

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

A335/01

**TWENTY FIRST CENTURY SCIENCE
ADDITIONAL APPLIED SCIENCE A**

**Harnessing Chemicals
(Foundation Tier)**

FRIDAY 19 JUNE 2009: Morning

DURATION: 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **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.**
- **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.**

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Answer ALL the questions.

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

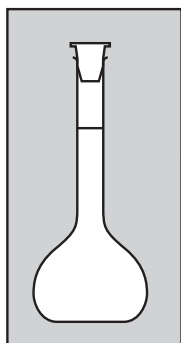
Draw a straight line from the PICTURE of each piece of equipment to its correct NAME and another line from the name to its correct USE.

One has been done for you.

EQUIPMENT

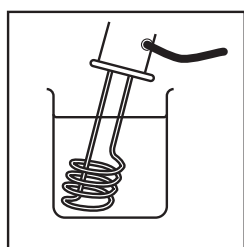
NAME

USE



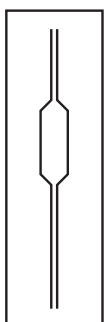
pipette

measuring the volume of a liquid accurately



magnetic stirrer and flea

making a standard solution

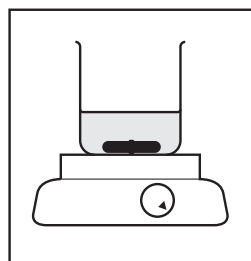


graduated flask

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

[TOTAL: 6]

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

The table below shows these products and their relative amounts.

<u>TYPE OF PRODUCT</u>	<u>PERCENTAGE OF THE TOTAL AMOUNT OF CHEMICALS PRODUCED IN BRITAIN</u>
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 The ingredients of low-sodium salt are potassium chloride, sodium chloride and magnesium carbonate.

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.

<u>MASS OF POTASSIUM CHLORIDE IN KG</u>	<u>COST IN £</u>		
	<u>TECHNICAL GRADE</u>	<u>LABORATORY GRADE</u>	<u>ANALYTICAL GRADE</u>
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 100 g sample of low-sodium salt.

Please show your working.

cost of 100 g of low-sodium salt =

_____ **[1]**

(iii) 100 g 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.

BAKING POWDER

CEMENT

MOUTHWASH

PAINT

TOOTH PASTE

[2]

[TOTAL: 7]

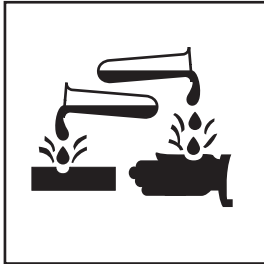
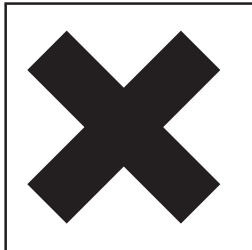
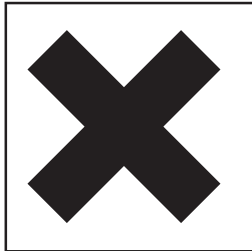
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4 Humans and animals need small traces of copper in their diet to stay healthy.

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.

	<u>CHEMICAL</u>	<u>HAZARD</u>	<u>OTHER INFORMATION</u>
<u>ACIDS</u> <u>(DILUTE)</u>	hydrochloric acid		dangerous with lithium, sodium and potassium
	nitric acid		
	sulfuric acid		
<u>METAL OR METAL COMPOUND</u>	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]**

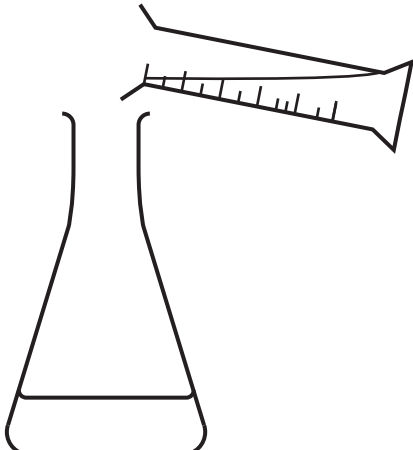
[TOTAL: 6]

- 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



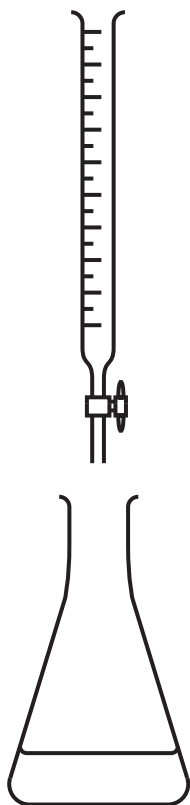
• add 25 cm³ of ammonia solution to a conical flask

STEP 2



• fill the burette with sulfuric acid

STEP 3



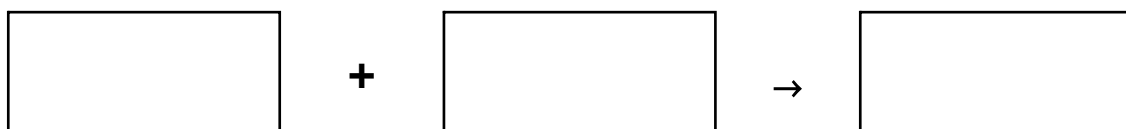
- **add the acid to the ammonia solution until the mixture is neutral**

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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