

Edexcel International AS/A Level

IAL CHEMISTRY

Getting Ready to Teach

Event Code:

First teaching in 2018, first assessment 2019



Aims and Objectives

- introduction to assessment objectives: what are they and why they are used
- analysis of recent question papers matching questions to assessment objectives
- investigate different assessment objectives looking at feedback from the previous exam series
- discuss strategies for teaching to ensure students can access questions targeting different assessment objectives
- review the support Pearson offers for the qualification
- network, discuss best practice and share ideas with other teachers



Session 1: Assessment Objectives



What is an AO?

Assessment objectives

The requirements that students need to meet to succeed in the qualification. Each assessment objective has a unique focus, which is then targeted in examinations or coursework

Assessment objectives may be assessed individually or in combination



Definitions of AOs

		% in IAS	% in IA2	% in IAL
AO1	Demonstrate knowledge and understanding of science.	34–36	29–31	32–34
AO2 (a)	Application of knowledge and understanding of science in familiar and unfamiliar contexts.	34–36	33–36	33–36
(b)	Analysis and evaluation of scientific information to make judgements and reach conclusions.	9–11	14–16	11–14
AO3	Experimental skills in science, including analysis and evaluation of data and methods.	20	20	20

Specification p75



AO1

Demonstrate knowledge and understanding of science

Recall facts and reasons

Example of command words:

Add/Label

Complete/Record

Describe (straightforward known ideas)

Explain (a simple idea or reason)

Give/State/Name

Write (a familiar equation)



A02(a)

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

Apply facts and reasons to contexts

Example of command words:

Assess

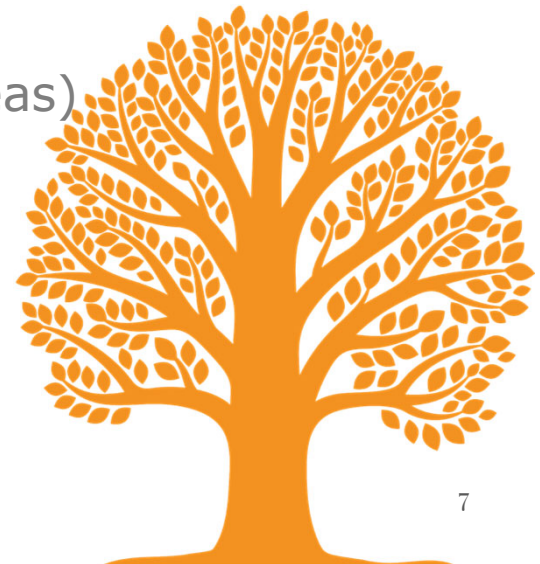
Criticise

Deduce

Evaluate

Explain (for more complex ideas)

Suggest



AO2(b)

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

Use information to explain facts and reasons or use information with facts and reasons to establish new ideas.

Example of command words:

Assess

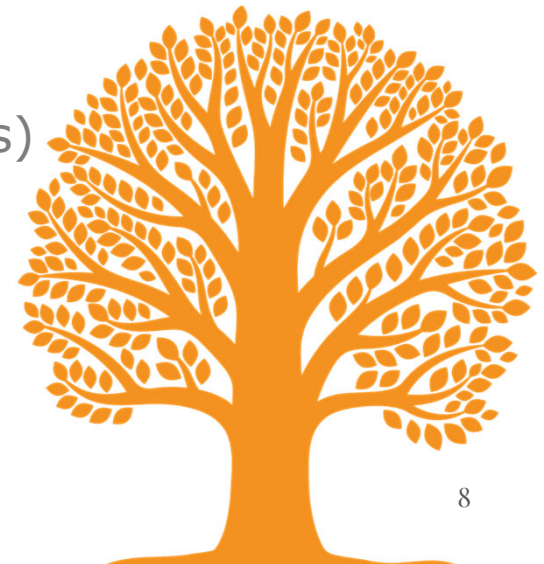
Criticise

Deduce

Evaluate

Explain (for more complex ideas)

Suggest



A03

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

Practical skills including recall of some key practical activities. Explanation for the steps involved may be looked at it both familiar and unfamiliar contexts as will the evaluation of data and methods

Any command words might be used



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Specification p75



WCH12 June 2019 Q21

21 The halogenoalkane 1-chlorobutane reacts under suitable conditions with potassium hydroxide to form the alcohol butan-1-ol.

(a) (i) Name a suitable solvent for the potassium hydroxide in this reaction.

(1)

(ii) State the type and mechanism of this reaction.

(1)

(iii) Draw the mechanism for this reaction.

Use curly arrows, and show relevant dipoles and lone pairs.

(3)



WCH12 June 2019 Q21

(b) A student carried out the reaction.

After separation and purification, the mass of butan-1-ol formed was 12.1 g.

The yield of the reaction was 64.0%.

Calculate the volume of 1-chlorobutane used in the reaction.

Give your answer to an appropriate number of significant figures.

[Density of 1-chlorobutane = 0.886 g cm^{-3}]

(4)



WCH12 June 2019 Q23

23 Propanoic acid, $\text{CH}_3\text{CH}_2\text{COOH}$, is a colourless liquid used as a preservative in animal feed. Propanoic acid can be formed by oxidising the alcohol propan-1-ol.

- (a) Write the balanced equation for the oxidation of propan-1-ol to form propanoic acid. Use [O] to represent the oxygen from the oxidising agent. State symbols are not required. (1)



WCH12 June 2019 Q23

*(b) Propan-1-ol is heated with a concentrated solution of acidified potassium dichromate(VI).

Explain how the conditions used affect the rate of the reaction **and** ensure that propanoic acid is the only organic product. (6)



WCH12 June 2019 Q23

- (c) A student suggested using universal indicator to check for the presence of propanoic acid formed in the reaction mixture.

Give a reason why the result of this test is **not** likely to be conclusive. (1)



WCH12 June 2019 Q23

- (d) The permitted mass of propanoic acid used in animal feed is in the range $1000\text{--}3000\text{ mg kg}^{-1}$. A titration method may be used to check the concentration of propanoic acid in animal feed.

A 50.0 cm^3 sample of propanoic acid solution was extracted from 50 g of an animal feed.

The sample was added to a volumetric flask and the volume made up to 250.0 cm^3 and mixed thoroughly. A pipette was used to transfer 25.0 cm^3 of the diluted acid into a conical flask containing an indicator.

The contents of the conical flask were titrated with a solution of sodium hydroxide, NaOH(aq) , with concentration $0.00668\text{ mol dm}^{-3}$.

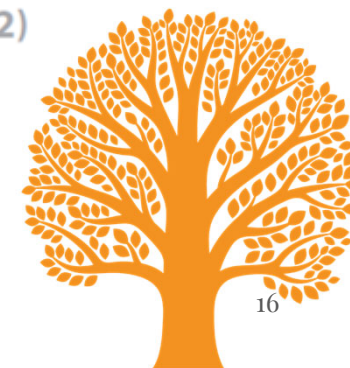
The procedure was repeated twice and the results obtained are shown.

	Run 1	Run 2	Run 3
Titre / cm^3	23.20	22.10	22.20

- (i) Phenolphthalein is a suitable indicator for this titration.

State the colour **change** at the end-point.

(2)

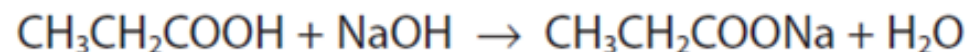


WCH12 June 2019 Q23

- (ii) Suggest **two** possible reasons why the titre for Run 1 is greater than the other two titres.

(2)

- (iii) The equation for the reaction of propanoic acid with sodium hydroxide is



Calculate the mass in grams of propanoic acid extracted from the animal feed.

Give your answer to an appropriate number of significant figures.

(5)



WCH12 June 2019 Q23

(iv) Use your answer to (d)(iii) to determine whether the acid in this sample lies within the permitted range for use in animal feed.

(2)

(v) Suggest how the animal feed would be affected if the amount of propanoic acid was outside the permitted range.

(1)



Session 2: A02



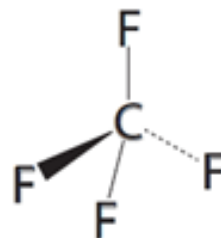
Why do we ask AO2?

- While AO1 is focused on recall of knowledge and explanation, AO2 focuses on application, analysis and evaluation
- AO2(a) Application of knowledge in familiar and unfamiliar contexts
- AO2(b) Analysis and evaluation of information



Example multiple choice Qs (WCH11)

4 Which is correct for tetrafluoromethane (CF_4)?



	Bonds	Molecule
<input checked="" type="checkbox"/> A	polar	polar
<input checked="" type="checkbox"/> B	non-polar	polar
<input checked="" type="checkbox"/> C	polar	non-polar
<input checked="" type="checkbox"/> D	non-polar	non-polar



Example multiple choice Qs (WCH11)

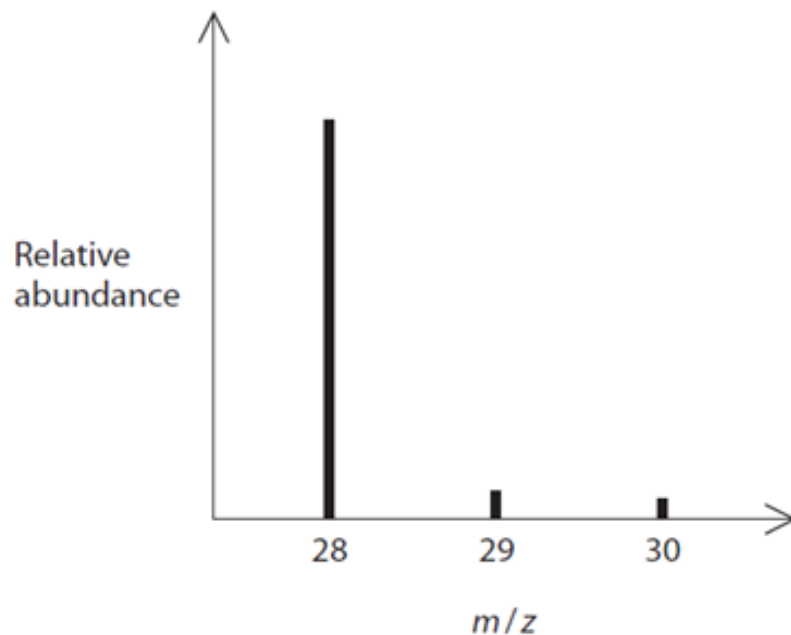
5 Which pair of ions gives the strongest ionic bonding?

- ☐ **A** Na^+ and F^-
- ☐ **B** K^+ and Br^-
- ☐ **C** Mg^{2+} and O^{2-}
- ☐ **D** Ca^{2+} and S^{2-}



Example multiple choice Qs (WCH11)

12 The mass spectrum of a sample of silicon is shown.



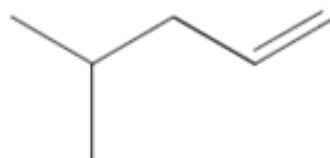
What is the **best** estimate for the relative atomic mass of silicon in this sample?

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



Example multiple choice Qs (WCH11)

16 What is the name of the product when this molecule reacts with chlorine gas?



- ☐ **A** 5,5-dichloro-2-methylpentane
- ☐ **B** 4,5-dichloro-2-methylpentane
- ☐ **C** 2,3-dichloro-4-methylpentane
- ☐ **D** 1,2-dichloro-4-methylpentane



Examiners' Report – WCH11 Q21(b)(i)

The majority of candidates scored two or three marks for their drawing of the graph.

Occasionally candidates lost a mark for having the axes the wrong way around, but the most frequent error was in the line of best fit. Candidates were expected to have points on either side of the line (ideally it should pass through the origin for this experiment) and use a ruler to draw a single straight line.



Examiners' Report – WCH11 Q21(b)(ii)

The upside-down measuring cylinder proved challenging for some candidates but transfer errors were given if they continued with their answer through the calculation. The common incorrect answers were 54cm^3 and, to a lesser extent, 45cm^3 .



Examiners' Report – WCH11 Q21(b)(iii)

Part Q21(b)(iii) was sometimes answered using the table or the gradient of the line, rather than the candidates' own graph, but this was allowed.



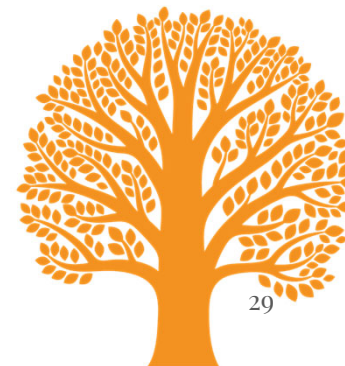
Examiners' Report – WCH11 Q21(b)(iv)

The most frequent error in part Q21(b)(iv) was the failure to use the volume from the measuring cylinder in their calculation. Often candidates quoted the molar volume and tried to use this to calculate the experimental molar volume. The final mark was for an answer of 2 or 3 significant figures with units.



Examiners' Report – WCH11 Q21(b)(iv)

Part Q21(b)(v), the calculation of the minimum concentration, was answered well with over half of candidates scoring both marks. Some errors in rounding were seen, but significant figures were not tested here. The common errors were omission of the 1:2 molar ratio or forgetting to convert the volume into dm^3 and still giving the units as mol dm^{-3} .



Examiners' Report – WCH11 Q21(c)

This question continues from Q21(b) and candidates are expected to be familiar with experimental issues that may arise in Core Practical 1 and, in this situation, apply their experience to an unexpected result of a calculation.

Most candidates gained one mark here, usually for saying that the carbon dioxide had dissolved in the water. "Leaks" was not acceptable without an explanation of how the loss of gas occurred. References to conditions being different to standard conditions had to be qualified. Frequently, candidates talked about the reaction being incomplete or there being impurities in the magnesium carbonate which were not accepted answers. Some also mentioned human errors such as reading errors (including parallax).



Examiners' report – WCH11 Q23(c)

Two bonding patterns were acceptable answers here. The lack of lone pairs was only penalised once and this was the most common reason for less than full marks being awarded for the bonding diagram.

Explanations of electron pair repulsion theory were mixed, with candidates most often neglecting the four areas of electron density (allowed as phosphorous bonds or bonding pairs).

Some confusion was seen about the relationship between separation and repulsion.

The most frequent incorrect answer for the shape was pyramidal. This was regularly seen with dot and cross diagrams showing dative covalent bonding as candidates did not take the oxygen into account when describing the shape of the molecule - or trigonal bipyramidal, when candidates thought there were five areas of electron density.

Some candidates included unnecessary information about the differing repulsion between bonding pairs and lone pairs.



Teaching Strategies

- Focus on understanding the requirements of questions looking carefully at what marks are awarded for
- Students should practice examination questions focusing on the use of mark schemes to understand the requirements of the questions
- Look at the wording of the question to identify where the context needs to be addressed (AO2) rather than simply facts and statements (AO1)



Session 3: A03



Why do we ask AO3?

- While AO1 is focused on recall of knowledge and explanation and AO2 focuses on application, analysis and evaluation, AO3 is placed in a practical context
- Practical work is an important part of Chemistry A level and a student's familiarity with practical techniques is tested in AO3
- The practical work may be familiar or unfamiliar but questions will focus on techniques and concepts



Types of Questions

- Any question in a practical context in paper WCH13 and WCH16
- Many questions similar to equivalent papers in the previous specification



Examiners' Report – WCH13 Q2(a)

Most students were able to describe a test for a hydroxyl group.

Phosphorus(V) chloride was the preferred reagent, although a significant minority suggested sodium metal; the results of these tests were well known.

The most common incorrect reagent was acidified potassium dichromate(VI) which gained no credit.



Examiners' Report – WCH13 Q2(b)(i)

The use of acidified potassium dichromate(VI) as the oxidising agent for alcohols was very well known and the most likely error was the omission of the acid.

The oxidation state of chromium was not required but, if given, had to be correct and correctly placed, so (eg) potassium(VI) dichromate gained no credit.

Some students gave acidified potassium manganate(VII), but this also gained no credit as this is not considered a suitable reagent for this oxidation.



Examiners' Report – WCH13 Q2(b)(ii)

The use of distillation to isolate the aldehyde was very well known but students were less clear on the reason for this, often focusing on the practicalities of distillation rather than the importance of preventing further oxidation.



Examiners' Report – WCH13 Q2(b)(iii)

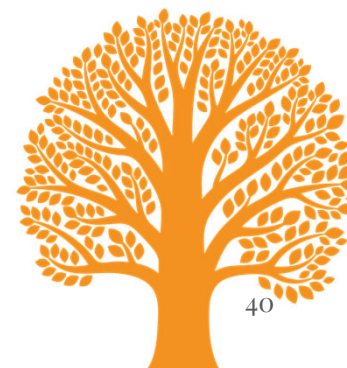
Most students were able to describe one of the standard tests for aldehydes.

The most common reason for losing the result mark was to give 'turns red' or 'red solution' rather than 'red precipitate' as the observation for the Fehling's or Benedict's tests.



Examiners' Report – WCH13 Q2(b)(iv)

Few students appreciated that, because there are two primary alcohols with the molecular formula $C_4H_{10}O$, the aldehyde test is inconclusive.



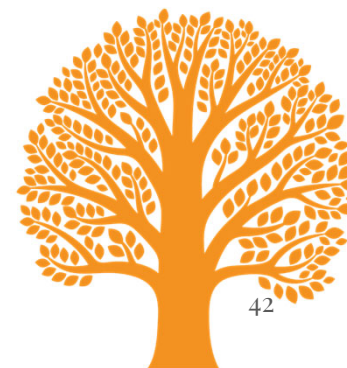
Examiners' Report – WCH13 Q2(b)(v)

The use of reflux in the oxidation of secondary alcohols was generally well known, however, many explanations were given in terms of retaining the volatile reagents rather than ensuring complete oxidation.



Examiners' Report – WCH13 Q2(c)(i)

Candidates were most likely to score the first and third marking points. Clear explanations of the importance of passing alcohol vapour slowly over the hot catalyst were quite rare.



Examiners' Report – WCH13 Q2(c)(ii)

There were some excellent responses with clear descriptions of suck-back and precise explanations in terms of the pressure differences, although, some students seemed unfamiliar with this type of experiment.

Some responses referred to suck-back of the alcohol or alkene which negated the mark, while others suggested that a violent reaction involving the aluminium oxide or the drop in pressure inside the reaction tube would cause an explosion to occur. Students needed to be accurate about which part of the apparatus was affected by suck-back.



Examiners' Report – WCH13 Q2(d)(ii)

The first two marks were accessible to students who appreciated that the mass spectrum under discussion was that of a dibromobutane. The third marking point was more challenging and required more from candidates than a repetition of the phrase used in the question 'alcohol **A** must be butan-2-ol'.

The best answers to this question showed a keen understanding of the chemistry and the mass spectrometry.



Teaching Strategies

- Practice questions of similar types can be found in the equivalent papers of the previous specification.
- There is no substitute for the experience gained through practical work.
- Questioning learners during practical work so they understand why they are doing a particular step, rather than allowing them to simply follow the 'recipe'.



Session 4:



15:00 – 15:30

Writing questions using AO1, 2 and 3



Plenary



Support Overview

Free Support

Getting Started
Guide & Scheme of
Work

Getting Ready to
Teach Events

Subject
interpretation of
transferable skills

Subject Advisor

Results Plus

Regional Support
Manager

Additional support for selected subjects

**Curriculum
Matched
Publishing**

Lesson plans

Exemplar Marked
Responses

Topic booklets &
Subject guides

Additional SAMs

Exam Wizard





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. So not just post results!
- ResultsPlus Direct gives your students access to their final grades and performance breakdown, wherever they are.
- Schools can sign up for free ResultsPlus account in just a few quick and easy steps:
<https://qualifications.pearson.com/en/support/Services/ResultsPlus.html>





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.



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.



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ALWAYS LEARNING