

# PEARSON EDEXCEL INTERNATIONAL GCSE (9-1)

## **Chemistry & Double Award science (Chemistry)**

GETTING READY TO TEACH

Event code: 4CH1-19IF01

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First teaching in 2017, first assessment in 2019.

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# Aims and objectives

This is what we hope to cover today:

- Specification structure and comparison with the Cambridge offer
- Core Practicals, Mathematics skills and command words
- Assessment and grading
- Free support and published resources
- Marking exercise using actual candidate scripts from the 2019 examination

# Today's Agenda

0930 – 1000	Arrival and registration, tea and coffee
1000 – 1010	Welcome and introductions
1010 – 1110	<b>Session 1</b> – Specification structure and comparison with Cambridge
1110 – 1130	Morning break
1130 – 1300	<b>Session 2</b> – Practical work, maths skills, command words and the 9-1 grading scheme
1300 – 1400	Lunch
1400 – 1530	<b>Session 3</b> – Resources and the 2019 exam session
1530 – 1600	Plenary and departure

# Getting to know you

Are you:

- a recently qualified teacher or do you have many years' experience?
- currently teaching the new 4CH1 Edexcel International GCSE Chemistry?
- do you also teach Science(Double Award)?

# Our suite of International GCSEs

Our International  
GCSE Science  
specifications

**EXAM SERIES**  
January  
May / June

**BIOLOGY**

**CHEMISTRY**

**PHYSICS**

**SCIENCE (DOUBLE AWARD)**

**SCIENCE (SINGLE AWARD) - NEW!!**

**In addition, there is also an International GCSE in Human Biology**

# Comparison with Cambridge iGCSE

Some teachers have moved from Cambridge to Edexcel

This is a summary of the main differences between Edexcel 4CH1 and Cambridge 0971 specifications, in terms of

- Availability
- assessment style
- content

# Comparison of availability

- Both have examinations in May/June
- Only Cambridge has examinations in November
- Only Edexcel has examinations in January
- Only Edexcel offers Human Biology

# Comparison of levels of entry

For Edexcel students:

- All take the same two question papers
- All are graded on the 9-1 scale

For Cambridge students:

- Teachers must choose between Core and Extended papers
- Those taking Core papers are graded on a 5-1 scale
- Those taking Extended papers are graded on the 9-1 scale

# Comparison of assessment styles

	Edexcel	Cambridge
<b>Question papers</b>	2	3
<b>Total examination time</b>	3h 15min	3h or 3h 15min
<b>Total number of marks</b>	180	160
<b>Assessment of practical skills</b>	in both papers	in one paper
<b>Options for assessing practical skills</b>	no options - skills assessed in both written papers	choice of practical test or written test for third paper
<b>Multiple choice questions</b>	a small number in both papers	40, all in one paper

# Comparison of content structure

	Edexcel	Cambridge
<b>Number of topics</b>	4	14
<b>Number of sub-topics</b>	28	41
<b>Assessment statements</b>	182 all numbered	not numbered total depends on whether Core or Extended
<b>Embedded practicals</b>	12	none

# Edexcel assessment statements

2.39 describe an experiment to prepare a pure, dry sample of a soluble salt, starting from an insoluble reactant

**2.40C describe an experiment to prepare a pure, dry sample of a soluble salt, starting from an acid and alkali**

**2.41C describe an experiment to prepare a pure, dry sample of an insoluble salt, starting from two soluble reactants**

2.42 *practical: prepare a sample of pure, dry hydrated copper(II) sulfate crystals starting from copper(II) oxide*

**2.43C practical: prepare a sample of pure, dry lead(II) sulfate**

# Cambridge assessment statements

## 2.2.1 Criteria of purity

### Core

- Demonstrate knowledge and understanding of paper chromatography
- Interpret simple chromatograms
- Identify substances and assess their purity from melting point and boiling point information
- Understand the importance of purity in substances in everyday life, e.g. foodstuffs and drugs

### Supplement

- Interpret simple chromatograms, including the use of  $R_f$  values
- Outline how chromatography techniques can be applied to colourless substances by exposing chromatograms to substances called locating agents. (Knowledge of *specific* locating agents is **not** required.)

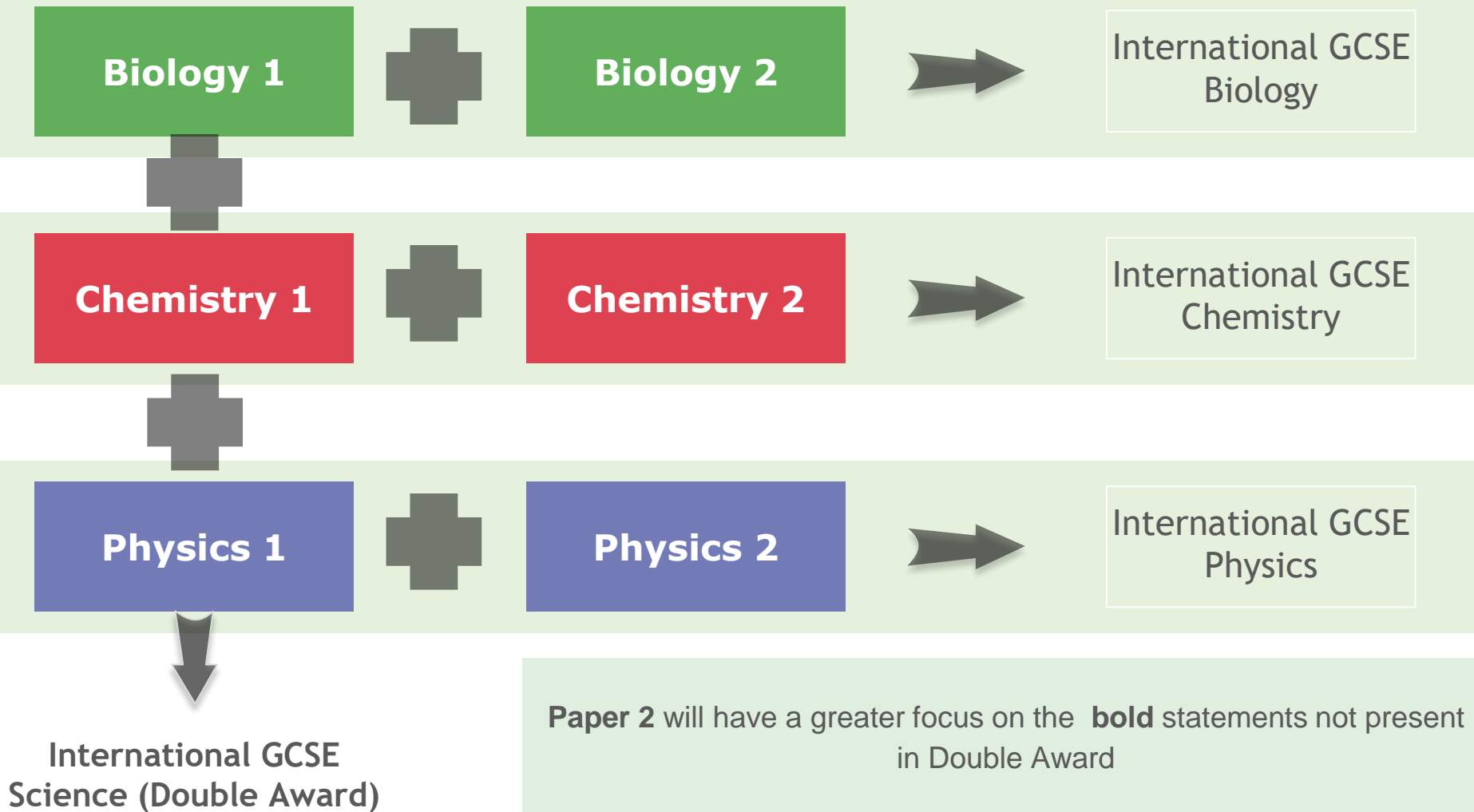
# Separate sciences or Double Award?

The next slide shows how students can qualify for

- biology, chemistry and physics as three separate awards

OR

- some content from all three subjects as a double award



# INTERNATIONAL GCSE CHEMISTRY

## 4CH1 Specification



# Key features of 4CH1

- Suitable for progression to UK and International A levels
- Content arranged in 4 sections
- More organic chemistry and less industrial chemistry compared to 4CH0
- 'Embedded' practicals (also called core practicals)
- Assessment statements clearly numbered
- Command words in question papers revised to ensure consistency across all new science specifications
- Assessment statements in **bold** are for Chemistry-only students (not for Double Award students)

# Chemistry (4CH1) content summary

There are now 4 overall topics with traditional names

## Principles of Chemistry

- States of matter
- Mixtures etc
- Atomic structure
- Periodic Table
- Equations and calculations
- Bonding
- Electrolysis

## Inorganic Chemistry

- Groups 1 & 7
- Reactivity series
- Gases in the atmosphere
- Reactivity series
- Metal extraction & uses
- Acids alkalis & titrations
- Salt preparation
- Chemical tests

## Physical Chemistry

- Energetics
- Rates of reaction
- Reversible reactions and equilibria

## Organic Chemistry

- Introduction
- Crude oil
- Alkanes
- Alkenes
- Alcohols
- Carboxylic acids
- Esters
- Polymers

# 4CH1 detailed content

- Specification available for download and included on delegate CD
- Too many assessment statements to consider them all in this event
- Some will be considered in detail later in this event

**Any questions about the  
structure or content?**



# ACTIVITY 1

Your first Activity is to consider how a question from a 4CH0 question paper can be modified for students studying 4CH1

You will need:

- Activity 1 Task
- Activity 1 Question

from your pack

# MORNING BREAK!

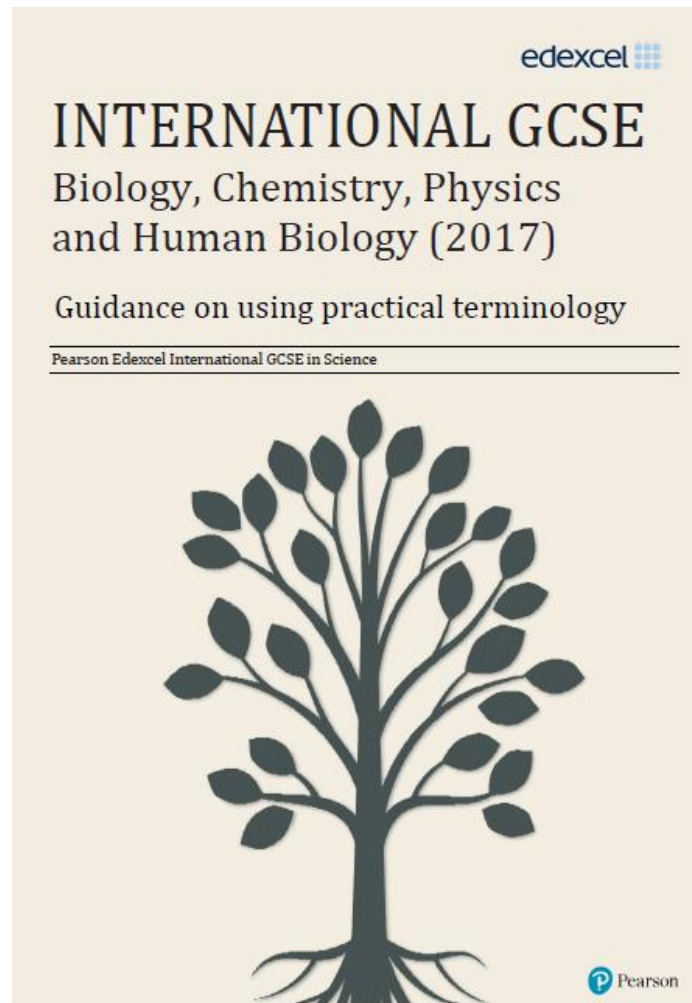
**Please be back in 20 minutes**

# INTERNATIONAL GCSE CHEMISTRY Practical skills

# Definitions of practical terms

- There has been much confusion about the meanings of some scientific terms used in practical work  
e.g. accuracy and precision are often confused  
many do not understand the difference between reliability, repeatability and reproducibility
- At GCSE level it isn't always appropriate to make fine distinctions between all such terms
- A helpful document you can download from the website is '**Guidance on using practical terminology**', which covers all the international GCSE science subjects

# Practical terminology document



# Practical terminology content

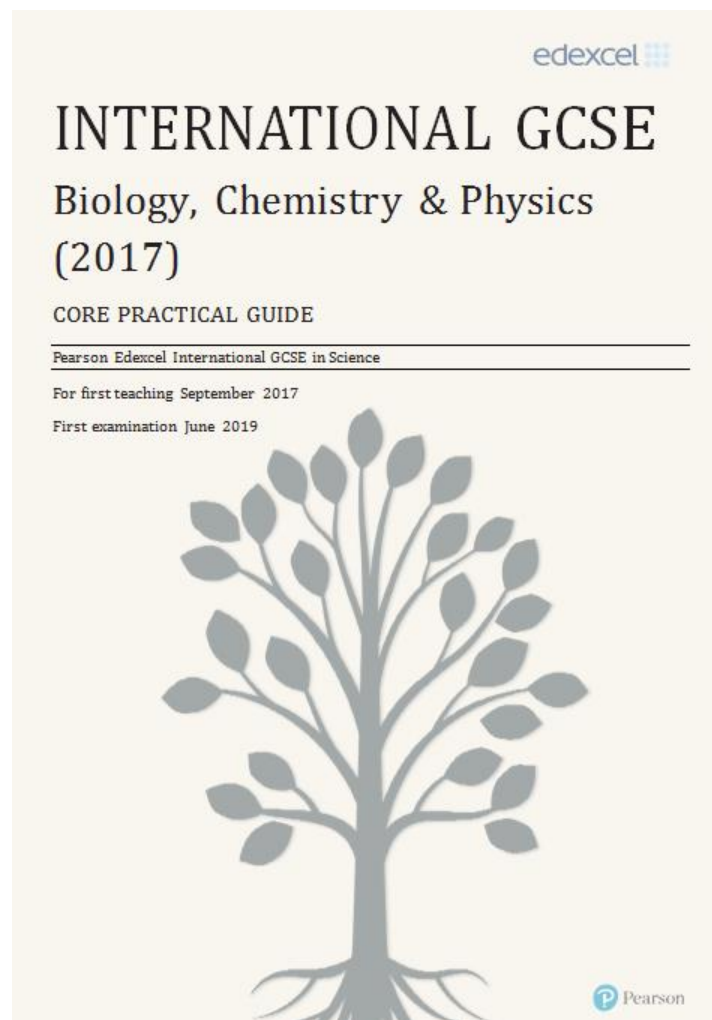
Key features of this document:

- All relevant terms are explained **in context**
- Guidance on maths aspects is given, including decimal places, significant figures and calculating means
- Bar charts, histograms and graphs are covered, including scales, lines of best fit and anomalies
- We will now look at an extract from this document – in your pack

# Practicals in the specification

- The embedded (core) practicals are identified in italics in the specification
- There are 12 in Chemistry, 8 of which are in Double Award
- Further suggestions for practical work appear in Appendix 6 of the specification
- The most useful document is the '**Core Practical Guide**' – the latest version on the website is a revised version of the original

# Core Practical Guide



# Core Practical Guide content

This document covers all international GCSE science subjects

For each core practical, many of these aspects are covered:

- links to the specification
- guidance on setting up apparatus
- sample results and how to interpret them
- sources of error
- skills covered
- questions you could ask students

We will look at one example, which is in your pack

# Core practicals

## - do students have to do them?

- The simple answer is no - but some examination questions test knowledge of practical techniques and skills (15% of marks)
- There is evidence that students perform better in written examinations when they have had more direct experience of practical work
- Ideally, students would carry out all the embedded practicals, either individually, or in pairs, or in small groups
- If this is not possible, then less satisfactory alternatives are teacher demonstrations or watching suitable video clips

# Practical skills in examinations

**Students may be tested on their ability to:**

Describe and plan experiments

Draw conclusions which are consistent with the evidence, using scientific knowledge and understanding

Describe safe and appropriate practical techniques

Communicate findings from experimental activities using appropriate vocabulary, calculations and graphs

Analyse and interpret data from experimental activities

Evaluate data and methods

# ACTIVITY 2

This Activity is about how to teach your students an assessment statement in the specification that covers a core practical.

You will need:

- Activity 2 Task
- Activity 2 Practical approach
- Activity 2 Examination question

from your pack

# Any questions about practical skills?



# INTERNATIONAL GCSE CHEMISTRY 2017

## Mathematical skills

# Mathematical skills - introduction

- The development and use of relevant mathematical skills is important for progression in science subjects
- A list of mathematical skills that should be developed appears in **Appendix 4** of the specification (these are the same skills as for the reformed UK GCSEs)
- These skills will be tested in question papers within the context of the particular science
- Marks awarded for mathematical skills will be approximately 10% in Biology, 20% in Chemistry, 30% in Physics

# Mathematical skills – categories

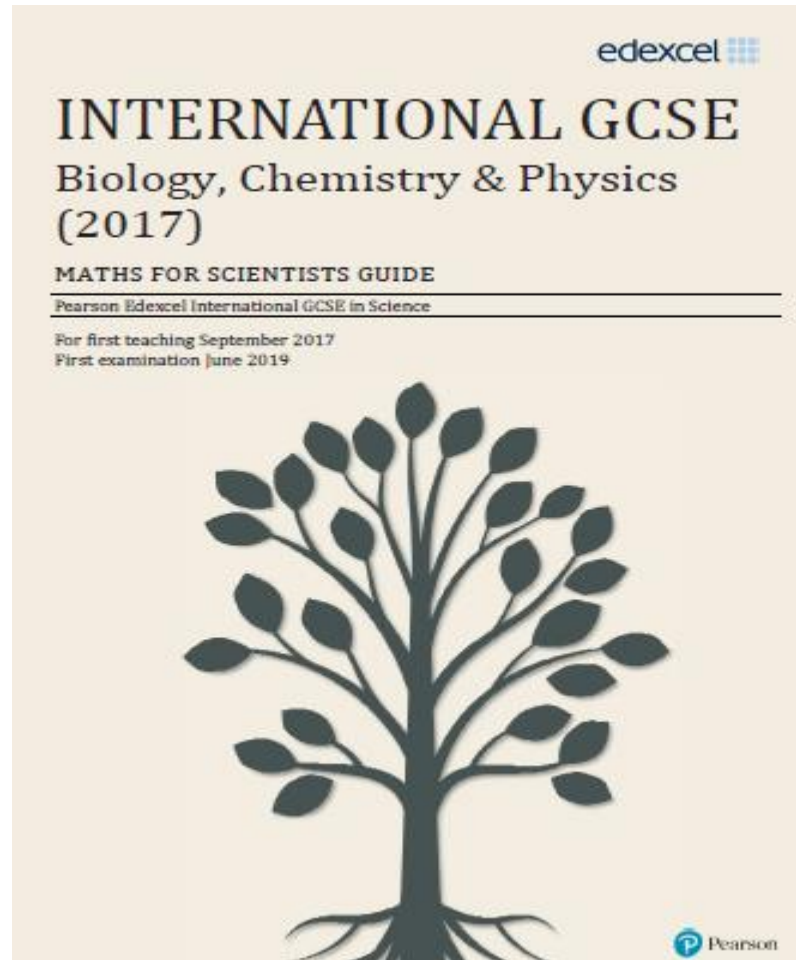
There are 5 categories of mathematical skills:

- 1 Arithmetical and numerical computation
- 2 Handling data
- 3 Algebra
- 4 Graphs
- 5 Geometry and trigonometry (does not apply to chemistry)

# Mathematical skills – examples

3	Algebra			
A	Understand and use the symbols $<$ , $>$ , $\alpha$ , $\sim$		✓	✓
B	Change the subject of an equation	✓	✓	✓
C	Substitute numerical values into algebraic equations using appropriate units for physical quantities	✓	✓	✓
D	Solve simple algebraic equations	✓	✓	✓

# Maths for scientists guide



# Maths for scientists example

Some parts of the guide might be useful for students who are not mathematically strong:

## Key point 7

To write a small number in standard form:

- Place the decimal point after the first non-zero digit.
- How many places has this moved the digit? This is the negative power of 10.

## Example 7

Write 0.003 52 in standard form.

$$0.003\,52 = 3.52 \times 10^{-3}$$

3.52 lies between 1 and 10.

Multiply by the power of 10 needed to give the original number.

0.003 52



# Any questions about maths skills?



# INTERNATIONAL GCSE CHEMISTRY

## Command words

# Command words used

- All our qualifications in science now use command words with a common meaning
- The list of command words used in external assessments appears in **Appendix 5** of the specification
- Students should expect to see many different command words in questions
- Some will be used rarely or not at all in chemistry
- The full list is reproduced in your pack

# Command words – describe or explain?

These two command words are often used in questions, but sometimes students are not clear about the differences between them

Note that dual commands are no longer used in questions – so  
'Explain' may sometimes have the same meaning as  
'State and explain'

# Command words – explain a statement that is given

## Question

Explain why the use of a catalyst has no effect on the position of equilibrium in a reversible reaction. (2 marks)

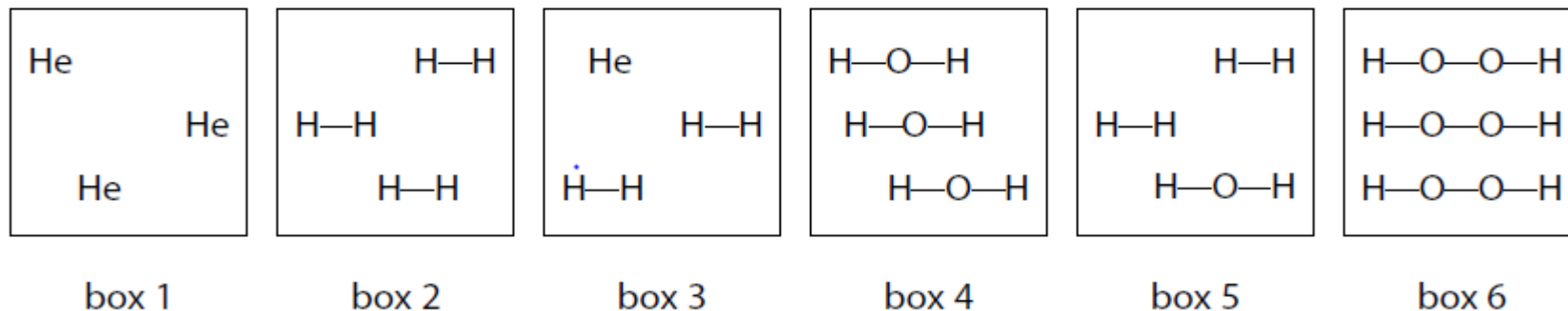
## Comment

Note that the students are told that the catalyst has no effect, so the 2 marks are for explaining why it has no effect

# Command words – explain something that must be stated

## Question

(a) Each of the boxes in the diagram represents either an element, a compound or a mixture.



(i) Explain which **two** boxes represent an element.

(2)

## Comment

The first mark is for identifying the two boxes, and the second mark is for giving the reason.

# Any questions about command words?



# **INTERNATIONAL GCSE CHEMISTRY 2017**

## **Assessment**

# Summary of assessment

## FAMILIAR AND NEW

100% external assessment – with no coursework

Linear assessment – all exams taken in the same exam session

Questions using maths skills:  
10% in Bio  
20% in Chem  
30% in Phys

Variety of question types – all marked with 'points-based' mark schemes

Single tier of entry – no foundation or higher

Each paper will have some longer question parts  
(4 – 6 marks)

# Assessment objectives

## A01

Knowledge and understanding of biology / chemistry / physics

**~40%**  
of total marks

## A02

Application of knowledge and understanding, analysis and evaluation of biology / chemistry / physics

**~40%**  
of total marks

## A03

Experimental skills, analysis and evaluation of data and methods in biology / chemistry / physics

**~20%**  
of total marks

# Assessment summary

## - duration and marks

### Paper 1

Two hours; 110 marks (reduced from 120)

### Paper 2

1 hour 15 mins (increased from 15 min)  
70 marks (increased from 60)

Both papers will contain  
a mixture of AO1,  
AO2 and AO3

The AO3 questions will  
be mainly in a practical  
context

# Assessment summary

## - what is assessed in each paper

There will be two examination papers:

### Paper 1

will **NOT** include the specification statements printed in **BOLD**

### Paper 2

includes **ALL** the specification statements, including those printed in **BOLD** –more bold statements now

Both papers have similar question types

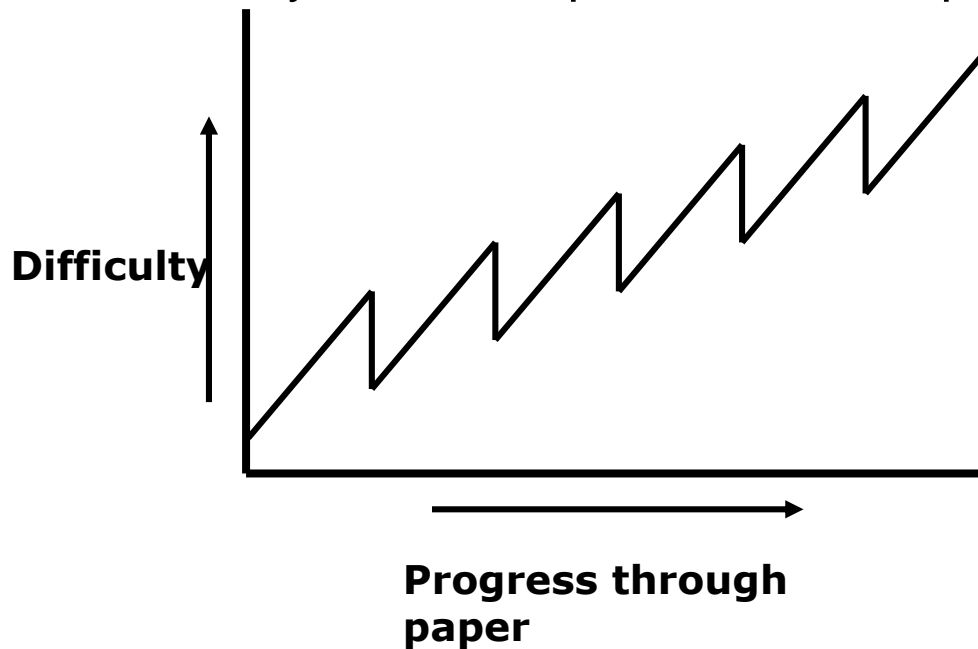
# INTERNATIONAL GCSE CHEMISTRY

## Examination papers and grading

# An ideal incline of difficulty

Where possible:

- Increase in difficulty within each question
- Increase in difficulty from first question to last question



# Exam question styles

The question style is similar to that of the previous specification

A small number of multiple choice questions

Short answer responses, usually worth 1 – 3 marks

Longer answer questions, up to 6 marks

All questions are **compulsory** and may cover **practical** situations as well as areas of **theory**

# The new 9-1 grading scale structure

The new grading scales gives teachers **more information about student's attainment** to help progression to A Level, and universities more information when looking at accepting students into HE.

The new **grade 9 represents a new level of attainment** and we've introduced this to really differentiate top performing students

There's **greater differentiation in the middle of the range of grades**, with three grades (4, 5 and 6) instead of two grades (grades B and C).

Using the same scale for Pearson Edexcel GCSE and International GCSE allows **clear comparison with English standards**, unlike the A\*-G scale.

NEW GRADING STRUCTURE	CURRENT GRADING STRUCTURE
9	A*
8	
7	A
6	B
5	
4	
3	D
2	E
1	F
	G
U	U

# Key features of the new International GCSE

- Reviewed and updated in light of UK GCSE changes
- Consultation with teachers and higher education institutions
- Dedicated textbooks are currently in production
- New 9-1 grading scale
- Transferable Skills embedded
- Pearson World Class Qualifications design principles
- Examinations available in January and June
- Dedicated Subject Adviser

**“Grade 9 is not the same as A\*; it’s a new grade, designed to recognise the very highest performing students.”**

*Ofqual*

# Grade 9 – an example

- Suppose an exam is sat by 10 000 students
- The grade boundaries are set – and 4000 students are above the Grade 6/7 boundary (some of them will be awarded grades 8 and 9)

## How many students are awarded Grade 9?

- 40% of the students reach achieve a minimum of grade 7
- So,  $(40 \div 2) + 7 = 27\%$  **of the Grade 7 students** will get a Grade 9
- 27% of 4000 students = 1080 students

# Any questions about the new grading scale?



# LUNCH BREAK!

**Please be back in 1 hour**

**Any further questions about  
this morning's sessions?**



# INTERNATIONAL GCSE CHEMISTRY

## Support and resources

# ResultsPlus and ExamWizard

- **ResultsPlus** provides the most detailed analysis available of your students' exam performance. This free online service helps you identify topics and skills where students could benefit from further learning, helping them gain a deeper understanding
- **ExamWizard** is a free exam preparation tool containing a bank of past Edexcel exam questions, mark schemes and examiners' reports, so you can create mock papers, homework or practice tests in minutes

# Paid for published resources

We are committed to helping teachers deliver our Edexcel qualifications and helping students to achieve their full potential

To do this, we aim for our qualifications to be supported by a wide range of high-quality resources, produced by a range of publishers

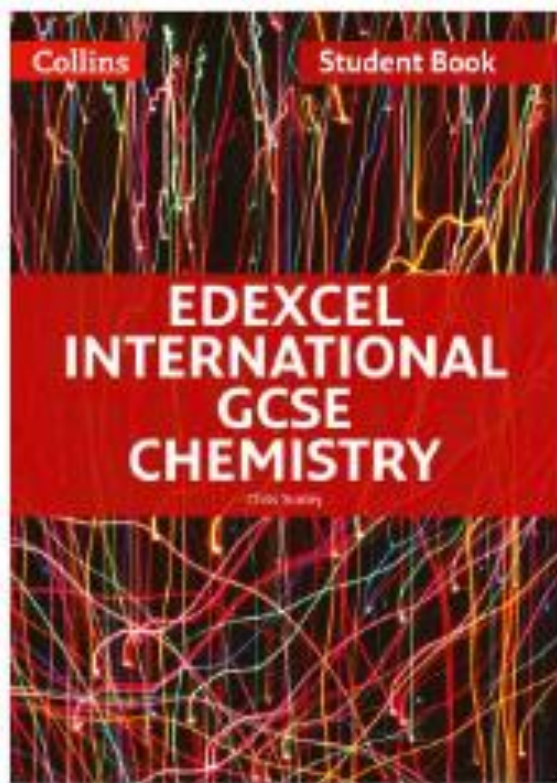
However, it is not necessary to purchase endorsed resources to deliver our qualifications

# Paid for 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 Pearson/Edexcel – which means that they have been checked for specification coverage

# Published resources –Collins

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



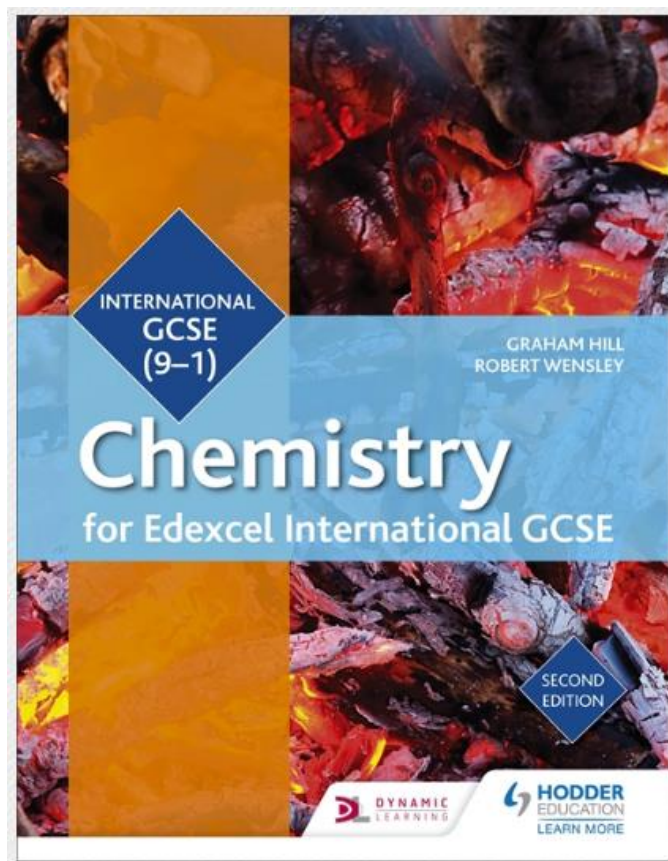
- **Student Book**
- **Teacher Pack**

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.

# 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.

# 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.

- **Teacher Pack**

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

# Free resources from the Pearson Edexcel website

<https://qualifications.pearson.com/en/qualifications/edexcel-international-gcses-and-edexcel-certificates/international-gcse-chemistry-2017.html>

- As of June 2019, apart from the Specification, SAMs and Published Resources, there are 11 resources freely available for download
- Some of these resources have been recently added
- Others are updated versions of previously available resources
- Please look at what is currently available and download whatever you find useful

# Free resources from the website: Specification

These are the sections:

- About this specification
- Chemistry content
- Assessment information
- Administration and general information
- Appendices

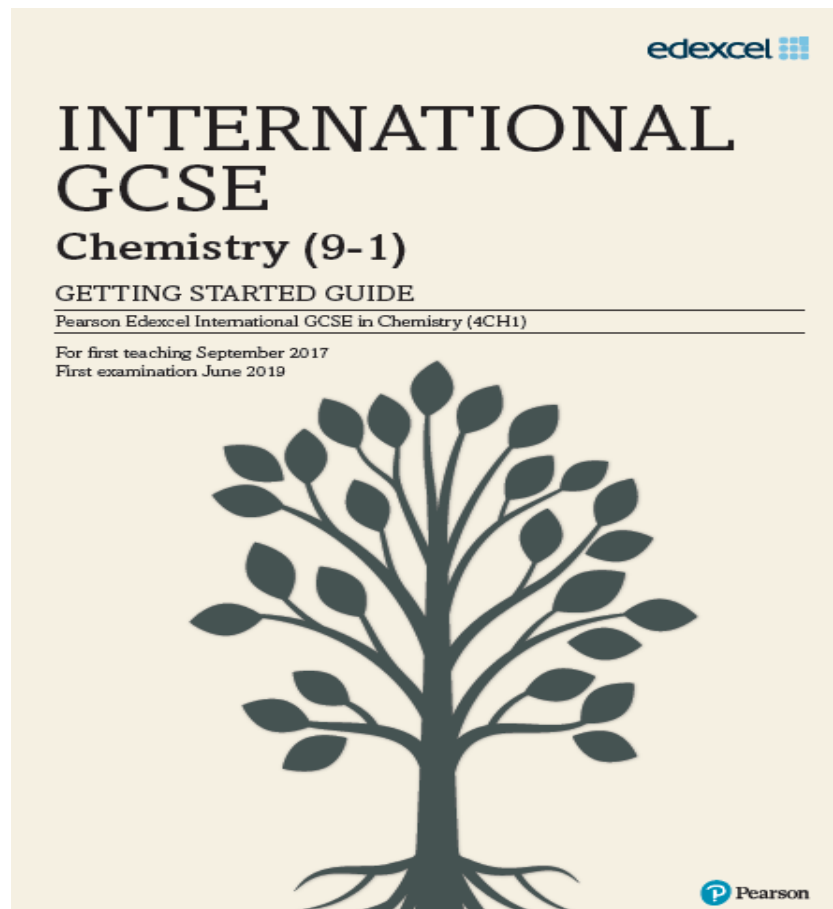
# Free resources from the website: Sample assessment material (SAM)

This includes:

- General marking guidance
- Paper 1C and mark scheme
- Paper 2C and mark scheme
- There is now a second set of SAMs available on the website (as of May 2019)

# Free resources from the website: Getting Started Guide

- 



# Free resources from the website: Scheme of work

This is much more detailed than the outline course planner.

It suggests one example of a logical order of teaching topics, not in the order in the specification.

It includes for each week:

- the assessment statements in the specification
- exemplar activities, including teacher demonstrations, class practicals and resources

# Scheme of work

Week	Content coverage	Learning outcomes	Exemplar activities	Exemplar resources	Which transferable skills are explicitly assessed through examination	Which transferable skills could also be acquired through teaching and delivery
37	<b>Section 3: Physical chemistry</b> (a) Energetics	<p>Students will be assessed on their ability to:</p> <p>3.1 know that chemical reactions in which heat energy is given out are described as exothermic, and those in which heat energy is taken in are described as endothermic</p> <p>3.2 describe simple calorimetry experiments for reactions such as combustion, displacement, dissolving and neutralisation</p> <p>3.3 calculate the heat energy change from a measured temperature change using the expression <math>Q = mc\Delta T</math></p> <p>3.4 calculate the molar enthalpy change (<math>\Delta H</math>) from the heat energy change, <math>Q</math>.</p>	<p><b>Activity:</b></p> <ul style="list-style-type: none"> <li>Complete exercises, identifying whether a reaction is exo- or endothermic given <math>\Delta H</math>.</li> </ul> <p><b>Class practicals:</b></p> <ul style="list-style-type: none"> <li>Exothermic or endothermic? (RSC 22).</li> <li>Heats of reaction (RSC 84).</li> <li>Thermometric titration (RSC 45).</li> <li>Calculating <math>\Delta H</math> from practical results.</li> </ul>	<p>Edexcel International GCSE Chemistry Student Book: Pages 120-122, 204-207</p> <p>RSC Classic Chemistry Experiments: Pages 54, 114 and 215</p>	Analysis	Analysis Reasoning

# Free resources from the website:

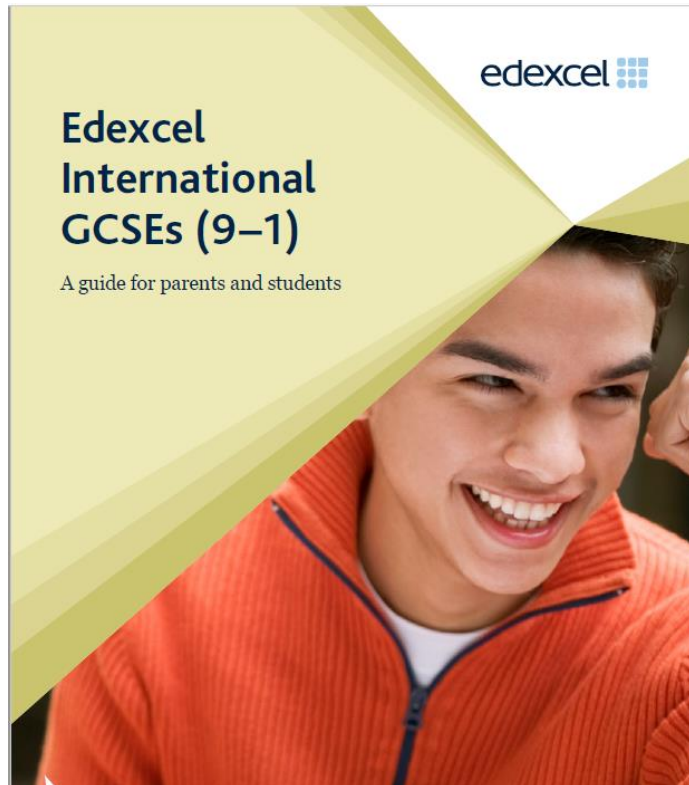
## Topic guides

There are two topic guides:

- Strategies for teaching chemical bonding
- Strategies for teaching chemical equilibrium

Each offers advice on approaches to teaching two of the most difficult topics in the specification

# Free resources from the website: Edexcel International GCSEs (9-1) – a guide for parents and students

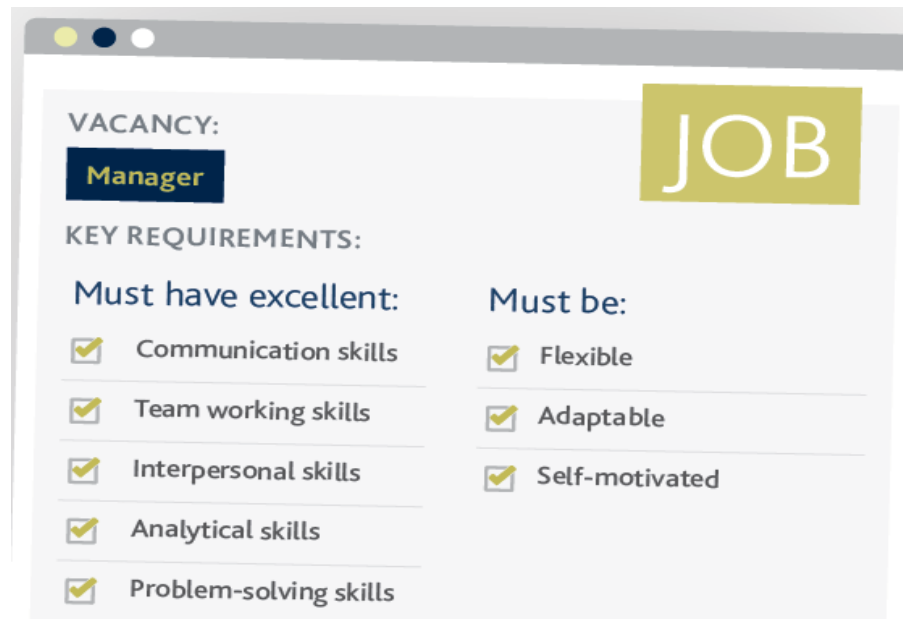


- This is a glossy brochure that gives general information about all the 9-1 GCSEs
- It gives full details of the 9-1 grading scale

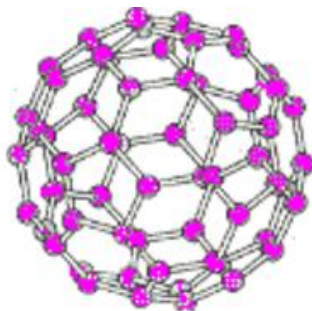
# Free resources from the website: Edexcel International GCSEs (9-1) - transferable skills



This is a glossy brochure that gives information about transferable skills in the context of the 9-1 GCSEs



# Other web resources 1



One of the simplest  
'buckyballs'  $C_{60}$

- There are many websites on the internet that provide free and useful information and support to chemistry teachers
- Very few of them are designed to cover a particular specification, but are still worth looking at
- Some of them are mentioned in the Scheme of Work – one is [www.docbrown.info](http://www.docbrown.info)
- Here is one example of how this might help students understand the structure of  $C_{60}$  fullerene (spec 1.50):

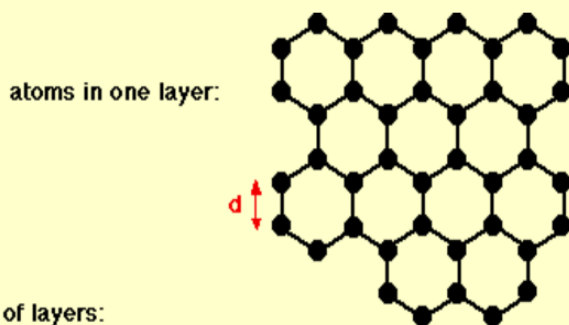
# Other internet resources 2

Another useful UK site is [www.chemguide.co.uk](http://www.chemguide.co.uk) - here is one small extract that also supports spec 1.50

explain how the structures of diamond, graphite and C<sub>60</sub> fullerene influence their physical properties, including electrical conductivity and hardness

## The giant covalent structure of graphite

Graphite has a **layer structure** which is quite difficult to draw convincingly in three dimensions. The diagram below shows the arrangement of the atoms in each layer, and the way the layers are spaced.



# RSC resources 3.1

- One of the best UK sites is the Royal Society of Chemistry
- Go to [www.rsc.org](http://www.rsc.org) then choose Resources and tools
- You can now click on either Learn Chemistry or ChemSpider
- Many resources can be downloaded free of charge

# RSC resources 3.2

Select audience ▼

Select resource type ▼

Select age group ▼

Select subject ▼

Learn Chemistry has a huge number of resources, and they can be searched by:

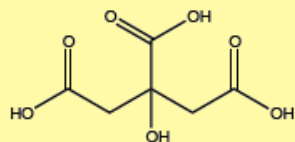
- Audience means Student or Teacher
- Resource type - a long list, e.g. video, experiment, handout
- Age group from Primary to Postgraduate – including 14-16
- Subject – includes Patterns, Organic chemistry and others

# RSC resources 3.3

Here is one example of an infographic from Learn Chemistry

## THE CHEMISTRY OF A LEMON

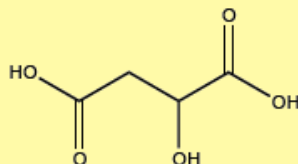
### ACIDIC COMPOUNDS IN LEMONS



CITRIC ACID

The sour taste of lemons is caused by the presence of organic acids. The major acid in lemons is citric acid, which constitutes around 5 to 6% of the lemon's juice.

Other acids are also present, although in much lower concentrations than citric acid. Malic acid is one of these, present at around 5% of the concentration of citric acid.

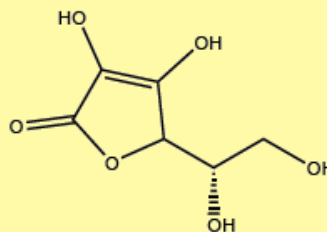


MALIC ACID

2014 COMPOUND INTEREST - WWW.COMPOUNDCHEM.COM



### VITAMIN C, LEMONS & SCURVY



VITAMIN C (ASCORBIC ACID)

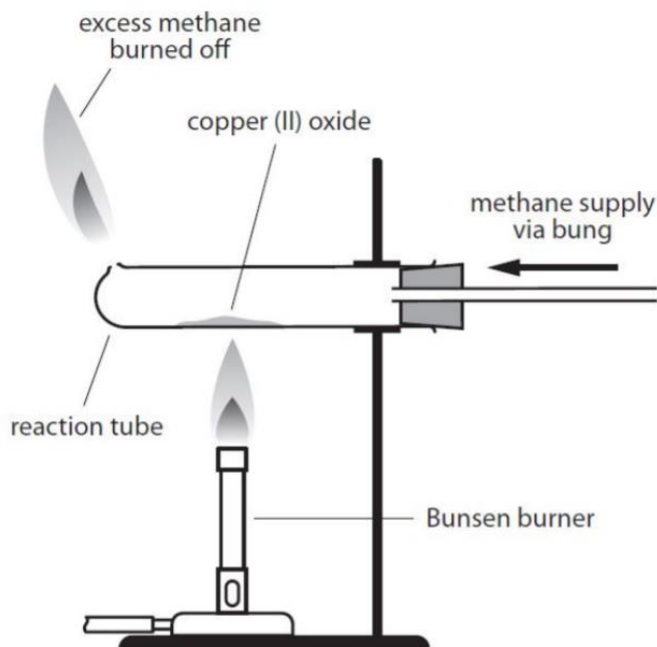
Lemons contain high levels of vitamin C, also known as ascorbic acid. The levels in lemons are around 50mg per 100g, on a par with oranges and around double the amount of limes.

Vitamin C deficiency can lead to scurvy, a disease that causes loss of teeth, jaundice, and eventually death. In the 1700s, all British ships were required to provide a lemon juice ration to seamen to guard against this disease.

# RSC resources 3.4

Here is one example of a practical resource from Learn Chemistry

## Finding the formula of copper(II) oxide



The resource includes:

- Practical details
- Safety precautions
- Sample calculation
- Video of the experiment

# INTERNATIONAL GCSE CHEMISTRY

## 2019 Summer examination session

# May/June 2019 exam responses (1)

- The other purpose of this afternoon's session is to consider a range of students' responses to the May/June 2019 question papers
- We will consider why some students scored higher marks than others
- In this session you will look at students' responses and mark some of them by applying the mark schemes
- You will not all agree the mark that should be awarded for each response – that does not matter - you are not being tested on how good you are as a marker!

# May/June 2019 exam responses (2)

- You can look at any examples we don't have time to consider during the event after you return home – they are all included on your delegate CD
- For each one, we will begin by looking at the question and going through the mark scheme
- Then you will look at three student responses and decide what mark to award by applying the mark scheme
- Then I will read you a commentary with the actual mark awarded and the justification for the mark

# May/June 2019 exam responses – Activity 3

- All the necessary documents are in your pack
- For each example there are two sheets – one has the question and mark scheme, the other has the three answers
- Let's start with Paper 1C Question 2(c)

Any final questions?

**Thank you for coming –  
and have a safe journey home!**

Please fill in your evaluation forms

**We value your  
feedback!**





# Thank you for your time

Find out more about us at:  
<http://qualifications.pearson.com>