AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.4.2.2

Response to exercise

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**7**
Available paper years	**2018–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.4.2.2 Response to exercise

Answer 01 · Mark scheme

June 2018 | 8464/B/1F | Original Q4

The full source mark scheme begins on page 24. Follow original question 4 in that document.

4.4.2.2 Response to exercise

Answer 02 · Mark scheme June 2019 | 8464/B/1F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	**B**		1	AO2 4.2.2.2
06.2	right atrium		1	AO1 4.2.2.2
06.3	foxgloves		1	AO1 4.3.1.9
06.4		an answer of 54 (cm^3) scores 3 marks		AO2 4.2.2.2
	X = 2800 / 52		1	
	53.846153		1	
	54 (cm^3)	allow correct rounding of an incorrectly calculated value of stroke volume	1	

4.4.2.2 Response to exercise

Answer 02 · Mark scheme

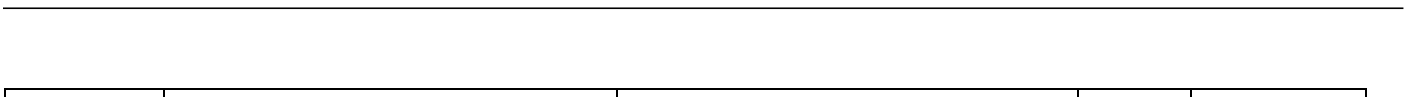
June 2019 | 8464/B/1F | Original Q6

Question	Answers	Mark	AO / Spec. Ref.
06.5	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO3 4.2.2.2 4.2.2.4 4.4.2.1 4.4.2.2
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO2 AO1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	No relevant content	0	
	Indicative content effect of exercise • during exercise body needs to transfer (more) energy • energy transferred during respiration • rate of respiration increases during exercise • (so) more oxygen is needed effect of beta blockers • beta blockers reduce (the increase in) heart rate (during exercise) • beta blockers reduce stroke volume (or described) • beta blockers reduce cardiac output • (so) heart cannot supply oxygen fast enough / in sufficient quantity to muscle cells effect on breathing rate • breathing rate increases to increase rate / amount of oxygen absorbed • breathing rate increases to increase rate / amount of carbon dioxide removed from body • (but) increased breathing rate cannot fully compensate for changes in heart function A level 3 response should make links between all three sections of indicative content A level 2 response should attempt to link effect of exercise with oxygen / energy requirement **and** beta blockers to effect on heart function. .		
Total		**12**	

4.4.2.2 Response to exercise

Answer 02 · Mark scheme

June 2019 | 8464/B/1F | Original Q6



4.4.2.2 Response to exercise

Answer 03 · Mark scheme November 2020 | 8464/B/1F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	eat less fatty food		1	AO2 4.2.2.5 4.2.2.6
01.2	any **two** from: • strengthens muscles • strengthens heart (muscle) • reduces risk of Can younCan(coronary) heart disease / CHD / cardiovascular disease • reduces blood pressure • reduces risk of (Type 2) diabetes • improves mental health / mood • improves mobility	ignore references to losing weight / mass ignore references to immediate effects of exercise on body eg increases heart rate ignore makes you healthier allow makes you stronger allow improves stamina allow keeps your heart healthy allow reduces (blood) cholesterol allow improves circulation allow strengthens bones allow boosts immunity allow reduces risk of (some) cancers allow makes you fitter ignore improves a person's appearance	2	AO2 4.2.2.4 4.2.2.6

4.4.2.2 Response to exercise

Answer 03 · Mark scheme

01.3	glucose + oxygen → carbon dioxide + water		1	AO1 4.4.2.1
01.4	C		1	AO2 4.2.1 4.2.2.2
01.5	any **two** from: • lowest / lower resting breathing rate • lowest / lower breathing rate after exercise • lowest / lower increase in breathing rate • least amount of time for breathing rate to return to resting rate	statements must be comparative allow less time for breathing rate to return to resting rate allow shortest recovery time	2	AO3 4.2.2.2 4.4.2.2
01.6	any **two** from: • only based on one measurement • person B may have done less intense exercise • other factors (besides breathing rate) indicate fitness	allow person B may have done a different type of exercise eg stamina / strength / speed allow age / sex / body mass may not have been controlled ignore references to medical conditions	2	AO3 4.4.2.2

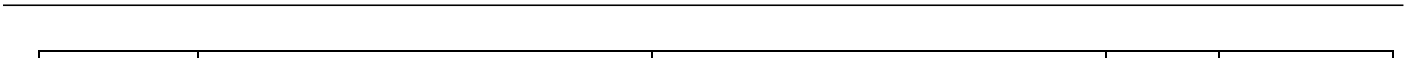
4.4.2.2 Response to exercise

01.7	deeper breathing increased heart rate	allow heavier breathing ignore breathing rate increases allow blood flows faster ignore more blood flows around body allow increased (body) temperature allow (increased) sweating allow increased blood flow to skin do **not** accept lactic acid is produced	1 1	AO1 4.4.2.2
01.8	oxygen lactic acid	word takes precedence allow O_2 ignore O / O^2	 1 1	AO1 4.4.2.1 4.4.2.2
Total			**13**	

4.4.2.2 Response to exercise

Answer 03 · Mark scheme

November 2020 | 8464/B/1F | Original Q1



4.4.2.2 Response to exercise

Answer 04 · Mark scheme

June 2022 | 8464/B/2F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	D		1	AO1 4.5.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	B		1	AO1 4.5.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	(in / through / via) blood(stream)	allow (in / through / via) plasma allow (in / through / via) blood vessels allow (in / through / via) arteries / veins / capillaries	1	AO1 4.5.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	insulin		1	AO1 4.5.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	glucose is converted to glycogen glucose moves from the blood into the cells		1 1	AO1 4.5.3.2

4.4.2.2 Response to exercise

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	8:30 (am)	allow 8:15 – 8:35 (am) allow time written in words	1	AO3 4.5.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	any value in the range ≥ 6.5 to ≤ 20 ($mmol/dm^3$)		1	AO3 4.5.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.8	any **two** from: • low carbohydrate diet • exercise (regime) • lose body mass	 allow low calorie / fat / sugar diet allow eat fewer (sugary) snacks allow description of exercise allow lose weight allow (metformin) tablets to reduce blood glucose	2	AO2 4.5.3.2

4.4.2.2 Response to exercise

Answer 04 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.9	(less) respiration		1	AO1 4.5.3.2
	(so) less energy released / transferred **or** less muscle contraction	do **not** accept energy produced / made / created	1	AO2 4.4.2.1

Total Question 4		**12**

4.4.2.2 Response to exercise

Answer 05 · Mark scheme

June 2023 | 8464/B/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	A		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	left ventricle		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	coronary artery		1	AO1 4.2.2.2 4.2.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	vein		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	to stop blood flowing in the wrong direction	allow to stop blood flowing backwards allow to stop backflow (of blood) allow to keep blood flowing in the correct direction	1	AO1 4.2.2.2

4.4.2.2 Response to exercise

Answer 05 · Mark scheme

June 2023 | 8464/B/1F | Original Q4

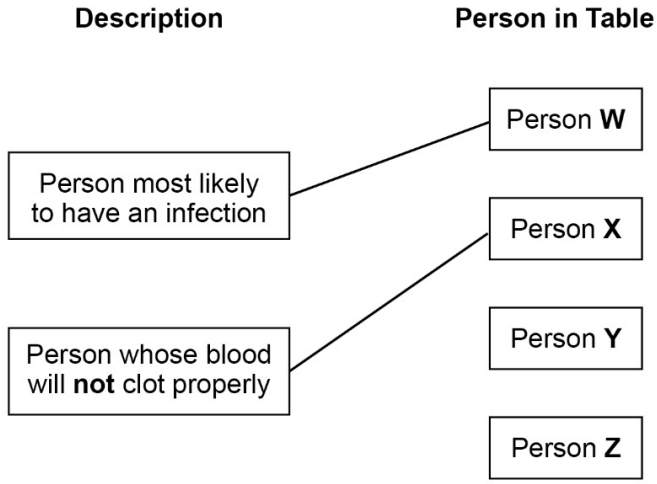
Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	walls that are one cell thick	allow thin walls ignore thin unqualified do **not** accept references to cell walls	1	AO1 4.2.2.2
	(so) there is a short diffusion distance	allow (so) substances can move (quickly) between blood and cells / tissues allow (so) diffusion / movement can happen faster allow (so) there is a short distance for substances to move	1	
	OR			
	large surface area (to volume ratio) (1)			
	for exchange of substances (1)	allow (so) more substances can diffuse / move at the same time (1)		
		allow (very) narrow (1) (so) are close to cells (1)		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	5×10^6		1	AO2 4.2.2.3

4.4.2.2 Response to exercise

Answer 05 · Mark scheme

June 2023 | 8464/B/1F | Original Q4

Question	Answers	Mark	AO / Spec. Ref.
04.8	 do **not** accept more than one line from a box on the left	1 1	AO3 4.2.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.9	more oxygen (can be transported / carried)	allow red blood cells carry oxygen	1	AO2 4.2.2.3 4.4.2.1
	(oxygen) is needed for (aerobic) respiration	allow (so) less anaerobic respiration	1	4.4.2.2
	(so) more energy can be transferred / released	do **not** accept energy is made / produced / created	1	

Total Question 4	13

4.4.2.2 Response to exercise

Answer 06 · Mark scheme

June 2023 | 8464/B/1F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	cancer		1	AO1 4.2.2.7 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	any **one** from: • (coronary) heart disease / CHD / cardiovascular disease • diabetes	ignore cancer allow atherosclerosis ignore heart attack allow high blood pressure allow stroke / asthma / depression / gallstones / (osteo)arthritis allow sleep apnoea	1	AO1 4.2.2.4 4.2.2.5 4.2.2.6

4.4.2.2 Response to exercise

Answer 06 · Mark scheme

June 2023 | 8464/B/1F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	any **one** from: • taxes on high energy / fat / sugar foods • education (about diet and health) • (government) advertising • restrict media advertising of high energy / fat / sugar foods • information on food labels • help / advice / groups for obese people via the NHS • calorie information on restaurant / takeaway menus • regulation of supermarket offers on high sugar / fat / energy foods • regulation of type of foods for sale near checkouts • exercise campaigns	allow increase the price on high energy / fat / sugar foods	1	AO3 4.2.2.5 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	BMI = $\frac{69}{1.64^2}$	allow BMI = $\frac{69}{1.64 \times 1.64}$ allow BMI = $\frac{69}{2.6896}$	1	AO2
	BMI = 25.6(5437….)	allow 26 or 25.7	1	AO2
	(the person's BMI category is) overweight	must be consistent with their calculated BMI value	1	AO3 4.2.2.5 4.2.2.6

4.4.2.2 Response to exercise

Answer 06 · Mark scheme June 2023 | 8464/B/1F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	any **one** from: • women will gain mass / weight (during pregnancy) • (developing) baby will increase mass / weight of woman	allow BMI (of woman) will increase (during pregnancy)	1	AO3 4.2.2.5 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	any **two** from: • smokers had babies with lower birth mass • women / smokers / non-smokers with higher BMI had heavier babies • smoking had the greatest effect on birth mass in underweight women • smoking had the least effect on birth mass in overweight women • smoking had less effect on birth mass in overweight and obese women (than in underweight and healthy weight women)	statements must be comparative allow converse statements allow weight for mass allow obese women have the heaviest / heavier babies allow underweight women have the lightest / lighter babies allow there is only a 365 g difference between the smallest and largest babies	2	AO3 4.2.2.5 4.2.2.6

4.4.2.2 Response to exercise

Answer 06 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.7		assume 'it' refers to the virus		AO1 4.3.1.1 4.3.1.2
	coughs / sneezes (spread virus in droplets)	allow breathing out (spreads virus in droplets)	1	
	droplets / virus are inhaled	allow droplets / virus are breathed in ignore contact with infected person unqualified allow touch a contaminated surface **and** then touch your mouth / nose / eyes for **1** mark if no other marks awarded allow kissing for **1** mark only	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.8	$\frac{17}{100}$ × 67 961 900	allow 0.17 x 67 961 900	1	AO2 4.3.1.4
	= 11 553 523	allow 11 553 500	1	

4.4.2.2 Response to exercise

Answer 06 · Mark scheme

June 2023 | 8464/B/1F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.9	any **one** from: • dry feet thoroughly (after washing) • do not share socks / tights / shoes / towels • use a fungicide • do not walk around barefoot in public / contaminated areas	allow use foot powder ignore keep feet dry ignore wash feet regularly allow named fungicide allow wear silver(-impregnated) socks allow wear flip flops in public / contaminated areas ignore avoid moist conditions	1	AO2 4.3.1.1 4.3.1.4

Total Question 6	**14**

4.4.2.2 Response to exercise

Answer 07 · Mark scheme

June 2025 | 8464/B/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	glucose		1	AO2 4.4.2.1 4.4.2.2
	oxygen		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	40 − 15		1	AO3
	25 (minutes)		1	AO2 4.4.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3		allow a correct calculation given to 2 significant figures using person **A** for **2** marks		AO2 4.4.2.2
	$\frac{104-60}{60} \times 100$	allow $\frac{44}{60} \times 100$	1	
	73.3(3333333…)		1	
	73 (%)		1	
		allow **2** marks for $\frac{102 - 60}{60} \times 100 = 70$ (%)		
		allow **1** mark for 0.73		

4.4.2.2 Response to exercise

Answer 07 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	any **two** from: person **B** • has a lower resting heart rate • has a smaller increase in heart rate • has a lower maximum heart rate • reaches their maximum heart rate later • has a shorter recovery time	answers must be comparative allow converse if clearly referring to person **A** allow takes longer to reach their maximum heart rate allow takes a shorter time to reach resting heart rate allow has a lower oxygen debt if no other marks awarded allow **1** mark for person **B** has lower heart rate	2	AO3 4.4.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	suitable scale for *y*-axis	a bar height must use at least half of graph paper	1	AO2 4.4.2.2
	bars plotted correctly	allow a tolerance of $\pm \frac{1}{2}$ small square the bars can be in any order ignore the width of the bar ignore if bars are touching	1	
	bars labelled correctly	allow the use of a correct key	1	

4.4.2.2 Response to exercise

Answer 07 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	$\propto$		1	AO1 4.4.2.2

Total Question 4	**13**

4.4.2.2 Response to exercise

AQA

GCSE
COMBINED SCIENCE: TRILOGY

8464/B/1F – BIOLOGY PAPER 1 FOUNDATION TIER

Mark scheme

8464

June 2018

Version/Stage: 1.0 Final

4.4.2.2 Response to exercise

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

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4.4.2.2 Response to exercise

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening and underlining

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

4.4.2.2 Response to exercise

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution?

[1 mark]

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system.

[2 marks]

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

4.4.2.2 Response to exercise

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ecf in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

Ignore is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

3.10 Do <u>not</u> accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

4.4.2.2 Response to exercise

Step 1: Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

Step 2: Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this.

The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

4.4.2.2 Response to exercise

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	cell membrane	extra ticks negates marks	1	AO1 4.1.1.2
01.2	engulf pathogens produce antibodies produce antitoxins	extra ticks negates marks	1 1 1	AO1 4.2.2.3 4.3.1.6
01.3	2050 − 100 = 1950	an answer of 1950 scores **2** marks allow **1** mark for a correct subtraction of incorrect values	1 1	AO2 4.3.1.2
01.4	any **one** from: • (more) people vaccinated • (more) people immune • no new measles strain	ignore injections / treatments / medicines unqualified allow vaccine produced allow (more people given) MMR (vaccine) do **not** allow antibiotics ignore less people infected	1	AO2 4.3.1.1 4.3.1.2 4.3.1.7
01.5	any **one** from: • measles is (caused by) a virus • viruses cannot be killed / destroyed by antibiotics	allow measles is not caused by a bacterium allow antibiotics **only** kill / destroy bacteria ignore harmed / treated	1	AO1 4.3.1.1 4.3.1.8 4.3.1.2
01.6	any **one** from: • use of a barrier method of contraception • use of a condom • vaccination / immunisation • avoid sexual intercourse / contact	ignore use of diaphragm ignore use protection / safe sex do **not** accept less sexual intercourse / contact	1	AO1 4.3.1.3

4.4.2.2 Response to exercise

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	any **one** from: • size / shape/ type of paper disc • concentration of antibiotic • volume / amount of antibiotic • (incubation) time • (incubation) temperature	ignore paper disc unqualified allow strength / dosage of antibiotic allow 3 days ignore size of petri dish	1	AO2 4.3.1.8
01.8	to check that the disc / water did not have an effect **or** to make sure it was the antibiotic that had an effect	allow for comparison with the antibiotics allow as a (experimental) control do **not** accept as a control variable	1	AO3 4.3.1.8
01.9	(antibiotic) **A** any **one** from: • (antibiotic **A**) had the larg**est** clear area around it • (antibiotic **A**) killed the **most** bacteria	no marks if wrong antibiotic given	1 1	AO3 4.3.1.8
Total			**13**	

4.4.2.2 Response to exercise

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	glucose oxygen	extra ticks negates marks	1 1	AO1 4.4.1.1
02.2	count the number of bubbles produced in 1 minute measure the volume of gas produced in 30 seconds	extra ticks negates marks	1 1	AO3 4.4.1.2
02.3	any **one** from: • to control the temperature • temperature affects the rate of photosynthesis	ignore reference to 'it' allow so pondweed / solution did not warm up allow correct description of effect of temperature on rate allow high temperatures denature enzymes ignore references to limiting factors	1	AO3 4.4.1.2
02.4	52		1	AO2 4.4.1.2
02.5	all points plotted correctly smooth curve drawn through all points	(where a bar chart has been plotted) allow **1** mark for all bars plotted correctly if points are plotted as well as bars, ignore bars allow ± ½ a square allow **1** mark for three points correctly plotted ignore extensions of line / curve unless inconsistent with line / curve drawn	2 1	AO2 4.4.1.2

4.4.2.2 Response to exercise

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	any **one** from: • the nearer the light source to the pondweed the faster the rate of photosynthesis • the greater the light intensity the faster the rate of photosynthesis	allow converse statements for all marking points allow the nearer the light source to the pondweed the faster the bubbles produced allow the greater the light intensity the faster the bubbles produced allow the closer the light source the more the plant photosynthesises ignore more bubbles are produced with no reference to rate allow oxygen for bubbles do **not** accept carbon dioxide	1	AO3 4.4.1.2
Total			**10**	

4.4.2.2 Response to exercise

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **one** from: • water on potato would increase mass • to control amount of water on potato	allow so only the mass of the potato is measured allow to remove water from outside of potato allow liquid / solution / sugar solution for water allow so you get the correct (starting) mass of the potato do **not** accept so that all the pieces of potato weighed the same	1	AO3 4.1.3.2
03.2	increase in mass increase in length	extra ticks negate marks	1 1	AO2 4.1.3.2
03.3	osmosis into lower	in this order only allow diffusion allow inside do **not** accept through allow low / more dilute / dilute	1 1 1	AO1 4.1.3.2 AO2 4.1.3.2 AO2 4.1.3.2
03.4	any **one** from: • the concentration (of sugar solution) in the cells is 0.4 (mol/dm^3) • the concentration (of sugar solution) in the cells is the same as the solution (in the tube)	allow reference to potato instead of cells	1	AO3 4.1.3.2

4.4.2.2 Response to exercise

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	any **two** from: • has (root) hairs • large surface / area • (root) hairs extend into soil • (root) hairs have thin walls	ignore references to active transport and mineral uptake allow root hair cells allow wide surface area allow (root) hairs are long / widespread	2	AO1 4.1.1.3 4.1.3.1 4.1.3.2
Total			**9**	

4.4.2.2 Response to exercise

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1		**max 2** marks if written in terms of heart rate		AO2 4.4.2.2
	breathing rate when walking is twice that at rest	allow breathing rate when walking is 12 (breaths / minute) more than at rest	1	
	breathing rate when jogging is 5 times that at rest	allow breathing rate when jogging is 48 (breaths / minute) more than at rest	1	
	breathing rate when jogging is 2.5 times that when walking	allow breathing rate when jogging is 36 (breaths / minute) more than when walking	1	
		allow for **1** mark if no other marks gained: breathing rate at rest is 12 (breaths per minute), breathing rate when walking is 24 (breaths per minute) and breathing rate when jogging is 60 (breaths per minute) **or** breathing rate increases with increasing activity		

4.4.2.2 Response to exercise

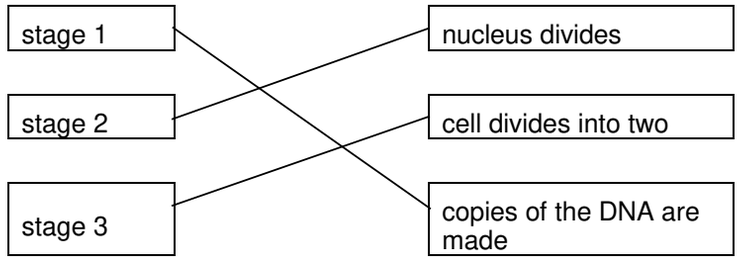
Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	(breathing rate increases)	reference to more / faster required at least once for full marks		AO1 4.4.2.2
	to supply more oxygen / O_2 **or** to supply oxygen / O_2 faster	allow to remove more carbon dioxide / CO_2 **or** to remove carbon dioxide / CO_2 faster do **not** accept incorrectly written formulae	1	
	for (aerobic) respiration **or** to reduce anaerobic respiration **or** to reduce lactic acid build up		1	
	(so) that more energy is transferred / released **or** (because) more energy is required	do **not** accept used / produced / created or energy made	1	
04.3	right ventricle / side of the heart pumps (blood) to the lungs		1	AO1 4.2.2.2
	left ventricle / side of the heart pumps (blood) to the body		1	
		if no other marks scored allow **1** mark for one side pumps blood to the lungs and the other side pumps blood to the body		

4.4.2.2 Response to exercise

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	any **one** from: • (the left ventricle) has to pump blood further (than the right ventricle) • (the left ventricle) has to pump blood with a greater force (than the right ventricle) • (the left ventricle) has to pump blood at a higher pressure (than the right ventricle)	there must be a comparative statement allow (the left ventricle) has to pump blood all around the body allow (left ventricle) has to pump blood harder	1	AO2 4.2.2.2
04.5	any **one** from: • strengthens heart (muscle) • reduces chance of another heart attack • reduces / controls weight • improves circulation	ignore prevents / no heart attacks allow decreases chance of fatty deposits **or** fat building up (in arteries / blood vessels) allow reduces resting heart rate	1	AO2 4.2.2.2 4.2.2.6
Total			**10**	

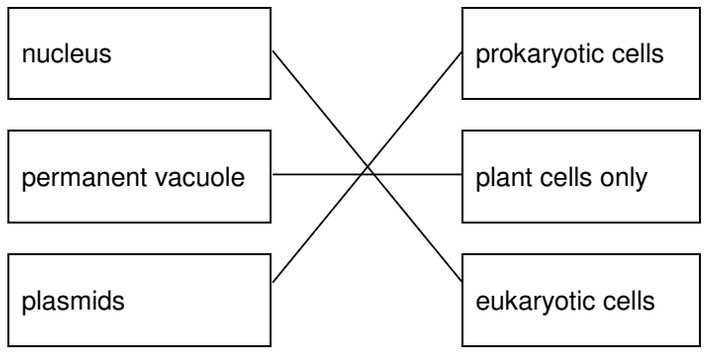
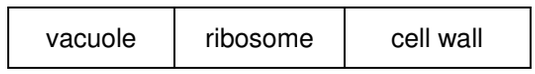
4.4.2.2 Response to exercise

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	 allow **1** mark for 1 or 2 correct credit can be given where students have matched the boxes correctly, for example numbering the boxes		2	AO1 4.1.2.2
05.2	6 picograms		1	AO2 4.1.2.2
05.3	meristem cells in plants can differentiate throughout the life of the plant		1	AO1 4.1.2.3

4.4.2.2 Response to exercise

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	any **two** from: • may cure / treat diseases **or** cure medical conditions **or** produce replacement cells / tissues / organs • cells unlikely to be **rejected** by patient • cells / tissues of any type can be produced • many cells produced • cells produced could be used for research • would reduce waiting time for transplants	ignore references to cost ignore all reference to producing babies / IVF allow example eg diabetes / paralysis allow cells can be stored for future use ignore used in medical treatments ignore patient makes / grows cells / tissues / organs ignore same genetic information ignore differentiated into most types of cells	2	AO3 4.1.2.3 4.1.1.4 4.6.2.4
05.5	any **two** from: • (potential) life is killed / destroyed • shortage of donors / eggs • egg donation / collection has risks • do not yet know risks / side effects of the procedure on the patient • may transfer (viral) infection • poor success rate	ignore references to cost ignore unethical unqualified Ignore reference to religion / beliefs allow embryo is killed ignore embryo is destroyed ignore embryo is a life / becomes a baby ignore long term effects are not well understood allow may cause tumours / cancer allow in terms of viable egg / embryo / cell / tissue / organ production	2	AO3 4.1.2.3 4.1.1.4 4.6.2.4
Total			**8**	

4.4.2.2 Response to exercise

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	 allow **1** mark for one or two correct links		2	AO1 4.1.1.1 4.1.1.2
06.2	 tick box takes precedence if no tick is given, look at both the figure and the circling of words in the table if writing is seen on the figure and in the table both must be correct		1	AO1 4.1.1.2
06.3	turn the (fine focusing) knob until the cells are in focus	allow focus it do **not** accept increase magnification ignore decrease magnification ignore clear ignore references to resolution / illumination ignore zoom in / out	1	AO2 4.1.1.2

4.4.2.2 Response to exercise

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	(rotate the) nosepiece / objective lens	allow change the (objective / eyepiece) lens	1	AO2 4.1.1.2
	to a higher power (lens)	allow (to) increase the magnification a comparator is required ignore change / adjust the magnification allow stronger or more powerful lens ignore references to resolution / illumination unqualified ignore zoom in / out ignore references to an electron microscope	1	

4.4.2.2 Response to exercise

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5		an answer of 400 (×) scores **3** marks		AO2 4.1.1.2
	conversion of units: (112 mm →) 112 000 (µm) **or** (280 µm →) 0.28 (mm)		1	
	(magnification =) $\frac{112}{0.28}$ **or** (magnification =) $\frac{112\,000}{280}$	allow **1** mark for no conversion of units 112 / 280 **or** incorrect value from step 1 correctly substituted	1	
	400 (×)	do **not** accept if units are given	1	
		if no other mark scored allow **1** mark for: magnification = $\frac{\text{size of image}}{\text{size of real object}}$ a triangle with words or letters in is insufficient, as the correct rearrangement is needed		
Total			**9**	

4.4.2.2 Response to exercise

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	is not caused by a pathogen / infective organism	allow not caused by a microorganism / microbe ignore not caused by infection ignore named pathogen unless bacteria, virus and fungus all mentioned	1	AO1 4.2.2.4 4.2.2.5 4.3.1.1 4.3
	(so) is not passed / spread (from person to person)	allow cannot be spread / caught allow is not infectious / contagious	1	AO2 4.2.2.4 4.2.2.5 4.3.1.1 4.3
07.2		allow 'it' for heart		AO1 4.2.2.4
	reduced / restricted / stopped blood flow	it does not matter where blood flow is restricted to – heart / body	1	
	(so) less oxygen reaches heart (muscle / cells)	must reference heart / it allow no oxygen reaches the heart (muscle / cells)	1	
	(so heart muscle / cells) cannot respire (enough) **or** (so heart muscle / cells) do not release (enough) energy	do **not** accept do not make / produce / create energy ignore references to breathing / suffocation ignore blood clots / blockages	1	

4.4.2.2 Response to exercise

Question	Answers	Mark	AO / Spec. Ref.
02.3	**Level 3:** Relevant points (factors / effects) are identified, given in detail and logically linked to form a clear account.	5–6	AO2
	Level 2: Relevant points (factors / effects) are identified and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO2 AO1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	No relevant content	0	
	Indicative content **medical risk factors:** • high blood pressure • high cholesterol • diabetes • genetic factors • medications **lifestyle risk factors:** • smoking • obesity • lack of exercise • high fat / energy diet • eating insufficient fruit / vegetables • alcohol • high salt intake • exposure to air pollution • certain drugs / correct named drug **examples of links:** • smoking – high bp / cholesterol / fatty deposition • obesity – lack of exercise / high bp / cholesterol / fatty deposition / diabetes • exercise – obesity / bp /diabetes • diet – obesity / cholesterol / diabetes • alcohol – bp / cholesterol • high salt intake - high blood pressure • genetic factors – bp / cholesterol / diabetes / obesity • medication – can affect blood / blood vessels / metabolism the main discriminator is the quality of linking both lifestyle and medical factors are required for **level 3**		4.2.2.2 4.2.2.4 4.2.2.5 4.2.2.6
Total		**11**	

4.4.2.2 Response to exercise

Answer 04 · Examiner comments June 2022 | 8464/B/2F | Original Q4

Question 4 (low & standard demand)

04.1 Two-thirds of students could identify the pancreas on Figure 5.

04.2 72% of students could identify the thyroid gland on Figure 5.

04.3 62% of students gained this mark. Blood, bloodstream and blood vessels were the most commonly seen correct answers. Named blood vessels were acceptable, as was plasma, but this was rarely seen.

Common misconceptions were seen, such as hormones travelling in blood cells, electrical impulses transporting hormones or the brain sending hormones out to the rest of the body.

04.4 45% of students gave the correct answer ‘insulin’. Phonetic spelling was allowed. Incorrect answers included a range of other hormones, diabetes and pancreas.

Answer 04 · Examiner comments June 2022 | 8464/B/2F | Original Q4

04.5 A fifth of students could identify two ways that hormone X causes a decrease in blood glucose concentration.

04.6 Students found this challenging, with fewer than 43% gaining the mark. Some students incorrectly gave the time that the graph peaked, others the trough or the start of the *x*-axis.

04.7 This was another challenging question, with a third of students gaining the mark.

04.8 Most students could give at least one lifestyle change. Exercise or descriptions of exercise were the most common correct response.

04.9 Students found this a very challenging question. Few students made correct reference to respiration. Energy was often referred to in incorrect terms, such as glucose making energy or glucose being needed to feel energised. Some students stated that you need lots of glucose for energy which was insufficient. Other students confused the idea that low blood glucose was because of insulin in this case.

4.4.2.2 Response to exercise

Answer 05 · Examiner comments June 2023 | 8464/B/1F | Original Q4

Question 4

04.1 Just under a third of students identified blood vessel A as the vena cava. Despite the question saying that the vena cava carries blood into the heart, vessels B and C, the pulmonary artery and the aorta, were selected almost as often as the correct answer.

04.2 Less than a third of students knew that the left ventricle is the chamber that pumps blood to the body.

04.3 Less than a third of students knew that the blood vessel that carries blood to the heart muscle is called the coronary artery. Most students thought it was the pulmonary artery.

04.4 Responses for identifying the blood vessel that has valves were evenly split between artery, capillary and vein.

04.5 Only a quarter of students knew the function of valves. The idea of preventing backflow of blood, or keeping blood flowing in the correct direction was required. Common incorrect responses included to pump blood, to control the flow of blood, to open and close or to prevent leaks.

04.6 Fewer than a fifth of students scored any marks. Of these most scored 1 mark, usually for saying capillaries have thin walls. Simply saying capillaries are thin was insufficient. There were many misconceptions about the structure of a capillary; some saying they had valves, a thick wall or a large lumen. Very few students understood the function of capillaries.

04.7 Over four fifths of students recognised how 5 000 000 is written in standard form.

04.8 Only a tenth of students scored both marks. Two fifths of students scored at least 1 mark which was usually for identifying Person X, who had the lowest concentration of platelets, as the person whose blood would not clot properly. Quite a lot of students thought Person X would also be most likely to have an infection.

04.9 Almost four fifths of students scored the first marking point for saying that more oxygen can be transported if there are more red blood cells. Knowing that oxygen is transported by red blood cells gained credit. Only a few students said oxygen is needed for respiration. Only a tenth of students scored 2 or more marks. This was usually for marking points 1 and 3, for example more oxygen can be carried so the athlete has more energy. If they said energy was made, produced or created the third marking point could not be awarded.

4.4.2.2 Response to exercise

Answer 06 · Examiner comments

June 2023 | 8464/B/1F | Original Q6

Question 6

Question 6 was common to both tiers and was set at standard demand.

06.1 The vast majority of students selected cancer as a non-communicable disease. Only a tenth of students selected an incorrect disease, and these were evenly split across AIDS, gonorrhoea and malaria.

06.2 Three quarters of students scored the mark for naming a non-communicable disease that obesity is a risk factor for. Diabetes or heart disease, which are both listed in the specification were the most common responses. References to heart attack or heart failure were ignored as a named disease was required.

06.3 A quarter of students suggested a national policy that could help people to lose weight. The most common suggestions related to increasing taxes on unhealthy foods. This was usually phrased as increase the cost of unhealthy foods. A few suggested decreasing the cost of healthy foods.

Quite a lot of students suggested providing free gym memberships, or more public sports facilities. Some referred to mandatory PE lessons in school. References to labelling the energy content of foods and meals on packaging and menus were also made.
A common mistake was to give lifestyle changes that an individual could make, rather than a policy that a national organisation or the Government could make. Exercise regularly and eat a balanced diet were often stated, but these did not gain credit. Saying increase the recommended amount of daily exercise a person should do would gain credit, as this suggests a national policy.

06.4 In this BMI calculation 1 mark was for the correct substitution into the equation. The second mark was for a correct calculation, which was usually given as 25.65. Most students did show their working, which was good to see. The final mark was for selecting the correct BMI category that matched their final answer. Therefore, if a student did an incorrect calculation, they could still score the third mark. This was sometimes seen if they didn't square 1.64, and gave an answer of 42.07 with the BMI category obese. On the Foundation tier well over half the students scored full marks. A tenth of students scored 2 marks. These were usually for a correct calculation, but then they did not give the BMI category. Just over a tenth scored 1 mark for identifying the correct BMI category for an incorrectly calculated BMI.

4.4.2.2 Response to exercise

Answer 06 · Examiner comments June 2023 | 8464/B/1F | Original Q6

06.5 Over a third of students scored the mark for saying that women gain weight when pregnant, or that their mass will increase due to the baby. A clear reference to the weight, mass or BMI of the woman increasing was needed, so saying the woman's weight would change was insufficient. Incorrect responses included saying the BMI category was calculated before the woman became pregnant to see if she was healthy enough to have a baby, or to check the baby's health. Some described the harmful effects of smoking on a developing baby, which did not answer the question.

06.6 Two conclusions were needed, so smoking or BMI of the mother had to be linked to the birth mass, or weight, of the babies. Comparative statements were needed. Half of the students scored at least 1 mark, and well over a tenth of students gave two correct conclusions.
The most common correct response was that non-smokers had heavier babies. Some students repeated this conclusion by also stating the converse, saying smokers had lower birth mass babies. These two statements could only score 1 mark. A reference to a healthier weight was often seen, which was insufficient. The main misunderstanding was that smoking affected the woman's mass, and not the birth mass of the baby. Some students gave general recommendations to stop smoking and to eat a healthy diet, which did not answer the question.

06.7 The first marking point was for how the virus is transferred out of an infected person. Two fifths of students scored this mark for saying by coughing or sneezing. The second mark was for how the virus is taken in by a second person. Few students scored the second mark. Many thought the virus was transferred by direct contact or sexual intercourse. Some said the virus travels in the air, but they did not describe how it left one person and entered another.

06.8 Just over half the students scored full marks for the percentage calculation to estimate the number of people with athlete's foot. Some students incorrectly converted 17% to 0.017, rather than to 0.17 Other students attempted to calculate 1% of 67 961 900, then multiply this value by 17 to obtain their answer. Errors were often made when calculating 1%.

06.9 Only just over a tenth of students scored a mark for suggesting one way a person could reduce their chance of catching athlete's foot. References to washing feet regularly were very common which were ignored. Saying keep your feet dry was too vague, a reference to drying feet thoroughly, properly or between the toes after washing was required, which was rarely seen. Vague statements about wearing clean socks, or not wearing shoes and socks were common. The idea of covering the feet when walking around at a public swimming pool was suggested by some students, but saying don't walk around barefoot, without qualification, was ignored.

4.4.2.2 Response to exercise

Answer 07 · Examiner comments

Question 4 (Low and Standard demand)

04.1 97% of students gained at least one mark, with 57% gaining both marks.

04.2 Some students correctly identified the region of the graph where the heart rate was elevated and sustained and used this to accurately calculate the exercise duration.

A significant number of students misinterpreted the graph. The most common error was to select the point where the heart rate had returned to its resting level and take that as the end of exercise, resulting in an incorrect answer of 35 minutes.

Others assumed that only the rising and falling sections of the graph indicated exercise or incorrectly believed that the period of maximum heart rate represented rest.

04.3 Most students completed the calculation correctly and rounded appropriately to two significant figures.

Most accurately identified both the maximum and resting heart rates from the graph and substituted these values into the correct formula. However, some students struggled with interpreting the *y*-axis scale, leading to the use of incorrect values.

The most commonly error was using 102 instead of 104 for person B's maximum heart rate. Similarly, some students incorrectly used person A's data. Both of these were able to gain compensatory marks. Only those alternative responses listed in the mark scheme were credited.

04.4 This question had good discrimination, over 66% of students gained 1 mark and over 27% gained both marking points.

To gain credit, students needed to make comparative statements using data from the graph. For example, 'Person A has a resting heart rate of 86, but Person B's resting heart rate is lower at only 60' would be awarded 1 mark as it is clearly comparative.
In general, 'lower resting heart rate' and 'lower maximum heart rate' for person B were the most common correct answers. The converse was also acceptable, such as 'Person A has a higher resting heart rate'.

Responses such as 'the heart rate came down faster' or 'went up slower' were too vague unless they clearly referenced before and after exercise or specified resting or maximum heart rate. Similarly, references to the time spent exercising or time taken to reach maximum heart rate did not gain credit.

The strongest responses used clear, comparative language and focused on key measures of fitness such as resting heart rate, maximum heart rate or recovery time — phrased with reference to either before or after exercise.

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4.4.2.2 Response to exercise

Answer 07 · Examiner comments June 2025 | 8464/B/1F | Original Q4

0 4 . 4 A student stated:

'Person **B** is fitter than person **A**.'

Give **two** pieces of evidence to support the student's statement.

Use **Figure 8**.

[2 marks]

1 their heart rate goes upto 104 maximum whereas Person A goes upto 136 bpm

2 Person B's resting heart rate is 60 whereas person A's is 86 bpm

This response was awarded 0 marks. The student simply quotes data taken directly from the graph without making any comparative statements.
To gain credit, the response needed to go beyond quoting figures and make a clear comparison—for example, stating that 'Person A's heart rate increases to a maximum of 104 bpm, whereas Person B's goes up to a higher rate of 136 bpm.'
This was a common issue across responses, where students showed they could extract relevant data but did not develop their answers to include the comparative language required by the question.

04.5 73% of students gained more than two marks on this question. Students who chose a suitable linear scale generally went on to plot and label their bars correctly.

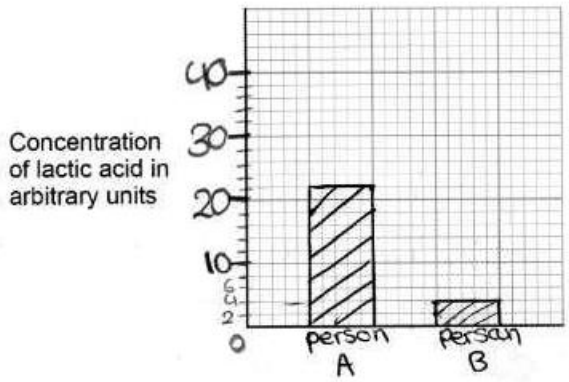
The most common issue was selecting an appropriate scale for the *y*-axis. A significant number of students used non-linear scales, such as 0, 5, 10, 20, 30, which made it difficult to plot accurate bars. Others chose unsuitable interval sizes, such as attempting to scale by 4.4 arbitrary units per centimetre, which led to considerable difficulty in producing consistent or readable graphs.
Some students also used overly simplistic scales, such as intervals of 10, which did not allow for appropriately sized or well-distributed bars.

In addition to scale errors, a number of students mislabelled their bars, mixing up categories or omitting labels entirely. A fairly large proportion also used incorrect graph types, such as scatter graphs or line graphs, instead of the required bar chart.

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4.4.2.2 Response to exercise

Answer 07 · Examiner comments



This response was awarded 2 marks and is a typical example of a student who selected a scale that was too small to make full use of the graph space. Despite this, the student correctly plotted the bars according to their chosen scale and accurately labelled each bar.

While the scale limited the clarity and precision of the graph, the technical accuracy of the plotting and labelling met the requirements for 2 marks. This was a common pattern across responses where students demonstrated sound graphing skills but lost marks due to poor scale selection.

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