

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
ADDITIONAL APPLIED SCIENCE A
Harnessing Chemicals (Foundation Tier)
FRIDAY 18 JANUARY 2008

A335/01

Afternoon
Time: 45 minutes

Candidates answer on the question paper.

Additional materials (enclosed):
None

Calculators may be used.

Additional materials: Pencil
Ruler (cm/mm)



* C U P / T 4 3 9 0 5 *

Candidate
Forename

Candidate
Surname

Centre
Number

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Candidate
Number

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INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **36**.

FOR EXAMINER'S USE		
Qu.	Max	Mark
1	4	
2	6	
3	11	
4	8	
5	7	
TOTAL	36	

This document consists of **11** printed pages and **1** blank page.

BLANK PAGE

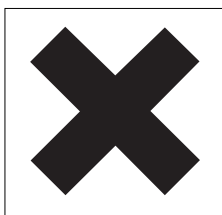
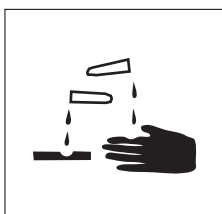
PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

- 1 Substances which are harmful to your health should have a hazard symbol clearly displayed on the container in which they are stored.

(a) Draw a straight line from each **hazard symbol** to the correct **hazard name**.

hazard symbol



hazard name

corrosive

toxic

highly flammable

irritant

[3]

- (b) Ethanol is a **highly flammable** substance. It will catch fire if it comes into contact with a flame.

The ester, ethyl ethanoate, is made by heating ethanol with ethanoic acid.

What could be used to safely heat the mixture?

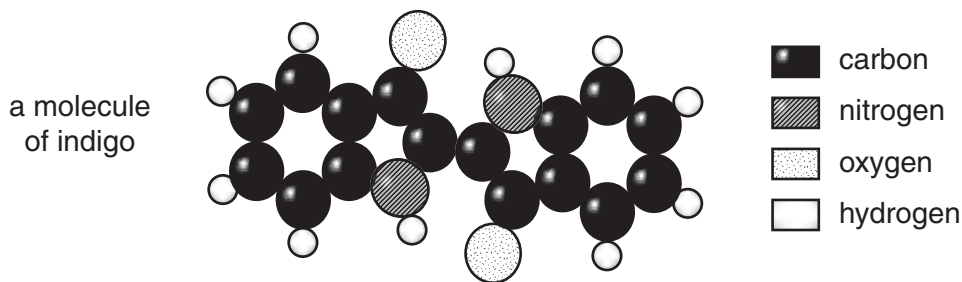
.....

..... [1]

[Total: 4]

2 Indigo is a blue dye used to colour jeans.

The picture below shows a molecule of indigo.



(a) A molecule of indigo contains atoms of **carbon**. What is the symbol for carbon?

Put a ring around the correct symbol in this list.

Co Ca C Cu [1]

(b) Indigo is an organic compound.

(i) Write down the name of **another** organic compound.

..... [1]

(ii) Indigo was originally obtained from plants such as woad. It is now more common to obtain indigo from non-living sources such as coal and crude oil.

Suggest why the production of indigo from coal or crude oil may not be possible in the future.

.....
 [1]

(c) Jeans are soaked in an aqueous solution of indigo dye to turn them blue.

Finish the sentences by choosing the **best** words from this list. Each word may be used once, more than once or not at all.

ethanol insoluble soluble water

Indigo is It must be changed into a form that will dissolve before it can be used to colour jeans. It is then added to to form an aqueous solution. [2]

(d) Some people like their jeans to be 'stonewashed'.

To obtain this faded effect, the dyed jeans are washed with cellulase.

Cellulase is a catalyst.

What happens to the amount of cellulase during this process?

Put a tick (✓) in the box next to the **one** correct answer.

The cellulase is used up.

More cellulase is made.

The amount of cellulase does not change.

[1]

[Total: 6]

- 3 Calcium carbonate is an insoluble chemical. It is used in indigestion tablets to neutralise excess stomach acid. This can be produced as a result of eating rich food or simply eating too quickly.



- (a) The exact composition of an indigestion tablet varies with each manufacturer.

This table shows all the ingredients of an indigestion tablet.

ingredient	amount (%)
antacid e.g. calcium carbonate (BP) and magnesium carbonate (BP)	55
sweetener e.g. sucrose and saccharin	?
binder, water repellent, flavour e.g. maize starch, magnesium stearate, peppermint	5

- (i) Use the information in the table above to work out the percentage of sweetener in the indigestion tablet.

answer % [1]

- (ii) Why do indigestion tablets contain sweetener?

.....
 [1]

- (iii) BP quality (suitable for medical use) antacids are used.

Suggest why these are used, despite their high cost.

.....

 [2]

- (iv) BP calcium carbonate is made on a **small scale** for use in drugs and cosmetics.

What term is used to describe this type of chemical?

Put a tick (✓) in the box next to the **one** correct answer.

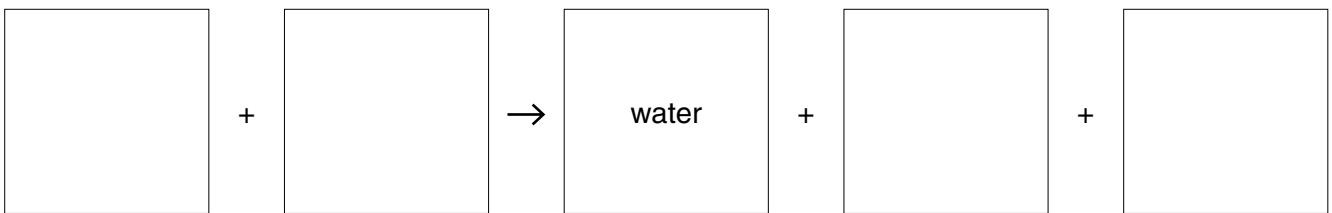
- | | | |
|-------|--------------------------|-----|
| bulk | <input type="checkbox"/> | |
| fine | <input type="checkbox"/> | |
| small | <input type="checkbox"/> | |
| rare | <input type="checkbox"/> | [1] |

- (b) Calcium carbonate reacts with hydrochloric acid in the stomach to produce water, calcium chloride and a gas.

- (i) Name the gas produced in this reaction.

..... [1]

- (ii) Complete the word equation for this reaction.



[2]

- (iii) This reaction between calcium carbonate and hydrochloric acid is exothermic.

What does **exothermic** mean?

.....
 [1]

- (c) Products such as indigestion tablets have to be thoroughly tested.

Suggest reasons why.

.....

 [2]

[Total: 11]

- 4 It is important in the chemical industry that a reaction proceeds at a suitable rate – not so fast that it is out of control and not so slow that it is inefficient.

When a solution of sodium thiosulfate reacts with hydrochloric acid a precipitate of sulfur forms.

- (a) The rate of this reaction can be found by measuring how quickly the mixture turns cloudy.

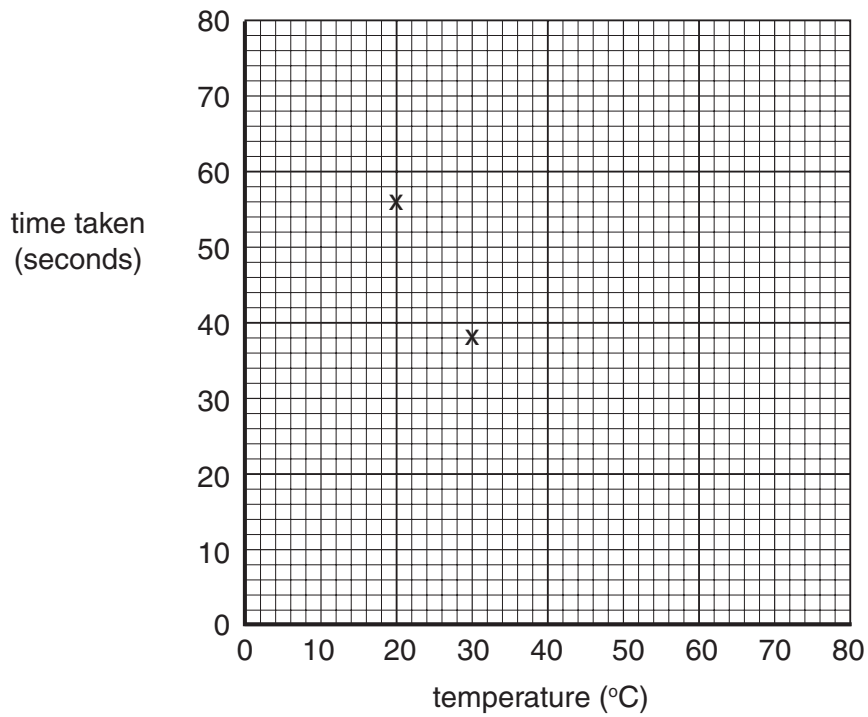
Draw and label the apparatus that you would use.

[3]

- (b) This table shows the time it took for the reaction between sodium thiosulfate and hydrochloric acid to take place at different temperatures.

temperature of reaction (°C)	time taken (seconds)
20	56
30	38
40	27
50	20
60	16
80	7

(i) Plot these results on this grid. The first two have been done for you.



[2]

(ii) Finish the graph by drawing the best line/curve through the points.

[1]

(iii) Describe how the **rate** of this reaction is affected by temperature.

.....

.....

..... [2]

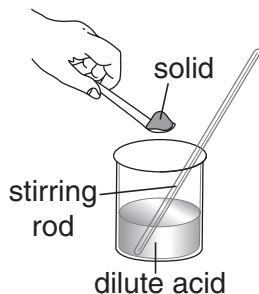
[Total: 8]

5 Alex follows a standard procedure to make copper sulfate.

Copper sulfate is a soluble chemical.

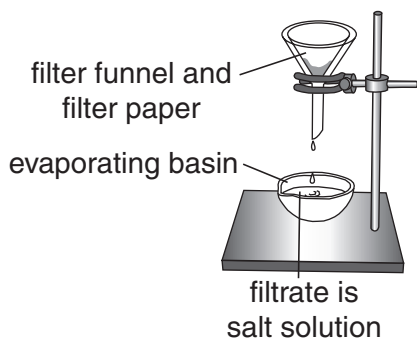
The diagrams below show the steps in the procedure.

step 1



- gently warm 100cm^3 of sulfuric acid in a beaker
- add solid copper oxide to the warm acid
- stir well
- continue until no more dissolves in the acid

step 2



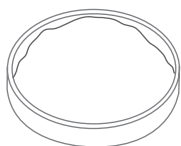
- filter the mixture using a filter funnel and filter paper

step 3



- gently heat the filtrate to evaporate some of the water to obtain a concentrated solution

step 4



- pour the concentrated solution into a labelled Petri dish
- leave to cool and crystallise

step 5



- weigh a labelled sample tube
- scrape the dry crystals into the sample tube
- reweigh the sample tube

(a) Why is the sulfuric acid warmed in **step 1**?

..... [1]

(b) Why is the mixture filtered in **step 2**?

.....
 [1]

(c) Alex wants to make larger crystals of copper sulfate.

How could the standard procedure be changed to do this?

..... [1]

(d) This table shows Alex's results for **step 5**.

mass of labelled sample tube (empty)	? g
mass of labelled sample tube and dry copper sulfate crystals	15.7 g
mass of dry copper sulfate crystals	1.1 g

(i) Calculate the mass of the empty sample tube.

You are advised to show how you work out your answer.

mass = g [1]

(ii) The **theoretical** yield of dry copper sulfate crystals is 1.6 g.

Calculate Alex's **percentage** yield.

You are advised to show how you work out your answer.

percentage yield =% [2]

- (iii) If the crystals were still wet when they were weighed in **Step 5**, how would this affect the value that Alex works out for the **actual** yield?

Put a tick (✓) in the box next to the **one** correct answer.

The value Alex works out will be bigger than the correct value.

The value Alex works out will be the same.

The value Alex works out will be smaller than the correct value.

[1]

[Total: 7]

END OF QUESTION PAPER

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