Pearson

Delegate Booklet

Course Title:

Welcome to Pearson:
Edexcel International GCSE Chemistry (9-1)

Prepared by Pack Production 2023

About this event

Course Title: Welcome to Pearson: Edexcel International GCSE Chemistry (9–1)

Course Code: 4CH1-23IF1

Aims and objectives of the event

- To gain an understanding about how the qualification is devised
- To understand the content of the qualification
- To understand the assessment of the qualification and how to cover the content
- To explore how to plan the course
- To understand the support that is available to help you to teach the content
- To network and share ideas with other teachers

Agenda of event

Timings are approximate

Time	Item
1000 – 1010	Welcome and introductions
1010 – 1115	Session 1 – Understanding the qualification and assessment
1115 – 1130	MORNING BREAK
1130 – 1245	Session 2 (Part 1) – Assessment objectives and exemplars
1245 – 1345	LUNCH
1345 – 1445	Session 2 (Part 1) – Assessment objectives and exemplars (contd.)
1445 – 1500	AFTERNOON BREAK
1500 – 1600	Session 3 – Support

PERSONAL LEARNING

Things to do:

-
-
-
-
-

Things to avoid:

-
-
-
-
-

Your ideas:

ACTIVITY 1

Devise a question to assess the following specification statement:

2.7 understand how displacement reactions involving halogens and halides provide evidence for the trend in reactivity in Group 7

ACTIVITY 2

Which specification point is the following question assessing?

Malachite is an ore of copper containing copper(II) carbonate and several other compounds that are insoluble in water.

You are supplied with several pieces of malachite, these chemicals and items of apparatus.

Chemicals: dilute sulfuric acid magnesium powder

Apparatus: beakers filter funnel and paper pestle and mortar

Describe how you would use the chemicals and the apparatus to obtain a sample of copper from the malachite.

(6)

ACTIVITY 3

What are the essential points to include when answering these two questions?

SiF_4 and $SiCl_4$ have simple molecular structures.

SiO_2 has a giant covalent structure.

(i) Explain why the boiling point of $SiCl_4$ is greater than the boiling point of SiF_4

(2)

(ii) Explain why the boiling point of SiO_2 is very much greater than the boiling point of $SiCl_4$

(2)

ACTIVITY 4

What is the answer to the following question?

Hydrogen iodide can be manufactured from its elements using this reaction.

$$H_2(g) + I_2(g) \rightleftharpoons 2HI(g) \qquad \Delta H = -9 \text{ kJ/mol}$$

A temperature of 500 °C, a pressure of 4 atm and a platinum catalyst are used in this manufacturing process.

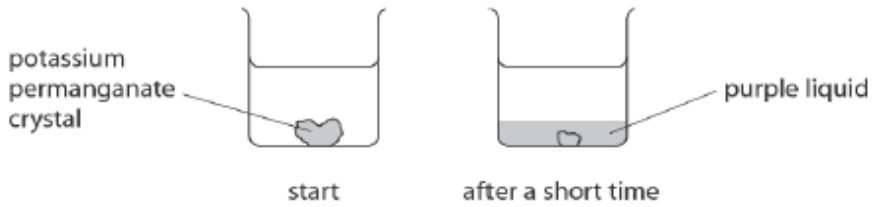
A manufacturer carries out this reaction using the same catalyst, a pressure of 4 atm, but a temperature of 400 °C.

State the effect of this change on the yield of hydrogen iodide.
Justify your answer. (2)

ACTIVITY 5
Assigning AOs to questions

1 Potassium permanganate is a purple solid that is soluble in water.

A crystal of potassium permanganate is placed in a beaker containing water.



(a) After a short time, the crystal becomes smaller and the liquid at the bottom of the beaker becomes purple.

Which statement explains this observation?

(1)

- ☐ **A** the crystal condenses in the water
- ☐ **B** the crystal dissolves in the water
- ☐ **C** the crystal evaporates in the water
- ☐ **D** the crystal melts in the water

(b) The beaker is left until there is no further change in the appearance of the liquid.

(i) Which statement describes the final appearance of the liquid?

(1)

- ☒ **A** all of the liquid is purple
- ☒ **B** none of the liquid is purple
- ☒ **C** only the bottom half of the liquid is purple
- ☒ **D** only the top half of the liquid is purple

(ii) Which process causes this change in appearance?

(1)

- ☒ **A** condensation
- ☒ **B** crystallisation
- ☒ **C** diffusion
- ☒ **D** evaporation

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6 The reactions of metals with water and with dilute sulfuric acid can be used to determine the order of reactivity of the metals.

The table shows the reactions of four metals, W, X, Y and Z, with water and with dilute sulfuric acid.

Metal	Reaction with water	Reaction with dilute sulfuric acid
W	no reaction	no reaction
X	very slow reaction	reacts quickly
Y	no reaction	reacts slowly
Z	reacts quickly	reacts violently

(a) What is the order of reactivity of these metals?

(1)

	most reactive →			least reactive
☐ A	W	X	Y	Z
☐ B	Z	X	Y	W
☐ C	W	Y	X	Z
☐ D	Z	Y	X	W

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3 A student does these two tests on a solution made from a white solid.

- flame test
- add acidified silver nitrate solution

The table shows his results.

Test	Result
flame test	red flame
add acidified silver nitrate solution	cream precipitate

(a) Give the formula of the ion that produces the red flame.

(1)

.....

(b) Name the cream precipitate.

(1)

.....

(c) Identify the white solid.

(1)

.....

(d) The student uses a clean metal wire in the flame test.

(i) State why the wire should be clean when used in the flame test.

(1)

.....

.....

(ii) The table lists properties of some metals.

Add ticks (✓) to the table to show the two properties needed in a metal wire used in a flame test.

(2)

Property	
good conductor of electricity	
high density	
high melting point	
unreactive	

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2 The table gives some information about the halogens, chlorine, bromine and iodine.

Halogen	Physical state at room temperature	Colour
chlorine	gas	pale green
bromine		red-brown
iodine	solid	

(a) Complete the table.

(2)

(b) Chlorine has two isotopes of mass numbers 35 and 37

The relative percentage of each isotope in a sample of chlorine is

chlorine-35 77.78% chlorine-37 22.22%

Calculate the relative atomic mass of this sample of chlorine.

Give your answer to one decimal place.

(3)

relative atomic mass = ...

(c) A student is given an aqueous solution of chlorine and an aqueous solution of potassium bromide.

Explain how he can use these two solutions to compare the reactivity of chlorine with the reactivity of bromine.

(4)

ACTIVITY 6:
Command words

The following table lists the command words used in the external assessments.

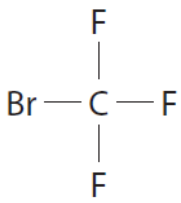
Command word	Definition
Add/Label	Requires the addition or labelling of a stimulus material given in the question, for example labelling a diagram or adding units to a table.
Calculate	Obtain a numerical answer, showing relevant working.
Comment on	Requires the synthesis of a number of variables from data/information to form a judgement.
Complete	Requires the completion of a table/diagram.
Deduce	Draw/reach conclusion(s) from the information provided.
Describe	To give an account of something. Statements in the response need to be developed, as they are often linked but **do not** need to include a justification or reason.
Determine	The answer must have an element that is quantitative from the stimulus provided, or must show how the answer can be reached quantitatively. To gain maximum marks, there must be a quantitative element to the answer.
Design	Plan or invent a procedure from existing principles/ideas.
Discuss	• Identify the issue/situation/problem/argument that is being assessed within the question. • Explore all aspects of an issue/situation/problem/argument. • Investigate the issue/situation etc. by reasoning or argument.
Draw	Produce a diagram either using a ruler or freehand.
Estimate	Find an approximate value, number or quantity from a diagram/given data or through a calculation.
Evaluate	Review information (e.g. data, methods) then bring it together to form a conclusion, drawing on evidence including strengths, weaknesses, alternative actions, relevant data or information. Come to a supported judgement of a subject's quality and relate it to its context.
Explain	An explanation requires a justification/exemplification of a point. The answer must contain some element of reasoning/justification – this can include mathematical explanations.
Give/State/Name	All of these command words are really synonyms. They generally all require recall of one or more pieces of information.
Give a reason/reasons	When a statement has been made and the requirement is only to give the reason(s) why.
Identify	Usually requires some key information to be selected from a given stimulus/resource.

Command word	Definition
Justify	Give evidence to support (either the statement given in the question or an earlier answer).
Plot	Produce a graph by marking points accurately on a grid from data that is provided and then draw a line of best fit through these points. A suitable scale and appropriately labelled axes must be included if these are not provided in the question.
Predict	Give an expected result.
Show that	Verify the statement given in the question.
Sketch	Produce a freehand drawing. For a graph, this would need a line and labelled axes with important features indicated. The axes are not scaled.
State what is meant by	When the meaning of a term is expected but there are different ways for how these can be described.
Suggest	Use your knowledge to propose a solution to a problem in a novel context.
Verb preceding a command word	
Analyse the data/graph to explain	Examine the data/graph in detail to provide an explanation.
Multiple choice questions	
What, Why	Direct command words used for multiple-choice questions.

ACTIVITY 7a
AO2 in Exams

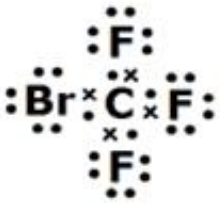
Paper 1C, Q9(b)

(b) The diagram shows the displayed formula of a molecule of Halon 1301.



Draw a dot-and-cross diagram to show all the outer electrons in this molecule.

(2)

Question number	Answer	Notes	Marks
9 b		**ACCEPT** any combination of dots and crosses	2
	M1 all four bonding pairs correct		
	M2 rest of electrons correct	**IGNORE** inner shell electrons even if incorrect **M2** DEP on **M1**	

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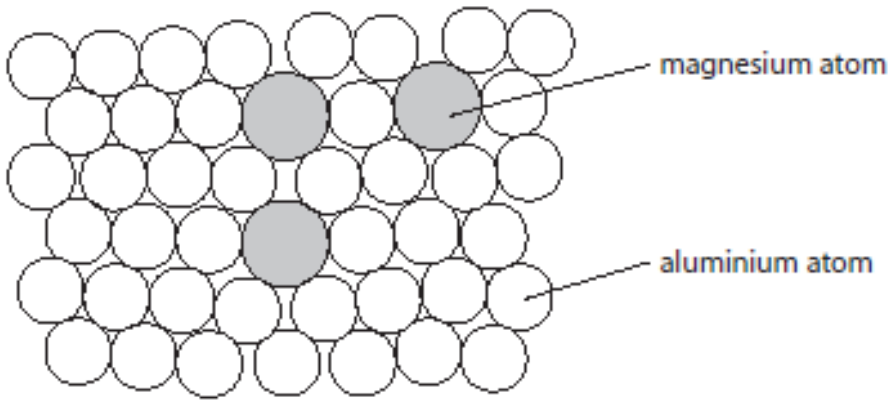
Paper 2C, Q4(c)(ii)

(c) Magnalium is an alloy of aluminium and magnesium.

The diagram shows how the atoms are arranged in this alloy.



(ii) Explain why magnalium is harder than aluminium.

(3)

Question number	Answer	Additional guidance	Marks
4 (c) (ii)	An explanation that links together the following three points:		
	M1 the regular arrangement of atoms is distorted/disrupted OWTTE	**ALLOW** lattice/layers/rows of atoms are disrupted/distorted **ALLOW** lattice/layers/rows of atoms less regular	3
	M2 because magnesium atoms are larger than aluminium atoms	**ALLOW** magnesium and aluminium atoms are of different sizes	
	M3 and therefore it is more difficult for the layers to slide over one another	**ALLOW** layers cannot (as easily) slide over one another **IGNORE** references to strength of metallic bonds	

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Paper 1C, Q14(f)(i) & (ii)

(f) The overall equation for the formation of hydrated copper(II) sulfate crystals from copper(II) oxide is

$$CuO(s) + H_2SO_4(aq) + 4H_2O(l) \rightarrow CuSO_4.5H_2O(s)$$

(i) In an experiment, a student completely reacts 9.54 g copper(II) oxide.

Show that the maximum possible mass of $CuSO_4.5H_2O$ crystals that can be obtained is about 30 g.

[M_r of CuO = 79.5 M_r of $CuSO_4.5H_2O$ = 249.5]

Give your answer to an appropriate number of significant figures.

(3)

mass = ... g

(ii) In this experiment, the actual yield of $CuSO_4.5H_2O$ crystals is 23.92 g.

Calculate the percentage yield of $CuSO_4.5H_2O$

(2)

percentage yield = ... %

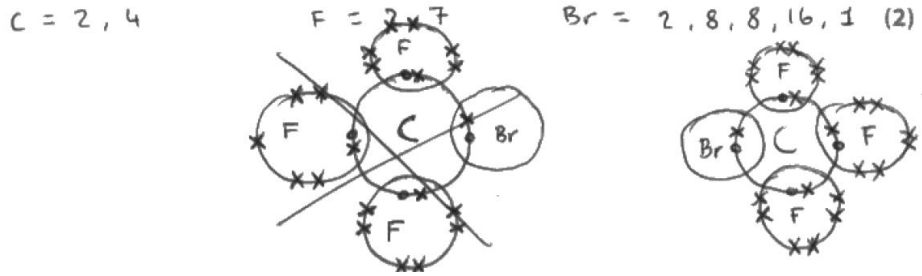
Question number	Answer	Notes	Marks
14 f i	• calculate the moles of CuO • calculate the mass of $CuSO_4.5H_2O$ • give the answer to an appropriate number of significant figures Example calculation **M1** *n*[CuO] = 9.54 ÷ 79.5 OR 0.120 (mol) **M2** mass of $CuSO_4.5H_2O$ = 0.120 × 249.5 **OR** 29.94 (g) **M3** = 29.9 **OR** **M1** 79.5 (g) → 249.5 (g) **M2** 9.94 (g) → (249.5 ÷ 79.5) × 9.54 (g) **OR** 29.94 (g) **M3** = 29.9	Final answer must be to 3 sig figs Final answer must be to 3 sig figs 29.94 with no working scores 2 29.9 with no working scores 3	**3**
ii	**M1** (23.92 ÷ 29.9) × 100 OR (23.92 ÷ **M3** from (i)) × 100 **M2** = 80(%)	**ALLOW** use of **M2** from (i) 29.94 gives 79.89% **ALLOW** any number of sig figs **ACCEPT** answer of 79.7(3)% using 30g Correct answer without working scores 2	**2**
		Total	**14**

ACTIVITY 7b
AO2 in Exams – Student Answers

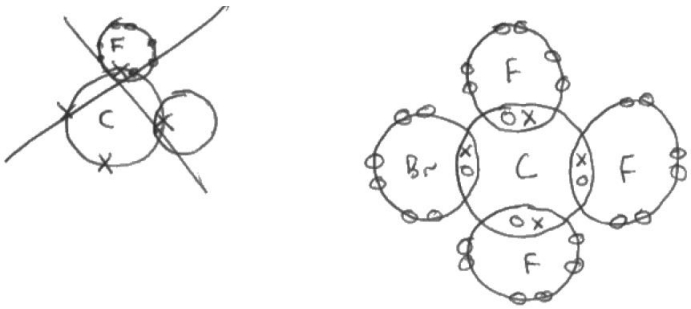
Paper 1C, Q9(b)

Student 1

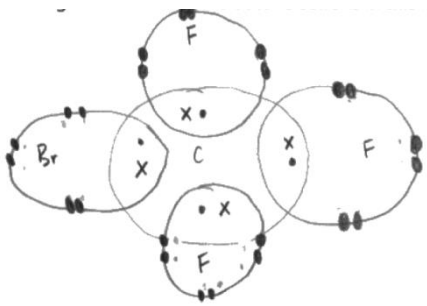
Student 2



Student 3



Student 4



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Paper 2C, Q4c(ii)

Student 1

(ii) Explain why magnalium is harder than aluminium.

(3)

In Magnalium the structure is less uniform as magnesium atoms disrupt the uniformity of the aluminium atoms. This means the atoms can slide over each other less easily, this means the metal is harder and less soft/malleable.

Student 2

(ii) Explain why magnalium is harder than aluminium.

(3)

Magnalium contains the different sized atoms of Mg and Al, therefore this distorts the layers. This means the layers are unable to slide over each other meaning that ~~they~~ Magnalium is hard and not malleable. Aluminium has the same sized atoms so layers can slide over each other, ~~not~~ making it softer, and malleable.

(Total for Question 4 = 7 marks)

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Student 3

(ii) Explain why magnalium is harder than aluminium.

(3)

Magnalium is harder than aluminium as its atoms have different shapes which break up the ~~perfect~~ perfect lattice and make it harder for the layers to slide over each other as they are not uniform in shape making them harder.

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Paper 1C, Q14(f)(i) & (ii)

Student 1

(i) In an experiment, a student completely reacts 9.54 g copper(II) oxide.

Show that the maximum possible mass of $CuSO_4.5H_2O$ crystals that can be obtained is about 30 g.

[M_r of CuO = 79.5 M_r of $CuSO_4.5H_2O$ = 249.5]

Give your answer to an appropriate number of significant figures.

(3)

$\frac{9.45}{79.5}$

$= 0.119$

$CuO : CuSO_4 \cdot 5H_2O$

$1 : 1$

$0.119 : 0.119$

$0.119 \times 249.5 = 29.69$

mass = 29.69 g

(ii) In this experiment, the actual yield of $CuSO_4.5H_2O$ crystals is 23.92 g.

Calculate the percentage yield of $CuSO_4.5H_2O$

(2)

percent yield = $\frac{\text{actual yield}}{\text{theoretical yield}}$

percent yield = $\frac{23.92}{29.69} \times 100$

$= 80.6$

percentage yield = 80.6 %

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Student 2

(i) In an experiment, a student completely reacts 9.54 g copper(II) oxide.

Show that the maximum possible mass of $CuSO_4.5H_2O$ crystals that can be obtained is about 30 g.

[M_r of CuO = 79.5 M_r of $CuSO_4.5H_2O$ = 249.5]

Give your answer to an appropriate number of significant figures.

(3)

1:1 ratio

$n = \frac{M}{Mr}$

$n = \frac{9.54}{79.5}$

$n = 0.12$

$n = \frac{M}{Mr}$

$0.12 = \frac{M}{249.5}$

$0.12 \times 249.5 = M$

$= 29.94$

$M = 29.94$

mass = 30.0 g

(ii) In this experiment, the actual yield of $CuSO_4.5H_2O$ crystals is 23.92 g.

Calculate the percentage yield of $CuSO_4.5H_2O$

(2)

$\frac{23.92}{29.94} \times 100 = 79.893\ \%$

79.9 %

percentage yield = 79.9 %

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Student 3

(i) In an experiment, a student completely reacts 9.54 g copper(II) oxide.

Show that the maximum possible mass of $CuSO_4.5H_2O$ crystals that can be obtained is about 30 g.

[M_r of CuO = 79.5 M_r of $CuSO_4.5H_2O$ = 249.5]

Give your answer to an appropriate number of significant figures.

(3)

n of CuO = $\frac{9.54}{79.5}$

= 0.12

m g crystals = n × M_r

= 0.12 × 249.5

= 29.94 g

mass = 29.94 g

(ii) In this experiment, the actual yield of $CuSO_4.5H_2O$ crystals is 23.92 g.

Calculate the percentage yield of $CuSO_4.5H_2O$

(2)

$\frac{23.92}{29.94} \times 100 = 92.21...$

percentage yield = 92.21 %

ACTIVITY 8
AO2 Exam Preparation

Question 1

6 Some cars in Brazil use ethanol, C_2H_5OH, as a fuel instead of petrol.

The ethanol is made by the fermentation of glucose which is obtained from sugar cane.

The sugar is extracted from the sugar cane and then dissolved in water to make a sugar solution.

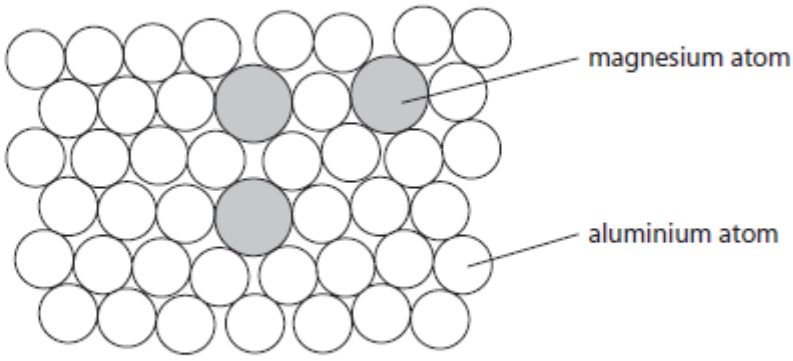
(iii) Explain why fermentation is done in the absence of air.

(2)

Question 2

(c) Magnalium is an alloy of aluminium and magnesium.

The diagram shows how the atoms are arranged in this alloy.



(ii) Explain why magnalium is harder than aluminium.

(3)

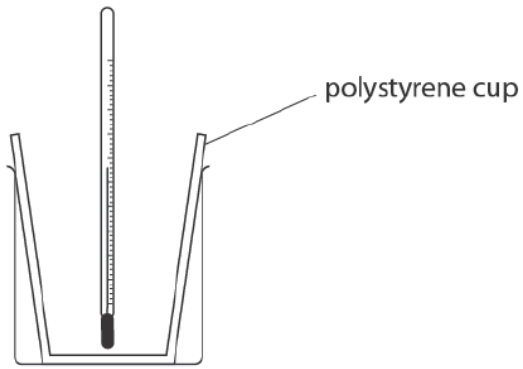
(iii)	An explanation using either of the following linked pairs: **M1** oxygen in the air would react with ethanol **M2** to form ethanoic acid **OR** **M1** the fermentation/reaction/respiration needs to be anaerobic **M2** ethanol would not be formed /CO_2 and H_2O would form	**ACCEPT** ethanol would be oxidised **ALLOW** to form carboxylic acid **ALLOW** to form vinegar	2

(ii)	An explanation that links together the following three points: **M1** the regular arrangement of atoms is distorted/disrupted OWTTE **M2** because magnesium atoms are larger than aluminium atoms **M3** and therefore it is more difficult for the layers to slide over one another	**ALLOW** lattice/layers/rows of atoms are disrupted/distorted **ALLOW** lattice/layers/rows of atoms less regular **ALLOW** magnesium and aluminium atoms are of different sizes **ALLOW** layers cannot (as easily) slide over one another **IGNORE** references to strength of metallic bonds	3

ACTIVITY 9a
AO3 in Exams

Paper 1C, Q12(a)

12 A student uses this apparatus to investigate the temperature change that occurs when ammonium nitrate is dissolved in water.



She uses this method.

- put 100 cm^3 of water into the polystyrene cup and measure the initial temperature of the water
- add 8.00 g of ammonium nitrate and stir
- record the lowest temperature reached by the solution

The table shows her results.

Initial temperature of water in °C	20.0
Lowest temperature of solution in °C	14.2

(a) Use the results of the experiment to explain what type of reaction is taking place when ammonium nitrate is added to water.

(2)

Question number	Answer	Notes	Marks
12 a	An explanation that links together **M1** the reaction is endothermic and either of the following points: **M2** as shown by the decrease in temperature (of the reaction mixture) **OR** **M3** it takes in thermal energy/heat (from the surroundings)	**REJECT** exothermic for both marks **ALLOW** references to cooling No M2 or M3 if the statements contradict each other	**2**

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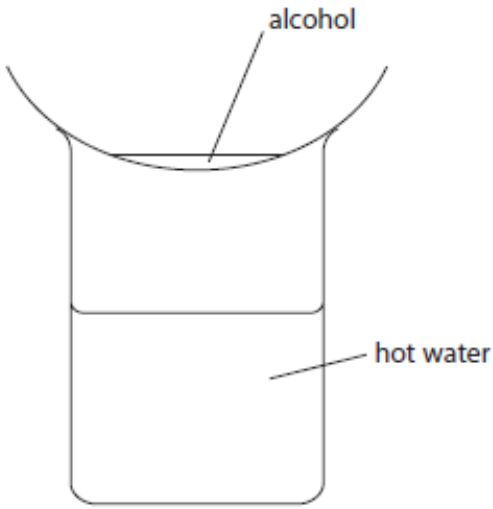
Paper 2C, Q3(c)(i)

3 Methanol, ethanol, propanol and butanol are alcohols. They are all liquids that evaporate easily when warmed.

A student uses this apparatus to compare the time taken for the four liquids to evaporate.



She uses this method.

- pour some methanol into an evaporating basin
- place the evaporating basin on top of a beaker containing hot water
- measure the time taken for the methanol to evaporate completely
- repeat the experiment with each of the other alcohols, using the same apparatus

(c) The table shows the results of experiments done by four students, A, B, C and D.

Alcohol	Formula of alcohol	Time taken for liquid to evaporate in s				
		Student A	Student B	Student C	Student D	Mean time in s
methanol	CH_3OH	20	24	22	26	23
ethanol	C_2H_5OH	32	34	35	30	33
propanol	C_3H_7OH	45	47	50	48	48
butanol	C_4H_9OH	64	63	90	60	

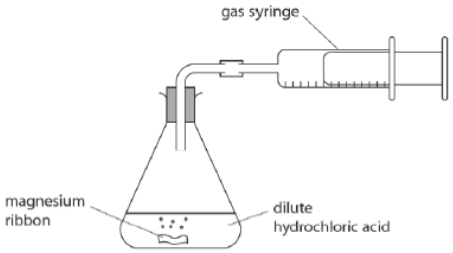
(i) Calculate the mean (average) time for butanol to evaporate.

(2)

Question number	Answer	Additional guidance	Marks
3 (c) (i)	**M1** (64 + 63 + 60) ÷3 **M2 =** 62	**ALLOW** 62.3 62/62.3 with no working scores 2 **ALLOW** 69/69.25/69.3 for 1 mark	2

Paper 1C, Q13(a) & (b)

13 A student uses this apparatus to investigate the rate of reaction between magnesium and an **excess** of dilute hydrochloric acid.



She uses this method.

- use a graduated beaker to pour 50 cm^3 of dilute hydrochloric acid of concentration 2.00 mol/dm^3 into the conical flask
- add a piece of magnesium ribbon of mass 0.086 g to the acid and put the bung into the neck of the flask
- measure the total volume of gas collected every ten seconds until the reaction stops

The table shows the student's results.

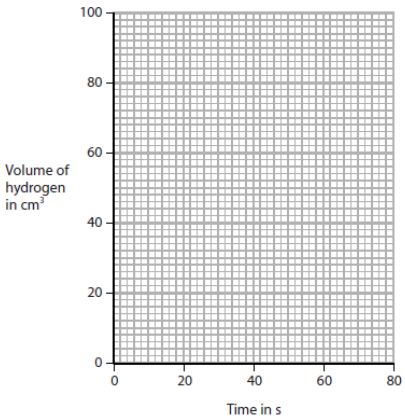
Time in s	Volume of hydrogen in cm^3
0	0
10	29
20	52
30	67
40	76
50	81
60	84
70	84
80	84

(a) (i) Plot the student's results on the grid.

(1)

(ii) Draw a curve of best fit.

(1)



(b) (i) The student repeats the experiment using

- 0.043 g of magnesium ribbon
- 50 cm^3 of 2.00 mol/dm^3 hydrochloric acid

Draw, on the grid in part (a), the curve you would expect in this experiment.

Label this curve Y.

(2)

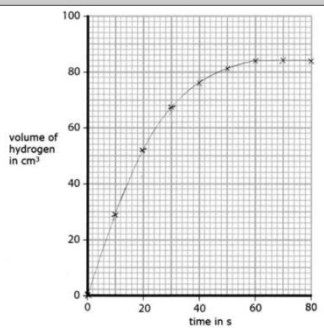
(ii) The student repeats the experiment again, using

- 0.086 g of magnesium ribbon
- 50 cm^3 of 2.00 mol/dm^3 hydrochloric acid
- a slightly higher temperature than the first experiment

Draw, on the grid in part (a), the curve you would expect in this experiment.

Label this curve Z.

(2)

Question number	Answer	Notes	Marks
13 a (i)		all points plotted correctly to + or – half a square	1
(ii)		curve of best fit drawn for points plotted	1

Question number	Answer	Notes	Marks
13 b i	**M1** curve Y starting at origin **and** below original curve **M2** levelling off at 42 cm^3 to + or – half a square		**2**
ii	**M1** curve Z starting at origin **and** above original curve **M2** levelling off at 84 cm^3 to + or – half a square	**ACCEPT** curves unlabelled If curves labelled incorrectly then deduct 1 mark	**2**

ACTIVITY 9b

AO3 in Exams – Student Answers

Paper 1C, Q12(a)

Student 1

It is endothermic as the reaction takes in more energy than it gives out so it cools.

Student 2

An exothermic reaction is occuring because the sat solution is giving out heat. This is shown by the decrease in temperature as it shows heat has been lost.

Student 3

This is an endothermic reaction because heat is lost once the ammonium nitrate is added.

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Paper 2C, Q3(c)(i)

Student 1

(c) The table shows the results of experiments done by four students, A, B, C and D.

Alcohol	Formula of alcohol	Time taken for liquid to evaporate in s				
		Student A	Student B	Student C	Student D	Mean time in s
methanol	CH_3OH	20	24	22	26	23
ethanol	C_2H_5OH	32	34	35	30	33
propanol	C_3H_7OH	45	47	50	48	48
butanol	C_4H_9OH	64	63	90	60	

(i) Calculate the mean (average) time for butanol to evaporate.

$\frac{64+63+90+60}{4} = 69.25$

$\frac{63+64+60}{3} = 62.3$ (2)

Without anomaly

mean time = 69.25 s

Student 2

(c) The table shows the results of experiments done by four students, A, B, C and D.

Alcohol	Formula of alcohol	Time taken for liquid to evaporate in s				
		Student A	Student B	Student C	Student D	Mean time in s
methanol	CH_3OH	20	24	22	26	23
ethanol	C_2H_5OH	32	34	35	30	33
propanol	C_3H_7OH	45	47	50	48	48
butanol	C_4H_9OH	64	63	90	60	

(i) Calculate the mean (average) time for butanol to evaporate.

(2)

mean time = 62 s

Pearson

Student 3

(c) The table shows the results of experiments done by four students, A, B, C and D.

Alcohol	Formula of alcohol	Time taken for liquid to evaporate in s				
		Student A	Student B	Student C	Student D	Mean time in s
methanol	CH_3OH	20	24	22	26	23
ethanol	C_2H_5OH	32	34	35	30	33
propanol	C_3H_7OH	45	47	50	48	48
butanol	C_4H_9OH	64	63	90	60	

(i) Calculate the mean (average) time for butanol to evaporate.

(2)

64 + 63 + 90 + 60 = 69.25

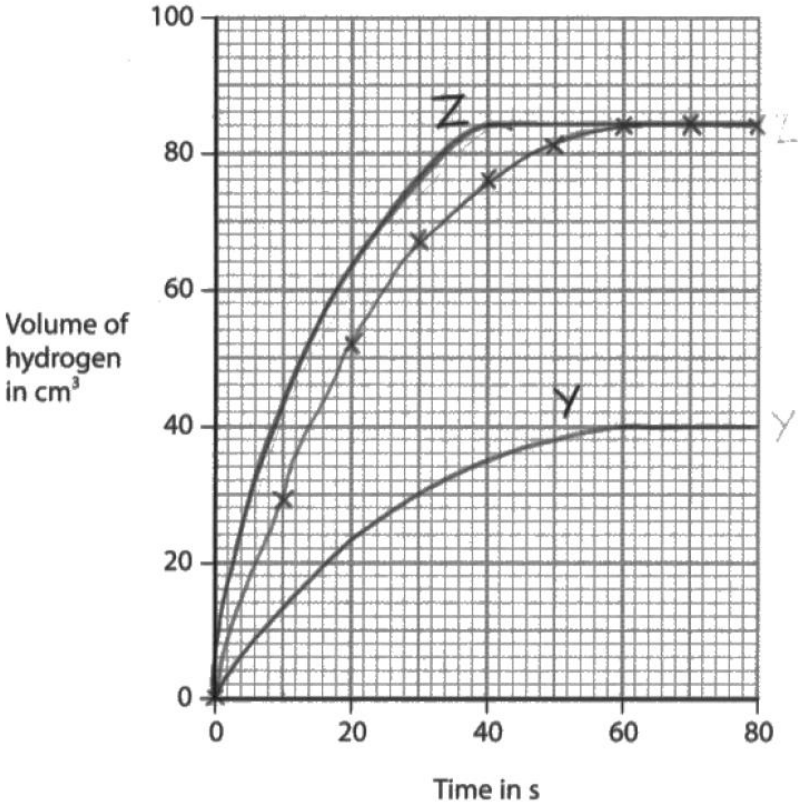
64 + 63 + 60 / 3 = 62.3. 4. Remove the aroudy.

mean time = ~~69.25~~ 62.3 s

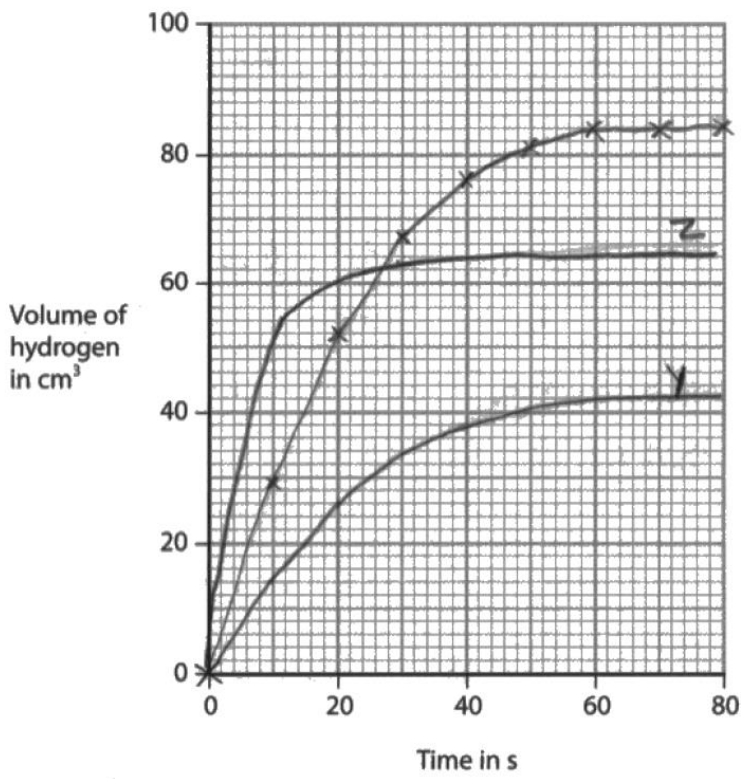
Pearson

Paper 1C, Q13(a) & (b)

Student 1

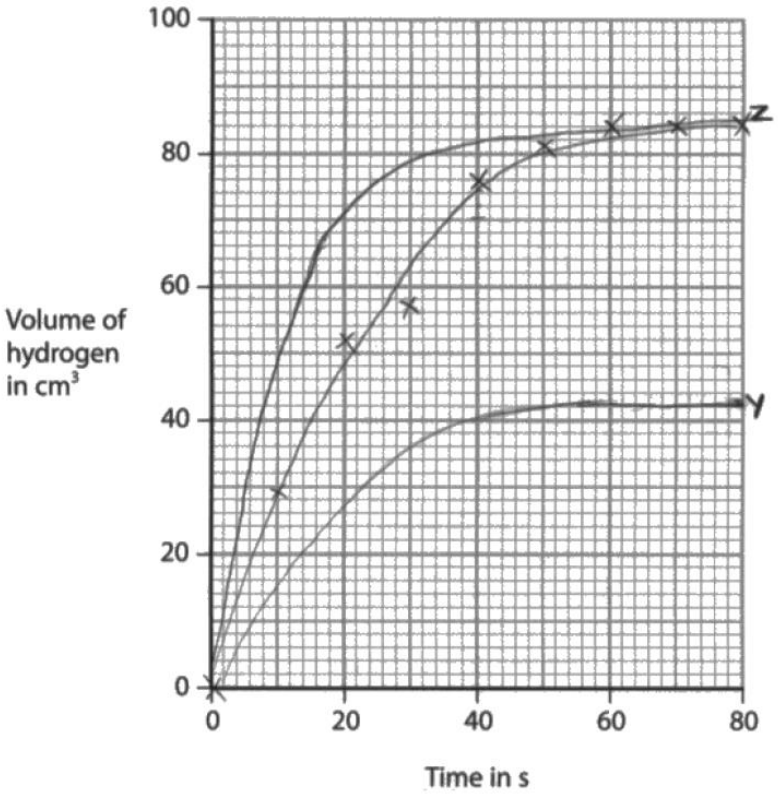


Student 2



Pearson

Student 3



Student 4