

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
ADDITIONAL APPLIED SCIENCE A**

A335/01

Harnessing Chemicals
(Foundation Tier)

**Friday 19 June 2009
Morning**

Duration: 45 minutes

Candidates answer on the question paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:

- Pencil
- Ruler (cm/mm)



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **36**.
- This document consists of **12** pages. Any blank pages are indicated.

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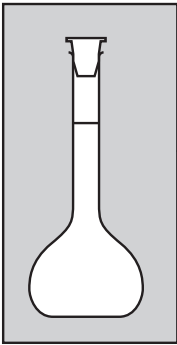
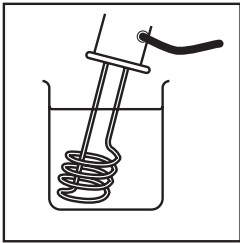
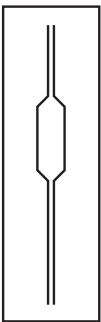
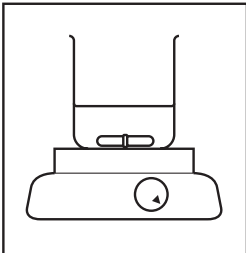
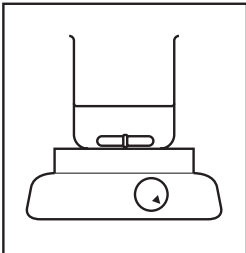
PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

- 1 Chemists use a variety of equipment to carry out experiments in the laboratory.

Draw a straight line from the **picture** of each piece of equipment to its correct **name** and another line from the name to its correct **use**.

One has been done for you.

equipment	name	use
	pipette	measuring the volume of a liquid accurately
	magnetic stirrer and flea	making a standard solution
	graduated flask	thoroughly mixing the substances to be reacted
	heating mantle	increasing the temperature of a liquid or solution
	immersion heater	measuring the volume of a liquid approximately

Connections shown in the image:
 - A line connects the pipette image to the 'pipette' name box.
 - A line connects the 'graduated flask' name box to the 'making a standard solution' use box.
 - A line connects the 'graduated flask' name box to the 'thoroughly mixing the substances to be reacted' use box.

[Total: 6]

2 The chemical industry in Britain produces a wide range of products.

The table below shows these products and their relative amounts.

type of product	percentage of the total amount of chemicals produced in Britain
agrochemicals	3
dyes and pigments	2
fertilisers	1
industrial gases	4
inorganic chemicals	4
synthetic fibres	1
organic chemicals	10
paints, varnishes and printing inks	8
pharmaceuticals	37
plastics and man-made rubber	8
soaps, toiletries and cleaning preparations	12
other specialities	10

(a) Which type of product makes up the largest percentage of the total amount of chemicals produced by industry in Britain?

..... [1]

(b) Finish the sentences about chemicals.

Choose words from this list.

ammonia aspirin bulk fine inorganic organic

Chemicals which are obtained from living, or once-lived sources are called

..... chemicals.

Chemicals made on a large scale are called chemicals.

An example of a chemical made on this scale is

[3]

(c) Lead chromate is one of the pigments made in Britain.

It is made by reacting lead nitrate, $\text{Pb}(\text{NO}_3)_2$, with K_2CrO_4 .

(i) K_2CrO_4 contains chromium and which **two** other elements?

Choose from the list below.

calcium carbon nitrogen oxygen potassium

..... and [2]

(ii) What is the total number of atoms in the formula K_2CrO_4 ?

..... [1]

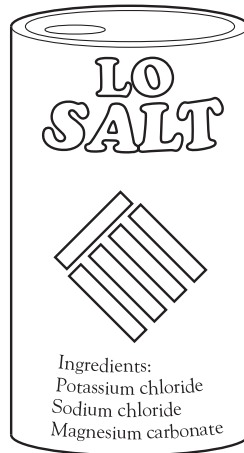
(d) The chemical industry aims to be as sustainable as it possibly can.

Suggest **two** ways it can do this.

.....
.....
.....
..... [2]

[Total: 9]

- 3 Low-sodium salt is an example of a complex formulation.



Kai wants to make a 100 g sample of low-sodium salt by mixing the three ingredients.

The school already has the sodium chloride and magnesium carbonate that he needs but has run out of potassium chloride.

Kai is given a catalogue from which to order more of the potassium chloride.

mass of potassium chloride in kg	cost in £		
	technical grade	laboratory grade	analytical grade
0.5	not available	9.36	15.30
5	not available	53.00	123.00
25	192.15	not available	not available

- (a) Why is the cost of potassium chloride different for the three grades?

.....
 [1]

(b) Kai orders **0.5 kg** of the **laboratory grade** potassium chloride.

He mixes ...

... 66 g of potassium chloride

... 33 g of sodium chloride (cost of 28 p)

... 1 g of magnesium carbonate (cost of 4 p).

(i) Calculate the cost of 66 g of the potassium chloride used.
Please show your working.

cost of potassium chloride = [2]

(ii) Calculate the total cost of materials for the 100g sample of low-sodium salt.
Please show your working.

cost of 100 g of low-sodium salt = [1]

(iii) 100g of low-sodium salt can be bought in the supermarket for less than this.

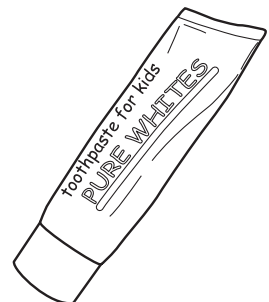
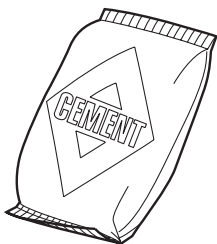
Why does it cost less to buy it than it does to make it yourself?

.....
..... [1]

(c) Low-sodium salt is an example of a solid mixture.

Which of the following are also solid mixtures?

Put a **ring** around each of the **two** correct answers.

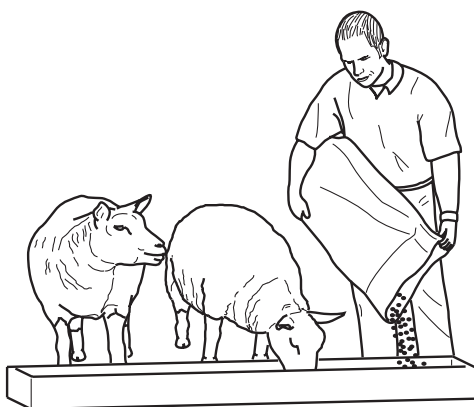


[2]

[Total: 7]



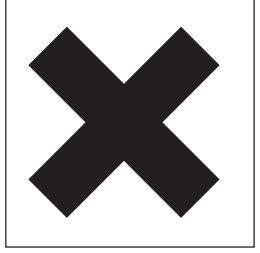
- 4 Humans and animals need small traces of copper in their diet to stay healthy.

Animal feed often contains very small amounts of the salt copper sulfate to provide the animal with the copper it needs.



Chloe wants to make copper sulfate.

The table below shows safety information about the chemicals she has available to use.

	chemical	hazard	other information
acids (dilute)	hydrochloric acid		dangerous with lithium, sodium and potassium
	nitric acid		
	sulfuric acid		
metal or metal compound	copper	not hazardous	does not react with acids
	copper oxide		do not breathe in the powder or get it into your eyes very slow reaction with acids at room temperature
	copper carbonate		do not breathe in the powder or get it into your eyes rapid reaction with acids at room temperature

(a) (i) Which **acid** should Chloe use to make copper sulfate?

..... [1]

(ii) Which of the following **best** describes the hazard symbol for this **acid**?

Put a **ring** around the correct answer.

corrosive dangerous flammable harmful hazardous

[1]

(b) Which metal or metal compound would you suggest she uses and why?

metal or metal compound:

reason:

..... [2]

(c) Chloe chooses to use a powder with the acid to make copper sulfate.

This powder reacts too slowly with the acid solution.

Suggest two ways Chloe could speed up the reaction.

1

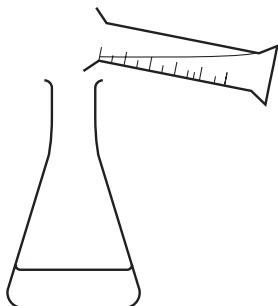
2 [2]

[Total: 6]

- 5 Farmers add fertilisers to their soil to increase the size of their crop. Some fertilisers contain nitrogen in the form of the soluble salt, ammonium sulfate.

Ally follows a standard procedure to make ammonium sulfate.

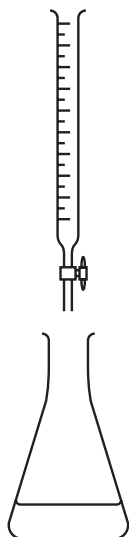
The diagrams below show the steps in this procedure.

step 1

- add 25 cm³ of ammonia solution to a conical flask

step 2

- fill the burette with sulfuric acid

step 3

- add the acid to the ammonia solution until the mixture is neutral

step 4

- pour the mixture into an evaporating dish
- evaporate until crystals start to form

(a) Complete the word equation for this reaction used to produce ammonium sulfate.



[2]

(b) Sulfuric acid is a solution.

What piece of apparatus should Ally use in **step 2** when filling the burette to reduce the risk of spillage?

..... [1]

(c) In **step 3** Ally needs to check that the mixture is neutral.

What should she do?

.....

What will she observe?

..... [2]

(d) Ally wants to produce **large** crystals of ammonium sulfate.

What should she do in **step 4**?

.....

Why does this work?

..... [2]

- (e) Another ammonium salt used in fertilisers is ammonium nitrate. This is also used in disposable cold packs.



When the pack is squeezed a chemical reaction begins which makes the pack feel cold.

What **type** of reaction is this?

Put a **ring** around the **correct** answer.

endothermic

exothermic

neutralisation

precipitation

[1]

[Total: 8]

END OF QUESTION PAPER

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