AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.7.1.4

Adaptations

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**12**
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.

4.7.1.4 Adaptations

Answer 01 · Mark scheme

June 2018 | 8464/B/1F | Original Q3

The full source mark scheme begins on page 37. Follow original question 3 in that document.

4.7.1.4 Adaptations

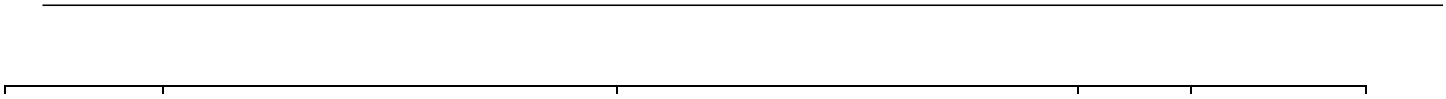
Answer 02 · Mark scheme June 2019 | 8464/B/1F | Original Q2

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**	

4.7.1.4 Adaptations

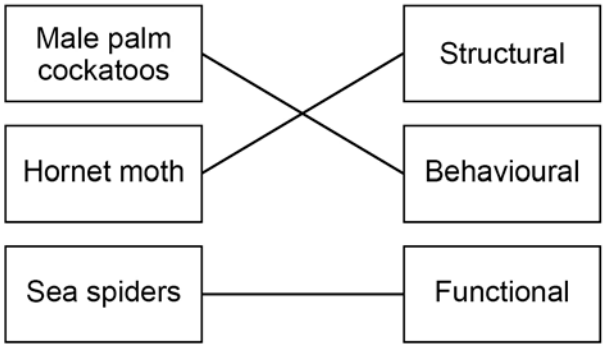
Answer 02 · Mark scheme

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



4.7.1.4 Adaptations

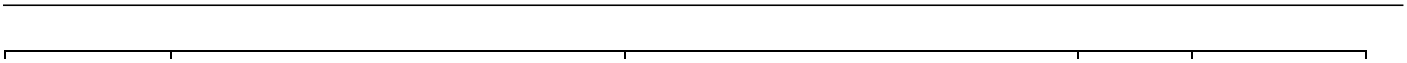
Answer 03 · Mark scheme June 2019 | 8464/B/2F | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	 additional lines from a box on the left negates the mark for that box 3 lines correct for **2** marks 1 **or** 2 lines correct for **1** mark		2	AO2 4.7.1.4
03.2	brightly coloured flowers large quantities of pollen		1 1	AO2 4.6.2.2 4.7.1.1 4.7.1.4
03.3	biodiversity		1	AO1 4.7.3.1
03.4	any **one** from: • to grow crops • to raise cows • to build	allow farming / biofuels or named crop allow houses **or** building materials allow mining allow paper / fuel	1	AO1 4.7.3.4
03.5	any **one** from: • (new) disease • (new) herbivore • climate change **or** global warming **or** ice age • volcano / earthquake / tsunami / meteor • lack of pollinators • (new) competitor	ignore (new) predator allow drought / flooding allow plant collectors	1	AO1 4.6.3.3
03.6	DNA	allow deoxyribonucleic acid	1	AO1 4.6.1.3
03.7	genome		1	AO1 4.6.1.3
Total			**9**	

4.7.1.4 Adaptations

Answer 03 · Mark scheme

June 2019 | 8464/B/2F | Original Q3



4.7.1.4 Adaptations

Answer 04 · Mark scheme

November 2020 | 8464/B/1F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	amylase	allow phonetic spelling allow carbohydrase do **not** accept amylose	1	AO1 4.2.2.1
06.2	small intestine		1	AO1 4.2.1 4.2.2.1
06.3	any **one** from: • greater magnification • higher resolving power	allow can see (smaller) sub-cellular structures / parts allow can see more detail (inside cells) allow reference to 3-D images	1	AO1 4.1.1.5
06.4	capillary		1	AO2 4.2.2.1 4.2.2.2
06.5	$20 = \frac{\text{image length}}{0.8}$ image length = 0.8 x 20 image length = 16 (mm)		1 1 1	AO2 4.1.1.5 RPA 1
06.6	diffusion		1	AO3 4.1.3.1
06.7	active transport	allow active uptake	1	AO3 4.1.3.3

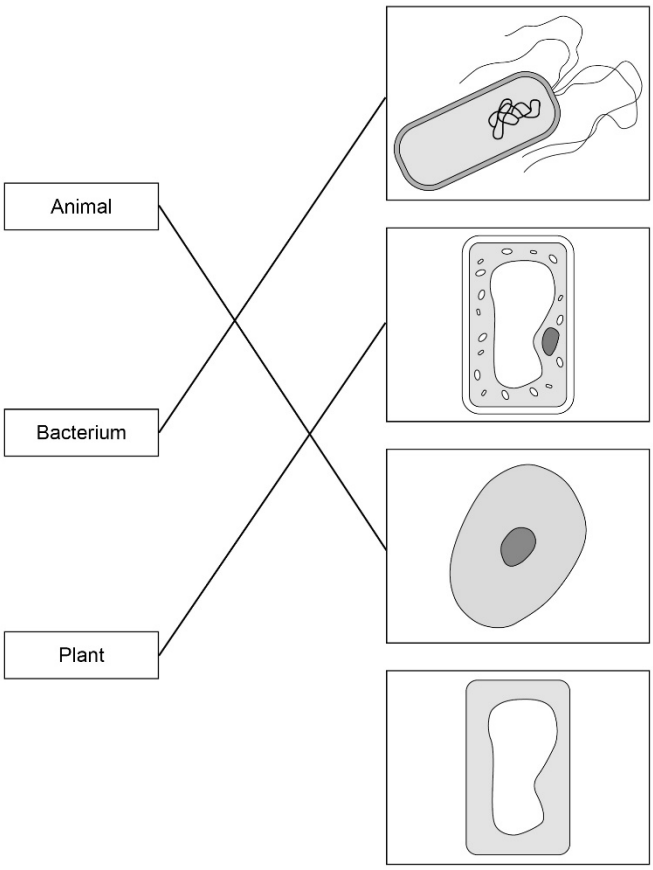
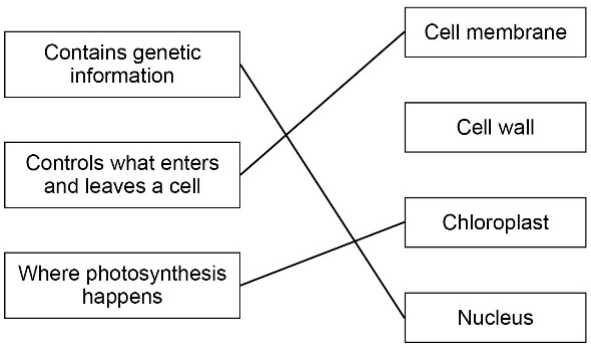
4.7.1.4 Adaptations

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.8	any **one** from: • respiration • to form glycogen • to make amino acids / proteins	allow as an energy source do **not** accept to make / use / create / produce energy allow to make lipid / fat	1	AO1 4.4.2.1 4.4.2.3
06.9	**Level 2:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.		3–4	AO2 4.1.1.3 4.1.3.1 4.1.3.3 4.2.2.1
	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 • have (many) microvilli • (to) increase surface area • wall of villus only one cell thick **or** is thin • capillaries are close to surface • (so) short pathway • good blood supply • (to) transport food molecules away **or** to the body • (and) maintain a diffusion gradient • cells have many mitochondria • (where) respiration takes place • (where) energy is transferred • (as) active transport requires energy • energy is needed to absorb sugar / food / molecules For Level 2 must make links between structure and it's function			
Total			**14**	

4.7.1.4 Adaptations

Answer 05 · Mark scheme

November 2021 | 8464/B/1F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	 do **not** accept more than one line from a box on the left		1 1 1	AO1 4.1.1.1 4.1.1.2
01.2	 do **not** accept more than one line from a box on the left		1 1 1	AO1 4.1.1.2 4.1.2.1 4.1.3.1 4.4.1.1

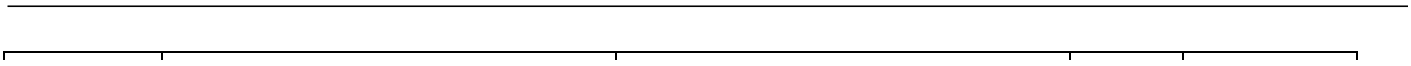
4.7.1.4 Adaptations

01.3	urea glycogen starch cellulose	must be in this order	1 1 1 1	AO1 4.1.1.2 4.4.1.3 4.4.2.3
01.4	any **one** from: • (to cause) movement • to contract / shorten	 allow example of movement ignore to relax / expand ignore references to strength / energy / power	1	AO1 4.1.1.3 4.4.2.2
01.5	(many) mitochondria to transfer / release (a lot of) energy	 allow (mitochondria) for respiration do **not** accept to produce / make / create energy ignore reference to the shape / strength of the cells	1 1	AO2 4.1.1.2 4.1.1.3 4.4.2.1
01.6	$\frac{2}{0.05}$ (×) 40	 do **not** accept if a unit is given	1 1	AO2 4.1.1.5 RPA 1
Total			**15**	

4.7.1.4 Adaptations

Answer 05 · Mark scheme

November 2021 | 8464/B/1F | Original Q1



4.7.1.4 Adaptations

Answer 06 · Mark scheme

November 2021 | 8464/B/2F | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	nut(s) → bird(s) → cat(s)	allow **1** mark for organisms in correct order (left to right) but arrows incorrect or missing allow **2** marks for cat(s) ← bird(s) ← nut(s) do **not** accept cat(s)bird(s) nut(s) do **not** accept cat(s) →bird(s) →nut(s)	2	AO2 4.7.2.1
03.2	answer must be consistent with food chain given in question **03.1**	if no answer to question **03.1** allow bird(s)	1	AO2 4.7.2.1
03.3	food pathogens		1 1	AO1 4.7.1.3
03.4	13.60 (mm)	allow 13.6 (mm)	1	AO2 4.6.2.2
03.5	structural		1	AO2 4.7.1.4
03.6	variation mutation reproduction generation	must be in this order	1 1 1 1	AO2 4.6.2.2

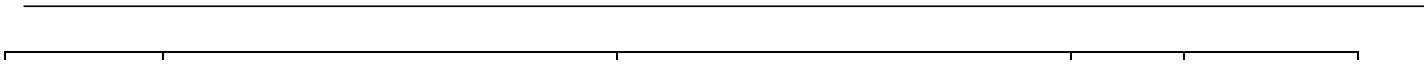
4.7.1.4 Adaptations

03.7	birds have a shorter life cycle than humans		1	AO3 4.6.3.1 4.6.3.4
03.8	bacteria can become resistant to antibiotics		1	AO1 4.6.3.1 4.6.3.4
Total			**13**	

4.7.1.4 Adaptations

Answer 06 · Mark scheme

November 2021 | 8464/B/2F | Original Q3



4.7.1.4 Adaptations

Answer 07 · Mark scheme

June 2022 | 8464/B/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	cells contain (many) chloroplasts	allow positioned nearest to the light **or** at the top of the leaf allow cells are closely packed **or** no gaps between cells allow chlorophyll for chloroplast	1	AO1 4.1.1.3 4.2.1 4.2.3.1 4.4.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	stomata		1	AO1 4.2.3.1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	(real length) = $\frac{28}{400}$ (real length in mm =) 0.07 (real length in µm =) 70	allow answer given for length in mm correctly multiplied by 1000	1 1 1	AO2 4.1.1.1 4.1.1.2 4.1.1.5 RPA1

4.7.1.4 Adaptations

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	diffusion		1	AO1 4.1.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	A Reason any **one** from: • steeper (diffusion) gradient • bigger difference in concentration of carbon dioxide inside and outside the cell	no marks if wrong cell chosen allow higher concentration of carbon dioxide outside the cell than inside the cell allow particles / molecules for carbon dioxide	1 1	AO3 AO2 4.1.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(number / amount of) bubbles time	allow volume of gas / oxygen allow suitable time eg 1 / 5 / 10 minutes	1 1	AO1 4.4.1.2 RPA5

4.7.1.4 Adaptations

Answer 07 · Mark scheme

June 2022 | 8464/B/1F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	any **two** from: • temperature (of water) • light intensity **or** distance of light (from pondweed) • concentration of carbon dioxide (in water)	do **not** accept colour of light ignore time allow amount of light ignore light unqualified allow amount / mass of sodium hydrogen carbonate (in water) allow type / size of plant ignore volume of water / solution	2	AO3 4.4.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	y-axis labelled: rate of photosynthesis in arbitrary units		1	AO2 4.4.1.2 RPA5
	suitable scale		1	
	all **bars** plotted correctly	allow ± ½ a small square the bars can be in any order	1	
	all bars labelled correctly		1	

4.7.1.4 Adaptations

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.9	blue		1	AO3 4.4.1.2 RPA5

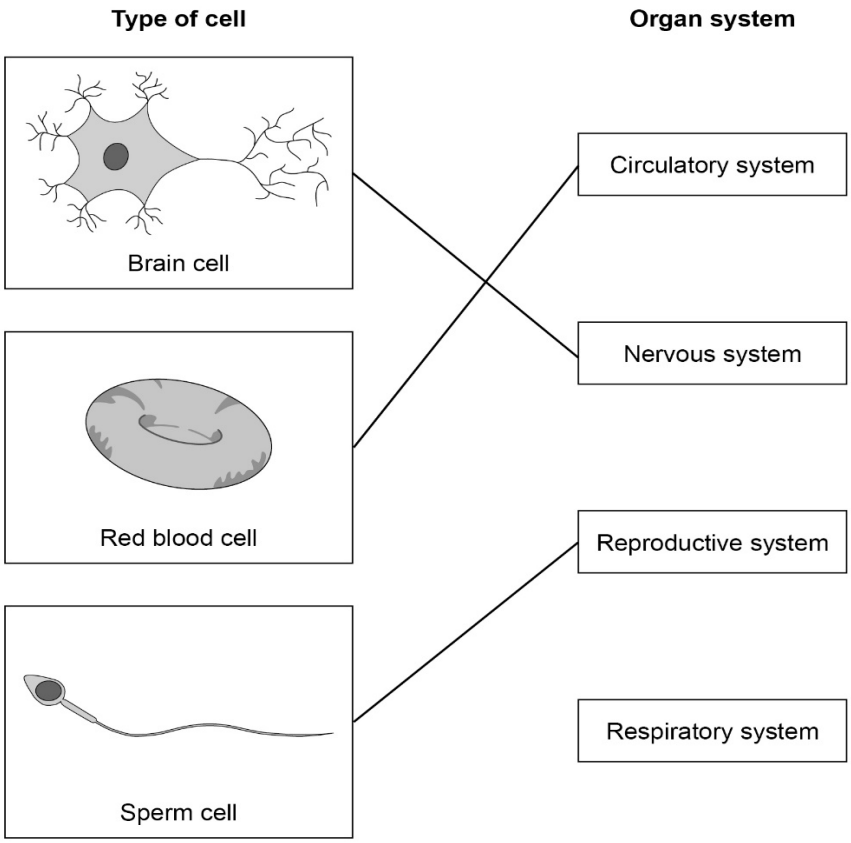
Total Question 2		**17**

4.7.1.4 Adaptations

Answer 08 · Mark scheme

June 2023 | 8464/B/1F | Original Q1

Question 1

Question	Answers	Mark	AO / Spec. Ref.
01.1	 do **not** accept more than one line from a box on the left	1 1 1	AO2 4.1.1.3 4.2.1 4.2.2.2 4..2.2.3

4.7.1.4 Adaptations

Answer 08 · Mark scheme

June 2023 | 8464/B/1F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	has a tail	allow has flagellum	1	AO1 4.1.1.2
	(so) it can swim	allow so it can move / travel	1	4.1.1.3
	OR			
	has (many) mitochondria (1)			
	to transfer / release / energy (for sperm to swim) (1)	allow for energy do **not** accept energy is made / produced / created		
	OR			
	has enzyme(s) (1)			
	to penetrate into the egg (1)			
	OR			
	is streamlined (1)			
	to swim faster (1)			
	OR			
	has 23 chromosomes (1)			
	to produce 46 chromosomes in fertilised cell (1)			
		allow a correct adaptation (1) and linked explanation (1)		

4.7.1.4 Adaptations

Answer 08 · Mark scheme

June 2023 | 8464/B/1F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	any **one** from: (cell in **Figure 1**) does **not** have • a (cell) wall • a (large) vacuole • chloroplasts	 ignore chlorophyll	1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	cell membrane		1	AO1 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	diffusion Reason: concentration (of oxygen) is greater outside the cell **or** concentration (of oxygen) is lower inside the cell	 allow (oxygen moves) from a high concentration to a low concentration allow there is more (oxygen) outside the cell (than inside the cell) allow there is less (oxygen) inside the cell (than outside the cell) ignore oxygen moves along a concentration gradient	1 1	AO3 AO2 4.1.3.1

4.7.1.4 Adaptations

Answer 08 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	any **two** from: • glucose / sugar • water • amino acids • fatty acids • glycerol • mineral ions	ignore oxygen allow H_2O allow minerals / salts / vitamins / hormones allow named ion / mineral / vitamin / hormone ignore carbon dioxide ignore urea	2	AO2 4.1.3.1 4.2.2.1 4.2.2.3 4.4.2.1 4.4.2.3

Total Question 1	11

4.7.1.4 Adaptations

Answer 09 · 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

4.7.1.4 Adaptations

Answer 09 · Mark scheme

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

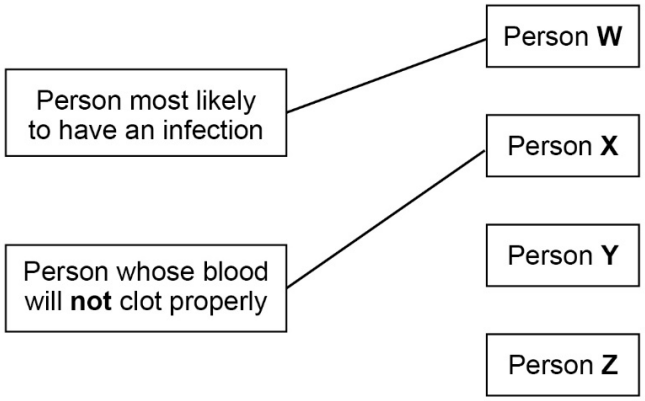
Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	walls that are one cell thick	allow thin walls ignore thin unqualified do **not** accept references to cell walls	1	AO1 4.2.2.2
	(so) there is a short diffusion distance	allow (so) substances can move (quickly) between blood and cells / tissues 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

4.7.1.4 Adaptations

Answer 09 · Mark scheme

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

Question	Answers	Mark	AO / Spec. Ref.
04.8	Description → Person in Table 2  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

4.7.1.4 Adaptations

Answer 10 · 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

4.7.1.4 Adaptations

Answer 10 · 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		

4.7.1.4 Adaptations

Answer 10 · 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**

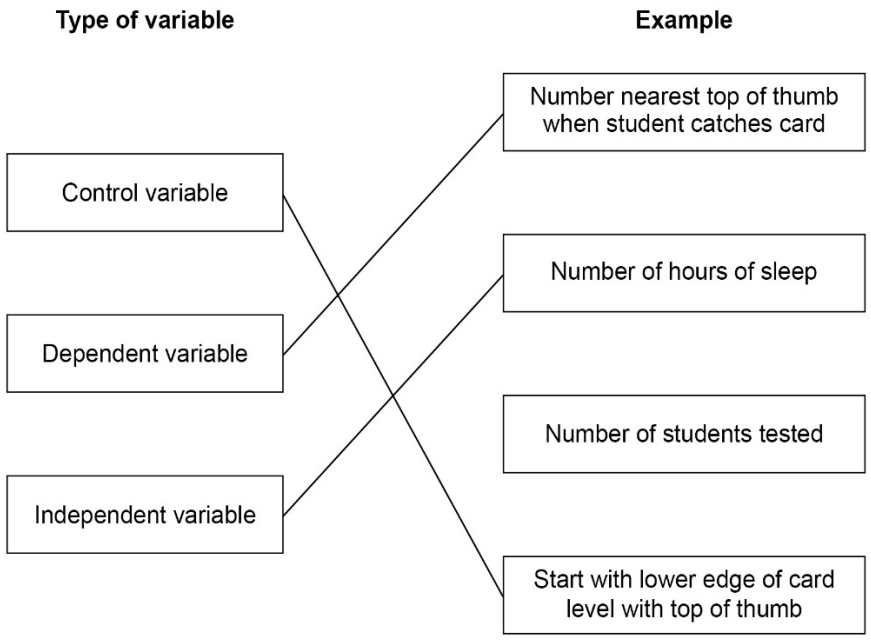
4.7.1.4 Adaptations

Answer 11 · Mark scheme

June 2024 | 8464/B/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **one** from: • (react in order) to brake / steer • avoid accidents / collision / people / cars / objects	allow for safety	1	AO2 4.5.2

Question	Answers	Mark	AO / Spec. Ref.
03.2	 do **not** accept more than one line from a box on the left	1 1 1	AO1 4.5.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	students may catch the card between scores		1	AO3 4.5.2 RPA6

4.7.1.4 Adaptations

Answer 11 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	plot at 8.5 hours and reaction score 3	allow a tolerance of ±½ small square	1	AO2 4.5.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	7.5 (hours)	allow 7 ½ (hours) allow 7 hours and 30 minutes allow 7:30 allow answer on **Figure 6** if no answer on line do **not** accept 7.3	1	AO2 4.5.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	reaction time stayed the same		1	AO3 4.5.2 RPA6

4.7.1.4 Adaptations

Answer 11 · Mark scheme

June 2024 | 8464/B/2F | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	any **two** from: • repeat (card drop) for each student • repeat on different days • repeat on larger number of students • repeat with wider range of sleep times • control / same age • control / same sex • control / same food / drink / caffeine / drugs (before test) • control distance between thumb and forefinger • control / same practice • remove distractions • use computer / phone reaction timer • have more divisions on the card • record sleep time in smaller intervals	if none of these awarded allow **1** mark for repeat unqualified allow control / same gender allow remove gaps between (reaction) scores for **2** marks allow repeat for each student and calculate a mean for **2** marks allow repeat on different days and calculate a mean	2	AO3 4.5.2 RPA6

4.7.1.4 Adaptations

Answer 11 · Mark scheme

June 2024 | 8464/B/2F | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.8	long (cell)		1	AO1 4.5.2
	to transport / carry the information / impulse(s) / signal	allow to transport / carry electrical messages ignore to carry messages unqualified	1	
	from CNS / coordinator / spinal cord / brain to muscle(s) / effector		1	
	alternative approach 1: (many) branches (1)	allow (many) dendrites		
	to transport / carry the information / impulse(s) / signal (1)	allow to transport / carry electrical messages ignore to carry messages unqualified		
	to many / several muscle cells (1)			
	alternative approach 2: attach to muscle cells (1)			
	to transport / carry the information / impulse(s) / signal (to muscle) (1)			
	for muscle contraction (1)			
	alternative approach 3: many mitochondria (1)			
	to respire (1)	allow to release energy do **not** accept energy produced / made / created		
	to assist / allow the information / impulse / signal to travel (1)	allow to assist / allow the transport / carriage of electrical messages		

4.7.1.4 Adaptations

Answer 11 · Mark scheme

June 2024 | 8464/B/2F | Original Q3

	alternative approach 4: insulation **or** fatty sheath (1) to transport / carry the information / impulse(s) / signal (1) (along the neurone) faster (1)	 allow to transport / carry electrical messages ignore to carry messages unqualified **alternative approach 5:** allow narrow (1) so many (neurones) can fit in a small space (1)		

Total Question 3	**13**

4.7.1.4 Adaptations

Answer 12 · Mark scheme

June 2025 | 8464/B/2F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	any **one** from: • (skin / body / plesiosaur) decays • skin was not fossilised • not enough evidence • no-one has seen one • fossils are (usually) from bones	 allow (skin / body / plesiosaur) not preserved allow no evidence allow description such as no DNA or no photographs allow no-one was there (at the time)	1	AO2 4.6.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	(limbs / feet / legs / arms / hands are) flat(tened) / streamlined / paddle-like / wide	allow flippers / fins	1	AO2
	for swimming	allow for movement / propulsion / pushing (through water or out of water onto land) allow to hold on to mate allow to kill prey allow to fight / protect / defend	1	AO3 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	behavioural		1	AO2 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	200 (million years ago)	allow two hundred ignore addition of 'million years ago'	1	AO2 4.6.3.2

4.7.1.4 Adaptations

Answer 12 · Mark scheme

June 2025 | 8464/B/2F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	130 **and** 180	allow (one small square is 5 million years, so) 10 × 5	1	AO2 4.6.3.2
	50 (million years)	ignore addition of 'million years'	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	not all plesiosaur fossils have been discovered		1	AO2 4.6.3.2 4.6.3.3
	some plesiosaur fossils will have been destroyed		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	plesiosaur **B** existed before plesiosaur **C**		1	AO3 4.6.3.1 4.6.3.2

4.7.1.4 Adaptations

Answer 12 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.8	any **two** from: • bacteria have a short life-cycle (so rapid evolution) • bacteria are continuing to evolve • can study the DNA of bacteria • bacteria are more easily available	allow converse if clearly referring to fossils allow evolution in bacteria is fast(er) allow (many) fossilised species are extinct allow not able to study DNA from fossils allow fossils do not contain DNA / chromosomes / genes / alleles allow many / some fossils have been destroyed allow there are gaps in the fossil record	2	AO3 4.6.3.1 4.6.3.2 4.6.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.9	(people with infections of antibiotic-resistant bacteria) cannot be treated (with those antibiotics)	allow (antibiotic-resistant) bacteria cannot be killed allow antibiotics will not work allow the infection may kill people allow development of new antibiotic(s) is costly / slow	1	AO3 4.6.3.4

Total Question 4	13

4.7.1.4 Adaptations

AQA

GCSE
COMBINED SCIENCE: TRILOGY

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

Mark scheme

8464

June 2018

Version/Stage: 1.0 Final

4.7.1.4 Adaptations

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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4.7.1.4 Adaptations

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.

4.7.1.4 Adaptations

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 not 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.

4.7.1.4 Adaptations

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

4.7.1.4 Adaptations

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**	

4.7.1.4 Adaptations

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

4.7.1.4 Adaptations

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**	

4.7.1.4 Adaptations

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

4.7.1.4 Adaptations

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**	

4.7.1.4 Adaptations

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		

4.7.1.4 Adaptations

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		

4.7.1.4 Adaptations

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**	

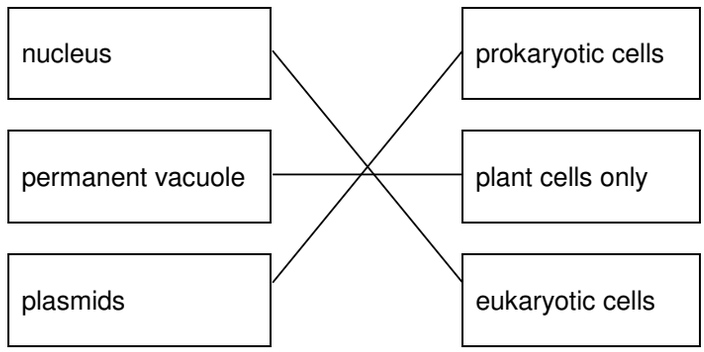
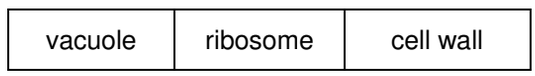
4.7.1.4 Adaptations

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	stage 1 → copies of the DNA are made stage 2 → nucleus divides stage 3 → cell divides into two 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

4.7.1.4 Adaptations

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**	

4.7.1.4 Adaptations

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

4.7.1.4 Adaptations

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	

4.7.1.4 Adaptations

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**	

4.7.1.4 Adaptations

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	

4.7.1.4 Adaptations

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**	

4.7.1.4 Adaptations

Answer 05 · Examiner comments November 2021 | 8464/B/1F | Original Q1

Question 1 (low & standard demand)

This question was about cells and cell structure. More than half of the students identified the drawings of animal, bacterial and plant cells. Most students could identify the drawing of a bacterial cell. Knowledge of the function of cell structures was variable, but most students knew that the nucleus contains genetic information and many knew that photosynthesis happens in chloroplasts. There was some confusion between the function of the cell membrane and cell wall.

01.3 was about chemicals in cells. Most students knew that cellulose strengthens plant cell walls and many knew that urea is excreted by animals and starch is stored in plant cells. Knowledge of glycogen was set at a higher demand, and few knew that it is stored in animal cells.

In **01.4**, many thought the function of a muscle cell is for strength, which was ignored. A reference to movement or contraction was needed. Approximately a quarter of students scored a mark for saying that muscle cells have many mitochondria, but a weak expression of language in reference to energy meant that very few students gained both marks for **01.5**. Energy being produced, made or created is never credited and students should be encouraged to say that energy is transferred.

Over half of the students gained both marks for calculating the correct magnification. If units were added to the answer this prevented students gaining one mark. Common mistakes included incorrectly substituting into the equation, or multiplying their answer by a factor of 10.

Answer 06 · Examiner comments November 2021 | 8464/B/2F | Original Q3

Question 3 (low demand)

Many students could not give the food chain. Some students obtained one mark out of two for having the organisms in the correct order, but used dashes or commas instead of arrows. More students could give the primary consumer in the food chain. Reading from the graph was generally answered well. Fewer students could complete the sentences about evolution.

4.7.1.4 Adaptations

Answer 07 · Examiner comments

June 2022 | 8464/B/1F | Original Q2

Question 2 (low & standard demand)

02.1 This question was not answered well. Students did not seem to understand the word adaptation. Some students talked about a protective layer to stop water getting in or out. There were many references to a large surface area, or to the palisade layer being thick or thin. All of these were ignored. A tenth of students scored the mark, usually for saying the layer contained chlorophyll or chloroplasts.

02.2 40% of students thought the small pores on a leaf are called guard cells. A third of students selected the correct answer, stomata.

02.3 More than half of the students scored full marks for calculating the real length of the cell in micrometres. An additional quarter of students scored two marks. This was either for:

- a correct substitution and calculation in mm, or
- a correct substitution and correct conversion of an incorrectly calculated length in mm.

8% of the students scored one mark either for a correct substitution, or for a correct conversion of mm to micrometres.

02.4 39% of students thought carbon dioxide moved in and out of cells by active transport. Slightly fewer selected the correct response, diffusion.

02.5 Very few students scored two marks. A quarter of the students scored a mark for identifying cell A as the cell into which carbon dioxide would move at the fastest rate. For the reason, a definition of diffusion was insufficient; a comparison was required. This would ideally be a comparison between the different cells in Figure 3, although a comparison between the concentration inside and outside the cell was allowed.

02.6 Just under half the students gave the two measurements that would be required to calculate the rate of photosynthesis. 36% of students scored one mark, usually for the number of bubbles produced. References to the distance of the lamp from the pondweed were ignored.

02.7 17% of students scored two marks for two correct control variables. 61% of students scored at least one mark. The most common correct answers were amount of light and the size or type of pondweed.

02.8 Most students could draw a bar chart. 42% of students scored full marks, and an equal proportion scored three marks. A complete label, including units, was needed for the *y*-axis. A suitable scale was 1 cm for every arbitrary unit, although 2 units per cm was allowed. Bars had to be plotted and labelled with the colour of light, not with just a letter.

02.9 The vast majority of students correctly interpreted the results to conclude that blue light would be the best colour of light to grow plants in. The second most common response was green light, selected by less than a tenth of students.

4.7.1.4 Adaptations

Answer 08 · Examiner comments June 2023 | 8464/B/1F | Original Q1

Question 1

01.1 Students had to link different types of cell to the organ system in which they are found. Almost all students scored at least 1 mark. Linking the sperm cell to the reproductive system being the most common correct response. Almost two thirds scored full marks, and over a quarter scored 2 marks. Common errors were to link the red blood cell with the respiratory system, or the brain cell to the circulatory system.

01.2 The question was answered well, with almost three quarters of students scoring both marks. Most students said the sperm cell has a tail so it can swim, and some said the cell has mitochondria to provide energy. A few students gave two adaptations, but did not explain the use of either, so were only awarded the first marking point.

01.3 Over half of the students scored the mark, usually for saying that the cell in the figure was not a plant cell because it did not have a cell wall, or it did not have a vacuole. Fewer students said the cell did not have chloroplasts.
There were many references to the oxygen molecules, or to the shape of the cell, which were ignored. Some said the cell was not a plant cell because it did not have ribosomes or mitochondria. Others said it did not have a nucleus. All these were incorrect.

01.4 Four fifths of students correctly identified the cell membrane as the structure that controls the movement of substances into and out of a cell.

01.5 Students had to interpret a diagram showing oxygen molecules in and around a cell to decide by which process the oxygen would enter the cell. Half the students correctly concluded that the oxygen would enter the cell by diffusion. Half of these also scored the second mark for explaining this was because the concentration of oxygen was higher outside the cell than inside the cell. Some students confused the process with osmosis. The marking points were independent, so a few students gained a mark for a correct explanation relating to the concentrations of oxygen inside and outside the cell, but had given an incorrect process.

01.6 Only a tenth of students correctly named two substances that move into most cells in the body from the blood. Half of the students named at least one substance. The most common correct substances given were glucose, sugar and water. Parts of the blood were very common answers which did not gain credit, as well as oxygen and carbon dioxide which were ignored.

4.7.1.4 Adaptations

Answer 09 · 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 10 · 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

4.7.1.4 Adaptations

Answer 10 · Examiner comments

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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.

4.7.1.4 Adaptations

Answer 11 · Examiner comments

Question 3 (low & standard demand)

03.1 Most students could suggest why fast reactions are important for car drivers.

Responses that restated the question, such as 'fast reactions are important', or 'to be alert' were not sufficient. Some students misinterpreted the question and explained how they could get to where they were going faster by driving quickly, which was incorrect.

03.2 The most common error was to confuse the independent and dependent variable.

03.3 Most students could identify that it was a problem that the student may catch the card between scores.

03.4 Most students could plot the point correctly.

03.5 Many students could give the mode. Some students attempted calculations in the answer space, which were not needed to answer the question. In most cases, these students were attempting to calculate the mean or median.

03.6 Approximately half of the students selected the correct response that reaction time stayed the same.

03.7 Many students gave the idea of repeats, or using a wider range of different sleep times.

In most cases, incorrect responses were suggesting other independent variables that could be changed, such a drinking different caffeine drinks before the test. Other students incorrectly stated that all the students should sleep for the same length of time or that a stopwatch should be used.

03.8 Few students could state an adaptation of the motor neurone cell. The most common correct answers were 'long' or 'attached to muscle cells'. Explanations of the adaptation were very rare.

A frequently seen misconception was that the muscle contracts and then a signal is passed to the motor neurone. Few students referred correctly to an impulse.

Misconceptions that were frequently seen included:

- neurones transport energy
- the motor neurone tells muscle/brain what to do
- the motor neurone sends messages
- the cell can move
- the cell has a large surface area
- the cell pulls the muscle
- the cell has a tail/arm/leg/stem.

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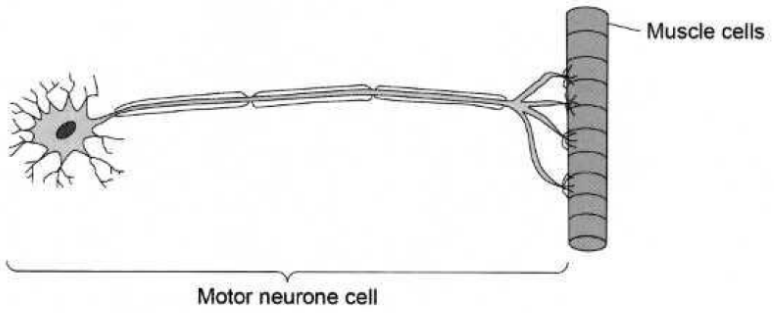
4.7.1.4 Adaptations

Answer 11 · Examiner comments June 2024 | 8464/B/2F | Original Q3

0 3 . 8 Motor neurones are involved in reactions.

Figure 7 shows a motor neurone.

Figure 7



Explain **one** way the motor neurone cell is adapted for its function.

[3 marks]

Motor neurone cells are long in length so that messages being sent around the body can happen quickly and efficiently. There length means they can travel longer distances so messages to the CNS can happen as fast as possible.

The student gained 1 mark for 'long'. The misconception here, that the motor neurone is sending impulses, was frequently seen. In this instance, the student also refers to 'impulses' as 'messages', which is insufficient. The misconception that the impulse is travelling from the muscle, as demonstrated here, was also common.

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Answer 12 · Examiner comments

June 2025 | 8464/B/2F | Original Q4

Question 4 (Low and Standard demand)

04.1 Many students gave correct ideas about skin decaying, or a lack of evidence. Many students repeated the information provided and simply stated 'they are extinct'. Repeating information provided can never be given credit.

04.2 For marking point 1, students could either describe how structure A was adapted, such as 'wide' or 'paddle-like', or use a term such as fin or flipper.

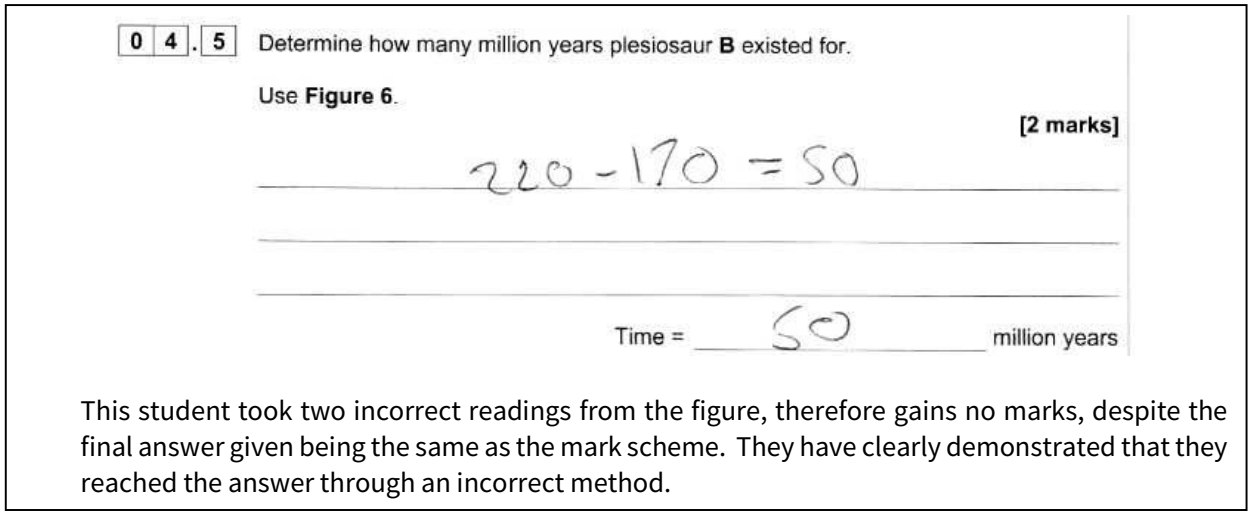
Marking point 2, for the explanation of how the structure would help the plesiosaur survive in the ocean, was more commonly seen than marking point 1.

A surprising number of students thought the label was directed at the neck. These responses could not gain credit.

04.3 Over 60% of students could identify the adaptation as behavioural.

04.4 Two thirds of student correctly interpreted the figure.

04.5 Many students made two correct readings and calculated the number of years correctly. Where errors were made, this was most often for misinterpreting the scale. 170 was frequently seen instead of 180.


0 4 . 5 Determine how many million years plesiosaur **B** existed for.

Use **Figure 6**.

[2 marks]

220 - 170 = 50

Time = 50 million years

This student took two incorrect readings from the figure, therefore gains no marks, despite the final answer given being the same as the mark scheme. They have clearly demonstrated that they reached the answer through an incorrect method.

04.6 Two thirds of students could identify two reasons why the exact date of extinction can only be estimated.

04.7 Almost 70% of students could select the correct statement as evidence.

04.8 The most common correct answer was that (some) fossils have been destroyed. Few students gained both marks.

04.9 Students had difficulty expressing their responses, and again, repeating information from the question was insufficient. Some students were too vague to gain credit, with responses such as 'it makes you ill'. Some misconceptions between antibiotic resistance and the term 'immunity' were seen and some students showed confusion over what was resistant, such as stating that the body is resistant.

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