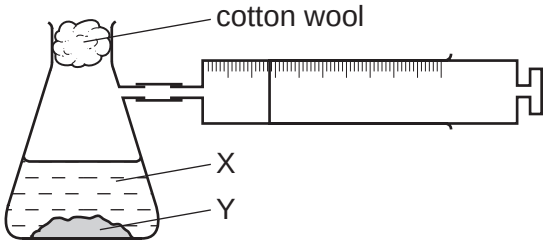
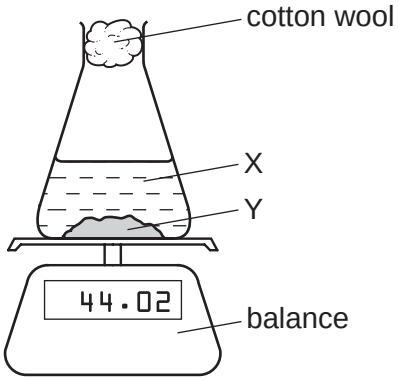
1 A liquid X reacts with solid Y to form a gas.

Which two diagrams show suitable methods for investigating the rate (speed) of the reaction?

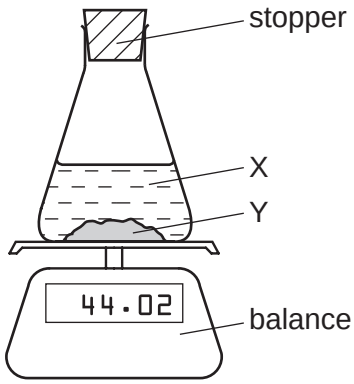
1



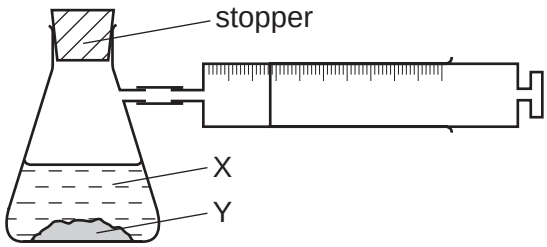
2



3



4

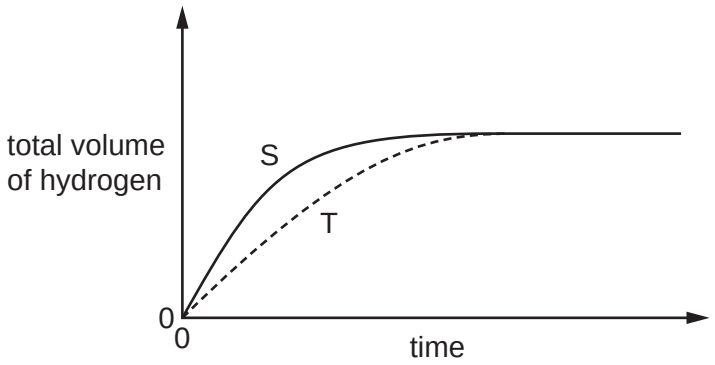


A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

2 An experiment, S, is carried out to measure the volume of hydrogen produced when excess dilute sulfuric acid is added to zinc.

A second experiment, T, is carried out using the same mass of zinc but under different conditions.

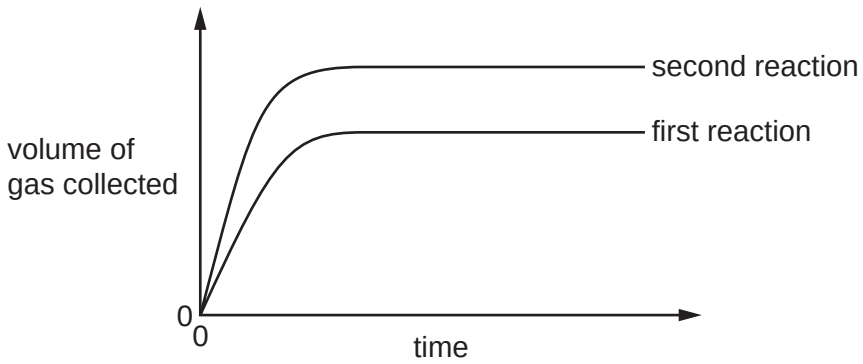
The results of the two experiments are shown.



Which changes in the conditions between experiments S and T give curve T?

	addition of a catalyst	the zinc is in large pieces not powdered
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

3 The results of two separate reactions between excess calcium carbonate and hydrochloric acid are shown.



Which statement explains the differences between the reactions?

A More calcium carbonate was used in the second reaction.

B The same volume of more concentrated acid was used in the second reaction.

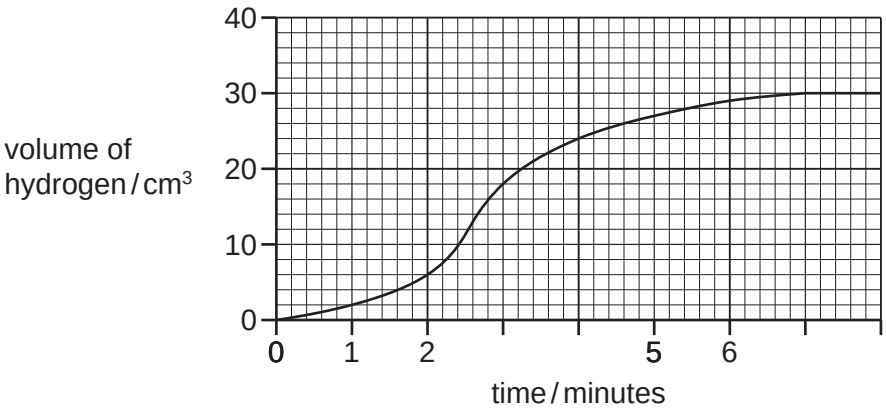
C The second reaction was allowed to react for longer.

D The temperature was higher in the second reaction.

4 Magnesium is reacted with a dilute acid.

The hydrogen gas is collected and its volume measured.

The results are shown on the graph.



Between which times was the reaction fastest?

A 0 and 1 minute

B 1 and 2 minutes

C 2 and 3 minutes

D 7 and 8 minutes

5 The effect of temperature on the rate of the reaction between marble chips and hydrochloric acid can be investigated by measuring the production of carbon dioxide.

Which item of equipment is **not** required for the investigation?

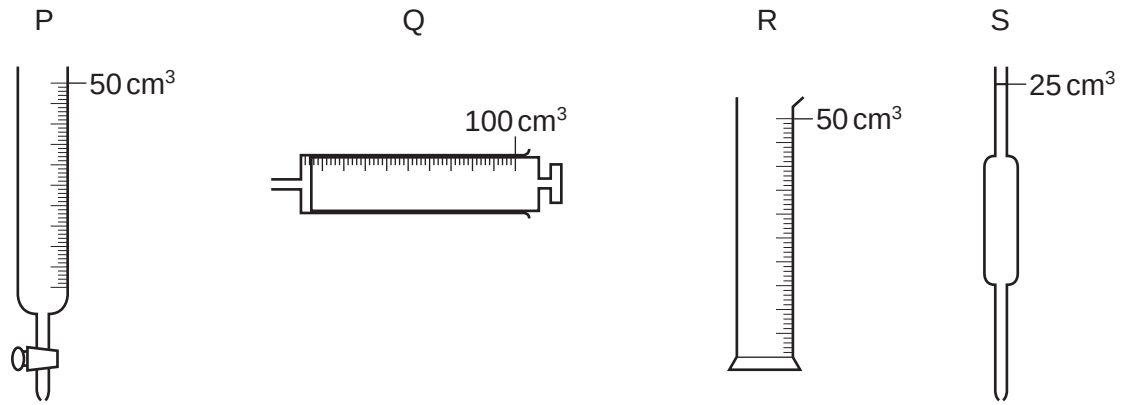
A condenser

B gas syringe

C stopclock

D thermometer

6 P, Q, R and S are pieces of apparatus.

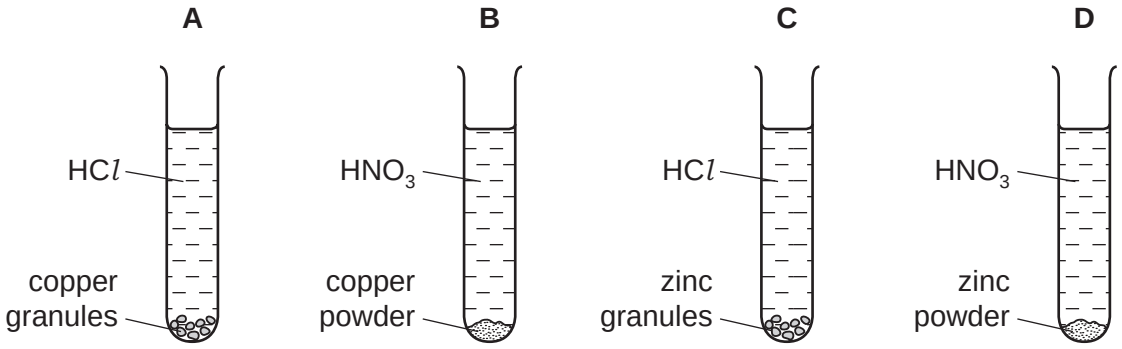


Which row describes the correct apparatus for the measurement made?

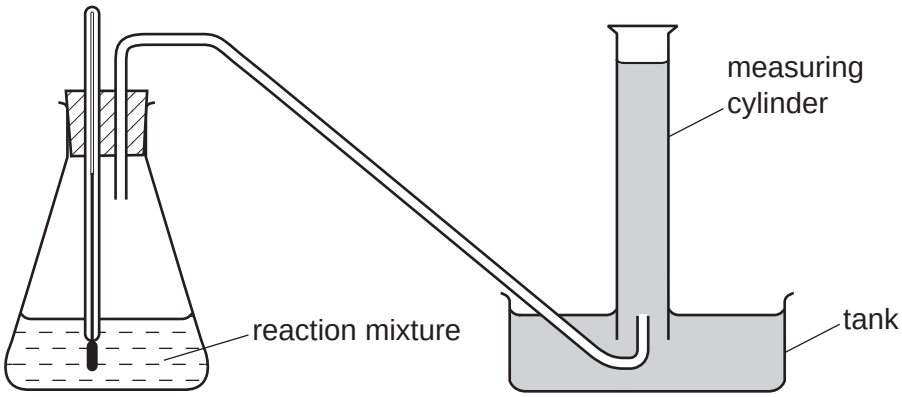
	apparatus	measurement made
A	P	the volume of acid added to alkali in a titration
B	Q	cm^3 of acid to add to calcium carbonate in a rate-determining experiment
C	R	7 cm^3 of a gas given off in a rate-determining experiment
D	S	2 cm^3 of alkali for use in a titration

7 The diagram shows four experiments in which equal volumes of aqueous acid (all in an excess) are added to equal masses of metal. Both acids have the same concentration.

In which experiment has the metal completely reacted in the shortest time?



8 The diagram shows apparatus being used to demonstrate how the rate of a chemical reaction changes with temperature.



Which statement must be correct?

A The reaction is endothermic.

B The reaction is exothermic.

C The reaction produces a gas.

D The reaction produces an acid.

9 Which of the following changes decreases the rate of the reaction between magnesium and dilute hydrochloric acid?

1 diluting the acid

2 using larger pieces of magnesium

3 cooling the mixture

A 1, 2

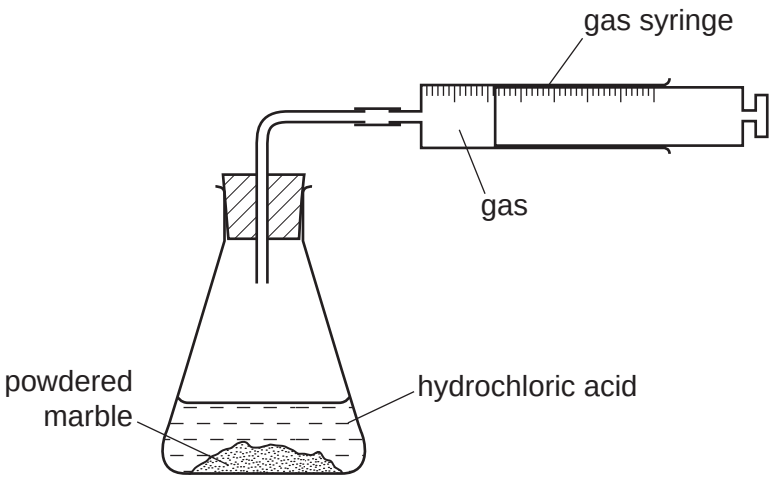
B 1 and 2 only

C 1 and 3 only

D 2 and 3 only

10 Powdered marble reacts with hydrochloric acid using the apparatus shown.

The gas syringe fills in 36 seconds.



The experiment is repeated using marble chips in place of powdered marble.

How long does it take to fill the gas syringe in this experiment?

A 9 seconds

B 18 seconds

C 36 seconds

D 72 seconds

11 A simple way of making bread includes

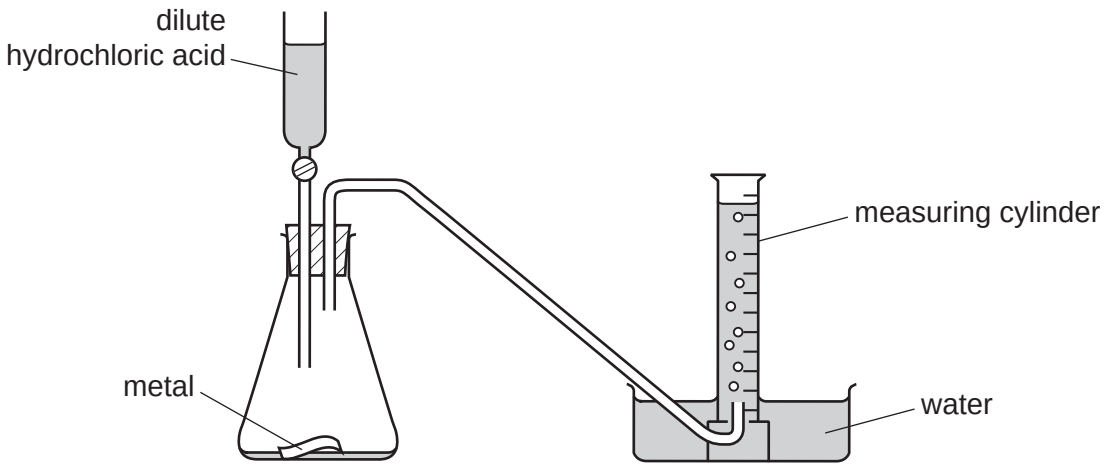
1 Mixing flour with a small amount of yeast and some water to make a ‘dough’.

2 Leaving the dough in a warm place for the yeast to act on the dough to form carbon dioxide which increases the volume of the dough.

Which factors affecting a reaction rate are involved in bread making?

	temperature	use of an enzyme
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

12 The diagram shows an experiment to measure the rate of a chemical reaction.



Which change decreases the rate of reaction?

A adding water to the flask

B heating the flask during the reaction

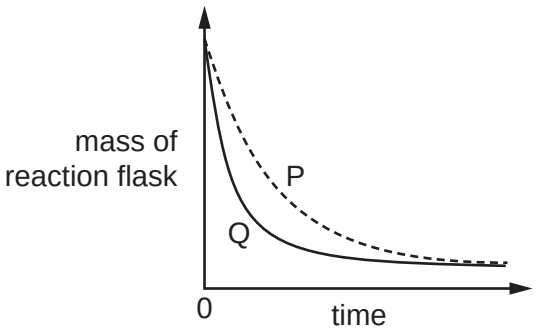
C using more concentrated acid

D using powdered metal

13 A student investigates the rate of reaction between marble chips and hydrochloric acid.

The mass of the reaction flask is measured.

The graph shows the results of two experiments, P and Q.



Which change explains the difference between P and Q?

A A catalyst is added in P.

B A higher temperature is used in P.

C Bigger marble chips are used in Q.

D Hydrochloric acid is more concentrated in Q.

14 The rate of a reaction depends on temperature, concentration, particle size and catalysts.

Which statement is **not** correct?

A Catalysts can be used to increase the rate of reaction.

B Higher concentration decreases the rate of reaction.

C Higher temperature increases the rate of reaction.

D Larger particle size decreases the rate of reaction.

15 Which changes decrease the rate of reaction between magnesium and air?

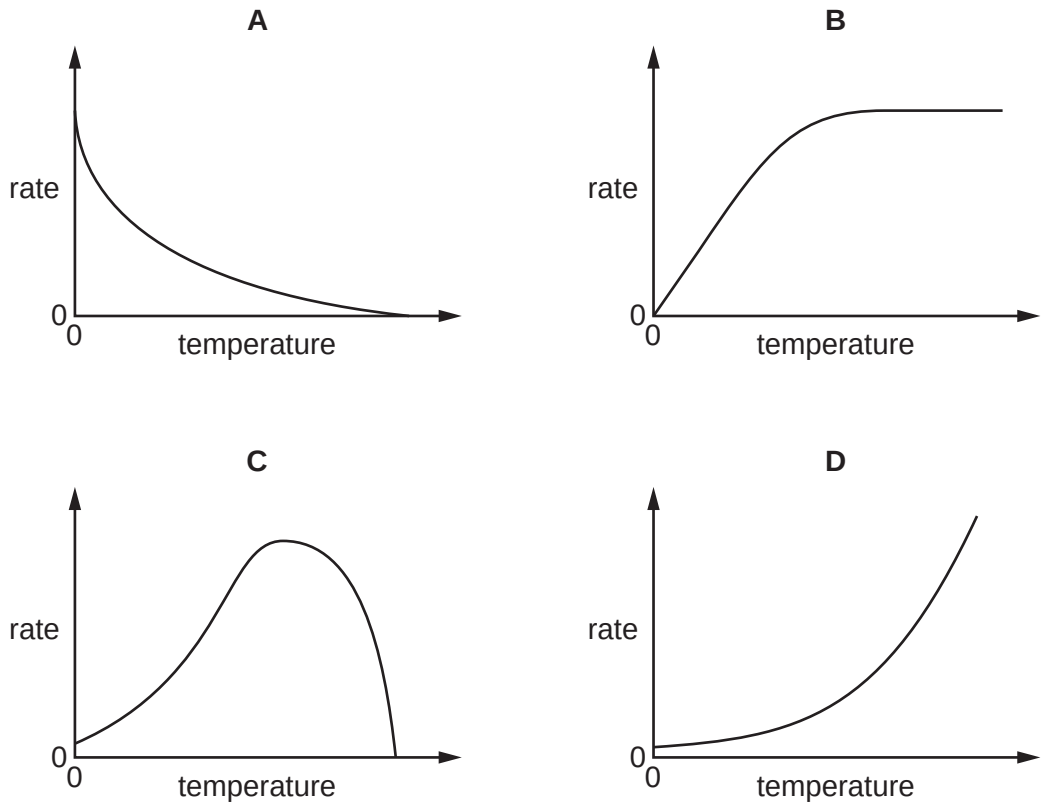
1 heating the magnesium to a higher temperature

2 using a higher proportion of oxygen in the air

3 using magnesium ribbon instead of powdered magnesium

A 1, 2 and 3 **B** 1 only **C** 2 only **D** 3 only

16 Which graph shows the effect of increasing temperature on the rate of reaction of calcium carbonate with dilute hydrochloric acid?



17 In separate experiments, a catalyst is added to a reaction mixture and the temperature of the mixture is decreased.

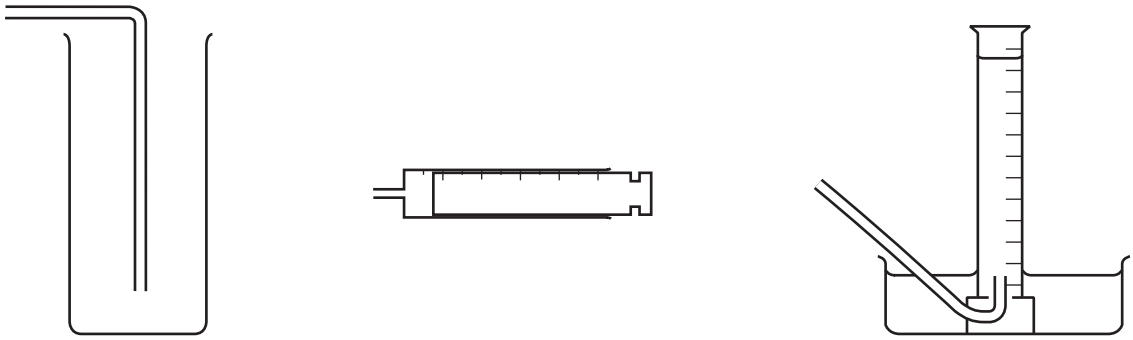
What are the effects of these changes on the rate of the reaction?

	catalyst added	temperature decreased
A	faster	faster
B	faster	slower
C	slower	faster
D	slower	slower

18 An experiment is carried out to investigate the rate of reaction when calcium carbonate is reacted with hydrochloric acid.

The volume of carbon dioxide gas given off is measured at different intervals of time.

The diagram shows pieces of apparatus used to collect gases.



1
downward delivery

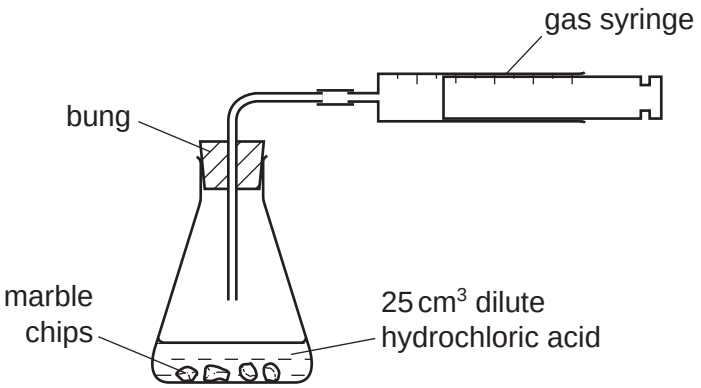
2
gas measuring syringe

3
over water in graduated tube

Which apparatus is suitable to collect and measure the volume of the carbon dioxide?

A 1, 2 and 3 **B** 2 and 3 only **C** 1 only **D** 3 only

19 A student was investigating the reaction between marble chips and dilute hydrochloric acid.

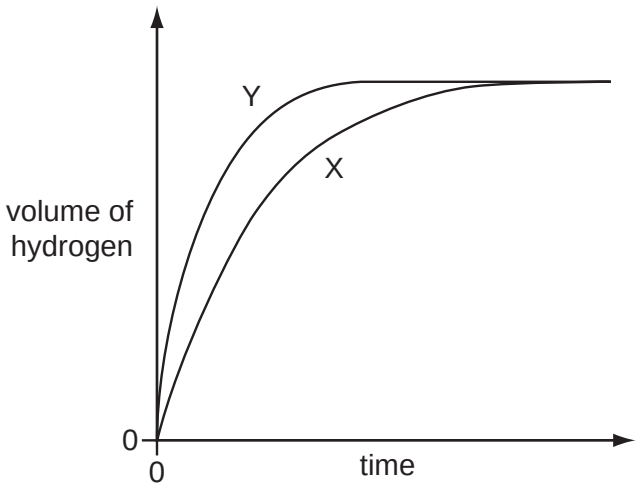


Which changes would reduce the rate of reaction?

	temperature of acid	concentration of acid	surface area of marble chips
A	decrease	decrease	decrease
B	decrease	decrease	increase
C	increase	decrease	decrease
D	increase	increase	increase

20 A student investigates the rate of reaction between zinc and an excess of sulfuric acid.

The graph shows the results of two experiments, X and Y.



Which change explains the difference between X and Y?

A A catalyst is added in Y.

B A lower temperature is used in Y.

C Larger pieces of zinc are used in Y.

D Less concentrated acid is used in Y.

21 Calcium carbonate reacts with hydrochloric acid to form carbon dioxide.

Which changes would slow this reaction down?

1 decreasing the concentration of hydrochloric acid

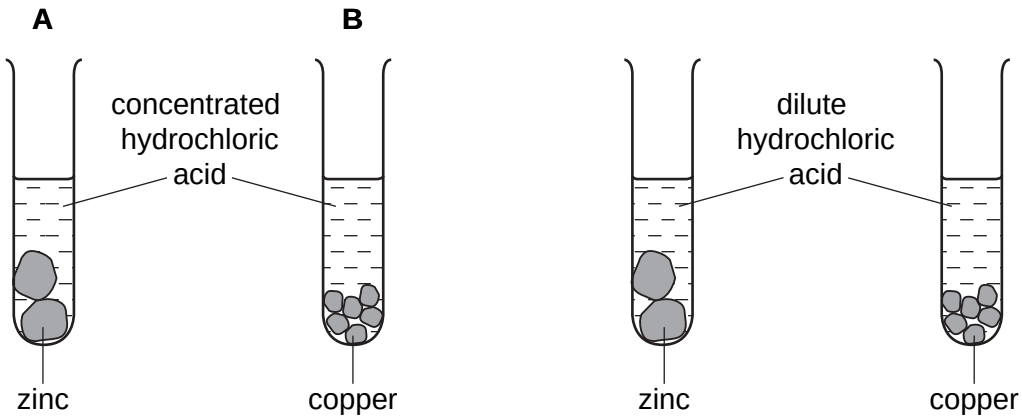
2 decreasing the particle size of calcium carbonate

3 decreasing the temperature

A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

22 The diagram shows an experiment to compare the rate of reaction when a metal is added to hydrochloric acid.

In which test-tube is the reaction fastest?



23 Which change does **not** increase the speed of reaction between zinc and hydrochloric acid?

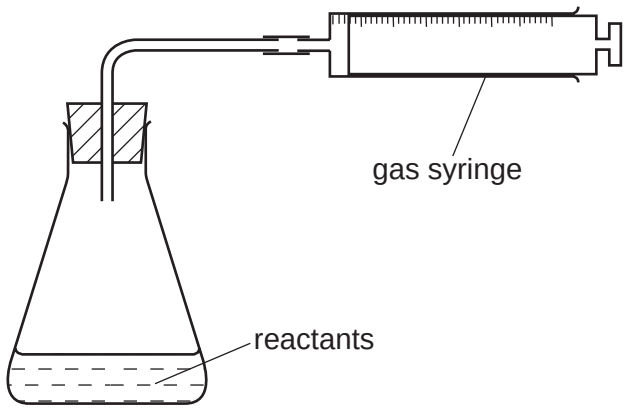
A adding a catalyst

B decreasing the particle size of the zinc

C decreasing the temperature

D using more concentrated acid

24 The apparatus shown is used to measure the speed of a reaction.



Which equation represents a reaction where the speed can be measured using this apparatus?

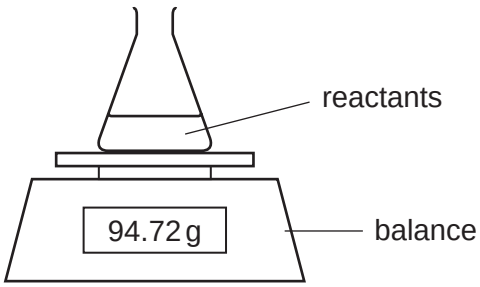
A $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$

B $HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(l)$

C $Fe(s) + CuSO_4(aq) \rightarrow Cu(s) + FeSO_4(aq)$

D $2Na(s) + Br_2(l) \rightarrow 2NaBr(s)$

25 The rates of some chemical reactions can be measured by using the apparatus shown.



For which reaction is this apparatus suitable?

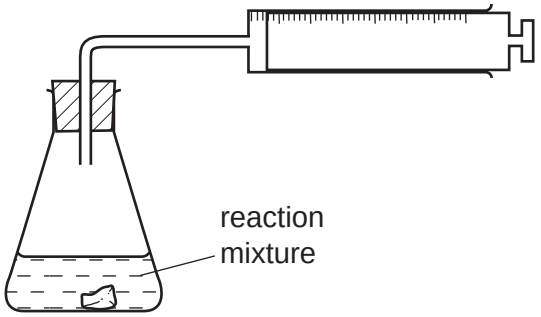
A $MgCO_3 + 2HCl \rightarrow MgCl_2 + CO_2 + H_2O$

B $Mg + ZnCl_2 \rightarrow MgCl_2 + Zn$

C $MgCl_2 + 2NaOH \rightarrow Mg(OH)_2 + 2NaCl$

D $MgO + 2HCl \rightarrow MgCl_2 + H_2O$

26 An experiment to determine the rate of a chemical reaction could be carried out using the apparatus shown.



Which reaction is being studied?

A $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

B $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

C $NaCl + AgNO_3 \rightarrow NaNO_3 + AgCl$

D $NaOH + HCl \rightarrow NaCl + H_2O$

27 Copper(II) carbonate reacts with dilute sulfuric acid.

$$CuCO_3(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + CO_2(g) + H_2O(l)$$

The speed of the reaction can be changed by varying the conditions.

Which conditions would always increase the speed of this chemical reaction?

1 Increase the concentration of the reactants.

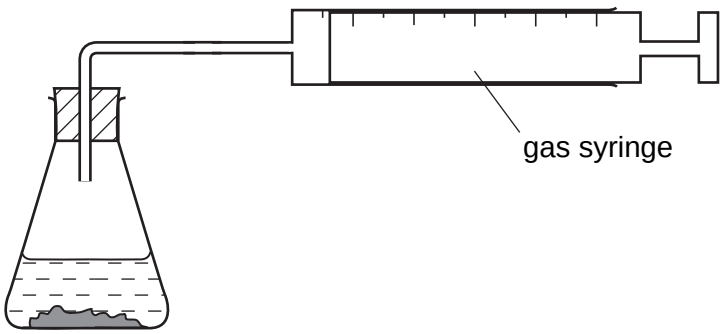
2 Increase the size of the pieces of copper(II) carbonate.

3 Increase the temperature.

4 Increase the volume of sulfuric acid.

A 1, 3 **B** 1 and 3 only **C** 2 and 3 **D** 3 and 4 only

28 The apparatus shown can be used to measure the rate of some chemical reactions.



For which two reactions would the apparatus be suitable?

reaction 1 $AgNO_3(aq) + HCl(aq) \rightarrow AgCl(s) + HNO_3(aq)$

reaction 2 $2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$

reaction 3 $MgO(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2O(l)$

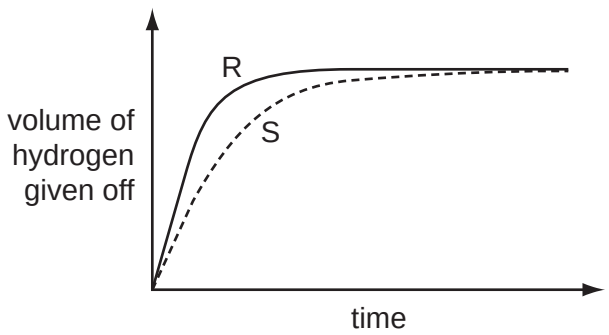
reaction 4 $ZnCO_3(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + CO_2(g) + H_2O(l)$

A 1 and 2 **B** 1 an **C** 2 and 4 **D** 3 and 4

29 A student investigates the rate of reaction between magnesium and excess sulfuric acid.

The volume of hydrogen given off in the reaction is measured over time.

The graph shows the results of two experiments, R and S.



Which change in conditions would cause the difference between R and S?

A A catalyst is added in S.

B The acid is more concentrated in R than in S.

C The magnesium is less finely powdered in R than in S.

D The temperature in R is lower than in S.

30 Calcium carbonate was reacted with hydrochloric acid in a conical flask. The flask was placed on a balance and the mass of the flask and contents was recorded as the reaction proceeded.

During the reaction, carbon dioxide gas was given off.

The reaction was carried out at two different temperatures.

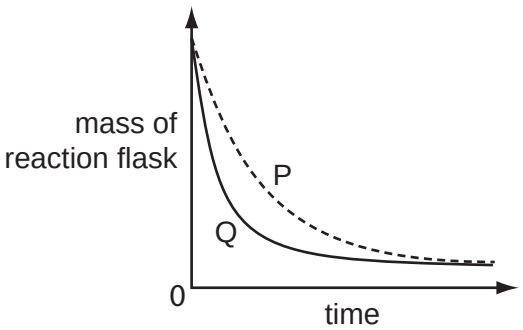
Which row is correct?

	change in mass	temperature at which mass changed more quickly
A	decrease	higher temperature
B	decrease	lower temperature
C	increase	higher temperature
D	increase	lower temperature

31 A student investigates the rate of reaction between marble chips and hydrochloric acid.

The loss in mass of the reaction flask is measured.

The graph shows the results of two experiments, P and Q.



Which change explains the difference between P and Q?

A A catalyst is added in P.

B A higher temperature is used in P.

C Bigger marble chips are used in Q.

D Hydrochloric acid is more concentrated in Q.

32 Which change does **not** increase the speed of reaction between zinc and hydrochloric acid?

A adding a catalyst

B decreasing the temperature

C decreasing the particle size of the zinc

D using more concentrated acid

33 Which does **not** increase the speed of a reaction?

A adding a catalyst

B increasing the concentration of one of the reactants

C increasing the particle size of one of the reactants

D increasing the temperature