

Candidate Name	Centre Number	Candidate Number
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**GCSE**

245/01

**SCIENCE CHEMISTRY  
FOUNDATION TIER  
CHEMISTRY 3**

A.M. THURSDAY, 4 June 2009

45 minutes

For Examiner's use only		
Question	Maximum Mark	Mark awarded
1.	9	
2.	5	
3.	5	
4.	4	
5.	5	
6.	7	
7.	5	
8.	5	
9.	5	
<b>Total</b>	<b>50</b>	

**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. (a) The box below gives some information about the conversion of grapes into wine.

Grapes contain sugar. When picked at the right time, they are covered with a layer of wild yeast. The grapes are crushed and the juices collected. The yeast cells multiply rapidly and cause the sugar to change to alcohol. This way of making alcohol has been used for thousands of years and is known as fermentation. Once the solution reaches about 13% alcohol by mass, the alcohol poisons the yeast. To make a spirit such as brandy, which contains about 35% alcohol by mass, the alcohol made from grapes needs to be distilled.

**Use only the information from the box to answer parts (i) to (iv).**

- (i) Name the substance in the grapes that is changed into alcohol. [1]  
.....
- (ii) State the name given to this way of obtaining alcohol from grapes. [1]  
.....
- (iii) State why the alcohol level only reaches about 13% by mass. [1]  
.....
- (iv) State how spirits are made from the alcohol in wine. [1]  
.....

- (b) The box below contains some statements about the effects of alcohol.

<b>may help to prevent heart disease;</b>	<b>causes liver damage;</b>
<b>causes road accidents;</b>	<b>helps people to relax;</b>
<b>makes people behave in an aggressive manner;</b>	

Put each statement into the correct column below.

[3]

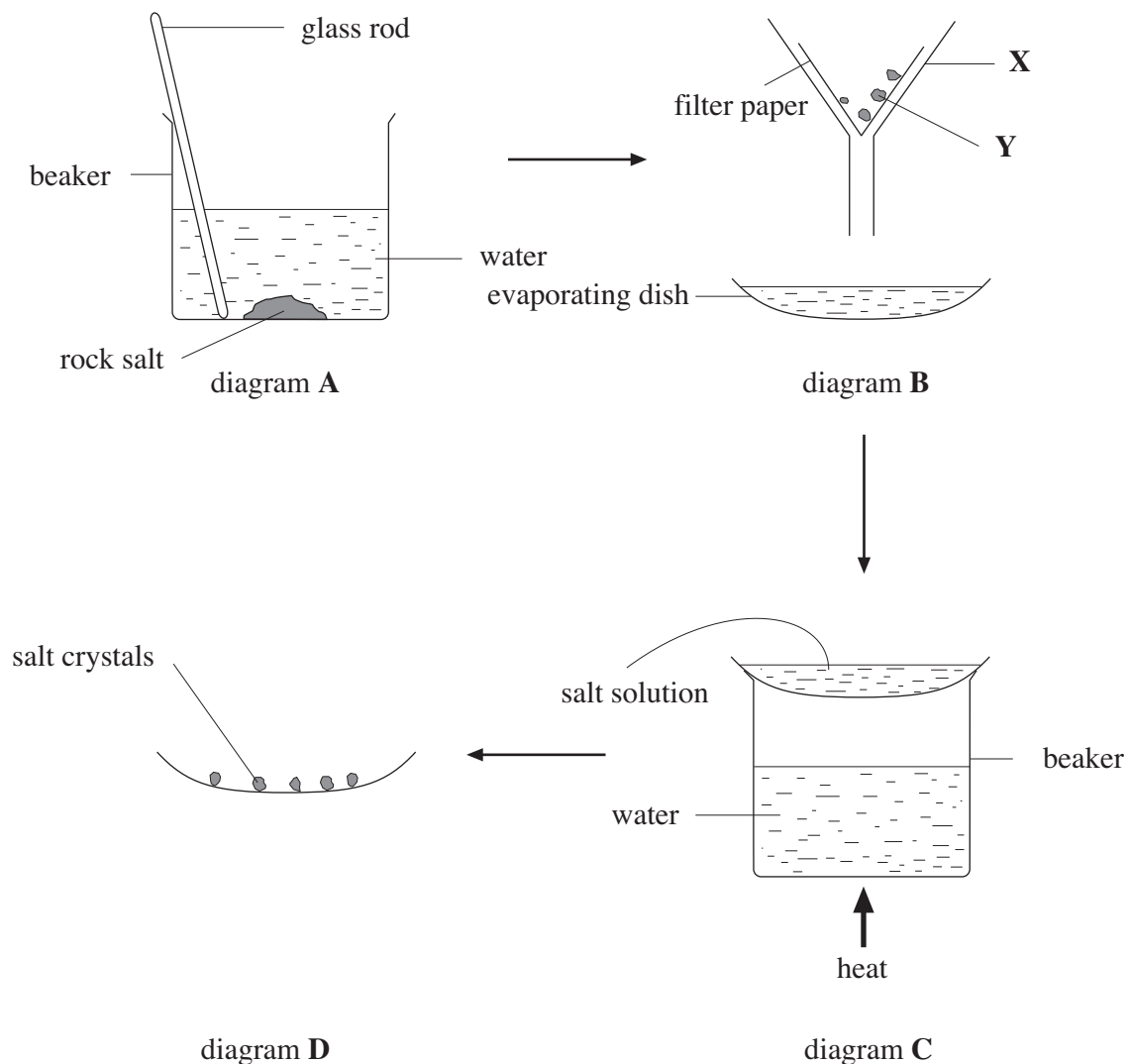
Advantages of alcohol	Disadvantages of alcohol

- (c) Alcohol has a number of uses other than in alcoholic drinks. Place a tick (✓) in each of the **two** boxes next to two uses of alcohol. [2]

Alcohol is used

- as a solvent,
- in car batteries,
- as a fuel,
- to extinguish a fire,
- in making fertilisers.

2. Rock salt is a mixture of salt and insoluble impurities such as clay and sand. The diagrams below show the main steps for obtaining pure salt from rock salt in a laboratory.



- (i) State the purpose of using the glass rod in diagram A. [1]

.....

.....

- (ii) Name the piece of equipment labelled X in diagram B. [1]

.....

- (iii) Choose the word in the box below which describes the method used in the separation in diagram **B**. [1]

<b>chromatography</b>	<b>crystallisation</b>	<b>distillation</b>	<b>filtration</b>
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The method used in diagram **B** is called .....

- (iv) What is **Y** in diagram **B**? [1]

.....

- (v) Place a tick (✓) in the box next to the statement that gives the reason for using the equipment shown in diagram **C**. [1]

The equipment in diagram **C** is used to

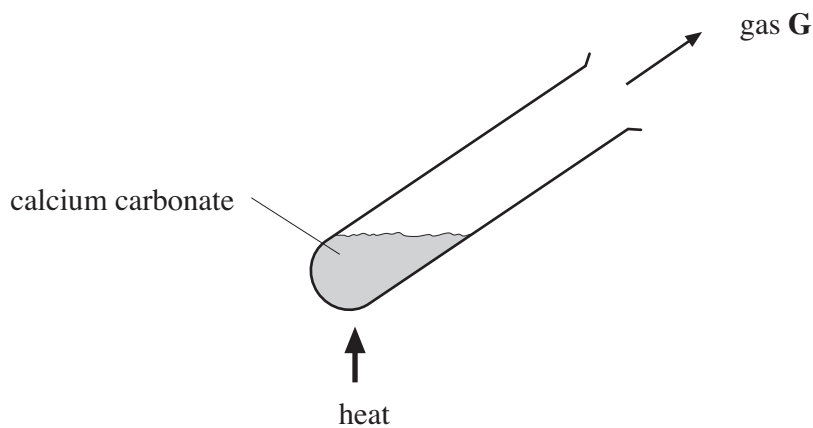
dissolve the salt in water,

remove the water from the salt solution,

carry out distillation,

remove the impurities from the rock salt.

3. The following diagram shows a method of demonstrating the thermal decomposition of calcium carbonate,  $\text{CaCO}_3$ .



- (i) **Name** the **three** elements present in calcium carbonate. [3]

.....  
 .....  
 .....

- (ii) Complete the **word** equation by identifying the gas **G**. [1]

calcium carbonate  $\longrightarrow$  calcium oxide + .....

- (iii)

<b>black</b>	<b>blue</b>	<b>red</b>	<b>white</b>
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- Use a word from the box above to give the colour of the product, calcium oxide. [1]

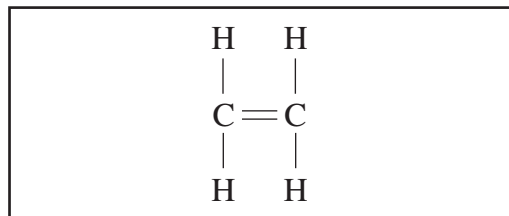
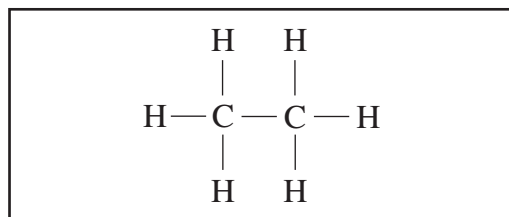
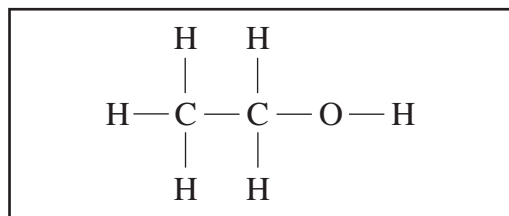
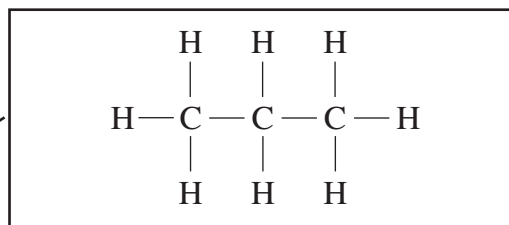
.....

4. (i) The information below shows the molecular and structural formulae of some compounds.

Draw a line from each molecular formula to the box containing its correct structural formula. One has been done for you. [2]

*Molecular formula*

*Structural formula*



(ii)

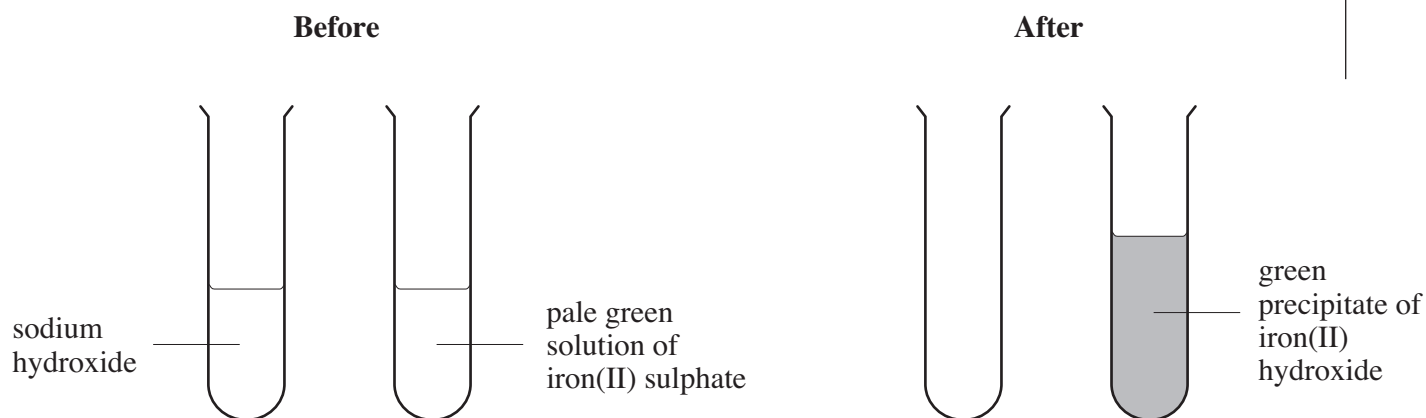


Choose from the box above, the name of the substance with the molecular formula of  $C_2H_4$ . [1]

.....

- (iii) The molecular formula for methane is  $CH_4$ . Give the structural formula for methane. [1]

5. Sodium hydroxide solution can be used to distinguish between iron(II) ions and copper(II) ions. The diagram below shows what happens when sodium hydroxide solution is carefully added to a solution of an iron(II) compound, such as iron(II) sulphate.



- (i) Sodium hydroxide is a **corrosive** substance. Give **one** safety precaution that should be taken when carrying out the above experiment. [1]

.....

- (ii) The above experiment was repeated using copper(II) sulphate solution instead of iron(II) sulphate.

- I. Give the colour and the name of the precipitate formed. [2]

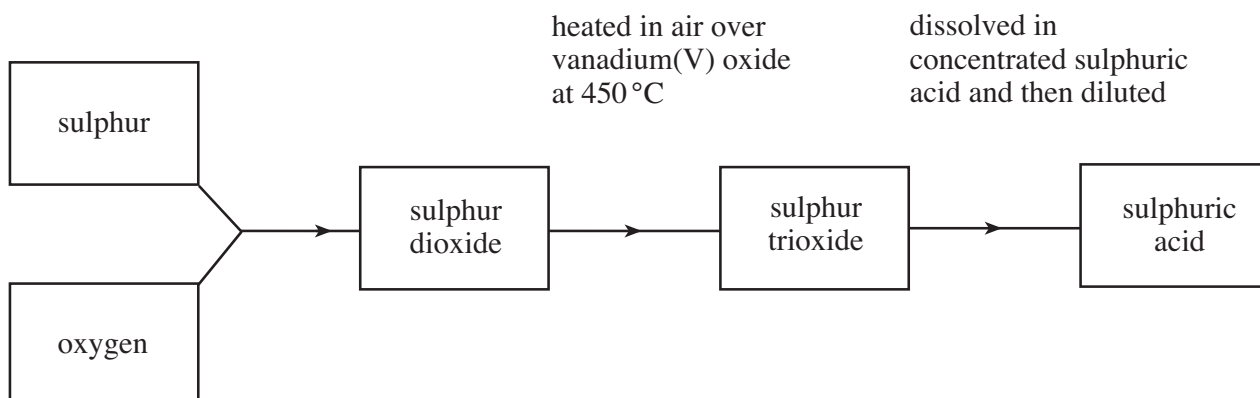
*Colour* .....

*Name* .....

- II. Give the **word equation** for the reaction that takes place between sodium hydroxide and copper sulphate solutions. [2]

..... + .....  $\longrightarrow$  ..... + .....

6. The following diagram shows a flow chart for the manufacture of sulphuric acid using the Contact process.



- (i) There are two raw materials used to make sulphur dioxide. One is sulphur. Name the raw material from which oxygen is obtained. [1]
- .....
- (ii) Give the **balanced symbol equation** for the formation of sulphur dioxide. [3]
- ..... + ..... → .....
- (iii) To convert sulphur dioxide to sulphur trioxide, the sulphur dioxide and air are passed over heated vanadium(V) oxide. State the purpose of vanadium(V) oxide in this reaction. [1]
- .....
- (iv) When concentrated sulphuric acid is added to cane sugar,  $C_{12}H_{22}O_{11}$ , a black, spongy looking solid was formed.

I. **Name** the black solid. .... [1]

II.

carbon	carbon dioxide	carbon monoxide
	hydrogen	water

Choose, from the box above, the substance that was removed during the reaction. [1]

.....

7. 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]

.....

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

.....

(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]

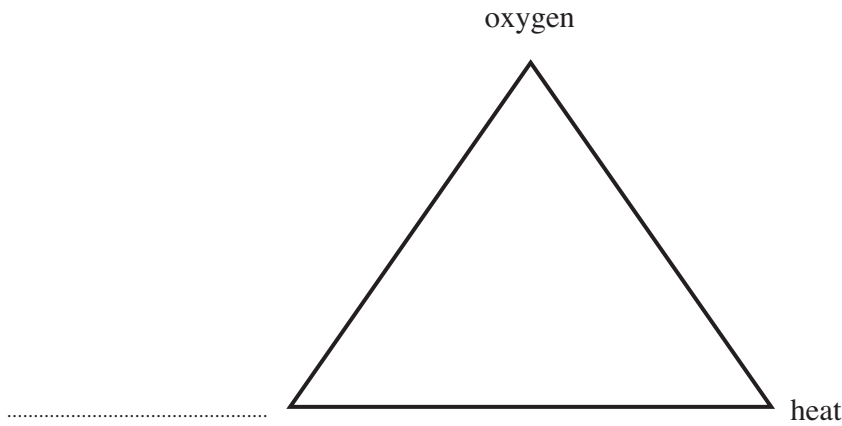
.....

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

.....

.....

8. 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]

.....  
.....

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

.....  
.....

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

.....  
.....  
.....

9. (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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**FORMULAE FOR SOME COMMON IONS**

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	$\text{Al}^{3+}$	Bromide	$\text{Br}^-$
Ammonium	$\text{NH}_4^+$	Carbonate	$\text{CO}_3^{2-}$
Barium	$\text{Ba}^{2+}$	Chloride	$\text{Cl}^-$
Calcium	$\text{Ca}^{2+}$	Fluoride	$\text{F}^-$
Copper(II)	$\text{Cu}^{2+}$	Hydroxide	$\text{OH}^-$
Hydrogen	$\text{H}^+$	Iodide	$\text{I}^-$
Iron(II)	$\text{Fe}^{2+}$	Nitrate	$\text{NO}_3^-$
Iron(III)	$\text{Fe}^{3+}$	Oxide	$\text{O}^{2-}$
Lithium	$\text{Li}^+$	Sulphate	$\text{SO}_4^{2-}$
Magnesium	$\text{Mg}^{2+}$		
Nickel	$\text{Ni}^{2+}$		
Potassium	$\text{K}^+$		
Silver	$\text{Ag}^+$		
Sodium	$\text{Na}^+$		

# PERIODIC TABLE OF ELEMENTS

**1 2****Group****3****4****5****6****7****0**

${}^7_3\text{Li}$ Lithium	${}^9_4\text{Be}$ Beryllium	${}^1_1\text{H}$ Hydrogen										${}^{11}_5\text{B}$ Boron	${}^{12}_6\text{C}$ Carbon	${}^{14}_7\text{N}$ Nitrogen	${}^{16}_8\text{O}$ Oxygen	${}^{19}_9\text{F}$ Fluorine	${}^{20}_{10}\text{Ne}$ Neon
${}^{23}_{11}\text{Na}$ Sodium	${}^{24}_{12}\text{Mg}$ Magnesium											${}^{27}_{13}\text{Al}$ Aluminium	${}^{28}_{14}\text{Si}$ Silicon	${}^{31}_{15}\text{P}$ Phosphorus	${}^{32}_{16}\text{S}$ Sulphur	${}^{35}_{17}\text{Cl}$ Chlorine	${}^{40}_{18}\text{Ar}$ Argon
${}^{39}_{19}\text{K}$ Potassium	${}^{40}_{20}\text{Ca}$ Calcium											${}^{45}_{21}\text{Sc}$ Scandium	${}^{48}_{22}\text{Ti}$ Titanium	${}^{51}_{23}\text{V}$ Vanadium	${}^{52}_{24}\text{Cr}$ Chromium	${}^{55}_{25}\text{Mn}$ Manganese	${}^{56}_{26}\text{Fe}$ Iron
${}^{86}_{37}\text{Rb}$ Rubidium	${}^{88}_{38}\text{Sr}$ Strontium	${}^{89}_{39}\text{Y}$ Yttrium	${}^{91}_{40}\text{Zr}$ Zirconium	${}^{93}_{41}\text{Nb}$ Niobium	${}^{96}_{42}\text{Mo}$ Molybdenum	${}^{99}_{43}\text{Tc}$ Technetium	${}^{101}_{44}\text{Ru}$ Ruthenium	${}^{103}_{45}\text{Rh}$ Rhodium	${}^{106}_{46}\text{Pd}$ Palladium	${}^{108}_{47}\text{Ag}$ Silver	${}^{112}_{48}\text{Cd}$ Cadmium	${}^{115}_{49}\text{In}$ Indium	${}^{119}_{50}\text{Sn}$ Tin	${}^{122}_{51}\text{Sb}$ Antimony	${}^{128}_{52}\text{Te}$ Tellurium	${}^{127}_{53}\text{I}$ Iodine	${}^{131}_{54}\text{Xe}$ Xenon
${}^{133}_{55}\text{Cs}$ Caesium	${}^{137}_{56}\text{Ba}$ Barium	${}^{139}_{57}\text{La}$ Lanthanum	${}^{179}_{72}\text{Hf}$ Hafnium	${}^{181}_{73}\text{Ta}$ Tantalum	${}^{184}_{74}\text{W}$ Tungsten	${}^{186}_{75}\text{Re}$ Rhenium	${}^{190}_{76}\text{Os}$ Osmium	${}^{192}_{77}\text{Ir}$ Iridium	${}^{195}_{78}\text{Pt}$ Platinum	${}^{197}_{79}\text{Au}$ Gold	${}^{201}_{80}\text{Hg}$ Mercury	${}^{204}_{81}\text{Tl}$ Thallium	${}^{207}_{82}\text{Pb}$ Lead	${}^{209}_{83}\text{Bi}$ Bismuth	${}^{210}_{84}\text{Po}$ Polonium	${}^{210}_{85}\text{At}$ Astatine	${}^{222}_{86}\text{Rn}$ Radon
${}^{223}_{87}\text{Fr}$ Francium	${}^{226}_{88}\text{Ra}$ Radium	${}^{227}_{89}\text{Ac}$ Actinium															

Key:

