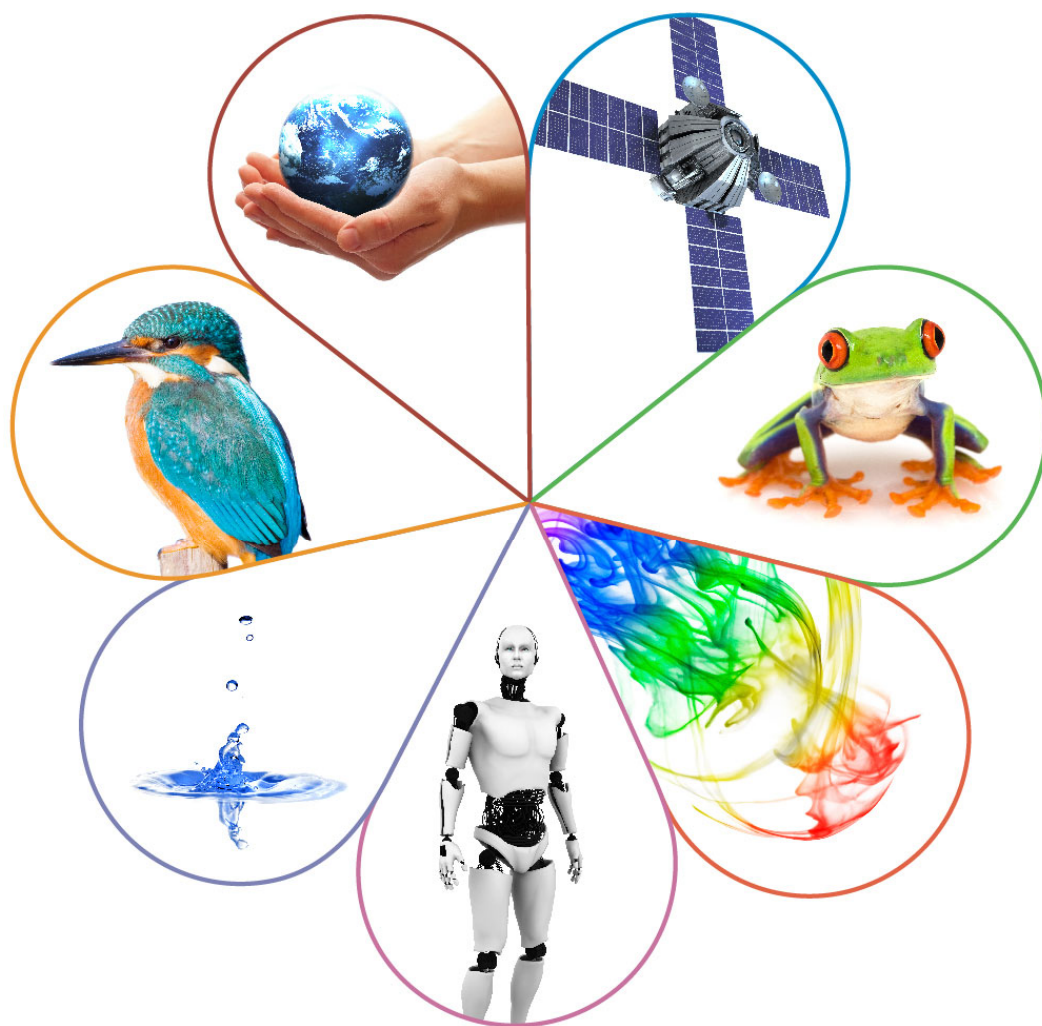


GCSE SCIENCE

Science hub meeting

Presentation slides booklet

Published: Spring 2020



GCSE Science Hub school network meeting

Spring 2020



This event will be recorded

Exam boards have an Ofqual requirement to record event audio.

Recordings are kept for the lifetime of the specification and not shared as an accompaniment to session resources.

The recording will begin now.

Agenda

- Reflections on mocks
 - Brief reminder on how to use MERiT
- Assessing maths skills at different levels of demand
- Discussion activity using sample schemes of work
- Updates
- Focus for summer meetings

Reflections on mocks

- What is the purpose of your mocks?
- How did you analyse the results?
- What aspects (eg application, extended response) are students not performing on so well?
- How did students respond to particular command words?
- How did your Foundation students do compared with your Higher students?
- What could you do in the time before the exams to help students improve in key areas?

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Analysing results through MERiT

exampro

All subjects

Science



ADMIN CONSOLE

Current

Archive

	Time remaining	Users
Science		
BETA GCSE Maths for Science	330 days	0 of 3
GCSE Biology (8461)	330 days	0 of 3
GCSE Chemistry (8462)	330 days	0 of 3
GCSE Combined Science (8464 8465)	330 days	0 of 3
GCSE Physics (8463)	330 days	0 of 3
KS3 Science	330 days	0 of 3

Science ready-made assessments

GCSE Science topic tests

MERiT

MERiT Science	330 days
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Licensed to - Doublestruck MERiT Science
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What does MERiT analysis show?

- Overall performance of your students against the sample population.
- Student performance by specification area covered by question.
- Student performance by Assessment Objective.
- How students performed on individual questions.
- Clear RAG rating for individual students to focus interventions.
- Data can be exported to your own Excel spreadsheets for reporting.

Limitations of MERiT analysis

- Sample size is small compared with GCSE entries
- Students have not finished the course
- Teachers not standardised on using the mark scheme
- Final award made on all papers combined
- No grade boundaries on MERiT
- Lots of data to input with large classes

Analysis from MERiT: Separate sciences

Paper 1 data only.

Paper	Tier	Total marks	Mean mark	Summer 2019 mean mark
Biology	F	100	50	56
Chemistry	F	100	44	53
Physics	F	100	50	56
Biology	H	100	49	56
Chemistry	H	100	43	54
Physics	H	100	48	60

Analysis from MERiT: Trilogy

Paper 1 data only.

Paper	Tier	Total marks	Mean mark	Summer 2019 mean mark
Biology	F	70	21	28
Chemistry	F	70	24	31
Physics	F	70	25	31
Biology	H	70	22	27
Chemistry	H	70	21	30
Physics	H	70	16	25

Assessing maths skills at different demands

- Maths skills that must be assessed
- Areas of particular challenge
 - Significant figures
 - Standard form
 - Plotting graphs
- AQA resources
- Other resources
- Incorporating these skills into your scheme of work

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The maths skills: DfE criteria

- Five broad areas
 - Arithmetic and numerical computation
 - Handling data
 - Algebra
 - Graphs
 - Geometry and trigonometry
- 10% of Biology marks, 20% Chemistry, 30% Physics
- Level of demand
 - Foundation tier **no lower than** KS3 maths
 - Higher tier **no lower than** F tier GCSE Maths

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Areas of particular challenge

- Using expressions in standard form
- Using an appropriate number of significant figures
- Graphing skills
 - Plotting points
 - Labelling of axes
 - Choosing appropriate scales
 - Lines of best fit
 - Bar charts and histograms

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Assessing standard form

- Use of standard form is considered to be at least standard demand
- Standard demand
 - Answer to be given in standard form, but not using numbers in SF in a calculation
 - Positive indices (eg $\times 10^6$)
- Higher demand
 - Numbers in standard form to be used in calculations (eg as unit conversions) as well as in answer
 - Negative indices (eg $\times 10^{-6}$) as well as positive
- Summary of progression of demand *Booklet 1* (page 7)

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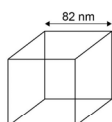
Assessing standard form: Example question

Zinc oxide can be produced as nanoparticles and as fine particles.

A nanoparticle of zinc oxide is a cube of side 82 nm

Figure 15 represents a nanoparticle of zinc oxide.

Figure 15



Calculate the surface area of a nanoparticle of zinc oxide.

Give your answer in standard form.

[3 marks]

Surface area = _____ nm²

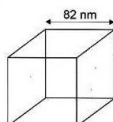
Assessing standard form: Student response

Zinc oxide can be produced as nanoparticles and as fine particles.

1 **0** **3** A nanoparticle of zinc oxide is a cube of side 82 nm

Figure 15 represents a nanoparticle of zinc oxide.

Figure 15



Calculate the surface area of a nanoparticle of zinc oxide.

Give your answer in standard form.

[3 marks]

$$82 \times 82 = 6724$$

$$6724 \times 6 \text{ sides} = 40344$$

Surface area = 40344 nm²

Assessing significant figures

- Rounding to a correct number of significant figures is considered to be at least standard demand.
- We don't assess significant figures at low demand, **but** we may assess decimal places at low demand.
- Rounding down is considered to be standard demand therefore may appear on a Foundation tier paper.
- Rounding up is considered to be higher demand and will appear only on Higher tier papers.
- For more information, see *Booklet 1* (page 18).
- For summary of progression of demand, see *Booklet 1* (page 18).

Assessing significant figures: Example question

0 2 7 Some homes have solar panels which generate electricity.

On a sunny day the potential difference across a solar panel is 31 volts.

A charge of 490 coulombs flows through the solar panel.

Calculate the energy transferred by the solar panel.

Use the equation:

$$\text{energy transferred} = \text{charge flow} \times \text{potential difference}$$

Give your answer to 2 significant figures.

[3 marks]

Energy transferred = _____ J

Assessing significant figures: Student response

0 2 7 Some homes have solar panels which generate electricity.

On a sunny day the potential difference across a solar panel is 31 volts.

A charge of 490 coulombs flows through the solar panel.

Calculate the energy transferred by the solar panel.

Use the equation:

$$\text{energy transferred} = \text{charge flow} \times \text{potential difference}$$

Give your answer to 2 significant figures. [3 marks]

Handwritten student work:

$$\begin{array}{r} 490 \times \\ 31 \\ \hline 490 \\ 14700 \\ \hline 15190 \end{array}$$

Energy transferred = $15190 = 15000 \text{ (2sf)}$ J

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Graphing skills: General points

- Plotting
 - Ink or pencil
 - Crosses versus dots
 - Precision of plotting
 - Number of data points to plot
- Choice of scales and labelling axes
 - Use of headings in tables
 - What is a 'sensible' scale?
- Lines of best fit
 - Straight line, curve or dot-to-dot?

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Assessing graphing skills at low demand

- Data points are whole numbers or simple decimals
- Single variable
- Clear, straightforward scales
- Numbers to plot will be on a straight line
- Line of best fit will be all points on a straight line
- May require extrapolation of a straight line

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Assessing graphing skills at standard demand

- More complex numbers
- May be a more complex scale
- Data may be on a straight line or a curve
- Line of best fit
 - Straight line where points do not all sit on the line **or**
 - Straight line, with an anomaly that needs to be ignored **or**
 - Curve, where all points sit on the curve
- May require extrapolation of a curved line

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Assessing graphing skills at higher demand

- May include negative values
- Combination of complex scale and multiple variables
- May be required to label and choose scale for both axes
- Line of best fit
 - Curve, where points do not all sit on the line **or**
 - Curve, where there is an anomaly that must be identified and ignored without prompting. Rest of the points will sit on the curve
- May require extrapolation of a curved line

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Low demand graphing: Example question

Table 4 shows the student's results.

Table 4

Number of resistors	Total resistance in ohms
1	2.2
2	4.4
3	6.6
4	8.8
5	11.0
6	13.2

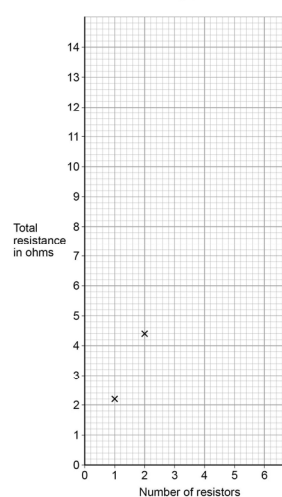
0 5 4 Complete Figure 4 using data from Table 4.

You should:

- plot the rest of the results
- draw a line of best fit.

[3 marks]

Figure 4



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Standard demand graphing: Example question

0 9 5 Complete Figure 15.

[4 marks]

Table 9 shows the student's results.

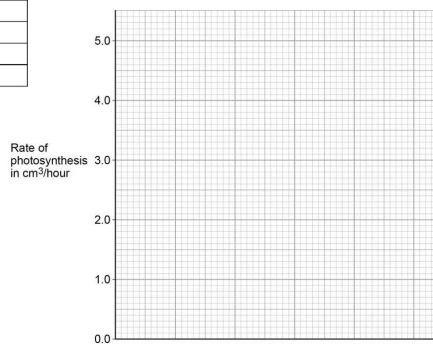
Table 9

Power output of bulb in watts	Volume of oxygen collected in 20 minutes in cm ³	Rate of photosynthesis in cm ³ /hour
60	0.5	1.5
100	0.8	2.4
150	1.1	X
200	1.2	3.6
250	1.2	3.6

You should:

- label the x-axis
- use a suitable scale
- plot the data from Table 9 and your answer to Question 09.4
- draw a line of best fit.

Figure 15



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High demand graphing: Example question

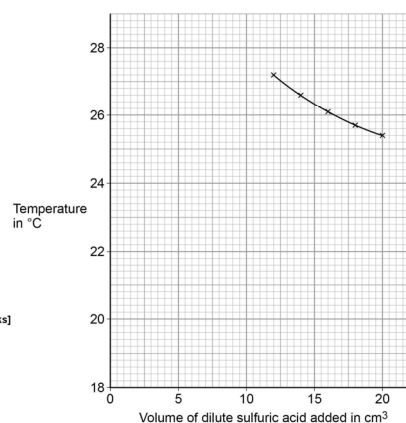
Table 6 shows some of the student's results.

Table 6

Volume of dilute sulfuric acid added in cm ³	Temperature in °C
0.0	18.9
2.0	21.7
4.0	23.6
6.0	25.0
8.0	26.1
10.0	27.1

Figure 11 shows some of the data from the investigation.

Figure 11



0 9 2 Complete Figure 11:

- plot the data from Table 6
- draw a line of best fit through these points
- extend the lines of best fit until they cross.

[4 marks]

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Discussion

- Look at the following examples in *Booklet 1*:
 - Student U (page 37)
 - Student W (page 41)
 - Student AB (page 47).
- None of these responses gained full marks. Can you see why?
- Compare your thoughts with the Examiner commentaries.

Assessing graphing skills: Bar charts

- Drawing bar charts is a Key Stage 3 skill, so is unlikely to be assessed on a Higher tier paper.
- However, if there are negative values to be plotted, the question would be considered standard demand, and might appear on a Higher tier paper.
- Examples can be found in the *Booklet 1*.

Maths in science resources on the AQA website

Subjects / Science / GCSE / Biology (8461) / Teaching resources

Teaching resources

Search resources

Clear all filters

Category

- ☐ Practicals (2)
- ☐ Schemes of work (0)
- ☐ Teaching resources (15)

Resource type

Component

Topic (1)

- ☒ Maths skills (17)

A-Z Page Items per page

Maths skills

Showing 17 results

-  Community link: Association for Science Education - the language of mathematics in science [ase.org.uk] Published 19 Sep 2019
-  Community link: STEM learning [stem.org.uk] Published 19 Sep 2019
-  Practical support: for practicals and maths - slides Published 15 Mar 2016 | PDF | 617 KB
-  Practical support: for practicals and maths - webcast [aqa.adobeconnect.com] Published 23 Sep 2019

Other Maths in science resources

- ASE guidance: *The Language of Mathematics in Science: A Guide for Teachers of 11-16 Science*
- Teachit
 - Maths in science posters
 - Other resources
- Resources from AQA endorsed publishers
 - [OUP](#)
 - [Hodder](#)

Discussion activity

- Look at the extract from the sample scheme of work (Biology, Chemistry or Physics).
- Are there opportunities for:
 - graph work
 - calculations including significant figures
 - use of standard form?
- How might you amend this scheme to include them?
- How could you target different abilities?
- How might you apply this to your own schemes?

Updates

- Release date for question papers on AQA website: Summer 2019 series 31 July 2020
- A-level Environmental Science Practical Handbook
- Self-guided training packs for teachers
- Tiering guidance
- 'New look' web pages

New look web pages

Subjects / Science / GCSE / Biology (8461) / Planning resources

Planning resources

Search resources

Relevance
Newest first
Oldest first
A-Z
Z-A

Items per page 10

Category

- ☐ Meetings and training (2)
- ☐ Planning guidance (5)
- ☐ Why choose AQA (2)

Resource type

Showing 9 results

- Co-teaching guide: Combined Science: Trilogy and Biology**
Published 16 Jul 2015 | PDF | 161 KB
- Teacher training: self-guided, modular training pack (extended response questions)** New
Published 2 Oct 2019 | ZIP | 13.4 MB
- Prepare to teach meeting: mathematics in GCSE Sciences**
Published 16 Jul 2015 | PDF | 1.2 MB
- Resource and support guide: exam navigation**
Published 16 Jul 2015 | PDF | 876 KB

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New GCSE science resources

- Five self-guided modular training packs being released over the next year
- Helping teachers to better understand the assessment requirements
- Pack 1: Extended response questions – help your students master the extended response
- Pack 2: AO2 – prepare students to manage scientific knowledge in an unfamiliar context
- Pack 3: Practical questions coming Spring 2020
- Pack 4: AO3 coming spring 2020
- Pack 5: Maths in science coming summer 2020



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Focus for summer 2020 meetings

- Understanding the language of practicals, incorporating aspects of the required practical activities, working scientifically and AO3 into your practical lessons
- Using ERA forwards to aid progression from GCSE to A-level

Event materials

The electronic materials from this event will be made available to you in the customer portal of our online booking system.

Once we receive notification that you have attended the course, you will be sent a certificate of attendance email. When you receive the email, please log in to your account and the materials will be available on the 'my resources' tab on the welcome screen.

How did we do?

Please take a moment to complete a brief evaluation form for today's event. Your feedback is very important to us as it helps us improve and plan future training.

You should have been emailed the evaluation form. Please check your inbox (possibly your junk mail folder). If you haven't received it please give your trainer your name, centre name/number and email address so that we can look into it for you.

Thank you.

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Get in touch

Our friendly team will be happy to support you between 8am and 5pm, Monday to Friday.

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