

Equations

Question paper 2

Level	GCSE
Subject	Chemistry
Exam Board	CCEA
Topic	Symbols, Formulae and Equations
Sub-Topic	Equations
Booklet	Question paper 2

Time Allowed: 62 minutes

Score: /51

Percentage: /100

HIGHER TIER

1 Acids and alkalis react together to form a salt and water.

(a) The following experiment was carried out to determine if the reaction between hydrochloric acid and sodium hydroxide was exothermic.

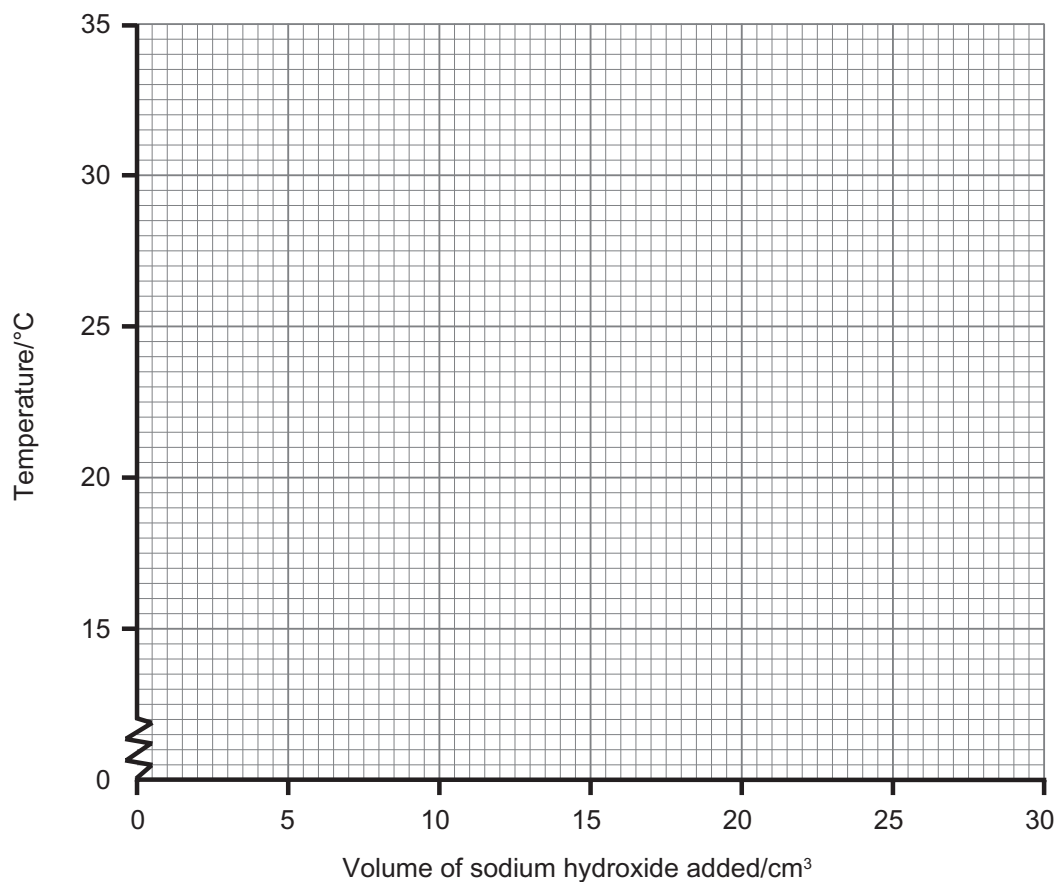
- 25 cm³ of 1.0 mol/dm³ hydrochloric acid were measured out and placed in a polystyrene cup.
- The temperature of the hydrochloric acid was recorded.
- 25 cm³ of 1.0 mol/dm³ sodium hydroxide solution were then added gradually in 5 cm³ portions to the hydrochloric acid, stirring after each addition.

The temperature of the reaction mixture was recorded and the results are shown in the table below.

Volume of sodium hydroxide added/cm³	0	5	10	15	20	25
Temperature of reaction mixture/°C	20.5	21.5	22.5	23.5	25.5	28.0

(i) On the axes opposite, plot a graph of temperature against volume of sodium hydroxide added using the results in the table above.

Examiner Only	
Marks	Remark



[3]

(ii) How does your graph prove that this reaction is exothermic?

[1]

(iii) Apart from exothermic, what other term is used to describe the type of reaction between an acid and an alkali?

[1]

(iv) Write a balanced symbol equation for the reaction between sodium hydroxide and hydrochloric acid.

[2]

Examiner Only	
Marks	Remark

(b) The salt potassium sulfate is widely used as a fertiliser and in the manufacture of glass.

(i) Describe the steps which should be taken to prepare pure, dry crystals of potassium sulfate from the reaction between sulfuric acid and potassium hydroxide solution using a named indicator.

[6]

Examiner Only	
Marks	Remark

- (ii) Write a balanced symbol equation for the reaction between potassium hydroxide and sulfuric acid.

_____ [3]

Examiner Only	
Marks	Remark
Total Question 4	

2 Fireworks contain the three ingredients shown in the box below.

colouring agent fuel oxidiser

(a) Magnesium is often used in fireworks as the colouring agent.

(i) What is the colour of the flame observed when magnesium burns?

_____ [1]

(ii) Write a balanced symbol equation for magnesium burning in air.

_____ [3]

(b) Carbon in the form of charcoal is often used as the fuel in fireworks.

(i) What is observed when a sample of carbon burns?

 _____ [2]

(ii) Name the product formed when carbon burns in a limited supply of oxygen.

_____ [1]

Examiner Only	
Marks	Remark

- (c) Oxidisers provide the oxygen needed to allow the firework to burn effectively. A common oxidiser is potassium nitrate, which thermally decomposes to produce potassium oxide, nitrogen and oxygen.

Write a balanced symbol equation for this reaction.

_____ [3]

- (d) Sparklers are hand held fireworks which contain a fuel, an oxidiser and iron powder. Often the iron powder is mixed with linseed oil to prevent it rusting.

(i) What conditions are required for iron to rust?

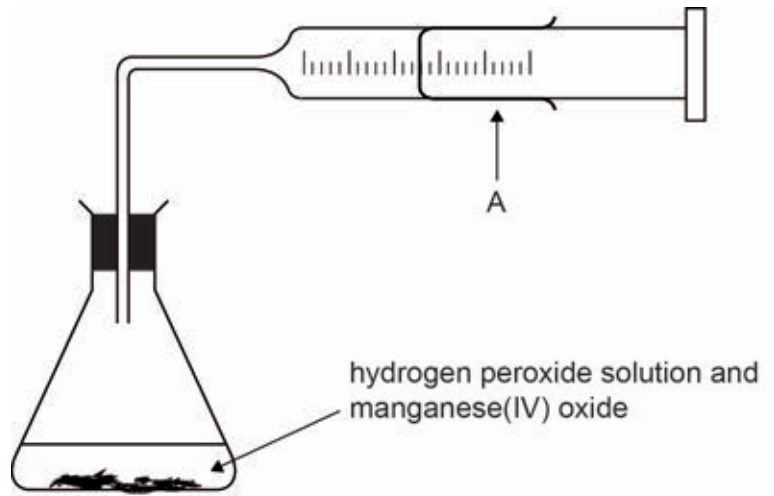
_____ [2]

(ii) What is the chemical name for rust?

_____ [2]

Examiner Only	
Marks	Remark

- 3 (a) The rate of decomposition of a solution of hydrogen peroxide using manganese(IV) oxide (manganese dioxide) can be measured using the apparatus shown below. The manganese(IV) oxide is a catalyst for the reaction.



© CCEA

- (i) Name the piece of apparatus labelled A.

_____ [1]

- (ii) What is meant by the term catalyst?

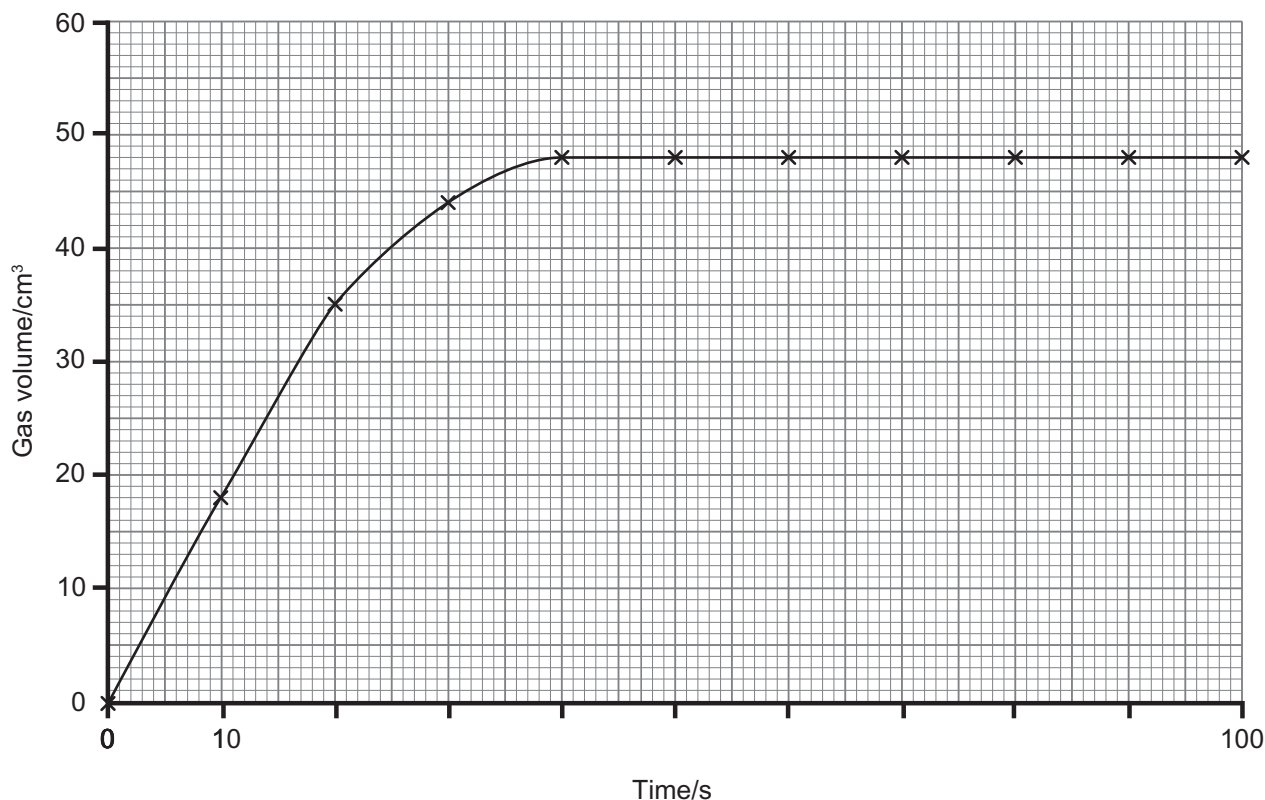
 _____ [3]

- (iii) Write a balanced symbol equation for the decomposition of hydrogen peroxide.

_____ [3]

Examiner Only	
Marks	Remark

- (b) The graph below shows data obtained at 25 °C using 25.0 cm³ of 0.16 mol/dm³ hydrogen peroxide solution with 1.0 g of solid powdered manganese(IV) oxide.



- (i) Apart from the apparatus shown in the diagram in part (a), name one other piece of equipment which would be required to collect the results used to draw the graph.

_____ [1]

- (ii) What was the total volume of gas collected?

_____ [1]

- (iii) The reaction was repeated at 40 °C with all other factors being kept the same. Sketch the graph you would expect to obtain on the axes above. [3]

Examiner Only	
Marks	Remark

- (c) The table below shows the time taken for the decomposition of hydrogen peroxide solution to be completed. 25.0 cm³ of 0.16 mol/dm³ hydrogen peroxide solution was used with 1.0 g of different powdered metal oxides as catalysts.

Metal oxide	Time for decomposition to be completed/s	Rate of decomposition/s ⁻¹ rate = $\left(\frac{1}{\text{time}}\right)$
Manganese(IV) oxide		
Copper(II) oxide	127	0.00787
Zinc oxide	360	0.00277

- (i) Using the graph at 25 °C in part (b), complete the table above. [2]
- (ii) State which of the metal oxides in the table is the **least** effective catalyst and explain your answer.

[2]

Examiner Only	
Marks	Remark
Total Question 2	