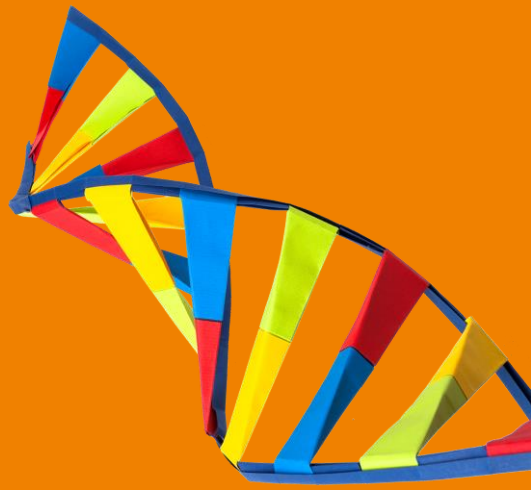
GCSE
Combined Science

Running and Marking Mocks



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Agenda

- 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.

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Introductions

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Today’s Objectives…

- 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.
- To network with colleagues from other centres.

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Marking Extended Open Response Questions (6-mark questions)

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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.

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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.

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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.

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Extended Open Response

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

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Example Question

*(b) Blood from the body enters the heart through the vena cava.

Describe how this blood flows through the heart and lungs to leave the heart through the aorta.

Include references to the chambers of the heart and the relevant valves in your answer.

(6)

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Mark Scheme

Question number	Indicative content	Mark
*8(b)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive, and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 (6 marks)** • Blood flows from vena cava into the right atrium • Into the right ventricle • Through valve • And is pumped into the pulmonary artery • Through valve to the lungs • From the lungs back to the heart through the pulmonary vein • Into the left atrium • Into the left ventricle • Through valve • And is pumped into the aorta • Through valve • valves prevent backflow	**(6)** AO1 1

Level Descriptors From the Mark Scheme

Level	Descriptor
	No rewardable material.
Level 1	• Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. • Presents an explanation with some structure and coherence.
Level 2	• Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. • Presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. • Presents an explanation that has a well-developed structure which is clear, coherent and logical.

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Mark Scheme

Level	Mark	Additional Guidance	General additional guidance – the decision within levels The correct linking of one structure to another
	0	No rewardable material.	
Level 1	1–2	• A correct reference to blood flowing through a named chamber of the heart or blood vessel or what valves do • Correctly linked to the next stage either chamber or blood vessel or through a valve (sides of the heart not necessary)	<u>Possible candidate responses</u> blood flows into the (right) atrium blood flows from the right ventricle to the lungs valves prevent backflow of blood blood flows through the (right) atrium into the right ventricle blood flows from the lungs to the atria
Level 2	3–4	• A correct reference to blood flow through one side of the heart either left or right Or the correct side of the heart linked to the correct blood vessel • Correctly linked to or from the lungs	<u>Possible candidate responses</u> blood flows into the right atrium to the right ventricle blood flows into the left atrium into the left ventricle blood flows into the right atrium to the right ventricle into the lungs blood flows into the left atrium into the left ventricle through a valve from the lungs
Level 3	5–6	• A correct reference to blood flow through the heart from right to left travelling through the lungs including valves • Correctly linked to the pulmonary artery and pulmonary vein	<u>Possible candidate responses</u> Blood flows from the right atrium to the right ventricle through a valve and is pumped to the lungs then enters the left atrium through to the left ventricle and is pumped to the body through the aorta Blood flows from the right atrium to the right ventricle through a valve and is pumped through the pulmonary artery to the lungs. Leaves the lungs via the pulmonary vein then enters the left atrium through to the left ventricle and is pumped to the body through the aorta

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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.

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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.

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Marking Activity

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

Chemistry:	Chemistry Paper 1 Higher Tier
Biology:	Combined Science Paper 1 Foundation Tier
Physics:	Combined Science Paper 1 Higher Tier

- Mark your chosen questions using the relevant mark scheme – make a note of the mark you have awarded.
- If you have time, mark the third exemplar.
- Enter your mark(s) into the group chat on-screen.

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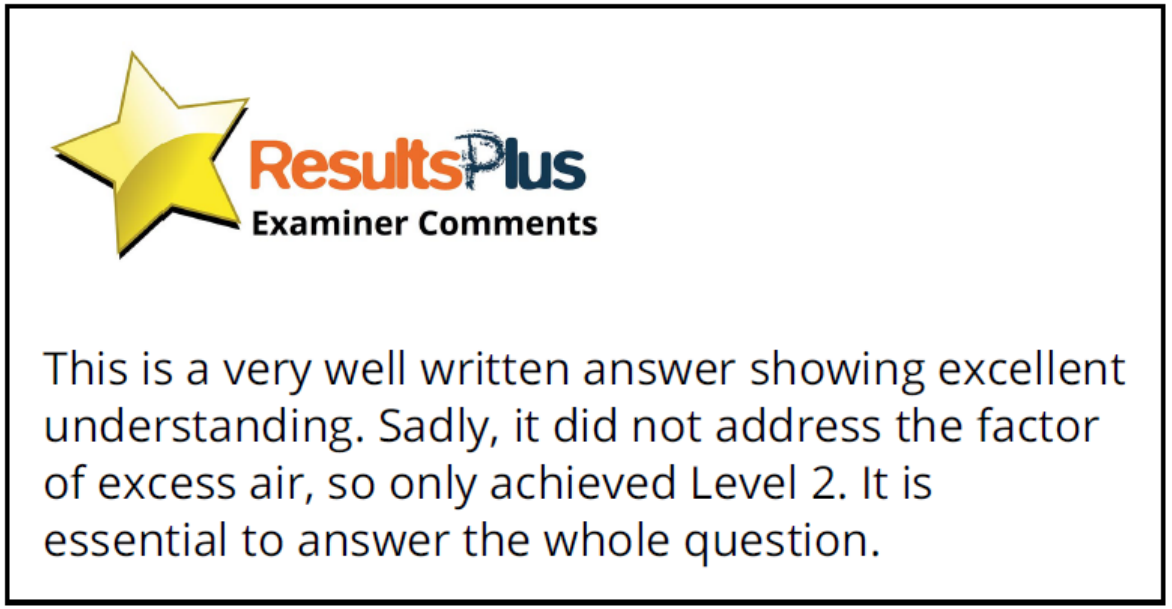
Marking Activity

Chemistry: Chemistry Paper 1 Higher Tier



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Marking Activity

Question 10 (c)

Most candidates attempted this question and discussed at least two factors, with excess air being the most common to leave out of discussion. Marks were generally gained from reference to the effects of pressure and temperature on rate of attainment of equilibrium. The effects of pressure and temperature on yield were given less often and were generally poorer quality responses. Quite a few candidates misidentified that increasing pressure or concentration of reactants 'increases energy of the particles'.

It was surpisingly common to see 10 atm as a decrease in pressure, many candidates seemingly unaware that normal atmospheric pressure is 1 atm. Many candidates just wrote what they had memorised regarding the Haber process. Some candidates compared the conditions in the Haber process to 10 atm pressure and a temperature of 900°C, disregarding the wording of the question.

The least successfully answered section of the question was explaining how excess air affects both rate and equilibrium. Candidates usually understood that extra air would increase yield but were unaware that excess air increased the concentration of oxygen

The poorest answers failed to appreciate that excess air in fact meant excess oxygen, suggested that nitrogen (in the air) was present to be converted into NH_3, NO or HNO_3, or that temperature, excess air and high pressure were 'catalysts'.

Candidates that were most clear structured their work very well, breaking down their answer into paragraphs under 3 headings of air, pressure and temperature, with each explaining rate and separately yield. Those that were not produced answers that were muddled and erratic.

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Marking Activity

Biology: Combined Science Paper 1 Foundation Tier

ResultsPlus
Examiner Comments

This enters Level 1 as there is information stating that tool A is sharper than tool C. This is just a simple observation without a valid explanation so Level 1 can be entered but the lack of linkage means that this is allocated as a low Level 1 and so one mark is awarded.

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Marking Activity

Question 6 (c)

This extended open-response question asked candidates to explain how information about tools found in different layers of rock provides evidence for human evolution. There are three areas of indicative content for this question: the age of the tools, the quality of the tools, and skills and intelligence. The level of the response is determined by the number of areas covered and the mark within the level is determined by how well the areas are linked together.

A Level 1 response required a simple observation from the diagram with a brief explanation from one of the three areas of indicative content.

A Level 2 response required a simple explanation from at least two areas of indicative content.

A Level 3 response required a detailed explanation linking ideas from all three areas of indicative content.

This was an excellent discriminator with the large majority of candidates accessing the question and reasonable percentages of candidates achieving each level and mark awarded, with 4 marks being slightly higher than the others.

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Marking Activity

Physics: Combined Science Paper 1 Higher Tier

ResultsPlus
Examiner Comments

An excellent, well-structured answer that focuses on the production of the two types of electromagnetic radiation.

This is a level 3 response that scored the full 6 marks.

ResultsPlus
Examiner Tip

The candidate has underlined the key word "produced" in the question. This often helps to make sure that the response answers the question.

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Marking Activity

Question 6 (d)

Candidates clearly had good knowledge of the properties of radio and gamma waves and very many spent most of the answer space expanding on comparisons between these properties rather than addressing the question about how they are produced.

There was general understanding that radio waves can be produced by electrical circuits and that gamma waves can originate from the atomic nucleus and this was usually sufficient for a level 2 answer. Examiners were looking for more detail for a level 3 answer. Where supplied, this was either about electrons in an alternating current in wires (for radio) or about energy changes and / or rearrangement of a nucleus (for gamma).

For many candidates, an understanding that radio waves may be produced by communication devices or satellites was just sufficient for level 1.

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Cascading to Your Department

- Use principal examiners' reports (Exam Papers, Mark Schemes and Examiner Reports).
- Edexcel online password.
- What information is on the reports?

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Principal Examiner Report

Question 3 (a) (i)

This question was based on one method of doing the respiration practical using hydrogen carbonate indicator. Candidates were asked how this method could be improved, this is another of the key practical tasks which need to be assessed on all biology papers. In order to improve on the experiment candidates needed to use correct terminology in their responses such as measuring the mass of organisms rather than the number of organisms. The idea of having the same volume of indicator solution. Please note that the amount of indicator solution is not creditable here, candidates must refer to volume for liquids or mass for organisms. Marks were also awarded for the idea of controlling temperature using a water bath. Candidates also lost marks here as they described changing the experiment using a gas syringe etc but this is not an improvement, it is a different experiment.

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(i) State **two** ways this method could be improved to make the results for these three organisms more comparable.

(2)

1 measure the volume of carbondioxide produced using a gas syringe to know the exact amount.

2 more test tubes with the same organisms to get an average mean which can make the results more comparable.

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ResultsPlus
Examiner Comments

The idea of repeating this is acceptable for the mark, here for 1 mark.

It is important that the answer is about controlling this experiment so changing things in the experimental set up is not accepted for this question.

ResultsPlus
Examiner Tip

When referring to solids in controlling variables always refer to the mass of solids. With liquids and gases the term volume is needed for the mark. Please never refer to amount of something in a biology paper as this will not be credited when talking about controlling a scientific variable.

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Marking Calculation Questions

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Marking Calculations

- Showing working
- Error carried forward
- Significant figures
- Units

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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 $= 3.0 \times 10^8$ m/s.

The energy released in one fusion reaction is 4.5×10^{-12} J.

Calculate the decrease in mass.

(3)

$E = mc^2$

$m = \frac{E}{c^2}$

$m = \frac{4.5 \times 10^{-12}}{(3.0 \times 10^8)^2}$

$m = 5 \times 10^{-29}$ kg

decrease in mass = 5×10^{-29} kg

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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.

(3)

A

A = 7

3.5

2

2

1

G

16

4

4

2

2

empirical formula of this compound = AG_2

Error Carried Forward

ResultsPlus
Examiner Comments

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 x 7 = 24.5, followed by 4 x 16 = 64 then adding them together and arriving at a final answer of 88.5.

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Error Carried Forward

Question number	Answer	Additional guidance	Mark
8(d)	**MP1 for dividing by atomic mass** **A : G** 3.5 : 4.0 (1) 7 16 **MP2 for deriving ratio <u>from MP1</u>** 0.5 : 0.25 OR 2 : 1 (1) **MP3 for ratio in MP2 to formula** empirical formula **A_2G** (1)	A_2G with no relevant working (1) ONLY AG_2 (0) 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 ecf on step 1: if inverted, 7 : 16 (0) 3.5 4.0 = 2 : 4 or 1 : 2 (1) AG_2 (1) allow 1 in empirical formula allow Li for A and O for G do not penalise incorrect case in formula	**(3)**

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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

$$\text{speed of sound} = \frac{K}{\sqrt{(\text{density})}}$$ where K 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 / m³
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.

(3)

Significant Figures

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

$$K = 375.94\ldots$$

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

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

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

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Significant Figures

Give your answer to an appropriate number of significant figures.

Cold air $k = 331 \times \sqrt{1.29} = 375.94$ (3)

$k = 375.94$

warm air $= \dfrac{375.94}{\sqrt{1.16}} = 349.05$

ResultsPlus
Examiner Comments

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 = 349.05 **m/s**

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Significant Figures

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

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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: $S = \frac{291.42925}{\sqrt{1.16}}$ $S = 270.5852657 \longrightarrow 271$

ResultsPlus
Examiner Comments

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

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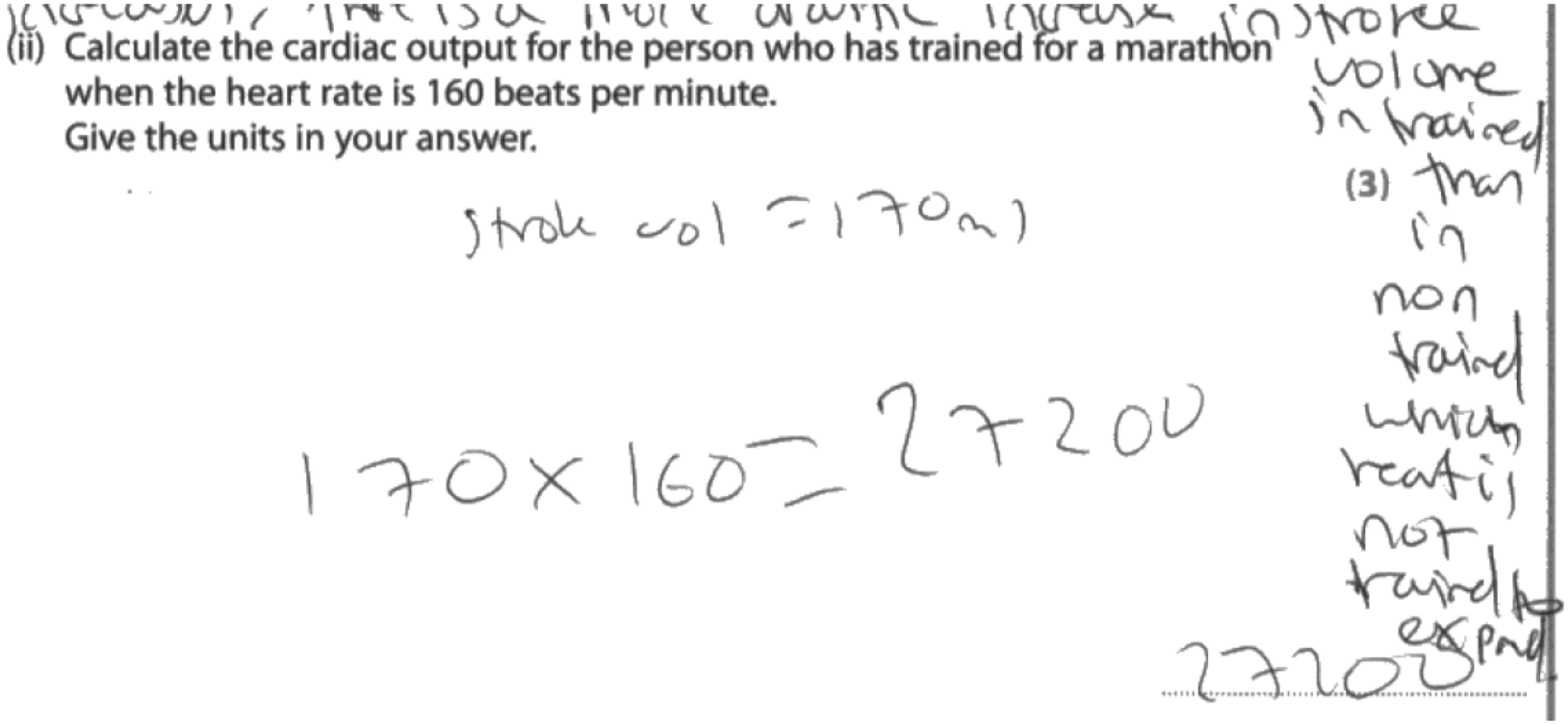
Units

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.



Mark Scheme

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

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Units

ResultsPlus
Examiner Comments

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.

ResultsPlus
Examiner Tip

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.

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Running and Marking Mock Exams

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Managing Mocks

Discussion opportunity:

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

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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.

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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.

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

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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).

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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?

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Today’s Objectives…

- 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.
- To network with colleagues from other centres.

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Next Steps and Evaluation

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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.

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Further Support: Subject Advisor

Irine Muhiuddin

Science

Email: teachingscience@pearson.com

teachingpsychology@pearson.com

Phone: +44 (0) 344 463 2535

(Teaching Services team |

Mon – Fri, 8am – 5pm GMT)

- Sign up for subject advisor updates
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