



## New Document 1

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

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Time: **40 minutes**

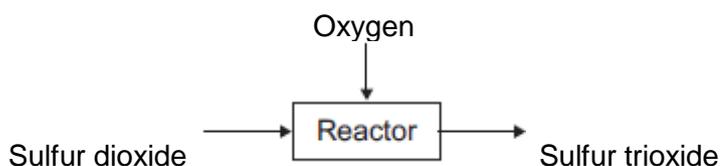
Marks: **40 marks**

Comments:

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**Q1.**

(a) The figure below represents the reaction of sulfur dioxide with oxygen.



(i) Complete the word equation for the reaction of sulfur dioxide with oxygen.

sulfur dioxide + \_\_\_\_\_ → \_\_\_\_\_

(1)

(ii) Draw a ring around the correct answer to complete the sentence.

Sulfur dioxide (SO<sub>2</sub>) is

a compound.
an element.
a mixture.

(1)

(b) The reactants are gases.

When the pressure of the gases is increased, the reaction gets faster.

Complete the sentence.

When the pressure of the gases is increased,  
the frequency of the collisions \_\_\_\_\_.

(1)

(c) The particles need energy to react.

Complete the sentence.

The minimum amount of energy that particles need to react is called  
the \_\_\_\_\_ energy.

(1)

(d) Give **one** way of increasing the rate of the reaction other than changing the pressure.

\_\_\_\_\_  
\_\_\_\_\_

(1)

(Total 5 marks)

**Q2.**

Hydrogen fluoride is used to make hydrofluoric acid.

- (a) A company makes hydrogen fluoride by reacting solid calcium fluoride with sulfuric acid. The reaction takes place in a rotating kiln.



The company want this reaction to take place quickly.

- (i) Rotating the kiln makes the reaction take place faster.

Suggest why.

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(1)

- (ii) Draw a ring around the correct word in each box.

To make the reaction take place **faster**:

the temperature should be 

higher
lower

 so that the particles have 

less
more

 energy

the solid calcium fluoride should be 

powder
lumps

 to give a 

small
big

 surface area

the sulfuric acid solution should be 

dilute
concentrated

 to give 

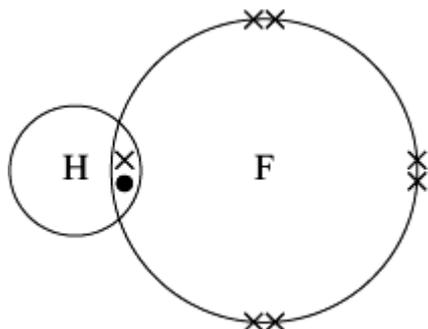
less
more

 collisions

between the particles each second.

(3)

- (b) The diagram represents a molecule of hydrogen fluoride.



The hydrogen and fluorine atoms are joined by a covalent bond.

Use the correct word from the box to complete the sentence.

<b>electrons</b>	<b>neutrons</b>	<b>protons</b>
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In a covalent bond the atoms share \_\_\_\_\_ .

(1)

- (c) Hydrogen fluoride is dissolved in water to make an acidic solution of hydrofluoric acid.

Draw a ring around the symbol of the ion that makes the solution acidic.

$H^+$

$OH^-$

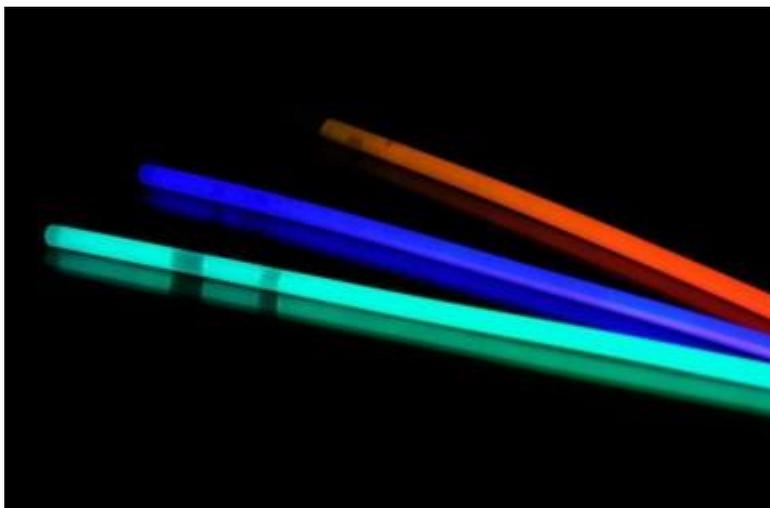
$F^-$

(1)

(Total 6 marks)

### Q3.

The picture shows three glowsticks.



Photograph supplied by iStockphoto/Thinkstock

Glow sticks contain several chemicals. When a glow stick is bent the chemicals mix. A chemical reaction takes place which causes light to be given out.

A student investigated three glow sticks. One was placed in water at 5 °C, one in water at 40 °C and one in water at 70 °C.

The results are shown in the table.

Temperature in °C	Effect on glow stick	
	Brightness of light	Time it gave out light, in hours
5	dim	7
40	bright	3
70	very bright	1

(a) How did increasing the temperature affect the brightness of the glow stick?

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(1)

(b) How did increasing the temperature affect the time it gave out light?

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(1)

(c) The student was asked why an **increase** in temperature changes the rate of the chemical reaction. The student listed five ideas. Only **three** of them are correct.

Put ticks (✓) next to the **three** correct ideas.

Ideas	Ticks (✓)
The particles will collide more often.	
The particles will be more concentrated.	
The particles will move faster.	
The particles will have more energy.	
The particles will get bigger.	

(3)

(d) Suggest **one** way the student could improve this investigation.

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(1)

(Total 6 marks)

**Q4.**

This label was on a bottle of stain remover.

# Simply Amazing

*Super Stain Remover*

*Removes stains caused by grass, blood, mould etc.*

## Instructions

Mix Simply Amazing with hot water and pour onto the stained areas. The hotter the water the stronger the cleaning power.

After 30 minutes rinse with water and then allow to dry.



When 'Simply Amazing' is mixed with water a reaction takes place which produces bubbles of oxygen gas.

- (i) Suggest a method that you could use to measure how quickly this reaction takes place.

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(2)

- (ii) Read the instructions on the label and then suggest how increasing the temperature of the water affects the rate of this reaction.

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(1)

- (iii) Suggest **one** other way in which the rate of a reaction can be changed.

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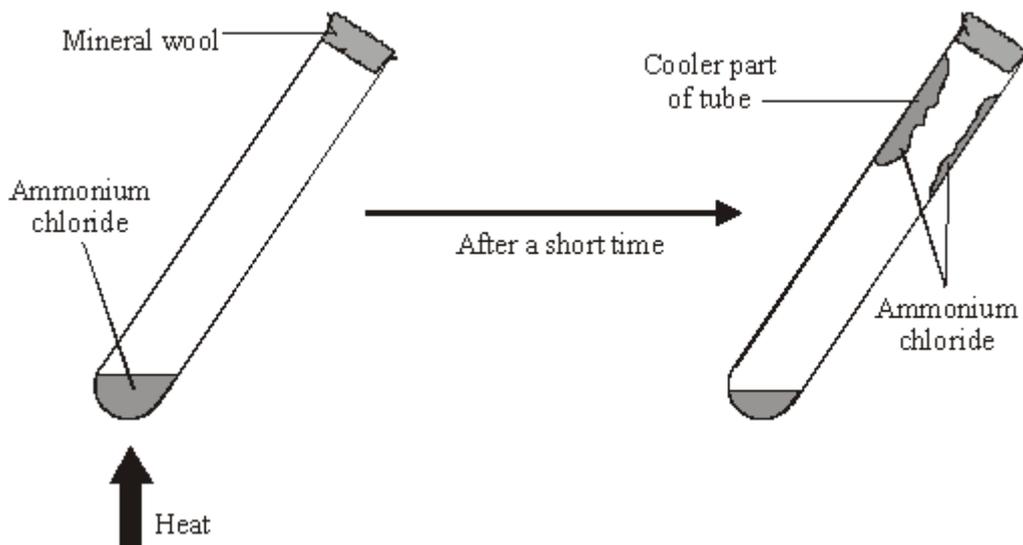
(1)

(Total 4 marks)

Q5.

A student did two experiments using ammonium chloride.

- (a) In the first experiment the student heated a small amount of ammonium chloride in a test tube.



Two reactions take place in the test tube.

Reaction 1	$\text{ammonium chloride} \rightarrow \text{ammonia} + \text{hydrogen chloride}$ (colourless gases)
Reaction 2	$\text{ammonia} + \text{hydrogen chloride} \rightarrow \text{ammonium chloride}$

- (i) Complete the sentences by crossing out the **incorrect** word in each box.

Reaction 1 takes place at a 

high
low

 temperature.

Reaction 2 takes place at a 

high
low

 temperature.

(1)

- (ii) Draw a ring around the word which best describes reactions 1 and 2.

**combustion   displacement   oxidation   reduction   reversible**

(1)

- (iii) Suggest a reason for the mineral wool at the top of the test tube.

\_\_\_\_\_

\_\_\_\_\_

(1)

- (b) In the second experiment the student mixed a small amount of ammonium chloride with some water in a beaker.

The temperature of the water was measured before and after adding the ammonium chloride.

Temperature before adding the ammonium chloride	20°C
Temperature after adding the ammonium chloride	16°C

Draw a ring around the word which best describes the process which takes place.

combustion      displacement      endothermic      exothermic      freezing

(1)

(Total 4 marks)

**Q6.**

- (a) You may find the Data Sheet helpful to complete the word equation.

These two gases react as shown in the balanced symbol equation.



Complete the word equation for this reaction.

hydrogen + \_\_\_\_\_ → \_\_\_\_\_

(2)

- (b) Complete this sentence by crossing out the **two** words in the box that are wrong.

catalyst
molecule
solution

This chemical reaction is much faster if a molecule if a \_\_\_\_\_ is used.

(1)

(Total 3 marks)

**Q7.**

- (a) The symbol equation for the decomposition of hydrogen peroxide is:

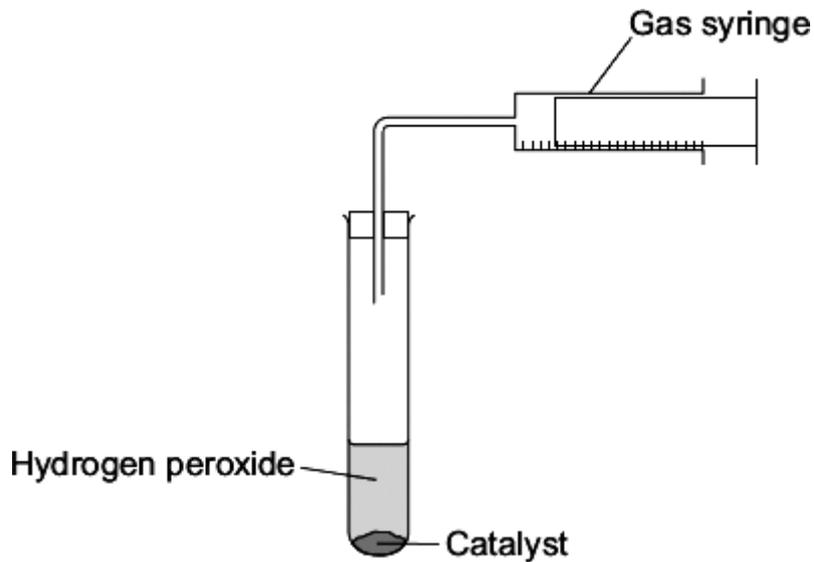


Complete the word equation for the decomposition of hydrogen peroxide.

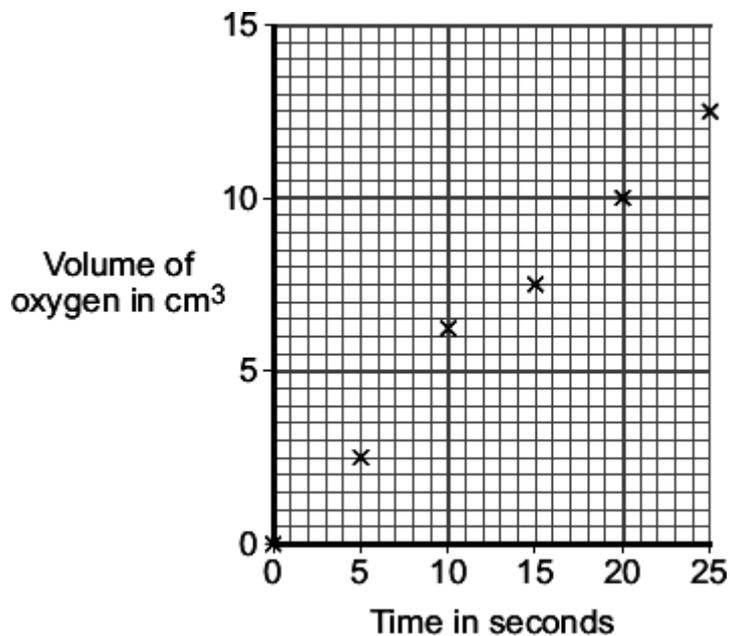
Hydrogen peroxide → \_\_\_\_\_ + \_\_\_\_\_

(1)

- (b) A student did an experiment to see how quickly hydrogen peroxide decomposes. The student used the apparatus shown below to measure the volume of oxygen.



(i) Draw a straight line of best fit to complete the graph.



(1)

(ii) Draw a circle around the anomalous point on the graph.

(1)

(iii) What is the volume of oxygen given off after 15 seconds?

\_\_\_\_\_ cm<sup>3</sup>

(1)

(iv) How did the volume of oxygen change between 0 and 25 seconds?

\_\_\_\_\_

(1)

(c) The student wanted to make the reaction faster.

Draw a ring around the correct answer to complete each sentence.

higher.

(i) To make the reaction faster, the temperature should be

lower.  
the  
same.

(1)

(ii) To make the reaction faster, the hydrogen peroxide should be

more dilute.  
more  
concentrated.  
the same.

(1)

(d) The diagram represents the bonding in oxygen.



Draw a ring around the correct answer to complete each sentence.

(i) When two oxygen atoms bond, the atoms

share  
transfer  
delocalise

electrons.

(1)

(ii) The oxygen atoms are joined by

ionic  
metallic  
covalent

bonds.

(1)

(iii) Oxygen is made of

simple  
molecules.  
a giant lattice.  
macromolecules.

(1)

(e) When hydrogen peroxide decomposes water is produced.  
Which **two** statements in the table explain why water is a liquid at room temperature?

Tick (✓) the **two** statements.

Statement	Tick (✓)
Water has a boiling point of 100 °C.	

Water is made of ions.	
Water has a melting point lower than room temperature.	
Water has a giant covalent structure.	

(2)  
(Total 12 marks)

## Mark schemes

### Q1.

- (a) (i) oxygen, sulfur trioxide  
*both needed for mark* 1
- (ii) compound 1
- (b) increases  
*accept (goes) higher / (goes) up / (is) faster / (are) more frequent* 1
- (c) activation 1
- (d) catalyst **or** increase temperature 1
- [5]

### Q2.

- (a) (i) mix (owtte)  
*accept to allow more collisions / helps particles to collide (owtte)*  
*idea of more efficient heat transfer*  
*do **not** allow heat is a catalyst* 1
- (ii) higher **and** more 1
- powder **and** big 1
- concentrated **and** more 1
- (b) electrons 1
- (c) H<sup>+</sup> 1
- [6]

### Q3.

- (a) the glow stick is brighter (owtte)  
*accept glow stick is less bright **at low temperatures** (owtte)*  
*ignore references to rate / particles* 1
- (b) gave out light for less time  
*accept use of figures from table for comparison*  
*allow reference to speed / rate eg quicker / faster reaction*

- 1
- (c) the particles will collide more often 1
- the particles will move faster 1
- the particles will have more energy 1
- (d) any **one** from:
- repeat 1
- allow more glow sticks*
- measure brightness eg use light meter
- more temperatures **or** wider range
- improve precision 1

[6]

**Q4.**

- (i) measure volume / mass of gas produced 1
- in a certain time period
- 1 mark is for a sensible way of measuring the amount of product produced and 1 mark is for the idea of timing*
- e.g. measure volume of gas produced at regular time intervals  
**or** time taken to fill a test tube with the gas  
 or collect a certain volume of gas
- (measuring the rate at which bubbles are produced e.g. number of bubbles in 30 seconds gains only 1 mark unless an enclosed system is used)*
- or** measure decrease in mass of flask and contents at regular time intervals
- or** time taken for the mass to decrease by certain amount 1
- (ii) increases rate (owtte) 1
- (ii) change the concentration **or** add a catalyst **or** change the surface area **or** lower the temperature 1
- accept 'expose to sunlight' (owtte) **or** change the amount of water / powder / solution used*
- ignore 'stirring'*

[4]

**Q5.**

- (a) (i) high **and** low
- both needed for mark*

- (ii) reversible 1
- (iii) to prevent ammonium chloride / solid / particles escaping 1  
*idea of a filter*  
*do **not** accept 'to prevent gases escaping'* 1
- (b) endothermic 1
- [4]**

**Q6.**

- (a) oxygen 1  
*Ignore any numbers*  
*accept hydrogen oxide / steam* 1
- water 1
- (b) catalyst 1
- [3]**

**Q7.**

- (a) oxygen **and** water 1  
*both needed for mark*  
*allow hydrogen oxide for water*  
*in any order*  
*ignore formulae* 1
- (b) (i) best fit line, omitting point at 10s 1  
*straight line drawn through all correct points* 1
- (ii) circle around point at 10 s 1  
*allow any indication* 1
- (iii) 7.5 1  
*allow ecf from candidate's line* 1
- (iv) increases (with time) 1  
*accept goes from 0 to 12.5* 1
- (c) (i) higher 1
- (ii) more concentrated 1
- (d) (i) share 1

- |   |   |
|---|---|
|   | 1 |
| (ii) covalent   | 1 |
| (iii) simple molecules                                | 1 |
| (e) Water has a boiling point of 100°C                | 1 |
| Water has a melting point lower than room temperature | 1 |

**[12]**