

**GCSE**

**ADDITIONAL APPLIED SCIENCE A**

AP4 Harnessing Chemicals

**Specimen Paper**

Candidates answer on the question paper:

Additional materials: ruler (cm/mm), calculator

**F** **A335/01**

45 mins

Candidate  
Name

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Centre  
Number

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Candidate  
Number

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**TIME** 45 mins

**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers on the dotted lines unless the question says otherwise.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- There is a space after most questions. Use it to do your working. In many questions marks will be given for a correct method even if the answer is incorrect.
- Do not write in the bar code. Do not write in the grey area between the pages.
- **DO NOT WRITE IN THE AREA OUTSIDE THE BOX BORDERING EACH PAGE. ANY WRITING IN THIS AREA WILL NOT BE MARKED.**

**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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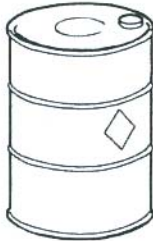
**This specimen paper consists of 15 printed pages.**

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**Section 1**

1. The chemical industry uses a wide variety of raw materials.

Some of these are shown below.



crude oil



coal



iron ore



sugar cane

Choose only from the diagrams to answer the following questions.

- (a) Which diagram shows a raw material that is living?

.....[1]

- (b) Which diagram shows a raw material that has never lived?

.....[1]

- (c) Which diagram shows a raw material that is organic but is non-living

.....[1]

[Total:3]

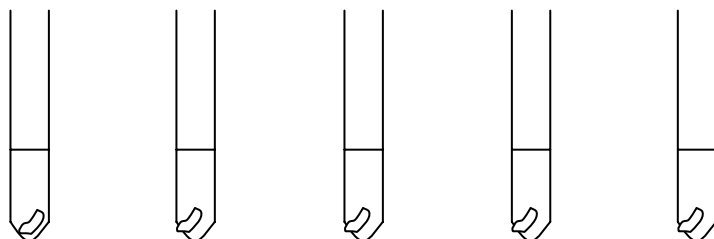
2. It is important that chemists understand about how quickly reactions take place.

Jo finds out about the reaction between zinc and dilute hydrochloric acid.

The diagrams show the experiments she carries out.

Each tube contains the same amount of zinc and hydrochloric acid.

Each is at a different temperature.



10 °C

20 °C

30 °C

40 °C

50 °C

- (a) How does temperature affect the rate of this reaction?

.....

..... [2]

- (b) Jo repeats the experiment at 10 °C but changes some conditions.

For each change say if the reaction is **faster**, **slower** or **stays the same**.

- (i) Jo uses zinc powder instead of one piece of zinc.

The reaction will be ..... [1]

- (ii) Jo adds water to the hydrochloric acid before adding the zinc.

The reaction will be ..... [1]

- (c) Jo knows that catalysts sometimes speed up chemical reactions.

What happens to the catalyst?

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

The catalyst is used up.

More catalyst is made.

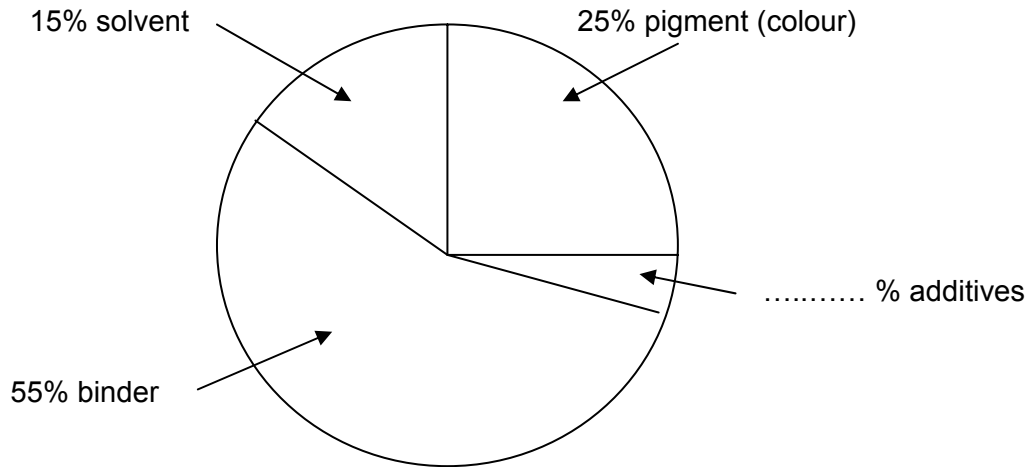
The amount of catalyst stays the same.  [1]

[Total: 5]

3. Tom finds out about paint.

He knows that gloss paint has been used in households for many years.

Tom finds this chart. It shows what is in some white gloss paint.



(a) Finish the chart to show the percentage of additives in gloss paint. [1]

(b) The only pigment used in this paint is titanium dioxide.

(i) What is the percentage of titanium dioxide in this paint?

.....% [1]

(ii) Titanium dioxide is obtained from a mineral.

What word describes titanium dioxide?

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

**inorganic**                      **living**                      **organic** [1]

(c) What happens to the solvent as the paint dries?

..... [1]

(d) Tom finds out about the binder in paint.

50 years ago the binder in the paint was linseed oil. Linseed oil is made from plants.

Now the binder is made from chemicals obtained from crude oil.

Tom thinks that in 200 years time we may have to use linseed oil again.

Why does Tom think this?

In your answer, you should write about sustainability.

.....

.....

.....

..... [2]

(e) Tom finds out that the paint industry carries out quality assurance tests on its paints.

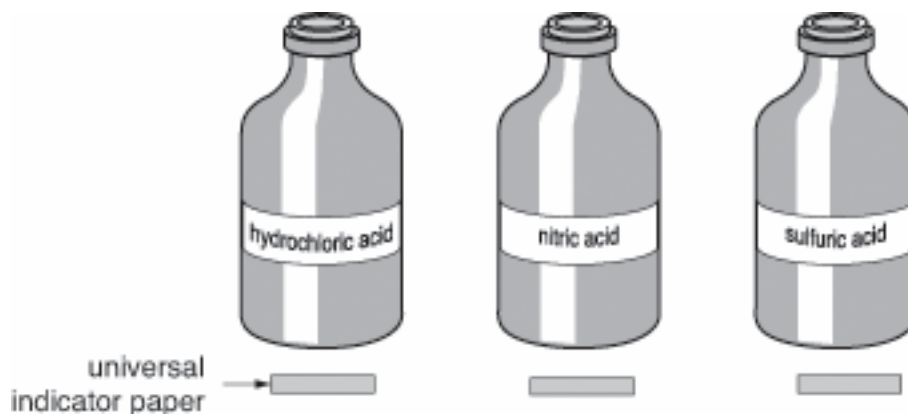
Suggest **two** reasons why it does this.

1. ....

2. .... [2]

[Total 8]

4. Sam finds out about acids. She finds out about hydrochloric acid, nitric acid and sulfuric acid.



- (a) All of these acids have the same effect on Universal indicator paper.

What happens to the Universal indicator paper when it is placed in any of the acids?

..... [1]

- (b) Sulfuric acid is manufactured on a **large scale**.

What word is used to describe the manufacture of sulfuric acid?

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

**bulk**

**fine**

**speciality**

[1]

- (c) The chemical formula of nitric acid is  $\text{HNO}_3$ .

How many oxygen atoms are present in a molecule of nitric acid?

.....

[1]

- (d) Hydrochloric acid reacts with zinc metal.

Heat is given off in the reaction.

What word is used for a reaction which gives off heat?

..... [1]

[Total:4]

5. Read this passage.

Lead iodide is a bright yellow solid. It does not dissolve in water.

To make lead iodide

- make a solution of potassium iodide in water
- make a solution of lead nitrate in water
- mix the two solutions to get a precipitate of lead iodide
- filter and wash the precipitate
- dry the lead iodide in an oven

Lead iodide is poisonous.

(a) Choose **only** chemicals from the passage to answer these questions.

(i) Name a solvent.

.....[1]

(ii) Name a soluble chemical.

.....[1]

(b) Why is it necessary to wash the precipitate?

.....

.....[1]

(c) Lead iodide is no longer used as a colouring agent in paints.

Suggest why.

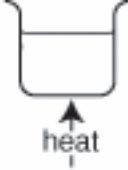




.....[1]

[Total:4]



6. Chris follows a standard procedure to make some magnesium sulfate.

The diagrams show the steps in the procedure.

step 1		warm 100 cm <sup>3</sup> of dilute sulfuric acid
step 2		add magnesium oxide a bit at a time until it is in excess stir
step 3		filter the mixture into an evaporating dish
step 4		gently heat to evaporate some of the water, until crystals form
step 5		set aside to cool remove small white crystals by filtration

- (a) How will Chris know when all of the sulfuric acid has reacted in **step 2**?

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

- (b) The standard procedure says to warm the sulfuric acid in **step 1**.

Suggest why.

.....[1]

- (c) Explain why **step 3** is necessary.

.....[1]

- (d) Chris wants to make **large** crystals of magnesium sulfate.

Suggest how the standard procedure could be changed to do this.

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

- (e) Chris uses 100 cm<sup>3</sup> of sulfuric acid and 8g of magnesium oxide in the experiment.

A catalogue shows the following for the cost of these chemicals.

sulfuric acid £9.20 per litre
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magnesium oxide £40.00 per kilogram
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- (i) What is the cost of the sulfuric acid that Chris uses?

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

[2]

- (ii) What is the cost of the magnesium oxide that Chris uses?

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

[2]

- (iii) The total cost of carrying out the experiment is greater than the cost of the chemicals used.

Suggest why.

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

- (f) Chris looks in the catalogue to find out the selling price for the magnesium sulfate she has made.

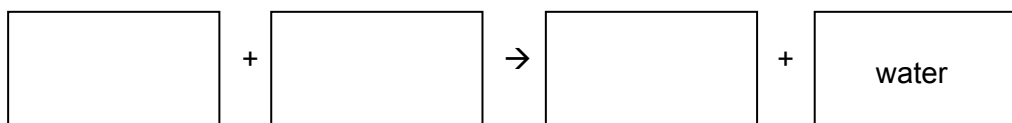
She finds the following information.

magnesium sulfate technical £1.20 per kilogram	magnesium sulfate laboratory £3.60 per kilogram	magnesium sulfate analytical £22.60 per kilogram
--	---	--

Why are the prices different?

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

- (g) Finish the word equation for the reaction between the sulfuric acid and the magnesium oxide.



[2]

[Total:12]

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**GCSE**

**ADDITIONAL APPLIED SCIENCE A**

AP4 Harnessing Chemicals

**Specimen Mark Scheme**

Maximum mark for this paper is [36]

**F** **A335/01**

45 mins

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**This specimen mark scheme consists of 3 printed pages.**

Question Number	Suggested answers	Marks
1(a) 1(b) 1(c)	sugar cane iron ore crude oil	[1] [1] [1]
	<b>Total</b>	[3]
2(a)  2(b)(i) 2(b)(ii) 2(c)	rate of reaction increases; as temperature increases faster slower The amount of catalyst stays the same.	[1] [1] [1] [1]
	<b>Total</b>	[5]
3(a) 3(b)(i) 3(b)(ii) 3(c) 3(d)  3(e)	5 25 inorganic The solvent evaporates. linseed oil is more sustainable than crude oil explanation of meaning of sustainable e.g. crude oil will one day run out but we can make grow more plants to make linseed oil to make sure they do the job they are supposed to do to make sure they are safe to use	[1] [1] [1] [1] [1] [2] [1]
	<b>Total</b>	[8]
4(a) 4(b) 4(c) 4(d)	turns red bulk 3 exothermic	[1] [1] [1] [1]
	<b>Total</b>	[4]
5(a)(i) 5(a)(ii) 5(b) 5(c)	water potassium iodide / lead nitrate to remove potassium nitrate solution it is poisonous	[1] [1] [1] [1]
	<b>Total</b>	[4]

Question Number	Suggested answers	Marks
6(a)	the magnesium oxide stays as a white powder / a white powder remains / the solid is still there / it doesn't dissolve <b>accept 'the magnesium oxide stops reacting/dissolving'</b>	[1]
6(b)	to speed up the reaction owtte / to increase solubility of magnesium oxide	[1]
6(c)	to remove unreacted magnesium oxide/white powder/any solids	[1]
6(d)	do not heat in step 4 / allow to cool slowly	[1]
6(e)(i)	use the fact that 100cm <sup>3</sup> is 1/10 of a litre;	[1]
6(e)(ii)	0.1 x £9.20 = £0.92 / 92p	[1]
6(e)(iii)	use the fact that 8 g is 8/1000 of a kilogram;	[1]
6(f)	0.008 x £40.00 = £0.32 / 32p	[1]
6(g)	cost of energy/heating / (possible) broken glassware / (possible) labour costs	[1]
6(g)	the purity/quality of each is different	[1]
	sulfuric acid + magnesium oxide magnesium sulphate + water	[2]
	<b>all three correct = 2, any two correct = 1</b>	