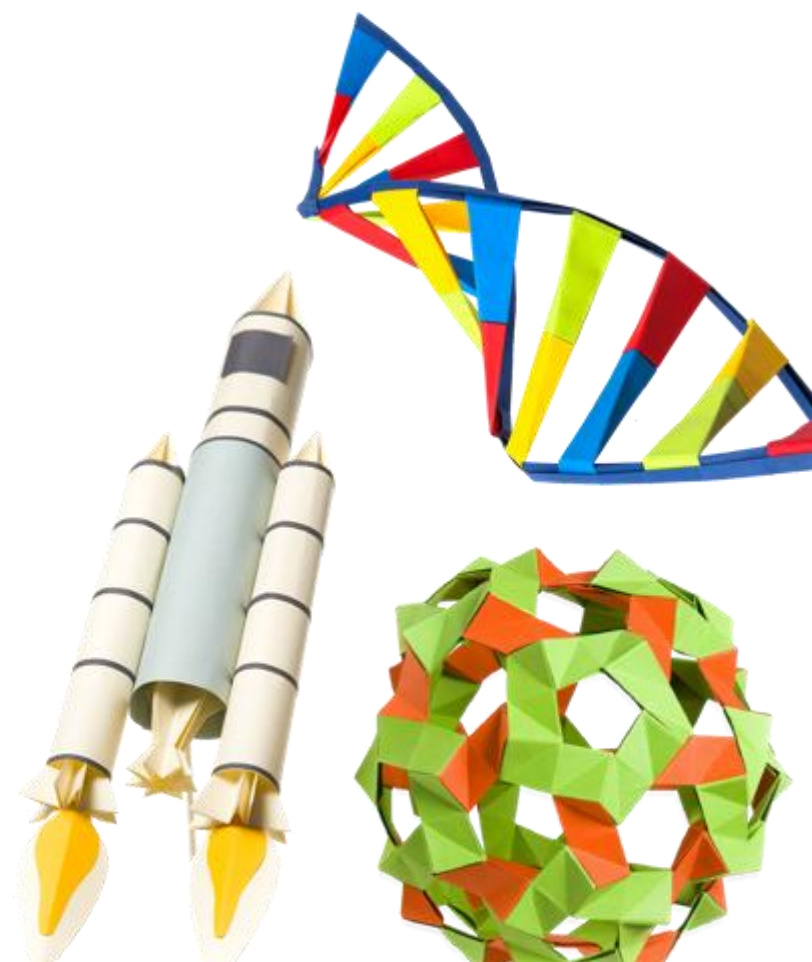


# GCSE Sciences

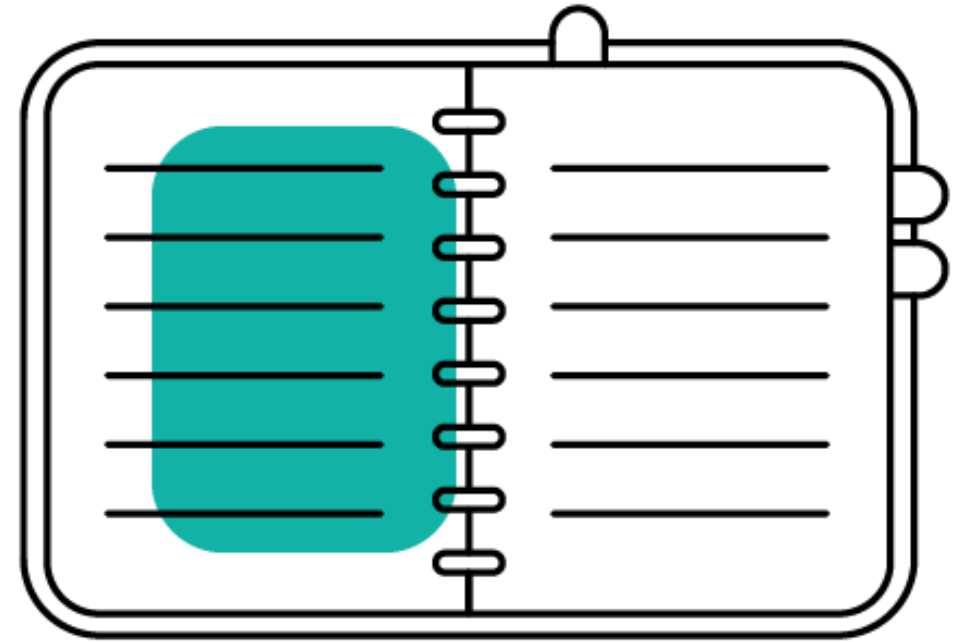
## Marking Masterclass



# Agenda

In this session we are going to look at:

- Effective planning and use of mock exams when delivering Pearson Edexcel GCSE (9–1) Science Qualifications.
- Understanding how to use and apply mark schemes when marking and moderating mock exams.

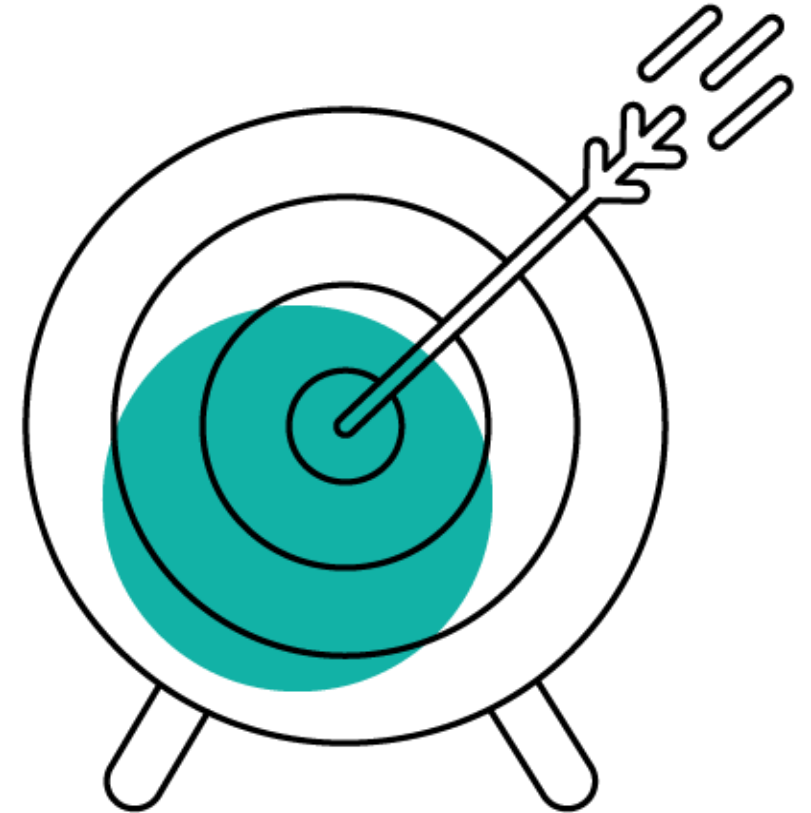


# Introductions



# Today's Objectives...

- To explore marking advice and guidance using Pearson Edexcel exam questions, mark schemes and examiner reports.
- To discuss strategies for how to use and apply mark schemes when marking and moderating mock exams.



# Marking Extended Open Response Questions (6-mark questions)



# Extended Open Response

- These questions have 6 marks.
- The questions have a levels-based mark scheme.
- There is no requirement to test quality of written communication.
- Can test AO1, AO2, AO3, or a mix, but only a maximum of two AOs.
- Assessed against indicative content.

# Extended Open Response in the Papers

- One 6-mark question in combined science papers.
- Two 6-mark questions in the separate science papers.
- Usually found towards the end of the paper.
- Designed to differentiate candidate ability.

# Extended Open Response: True or False

- Candidates cannot answer in bullet points.
- Candidates can use tables and diagrams to help them answer the questions.
- Candidates must give 6 correct points to gain 6 marks.
- Candidates have to give all the indicative content to gain all 6 marks.
- 6-mark questions are always the hardest on the paper.

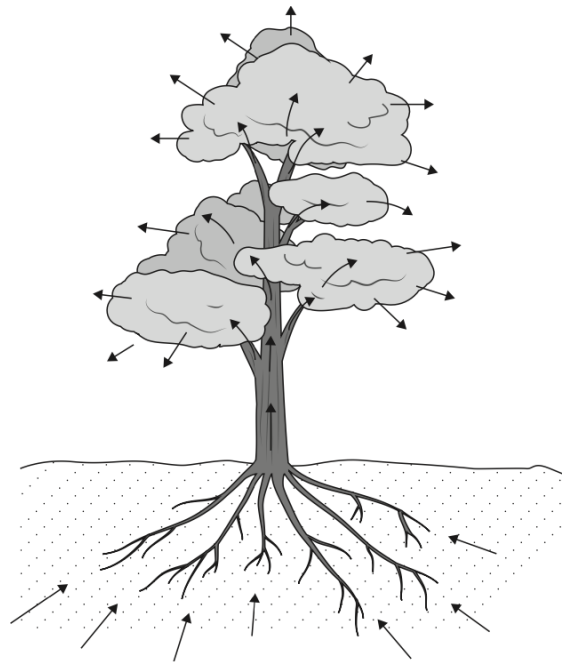


# Extended Open Response

Candidate cannot answer in bullet points	<b>FALSE</b>
Candidates can use tables and diagrams to help them answer the questions	<b>TRUE</b>
Candidates must give 6 correct points to gain 6 marks	<b>FALSE</b>
Candidates have to give all the indicative content to gain all 6 marks	<b>FALSE</b>
6-mark questions are always the hardest on the paper	<b>FALSE</b>

# Example Question

\*(c) The arrows in Figure 11 show the direction of water movement through a tree.



**Figure 11**

Explain how water is moved from the soil, through the plant and into the air.

(6)

# Mark Scheme – Indicative content

Question number	Indicative content	Mark
6 *(c)	<p><b>A01 6 marks</b></p> <p><b>Roots</b></p> <ul style="list-style-type: none"> <li>• water enters the roots</li> <li>• into root hair cells</li> <li>• which have a projection / large surface area</li> <li>• by osmosis</li> <li>• from a dilute solution in the soil to a more concentrated solution in the root cells.</li> </ul> <p><b>Stem/trunk</b></p> <ul style="list-style-type: none"> <li>• through xylem</li> <li>• which are long / thin / hollow / lignified / dead cells</li> <li>• because water is being pulled up</li> <li>• because of transpiration</li> </ul> <p><b>Leaves</b></p> <p>water moves into the leaves</p> <ul style="list-style-type: none"> <li>• by osmosis</li> <li>• because the leaf cell contents are more concentrated than in the xylem</li> <li>• water evaporates / water moves out of the leaves</li> <li>• through the stomata</li> <li>• (into the air) by diffusion</li> <li>• reference to transpiration</li> </ul>	(6)

# Mark scheme – Level Descriptors

Level	Mark	Descriptor
	0	<ul style="list-style-type: none"><li>• no rewardable material.</li></ul>
Level 1	1-2	<ul style="list-style-type: none"><li>• demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail.</li><li>• presents an explanation with some structure and coherence.</li></ul>
Level 2	3-4	<ul style="list-style-type: none"><li>• demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed.</li><li>• presents an explanation that has a structure which is mostly clear, coherent and logical.</li></ul>
Level 3	5-6	<ul style="list-style-type: none"><li>• demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed.</li><li>• presents an explanation that has a well-developed structure which is clear, coherent and logical.</li></ul>

# Mark scheme – Additional guidance

Level	Mark	Additional guidance	General additional guidance The level is driven by the areas covered in the response. The mark within the level is determined by the detail.
	0	No rewardable material.	
Level 1	1-2	<p>The answer refers to part of the route taken by water through the plant / tree</p> <p>The response includes a basic explanation of how water moves through the plant</p>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> <li>• water leaves the plant through the leaves</li> <li>• water leaves the plant via evaporation from the leaves</li> </ul>
Level 2	3-4	<p>The answer refers to more than one part of the route taken by water through the plant / tree</p> <p>The response includes an explanation of how water is moved into the roots, through the plant or through the leaves</p>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> <li>• water moves into the root and up the stem</li> <li>• water moves into the root via osmosis and up the stem</li> </ul>
Level 3	5-6	<p>The answer is detailed and refers to water moving into the roots, through the stem / branches and out of the leaves</p> <p>The response includes a detailed explanation of how water is moved into the roots, through the plant or out of the leaves</p>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> <li>• water moves into the root. Water then moves up the stem in the xylem out of the leaves.</li> <li>• water moves into the root. Water then moves up the stem in the xylem to the leaves where it is lost to the air via transpiration</li> </ul>

# Mark Scheme

To apply the mark scheme:

1. the level is decided
2. the correct information and arguments are then considered.

Once the level is decided, the examiner determines whether the answer has 'scraped in' to that level (lower mark) or has met the requirements of that level well (higher mark). It should be noted that for 6 marks, perfection is not expected.

In general, for the higher marks examiners are looking for:

- correct terminology appropriately used
- answers which have linkage/logical connections
- answers that include all relevant scientific theory

# Mark Scheme

Good rules of thumb are:

- Level 1 are simple unlinked statements
- Level 2 contains linked or developed ideas
- Level 3 fully answers the question.

Teachers tend to mark these too harshly. Remember to compare this question to other ways candidates can get 6 marks. If this is targeted at medium level then the best answer should be comparable to one written by a good C candidate on the 'old' specification.

Markers ignore waffle and incorrect science as long as it does not directly contradict correct science the candidates have written.

# Marking Activity

Choose **one or two** of the exemplars available to you:

- Chemistry:** Combined science Paper 1 Foundation Tier (2024)  
**Biology:** Combined Science Paper 1 Foundation Tier (2024)  
**Physics:** Combined Science Paper 1 Higher Tier (2023)

- Mark your chosen question(s) using the relevant mark scheme – make a note of the mark you have awarded
- Enter your mark(s) into the group chat on-screen



# Marking Activity

**Chemistry:** Combined science Paper 1 Foundation Tier, 2024, Q6c

This is an example of a level 3 response.

If the response had only included the information written around the table then that alone would have been enough to award four marks.

All three solids are correctly identified in the table, as is the test for hydrogen.

The candidate has then given more information to support their conclusion including that limewater is used to test for carbon dioxide, the blue solution is copper solid and the black solid is leftover copper oxide. Although there are no equations in the answer there is enough correct detail for full marks to be awarded.

# Marking Activity

## **Chemistry:** Combined science Paper 1 Foundation Tier, 2024, Q6c **Question 6 (c)**

The six mark question on the paper gave information about the reaction of different solids with sulfuric acid and asked candidates to identify the solids and explain their choices. It was intended that the information given would help with answering the question, but the majority of candidates still found this to be a challenging question and seemed to score some marks through luck or very basic knowledge rather than being able to use the data to inform their conclusions. As always a large proportion of responses to this question were simply left blank.

Candidates were often able to identify the gas tests for hydrogen and carbon dioxide, but were not able to successfully use this to identify the correct solid with many candidates stating that Solid A was hydrogen and Solid C was carbon dioxide. The solid that was most commonly identified correctly was C as sodium carbonate but again, this wasn't always well linked with the data from the table.

Solid B was often incorrectly identified as leftover powdered zinc even though the preparation of copper sulfate crystals using copper oxide is one of the core practical activities.

Very few responses attempted any form of equation at all, and a lot of candidates simply wrote out information from the table.

# Marking Activity

**Biology:** Combined Science Paper 1 Foundation Tier, 2024, Q6dii



This response scores just two marks which is a pity as the information supplied is good. However, the stem of the question tells the candidate to reference / name neurones X, Y and Z and as they have not done so, they have not fulfilled the requirements and so cannot access higher than Level 1 marks.



The last instruction of the stem of the question states 'Include the name of neurones X, Y and Z in your answer'. Ensure that you fulfil all the instructions given, or you will limit the marks awarded for your response.

# Marking Activity

**Biology:** Combined Science Paper 1 Foundation Tier, 2024, Q6dii

## **Question 6 (d)(ii)**

It was disappointing that with all the scaffolding supplied in this item so few candidates, over one third, scored no marks and only approximately one in ten candidates managed to access Level 3 of this six mark EOR task.

The diagram in Figure 10 showed a pin pricking an arm and the three neurones labelled neurone X, neurone Y and neurone Z. Referencing the impulse travelling down neurones X, Y and Z would give access to Level 2 and with an extra piece of detail, correct reference to the spinal cord or crossing a synapse with named neurones, X = a sensory neurone, Y = a relay neurone and Z = a sensory neurone for example would access four, five or six marks, depending on the amount of extra detail / number of named neurones.

This item scored well and was clearly accessible to many candidates who gave excellent written accounts of the reflex arc.

Some excellent answers were seen with myelin sheaths described and related to speeding the impulse and neurotransmitters diffusing across the synapse. Some very poor responses were also seen and a common error was to refer to the brain receiving the pin prick stimulus and telling the arm to move away.

# Marking Activity

**Physics:** Combined Science Paper Higher Tier, 2023, Q6c



The diagram shows the equipment needed and this reaches Level 1 straight away.

The candidate then describes how the weights apply a force and how this force can be changed. This description of a procedure brings the answer to level 2.

There is a short description of how the light gates are used to determine the acceleration. This brings the answer to Level 3.

# Marking Activity

**Physics:** Combined Science Paper Higher Tier, 2023, Q6c

## **Question 6 (c)**

The question asked candidates to describe a core practical and many candidates were able to do so. A good answer often included equipment added to the diagram such as light gates next to the runway and a interrupter card on the trolley. It would also show weights on a string passing over a pulley and attached to the trolley. This put the candidate well on the way to scoring several marks and indeed, Level 1 could be reached by simply stating some of these items or showing them on the diagram. To reach level 2, there needed to be some detail of the procedure. This could be, for example, how the light gate(s) are used or how the runway can be slightly sloped to compensate for friction. Level 3 answers would continue to describe at least one other procedure together with mention of some additional facts about the equipment to be used or how the results could be processed. Although some very good answers were often seen, many candidates were unclear about how the acceleration was measured; vague statements such as “use a stopwatch to find the acceleration” were common. There was also considerable uncertainty about where to place additional weights and their purpose. Lastly, it was often not clear about how a steady force can be applied and suggestions involving pulling the trolley by hand were not uncommon.

# Making the most of the information available

Examiners' Reports include:

- Question commentary – giving general oversight of how candidates did
- Exemplar answers – including some answers awarded full marks and others demonstrating common errors and 'examiner tip'
- Examiner Report Summaries – containing suggestions for students, based on feedback from the exam series

# Marking Calculation Questions





# Marking Calculations

- Showing working (to support error carried forward)
- Significant figures
- Units

# Showing Working

- (ii) In a fusion reaction, the combined mass of the two small nuclei is greater than the mass of the resulting nucleus.

This decrease in mass,  $m$ , appears as energy,  $E$ , according to the equation.

$$E = mc^2$$

$c$  is the speed of light =  $3.0 \times 10^8 \text{ m/s}$ .

The energy released in one fusion reaction is  $4.5 \times 10^{-12} \text{ J}$ .

Calculate the decrease in mass.

(3)

$$\begin{aligned} E &= mc^2 \\ m &= \frac{E}{c^2} \\ m &= \frac{4.5 \times 10^{-12}}{(3.0 \times 10^8)^2} \\ m &= 5 \times 10^{-29} \text{ kg} \end{aligned}$$

decrease in mass =  $5 \times 10^{-29}$  kg

# Error Carried Forward

(d) In an experiment, 3.5 g of element **A** reacted with 4.0 g of element **G** to form a compound.

Calculate the empirical formula of this compound.  
(relative atomic masses: **A** = 7, **G** = 16)

You must show your working.

<b>A</b>	<b>G</b>	
$A = 7$		(3)
$\frac{3.5}{7}$	$\frac{4.0}{16}$	
$\frac{0.5}{0.5}$	$\frac{0.25}{0.25}$	
$1$	$2$	

empirical formula of this compound =  $A G_2$

# Error Carried Forward



This response scored 2 marks by error carried forward on the first step in the calculation.

In effect, only one error has been made. The ratios have been incorrectly inverted and the ratio stated. This in turn has been converted into an empirical formula based on the error carried forward.

This question was poorly answered on the whole with most responses not scoring any of the 3 marks available.

Most candidates struggled with this empirical formula calculation.

The most major and regularly seen misconception was that candidates multiplied the masses and relative formula masses, namely stating  $3.5 \times 7 = 24.5$ , followed by  $4 \times 16 = 64$  then adding them together and arriving at a final answer of 88.5.

# Error Carried Forward

Question number	Answer	Additional guidance	Mark
8(d)	<p><b>MP1 for dividing by atomic mass</b></p> $\begin{array}{ccc} \text{A} & : & \text{G} \\ \underline{3.5} & : & \underline{4.0} \quad (1) \\ 7 & & 16 \end{array}$ <p><b>MP2 for deriving ratio from MP1</b></p> $0.5 : 0.25$ <p>OR</p> $2 : 1 \quad (1)$ <p><b>MP3 for ratio in MP2 to formula</b> empirical formula <b>A<sub>2</sub>G</b> (1)</p>	<p>A<sub>2</sub>G with no relevant working (1) ONLY AG<sub>2</sub> (0)</p> <p>For MP2: If they go on to calculate a different ratio in addition to 0.5:0.25 or 2:1 do not award MP2</p> <p>ecf on step 1: if inverted,  <math display="block">\frac{7}{3.5} : \frac{16}{4.0} \quad (0)</math> <math display="block">= 2 : 4</math> or <math>1 : 2 \quad (1)</math> AG<sub>2</sub> (1)</p> <p>allow 1 in empirical formula allow Li for A and O for G do not penalise incorrect case in formula</p>	(3)

# Significant Figures

- (d) Sound travels slower in cold air than it does in warm air.

The equation relating the speed of sound in air to the density of the air is

$$\text{speed of sound} = \frac{K}{\sqrt{(\text{density})}} \quad \text{where } K \text{ is a constant.}$$

The table in Figure 7 gives some data about the speed of sound in air and the density of air.

	speed of sound in m/s	density of air in kg / m <sup>3</sup>
in cold air	331	1.29
in warm air		1.16

**Figure 7**

Use the equation and the data in the table in Figure 7 to calculate the speed of sound in warm air.

Give your answer to an appropriate number of significant figures.

# Significant Figures (1)

$$331 = \frac{k}{\sqrt{1.29}}$$

$$k = 375.94\dots$$

$$S = \frac{k}{\sqrt{1.16}}$$

$$S = 349 \text{ (to 3sf)}$$



**ResultsPlus**  
Examiner Comments

This is an exemplary text book answer with commendable clarity at every stage.

speed of sound in warm air = ..... **349** ..... m/s

# Significant Figures (2)

Give your answer to an appropriate number of significant figures.

$$\begin{aligned}\text{cold air } k &= 331 \times \sqrt{1.29} = 375^{(3)} 94 \\ k &= 375.94 \\ \text{warm air} &= \frac{375.94}{\sqrt{1.16}} = 344.09\end{aligned}$$



The k calculation is good from the cold data.

The substitution and first evaluation is good.

However the final evaluation has too many significant figures so 2 marks out of 3 are obtained.

speed of sound in warm air = 344.09 m/s



# Significant Figures

Question Number	Answer	Additional guidance	Mark
6(d)	<p>using cold row: evaluate (K=)376 (1)</p> <p>using warm row: substitute K and <math>\rho</math> <math>\frac{376}{\sqrt{1.16}}</math> OR 349.10.... (1)</p> <p>349 (m/s) to 3 sig figs (1)</p>	<p>other K from earlier calculation <math>\frac{\quad}{\sqrt{1.16}}</math></p> <p>any answer to 3 sig figs</p> <p>349.10... scores MP1 and MP2</p> <p>award full marks for the correct answer without working</p>	(3)

# Significant Figures

Give your answer to an appropriate number of significant figures.

(3)

in cold air:  $331 = \frac{k}{\sqrt{1.29}}$   $k = 291.42925$

in warm air:  $s = \frac{291.42925}{\sqrt{1.16}}$   $s = 270.5852657 \rightarrow 271$



The evaluation of  $k$  is wrong so mark point 1 is not achieved.

However using their value of  $k$  an error carried forward is allowed for mark point 2.

The final answer is evaluated to 3 significant figures so the third mark point is given.

speed of sound in warm air = 271 m/s

# Units

## Question 8 (a) (ii)

For this question candidates had to recall the equation to calculate cardiac output, which is in the specification, then read from the graph and calculate the cardiac output. The question asks for the units to be given in the answer which many candidates missed so lost 1 mark. The units should be ml per minute or l per minute if converted. A common error was ml per beat per minute which is incorrect.

(ii) Calculate the cardiac output for the person who has trained for a marathon when the heart rate is 160 beats per minute. Give the units in your answer.

stroke vol = 170 ml

$170 \times 160 = 27200$

stroke volume in trained (3) than in non trained which beats not trained expand

27200

# Mark Scheme

Question number	Answer	Additional guidance	Mark
8(a)(ii)	cardiac output = heart rate x stroke volume (1)  Substitution $160 \times 170 = 27\,200$ (1)  unit	accept correct calculation for 2 marks as equation is implied.  accept range for stroke volume of 168 -172	<b>(3)</b>  AO1 1
	ml per min/ ml.min <sup>-1</sup>	accept 27.2 L.min <sup>-1</sup> / 27.2 dm <sup>3</sup> .min <sup>-1</sup> for 3 marks	

# Units



This candidate has correctly recalled the equation for cardiac output and correctly calculated the cardiac output. The question asks for the units to be included in the answer in this case ml per minute.

Note m is not acceptable for minute as it is the SI unit abbreviation for metres.

This response scored 2 marks.



In the enclosed clip it is clear that the candidate has written below the line above. Do not do this in examinations as the person marking will not see this on the previous question. If you need more space to write then ask for extra paper.

# Running and Marking Mock Exams



# Managing Mocks – Discussion Activity

What strategies do you have in place to manage running and marking the mock papers?

For example:

- When (in the year) do they occur?
- Are they sat under full exam conditions; including the number and length of papers?
- Who sets the paper(s)?
- Who marks the paper(s)?

Enter your answers into the group chat

# Formative / Summative Assessment

**Formative assessment** should happen throughout the learning process. It should be used to find out how students are progressing through a certain learning goal. It should inform future practice.

**Summative assessment** happens at the end of the year or a unit. It assesses how well students have understood/can apply the skills, concepts and knowledge in the course/unit.

**Reflection:** Do you view mock exams as formative or summative assessment?



# Formative Assessment of Practical Activities

The GCSE (9–1) Science specification assesses students' knowledge and understanding of 'working scientifically skills' within the written final examinations – questions on this aspect of science account for 15% of the total marks available.

It is, therefore, well worth considering how we are formatively assessing students' development of those specific skills (both within the mock exams, and whilst teaching that aspect of the course).

# Formative Assessment of Practical Activities

Choose one of the core practicals (perhaps the one you are about to do next with your year 11 group):

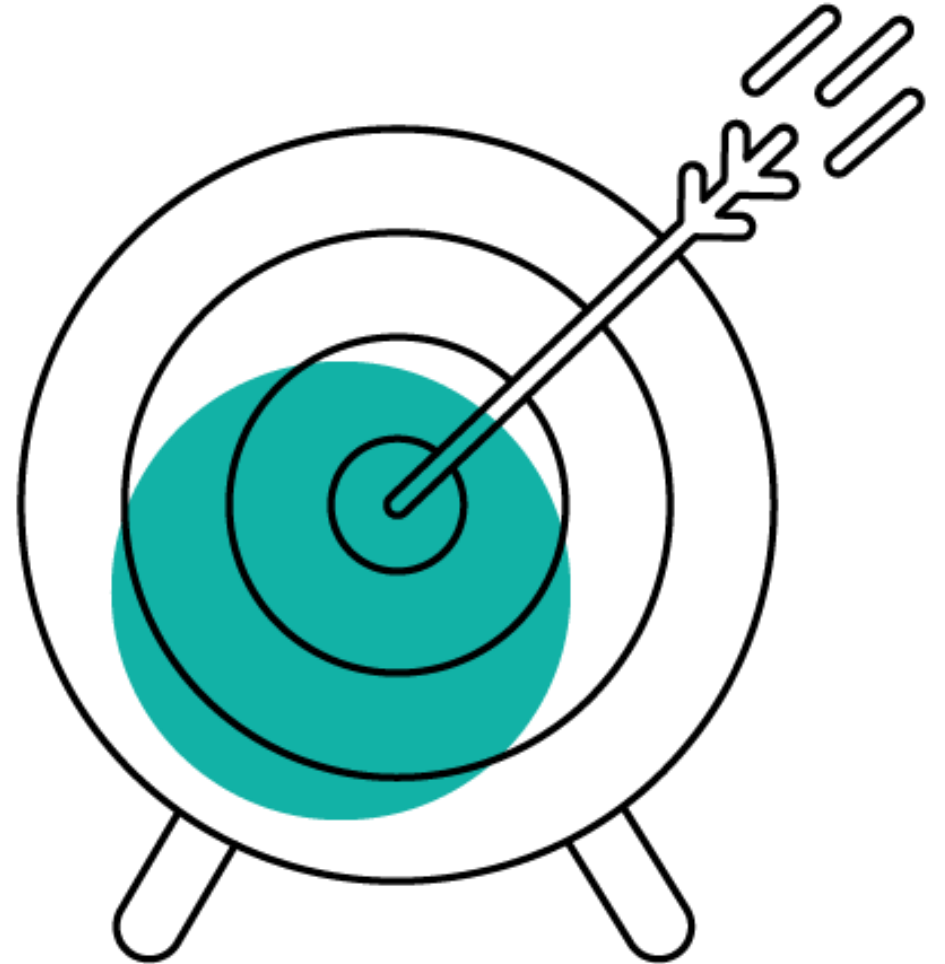
Think how you formatively assess when delivering these practicals:

- What are you currently assessing?
- What else could you be assessing?
- How do you use this assessment?
- How might you use this assessment differently?

# Summary

In today's session our objectives were to:

- To explore marking advice and guidance using Edexcel exam questions, mark schemes and examiner reports.
- To discuss strategies for how to use and apply mark schemes when marking and moderating mock exams.



# Next Steps and Evaluation



## Next Steps

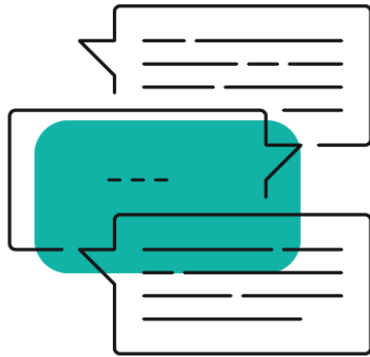


Think of ONE or TWO things you might try or do differently as a result of ideas arising from this training event.

Share them in the group chat.

# Subject Advisor Support

Our subject advisors are experts in their fields and are here to support you throughout the year.



Find the Subject Advisor for your area [here](#) and sign up to receive regular updates from your Subject Advisor on qualification news and support for your subject [here](#).

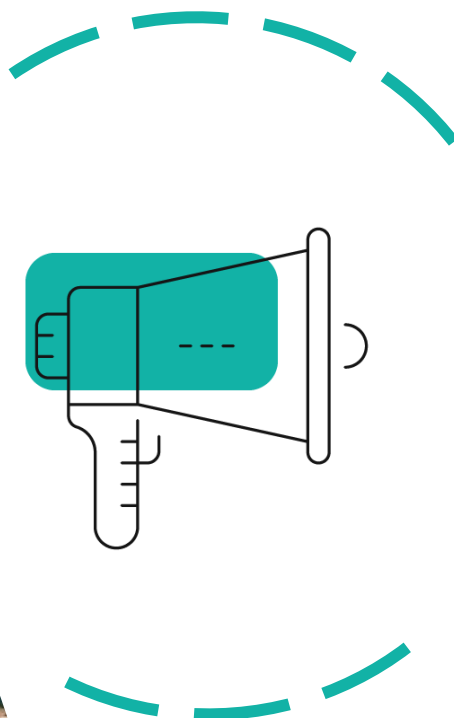




# Find out more

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# Your Feedback Matters

Following this event, you will receive an invitation to share your thoughts about the session. Your feedback is invaluable to us, as it helps us tailor our professional development materials to better meet your needs. Please don't hesitate to let us know what you'd like to see more of and what areas you think could be improved.





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