

Candidate Name	Centre Number	Candidate Number
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GCSE

245/02

**SCIENCE CHEMISTRY
HIGHER TIER
CHEMISTRY 3**

A.M. THURSDAY, 4 June 2009

45 minutes

For Examiner's use only		
Question	Maximum Mark	Mark awarded
1.	5	
2.	5	
3.	5	
4.	10	
5.	8	
6.	10	
7.	7	
Total	50	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

Answer **all** questions.

1. The following table shows the colours of universal indicator at different pH values.

<i>Colour</i>	<i>Red</i>	<i>Orange</i>	<i>Yellow</i>	<i>Green</i>	<i>Blue</i>	<i>Navy Blue</i>	<i>Purple</i>
pH	0 - 2	3 - 4	5 - 6	7	8 - 9	10 - 12	13 - 14

- (i) A solution turns universal indicator purple.

I. Give the pH range of this solution. [1]

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II. State what the pH range tells us about this solution. [1]

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- (ii) Limewater is a solution of calcium hydroxide.

A student noticed that on adding some hydrochloric acid to limewater, a chemical reaction took place, with the temperature increasing by 3 °C.

I. State the word used to describe the type of reaction that takes place between hydrochloric acid and limewater. [1]

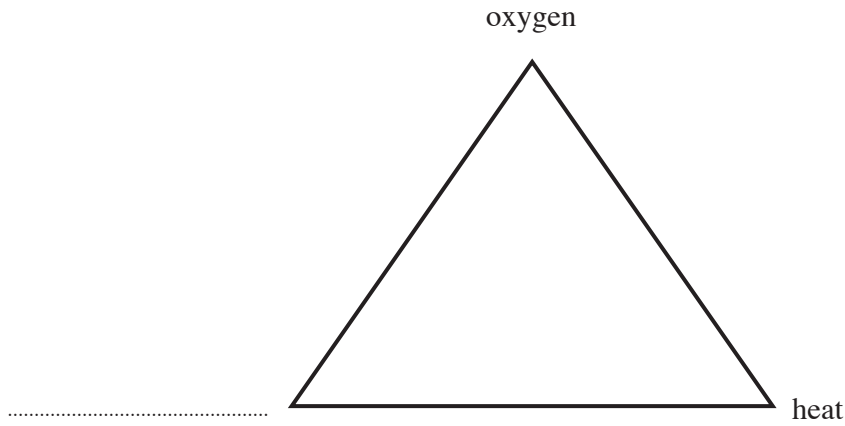
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II. State **and** explain what happened to the pH value of 11 for limewater when excess hydrochloric acid was added. [2]

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2. The fire triangle can be used to explain how fires start and how they can be put out.



(i) Complete the fire triangle by naming the missing factor in the diagram above. [1]

(ii) A chip pan fire is often put out by a fire blanket. Explain how this extinguishes the fire. [1]

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.....

(iii) A fireman sprays water on the burning wooden beam of a warehouse. Explain how this extinguishes the fire. [1]

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(iv) Give the best method for extinguishing fires in electrical home appliances, such as televisions, and explain your answer. [2]

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3. (i) An unknown gas **X** was found to have the following properties:

- colourless
- pungent smell
- very soluble in water
- a pH value of 9
- extinguishes a lighted splint
- turns red litmus blue

Name gas **X** and explain your choice.

[2]

Name

Explanation

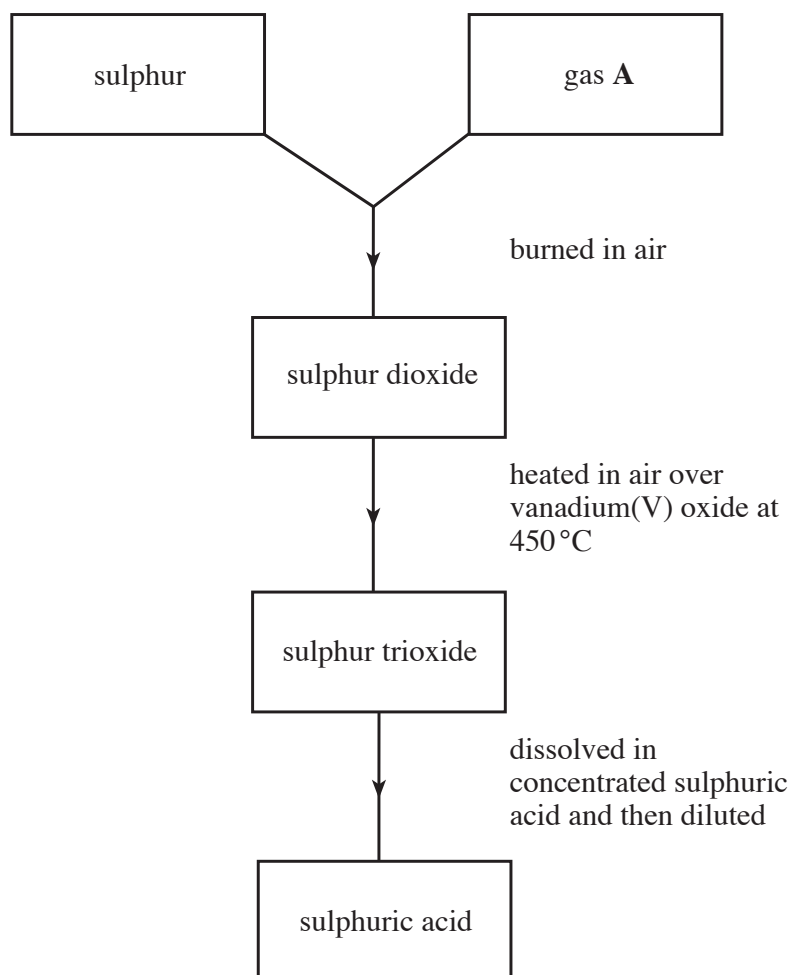
(ii) A student was provided with two gas jars, one containing oxygen and the other, carbon dioxide. Give **one** test that would distinguish between the oxygen and the carbon dioxide.

[3]

State what the student should do and the expected results for both gases.

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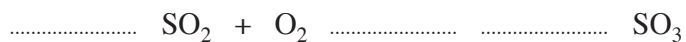
4. (a) The diagram below shows how sulphur is converted into sulphuric acid by the Contact process.



- (i) Name gas A. [1]

.....

- (ii) **Complete** and **balance** the following **symbol** equation for the **reversible reaction** between sulphur dioxide and oxygen. [2]



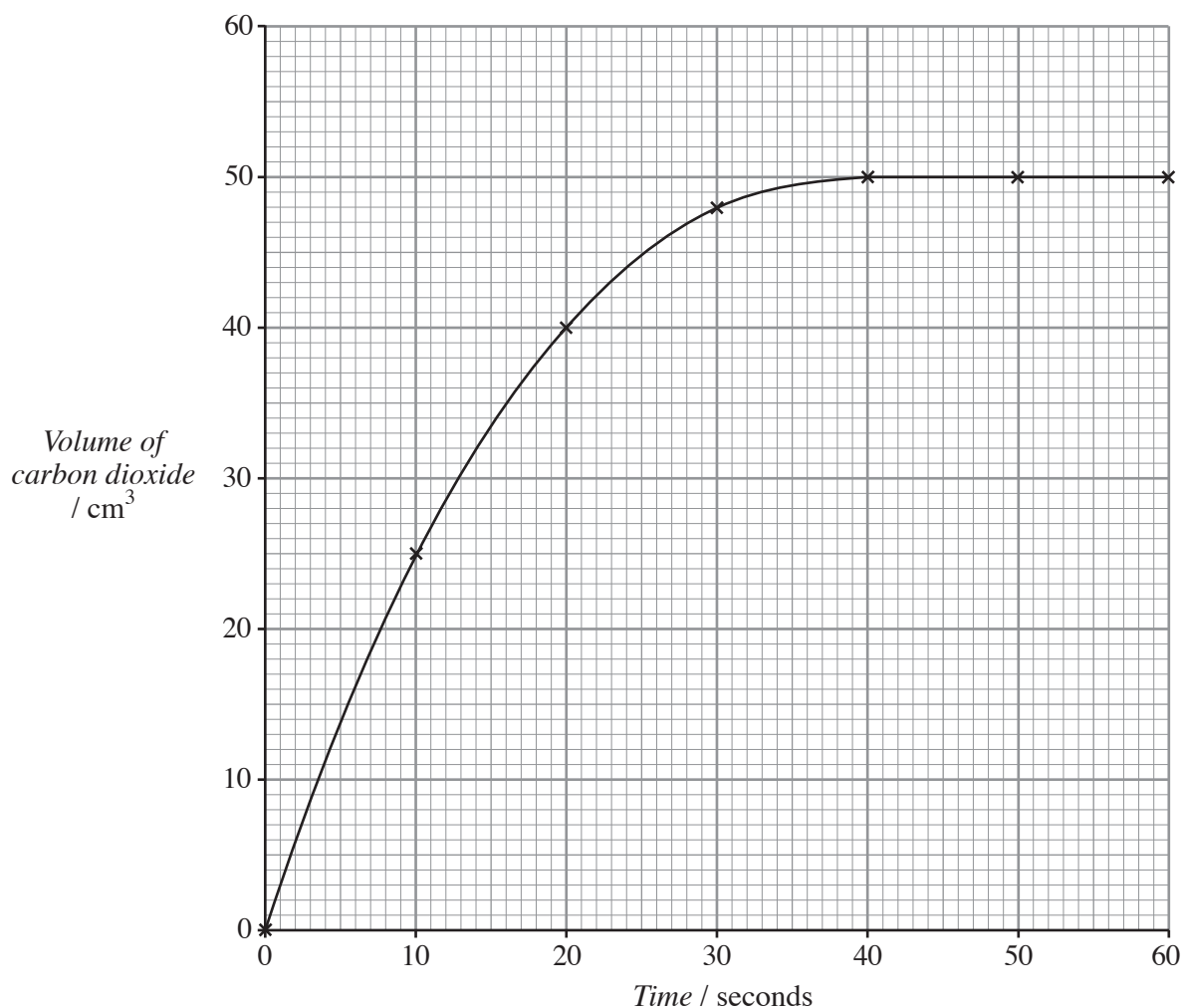
- (iii) Give the reason for using vanadium(V) oxide in the conversion in part (ii). [1]

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- (b) Two experiments were carried out to investigate the volume of carbon dioxide given off when sodium carbonate reacted with two acids. 50 cm³ of two acids, ethanoic acid and sulphuric acid, both of equal concentrations were added separately to the same mass of sodium carbonate powder. The total volume of carbon dioxide given off was recorded every 10 seconds in the results table below.

<i>Time / seconds</i>	0	10	20	30	40	50	60
<i>Volume of carbon dioxide from ethanoic acid / cm³</i>	0	15	27	37	44	49	50
<i>Volume of carbon dioxide from sulphuric acid / cm³</i>	0	25	40	48	50	50	50

- (i) Using the table above, plot the results for the ethanoic acid on the grid below and draw the curve of best fit. The curve for sulphuric acid has been done for you. [3]



- (ii) I. Use the graph to give the volume of gas given off when both reactions are complete.

..... cm³ [1]

- II. State which acid reacted more quickly with the sodium carbonate and give a reason for your answer. [2]

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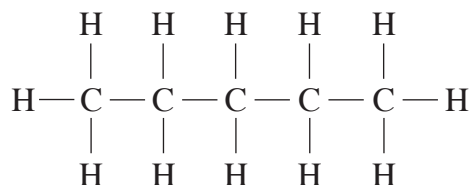
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5. (i) C_5H_{12} is a member of the same homologous series as methane, CH_4 .

I. Give the name of this homologous series. [1]

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II. C_5H_{12} has three different isomers. The structural formula of one is given below.



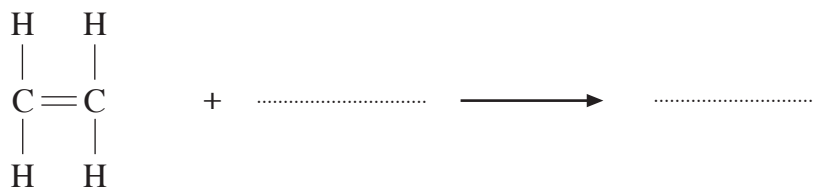
Give the structural formula of the other **two** isomers of C_5H_{12} in the boxes below. [2]

(ii) Ethene, C_2H_4 , reacts with bromine water.

Describe what would be **seen** during the reaction. [2]

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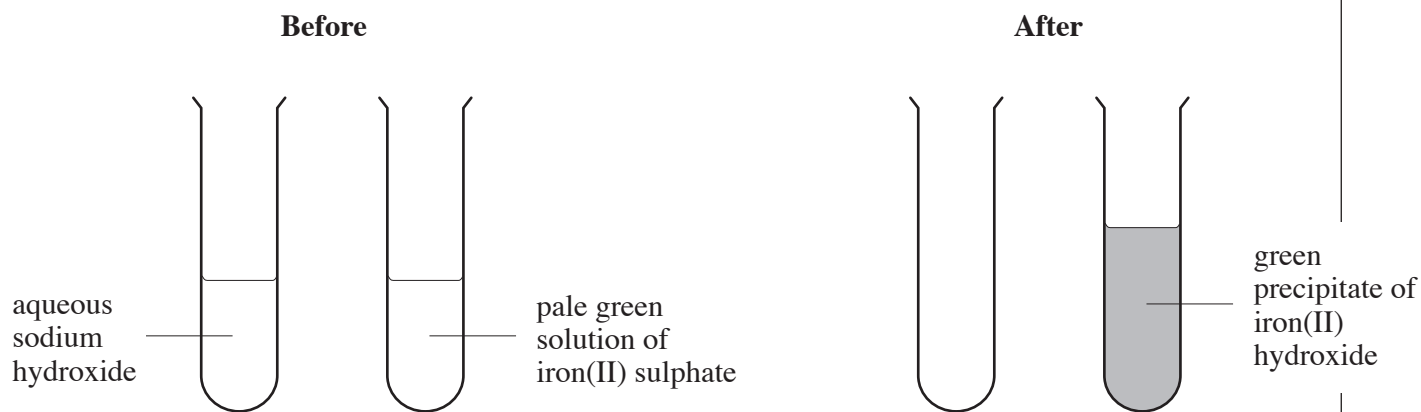
(iii) I. **Complete** the following **symbol** equation for the reaction between ethene and bromine. [2]



II. Give the term used for this type of reaction. [1]

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6. (a) Aqueous sodium hydroxide solution can be used to distinguish between ions such as Fe^{2+} and Cu^{2+} .
The reaction of aqueous sodium hydroxide with an aqueous solution of iron(II) sulphate, FeSO_4 , can be summarised by the following diagrams.



- (i) Give the meaning of the term *aqueous*. [1]

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- (ii) Describe what you would **see** if the above reaction had been repeated using copper(II) sulphate solution instead of iron(II) sulphate solution. [3]

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- (iii) Name the copper substance formed during the reaction in part (ii). [1]

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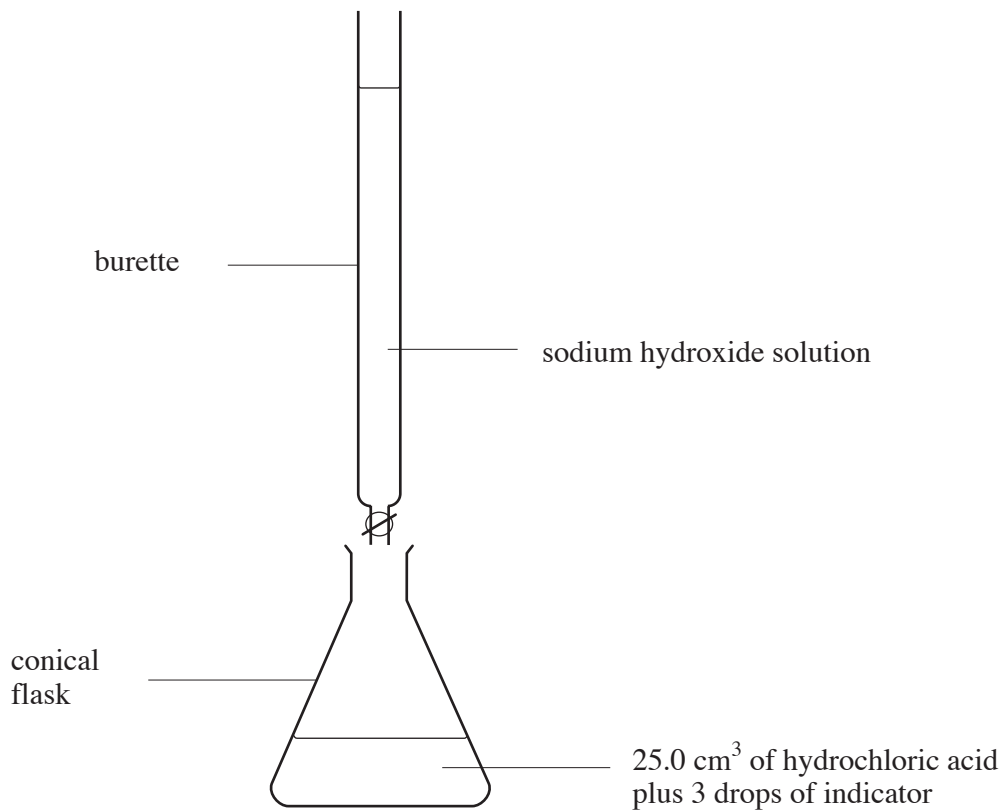
- (iv) Give the **balanced symbol equation** for the reaction that took place between sodium hydroxide and copper(II) sulphate in part (ii). [3]



- (b) Describe how barium chloride solution can be used to test for the sulphate ions present in solutions such as iron(II) sulphate and copper(II) sulphate. [2]

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7. In order to calculate the concentration of a sample of dilute hydrochloric acid, the acid was titrated with sodium hydroxide solution of known concentration using the following apparatus.



The titration was carried out three times. The results obtained are given in the table below.

	<i>Burette reading / cm³</i>		
<i>Volume of sodium hydroxide / cm³</i>	19.9	20.1	20.0

- I. Give the reason for repeating the titration.

[1]

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- II. Calculate the average volume of sodium hydroxide solution needed.

[1]

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- III. Given that the concentration of the sodium hydroxide solution was 0.1 mol dm^{-3} , and using your answer to part II., calculate the number of moles of sodium hydroxide added to the acid. [2]

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- IV. The balanced symbol equation for the reaction between hydrochloric acid and sodium hydroxide is shown below.



Use the equation to state the number of moles of hydrochloric acid in the flask. [1]

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- V. Calculate the concentration of the hydrochloric acid. [2]

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FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	Al^{3+}	Bromide	Br^-
Ammonium	NH_4^+	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^-
Calcium	Ca^{2+}	Fluoride	F^-
Copper(II)	Cu^{2+}	Hydroxide	OH^-
Hydrogen	H^+	Iodide	I^-
Iron(II)	Fe^{2+}	Nitrate	NO_3^-
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^+	Sulphate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^+		
Silver	Ag^+		
Sodium	Na^+		

