

Pearson Edexcel International A Level Chemistry

Welcome to Pearson
Event Code: YCH11-23IF1

First teaching in 2018, first assessment in 2019





Welcome to today's event

- Introduction to your trainer
- Housekeeping
- What's in your pack?



Getting to know you

- Who are you, and at which school do you teach?
- Are you new to Pearson Edexcel International GCSE; or have you been teaching the existing specification?
- Do you also teach the Single Award or Double Award specifications?




Today's Agenda

1000 – 1010	Welcome and introductions
1010 – 1115	Session 1
1115 – 1130	MORNING BREAK
1130 – 1245	Session 2 (Part 1)
1245 – 1345	LUNCH
1345 – 1445	Session 2 (Part 2)
1445 – 1500	AFTERNOON BREAK
1500 – 1600	Support



Aims and objectives

- 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 Assessment Objectives for the qualification
- To understand the question types for the qualification
- To understand the mark schemes for the qualification
- To practise using the mark schemes using exemplar student work
- To network and share ideas with other teachers

The image features a solid orange background. A white rectangular area is positioned on the left side, containing the text. To the left of this white area, a thin vertical grey line extends from the top of the text block to the bottom of the white area.

Understanding how
the qualification and
assessment are
devised

World-class qualifications

All Edexcel qualifications are developed to meet Pearson's **World Class Qualification design principles**

Developed using an understanding and benchmarking of **all educational systems**



Endorsement of educational **thought-leaders and assessment experts** from across the globe

Qualifications that support young people to **develop the capabilities** they need to **progress** and prosper in their lives



Key documents

There are two key documents needed to deliver the course

- The specification
- The SAMS



Key documents

- There are two key documents needed to deliver the course
- The specification
 - The specification is the main document you need to teach the course
 - It outlines the aims of the course, the content you **MUST** cover and all the information you need about assessing your students
 - This document can be found on our website
- The SAMS
 - SAMS is short for Sample Assessment Materials
 - This document is just as important as the specification
 - The SAMS are examples of the question papers and mark schemes and show the question types and how they will be marked by the examiners.
 - We base our future papers and assessments on these Sample Assessment Materials

Overview of the specification – IAS

UNIT 1	UNIT 2	UNIT 3
<ul style="list-style-type: none">• Formulae, Equations and Amount of Substance• Atomic Structure and the Periodic Table• Bonding and Structure• Introductory Organic Chemistry and Alkanes• Alkenes	<ul style="list-style-type: none">• Energetics• Intermolecular Forces• Redox Chemistry and Groups 1, 2 and 7• Introduction to Kinetics and Equilibria• Organic Chemistry: Alcohols, Halogenoalkanes and Spectra	<p>Students are expected to develop experimental skills, and a knowledge and understanding of experimental techniques, by carrying out a range of practical experiments and investigations while they study Units 1 and 2.</p> <p>This unit will assess students' knowledge and understanding of experimental procedures and techniques that were developed in Units 1 and 2.</p>

Overview of the specification – IAL

UNIT 4	UNIT 5	UNIT 6
<ul style="list-style-type: none">• Kinetics• Entropy and Energetics• Chemical Equilibria• Acid-base Equilibria• Organic Chemistry: Carbonyls, Carboxylic Acids and Chirality	<ul style="list-style-type: none">• Redox Equilibria• Transition Metals and their Chemistry• Organic Chemistry: Arenes• Organic Nitrogen Compounds: Amines, Amides, Amino Acids and Proteins• Organic Synthesis	<p>Students are expected to develop further the experimental skills and the knowledge and understanding of experimental techniques that they acquired in Units 1 and 2 (tests for anions and cations, gases and organic functional groups) by carrying out a range of practical experiments and investigations while they study Units 4 and 5.</p> <p>This unit will assess students' knowledge and understanding of the experimental procedures and techniques that were developed in Units 4 and 5.</p>

How is the content assessed?

IAS Unit 1: Structure, Bonding and Introduction to Organic Chemistry		*Unit code: WCH11/01	
Externally assessed Written examination: 1 hour and 30 minutes Availability: January, June and October First assessment: January 2019 80 marks		40% of the total IAS	20% of the total IAL
Assessment overview <ul style="list-style-type: none"> This paper has two sections: <ul style="list-style-type: none"> Section A: multiple choice questions Section B: mixture of short-open, open-response and calculation questions. This paper will include a minimum of 18 marks that target mathematics at Level 2 or above (see <i>Appendix 6: Mathematical skills and exemplifications</i>). Students will be expected to apply their knowledge and understanding of experimental methods in familiar and unfamiliar contexts. 			

IAS Unit 2: Energetics, Group Chemistry, Halogenoalkanes and Alcohols		*Unit code: WCH12/01	
Externally assessed Written examination: 1 hour and 30 minutes Availability: January, June and October First assessment: June 2019 80 marks		40% of the total IAS	20% of the total IAL
Assessment overview <ul style="list-style-type: none"> This paper has three sections: <ul style="list-style-type: none"> Section A: multiple choice questions Section B: mixture of short-open, open-response, calculations and extended-writing questions Section C: contemporary context question. This paper will contain questions that require information from the Data Booklet (see <i>Appendix 9</i>). This paper will include a minimum of 18 marks that target mathematics at Level 2 or above (see <i>Appendix 6: Mathematical skills and exemplifications</i>). Students will be expected to apply their knowledge and understanding of experimental methods in familiar and unfamiliar contexts. This paper may contain some synoptic questions which require knowledge and understanding from Unit 1. 			

IAS Unit 3: Practical Skills in Chemistry I		*Unit code: WCH13/01	
Externally assessed Written examination: 1 hour and 20 minutes Availability: January, June and October First assessment: June 2019 50 marks		20% of the total IAS	10% of the total IAL
Content overview <p>Students are expected to develop experimental skills, and a knowledge and understanding of experimental techniques, by carrying out a range of practical experiments and investigations while they study Units 1 and 2.</p> <p>This unit will assess students' knowledge and understanding of experimental procedures and techniques that were developed in Units 1 and 2.</p>			
Assessment overview <ul style="list-style-type: none"> This paper may include short-open, open-response and calculation questions. This paper will include a minimum of 6 marks that target mathematics at Level 2 or above (see <i>Appendix 6: Mathematical skills and exemplifications</i>). Students will be expected to apply their knowledge and understanding of practical skills to familiar and unfamiliar situations. 			

How is the content assessed?

IA2		*Unit code: WCH14/01
Unit 4: Rates, Equilibria and Further Organic Chemistry		
Externally assessed	40% of the total IA2	20% of the total IAL
Written examination: 1 hour and 45 minutes		
Availability: January, June and October		
First assessment: January 2020		
90 marks		
Assessment overview <ul style="list-style-type: none"> This paper has three sections: <ul style="list-style-type: none"> Section A: multiple choice questions Section B: mixture of short-open, open-response, calculations and extended-writing questions Section C: data or calculation question. This paper will contain questions that require information from the Data Booklet (see <i>Appendix 9</i>). This paper will include a minimum of 22 marks that target mathematics at Level 2 or above (see <i>Appendix 6: Mathematical skills and exemplifications</i>). Students will be expected to apply their knowledge and understanding of experimental methods in familiar and unfamiliar contexts. This paper may contain some synoptic questions which require knowledge and understanding from Units 1 and 2. 		

IA2		*Unit code: WCH15/01
Unit 5: Transition Metals and Organic Nitrogen Chemistry		
Externally assessed	40% of the total IA2	20% of the total IAL
Written examination: 1 hour and 45 minutes		
Availability: January, June and October		
First assessment: June 2020		
90 marks		
Assessment overview <ul style="list-style-type: none"> This paper has three sections: <ul style="list-style-type: none"> Section A: multiple choice questions Section B: mixture of short-open, open-response, calculations and extended-writing questions Section C: contemporary context question. This paper will contain questions that require information from the Data Booklet (see <i>Appendix 9</i>). This paper will include a minimum of 18 marks that target mathematics at Level 2 or above (see <i>Appendix 6: Mathematical skills and exemplifications</i>). Students will be expected to apply their knowledge and understanding of experimental methods in familiar and unfamiliar contexts. This paper may contain some synoptic questions which require knowledge and understanding from Units 1, 2 and 4. 		

IA2		*Unit code: WCH16/01
Unit 6: Practical Skills in Chemistry II		
Externally assessed	20% of the total IA2	10% of the total IAL
Written examination: 1 hour and 20 minutes		
Availability: January, June and October		
First assessment: June 2020		
50 marks		
Assessment overview <ul style="list-style-type: none"> This paper may include short-open, open-response and calculation questions. This paper will include a minimum of 6 marks that target mathematics at Level 2 or above (see <i>Appendix 6: Mathematical skills and exemplifications</i>). Students will be expected to apply their knowledge and understanding of practical skills to familiar and unfamiliar situations. 		

ACTIVITY 1

Which specification point is the following question assessing?

(ii) Explain how the electrical conductivity, high melting temperature and malleability of metals depend on their structure and bonding.

(3)

Electrical conductivity

.....

.....

High melting temperature

.....

.....

Malleability

.....

.....

ACTIVITY 2

Devise a multiple choice question to assess the specification statement 9.10

Which equilibrium shifts to the right-hand side when the pressure in the system **decreases** at constant temperature?

- ☐ **A** $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$
- ☐ **B** $\text{F}_2(\text{g}) + \text{H}_2(\text{g}) \rightleftharpoons 2\text{HF}(\text{g})$
- ☐ **C** $\text{C}_6\text{H}_6(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons \text{C}_6\text{H}_{12}(\text{g})$
- ☐ **D** $2\text{NOCl}(\text{g}) \rightleftharpoons 2\text{NO}(\text{g}) + \text{Cl}_2(\text{g})$

ACTIVITY 3

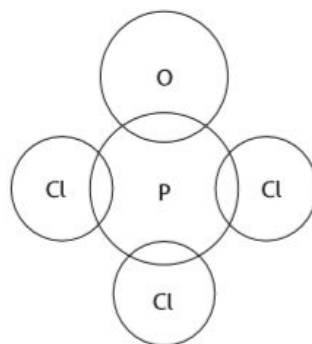
What are the essential points to include when answering the following two questions?

(c) The compound POCl_3 has a simple molecular structure.

(i) Complete the dot-and-cross diagram for the POCl_3 molecule.

Use crosses (x) for the phosphorus electrons, dots (•) for the chlorine electrons and circles (o) for the oxygen electrons.

(2)



(ii) Explain the shape of this molecule using the electron-pair repulsion theory.

(3)



ACTIVITY 3

(c)(i) Bonding pairs

Non-bonding (lone) pairs on both O and Cl atoms

(c)(ii) Shape of the molecule

Regions of bonding electrons repel one another
to adopt positions of minimum repulsion



ACTIVITY 4

What is the answer to the following question?

(ii) Explain why iodine is very soluble in cyclohexane but only slightly soluble in water.

(2)

Cyclohexane and iodine form London forces between their molecules, so iodine is soluble in cyclohexane

Hydrogen bonds between water molecules are stronger than London forces between iodine and water molecules, so iodine is less soluble in the aqueous layer



How do I make sure I cover the content?

- Specification
- Schemes of work
- Lesson plans



Support

Teaching and Learning Materials

Chemistry (2018)

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Booklet



Data Booklet - IAL Chemistry 2018

Data Booklet for use for assessment of units WCH12, WCH14 and WCH15

| PDF 2.4 MB | 28 Mar 2019

Teaching and Learning Materials

Exemplar
Material

Course Planner

**Getting Started
Guide**

Teacher
Mathematics
Support

Teacher Practical
Guide

Transition Guide

Scheme of
Work

Topic Guide –
Energetics: Energy &
Entropy

**Topic Guide –
Instrumental
Analysis**



Break



Assessment Objectives and Exemplars



Aims and Objectives

- To understand the Assessment Objectives for the qualification.
- To understand the question types for the qualification
- To understand the mark schemes for the qualification
- To practise using the mark schemes using exemplar student work



Why do we have assessment objectives?

- Help make exams fairer year on year
- Provide structure for question paper writers
- Make sure that exams are about skills, not just about knowledge
- Can provide students with some reassurance about the types of questions they will be asked

Assessment Objectives

A01

Demonstrate knowledge and understanding of science

Questions requiring students to recall and use information that you have taught them

A02a

Application of knowledge and understanding of science in familiar and unfamiliar contexts

Questions requiring students to apply what you have taught them, or to use skills

A02b

Analysis and evaluation of scientific information to make judgements and reach conclusions

Questions requiring students to analyse and make judgements

A03

Experimental skills in science, including analysis and evaluation of data and methods

Questions on practical work and associated practical skills, such as planning, drawing graphs, analysing data, evaluating methods

Typical AO1 questions

Covalent bonding is best described as the electrostatic attraction between

- ☐ A oppositely charged ions
- ☐ B positive ions and delocalised electrons
- ☐ C a shared pair of electrons
- ☐ D two nuclei and a shared pair of electrons

(a) Draw an electron density map for a molecule of oxygen. (1)

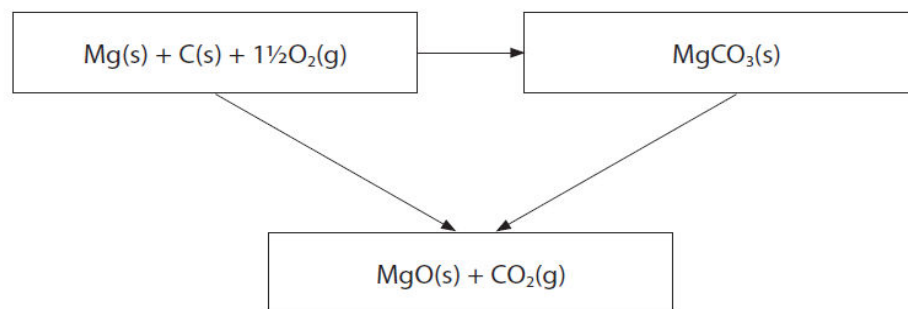
(b) Draw a diagram to show the shape of a water molecule.
Give the bond angle. (2)

Typical AO2a questions

Which is the electronic configuration of the Sc^{3+} ion?

- ☐ **A** $1s^2 2s^2 2p^6 3s^2 3p^6$
- ☐ **B** $1s^2 2s^2 2p^6 3s^2 3p^5 3d^1$
- ☐ **C** $1s^2 2s^2 2p^6 3s^2 3p^6 3d^1 4s^2$
- ☐ **D** $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4 4s^2$

The Hess cycle and data to calculate the enthalpy change for the thermal decomposition of MgCO_3 are shown.



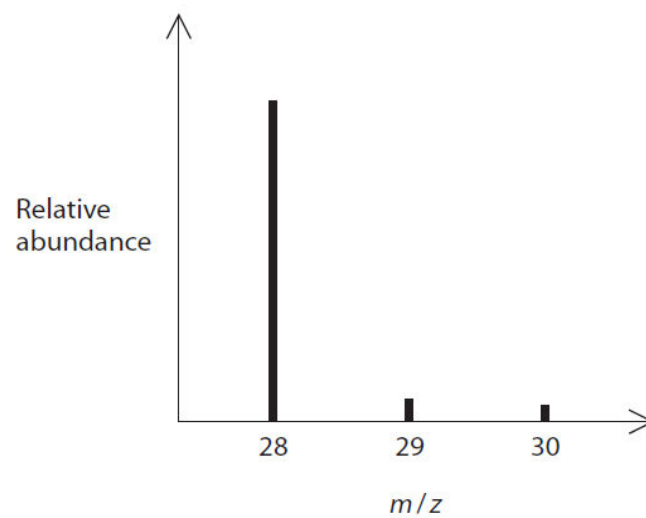
Compound	$\Delta_f H^\ominus / \text{kJ mol}^{-1}$
$\text{CO}_2(\text{g})$	-394
$\text{MgO}(\text{s})$	-602
$\text{MgCO}_3(\text{s})$	-1096

Calculate the enthalpy change for the thermal decomposition of MgCO_3 .

(2)

Typical AO2b question

The mass spectrum of a sample of silicon is shown.



What is the **best** estimate for the relative atomic mass of silicon in this sample?

- ☐ A 28.0
- ☐ B 28.2
- ☐ C 28.8
- ☐ D 29.0

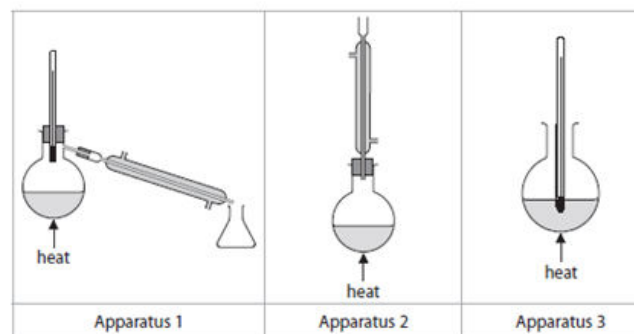
Typical A03 questions

A group of students was asked to investigate a liquid organic compound **A**. They were told that it was an alcohol with molecular formula $C_4H_{10}O$.

- (a) A chemical test may be used to confirm the presence of the hydroxyl group in **A**.

Identify a suitable reagent for this test, giving the positive result. (2)

- (b) The students suggested that oxidation of **A** would help to identify it. The sets of apparatus shown below were provided for the students' use.



- (i) Identify the reagent mixture that can be used to oxidise **A**. (1)

- (ii) One student said that if **A** was a primary alcohol this could be shown by oxidising it to the corresponding aldehyde and testing the product.

Identify which apparatus (1, 2 or 3) should be used for this oxidation. Justify your answer. (2)

- (iii) A chemical test may be used to confirm the presence of an aldehyde. Identify the reagent used, giving the positive result of the test. (2)

- (iv) State whether or not a positive result for the test in (b)(iii), together with the molecular formula, would allow the alcohol **A** to be identified. Justify your answer. (1)

- (v) Another student said that if **A** was a secondary alcohol this could be shown by oxidising it to the corresponding ketone.

Identify which apparatus (1, 2 or 3) should be used for this oxidation. Justify your answer. (2)

ACTIVITY 5 – Assigning AOs

Assign an AO to each of the following questions/part questions

1 Which statement is **not** true for sodium chloride?

- ☐ **A** sodium chloride conducts electricity in aqueous solution
- ☐ **B** sodium chloride conducts electricity when molten
- ☐ **C** sodium chloride has a molecular structure
- ☐ **D** sodium chloride has a giant structure

A01

ACTIVITY 5 – Assigning AOs

- 12** In an experiment, 50.0 cm^3 of 1.0 mol dm^{-3} HCl(aq) reacts with 50.0 cm^3 of 1.0 mol dm^{-3} NaOH(aq) .

The energy released = 2500 J .

The specific heat capacity of the mixture is $4.18\text{ J g}^{-1}\text{ }^{\circ}\text{C}^{-1}$

What temperature change occurs in the reaction?

- ☐ **A** an increase of 6.0°C
- ☐ **B** a decrease of 6.0°C
- ☐ **C** an increase of 12.0°C
- ☐ **D** a decrease of 12.0°C

A02b

ACTIVITY 5 – Assigning AOs

8 Which of these sulfates is the **least** soluble in water?

☐ **A** CaSO_4

☐ **B** BaSO_4

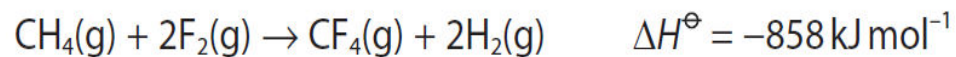
☐ **C** K_2SO_4

☐ **D** Rb_2SO_4

A01

ACTIVITY 5 – Assigning AOs

9 Use the data shown.



What is the standard enthalpy change of formation of methane (CH_4) in kJ mol^{-1} ?

☐ **A** -1791

☐ **B** -75

☐ **C** +75

☐ **D** +1791

A02a

ACTIVITY 5 – Assigning AOs

22 This question is about fuels and polymers.

Used coffee grounds have been suggested as a carbon-neutral fuel to replace some fossil fuels.

(a) (i) Explain why coffee grounds might be considered a carbon-neutral fuel. (2)

(ii) Explain how the use of fossil fuels causes climate change. (2)

(a)(i) A02a (ii) A01

ACTIVITY 5 – Assigning AOs

22 (d) Alkenes, such as ethene, can be used to make polymers.

(i) Write a balanced equation for the polymerisation of ethene using displayed formulae. (1)

(ii) Bananas produce ethene as they ripen.

Suggest one advantage and one disadvantage of using ripening bananas as a source of ethene for polymer production. (2)

(d)(i) A02a (ii) A02b

ACTIVITY 5 – Assigning AOs

- (d) A sample of ammonium carbonate was dissolved in distilled water and the solution tested.

Complete the table to give the expected observations and the identity of the observed products.

Test	Observation	Observed product
(i) About 1 cm ³ of barium chloride solution was added to 5 cm ³ of the ammonium carbonate solution	<div></div> <div></div> <div></div>	<div></div> <div></div> <div></div>
(ii) About 5 cm ³ of hydrochloric acid was added to the mixture from (i)	<div></div> <div></div> <div></div>	<div></div> <div></div> <div></div>

(2)

(2)

A03



Command words

- Questions in our exam papers are designed to use a specific command word to guide students
- The command words represent a range of skills:
 - simple recall (Give..., Name...)
 - using knowledge (Describe...)
 - giving reasons (Explain...)
 - provide more detailed analysis (Evaluate, Justify)
 - show particular skills (Calculate..., Plot...)
- Is there a link between command words and AOs?

Activity 6 – Assigning Command Words to AOs

Your pack contains a list of command words used in IAL Chemistry question papers

Draw a table with 4 columns, one for each AO

A01	A02a	A02b	A03

Place command words into the columns, to show which command words can commonly be used to assess that AO

Activity 6 – Assigning Command Words to AOs

A01	A02a	A02b	A03
Add/Label Complete Describe (straightforward known ideas) Draw Explain (a simple idea or reason) Give/State/Name State what is meant by Write (a familiar equation)	Calculate Comment on Deduce Evaluate Explain (for more complex ideas) Suggest Write (an unfamiliar or more complicated equation)	Comment on Deduce Evaluate Explain (for more complex ideas) Suggest	Any command word can be used



AO2 QUESTIONS



Why not look at AO1?

- AO1 is all about knowledge – and basic understanding
- This is not one that teachers can influence much...
- ... students either go away and learn what you teach them or they do not!
- **BUT...** remember that students should still recognise AO1 questions and not spend time going beyond AO1



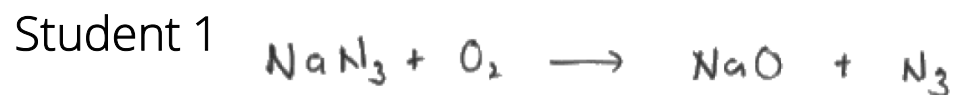
ACTIVITY 7 – AO2a in exams

Use the mark schemes provided in your pack to mark the student responses

We will go through each question one at a time

ACTIVITY 7 – AO2a in exams

UNIT 1, Q24(a)



ACTIVITY 7 – AO2a in exams

UNIT 2, Q20(b)

Student 1

Thermal stability of group 2 carbonates decreases down the group. Because the size of the cation increases as the inner shielding increases with the same no. of ~~valency~~ valency electron. The atomic radius increases down the group. The size of the cation ~~and~~ remain the same. The charge density ~~increases~~ decreases. \therefore the distortion of electron cloud by group 2 carbonates decreases down the group and \therefore thermal stability decreases down the group.

ACTIVITY 7 – AO2a in exams

UNIT 2, Q20(b)

Student 2

Down the group, the number of shells increase, therefore size increases. Charge increases as the number of protons increases.

Charge density remains the same.

Polarisation decreases, i.e. the distortion of CO_3^{2-} decreases.

Thus down the group the thermal stability of group 2 carbonates increases.

ACTIVITY 7 – AO2a in exams

UNIT 2, Q20(b)

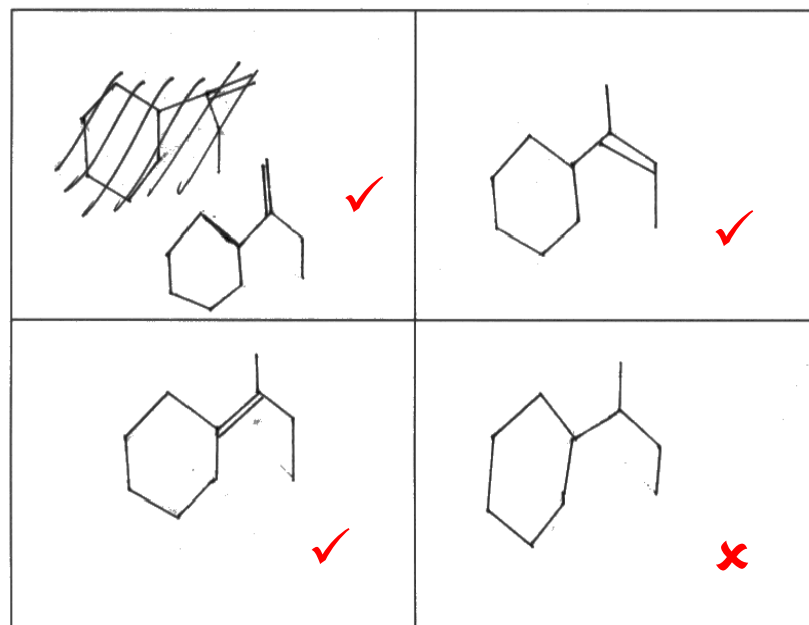
Student 3

- Going down the group 2, thermal stability of carbonates increases.
- This is because going down the group, the ionic radius of cations increase, and the charge stays +2, so the charge density of the cations decrease.
- This causes the anion (CO_3^{2-}) to be less distorted, so the C-O bond is less weakened and decomposition ability decrease.

ACTIVITY 7 – AO2a in exams

UNIT 2, Q22(b)(i)

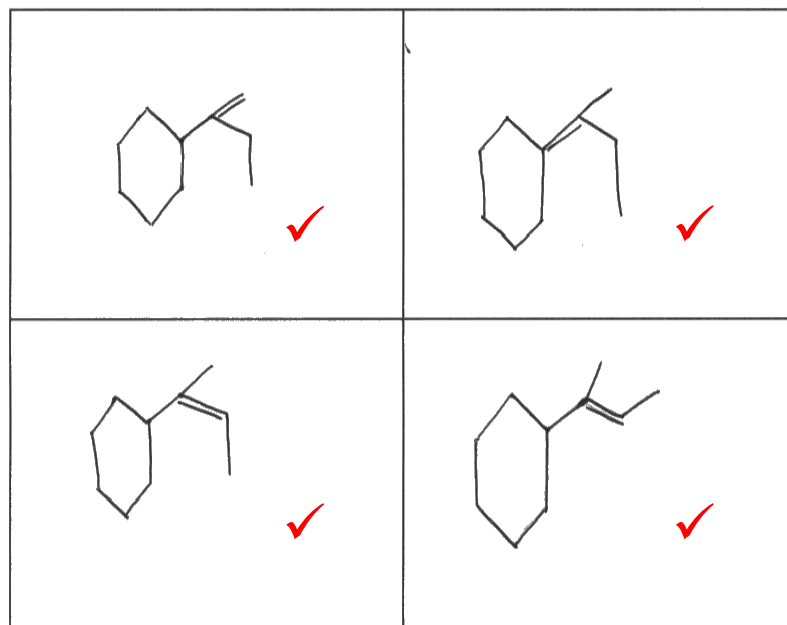
Student 1



ACTIVITY 7 – AO2a in exams

UNIT 2, Q22(b)(i)

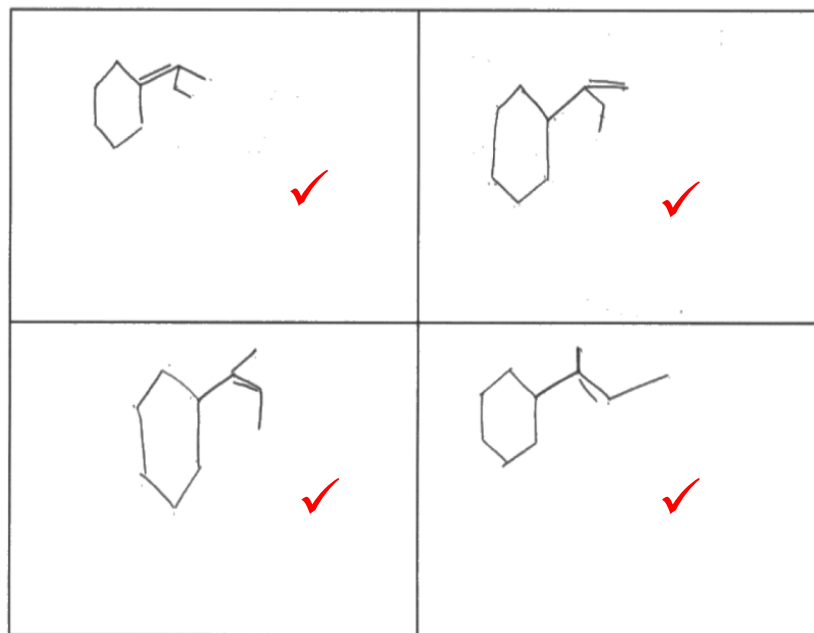
Student 2



ACTIVITY 7 – AO2a in exams

UNIT 2, Q22(b)(i)

Student 3





ACTIVITY 8 – AO2b in exams

Use the mark schemes provided in your pack to mark the student responses

We will go through each question one at a time

ACTIVITY 8 – AO2b in exams

UNIT 1, Q22(e)(ii)

Student 1

~~React~~ Add Ammonia to produce
 NH_4Cl

Student 2

The gases can be passed into a fractionating
column and the hydrogen chloride can be
condensed off by sorting

ACTIVITY 8 – AO2b in exams

UNIT 1, Q22(e)(ii)

Student 3

Can be removed using a gas scrubber

Student 4

Pass the waste gases through a base
like NaOH. HCl reacts with NaOH
to produce harmless NaCl and H_2O .

ACTIVITY 8 – AO2b in exams

UNIT 2, Q23(c)

Student 1

Because ~~stop~~ sulfuric acid could be an impurity
(and the indicator would show positive)

Student 2

Because It has a range of colours which makes it hard
to find the pH of the mixture

ACTIVITY 8 – AO2b in exams

UNIT 2, Q23(c)

Student 3

Universal indicator will show the same results
for any acid be it propanoic or hydrochloric
Even propan-1-ol has an acidic feature so universal
indicator will still show acidity present in the mixture

Student 4

The reaction mixture turns green when
oxidised so no colour of the indicator ~~is~~
will ~~show~~. ~~MS~~



AO2 in exams

Teaching approaches: Is it better to present facts or to teach principles? Why?

Questioning styles: Is it better to ask closed or open questions? Why?

Assessment activities: Is it better to set formative or summative assessments? Why?

Exam preparation: What else could you do to prepare your students to answer the AO2 exam questions?



AO2: question styles

Think about one of the topics that you teach which often has AO2 questions in exams.

What sorts of questions do you ask in class when teaching this topic?

How do these questions help students to prepare for AO2 questions?



AO2 Homework Activities

- Why do you set homework?
- What sort of questions/problems do you set?
- What do you expect students to gain from the questions that you set?
- Will what they gain help them to answer AO2 questions?



Lunch

AO3 QUESTIONS



What is AO3?

AO3 assesses the practical skills and understanding gained by students as they undertake practical work

AO3 questions may require RECALL of practical techniques and understanding or APPLICATION of these to new situations

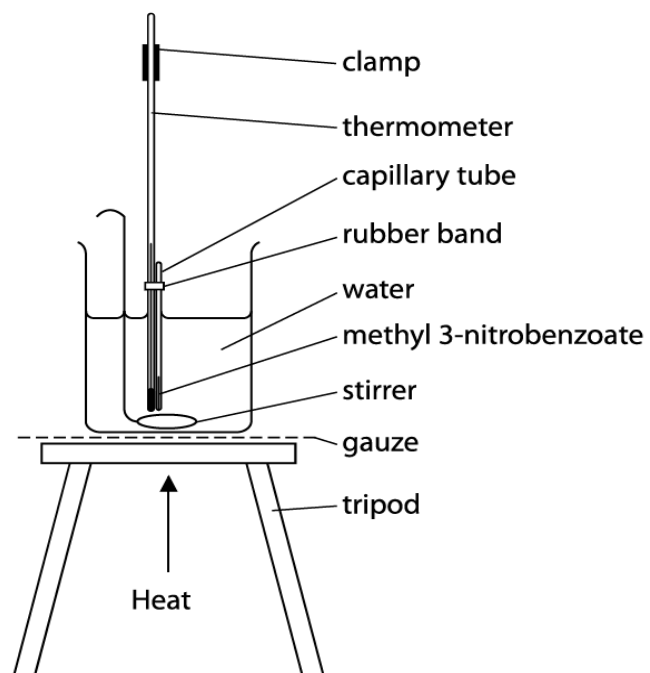
AO3 may also involve the use of experimental data, and the evaluation of experimental methods or results

AO3: Recall of Practical Technique

The melting temperature of methyl 3-nitrobenzoate is 77 °C.

Describe how the students should use the apparatus shown to determine the melting temperature **range** of a sample of their crystallised methyl 3-nitrobenzoate.

(3)



AO3: Analysis of results

The inorganic compounds **A** and **B** contain the same Group 2 cation but different anions.

- (a) Two tests were carried out on **A**. The observations made for each test are recorded in the table.
- (i) Complete the statements in the inference column in the table by writing the names or formulae of the ions.

(3)

Test	Observation	Inference
Dilute sulfuric acid was added to an aqueous solution of A	A white precipitate formed	Two possible cations in A are
A sample of A was heated in a test tube A glowing splint was held in the mouth of the test tube	A brown gas was evolved The splint relit	The anion in A is

- (ii) There were two gases evolved when **A** was heated; a brown gas **C**, and a gas **D** which relit the glowing splint.
Identify the gases **C** and **D** by giving their name or formula.

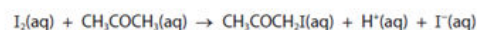
(2)

Gas **C**

Gas **D**

AO3: Analysis of results

The equation for the reaction between iodine and propanone in acidic solution is



The order of reaction with respect to iodine was investigated using a titration method.

The concentration of hydrogen ions and propanone were in large excess. 30 cm^3 of acidified aqueous propanone was added to a flask containing 30.0 cm^3 of 0.020 mol dm^{-3} aqueous iodine. At the same time, the contents were mixed thoroughly and a timer started.

A pipette was used to remove 10.0 cm^3 samples of the reaction mixture every 5 minutes. The samples were immediately run into flasks containing sodium hydrogencarbonate solution, which quenched the reaction.

The volume of sodium thiosulfate solution needed to react with the iodine in each quenched sample was then determined by titration.

(b) The results were recorded in a table

Volume of sodium thiosulfate / cm^3	Time the sample was quenched / minutes
	0
18.50	5
16.10	10
13.50	15
10.90	20
8.50	25

- (i) Complete the table by estimating the volume of sodium thiosulfate that would be required for titration at time = 0. (1)
- (ii) Plot a graph of volume of sodium thiosulfate on the vertical axis, against time on the horizontal axis. (3)
- (iii) Calculate the gradient of the line drawn through the points. Include units in your answer. (2)
- (c) Assume that the volume of sodium thiosulfate required is proportional to the amount of iodine in the reaction mixture.
- Deduce the order of reaction with respect to iodine. Justify your answer. (1)

Evaluation of methods

Student 1 described how to carry out the recrystallisation in **Step 7** to obtain a pure sample of methyl 3-nitrobenzoate.

Step A *Dissolve the impure solid in some hot methanol.*

Step B *Cool the solution in an ice-bath.*

Step C *Separate the crystals using suction filtration.*

Step D *Dry the crystals by mixing them with solid anhydrous sodium sulfate in a stoppered boiling tube.*

- (i) The student's description of **Step A** omitted an important detail.
State how the method for **Step A** should be changed.
Justify your answer. (2)
- (ii) Describe what the student should do after **Step A** and before carrying out **Step B**.
Justify your answer. (2)
- (iii) Give a reason why **Step D** would not work and describe how the student should dry the crystals. (2)



Evaluation of methods

Examiner's Report

Many candidates have a good knowledge of recrystallisation and have obviously carried this out as they knew the reasons for the errors in the description of Student 1.

Others would benefit from more experience with this practical technique. Many candidates knew that the minimum amount of hot methanol should be used but all of them knew that this was to make a saturated solution.

The use of hot filtration to remove the insoluble impurities was known by many candidates.

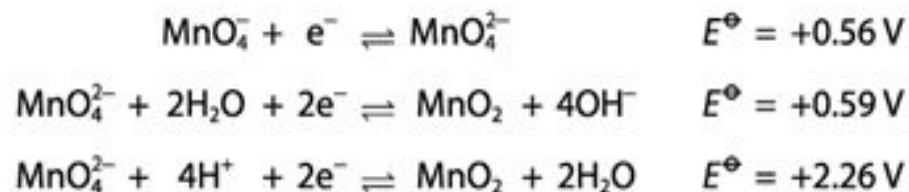
The method described by the student to dry the crystals is seen frequently written by candidates when they are describing recrystallisation.

It was interesting to see that some candidates understood why this would not work.

Use of data

- (b) A sample of an aqueous solution of manganate(VI) ions is prepared from an aqueous solution of manganate(VII) ions and solid manganese(IV) oxide under appropriate conditions.

The relevant standard electrode potentials are



- (i) Choose appropriate standard electrode potentials to calculate E_{cell}^\ominus for the formation of manganate(VI) ions in **acidic** solution.
Use your calculated value of E_{cell}^\ominus to explain why manganate(VI) ions cannot be prepared under acidic conditions. (2)
- (ii) Explain, in terms of standard electrode potentials, why manganate(VI) ions can be prepared in a **concentrated** alkaline solution. (2)

Use of data

Examiner's Report

The majority of candidates could select the correct two half-equations needed to calculate the E^\ominus_{cell} value and realised that the reaction does not occur because it is negative.

Those candidates who calculated a positive value should have checked their working as they were told that the reaction does not take place.

There were some very good explanations about the effect of using concentrated alkali.

However, many candidates wrote vague answers and did not make it clear which of the three half-equations they were writing about.

Some candidates showed the working for E^\ominus_{cell} to be negative for the formation of manganate(VI) ions under standard alkaline condition but they then wrote a positive sign so the reaction could be feasible.

Teaching A03 - Terminology

validity

uncertainty

precision

anomaly

accuracy

error

reliability



Accuracy .v. precision

- An **accurate** measurement is one which is close to the true or
- accepted value

- If repeated measurements gives the same result each time, the
- measurements are said to be precise



Error .v. uncertainty

- **Error** is the difference between the measured value and the 'true' or 'accepted' value of the thing being measured
- **Uncertainty** is a quantification of the doubt about the measurement result



ACTIVITY 9 – AO3 in exams

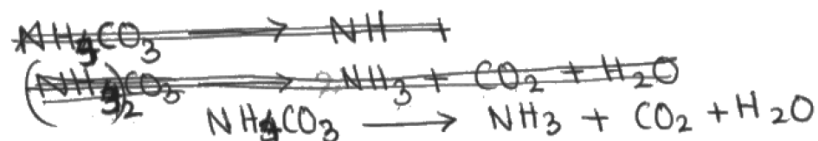
Use the mark schemes provided in your pack to mark the student responses

We will go through each question one at a time

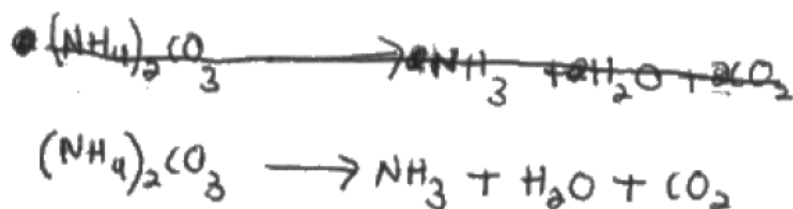
ACTIVITY 9 – AO3 in exams

UNIT 3, Q1(a)

Student 1



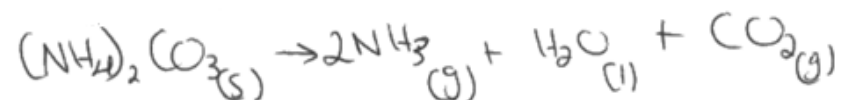
Student 2



Student 3



Student 4



ACTIVITY 9 – AO3 in exams

UNIT 3, Q1(b)

Student 1

Product	Chemical test	Result of test
ammonia	place tube of ammonia close to an open bottle of conc. HCl ✓	white fumes are produced (NH ₄ Cl) ✓
water	Add to calcium chloride ✗	turns from white to Blue ✗
carbon dioxide	pass through lime water (Ca(OH) ₂) ✓	Turns milky (white ppt - CaCO ₃) ✓

ACTIVITY 9 – AO3 in exams

UNIT 3, Q1(b)

Student 2

Product	Chemical test	Result of test
ammonia	Damp litmus paper ✗	turns red litmus paper blue ✗
water	limewater put thermometer and boil it ✗	turns it cloudy or milky boils at 100°C ✗
carbon dioxide	limewater put CO ₂ into limewater ✓	turns it cloudy or milky ✓

ACTIVITY 9 – AO3 in exams

UNIT 3, Q1(b)

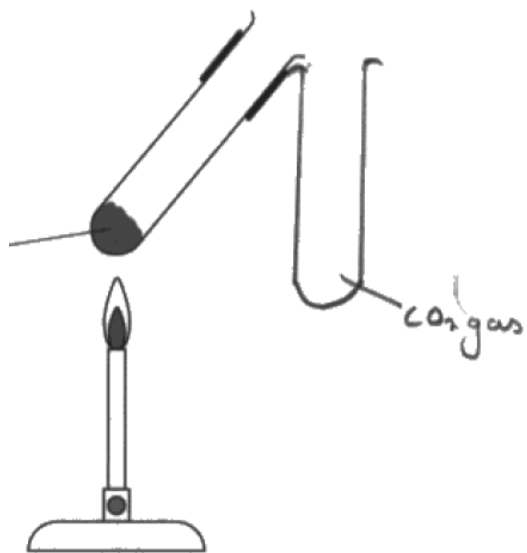
Student 3

Product	Chemical test	Result of test
ammonia	add aqueous sodium hydroxide HCl ✓	white precipitate forms ✗
water	add anhydrous copper(II) sulphate ✓	colour changes from white to blue ✓
carbon dioxide	add lime water ✓	turns milky ✓

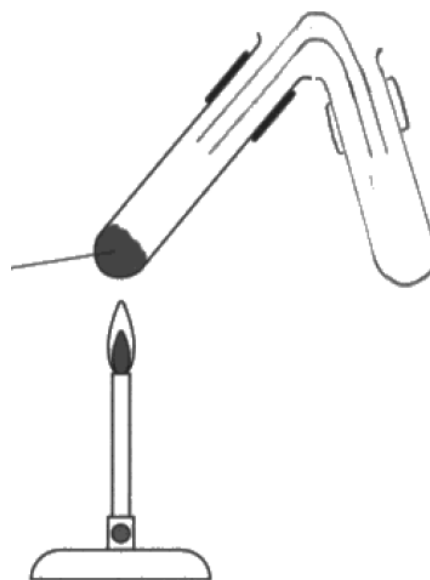
ACTIVITY 9 – AO3 in exams

UNIT 3, Q1(c)

Student 1



Student 2



ACTIVITY 9 – AO3 in exams

UNIT 3, Q1(d)(i) & (ii)

Student 1

	Test	Observation ✗	Observed product ✓	
(i)	About 1 cm ³ of barium chloride solution was added to 5 cm ³ of the ammonium carbonate solution	<i>Insoluble</i> ✓	<i>BaCO₃</i> ✓	(2)
(ii)	About 5 cm ³ of hydrochloric acid was added to the mixture from (i)	<i>Fizzing</i>	<i>CO₂</i>	(2)

ACTIVITY 9 – AO3 in exams

UNIT 3, Q1(d)(i) & (ii)

Student 2

	Test	Observation	Observed product	
(i)	About 1 cm ³ of barium chloride solution was added to 5 cm ³ of the ammonium carbonate solution	A white precipitate ppt forms	<div>Barium carbonate ✓</div> <div>Ammonium chloride</div> <div>Ammonium chloride (2)</div>	✓
(ii)	About 5 cm ³ of hydrochloric acid was added to the mixture from (i)	precipitate dissolves	<div>Formation of</div> <div>Barium chloride</div> <div>(2)</div>	✗

ACTIVITY 9 – AO3 in exams

UNIT 3, Q1(d)(i) & (ii)

Student 3

x

	Test	Observation	Observed product	
(i)	About 1 cm ³ of barium chloride solution was added to 5 cm ³ of the ammonium carbonate solution	vigorous effervescence and white precipitate.	Barium carbonate Hydrochloric acid	x (2)
(ii)	About 5 cm ³ of hydrochloric acid was added to the mixture from (i)	effervescence is produced.	✓ a gas that turns lime water cloudy, effervescence (CO ₂)	✓ (2)

ACTIVITY 9 – AO3 in exams

UNIT 3, Q1(d)(i) & (ii)

Student 4

	Test	Observation	Observed product	
(i)	About 1 cm ³ of barium chloride solution was added to 5 cm ³ of the ammonium carbonate solution	A white precipitate forms	Barium carbonate, BaCO ₃	(2) ✓
(ii)	About 5 cm ³ of hydrochloric acid was added to the mixture from (i)	The precipitate dissolves, effervescence	BaCl ₂ and CO ₂ and H ₂ O forms.	(2) ✓



Teaching AO3 – doing practical work

- The specification for IAL Chemistry contain a number of practical activities that form part of the subject content
- Exam questions expect students to be familiar with methods for these practicals
- Questions also expect students to apply their knowledge of practical methodology to unfamiliar scenarios



Teaching A03 – doing practical work

- Why should students do practical work?
- Are students getting knowledge or skills from practical activities?
- When do you do practical activities: before or after teaching the theory of a topic?



Break



SUPPORT



Support Overview

Results Plus

examWizard

Post results service

Subject Advisor

**Published
resources**



ResultsPlus is the free online results analysis tool for teachers - it provides analysis features that other similar solutions don't

- Provides a detailed breakdown of student performance in Edexcel exams.
- Helps identify topics where the student can benefit from further learning and allows this knowledge to inform teaching strategies and approaches.
- Provides a comparison of student performance at regional level.
- Allows you to view your school's performance against other Pearson Edexcel schools in your country. You can also find student results analysis from their previous Pearson Edexcel school.
- Mock exams results can also be fed into the system to produce an analysis.



- [ResultsPlus Direct](#) gives your students access to their final grades and performance breakdown, wherever they are.
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[ResultsPlus - Global Analysis](#)



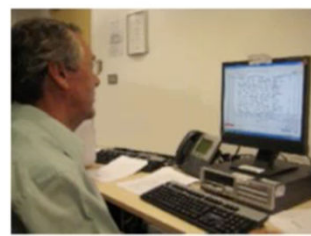
How Result Plus works



1.
Student
takes exam
on paper



2.
Exam papers
scanned





3.
Examiners
mark papers
online







4.
Performance
reports
shared



ResultsPlus Home page



Select an option



**Results Plus Analysis**
Analysis and reports on your Edexcel examinations



**Mock Analysis Service**
Print off past papers, assign papers to students for mock mark entry, enter student marks, analyse performance

**Create or edit a group**
Set up classes and other groups to help analyse performance

**Functional Skills on Demand Analysis**
Analysis and reports of your student's test performance

**BTEC Analysis**
Analysis of your student's BTEC National External Test performance

**Global Results Analysis**
View overall performance for the whole Edexcel cohort

**Retrieve Incoming Learner Results**
Retrieve Pearson results from a learner's previous centre



examWizard is a free tool for teachers containing a bank of past paper questions to help create their own bespoke mock exams and tests to focus on particular topic areas as needed:

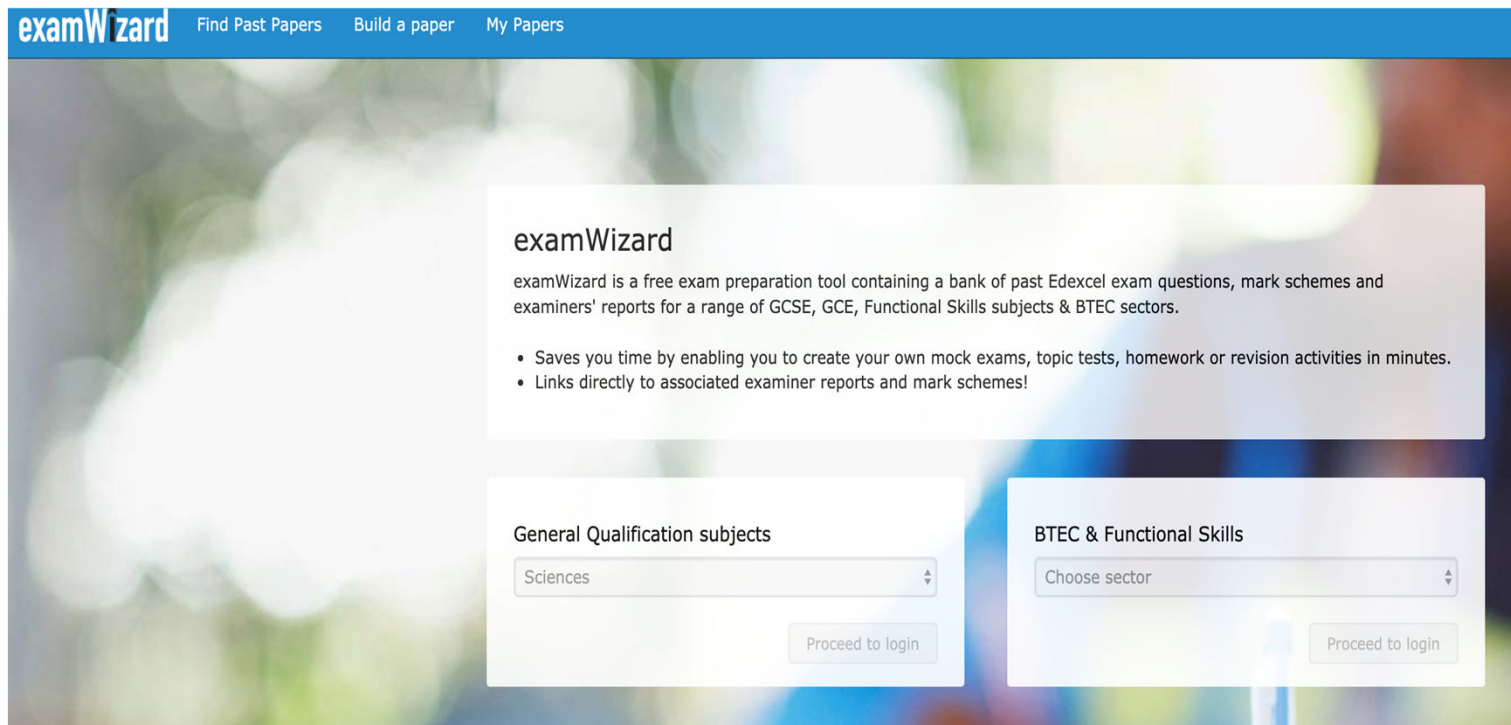
- Use existing mark schemes for accurate marking
- Use existing examiner report for insight
- Use the results to understand where students need more support, informing teaching strategies.



Unlike other similar question banks, examWizard is:

- Available free to all Edexcel centres
- Updated with latest questions faster, following the exam series
- One stop shop for assessment material with access to whole past papers and examiner reports as well as the ability to construct bespoke ones easily with content tagged to specific attributes.

examWizard Home page

The image shows the home page of the examWizard website. It features a blue header with the logo and navigation links. The main content area has a blurred background and contains a central text box with the site's description and a list of features. Below this are two side-by-side form boxes for selecting exam subjects or sectors, each with a 'Proceed to login' button.

examWizard Find Past Papers Build a paper My Papers

examWizard

examWizard is a free exam preparation tool containing a bank of past Edexcel exam questions, mark schemes and examiners' reports for a range of GCSE, GCE, Functional Skills subjects & BTEC sectors.

- Saves you time by enabling you to create your own mock exams, topic tests, homework or revision activities in minutes.
- Links directly to associated examiner reports and mark schemes!

General Qualification subjects

Sciences

Proceed to login

BTEC & Functional Skills

Choose sector

Proceed to login

Post Results Service

Reviews of marking and moderation (RoMM)

Access to scripts (ATS)

Appeals

Our Reviews of marking and moderation (RoMM) services allow you to request us to run additional checks that the grades we've issued your candidates are correct.

Clerical check (Service 1)



Review of marking of externally assessed components (Service 2)



Priority review of marking of externally assessed components (Service P2)



Review of moderation for internally assessed/externally moderated controlled assessment and coursework components (Service 3)



If a centre is concerned about the marking of a centre cohort



New Access to Script (ATS) Online Portal

Access to Scripts (ATS) is a free online portal which allows teachers to immediately access electronically marked exam papers

Provides enhanced transparency and

- Offers transparent approach to marking process
- Provides better understanding of marking before requests for enquiries about results are made
- Provides excellent aid for teaching and preparing other cohorts for examinations by helping you to evaluate a student's performance on particular questions in relation to what they have been taught.

Available instantly from results day for all our examination series, for a defined window, you can view and download scripts which have been marked online free of charge from our Self-Service Portal.

For more information on ATS, and the post results windows, visit our [post-results pages here](#).





Other useful links

[1. Grade Boundaries](#)

This page shows the minimum marks needed to achieve a certain grade for all UK and international examinations

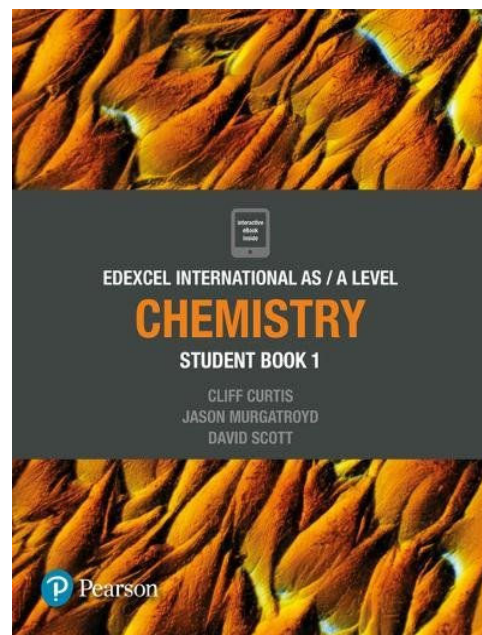
Also refer to the examiners report that is available for download with other documents

[2. Examination Results Statistics](#)

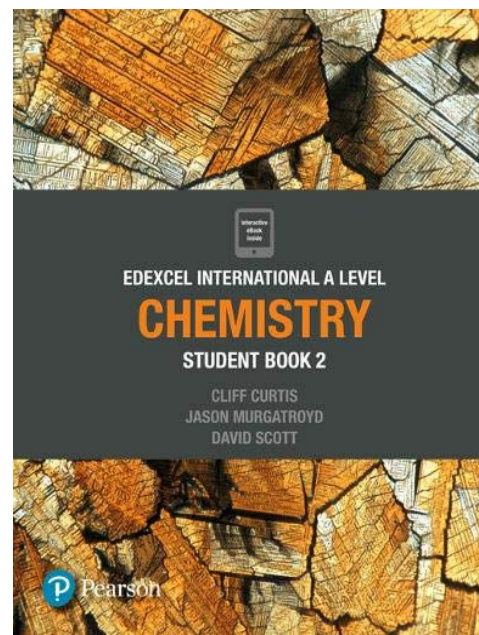
Results statistics summarise the overall grade outcomes of candidates sitting Pearson Edexcel examinations

Published resources

Pearson have published two student books to cover the IAS and IAL courses



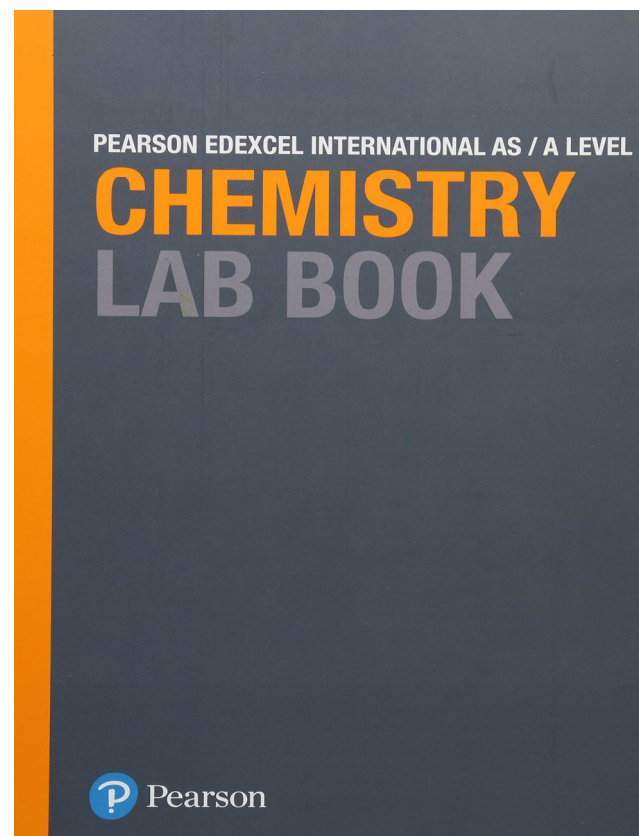
SB1 covers IAS content



SB2 covers IAL content

Published resources

Pearson have also published a Lab Book that covers all of the Core Practicals



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