AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.2.2.2

The heart and blood vessels

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**8**
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.

4.2.2.2 The heart and blood vessels

Answer 01 · Mark scheme June 2018 | 8464/B/1F | Original Q4

The full source mark scheme begins on page 19. Follow original question 4 in that document.

Answer 02 · Mark scheme June 2018 | 8464/B/1F | Original Q7

The full source mark scheme begins on page 19. Follow original question 7 in that document.

4.2.2.2 The heart and blood vessels

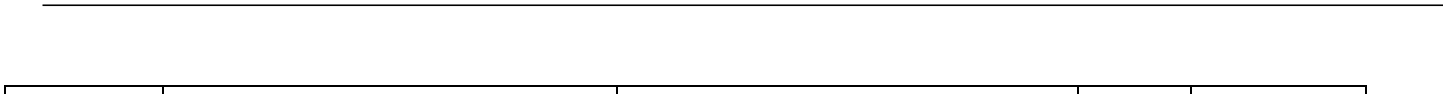
Answer 03 · Mark scheme June 2019 | 8464/B/1F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	diffusion		1	AO1/1 4.1.3.1
02.2	(SA of one face = 2 × 2) =4 (Total SA = 4 × 6) = 24 (Volume = 2 × 2 × 2) =8 (SA:volume ratio =) 24:8 **or** 3:1	ignore units allow correct calculation using their calculated SA of 1 face x 6 ratio must be consistent with their figures	1 1 1 1	AO2 4.1.3.1
02.3	red (blood) cell(s)	allow erythrocyte(s)	1	AO1 4.2.2.3
02.4	carbon dioxide	name takes precedence allow CO_2 ignore CO^2 / CO2 ignore water (vapour)	1	AO2 4.2.2.2 4.2.2.3 4.4.2.1
02.5	any **two** from: • wall of alveolus (only) one cell thick • wall of capillary (only) one cell thick • cells of alveolus / capillary wall are flattened / thin • good blood supply • (well) ventilated	ignore large surface area ignore many alveoli ignore moist lining if none of these mentioned allow **1** mark for idea of short distance between (air in) alveolus and blood	2	AO1 4.1.3.1 4.2.2.2
Total			**9**	

4.2.2.2 The heart and blood vessels

Answer 03 · Mark scheme

June 2019 | 8464/B/1F | Original Q2



4.2.2.2 The heart and blood vessels

Answer 04 · 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	

4.2.2.2 The heart and blood vessels

Answer 04 · Mark scheme

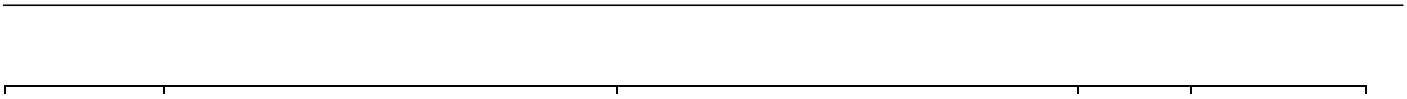
June 2019 | 8464/B/1F | Original Q6

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**	

4.2.2.2 The heart and blood vessels

Answer 04 · Mark scheme

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



4.2.2.2 The heart and blood vessels

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

4.2.2.2 The heart and blood vessels

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

4.2.2.2 The heart and blood vessels

Answer 05 · Mark scheme

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

Question	Answers	Mark	AO / Spec. Ref.
04.8	Description → Person in Table 2 Person most likely to have an infection → Person **W** Person whose blood will **not** clot properly → Person **X** Person **Y** Person **Z** 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

4.2.2.2 The heart and blood vessels

Answer 06 · Mark scheme

June 2023 | 8464/B/1F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	(A) trachea (B) bronchus	 must be in this order	1 1	AO1 4.2.1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	D		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	any **two** from: • many alveoli • large surface area • short diffusion distance • wall of alveolus only one cell thick • wall of blood capillaries only one cell thick • good blood supply • well ventilated	 allow short distance for gas to travel across allow (wall of) alveolus is thin do **not** accept cell wall allow thin (wall of) blood capillary do **not** accept cell wall ignore moist	2	AO1 4.2.2.2 4.1.3.1

4.2.2.2 The heart and blood vessels

Answer 06 · Mark scheme

June 2023 | 8464/B/1F | Original Q5

Question	Answers	Mark	AO / Spec. Ref.
05.4	**Level 2:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	3–4	AO2 4.2.2.2 4.4.2.1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content • less oxygen in exhaled air (than inhaled air) o (because) the body has used some oxygen o for respiration • more carbon dioxide in exhaled air (than inhaled air) o (because) carbon dioxide is produced in respiration o carbon dioxide can cause poisoning (in high concentration) o (so) needs to be removed from the body • no difference in the percentage of nitrogen in inhaled and exhaled air o (because) nitrogen is not used by the body • more water vapour / moisture in air breathed out o (because) water is produced in respiration • exhaled air is warmer (than inhaled air) o (because) energy is transferred during respiration o thermal energy of body warms the exhaled air For **Level 2**, explanation(s) and difference(s) must be given		

4.2.2.2 The heart and blood vessels

Answer 06 · Mark scheme

June 2023 | 8464/B/1F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	any **one** from: • there are other gases present • water (vapour) is present • the numbers are rounded	allow named gas eg argon	1	AO3 4.2.2.2 4.4.2.1

Total Question 5	**10**

4.2.2.2 The heart and blood vessels

Answer 07 · Mark scheme

June 2024 | 8464/B/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	pain when urinating		1	AO1 4.3.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	any **one** from: • not all cases are reported / recorded • (there may be) false positives / negatives • references to population numbers only being estimates	allow people may not know they have it allow idea of misdiagnosis	1	AO3 4.3.1.3 4.2.2.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	bar chart		1	AO2 4.3.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	to compare **or** different cities have different population sizes	allow cities are different sizes	1	AO3 4.3.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	high fat diet smoking		1 1	AO2 4.2.2.4 4.2.2.6

4.2.2.2 The heart and blood vessels

Answer 07 · Mark scheme

June 2024 | 8464/B/1F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	a stent		1	AO2 4.2.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	less / no blood (flow)		1	AO2 4.2.2.4 4.2.2.3
	(so) less / no oxygen (to heart muscle / cells)		1	4.4.2.1
	(so) less / no respiration	allow less energy available ignore reference to lactic acid	1	

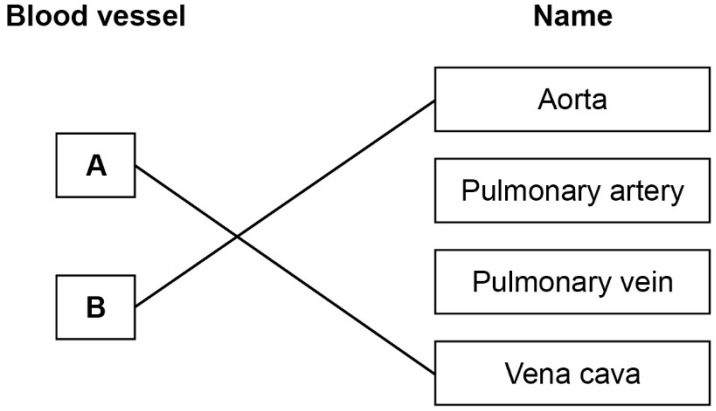
Total Question 4	**10**

4.2.2.2 The heart and blood vessels

Answer 08 · Mark scheme

June 2025 | 8464/B/1F | Original Q5

Question 5

Question	Answers	Mark	AO / Spec. Ref.
05.1	 do **not** accept more than one line from a box on the left	1 1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	F		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	(more) respiration (in mitochondria)	do **not** accept anaerobic respiration	1	AO2
	(which) releases more energy	allow (muscles) need more energy do **not** accept energy produced / made / created do **not** accept provides more energy for respiration	1	AO2
	(so the heart) muscle <u>contracts</u>		1	AO1 4.2.2.2 4.4.2.1 4.1.1.2

4.2.2.2 The heart and blood vessels

Answer 08 · Mark scheme

June 2025 | 8464/B/1F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	any **two** from: • fast / increased heart rate • fast / increased breathing (rate) • tiredness • pale skin • heart attack • difficulty exercising • difficulty gaining weight	 allow irregular heartbeat ignore shortness of breath allow fatigue allow blue skin (due to poor oxygenation) allow cold / cool skin (to the touch) allow cyanosis allow blood clots allow chest pain allow stroke allow increased sweating allow frequent chest infections allow swelling in legs / feet / abdomen	2	AO3 4.2.2.2

4.2.2.2 The heart and blood vessels

Answer 08 · Mark scheme

June 2025 | 8464/B/1F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	any **two** from: • heavy / internal bleeding • infection • damaging blood vessels • damaging the heart • risk from anaesthetic • risk of rejection (of the mesh / tube)	allow named infection e.g. MRSA ignore risk of disease allow blood clots allow stroke allow heart attack allow irregular heartbeat ignore damage unqualified	2	AO3 4.2.2.2
Total Question 5			**10**	

4.2.2.2 The heart and blood vessels

AQA

GCSE
COMBINED SCIENCE: TRILOGY

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

Mark scheme

8464

June 2018

Version/Stage: 1.0 Final

4.2.2.2 The heart and blood vessels

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

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.

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.

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.

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.

4.2.2.2 The heart and blood vessels

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

4.2.2.2 The heart and blood vessels

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**	

4.2.2.2 The heart and blood vessels

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

4.2.2.2 The heart and blood vessels

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**	

4.2.2.2 The heart and blood vessels

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

4.2.2.2 The heart and blood vessels

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**	

4.2.2.2 The heart and blood vessels

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		

4.2.2.2 The heart and blood vessels

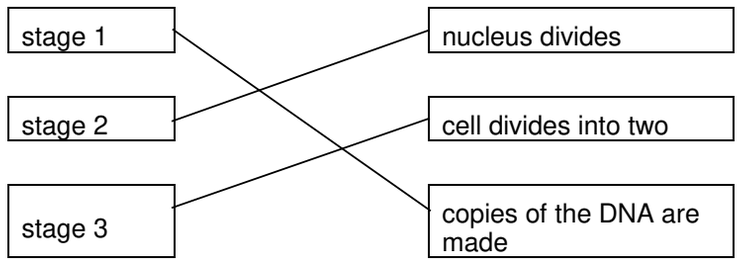
Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	(breathing rate increases)	reference to more / faster required at least once for full marks		AO1 4.4.2.2
	to supply more oxygen / O_2 **or** to supply oxygen / O_2 faster	allow to remove more carbon dioxide / CO_2 **or** to remove carbon dioxide / 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		

4.2.2.2 The heart and blood vessels

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**	

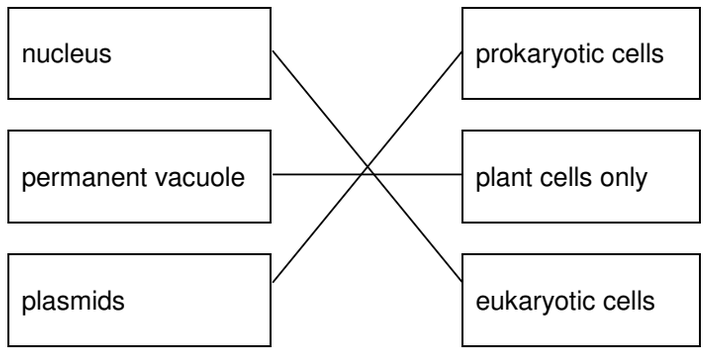
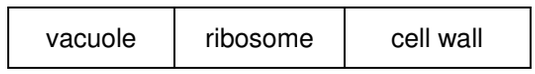
4.2.2.2 The heart and blood vessels

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

4.2.2.2 The heart and blood vessels

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**	

4.2.2.2 The heart and blood vessels

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

4.2.2.2 The heart and blood vessels

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	

4.2.2.2 The heart and blood vessels

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**	

4.2.2.2 The heart and blood vessels

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	

4.2.2.2 The heart and blood vessels

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**	

4.2.2.2 The heart and blood vessels

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.

Answer 06 · Examiner comments — June 2023 | 8464/B/1F | Original Q5

Question 5

05.1 Two fifths of students scored both marks for identifying the trachea and bronchus. Many students gave alveolus instead of trachea. A third of students scored 1 mark which was usually for the trachea.

05.2 Three fifths of students identified D, the alveoli, as where gas exchange occurs in the breathing system.

05.3 Two ways that the lungs are adapted for efficient gas exchange were needed. Just over a quarter of students scored 1 or more marks. Simply naming structures, such as the lungs have alveoli, was insufficient. A reference to many, or lots of alveoli was needed. The most common correct responses were many alveoli and large surface area. The small number of students who

4.2.2.2 The heart and blood vessels

Answer 06 · Examiner comments

June 2023 | 8464/B/1F | Original Q5

scored 2 marks usually linked these together. Some students referred to the wall of the alveolus being thin or to the lungs having a good blood supply, both of which gained credit.

05.4 The question asked students to explain the differences between air breathed into the lungs and air breathed out of the lungs using data presented in a table. Students who only quoted values from the table, without describing how the gases changed, were awarded zero marks. Those who described differences for two or three of the gases, but did not give any explanations were limited to a maximum of two marks. Almost half of the students were awarded 2 or more marks.
Only a tenth of students gave a Level 2 response as differences and linked explanations were needed. The most common link was to say exhaled air contained less oxygen than inhaled air because oxygen is used by the body or is used in respiration.

05.5 A third of students gave a correct reason why the percentage of gases given in each column of the table did not add up to 100%. The most common reason was that there are other gases in the air.

Answer 07 · Examiner comments

June 2024 | 8464/B/1F | Original Q4

Question 4 (low & standard demand)

04.1 The majority of students gave the correct symptom of gonorrhoea.

04.2 This question was well answered: 63% gained credit, with most correct answers being gained from 'not all cases are reported/recorded' (or words to that effect). The idea of false positives and negatives was seen by examiners less often; however, the idea of misdiagnosis was seen more frequently. References to population numbers only being estimates was very rarely seen.

Some students incorrectly commented on the numbers and data given in the table and a significant few suggested that the 100 000 was an estimate as the numbers were too high to count. Other students talked about not being able to ask everyone in the city.

Some students incorrectly said the numbers weren't accurate because the numbers in the table don't add up to 100 000.

04.3 Three-quarters of students correctly picked bar graph for representing the data given.

04.4 Very few students gained any credit for this question, many making reference to the data being an estimate, which was not creditworthy. Students did not really appear to understand the need to manipulate data to make it comparable.

There were many incorrect ideas:

- counting everyone would be too many or take too long
- smaller numbers make it easier for people to understand
- smaller numbers make collecting data easier and quicker
- because they do not know the exact number
- it is better to give a rough estimate
- makes data more accurate
- linking it to a graph, eg 'makes the data easier to plot', 'smaller numbers for plotting on a graph', 'number would be too high to plot on a graph'.

A very large proportion of students talked about unreported cases / 'not knowing they have it', giving what would have been a correct response for question 04.2.

04.5 68% of students gave two correct risks for increasing plaque in the coronary artery; 28% gained 1 mark.

04.6 About two-thirds of students correctly identified a stent as to the treatment for plaques in the coronary artery.

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4.2.2.2 The heart and blood vessels

Answer 07 · Examiner comments June 2024 | 8464/B/1F | Original Q4

04.7 The most common answer was able to articulate that there was a lack of blood flow, gaining 1 mark. However, students failed to link this to lack of oxygen or respiration.

Many students showed a misconception of the heart attack being caused by the heart having to beat faster to get blood past the blockage. Many descriptions/explanations were given as to what caused the blockage, which was not answering the question asked.

There were incorrect references to muscle cells moving in the blood rather than being part of the heart. A lot of answers saw students discussing the general role of arteries which were not specific to the question and they did not gain marks as the question asked about coronary arteries.

0 4 . 7 A heart attack can happen when plaques block a coronary artery.

During a heart attack muscle cells in the heart die.

Explain how the blockage can lead to the death of muscle cells in the heart.

[3 marks]

When the coronary artery fills with ~~plague~~ plaques, it decreases the flow of blood to the heart as it may clot. This leads to death of muscle cells as less blood is being transported to them, meaning the heart has less blood to pump around the body so the muscles contract less, which leads them to be weaker.

This response demonstrates the most common type of answer: the student has got to the idea of there being less blood flow to the heart muscle but does not link this to there being less oxygen, and therefore less respiration.

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Answer 08 · Examiner comments

June 2025 | 8464/B/1F | Original Q5

Question 5 (Standard demand)

05.1 Credit was given where students had only annotated the diagram. A number of students incorrectly drew multiple lines from the same blood vessel.

05.2 27% of student gained the mark on this question. The most common incorrect response was the left ventricle, D.

05.3 Most students were familiar with the link between mitochondria and respiration, fewer could clearly explain the purpose of the energy released, or the role of contraction in the functioning of heart muscle. Only 6% of students gained two or more marks, 32% gained one mark.

Many students correctly identified that mitochondria are involved in respiration. Responses such as 'to provide energy for respiration' gained a mark for the link to energy but could not be awarded further marks unless the student clearly described the correct use of that energy. This could be explicitly stated or inferred from phrases such as 'more respiration for energy release'. However, responses that said 'energy is made' or 'energy is produced' did not gain the marks.

Many students used vague language like 'the muscle works' or 'pumps blood' without explicitly referencing contraction.

05.4 Many students demonstrated a good understanding of the condition of a hole in the heart, with 50% gaining at least one mark. However, a number of common misconceptions and vague responses limited access to full marks.

Students were credited if they referenced an irregular heartbeat, heart murmur or palpitations.
Many students used vague terms such as 'difficulty breathing', 'struggling to breathe', or 'heavy breathing', which were not sufficient. Many students were credited for using terms like 'tiredness', 'lack of energy', 'light-headedness', or 'dizziness'.
While 'heart burn' was not accepted, terms such as 'heart ache' or 'heart pain' were just sufficient for credit.

05.5 Many students demonstrated an understanding of general surgical complications; however, several common misconceptions or vague responses prevented them from accessing all available marks.

Creditworthy responses included statements concerning infection and references to heart damage. Descriptions such as 'heart stopping' or 'heart being punctured' were considered synonymous with damaging the heart.

Vague responses such as 'bleeding' or 'blood loss' alone were insufficient, as they lacked the necessary context linking them to the surgical procedure. Similarly, statements like 'harming the heart' or 'death' without further qualification were not sufficient.

Additionally, references to the operation not working, failing, or long-term tissue growth issues were considered long-term effects and therefore not acceptable in the context of immediate surgical risks.

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4.2.2.2 The heart and blood vessels

Answer 08 · Examiner comments June 2025 | 8464/B/1F | Original Q5

0 5 . 5 In an operation to repair a hole in the heart:

- a flexible tube is inserted into a blood vessel and guided to the heart
- a mesh patch is passed down the tube
- the mesh patch covers the hole.

Heart tissue grows around the mesh and closes the hole.

Suggest **two** possible risks of this operation to repair a hole in the heart.

[2 marks]

1 body rejecting the mesh

2 mesh patch gets stuck in the tube.

This response was awarded 1 mark for correctly identifying the idea of rejection, which meets one of the marking points.

However, the second point—referring to things 'getting stuck in the tube' was a commonly seen but was an insufficient answer. While it suggests a risk, it lacks the necessary explanation that this could lead to damage to the heart or blood vessels. As a result, no further credit could be given.

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