

PEARSON EDEXCEL INTERNATIONAL GCSE (9–1)

Chemistry **Welcome to Pearson** **(Module 1)**

Event code: 4CH1-20IO2

First teaching in 2017, first assessment in 2019



Aims and objectives

- To understand the question types for the qualification
- To understand the Assessment Objectives for the qualification
- To practise using the mark schemes using exemplar student work
- To learn about the support provided by Pearson around assessment and exemplars



Today's agenda

Item
Introductions
Question Types
Assessment Objectives
AO2 Questions
BREAK
AO3 Questions
Support



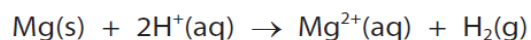
QUESTION TYPES



Short response

Here is a typical short response question:

The ionic equation for the reaction between magnesium and hydrochloric acid is



Use the information in this equation, and the particle collision theory, to explain why the rate of reaction decreases during each of the experiments.

(3)

.....

.....

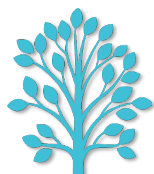
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Extended writing

Here is a typical extended writing question:

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)



Question types

The following question types will be set in both Papers 1 and 2:

- Multiple choice with 4 alternative answers labelled **A, B, C & D**
- Short response with a mark range from 1 to 4
- Extended writing worth 5 or 6 marks
- Calculations

Questions assessing experimental skills will be set in both papers.



Multiple choice

Here is a typical multiple choice question:

In 1937 an airship full of hydrogen gas flew from Germany to America.

(a) Which property of hydrogen makes it a suitable gas to use in an airship?

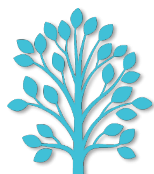
- ☐ **A** colourless
- ☐ **B** insoluble in water
- ☐ **C** low density
- ☐ **D** no smell



cross in box



**line through
cross in box**



Pearson
Edexcel

Calculations

Here is a typical calculation:

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



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

Show that the maximum possible mass of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ crystals that can be obtained is about 30 g.

$[M_r \text{ of CuO} = 79.5 \quad M_r \text{ of CuSO}_4 \cdot 5\text{H}_2\text{O} = 249.5]$

Give your answer to an appropriate number of significant figures. (3)

- (ii) In this experiment, the actual yield of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ crystals is 23.92 g.

Calculate the percentage yield of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (2)



ACTIVITY 1

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

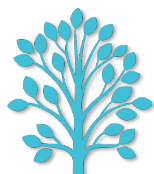
Hydrogen iodide can be manufactured from its elements using this reaction.



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)



ACTIVITY 1

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

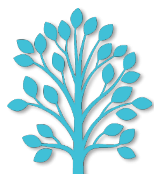


ACTIVITY 2

What are the five essential points to include in the answer to the following question?

Describe how a pure, dry sample of hydrated copper(II) sulfate crystals can be obtained from a dilute aqueous solution of copper(II) sulfate.

(5)



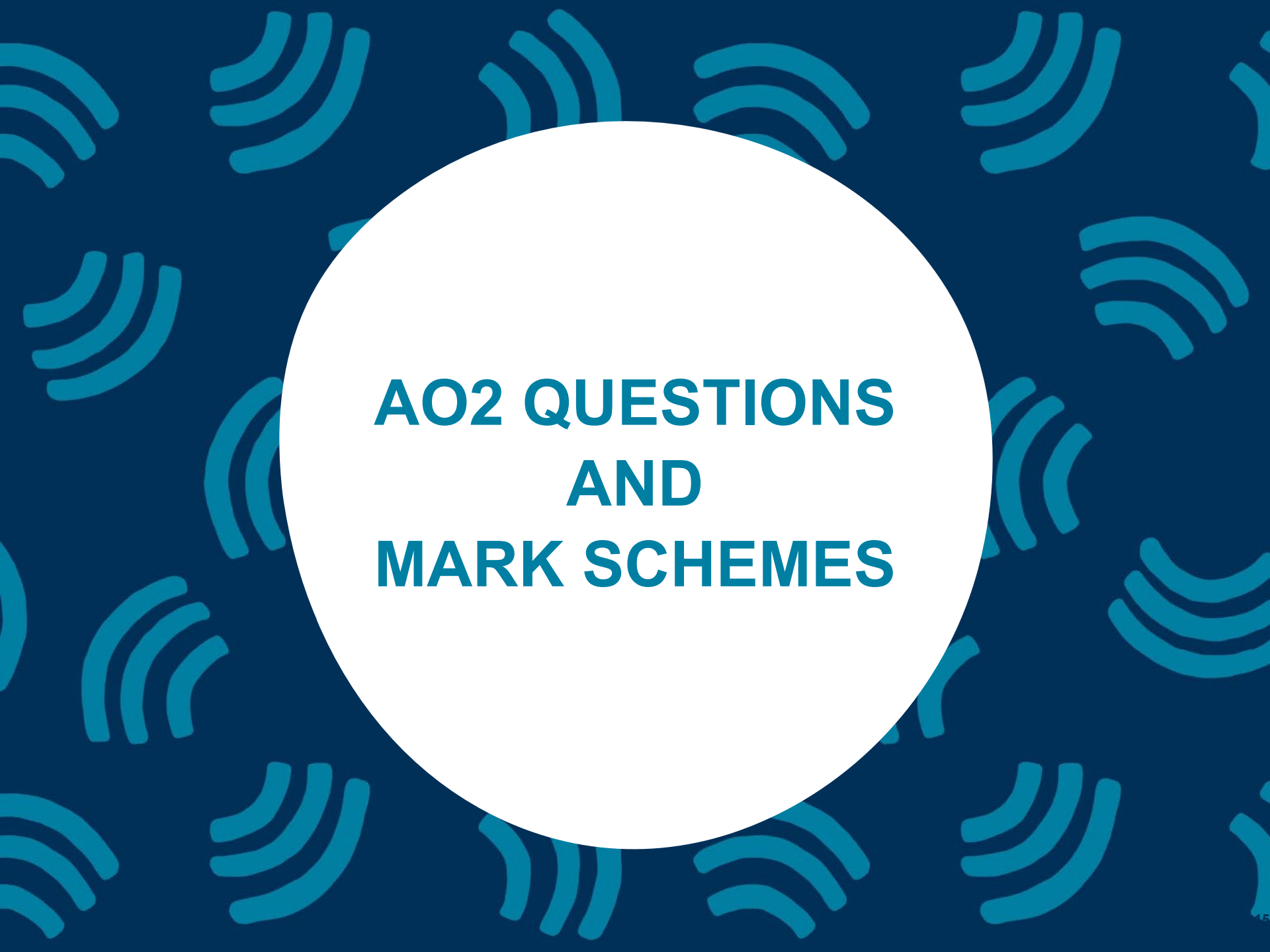
ACTIVITY 2

- Heat/boil the filtrate until crystals form in a cooled sample
- Leave the solution to cool so that crystals form
- Filter to remove the crystals
- Dry the crystals on filter paper



ASSESSMENT OBJECTIVES





AO2 QUESTIONS AND MARK SCHEMES

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

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



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



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



Typical AO1 questions

Can be simple recall

OR

Can be based on understanding, not just knowledge



Typical AO2 questions

Can involve simple ideas being applied to unfamiliar scenarios

OR

Can involve more complex scenarios involving data analysis or evaluation



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)

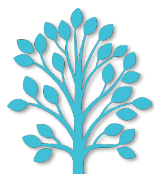
acid

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)



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?



Assigning command words to AOs

AO1

Add/Label
Describe
Explain
Give/State/Name
Give a reason

AO2

Calculate
Identify
Deduce
Determine
Predict
Suggest
Write (an equation)

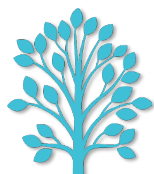
AO3

Deduce
Design
Draw
Estimate
Evaluate
Plot



Why not look at AO1?

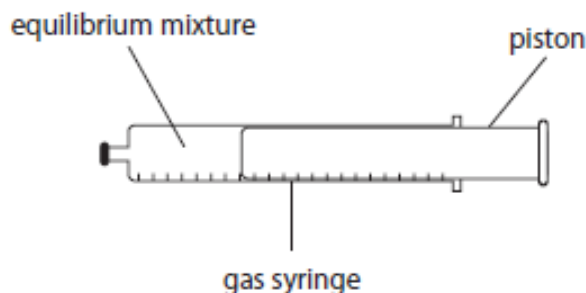
- AO1 is all about knowledge – and basic understanding
- This is not one that teachers can influence much...
- ... students either go away and learn what you teach them or they do not!
- **BUT**... remember that students should still recognise AO1 questions and not spend time going beyond AO1



What is A02?

Application of knowledge to unfamiliar situations

- (b) Some N_2O_4 and some NO_2 are put into a sealed gas syringe and allowed to form an equilibrium mixture.

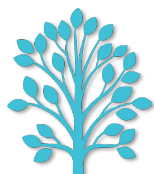


This equilibrium mixture is brown.

- (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 NO_2 than the original equilibrium mixture.

(2)



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 CBrF_3

(2)

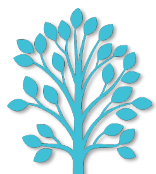


What is AO2?

Equations

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

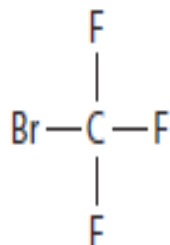
(2)



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)



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?



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

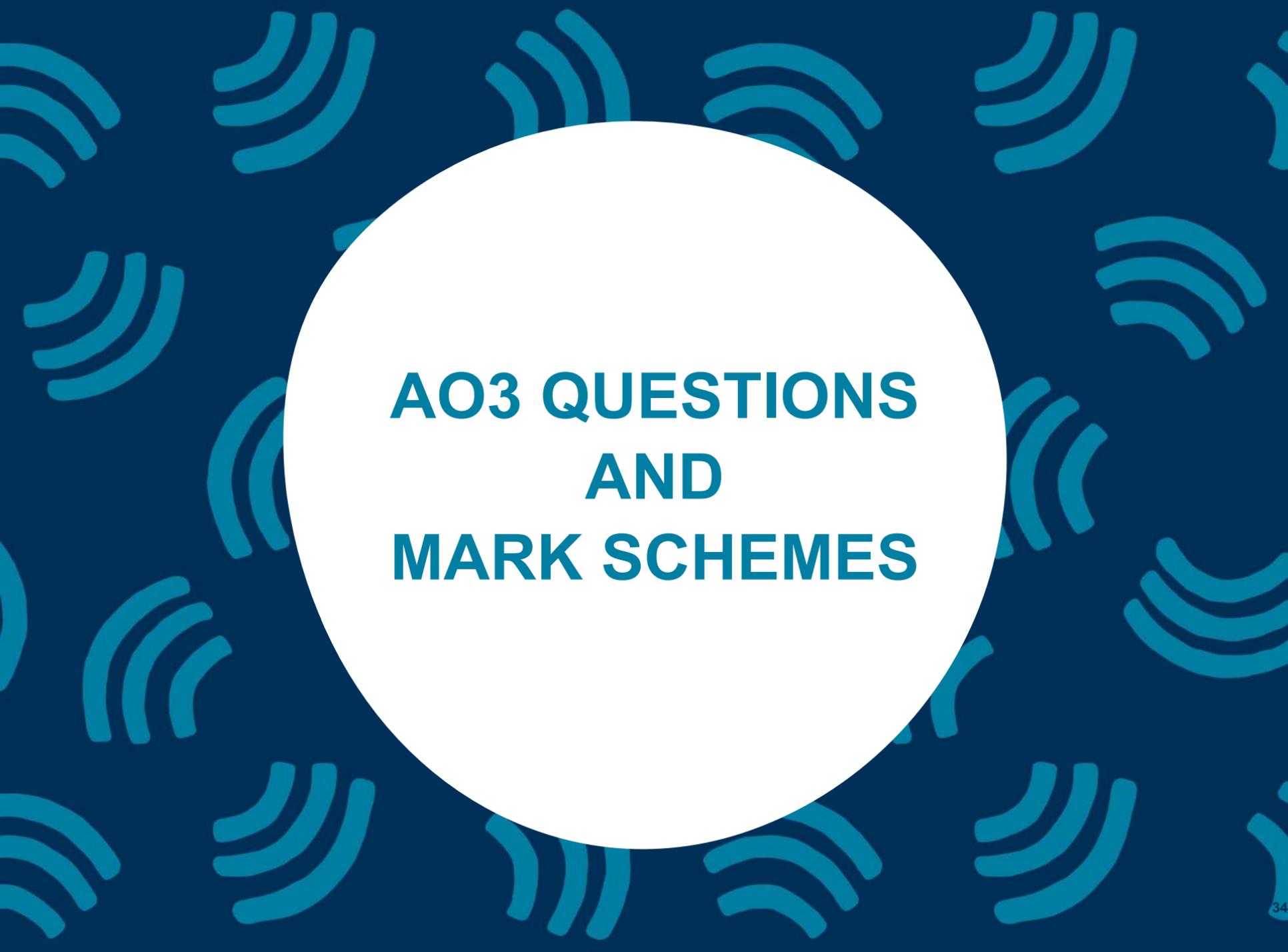
- Why do you set homework?
- What sort of questions/problems do you set?
- What do you expect students to gain from the questions that you set?
- Will what they gain help them to answer AO2 questions?





BREAK TIME!

**PLEASE BE BACK
IN 5 MINS**



**AO3 QUESTIONS
AND
MARK SCHEMES**

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

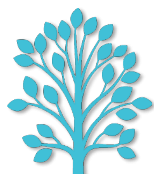
(e) Describe how the student could obtain a pure, dry sample of hydrated copper(II) sulfate crystals from the filtrate in stage 6.

(5)

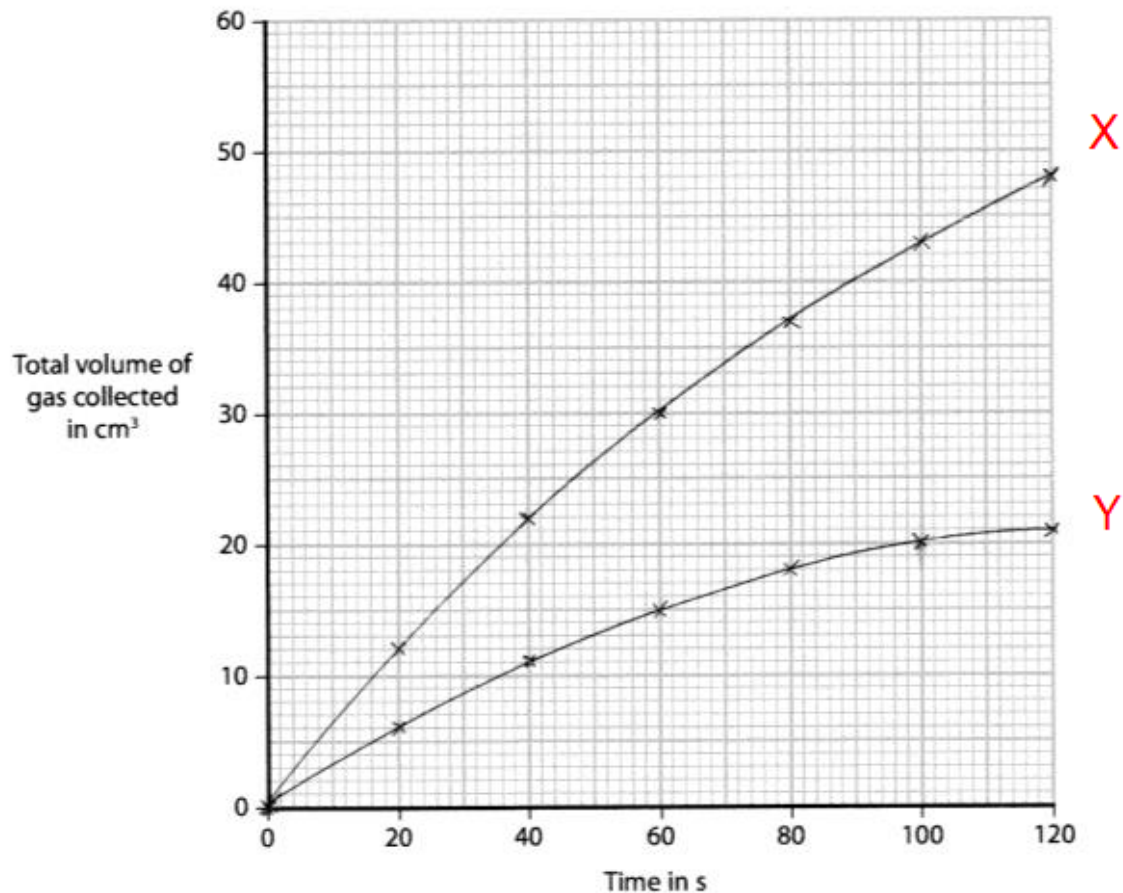


AO3: Analysis of results – graph

- 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 of hydrogen ions.

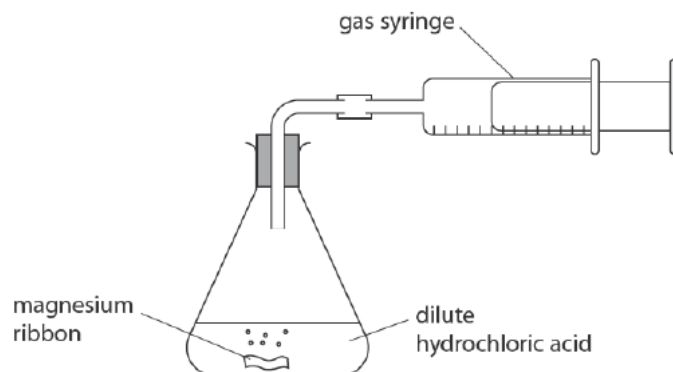


AO3: Analysis of results – graph



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

- (c) The expected volume of gas produced in the first experiment is 86 cm^3 .

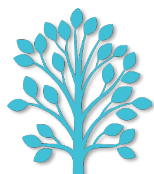
Suggest why the volume collected is less than the expected volume.

(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)



AO3: Evaluation of methods

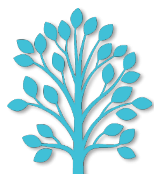
Examiner's report

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.



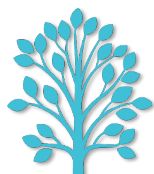
AO3: Use of data

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

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

(2)



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.



Teaching A03 – Terminology

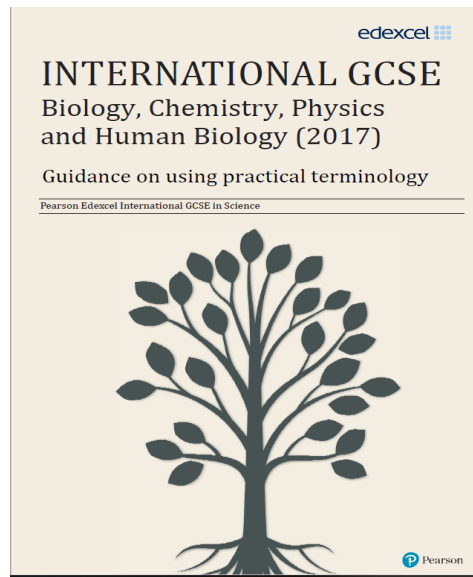
validity

anomaly

precision

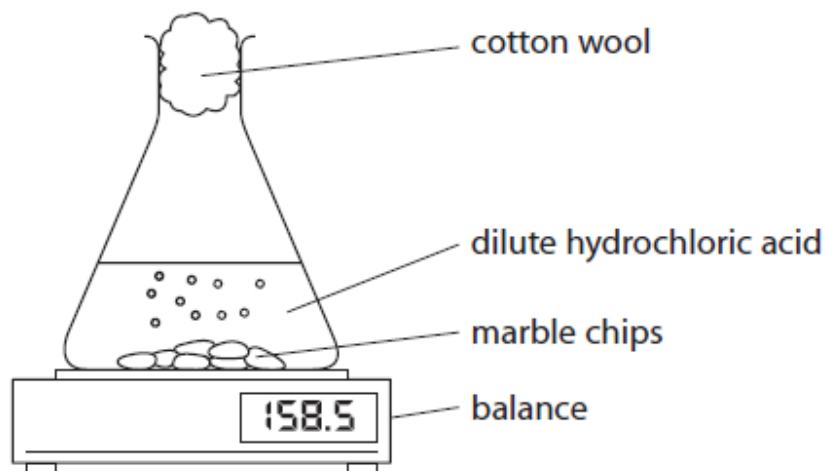
accuracy

reliability



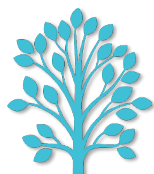
Terminology – Accuracy

- 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.

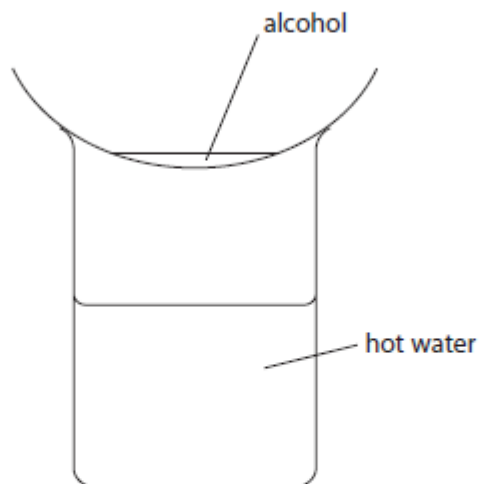
(2)



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.

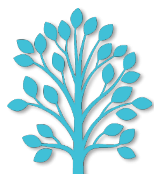


She uses this method.

- 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

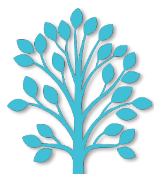
(a) State two variables the student should control to make sure her results are valid.

(2)



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



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?



Preparing students for AO3

Teaching approaches: fact vs. investigative

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

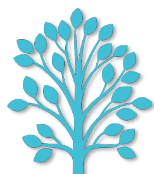
Fact: Copper reacts with oxygen to form copper(II) oxide

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

Answer – the Bunsen flame or the air

How can we find out which?

Answer – heat the copper in a vacuum (not practical) OR
heat the copper in a test tube so it is not in contact
with the Bunsen flame



Preparing students for AO3

Teaching approaches: fact vs. investigative

Investigative: The copper still turns black so it must be something in the air

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

Answer – heat copper in each gas separately (not practical)

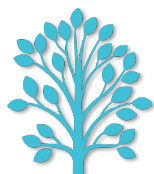
- heat copper in a sample of air and find out the percentage of gas used up
- $\approx 20\%$ used up, so copper has combined with oxygen



Preparing students for AO3

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

- Add 1 cm depth of 1 mol/dm³ hydrochloric acid to each of 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

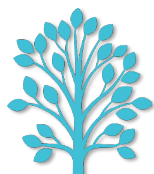


Preparing students for AO3

Prediction – magnesium disappears first at 50°C and last at room temperature

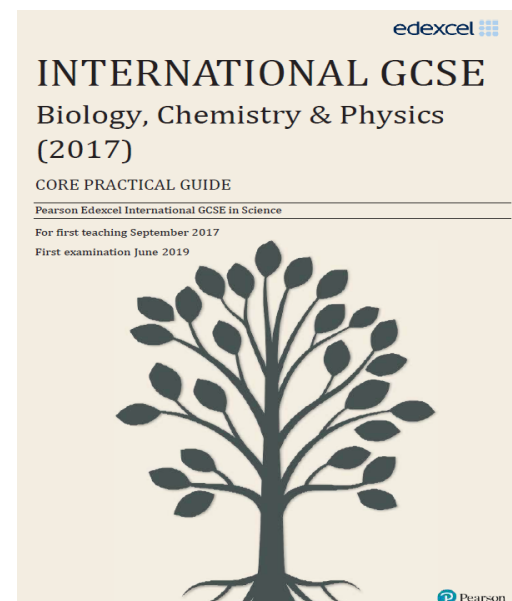
Outcome – magnesium usually disappears first at room temperature and last at 60°C

Explanation – gas given off so violently at 60°C that magnesium continuously lifts off the acid and falls back down
– at room temperature the magnesium sinks



Core practical guide

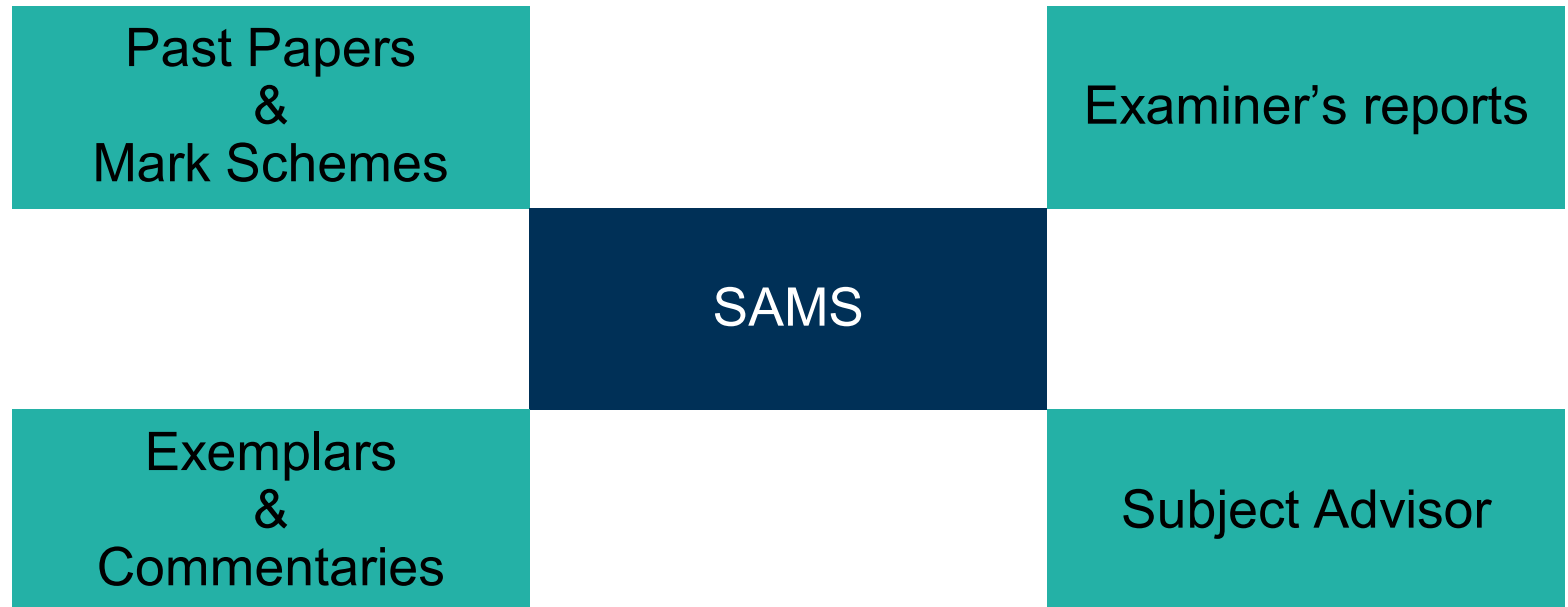
- An introduction to each practical activity
- Description of the practical, with some useful hints and tips
- Questions to use with students to test their understanding as they do the experiment in the lab
- A past paper question, where relevant, to use as a homework activity



SUPPORT



Support overview



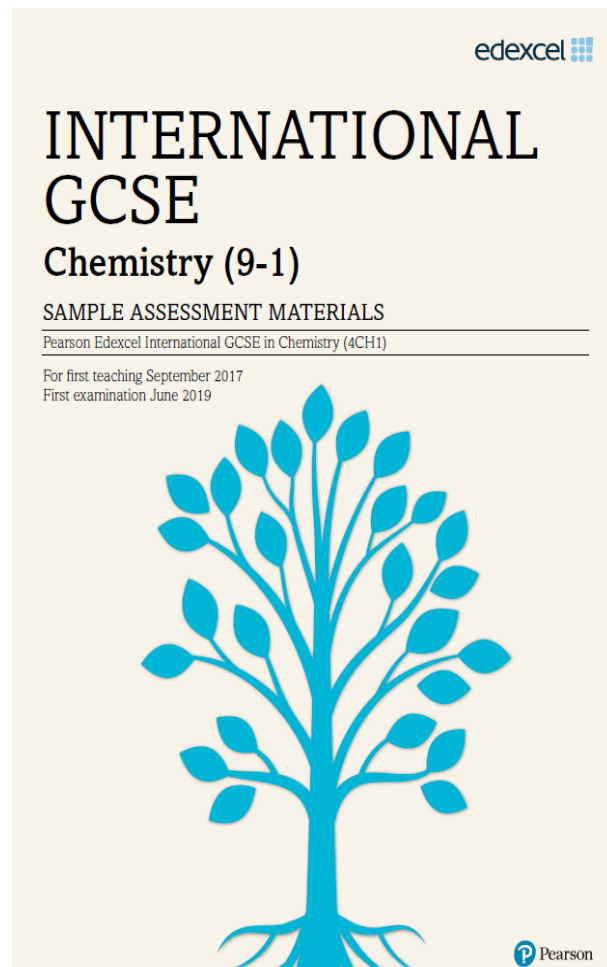
Past exam papers, mark schemes & Examiner's reports

- These are available on the Pearson website for both the 2017 specification and the 2011 specification.
- Questions from past papers from the 2011 specification can be used but care must be taken to make sure they are relevant to the current (i.e. 2017) specification.
- Some content in the 2011 specification is not in the 2017 specification.



SAMS

- SAMS is short for Sample Assessment Materials.
- 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.
- All of our future exam papers are based on these Sample Assessment Materials.



Exemplars and commentaries

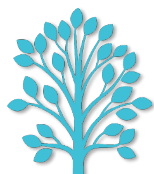
Marked exemplars with
examiner commentaries



**Pearson Edexcel
International GCSE in
Chemistry (9-1)**

**Exemplar student answers
with examiner comments**

1



Contact your dedicated Subject Advisor

Subject Advisor details

Your subject advisor is Irine Muhiuddin

Phone: +44 (0)344 363 2934

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ALWAYS LEARNING