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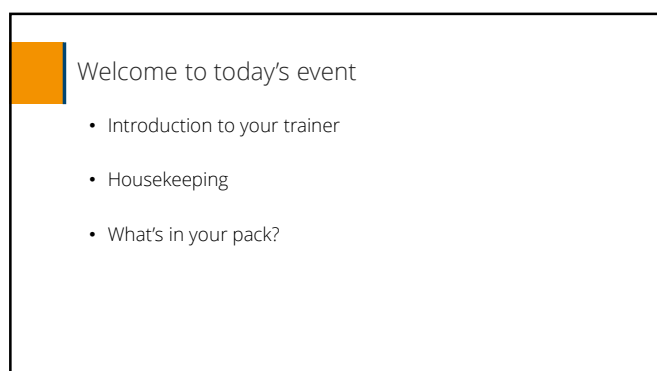
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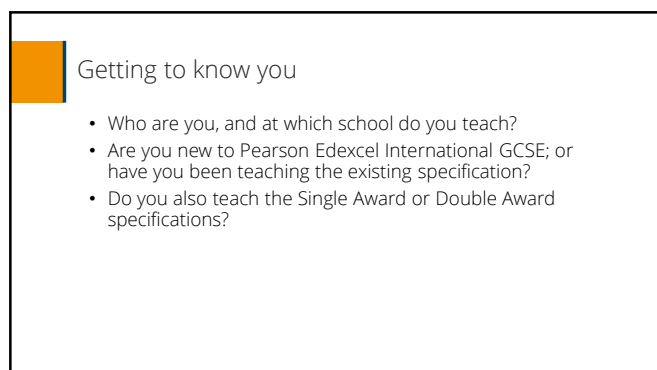
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## Today's Agenda

10.00 – 10.10	Welcome and introductions
10.10 – 11.15	Session 1
11.15 – 11.30	MORNING BREAK
11.30 – 12.45	Session 2 (Part 1 )
12.45 – 13.45	LUNCH
13.45 – 14.45	Session 2 (Part 2)
14.45 – 15.00	AFTERNOON BREAK
15.00 – 16.00	Session 3

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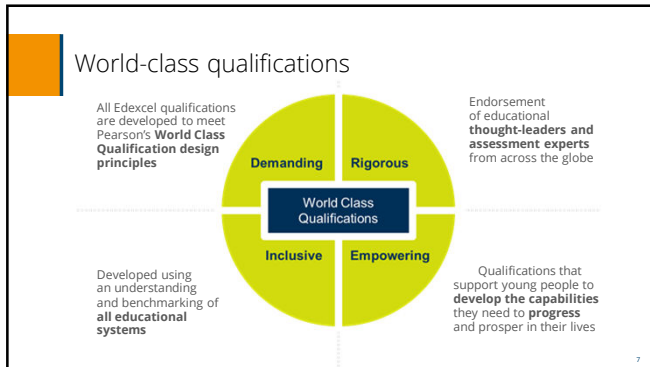
## Aims and objectives

- 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 network and share ideas with other teachers

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Understanding how  
the qualification and  
assessment are  
devised

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### Key documents

There are two key documents needed to deliver the course:

- The specification
- The SAMS

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### What is 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.

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## What are 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 all of our future papers and assessments on these Sample Assessment Materials.

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## Overview of the specification

Principles of chemistry	Inorganic chemistry	Physical chemistry	Organic chemistry
(a) States of matter (b) Elements, compounds and mixtures (c) Atomic structure (d) The Periodic Table (e) Chemical formulae, equations and calculations (f) Ionic bonding (g) Covalent bonding (h) Metallic bonding (i) Electrolysis	(a) Group 1 (alkali metals) – lithium, sodium and potassium (b) Group 7 (halogens) – chlorine, bromine and iodine (c) Gases in the atmosphere (d) Reactivity series (e) Extraction and uses of metals (f) Acids, alkalis and titrations (g) Acids, bases and salt preparations (h) Chemical tests	(a) Energetics (b) Rates of reaction (c) Reversible reactions and equilibria	(a) Introduction (b) Crude oil (c) Alkanes (d) Alkenes (e) Alcohols (f) Carboxylic acids (g) Esters (h) Synthetic polymers

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## Paper-by-paper breakdown

Paper 1	Paper 2
Externally assessed • Availability: January and June	Externally assessed • Availability: January and June
<b>Content summary</b> Assesses core content that is <b>not</b> in bold and does not have a 'C' reference. Questions may come from any topic area across the specification. 1 Principles of chemistry 2 Inorganic chemistry 3 Physical chemistry 4 Organic chemistry	<b>Content summary</b> Assesses <b>all the content</b> , including content that is in bold and has a 'C' reference. Questions may come from any topic area across the specification. Bold statements cover some sub-topics in greater depth. 1 Principles of chemistry 2 Inorganic chemistry 3 Physical chemistry 4 Organic chemistry

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## Paper-by-paper breakdown

Paper 1	Paper 2
<b>Assessment</b> <ul style="list-style-type: none"> <li>The paper is assessed through a 2-hour written examination paper set and marked by Pearson.</li> <li>The total number of marks is 110.</li> <li>A mixture of different question styles, including multiple-choice questions, short-answer questions, calculations and extended open-response questions.</li> <li>A calculator may be used in the examinations.</li> <li>61.1% of the total International GCSE</li> </ul>	<b>Assessment</b> <ul style="list-style-type: none"> <li>The paper is assessed through a 1-hour and 15-minute written examination paper set and marked by Pearson.</li> <li>The total number of marks is 70.</li> <li>A mixture of different question styles, including multiple-choice questions, short-answer questions, calculations and extended open-response questions.</li> <li>A calculator may be used in the examinations.</li> <li>38.9% of the total International GCSE</li> </ul>

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## How is the content assessed?

Here are two questions from May 2019 Paper 1C.

(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)

(c) The boiling point of Halon 1301 is  $-58^{\circ}\text{C}$ .

Explain why Halon 1301 has a low boiling point. (2)

Which specification statements are the questions testing?

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## How is the content assessed?

(b) 1.46: understand how to use dot-and-cross diagrams to represent covalent bonds in inorganic molecules

(c) 1.47: explain why substances with simple molecular structures are gases or liquids, or solids with low melting and boiling points

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## ACTIVITY 1

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)

2.24C be able to comment on a metal extraction process, given appropriate information

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## ACTIVITY 2

**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

Here is an example question:

Explain how you could use the following solutions to obtain the order of reactivity bromine, chlorine and iodine:

aqueous bromine    aqueous chlorine    aqueous iodine

aqueous potassium bromide

aqueous potassium chloride

aqueous potassium iodide

Your plan should contain as few experiments as possible.

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## Key content

**The following topics are those that candidates regularly find more challenging in exam papers:**

- Writing balanced chemical equations, particularly ionic equations (1.25)
- Calculations involving moles, particularly those involving volume and concentration (1.34C) and bond energies (3.7C)
- Linking properties to structures (1.41, 1.47, 1.49 and 1.50)
- Reversible reactions and equilibria (3.19C to 3.22C inclusive)
- Analysis of experimental data and evaluation of experimental methods

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### Some common errors seen in answers

- Referring to intermolecular forces of attraction when discussing the properties of substances with giant covalent structures, ionic compounds and metals
- Stating that covalent bonds are weak, and therefore require little energy to break, when explaining why simple molecular substances have low melting/boiling points
- Losing marks when writing chemical equations by getting the formulae incorrect (e.g. H instead of  $H_2$ , MgCl instead of  $MgCl_2$ )

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### Some common errors seen in answers

- Referring to changes in (kinetic) energy of the particles when explaining the effect of surface area of a solid or concentration of a solution on the rate of reaction
- Providing contradicting information when explaining the effects of the change of a variable on the position of equilibrium of a reversible reaction

E.g.  $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) \quad \Delta H = -92 \text{ kJ/mol}$

A decrease in temperature will increase the yield of ammonia as the equilibrium shifts in the endothermic direction.

Note that Le Chatelier's principle is not on the specification.

Mark schemes never give credit for the idea that an equilibrium reaction "wants to resist a change" or "moves to oppose a change".

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### ACTIVITY 3

$SiF_4$  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)

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

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## ACTIVITY 3

Simple molecular	Giant covalent
Compound exists as simple molecules	The structure is a giant lattice, not molecular
Weak forces between molecules	Strong covalent bonds between atoms
Forces easily overcome – so low boiling point	Lots of energy needed to break the bonds – high boiling point
Stronger intermolecular forces lead to higher boiling point	There are no molecules, so no intermolecular forces

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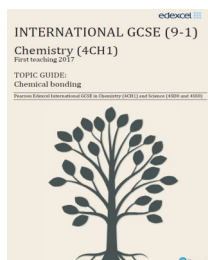
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## Topic Guide – Chemical Bonding



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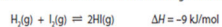
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## ACTIVITY 4

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



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)

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## ACTIVITY 4

For this reaction it is sufficient to say:

A decrease in temperature increases the yield (1 mark) because the forward reaction is exothermic (1 mark).

**N.B.** No credit is given for 'decreasing the temperature favours the exothermic reaction', since favours could also refer to rate of reaction

**N.B.** Le Chatelier's Principle is not needed and should not be used

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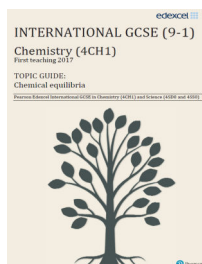
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## Topic Guide – Chemical Equilibria



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How do I make sure I cover the content?

- Specification
- Schemes of work
- Lesson plans

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Break

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## SESSION 2

### Assessment objectives and exemplars

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## 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

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### 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

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### Assessment objectives

AO1 Knowledge and understanding in chemistry

AO2 Application of knowledge and understanding, analysis and evaluation in chemistry

AO3 Experimental skills, analysis and evaluation of data and methods in chemistry

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### Assessment objectives

AO1 Questions requiring students to recall and use information that you have taught them

AO2 Questions requiring students to apply what you have taught them, or to use skills, or to analyse and make judgements

AO3 Questions on practical work and associated practical skills, such as planning, drawing graphs, analysing data, evaluating methods

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## Assessment objectives

AO1

≈ 40%  
of total marks

AO2

≈ 40%  
of total marks

AO3

≈ 20%  
of total marks

- Note the proportions of AOs on International GCSE papers
- Paper 1 and Paper 2 both have the same balance of AO1 : AO2 : AO3
- Compared to our previous specification, the new specification has less AO1 and more AO2

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## Typical AO1 questions

- Can be simple recall

OR

- Can be based on understanding, not just knowledge

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## Typical AO2 questions

- Can involve simple ideas being applied to unfamiliar scenarios

OR

- Can involve more complex scenarios involving data analysis or evaluation

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## Typical AO3 questions

- Questions based on practical experiences – not just Core Practicals, but any practical work!

3 Sodium chloride is a soluble salt.

(a) Name the acid and the alkali that can be used to make sodium chloride. (2)

acid \_\_\_\_\_

alkali \_\_\_\_\_

(b) A teacher drops a bottle containing sodium chloride. The bottle breaks when it hits the floor. The teacher sweeps up the mixture of sodium chloride and glass. Describe how the teacher can obtain a pure, dry sample of sodium chloride from the mixture. (4)

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## ACTIVITY 5 – Assigning AOs

Your pack contains questions from May/June 2019 Papers 1C and 2C.

Read the questions and assign an AO to each question part.

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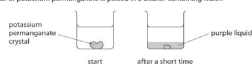
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## ACTIVITY 5 – Assigning AOs

### AOs in Multiple choice 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

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## ACTIVITY 5 – Assigning AOs

### AOs in Multiple choice questions

- (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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## ACTIVITY 5 – Assigning AOs

### AOs in Multiple choice questions

- 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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## ACTIVITY 5 – Assigning AOs

### AOs in structured questions

- 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)

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## ACTIVITY 5 – Assigning AOs

### AOs in structured questions

(6) 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)

(6) 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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## ACTIVITY 5 – Assigning AOs

### AOs in structured questions

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 77.96% chlorine-37 22.04%

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 the student can use these two solutions to compare the reactivity of chlorine with the reactivity of bromine.

(3)

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## 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?

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## ACTIVITY 6 – Assigning Command Words to AOs

Your pack contains a list of command words used in International GCSE Chemistry question papers.

- Draw a table with 3 columns one for each AO.

AO1	AO2	AO3

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

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## ACTIVITY 6 – Assigning Command Words to AOs

AO1	AO2	AO3
Add/Label	Calculate	Deduce
Describe	Identify	Design
Explain	Deduce	Draw
Give/State/Name	Determine	Estimate
Give a reason	Predict	Evaluate
	Suggest	Plot
	Write (an equation)	

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## AO2 Questions

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## 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.

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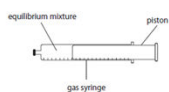
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## What is AO2?

- Application of knowledge to unfamiliar situations

(b) Some  $\text{N}_2\text{O}_4$  and some  $\text{NO}_2$  are put into a sealed gas syringe and allowed to form an equilibrium mixture.



This equilibrium mixture is brown.

(i) The pressure of the gas in the syringe is increased by pushing in the piston. The mixture is then allowed to reach a new equilibrium at the same temperature as before.

Explain why the new equilibrium mixture contains less  $\text{NO}_2$  than the original equilibrium mixture.

(2)

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## What is AO2?

- Calculations

9 Halon 1301 is a compound used in some fire extinguishers.

Halon 1301 has the percentage composition by mass of

C 8.05% Br 53.69% F 38.26%

(a) Show, by calculation, that the empirical formula of this compound is  $\text{CBrF}_3$

(2)

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## What is AO2?

- Equations

(ii) Write a chemical equation for the complete combustion of ethanol in air.

(2)

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## What is AO2?

- Unfamiliar dot and cross diagrams

(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)

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## ACTIVITY 7 – AO2 in exams

Your pack contains questions from May/June 2019 Papers 1C and 2C, with mark schemes and student answers.

Mark the questions using the scheme provided.

We will discuss the students' answers to each question one by one, but don't let that stop you working on the next question if you are waiting for others to finish.

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ACTIVITY 7 – AO2 in exams

Paper 1C, Q9(b)  
Student 1



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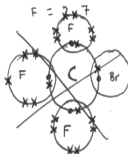
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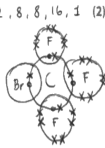
ACTIVITY 7 – AO2 in exams

Student 2

C = 2, 4



Br = 2, 8, 8, 16, 1 (2)



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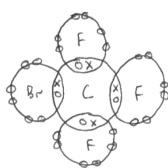
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ACTIVITY 7 – AO2 in exams

Student 3



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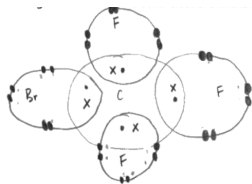
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## ACTIVITY 7 – AO2 in exams

Student 4



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## ACTIVITY 7 – AO2 in exams

Paper 2C, Q4c(ii)  
Student 1

(ii) Explain why magnesium is harder than aluminium.

(3)

In Magnesium the structure is less uniform as magnesium atoms distort 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.

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## ACTIVITY 7 – AO2 in exams

Student 2

(ii) Explain why magnesium is harder than aluminium.

(3)

Magnesium 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 Magnesium is hard and not malleable. Aluminium has the same sized atoms so layers can slide over each other, making it softer, and malleable.

(Total for Question 4 = 7 marks)

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## ACTIVITY 7 – AO2 in exams

Student 3

(ii) Explain why magnesium is harder than aluminium.

(3)

Magnesium 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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## ACTIVITY 7 – AO2 in exams

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

Student 1

$$\begin{aligned}
 & \text{ii} \quad \frac{9.49}{29.9} \\
 & \quad = 0.317 \\
 & \quad \times 100 = 31.7\% \\
 & \quad \text{or } 100 - 31.7 = 68.3\% \\
 & \quad \text{percentage yield} = 68.3\%
 \end{aligned}$$

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## ACTIVITY 7 – AO2 in exams

Student 2

$$\begin{aligned}
 & \text{ii} \quad \frac{23.92}{29.94} \\
 & \quad = 0.799 \\
 & \quad \times 100 = 79.9\% \\
 & \quad \text{percentage yield} = 79.9\%
 \end{aligned}$$

63

### ACTIVITY 7 – AO2 in exams

Student 3

$$\begin{aligned}
 \text{ii) } n \text{ of } \text{CuO} &= \frac{9.54}{74.7} \\
 &= 0.127 \\
 m \text{ of } \text{copper} &= n \times M_r \\
 &= 0.127 \times 63.5 \\
 &= 8.06 \text{ g} \\
 \text{mass} &= 25.94 \text{ g} \\
 \text{iii) } \frac{23.97}{25.94} \times 100 &= 92.21\% \\
 \text{percentage yield} &= 92.21\%
 \end{aligned}$$

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### Preparing students for AO2

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### Preparing students for AO2

**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?

66

### 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?

67

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### 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?

68

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### ACTIVITY 8 – AO2 Exam preparation

Your pack contains two questions from June 2019 International GCSE Chemistry Paper 2C.

- Why is each question classified as AO2?
- How are these two questions different?
- What advice would you give to your students when trying to answer each question?

69

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Lunch

70

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AO3 QUESTIONS

71

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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.

72

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### AO3: Recall of Practical Technique

(e) Describe how the student could obtain a pure, dry sample of hydrated copper(II) sulfate crystals from the filtrate in stage 6.

(5)

73

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### AO3: Analysis of results – graph

The graph on the next slide shows the results of reacting two different acids, X and Y, with the same mass of magnesium ribbon and at the same temperature.

Explain how the curves show which acid has the greater concentration.

74

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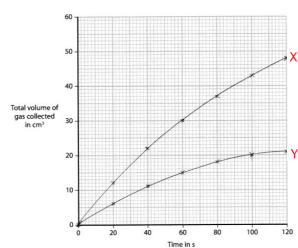
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### AO3: Analysis of results – graph



75

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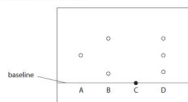
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### AO3: Analysis of results – diagram

(b) Another student does the experiment but does not make any mistakes.  
The diagram shows her results.



(i) State how many colours ink D contains.

(1)

(ii) State which of the inks tested could be mixed together to make ink D.

(1)

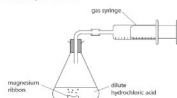
(iii) Explain which of the inks tested is insoluble in water.

(2)

76

### AO3: Evaluation of methods

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<sup>3</sup> of dilute hydrochloric acid of concentration 2.0 mol/dm<sup>3</sup> into the conical flask
- add a piece of magnesium ribbon of mass 0.286 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

(c) The expected volume of gas produced in the first experiment is 86 cm<sup>3</sup>.

Suggest why the volume collected is less than the expected volume.

(1)

(d) The student uses a graduated beaker to measure the volume of dilute hydrochloric acid.

Explain why it is **not** necessary to use a measuring cylinder in this experiment.

(2)

77

### AO3: Evaluation of methods

#### Examiner's report

##### Question 13 (c)

This question was poorly answered by the majority of candidates. Many said that gas escapes or is lost, but very few of these went on to say why it escapes, so this was insufficient to be awarded the mark. Mention of the magnesium being impure was rarely seen. Some said that the magnesium did not fully react, which was not creditworthy because as the acid is in excess there is no reason why the magnesium would stop reacting.

##### Question 13 (d)

This question was not particularly well answered. Many talked about an accurate measurement not being required but failed to mention that this was because the acid was in excess. As the second marking point was dependent on the first, answers such as these could not be awarded any marks.

78

### AO3: Use of data

(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				Mean time in s
		Student A	Student B	Student C	Student D	
methanol	CH <sub>3</sub> OH	20	24	22	26	23
ethanol	C <sub>2</sub> H <sub>5</sub> OH	32	34	35	30	33
propanol	C <sub>3</sub> H <sub>7</sub> OH	45	47	50	48	48
butanol	C <sub>4</sub> H <sub>9</sub> OH	64	63	90	60	

(ii) Explain how the results show which alcohol evaporates most easily.

(2)

79

### AO3: Use of data

#### Examiner's report

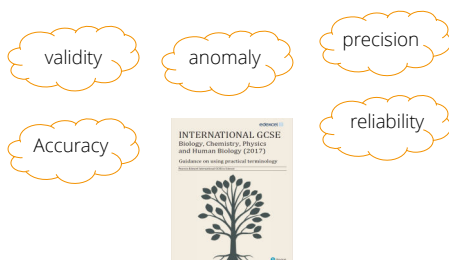
##### Question 3 (c) (ii)

Most candidates identified that methanol was the alcohol that evaporates most easily and gained the first mark.

The question asked for an explanation for this from the results, and as the results in the table were values of times, the required explanation needed to refer to methanol taking the shortest time.

80

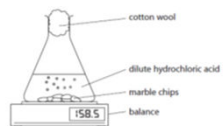
### Teaching AO3 – Terminology



81

## Terminology – Accuracy

5 A student uses this apparatus to investigate the rate of reaction between marble chips and dilute hydrochloric acid.



- (a) During the reaction, the reading on the balance decreases because mass is lost from the flask.  
(i) Explain how using the cotton wool increases the accuracy of this investigation. (2)

82

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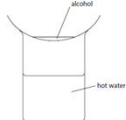
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## Terminology – Validity

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
- (a) State two variables the student should control to make sure her results are valid. (2)

83

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## ACTIVITY 9 – AO3 in exams

Your pack contains three questions from May/June 2019 Papers 1C and 2C, with mark schemes and student answers.

- Mark the questions using the scheme provided.
- Are students showing understanding of what they did in practical lessons?

84

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## ACTIVITY 9 – AO3 in exams

Paper 1C, Q12(a)  
Student 1

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

85

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## ACTIVITY 9 – AO3 in exams

Student 2

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

86

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## ACTIVITY 9 – AO3 in exams

Student 3

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

87

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ACTIVITY 9 – AO3 in exams

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	Student A	Student B	Student C	Student D	Mean time in s
methanol	CH <sub>3</sub> OH	20	24	22	26	23
ethanol	C <sub>2</sub> H <sub>5</sub> OH	32	34	35	30	33
propanol	C <sub>3</sub> H <sub>7</sub> OH	45	47	50	48	48
butanol	C <sub>4</sub> H <sub>9</sub> OH	64	63	90	60	

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

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

88

ACTIVITY 9 – AO3 in exams

Student 2

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

Alcohol	Formula of alcohol	Student A	Student B	Student C	Student D	Mean time in s
methanol	CH <sub>3</sub> OH	20	24	22	26	23
ethanol	C <sub>2</sub> H <sub>5</sub> OH	32	34	35	30	33
propanol	C <sub>3</sub> H <sub>7</sub> OH	45	47	50	48	48
butanol	C <sub>4</sub> H <sub>9</sub> OH	64	63	90	60	

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

(2)

mean time = 62 s

89

ACTIVITY 9 – AO3 in exams

Student 3

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

Alcohol	Formula of alcohol	Student A	Student B	Student C	Student D	Mean time in s
methanol	CH <sub>3</sub> OH	20	24	22	26	23
ethanol	C <sub>2</sub> H <sub>5</sub> OH	32	34	35	30	33
propanol	C <sub>3</sub> H <sub>7</sub> OH	45	47	50	48	48
butanol	C <sub>4</sub> H <sub>9</sub> OH	64	63	90	60	

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

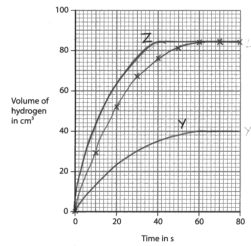
(2)

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

90

ACTIVITY 9 – AO3 in exams

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



91

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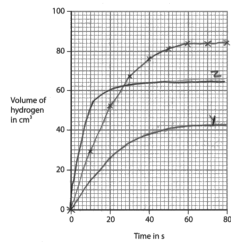
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ACTIVITY 9 – AO3 in exams

Student 2



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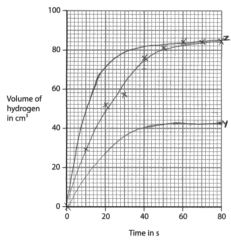
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ACTIVITY 9 – AO3 in exams

Student 3



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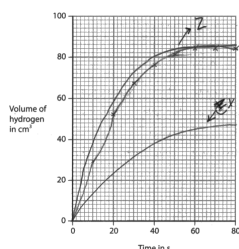
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### ACTIVITY 9 – AO3 in exams

Student 4



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Break

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### Teaching AO3 – doing practical work

- The specification for International GCSE Chemistry contains 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.

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## Teaching AO3 – 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?

97

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## Preparing students for AO3

### Teaching approaches: fact vs. investigative

Why does copper turn black when heated in air using a Bunsen burner?

**Fact:** Copper reacts with oxygen to form copper(II) oxide

**Investigative:** What may have caused the black substance to appear?

How can we find out which?

98

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## Preparing students for AO3

### Teaching approaches: fact vs. investigative

**Investigative:** The copper stills turns black so it must be something in the air.

How can we find out which gas in the air is responsible?

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## Preparing students for AO3

### Good, I'm glad it's gone wrong!

- Add 1 cm depth of 1 mol/dm<sup>3</sup> hydrochloric acid to each of the three boiling tubes
- Leave one tube at room temperature
- Place the second in a water bath at  $\approx 40^{\circ}\text{C}$
- Place the third in a water bath at  $\approx 60^{\circ}\text{C}$
- You are going to add a 1 cm strip of clean magnesium ribbon to each tube and measure how long it takes for the magnesium ribbon to completely disappear
- Predict the order of disappearance and then do the experiment

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## Preparing students for AO3

**Prediction** magnesium disappears first at  $50^{\circ}\text{C}$  and last at room temperature

**Outcome** magnesium usually disappears first at room temperature and last at  $60^{\circ}\text{C}$

**Explanation**

- gas given off so violently at  $60^{\circ}\text{C}$  that magnesium continuously lifts off the acid and falls back down
- at room temperature the magnesium sinks

101

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## ACTIVITY 10 – Questions for practicals

Your pack has a list of Core Practicals.

- Select one Core Practical from the list: it should ideally be one that your students actually do.
- What questions would you ask your students as they do this practical?
- What homework would you set?

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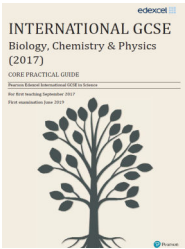
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Core practical guide

- An introduction to each practical activity
- Description of the practical, with some useful hints and tips
- Questions to use with students to test their understanding as they do the experiment in the lab
- A past paper question, where relevant, to use as a homework activity



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Support

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Support overview

Getting Started Guide & Scheme of Work	Welcome to Pearson Events	Subject interpretation of transferable skills
Subject Advisor	ResultsPlus	Regional Support Manager
Curriculum Matched Publishing	Qualification Guides	Pre-recorded training
Exemplar marked responses with commentaries	examWizard	Access to Scripts

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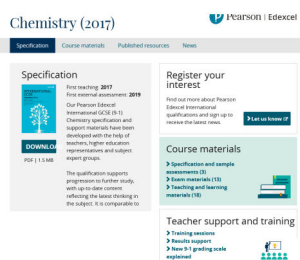
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## Subject Home page



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## Teaching and learning materials

- Guidance on using practical terminology
- Exemplars with commentary
- Mapping documents
- Past training materials
- Guide for Core Practicals and Mathematics
- Scheme of work
- Topic Guides – Chemical bonding and chemical equilibrium

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## Published resources

- Three UK publishers have prepared resources, including Student Books, for the new International GCSE qualifications
- These are **Collins**, **Hodder** and **Pearson**
- All resources are now available
- The Student Books are endorsed by Edexcel – which means that they have been checked for specification coverage

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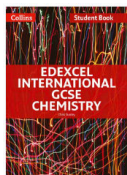
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## Published resources – Collins

<http://collins.co.uk/product/9780008236212/Edexcel+International+GCSE+-+Edexcel+International+GCSE+Chemistry+Student+Book>

**Student Book  
Teacher Pack**

The Collins Student Book allows you to co-teach Edexcel International GCSE Chemistry and Double Award Science. It is packed full of engaging content, practical skills features and questions, and is rigorously updated for the new specifications.

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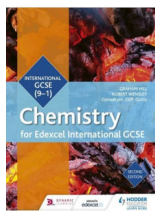
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## Published resources – Hodder

[www.hoddereducation.co.uk/edexceligcse](http://www.hoddereducation.co.uk/edexceligcse)

**Student Book**

Provide your students with complete coverage of the Edexcel International GCSE Chemistry specification with these affordable student books written by expert authors and teachers; testing knowledge and building practical skills throughout.

**Workbook**

Maximise every student's performance with exam-style questions, sample answers and examiner comments, written to support and enhance the content of the Edexcel International GCSE Chemistry book.

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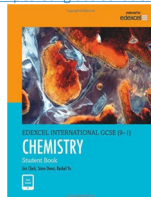
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## Published resources – Pearson

<http://www.pearsonglobalschools.com>

**Student Book**

This includes access to an eBook, has been developed for the new Edexcel International GCSE specification with progression, international relevance and support at their core. It is designed to supply students with the best preparation possible for the examination.

**Teaching Hubs**

This is available online, and includes videos, worksheets, full day to day lesson plans and other support to help you deliver the International GCSE in Chemistry.

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<https://qualifications.pearson.com/en/support/training-from-pearson-uk/pre-recorded-training.html>

## Pre-recorded training

**Pre-recorded training**  
These pre-recorded training videos have been developed to support you in the delivery, assessment and post-examination feedback for a range of different subjects. They can be watched at a time that suits you, shared with colleagues and revisited when needed.

Find your pre-recorded Training

Step 1. Select qualification family	
<ul style="list-style-type: none"> <li>A Level</li> <li>Applied GCE</li> <li>Applied GCSE</li> <li>AS and A Level</li> <li>AS Level</li> <li>BTEC Firsts</li> <li>BTEC Nationals</li> <li>Digital Applications (DQA And DQAA)</li> </ul>	<ul style="list-style-type: none"> <li>Entry Level Certificate</li> <li>GCSE</li> <li>International Advanced Levels</li> <li>International GCSE and Advanced Certificates</li> <li>LEO Financial and Quantitative Mathematics in Context</li> <li>Project Qualification</li> </ul>

Step 2. Select Qualification Subject.

Step 3. Available Resource.

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- Free online results analysis tool for teachers.
- Provides a detailed breakdown of student performance in Pearson Edexcel exams.
- Identify topics and questions where the student could benefit from further learning and inform teaching strategies and approaches.
- Benchmark your school's performance against other Pearson Edexcel schools in your country.
- Not just a post-results tool: Mock exam results can also be fed into the system to produce analysis.
- Find student results analysis from their previous Pearson Edexcel school.
- Find your Direct gives you 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>

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- [ResultsPlus Direct](#) gives your students access to their final grades and performance breakdown, wherever they are.
- Sign up for free ResultsPlus account in just a few quick and easy steps [here](#).
- Access additional video guides here:

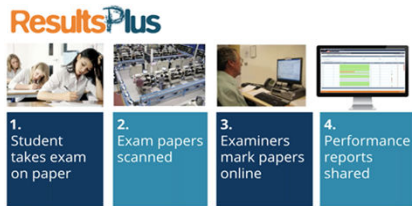
**ResultPlus - Individual Student Analysis**

ResultsPlus - Cohort Analysis

### ResultsPlus - Mock Analysis

### ResultsPlus - Global Analysis

### How ResultsPlus works



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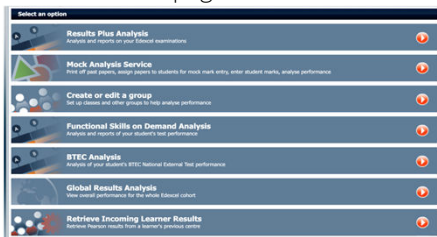
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### ResultsPlus Home page



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### examWzard

- A free tool for teachers which helps you make quick homework assignments, topic tests and mock exams.
- Questions tagged against unit, topic and assessment objective or simply choose a whole past paper.
- Use existing mark schemes for accurate marking.
- Use examiner report for insight.
- Most recent exam content available sooner.
- Use the results to understand where students need more support, informing teaching strategies.

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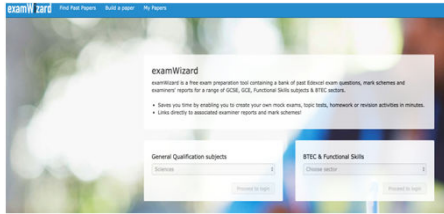
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## examWizard Home page



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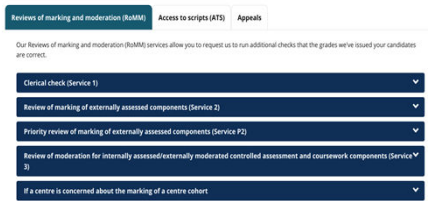
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## Post-results services



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## 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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### 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 Examiner's report which is available for download with other documents.
- [2 Examination Results Statistics](#)  
Results statistics summarise the overall grade outcomes of candidates sitting Pearson Edexcel examinations.
- [3 Progress to University](#)  
Here you can find information and guidance about how to progress to universities worldwide with Pearson Edexcel qualifications.
- [4 Access to scripts](#)  
Make an informed enquiry about results (EARs) using our free access to scripts portal.

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### Subject advisor

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Twitter: @PearsonSciences

Phone: +44 (0) 344 463 2535



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### Questions

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