Surname	Centre Number	Candidate Number
Other Names		0

WJEC CBAC

GCSE

245/02

SCIENCE CHEMISTRY
HIGHER TIER
CHEMISTRY 3

A.M. WEDNESDAY, 25 May 2011

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**8**	
3.	**6**	
4.	**9**	
5.	**8**	
6.	**8**	
7.	**6**	
Total	**50**	

0245 020001

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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.

Examiner only

Answer **all** *questions.*

1. *(a)* The following table shows the number of people admitted to a particular hospital for treatment for the effects of alcohol abuse over a period of five years.

Year	2004	2005	2006	2007	2008
Number of people treated	264	346	466	499	571

(i) State how the number of people treated for the effects of alcohol abuse has changed over time. [1]

.....

(ii) Give **one** social problem caused by alcohol abuse. [1]

.....

(iii) State **one** possible effect of long term alcohol abuse on an individual's health. [1]

.....

(b) Alcohol is used as a biofuel. State **one** advantage and **one** disadvantage of the use of alcohol as a biofuel. [2]

Advantage .....

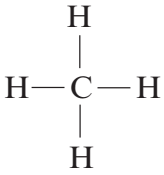
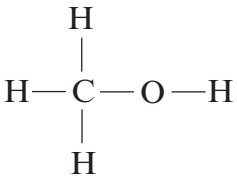
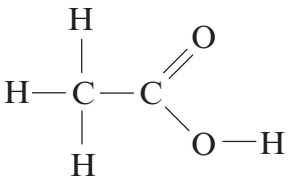
.....

Disadvantage .....

.....

5

2. The following table shows the names and formulae of some organic compounds.

Name	Formula	Structural formula
methane	CH_4	
propane	C_3H_8	
	CH_3OH	
ethene	C_2H_4	
ethanoic acid		

(a) Complete the table. [4]

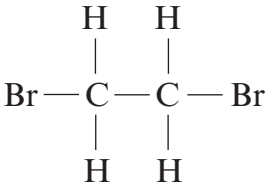
(b) Name the **two** compounds in the table that are members of the **alkane** homologous series. [1]

..... and .....

(c) Name the compound produced when alcoholic drinks containing ethanol are left exposed to air for a period of time. [1]

.....

(d) (i) Name the substance that reacts with bromine water to form [1]



.....

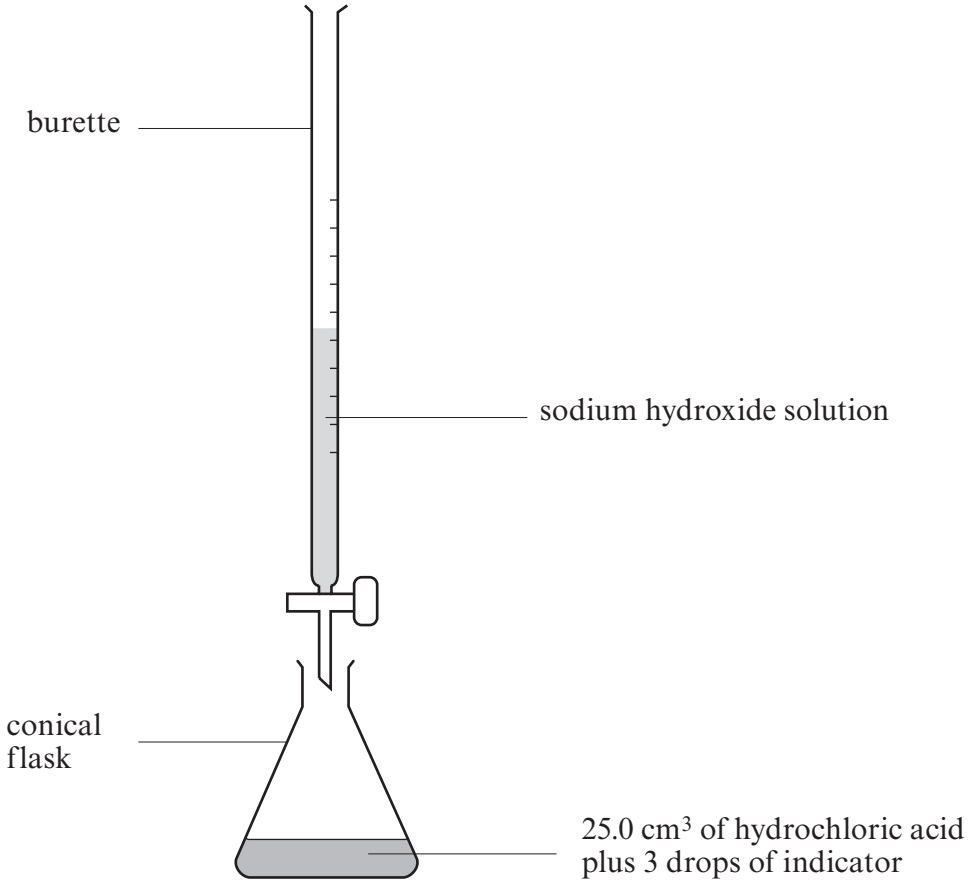
(ii) Give **one** observation that you would make during this reaction. [1]

.....

Turn over.

Examiner only

3. *(a)* A student added sodium hydroxide solution to 25.0 cm^3 of hydrochloric acid as shown in the diagram below.



$$NaOH + HCl \longrightarrow NaCl + H_2O$$

The titration was carried out three times and the results are shown below.

	Titration readings		
	1	2	3
Volume of sodium hydroxide used / cm^3	24.9	25.1	25.0

(i) State what the readings tell you about the relative concentrations of hydrochloric acid and sodium hydroxide solution. Give a reason for your answer. [2]

.....

.....

.....

(ii) Give a reason for

I. repeating the titration, [1]

.....

.....

II. adding an indicator to the hydrochloric acid. [1]

.....

.....

(b) Name the type of reaction taking place when an acid reacts with an alkali. [1]

.....

(c) Complete the following general **word** equation for this type of reaction. [1]

acid + alkali ⟶ ..... + ...

Examiner only

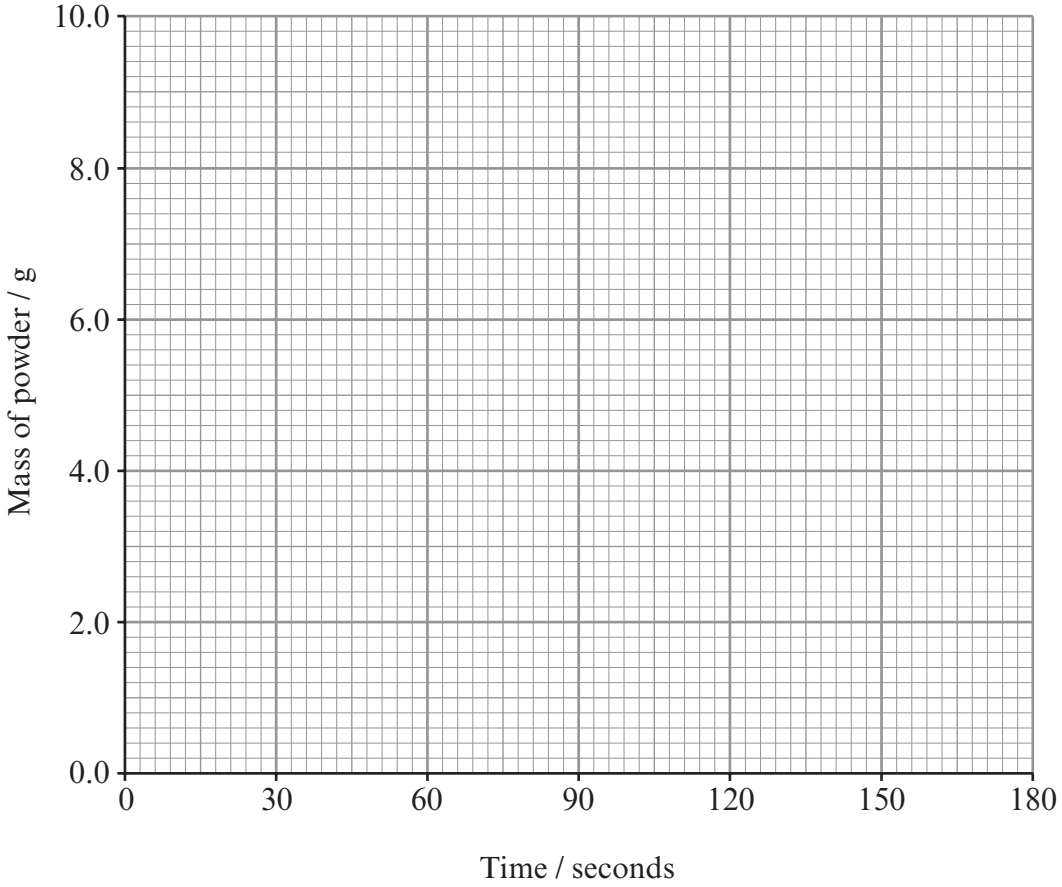
4. *(a)* Carl is investigating the decomposition of carbonates. He heats 10.0 g of green copper(II) carbonate in a boiling tube and weighs the tube every 30 seconds. His results are shown in the table below.

Time / sec	0	30	60	90	120	150	180
Mass of the tube and powder / g	19.6	17.2	15.8	15.0	14.6	14.6	14.6
Mass of powder / g	10.0	7.6	6.2	.....	5.0	5.0	5.0

(i) Use the information in the table to calculate the mass of powder present in the boiling tube after 90 seconds. [2]

Mass of powder = ... g

(ii) Plot the mass of powder on the grid below and draw a **smooth curve through the points**. [3]



(iii) At the end of the experiment, a black powder remains in the tube. Name the black powder. [1]

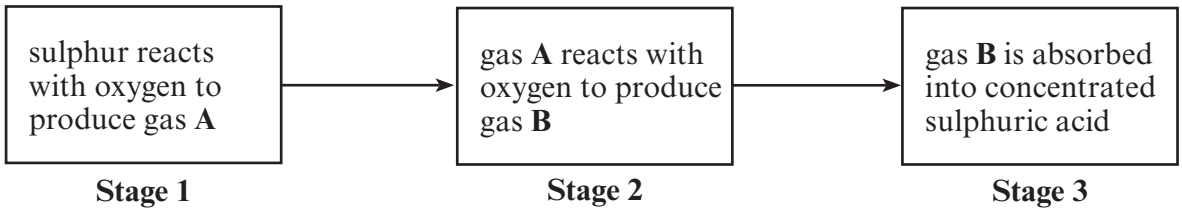
.....

(b) Write a **balanced symbol** equation to show the thermal decomposition of copper(II) carbonate. [3]

..... ⟶ ..... + ...

Examiner only

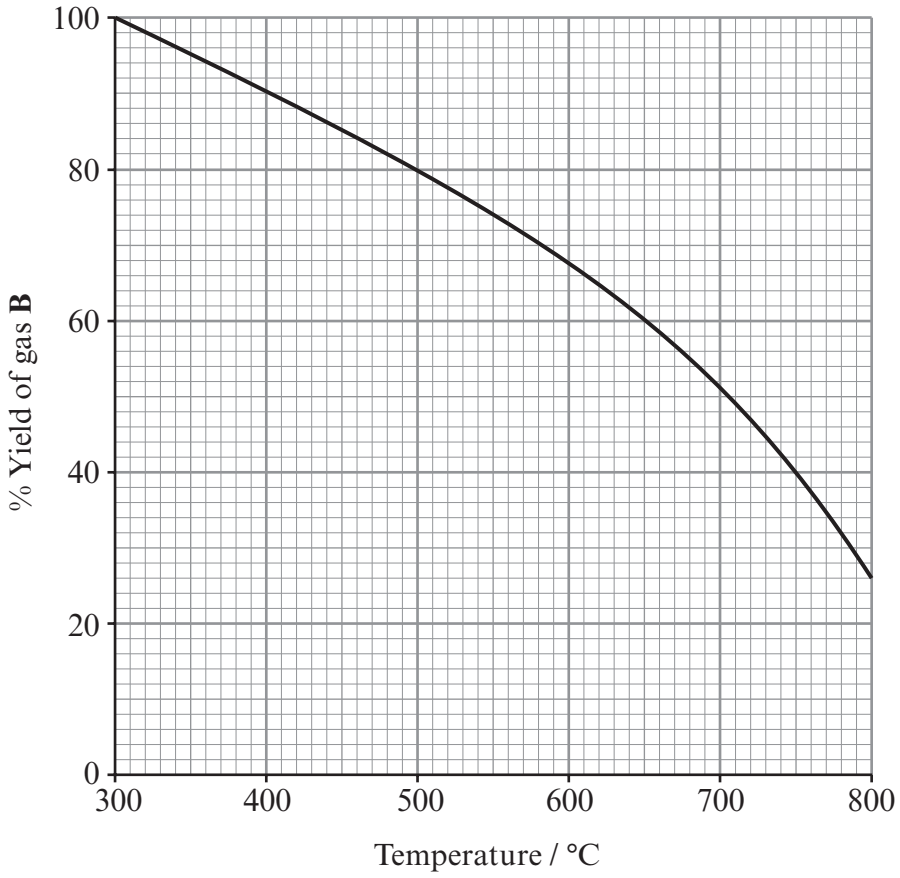
5. *(a)* Sulphuric acid is produced industrially by the Contact Process. The process involves three stages as shown below.



(i) Give the name and chemical formula of gases **A** and **B**. [2]

Gas	Name	Chemical formula
A		
B		

(ii) **Stage 2** involves a reversible reaction. The yield of gas **B** depends on the conditions used. The following graph shows how the percentage yield of gas **B** varies with temperature.



I. From the graph, calculate the difference between the yield at 300 °C and 450 °C. [1]

.....

II. Despite this difference in yield, manufacturers use a temperature of 450 °C. Give a reason why they choose this higher temperature. [1]

.....

III. State the purpose of using vanadium(V) oxide during this stage of the process. [1]

.....

(iii) Give a reason why gas **B** is not absorbed directly into water during **stage 3** of the process. [1]

.....

(b) All acids dissociate in water to produce hydrogen ions. This can be represented by the following equation.

$$HX \longrightarrow H^+ + X^-$$

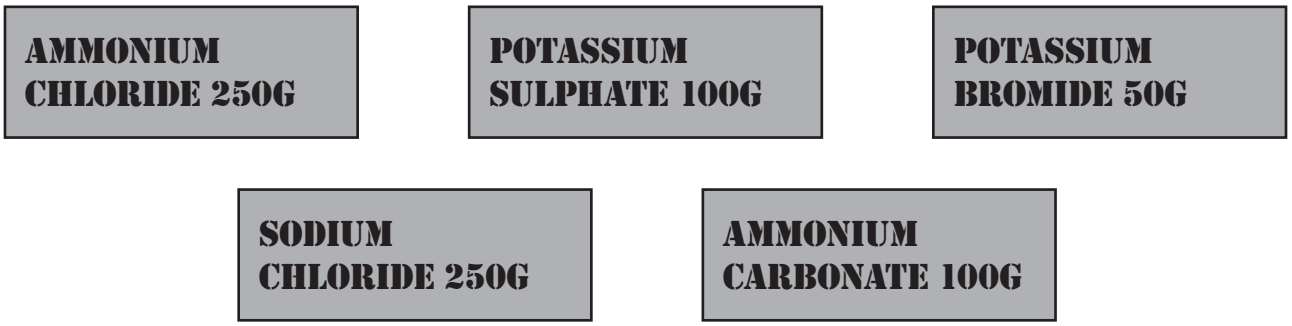
Use this equation to explain why sulphuric acid is a strong acid and ethanoic acid is a weak acid. [2]

.....

.....

.....

6. *(a)* A laboratory technician found three unlabelled bottles containing white powders. He also found five labels as shown below.



He carried out tests to identify the powders and obtained the following results.

Bottle 1
- The powder produced a gas when hydrochloric acid was added. The gas produced turned limewater milky.
- No colour was seen when a flame test was carried out.
- When heated with sodium hydroxide solution, a gas was produced. The gas turned damp red litmus paper blue.

Bottle 2
- No gas was produced when hydrochloric acid was added to the powder.
- A yellow flame was seen when a flame test was carried out.
- A solution of the powder produced a white precipitate when silver nitrate solution was added.

Bottle 3
- A lilac flame was seen when a flame test was carried out.
- A solution of the powder gave an off-white (cream) precipitate when silver nitrate solution was added.

Use the results given to identify the powder in each bottle. [3]

Bottle 1 .....

Bottle 2 .....

Bottle 3 .....

(b) (i) Sodium hydroxide solution can be used to distinguish between iron(II), Fe^{2+}, and iron(III), Fe^{3+}, ions in solution. Give the observations for **both** ions. [2]

Iron(II) .....

Iron(III) .....

(ii) Write a **balanced symbol** equation to show the reaction taking place between iron(III) chloride and sodium hydroxide solution. [3]

..... + ... ⟶ ..... + ...

Examiner only

7. *(a)* Rebecca prepared a solution of sodium hydroxide, NaOH, by dissolving 1.20 g of sodium hydroxide pellets in 250 cm^3 of water.

Calculate the concentration of the sodium hydroxide solution in mol dm^{-3}. [2]

$$M_r(NaOH) = 40$$

Concentration = ... mol dm^{-3}

(b) She then used this solution to determine the concentration of dilute sulphuric acid.

She measured exactly 25.0 cm^3 of sodium hydroxide solution and titrated it against the dilute sulphuric acid. The results obtained are shown in the table below.

Titration number	1	2	3	4
Volume of sulphuric acid used / cm^3	17.3	15.9	16.1	16.0

(i) Use the **reliable** results in the table to calculate the average volume of sulphuric acid used. [1]

Average volume = ... cm^3

(ii) Sulphuric acid reacts with sodium hydroxide according to the following equation.

$$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$$

Use the average volume of sulphuric acid and the equation shown to calculate the concentration of the dilute sulphuric acid in mol dm^{-3}. [3]

Concentration = ... mol dm^{-3}

6

BLANK PAGE

Turn over.

BLANK PAGE

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^{+}		

Turn over.

PERIODIC TABLE OF ELEMENTS

1	2	Group										3	4	5	6	7	0
								$^{1}_{1}$H Hydrogen									$^{4}_{2}$He Helium
$^{7}_{3}$Li Lithium	$^{9}_{4}$Be Beryllium											$^{11}_{5}$B Boron	$^{12}_{6}$C Carbon	$^{14}_{7}$N Nitrogen	$^{16}_{8}$O Oxygen	$^{19}_{9}$F Fluorine	$^{20}_{10}$Ne Neon
$^{23}_{11}$Na Sodium	$^{24}_{12}$Mg Magnesium											$^{27}_{13}$Al Aluminium	$^{28}_{14}$Si Silicon	$^{31}_{15}$P Phosphorus	$^{32}_{16}$S Sulphur	$^{35}_{17}$Cl Chlorine	$^{40}_{18}$Ar Argon
$^{39}_{19}$K Potassium	$^{40}_{20}$Ca Calcium	$^{45}_{21}$Sc Scandium	$^{48}_{22}$Ti Titanium	$^{51}_{23}$V Vanadium	$^{52}_{24}$Cr Chromium	$^{55}_{25}$Mn Manganese	$^{56}_{26}$Fe Iron	$^{59}_{27}$Co Cobalt	$^{59}_{28}$Ni Nickel	$^{64}_{29}$Cu Copper	$^{65}_{30}$Zn Zinc	$^{70}_{31}$Ga Gallium	$^{73}_{32}$Ge Germanium	$^{75}_{33}$As Arsenic	$^{79}_{34}$Se Selenium	$^{80}_{35}$Br Bromine	$^{84}_{36}$Kr Krypton
$^{86}_{37}$Rb Rubidium	$^{88}_{38}$Sr Strontium	$^{89}_{39}$Y Yttrium	$^{91}_{40}$Zr Zirconium	$^{93}_{41}$Nb Niobium	$^{96}_{42}$Mo Molybdenum	$^{99}_{43}$Tc Technetium	$^{101}_{44}$Ru Ruthenium	$^{103}_{45}$Rh Rhodium	$^{106}_{46}$Pd Palladium	$^{108}_{47}$Ag Silver	$^{112}_{48}$Cd Cadmium	$^{115}_{49}$In Indium	$^{119}_{50}$Sn Tin	$^{122}_{51}$Sb Antimony	$^{128}_{52}$Te Tellurium	$^{127}_{53}$I Iodine	$^{131}_{54}$Xe Xenon
$^{133}_{55}$Cs Caesium	$^{137}_{56}$Ba Barium	$^{139}_{57}$La Lanthanum	$^{179}_{72}$Hf Hafnium	$^{181}_{73}$Ta Tantalum	$^{184}_{74}$W Tungsten	$^{186}_{75}$Re Rhenium	$^{190}_{76}$Os Osmium	$^{192}_{77}$Ir Iridium	$^{195}_{78}$Pt Platinum	$^{197}_{79}$Au Gold	$^{201}_{80}$Hg Mercury	$^{204}_{81}$Tl Thallium	$^{207}_{82}$Pb Lead	$^{209}_{83}$Bi Bismuth	$^{210}_{84}$Po Polonium	$^{210}_{85}$At Astatine	$^{222}_{86}$Rn Radon
$^{223}_{87}$Fr Francium	$^{226}_{88}$Ra Radium	$^{227}_{89}$Ac Actinium															

Key: