AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.7.3.3

Land use

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**21**
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.

4.7.3.3 Land use

Answer 01 · Mark scheme

June 2018 | 8464/B/1F | Original Q2

The full source mark scheme begins on page 61. Follow original question 2 in that document.

4.7.3.3 Land use

Answer 02 · Mark scheme

June 2018 | 8464/B/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	<table><tr><th>Factor</th><th>Biotic</th><th>Abiotic</th></tr><tr><td>Diseases</td><td>✓</td><td></td></tr><tr><td>Herbivores</td><td>✓</td><td></td></tr><tr><td>Temp</td><td></td><td>✓</td></tr><tr><td>Water</td><td></td><td>✓</td></tr></table>	allow **1** mark for 2 or 3 correct	2	AO1 4.7.1.3 4.7.1.2
06.2	(leaves block light near tree so) more light (as you move outwards) for photosynthesis (which) produces (more) glucose / proteins (for growth)	allow low light intensity under tree ignore Sun allow less photosynthesis under the tree ignore growth ignore food allow molecules, cell components or other correct substances instead of proteins if no other mark awarded allow less water / ions / minerals / nutrients under the tree	1 1 1	AO2 4.7.2.1 AO1 4.7.2.1 4.4.1.1 4.4.1.3 AO1 4.7.2.1 4.4.1.1 4.4.1.3
06.3	 quadrat light meter	in this order correct spelling only allow lux meter allow light intensity meter allow light data logger	 1 1	AO1 4.7.2.1
06.4	1.5(0) (m^2)	allow 15 000 cm^2	1	AO2 4.7.2.1

4.7.3.3 Land use

Answer 02 · Mark scheme

June 2018 | 8464/B/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	to keep light (intensity) as similar as possible	allow the light (intensity) might change ignore references to temperature ignore weather ignore Sun	1	AO3 4.7.2.1
06.6	any **one** from: • repeat (investigation) around the tree • repeat (investigation) for other trees / areas • sample every one metre • count the number of each species present (rather than percentage cover)	allow repeat in different directions ignore repeats unqualified ignore repeat at different times / days / seasons ignore different size quadrat ignore random sampling	1	AO3 4.7.2.1
06.7	daisy		1	AO3 4.7.2.1
06.8	as light (intensity) increased so did the percentage / cover of plants up to 100% / maximum at 175 (arbitrary units)	ignore directly proportional ignore positive correlation unqualified ignore distance	1 1	AO3 4.7.2.1

4.7.3.3 Land use

Answer 02 · Mark scheme

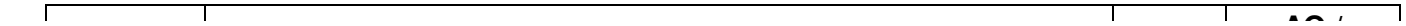
June 2018 | 8464/B/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.9	any pair from: • (lack of) water / rain (1) because the leaves are stopping the rain **or** because the roots of the tree are absorbing it (1) • (lack of) minerals / ions (1) because the tree (roots) have absorbed them (1) • temperature (1) because less thermal energy from the sun is reaching under the tree canopy (1)	ignore carbon dioxide do **not** accept oxygen allow soil moisture allow magnesium / nitrate / nutrients allow too cold / cooler allow 'heat' for thermal energy allow pH / acidity (1) because (some) fallen leaves are acidic (1)	2	AO2 4.7.2.1
Total			**15**	

4.7.3.3 Land use

Answer 02 · Mark scheme

June 2018 | 8464/B/2F | Original Q6



4.7.3.3 Land use

Answer 03 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	transpiration		1	AO1 4.2.3.2
04.2	guard cell		1	AO1 4.2.3.1 4.2.3.2
04.3	(real length of cell =) $\frac{25}{800}$ 0.03125 31.25 (µm)	an answer of 31.25 (µm) scores 3 marks allow 2 marks for $\frac{25\,000}{800}$ allow 31 or 31.3 allow correct unit conversion of incorrect answer	1 1 1	AO2 4.1.1.5
04.4	temperature of the room		1	AO2 4.2.3.2
04.5	any water / mass lost was from the leaves / plant	allow so no water was lost (directly) from the soil	1	AO3 4.2.3.2
04.6	0.1 g		1	AO2 4.2.3.2
04.7 View with Table 1	511.2 (g)	answer line takes precedence	1	AO2 4.2.3.2
04.8	the higher the temperature the more water lost	cause and effect must be the correct way round	1	AO3 4.2.3.2

4.7.3.3 Land use

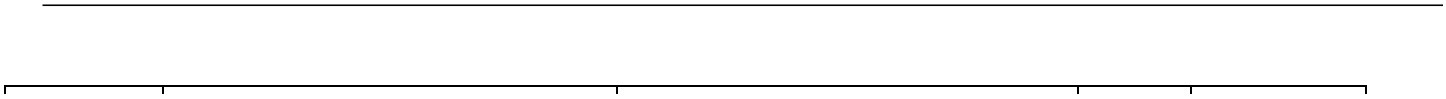
Answer 03 · Mark scheme

04.9	any **two** from: • humidity • air movement • light (intensity) • water availability • rate of photosynthesis	 allow wind allow time of day allow number / size of leaves / allow number of stomata on plant ignore type of plant ignore time plant left for	2	AO1 4.2.3.2
Total			**12**	

4.7.3.3 Land use

Answer 03 · Mark scheme

June 2019 | 8464/B/1F | Original Q4



4.7.3.3 Land use

Answer 04 · Mark scheme

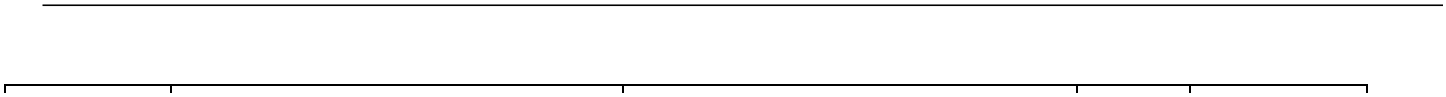
June 2019 | 8464/B/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	description of any correct method to achieve randomness e.g. random number generator	ignore throwing quadrat / frame	1	AO3 4.7.2.1 10.2.7
02.2	frame / square	allow rectangle ignore internal squares / grid	1	AO1 4.7.2.1 10.2.7
02.3 mark with **2.4** and **2.5**	9(.0)		1	AO2 4.7.2.1 10.2.7
02.4 mark with **2.3** and **2.5**	15 000 (m^2)		1	AO2 4.7.2.1 10.2.7
02.5 mark with **2.3** and **2.4**	9.0 × 15 000 135 000	answer must be consistent with answers in questions **02.3** and **02.4**	1 1	AO2 4.7.2.1 10.2.7
02.6	any **two** from: • herbivores / animals • competing (with other plants) • (human) trampling / playing • (plant) disease / pathogen • mowing	allow being eaten	2	AO1 4.7.1.2 4.7.1.3
02.7	less light / water for photosynthesis **or** fewer ions / nitrates / minerals (1) so fewer proteins (1)	ignore Sun allow fewer magnesium (ions) allow less nutrients idea of fewer only needed once to gain both marks allow fewer ions / nitrates / minerals / nutrients so less growth for **2** marks	1 1	AO3 AO2 4.7.1.3 4.7.1.2
Total			**10**	

4.7.3.3 Land use

Answer 04 · Mark scheme

June 2019 | 8464/B/2F | Original Q2



4.7.3.3 Land use

Answer 05 · Mark scheme

June 2019 | 8464/B/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	hold a ruler (just) above the (open) hand of the other student drop the ruler and other student catches it record where the ruler is caught	ignore near the hand do **not** accept give verbal signal ignore timing	1 1 1	AO1 4.5.2
06.2	193.5		1	AO2 4.5.2
06.3	to compare the effect of no caffeine	allow as a control (group) allow to show the effect of caffeine do **not** accept control variable	1	AO3 4.5.2
06.4	0.217 (s)	allow any value in the range 0.2150 to 0.2180	1	AO2 4.5.2
06.5	as mass of caffeine increases the decrease / change in reaction time increases	allow converse ignore caffeine decreases reaction time do **not** accept the greater the increase in reaction time the greater the mass of caffeine	1	AO3 4.5.2
06.6	their reaction time was greater (after the drink)	allow converse allow slower / longer for greater do **not** accept anomalous result	1	AO3 4.5.2

4.7.3.3 Land use

Answer 05 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.7	0.01(0) to 0.18(0) **or** 0.18(0) to 0.01(0) **or** 0.17(0)	allow values in range 0.008 to 0.012 **and** 0.178 to 0.182 allow correct calculation from values in range if no values are given, allow answers in the range 0.166 to 0.174 allow 0.01 ≤ C ≤ 0.18 ignore units	1	AO2 4.5.2
06.8	any **two** from: • (same range of) age • (same) sex / gender • (same) height / weight / BMI • all had no caffeine / medication / drugs earlier that day • equally tired or (same) amount of sleep • practice of the ruler drop test • starting point of ruler / hand • same point to take measurement above / below the thumb / finger • using the same hand • (same) number of students in each group	allow height ruler dropped from do **not** accept volume / concentration of caffeine	2	AO3 4.5.2
06.9	not automatic (because) it involves the (conscious part of the) brain	allow it is a voluntary action allow because it involves thinking / decision **or** conscious action	1 1	AO2 4.5.2
Total			**13**	

4.7.3.3 Land use

Answer 05 · Mark scheme

June 2019 | 8464/B/2F | Original Q6

4.7.3.3 Land use

Answer 06 · Mark scheme

November 2020 | 8464/B/1F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	concentration of the sugar solution		1	AO1 4.1.3.2 RPA 2
05.2	gained <u>water</u> (water moves) by osmosis **or** (because) concentration of water outside the potato is greater than inside the cells / potato	 allow converse statements (because) concentration (of sugar solution) inside the potato is greater than outside the potato / cells	1 1	AO2 AO1 4.1.3.2 RPA 2
05.3	all points correctly plotted line of best fit drawn as a curve through all the points	allow ± ½ a square ignore extrapolation of curve	1 1	AO2 4.1.3.2 RPA 2
05.4	correct reading from their graph	allow ± ½ a square allow answer in range 0.23 to 0.24 (mol/dm^3) if no line drawn	1	AO3 4.1.3.2 RPA 2

4.7.3.3 Land use

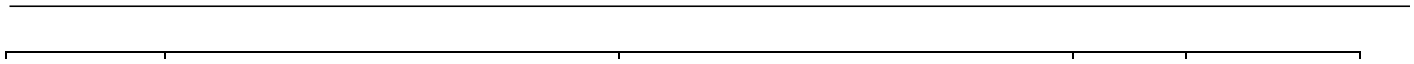
Answer 06 · Mark scheme

05.5	$\frac{0.25 \times 100}{7.96}$ = 3.14(070352) 3.14 (%)	allow $\frac{(8.21-7.96) \times 100}{7.96}$ allow correct rounding to 3 sig figs of an incorrectly calculated percentage change	1 1 1	AO2 4.1.3.2 RPA 2
Total			**9**	

4.7.3.3 Land use

Answer 06 · Mark scheme

November 2020 | 8464/B/1F | Original Q5



4.7.3.3 Land use

Answer 07 · 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

4.7.3.3 Land use

Answer 07 · Mark scheme

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

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**	

4.7.3.3 Land use

Answer 08 · Mark scheme

November 2020 | 8464/B/2F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	plant hedgerows around his fields plant many different crops in his fields		1 1	AO3 4.7.3.6
05.2	any **one** from: • repeat in each area • do more quadrats (to take more readings) • count the number of individuals of each species • remove leaf litter and search in tray • do a timed search of the leaf litter • do on the same day or time of day		1	AO3 4.7.2.1 RPA 7
05.3	the trees provide habitat(s) or shelter so (more) food / camouflage / shade available	allow described allow places to hide or cooler or wetter environment	1 1	AO2 4.7.2.1 RPA 7
05.4	ring drawn around 20		1	AO3 4.7.2.1 RPA 7
05.5	(removing trees) decreases the number of invertebrate species		1	AO3 4.7.2.1 RPA 7

4.7.3.3 Land use

Answer 08 · Mark scheme

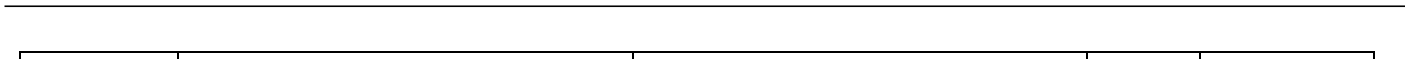
November 2020 | 8464/B/2F | Original Q5

05.6	(less trees means) more light (and) more water / minerals in soil (so) reduced competition **OR** (less trees means) more light (1) (so) (more) photosynthesis (1) (so) (more) glucose (for growth) (1)		1 1 1	AO2 4.7.1.2 4.4.1.1 4.4.1.3
Total			**10**	

4.7.3.3 Land use

Answer 08 · Mark scheme

November 2020 | 8464/B/2F | Original Q5



4.7.3.3 Land use

Answer 09 · Mark scheme

November 2021 | 8464/B/1F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	penicillin		1	AO1 4.3.1.8 4.3.1.9
02.2	any **one** from: • (yellow / green / white / beige) discharge from vagina / penis • pain on urinating	ignore colour of urine allow yellow / green / white / beige discharge ignore pain unqualified allow pain in abdomen allow pain in testes allow inflammation of foreskin allow bleeding between periods allow bleeding after sex allow fever / nausea / vomiting	1	AO1 4.3.1.3
02.3	any **two** from: • concentration (of antibiotic) • type of disc • size of disc • temperature **or** kept at 25 °C • time **or** kept for 3 days	allow same type of (filter) paper allow use sterile Petri dish **or** use sterile agar	2	AO2 4.3.1.3 4.3.1.8
02.4	B		1	AO3 4.3.1.3 4.3.1.8 4.3.1.9

02.5	C		1	AO3 4.3.1.3 4.3.1.8 4.3.1.9
02.6	A		1	AO3 4.3.1.3 4.3.1.8 4.3.1.9
02.7	any **one** from: • antibiotics do **not** destroy viruses • viruses are inside cells	 allow antibiotics do **not** kill viruses allow antibiotics **only** kill bacteria allow HIV is a virus allow HIV is **not** a bacterium allow idea that it is difficult to get the antibiotic to the virus	1	AO1 4.3.1.2 4.3.1.8
02.8	any **one** from: • disinfect / sterilise tools / scissors / files • use a new file for each customer • do not treat people with a fungal nail infection • disinfect hands between customers • use new gloves for each customer	 allow put tools / scissors / files in fungicide allow washing / cleaning tools allow use a new tool / scissors for each customer ignore gloves / PPE unqualified allow wear masks	1	AO2 4.3.1.1 4.3.1.4

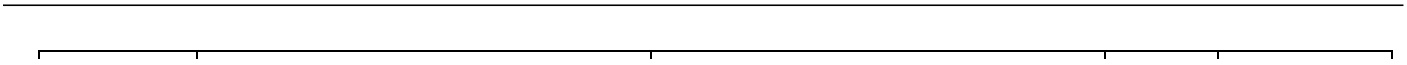
4.7.3.3 Land use

02.9	any **one** from: • feet are washed less • feet are in (more) moist conditions • feet are (often) warmer	allow converse statements allow idea that less air gets to feet allow idea that feet are wetter / warmer (inside socks) allow idea of (bare) feet in contact with the floor allow idea of sharing footwear	1	AO3 4.3.1.1 4.3.1.4
Total			**10**	

4.7.3.3 Land use

Answer 09 · Mark scheme

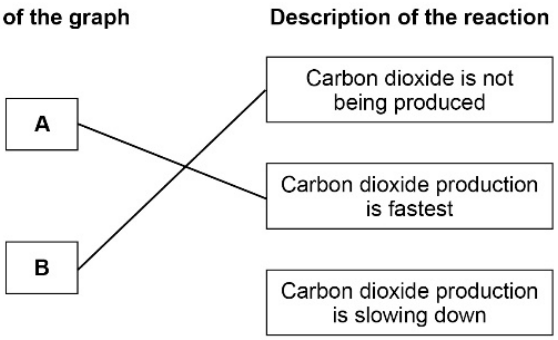
November 2021 | 8464/B/1F | Original Q2



4.7.3.3 Land use

Answer 10 · Mark scheme

November 2021 | 8464/B/1F | Original Q3

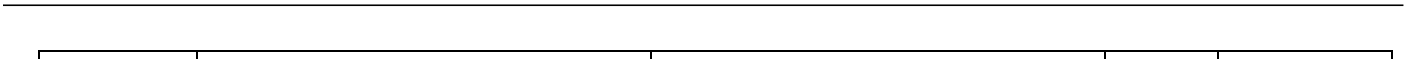
Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	no oxygen (reacting with the glucose)	ignore there is no air	1	AO2 4.4.2.1
03.2	produces ethanol / alcohol		1	AO1 4.4.2.1
03.3	produces carbon dioxide / gas (which) makes the bread / dough rise	 allow idea related to making the bread lighter **or** affecting its texture	1 1	AO1 AO2 4.4.2.1
03.4	45 (cm^3)		1	AO2 4.4.2.1
03.5	to allow time for the mixture to reach 35 °C		1	AO3 4.4.2.1
03.6	 do **not** accept more than one line from a box on the left		1 1	AO3 4.4.2.1

03.7	any **one** from: • glucose / sugar / food ran out • ethanol / alcohol killed the cells / yeast	 ignore yeast / cells died unqualified ignore produced ethanol / alcohol unqualified	1	AO2 4.4.2.1
03.8	(2 °C) too cold (for enzymes / yeast to work) (75 °C) enzymes denatured	allow yeast / enzyme was inactive ignore yeast killed allow no / few successful collisions do **not** accept enzymes are denatured allow enzymes destroyed allow description eg change in shape of active site or of enzyme allow yeast killed do **not** accept enzymes killed ignore references to collisions unqualified	1 1	AO2 4.2.2.1 4.4.2.1
03.9	glucose → lactic acid	**1** mark for each chemical must be in this order ignore formulae	2	AO1 4.4.2.1
Total			**13**	

4.7.3.3 Land use

Answer 10 · Mark scheme

November 2021 | 8464/B/1F | Original Q3



4.7.3.3 Land use

Answer 11 · Mark scheme

November 2021 | 8464/B/1F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	$6\,CO_2 + 6\,H_2O \rightarrow C_6H_{12}O_6 + 6\,O_2$		1	AO1 4.4.1.1
05.2	distance of the pondweed from the lamp		1	AO1 4.4.1.2 RPA5
05.3	bubbles (of gas) would be produced faster	allow more / bigger bubbles of gas would be produced (in a given time)	1	AO3 4.4.1.2 RPA5
	(because) enzymes work faster	allow (because) photosynthesis is controlled by enzymes allow (because) photosynthesis would be faster	1	AO2 4.2.2.1 4.4.1.2
05.4	any **one** from: • use an LED (lamp) • place a tank / beaker of water between the lamp and tube / pondweed • put the tube in a beaker of water • put the tube in a (thermostatically controlled) water bath • place a piece of glass between the lamp and tube / pondweed	allow use a light that does not emit (a lot of) infrared / thermal radiation allow place a heat shield between the lamp and tube / pondweed	1	AO3 4.4.1.2 RPA5

Answer 11 · Mark scheme

05.5	any **two** from: • measure the volume of gas produced • allow the pondweed time to equilibrate • repeat **and** calculate a mean **or** repeat **and** remove anomalies • control the concentration of carbon dioxide (in the water) • use the same bulb / lamp	allow amount for volume allow use a cylinder / gas syringe to collect the gas allow a description of this ignore repeat unqualified allow put the pondweed in sodium hydrogen carbonate (solution) **or** sodium bicarbonate (solution) allow use the same type / size / age / piece of pondweed allow record the number of bubbles of gas produced in a longer period of time	2	AO3 4.4.1.2 RPA5
05.6	3 (bubbles of gas produced per minute)	allow 3.2 (bubbles of gas produced per minute) do **not** accept 3.0 (bubbles of gas produced per minute)	1	AO2 4.4.1.2 RPA5
05.7	as light intensity decreases the rate of photosynthesis decreases	allow as distance from lamp increases rate of photosynthesis decreases allow as distance from lamp increases number of bubbles produced decreases	1	AO3 4.4.1.2 RPA5

4.7.3.3 Land use

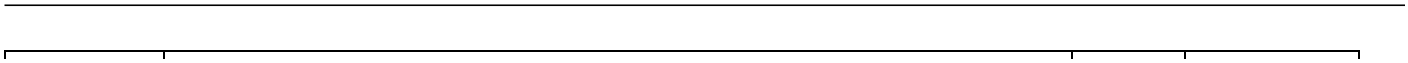
Answer 11 · Mark scheme

05.8	all points plotted correctly line of best fit through their points	allow tolerance of ± ½ a small square allow **1** mark for four points plotted correctly do **not** accept line extended to 0, 0 ignore extrapolations of line	2 1	AO2 4.4.1.2 RPA5
05.9	8	allow correct value from their line ± ½ a small square allow value in range 6 to 9 if a curved line of best fit is not drawn	1	AO3 4.4.1.2 RPA5
Total			**13**	

4.7.3.3 Land use

Answer 11 · Mark scheme

November 2021 | 8464/B/1F | Original Q5



4.7.3.3 Land use

Answer 12 · Mark scheme

November 2021 | 8464/B/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	the reaction time		1	AO1 4.5.2 RPA6
02.2	any **two** from: • age • sex • previous intake of caffeine / coffee that day • usual intake of caffeine / coffee (on previous days) • concentration of caffeine / coffee • volume of caffeine / coffee • time of day • amount / length of sleep • health • body mass • same / type of reaction time program / software • same keyboard • prior experience with the reaction timer	allow gender if neither given allow amount / mass of caffeine / drink **or** type / brand of coffee for **1** mark allow fatigue allow other drugs taken allow (body) weight	2	AO1 4.5.2 RPA6
02.3	any **one** from: • (time) for the coffee / caffeine to work • (time) for coffee / caffeine to be absorbed • (time) for caffeine to reach the brain • (time) for coffee / caffeine to get round the body	allow (time) for the coffee / caffeine to be digested allow (time) for coffee to reach the brain	1	AO3 4.5.2 RPA6

4.7.3.3 Land use

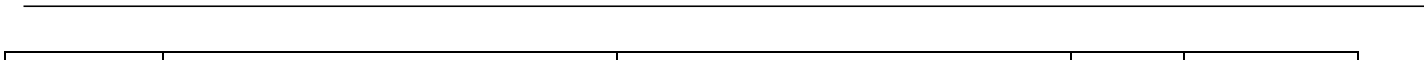
Answer 12 · Mark scheme

02.4	eye		1	AO2 4.5.2 RPA6
02.5	muscle		1	AO2 4.5.2 RPA6
02.6	(reaction time is) decreased	allow reaction time is shorter allow reactions are faster allow (reaction) time is quicker	1	AO2 4.5.2 RPA6
02.7	student 3		1	AO3 4.5.2 RPA6
02.8	leave it out (and divide sum of the others by 4) **or** divide the sum of the others by 4	ignore repeat the test	1	AO3 4.5.2 RPA6
Total			**9**	

4.7.3.3 Land use

Answer 12 · Mark scheme

November 2021 | 8464/B/2F | Original Q2



4.7.3.3 Land use

Answer 13 · Mark scheme

November 2021 | 8464/B/2F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	any **one** from: • less / decreased / reduced photosynthesis • (more) burning / combustion (of wood) • decomposition / decay (of wood)	allow burning / combustion (of fossil fuel in machinery)	1	AO1 4.7.3.4
05.2	methane	allow water (vapour) allow other correct greenhouse gases eg nitrous oxide(s), nitrogen oxide, ozone, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride	1	AO1 4.7.3.5
05.3	any **two** from: • respiration (by animals) • fuel burnt / used for transport • fuel burnt / used to heat / light buildings (in intensive farming) • fuel burnt / used to process / cook (meat)	ignore burning / combustion unqualified	2	AO2 4.7.3.5 4.7.3.4 4.7.2.2

4.7.3.3 Land use

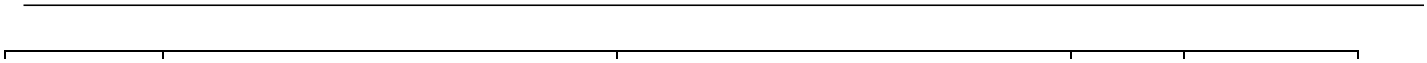
Answer 13 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
05.4	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.	3–4	AO3 4.7.3.5
	Level 1: Relevant features are identified and differences noted.	1–2	
	No relevant content	0	
	Indicative content General • all diets cause carbon dioxide to be released Typical diet • releases more carbon dioxide than diet A **and** B • releases 750 (kg per person per year) more carbon dioxide than diet A • releases 1750 (kg per person per year) more carbon dioxide than diet B Diet A • releases less carbon dioxide than typical diet • releases more carbon dioxide than diet B • releases 1000 (kg per person per year) more carbon dioxide than diet B comparisons can be given in terms of correct data or calculations or proportions for example, typical diet releases 8 times more carbon dioxide than diet B For **Level 2** both comparison of all three diets **and** quoting data or calculation are required.		
Total		**8**	

4.7.3.3 Land use

Answer 13 · Mark scheme

November 2021 | 8464/B/2F | Original Q5



4.7.3.3 Land use

Answer 14 · Mark scheme

November 2021 | 8464/B/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	increases (from 2005) to 690 million **or** increases to 2008	allow peak in 2008 allow peak at 690 million	1	AO2 4.7.3.1 4.7.3.6
	decreases (from 2008) to 630 million		1	
		if no other mark awarded, allow overall increase from 470 million **or** overall increase to 630 million **or** (overall) increase of 160 million **or** increases to 690 and decreases to 630 (without units) for **1** mark		
07.2	$\frac{690(\text{million}) - 460(\text{million})}{690(\text{million})} \times 100$	allow $\frac{230(\text{million})}{690(\text{million})} \times 100$	1	AO2 4.7.3.1 4.7.3.6
	33.3 (%)	ignore number of decimal places allow calculated value from incorrect graph readings	1	
	33 (%)	allow calculated answer correctly given to 2 significant figures	1	
07.3	compost	allow improving soil (texture / drainage / quality) ignore farming unqualified ignore as fertiliser	1	AO1 4.7.3.3
	burning **or** as a fuel		1	

4.7.3.3 Land use

Answer 14 · Mark scheme

November 2021 | 8464/B/2F | Original Q7

07.4	any **two** from: • reduce pollution • plant trees • breeding programmes (for endangered species) • rewilding / regeneration of habitats / hedgerows / meadows • (reintroducing) wider field margins • plant a variety of crops • reduce use of pesticide / herbicide / insecticide	ignore references to carbon dioxide, greenhouse gases or global warming allow reduce named example of pollution, eg smoke **or** acidic gases **or** sewage **or** fertiliser allow reduce toxic waste dumping allow afforestation allow reforestation ignore reduce / stop deforestation allow planting wild flower seeds allow reduce monoculture ignore recycling ignore protect / conserve habitat(s) / areas	2	AO1 4.7.3.1 4.7.3.2 4.7.3.4 4.7.3.6
Total			**9**	

4.7.3.3 Land use

Answer 15 · Mark scheme

June 2023 | 8464/B/1F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	soil	allow ground ignore air ignore rain ignore roots	1	AO1 4.4.1.1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	transpiration		1	AO1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	510.7 – 9(.0) **or** 503.5 – 1.8 501.7 (grams)		1 1	AO2 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	1.8 grams/hour		1	AO2 4.2.3.2

4.7.3.3 Land use

Answer 15 · Mark scheme

June 2023 | 8464/B/1F | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	straight line drawn from 0,0 to 5 hours at a less steep gradient below the line on **Figure 5**	ignore any extrapolations	1 1	AO2 AO3 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	any **one** from: • increase air movement • increase light intensity • decrease humidity	ignore references to temperature ignore references to the bag allow descriptions of how changes could be achieved experimentally eg use a fan	1	AO3 4.2.3.2

Total Question 3	**8**

4.7.3.3 Land use

Answer 16 · Mark scheme

June 2023 | 8464/B/2F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	to produce garden compost		1	AO1 4.7.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	microorganism(s) / bacteria / fungi	allow decomposer(s) / microbe(s) allow mould / mushrooms ignore worm(s) / germ(s)	1	AO1 4.7.2.2 4.7.3.3 4.6.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	oxygen carbon dioxide	must be in this order only	1 1	AO1 4.7.2.2 4.7.3.3 4.6.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	$3\,700\,000 \times \frac{46}{100}$		1	AO2 4.7.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	any **one** from: • climate change • global warming	allow it is getting warmer	1	AO2 4.7.3.3 4.7.3.5

4.7.3.3 Land use

Answer 16 · Mark scheme

June 2023 | 8464/B/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	building factories quarrying rocks		1 1	AO1 4.7.3.3

Total Question 1	8

4.7.3.3 Land use

Answer 17 · Mark scheme

June 2023 | 8464/B/2F | Original Q2

Question 2

Question	Answers	Mark	AO / Spec. Ref.
02.1	<table><tr><th>Variable</th><th>Independent variable</th><th>Dependent variable</th><th>Control variable</th></tr><tr><td>Distractions from background sounds</td><td></td><td></td><td>✓</td></tr><tr><td>Reaction time</td><td></td><td>✓</td><td></td></tr><tr><td>Type of stimulus</td><td>✓</td><td></td><td></td></tr></table> do **not** accept more than one tick in any row	1 1 1	AO1 4.5.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	repeat both methods 10 times		1	AO3 4.5.2 4.5.1 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	any **one** from: • practice • fewer distractions • familiarity (with test)	ignore repeating allow reference to effect of caffeine allow answers referring to competitiveness eg the student wanted to beat a previous time	1	AO3 4.5.2 4.5.1 RPA6

4.7.3.3 Land use

Answer 17 · Mark scheme

June 2023 | 8464/B/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	2 bars correctly plotted **and** 2 bars correctly labelled as seeing (the stimulus) and hearing (the stimulus)	allow a tolerance of ± ½ a small square allow any width bars touching or not allow bars in either order	1	AO2 4.5.2 4.5.1 RPA6
	(y axis label) (mean reaction) time in milliseconds / ms		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5		allow converse for hearing stimulus if clearly stated		
	(when seeing stimulus reaction time is) longer / greater / higher	allow bigger / larger allow slower (reaction time) allow slower (reactions) allow 130 milliseconds more ignore 130 milliseconds unqualified	1	AO3 4.5.2 4.5.1 RPA6

Total Question 2	8

4.7.3.3 Land use

Answer 18 · Mark scheme

June 2024 | 8464/B/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(as a) control **or** (to) compare (the other results to)	allow to show the effect of fan / wind do **not** accept control variable	1	AO3 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(loss of mass / water) increases	allow mass of leaves decreases more allow more (mass / water) is lost	1	AO2 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	loss of water (because water) evaporated from stomata / stoma	 allow by transpiration allow diffusion ignore from guard cells	1 1 1	AO2 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	greater		1	AO2 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	do the investigation again using the same method		1	AO3 4.2.3.2

Total Question 2	7

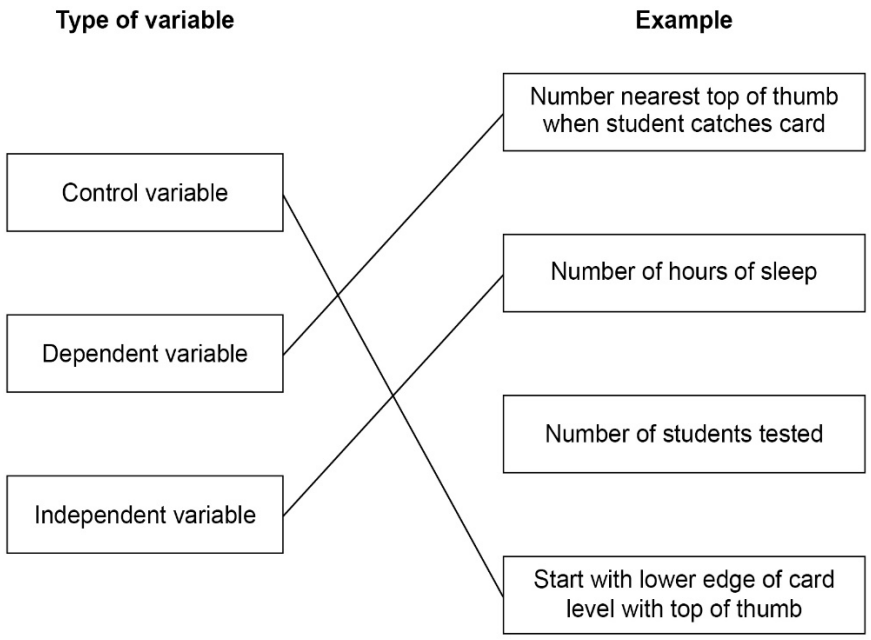
4.7.3.3 Land use

Answer 19 · 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

4.7.3.3 Land use

Answer 19 · 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

4.7.3.3 Land use

Answer 19 · 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

4.7.3.3 Land use

Answer 19 · 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		

	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**

4.7.3.3 Land use

Answer 20 · Mark scheme

June 2025 | 8464/B/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	the length of the pondweed the temperature of the water		1 1	AO1 4.4.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	as the distance increases the volume / oxygen decreases	allow as the light intensity decreases the volume / oxygen decreases ignore use of figures	1	AO2 4.4.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	3.6 (cm^3)		1	AO2 4.4.1.2 RPA 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	accuracy		1	AO2 4.4.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	greater (because) the rate of photosynthesis is higher	no marks if incorrect word chosen allow (because) photosynthesis would be faster / quicker allow (because) there is more photosynthesis allow (because) photosynthesis is controlled by enzymes allow (because) enzymes work faster allow (because) particles have more energy allow (because) the rate of reaction is faster / quicker	1 1	AO2 4.4.1.2

4.7.3.3 Land use

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	palisade mesophyll		1	AO1 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	chlorophyll		1	AO1 4.1.1.2 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	destroy the affected leaves		1	AO2 4.3.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.9	less / no light absorbed		1	AO2 4.3.1.4 4.4.1.2
	(so) less / no photosynthesis	allow (because) chloroplasts / chlorophyll is needed for photosynthesis	1	
	(so) less / no glucose / sugar (is made / produced)	allow (so) less / no protein / fat / starch / cellulose (is made / produced)	1	

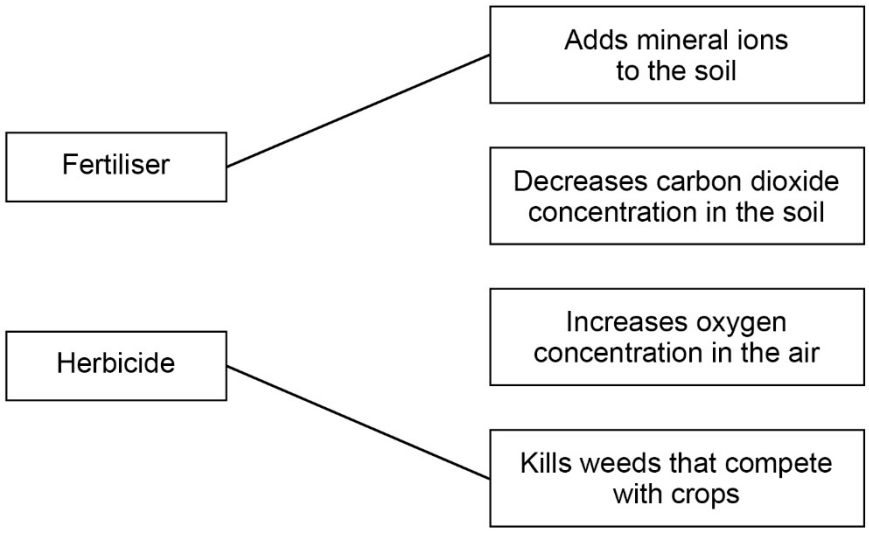
Total Question 2	13

4.7.3.3 Land use

Answer 21 · Mark scheme

June 2025 | 8464/B/2F | Original Q2

Question 2

Question	Answers	Mark	AO / Spec. Ref.
02.1	 do **not** accept more than one line from a box on the left	1 1	AO1 4.7.1.1 4.7.1.2 4.7.3.2 4.6.2.4 4.7.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	owls		1	AO2 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	insects eat pests on the crop insects pollinate the crop		1 1	AO2 4.7.1.1 4.7.2.1

4.7.3.3 Land use

Answer 21 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	any **one** from: • as a habitat for (beneficial) insects / animals • to keep (larger) animals out **or** to keep people out • (to increase) biodiversity • to reduce wind speed • as a habitat for predators of crop damaging organisms • to prevent / reduce soil erosion	allow as a shelter / space for (beneficial) insects / animals allow to protect (the crop) from (larger) animals allow to protect (the crop) from people ignore keep insects / birds out ignore to protect the crop unqualified ignore to stop pests eating the crop allow to increase the number of insects / plants allow descriptions of increasing biodiversity allow act as wind break ignore to reduce pests unqualified ignore so more (crop) can be grown	1	AO2 4.7.3.6 4.7.3.1 4.7.1.1

4.7.3.3 Land use

Answer 21 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5		allow converse if clearly referring to soil		
	water takes more time to drain (through)	allow there will be more water (in the peat compost) allow water drains / moves slow**er** allow water drains / moves more slowly ignore water drains slow / slowly	1	AO3 4.7.3.3
	(so) water is more likely to be taken up by plants **or** (so) do not need to water plants (as) frequently **or** (which is an advantage because) young plants cannot reach water that is deep (in soil / compost)	allow (so) there is more time for plants to take up water allow (so) reduces water use ignore references to cost allow **2** marks for water more likely to be taken up by plants before it drains away	1	

4.7.3.3 Land use

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(A) respiration (B) photosynthesis	answer line takes precedence	1 1	AO1 4.7.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	(burning peat) releases / increases carbon dioxide (which) causes / increases global warming	allow (burning peat) releases / increases CO_2 ignore burning releases carbon do **not** accept peat contains carbon dioxide allow (which) is a greenhouse gas allow (which) causes the greenhouse effect ignore (which) causes / increases climate change	1 1	AO1 4.7.2.2 4.7.3.3 4.7.3.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	bacteria fungi		1 1	AO1 4.7.2.2 4.7.3.3

4.7.3.3 Land use

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.9	farming (cattle / biofuel / crops / animals)	allow examples of farming a crop / animal allow building allow named type of building eg houses / factories allow mining allow landfill allow reforestation / rewilding	1	AO1 4.7.3.4

Total Question 2	**15**

4.7.3.3 Land use

AQA

GCSE
COMBINED SCIENCE: TRILOGY

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

Mark scheme

8464

June 2018

Version/Stage: 1.0 Final

4.7.3.3 Land use

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.

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

4.7.3.3 Land use

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**	

4.7.3.3 Land use

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

4.7.3.3 Land use

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**	

4.7.3.3 Land use

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

4.7.3.3 Land use

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**	

4.7.3.3 Land use

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		

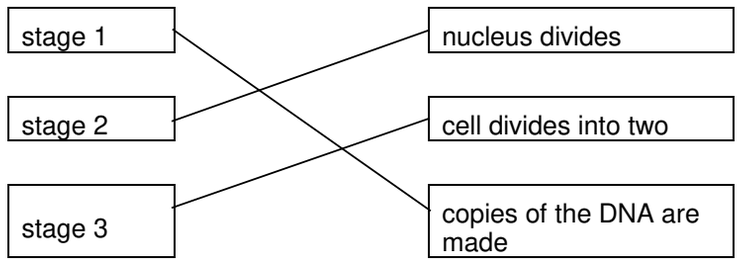
4.7.3.3 Land use

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		

4.7.3.3 Land use

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**	

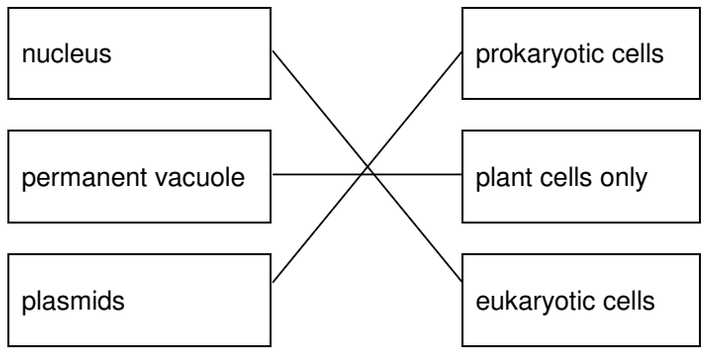
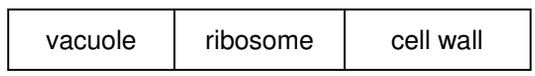
4.7.3.3 Land use

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

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

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**	

4.7.3.3 Land use

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

4.7.3.3 Land use

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	

4.7.3.3 Land use

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**	

4.7.3.3 Land use

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)		1	
	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		

4.7.3.3 Land use

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**	

4.7.3.3 Land use

Answer 09 · Examiner comments

November 2021 | 8464/B/1F | Original Q2

Question 2 (low & standard demand)

This question was about communicable diseases. Most students performed well across the questions relating to the antibiotic investigation. The most common control variables given were the length of time the Petri dishes were incubated, the incubation temperature or the size of the paper discs. Some students gave more than two correct control variables, but if an additional incorrect variable was given the list principle was applied and maximum marks were not awarded. It is advisable just to give the number of variables specified in the question.

Most students correctly interpreted the results shown on the two Petri dishes and selected the correct conclusions. The two questions relating to fungal nail infections were set at a higher level of demand. Some students referred to cleaning hands, surfaces or tools between customers to reduce the risk of nail infections being spread. Wearing gloves or PPE was ignored unless qualified, for example by saying wear new gloves for each customer.

Answer 10 · Examiner comments

November 2021 | 8464/B/1F | Original Q3

Question 3 (low & standard demand)

Ths question was about anaerobic respiration. Two of the questions tested understanding of the equation for fermentation. The equation shows that fermentation is anaerobic because there is no oxygen reacting with the glucose. Many students thought it showed an anaerobic reaction because carbon dioxide was being produced or being used. In a later question some students thought fermentation stopped because the carbon dioxide had all been used up. Few students knew that fermentation is used to make beer and wine because ethanol or alcohol is produced, but more said yeast is used to make bread because it makes the dough rise. Hardly any students linked this to the production of carbon dioxide.

Most students recognised that the steepest part of the graph represented when the rate of gas production was the fastest, but more than half thought that the horizontal line on the graph showed that gas production was slowing down, when it had actually stopped being produced. Two-thirds of students scored a mark for saying no carbon dioxide was being produced at 2 ºC because it was too cold, or because it was not hot enough. Some said the enzymes were denatured at 75 ºC. A tenth of students identified the names of both the reactant and the product for anaerobic respiration in animal cells. Many students wrote down more than one reactant or product.

4.7.3.3 Land use

Answer 11 · Examiner comments

November 2021 | 8464/B/1F | Original Q5

Question 5 (standard demand)

This question assessed knowledge and understanding of Required Practical Activity 5: investigating the effect of light intensity on the rate of photosynthesis. Two-fifths of students correctly identified the balanced equation for photosynthesis, with a similar proportion knowing that the distance of the pondweed from the lamp was the independent variable. Almost half of students stated a higher temperature would cause the pondweed to produce more bubbles, which was allowed. On the Foundation Tier students did not go on to explain why the rate would be faster at a higher temperature, nor did they suggest how the investigation could be improved so the temperature of the water did not increase. Many students did not understand what was being investigated, and suggested moving the lamp further away from the pondweed. A fifth of students scored one of the marks for **05.5**, usually for saying that using the same pondweed would make the results more valid. Quite a few students referred to carrying out repeats, but did not go on to say calculate a mean, or remove anomalies.

A third of students correctly calculated the rate of photosynthesis as 3 bubbles of gas per minute. The most common error was to divide the distance by the number of bubbles produced at that distance, or to multiply the distance by the number of bubbles. Over half of students made a correct conclusion describing the effect of light intensity on the rate of photosynthesis. Some students only described a pattern, such as ‘as distance increased the number of bubbles decreased’, which was insufficient. A reference to light intensity or distance from the lamp was needed, as well as a reference to the rate of photosynthesis, or to the number of bubbles produced. Cause and effect also had to be the correct way around, to link back to what the investigation was set up to find out.

Approximately two-thirds of students correctly plotted the results on the graph paper, using a small cross drawn with a sharp pencil. Only a few went on to join the points with a smooth curve. Most drew a ruled straight line. About a quarter of students extrapolated their line to predict the number of bubbles that would be produced if the lamp was 60 cm from the lamp.

Answer 12 · Examiner comments

November 2021 | 8464/B/2F | Original Q2

Question 2 (low & standard demand)

This was based on Required Practical Activity 6. It was clear that many students did not appear to understand the method given. When asked for two control variables, many students copied steps from the method that were not applicable.

Most students could identify the receptor and effector in this situation. It was more challenging to describe the effect of drinking coffee on reaction time, with many students stating reaction time increased. **02.7** required students to identify the smallest change in reaction time. A common incorrect answer was student 5, who showed the lowest reaction time, but not the smallest change. Most students knew that the anomalous result should not be included when calculating the mean. Common incorrect responses referred to rounding the anomaly up or down.

4.7.3.3 Land use

Answer 13 · Examiner comments

November 2021 | 8464/B/2F | Original Q5

Question 5 (low & standard demand)

Few students could give one way that deforestation can increase carbon dioxide levels in the atmosphere. Methane was the most common correct answer given to **05.2**. Common incorrect responses included nitrogen, oxygen and hydrogen.

Students found it difficult to give two ways the production of meat releases carbon dioxide. The most common correct answer referred to fuel used to cook meat. Respiration of the animals was not a common response. Frequent misconceptions were that the animals release carbon dioxide when they are killed or cut open. Some responses were too vague at this level, therefore 'transport' was insufficient, but 'fuel is burnt or used to transport the animals/meat' was acceptable.

In **05.4** students were expected to compare the carbon dioxide released during the production of all three diets and use data from the graph. Students who did not compare all three diets and use the data could not access level 2 (for 3 or 4 marks). Responses that indicated only which diet released most or least carbon dioxide during production generally only gained 1 mark. If all three diets were compared and correct calculations of the differences from the graph were given, then 4 marks was awarded.

4.7.3.3 Land use

Answer 14 · Examiner comments

November 2021 | 8464/B/2F | Original Q7

Question 7 (standard demand)

Generally, students could interpret the graph and describe the trends between 2008 and 2011 in terms of years, such as 'it increases to 2008' however, fewer could correctly extract relevant data, such as the money spent in millions of pounds in 2008 or 2011. References to trends beyond 2011 were ignored. Some students tried to give economic or 'levels of concern' reasons for the trends which did not answer the question. When 'describe' is used as a command word the answer does not require an explanation.

In **07.2** students were asked to calculate the percentage change, and given the equation. Some students did not appear to read the appropriate figures from the graph. The most common error was not giving the answer to two significant figures. This is prompted in the question and on the answer line. There were indications that some students are confused between decimal places and significant figures.

Knowledge about uses of peat was very limited, with most students not being able to give one use of peat taken from peat bogs. The most common correct answer related to peat in compost. Misconceptions of the term biodiversity were frequently seen in **07.4**, with answers referring to diversity in the human population or vague answers relating to recycling or climate change that would not directly increase biodiversity. Suggestions that would maintain, or decrease the rate of biodiversity decline, such as 'stop hunting' may maintain, but not increase biodiversity, and therefore were considered to be insufficient at this level.

Concluding remarks

It was clear that in the unusual teaching circumstances leading up to this exam, it had not been possible for more some topics and practical work to be covered in the typical way. It was a small and seemingly atypical cohort of students who have chosen to take the autumn series of examinations. Gaps in both knowledge and skills were evident.

4.7.3.3 Land use

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

4.7.3.3 Land use

Answer 15 · Examiner comments

June 2023 | 8464/B/1F | Original Q3

Question 3

03.1 Just over a quarter of students said plants obtain water from the soil or from the ground. Common responses that were ignored included from rain, from the air or from roots.

03.2 Three fifths of students knew that the evaporation of water from leaves is called transpiration. The most common incorrect response was respiration.

03.3 Almost three fifths of students scored both marks for calculating the mass of the plant on the balance after 5 hours. There were two ways to calculate the answer, both of which were seen. Some students subtracted the mass of water lost at 5 hours (9 g) from the starting mass (510.7 g), whilst others subtracted the difference in water loss between 4 and 5 hours (1.8 g) from the mass of the plant at 4 hours (503.5 g). Both gave the answer 501.7 grams. The answer of 507.1 g was often seen, which might have been due to a transcription error. However, some students showed that they added together the 5 values of mass for 0, 1, 2, 3 and 4 hours, and then divided the total by 5, giving a final answer of 507.1 g. Very few students scored only 1 mark, but over a third scored 0 marks.

03.4 Two thirds of students correctly worked out the rate of water loss from the plant as 1.8 grams/hour. They could have used the table of results or the graph to work out the answer. The most common incorrect response was 9.0 grams/hour.

03.5 Students were asked to draw a line on the graph to show how the results would be different if the investigation was repeated at a lower temperature. The rate would have been slower, therefore a less steep line should have been drawn. The reaction would still have started at 0 hours and finished at 5 hours, so a straight line, drawn using a ruler from 0,0 to 5 hours was needed. Almost two thirds of students scored at least 1 mark and over half of the students scored both marks. It was good to see a ruler being used by the majority of students.

03.6 The question asked for one change to the investigation that would increase the rate of water loss from the plant. A factor that would affect the rate did not gain credit unless it was clear whether the factor should be increased or decreased. Quite a lot of students said increase the time the plant was left for. This would not affect the rate so was ignored.
Only a tenth of students gave a creditworthy response. The most common correct response was to increase the light intensity. Those who just wrote light intensity did not gain credit. References to increasing the temperature were ignored. This idea had been tested in the previous question, and students were told not to refer to temperature in their answer. Quite a lot of students said remove the bag. They did not realise that transpiration is from the leaves and the bag was there to prevent loss of water from the soil.

4.7.3.3 Land use

Answer 16 · Examiner comments

June 2023 | 8464/B/2F | Original Q1

Question 1 (Low demand)

01.1 Students were asked to identify why peat is removed from peat bogs. One-third of students were able to do this.

01.2 The most common correct answer for the name of one type of organism that causes decay was bacteria. Frequently seen incorrect responses included insects, or named insects. Either the question was not well read or there was frequent confusion that a gas was an organism, with various gases being named, perhaps as a result of question **01.3**.

01.3 The most common error was to confuse oxygen and carbon dioxide as a product and reactant in respiration, but all combinations of the words in the answer spaces were seen.

01.4 50% of students could identify how the percentage could be calculated.

01.5 Many students could state the reason as climate change or global warming. Incorrect or insufficient answers included 'they are melting', 'because they are decaying' (both of which are simply rephrasing what has been given in the question and not creditworthy), 'people are taking peat' and 'we aren't making them anymore'.

Some students had made the correct connection between the reduction of frozen peat bogs and temperature but were not awarded the mark as they had just said that temperature 'changes' or has 'changed over the years' which was insufficient as the 'change' could be colder temperatures.

01.6 Over 50% of students could identify two activities that decrease the area of land available for other animals and plants.

Answer 17 · Examiner comments

June 2023 | 8464/B/2F | Original Q2

Question 2 (Low demand)

02.1 20% of students could correctly identify which variable was a control, independent or dependent variable for 3 marks. A further 40% gained 1 mark. The most common correct answer was for the control variable.

02.2 50% of students could correctly identify an improvement to the method.

02.3 Although the context of the investigation was a novel application of the required practical activity, many students had no difficulty applying their knowledge of the effects or practice and familiarity to answer the question. Few students mentioned distractions. References to simply repeating were insufficient (and just repeated part of the question). Being focused / alert / prepared were considered insufficient because these ideas could equally apply the first time the student undertook the test.

02.4 Students were asked to label the *y*-axis. Axes labels should enable anyone viewing the graph to make sense of the results. Therefore, simply labelling the *y*-axis 'y-axis' is insufficient. The label should include the unit. The brackets on the mark scheme indicate what was considered essential for the label, therefore 'Time / ms' was the minimum requirement.

The bars could be in either order. Some students confused the labels on the two bars. Students should be encouraged to use a ruler to draw bar charts. Those who drew the bars freehand were sometimes out of tolerance on the height of the bars.

4.7.3.3 Land use

Answer 17 · Examiner comments June 2023 | 8464/B/2F | Original Q2

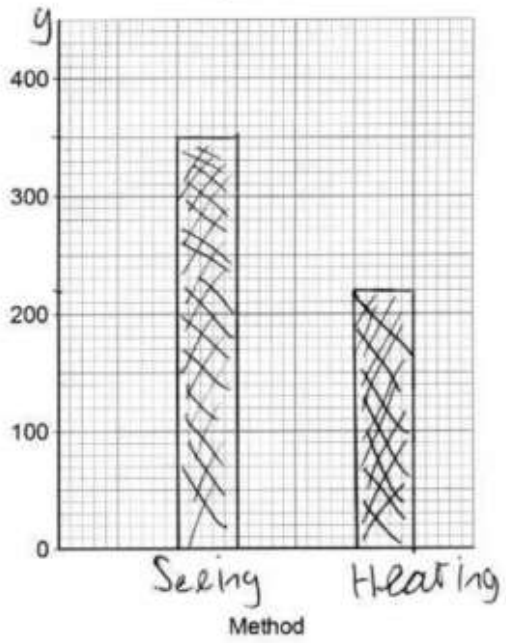
0 2 . 4 Complete **Figure 2**.

You should:

- plot the data from **Table 2** as a bar chart
- label each bar
- label the y-axis.

[2 marks]

Figure 2



The student has simply labelled the axis 'y' therefore marking point 2 cannot be awarded. The labels for the bars and the height of the bars allow marking point 1 to be awarded.

02.5 There are many ways that students could make a correct comparative statement about the two reaction times. Some students incorrectly stated that the reaction time when seeing was faster. This continues to be an issue, with students equating a larger number with 'faster'.

Unless stated otherwise by the student, we assumed the answer referred to reaction time when seeing the stimulus. This is due to the way the question is phrased. Therefore, 'it' was taken as the reaction time when seeing the stimulus, unless otherwise stated.

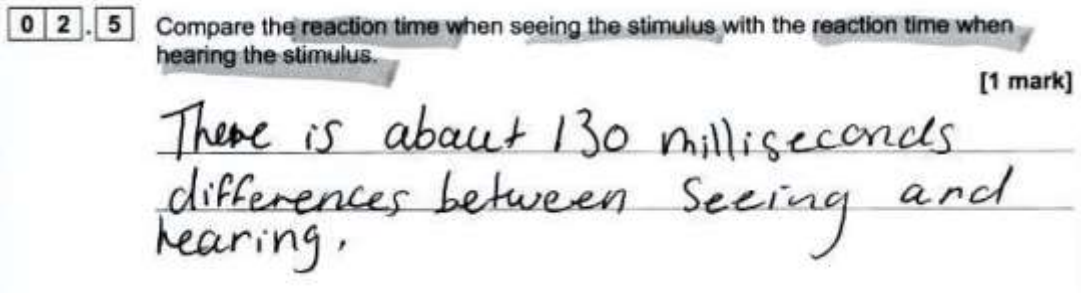
It is equally valid for students to give the converse argument, but only if clearly relating that argument to hearing. Therefore, 'They heard it quicker than they saw it' was acceptable.

4.7.3.3 Land use

Answer 17 · Examiner comments June 2023 | 8464/B/2F | Original Q2

0 2 . 5 Compare the reaction time when seeing the stimulus with the reaction time when hearing the stimulus.

[1 mark]



The student has calculated the difference in reaction time, but the mark is not awarded because they have not stated which reaction time is greater / smaller.

Answer 18 · Examiner comments June 2024 | 8464/B/1F | Original Q2

Question 2 (low & standard demand)

02.1 The majority of students were unable to identify that this was a control and that it allowed a comparison to be made. Most just repeated that it was to see the loss of mass with the fan off. Whilst this is a correct statement, it does not answer the question.

02.2 Many students did not express their answer well, saying that mass loss 'changed' without qualifying that the mass loss increased.

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4.7.3.3 Land use

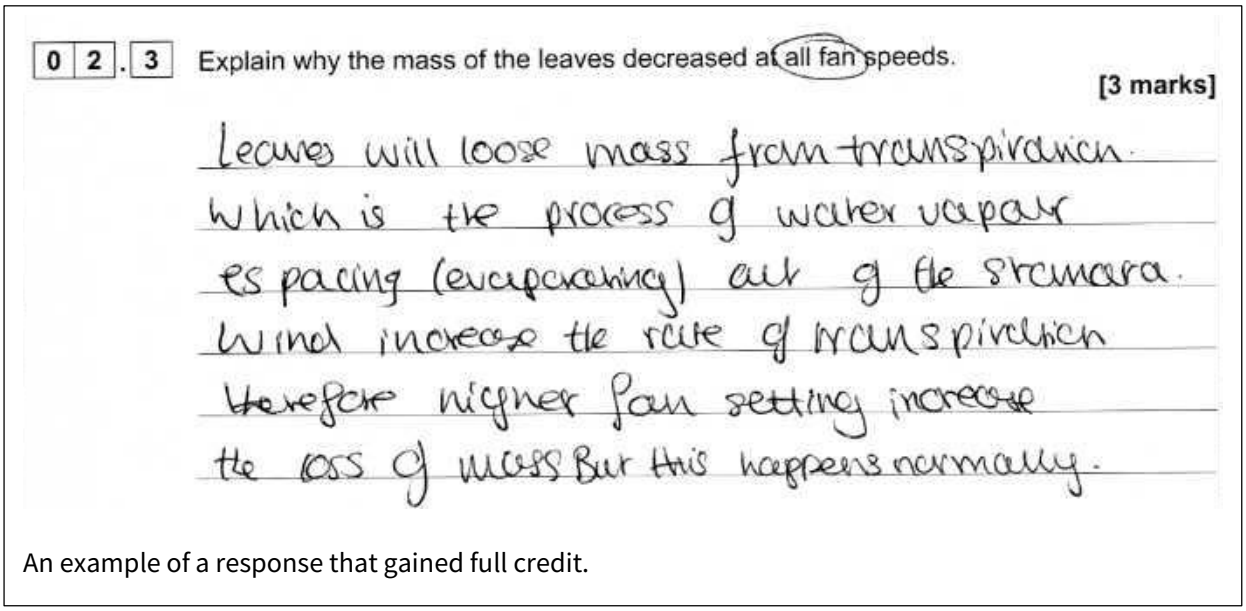
Answer 18 · Examiner comments June 2024 | 8464/B/1F | Original Q2

02.3 This proved a challenging question for many students and 81% did not gain any credit. Students were unable to link the idea of water loss to the mass loss from the leaves. A few students were able to articulate that mass was lost because water was lost. However, many of these students expressed this as water blowing off the leaf rather from inside the leaf.

Many students stated that the mass decreased due to bits of the leaf blowing off; 'dirt', 'dust' and 'parts' were all regularly used as a reason for the mass loss.

There were many other incorrect descriptions of how parts of the leaf could be lost or how the pressure of the wind would affect the leaf. Some students said that the leaf could no longer photosynthesise, and this was why it would lose mass. Others wrote about the leaf using energy as it was blown around by the fan. A small number of students wrongly described the water being lost by the guard cells.

A very high proportion of students had no clear understanding of what was being lost, through what process and which leaf structure enabled the loss.


0 2 . 3 Explain why the mass of the leaves decreased at all fan speeds.

[3 marks]

Leaves will loose mass from transpiration. which is the process of water vapour escaping (evaporating) out of the stomata. Wind increase the rate of transpiration therefore higher fan setting increase the loss of mass But this happens normally.

An example of a response that gained full credit.

02.4 60% of students correctly picked greater with the common incorrect answer being smaller.

02.5 About three-quarters of students correctly picked how to improve repeatability.

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Answer 19 · 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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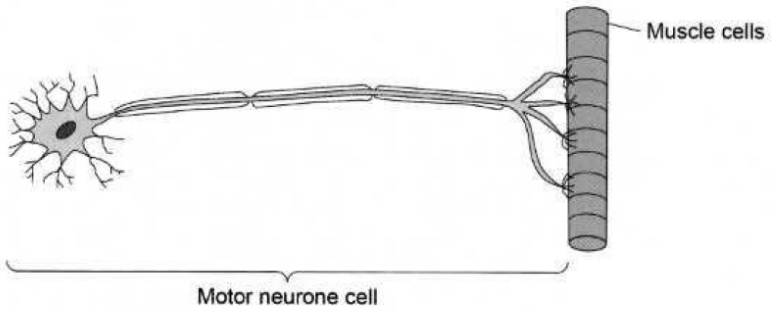
4.7.3.3 Land use

Answer 19 · 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 20 · Examiner comments

June 2025 | 8464/B/1F | Original Q2

Question 2 (Low and Standard demand)

02.1 82% of students gained at least one mark, with 24% achieving both marks.

02.2 This question was generally well answered, with many students correctly identifying that as the distance increased, the volume of oxygen decreased.

However, students who failed to gain credit often gave vague responses such as ‘it went down’ or ‘it decreased’, without specifying what changed or how the two variables were related.

Some students attempted to explain the trend instead of describing it—for example, by writing ‘as the distance increased, photosynthesis was slower’. While this demonstrated some understanding, it did not directly answer the question and could not be awarded credit.

02.3 The direction of the scale confused many students, most of whom incorrectly gave the value corresponding to the shaded area (representing water) instead. As a result, the most common incorrect responses fell within the range of 4.2 to 4.6, which reflected the volume of water rather than of oxygen.

02.4 78% of students gained the mark on this question.

02.5 This question was generally well attempted, with many students correctly selecting ‘greater’. However, some students were not awarded this mark by either not selecting a word from the list or by choosing their own term.

Despite many students recognising that the volume of oxygen collected would increase, few successfully linked this to photosynthesis as the underlying biological process. Instead, a common error was to rephrase the question stem with responses such as ‘the warmer it is, the more oxygen is produced’, which lacked scientific reasoning.

Some students attempted to explain the increase in oxygen production by referencing energy, but many incorrectly linked this energy increase to the lamp or plant rather than to the particles involved in the reaction.

02.6 49% of students gained the mark on this question. The most frequently chosen incorrect response was spongy mesophyll.

02.7 This question was generally well answered, with most students, 51%, able to provide a recognisable version of the correct answer such as 'chloraphyill’ or ‘chlorofill’.
However, ambiguous responses such as ‘chloroplasm’ were not awarded credit.

02.8 42% of students gained the mark on this question. The most frequently chosen incorrect response was the use of an antitoxin on the affected leaves.

02.9 Very few students, only 8%, gained two or more marks on this question. Some students misinterpreted the question, assuming that all leaves had been infected or removed. In these cases, responses that stated no light absorbed, no photosynthesis, or no glucose/protein production were accepted for each respective marking point, as this was a reasonable interpretation.

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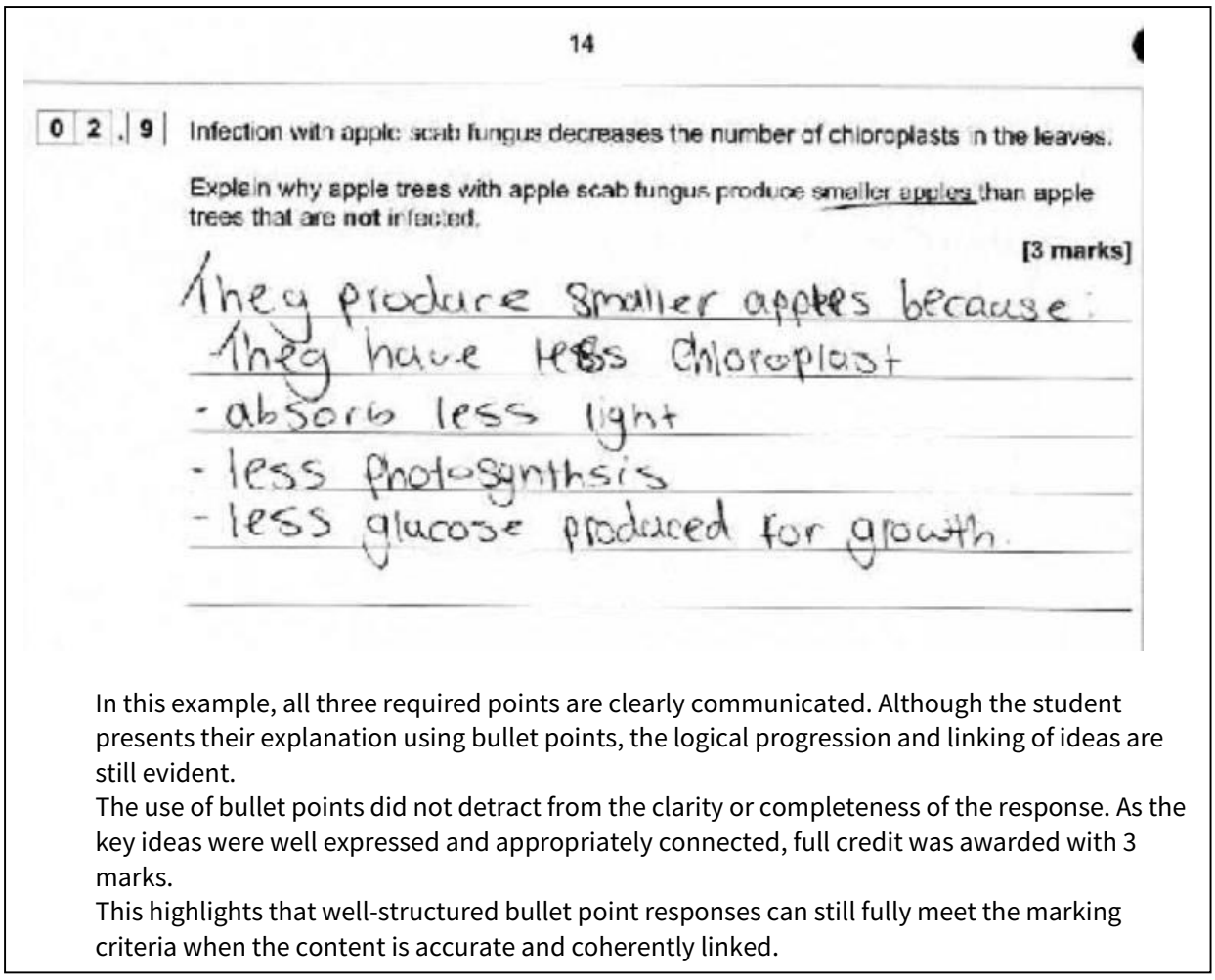
4.7.3.3 Land use

Answer 20 · Examiner comments June 2025 | 8464/B/1F | Original Q2

Many students correctly identified that less photosynthesis would occur. Some students were credited for recognising that less light is absorbed. Acceptable alternatives included less light is taken in, but responses such as 'less light is attracted to the leaf' were not creditworthy.

A number of students made the connection between smaller apples and glucose production or referred to complex substances such as starch. cellulose, fat or protein, all of which were acceptable.

Answers that referred to less energy, but without qualifying this in terms of glucose or product synthesis, could not be credited.



14

0 2 . 9 Infection with apple scab fungus decreases the number of chloroplasts in the leaves.

Explain why apple trees with apple scab fungus produce smaller apples than apple trees that are **not** infected.

[3 marks]

They produce smaller apples because:
They have less chloroplast
- absorb less light
- less photosynthsis
- less glucose produced for growth.

In this example, all three required points are clearly communicated. Although the student presents their explanation using bullet points, the logical progression and linking of ideas are still evident.
The use of bullet points did not detract from the clarity or completeness of the response. As the key ideas were well expressed and appropriately connected, full credit was awarded with 3 marks.
This highlights that well-structured bullet point responses can still fully meet the marking criteria when the content is accurate and coherently linked.

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Answer 21 · Examiner comments

June 2025 | 8464/B/2F | Original Q2

Question 2 (Low and Standard demand)

02.1 The correct role of fertiliser was seen more frequently than that of herbicide, but many students did not seem familiar with either term.

02.2 Fewer than half of students could identify the secondary consumer in the food chain. 'Mice' was the most commonly selected answer, presumably with students focussing on the 'secondary' rather than understanding the term 'secondary consumer'.

02.3 Most often, students could identify that insects pollinating the crop would increase yield, but fewer students realised that insects eating pests on the crop would also increase crop yield.

02.4 Many students gave a correct suggestion about why farmers increase the size of hedgerows. Most frequently this was the idea of keeping animals or people out or increasing the number of insects. Reponses suggesting that this gives more space for crops to grow was a frequent misconception, along with incorrect ideas of what hedges are and how much of a barrier they represent, for example, preventing insects passing through or preventing the spread of disease. Some students mistakenly thought hedgerows would keep birds out. Overall, there was a lack of appreciation for the role of hedgerows in increasing biodiversity.

02.5 Student can never be given credit to repeating information in the question, so statements such as 'the water drains slow' could not be awarded mark point 1. If students went a little further to state that 'the water drains more slowly', the response was then comparative and the mark could be awarded.

Peat comes from peat bogs.

0 2 . 5 Peat can be used to produce garden compost.

Table 1 compares peat compost with a sample of soil.

Table 1

	Mineral ion concentration	Speed at which water drains through
Peat compost	Low	Slow
Soil	High	Fast

Young plants have short roots.

Explain **one** advantage of growing young plants in peat compost instead of in soil.

[2 marks]

They have a low mineral ion concentration
A slow speed at which water drains
through.

This student has not added any information that is not taken directly from Table 1, therefore no marks could be awarded. If the student had stated 'A slower speed at which water drains through' then the mark would be awarded for that comparative response.

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4.7.3.3 Land use

Answer 21 · Examiner comments June 2025 | 8464/B/2F | Original Q2

02.6 **‘**Transpiration’ was frequently given as an incorrect answer. Presumably because students are more familiar with plants transpiring, than with plants respiring.

02.7 Students were provided with the information that peat contains carbon compounds and that burning peat contributes to climate change. Therefore, neither of those ideas could be awarded credit. The most common response that did not gain credit was that ‘burning peat releases carbon and contributes to climate change’. Some students were incorrectly linking carbon dioxide with the ozone layer.

02.8 Nearly 50% of students could identify that both bacteria and fungi cause decay. The most common incorrect answer was ‘algae’.

02.9 The wide mark scheme indicates the many and varied ways that students could answer this question. All the ideas on the mark scheme were seen. When the mark was not awarded, this was usually because students had not read or understood the question and they responded in terms of ‘fewer trees giving out oxygen’.