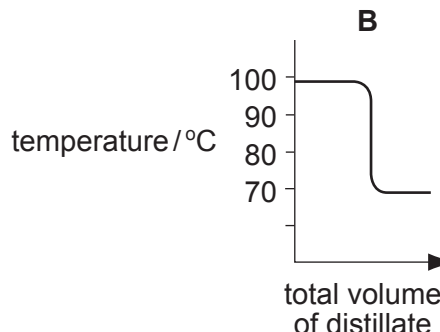
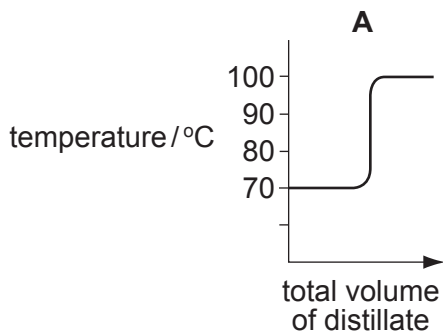
What was the average rate of production of hydrogen?

- A** 0.4 cm³/s **B** 2.5 cm³/s **C** 4 cm³/s **D** 40 cm³/s

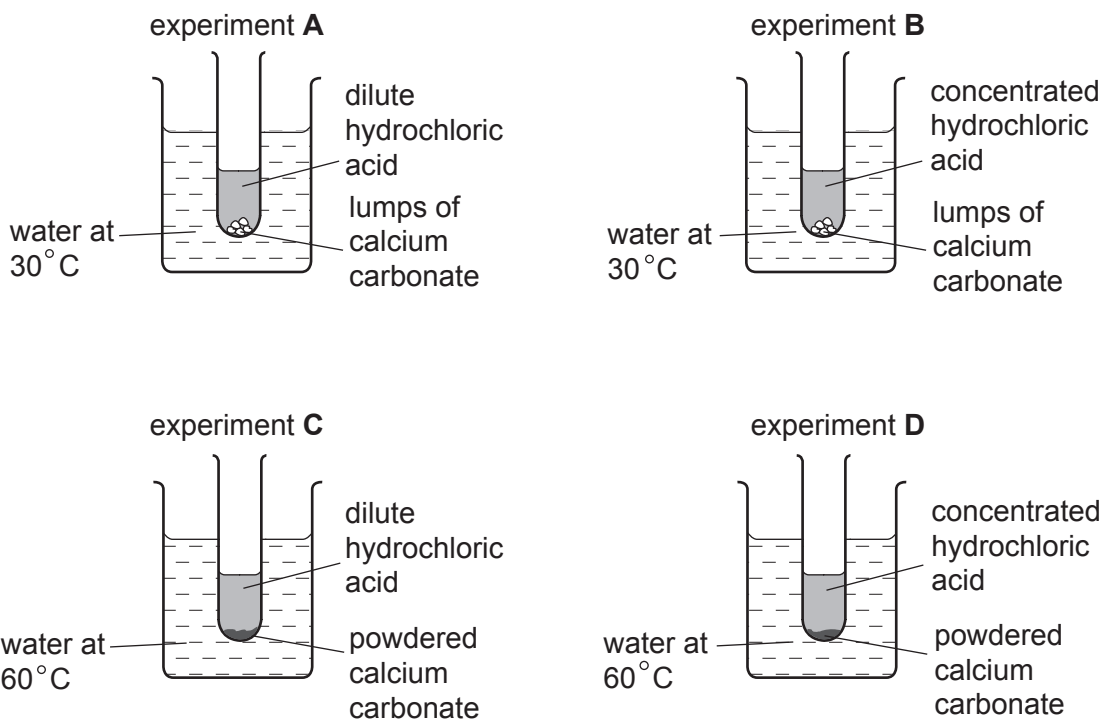
29 The diagram shows apparatus used to separate hexane (boiling point, 70°C) and heptane (boiling point, 98°C).



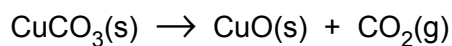
Which graph would be obtained if the temperature at point T was plotted against the total volume of distillate collected?



30 Which reaction is the fastest?



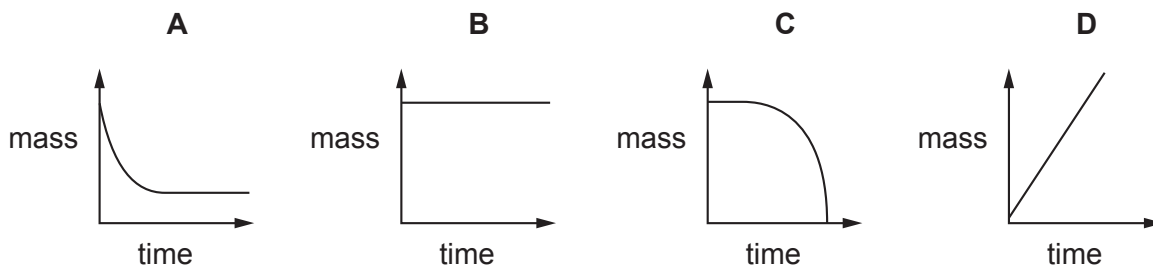
31 The equation shows the effect of heat on copper(II) carbonate.



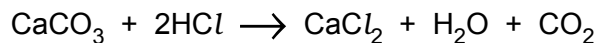
A known mass of copper(II) carbonate was placed in an open crucible and heated until no more change occurred.

The mass of the crucible and contents was weighed every minute during the heating.

Which graph shows what happens to the mass of the crucible and contents?



32 Calcium carbonate was reacted with an excess of dilute hydrochloric acid at room temperature.



Two experiments were carried out.

Experiment 1 100 g of calcium carbonate in large lumps.

Experiment 2 50 g of calcium carbonate as a fine powder.

Which of the graphs is correct?

