GCSE
BIOLOGY
8461/1F

Paper 1 Foundation Tier

Mark scheme

June 2022

Version: 1.0 Final Mark Scheme



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 Examiner.

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.

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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 their 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 (for example, a scientifically correct answer that could not reasonably be expected from a student's knowledge of the specification).

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**.
Alternative words in the mark scheme are shown by a solidus 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 errors / 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** magnetic materials.

[2 marks]

Student	Response	Marks awarded
1	iron, steel, tin	1
2	cobalt, nickel, nail*	2

3.2 Use of symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, or uses symbols to denote quantities in a physics equation, 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. At any point in a calculation students may omit steps from their working. If a subsequent step is given correctly, the relevant marks may be awarded.

Full marks are **not** awarded for a correct final answer from incorrect working.

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

An error can be carried forward from one question part to the next and is shown by the abbreviation 'ecf'.

Within an individual question part, an incorrect value in one step of a calculation does not prevent all of the subsequent marks being awarded.

3.6 Phonetic spelling

Marks should be awarded if spelling is not correct but the intention is clear, **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.

3.11 Numbered answer lines

Numbered lines on the question paper are intended to support the student to give the correct number of responses. The answer should still be marked as a whole.

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, if necessary, 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. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

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.

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	sexual intercourse		1	AO1 4.3.1.1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	increased (at first) (then) decreased	ignore numbers unqualified do **not** accept an implication of an overall increase if no other mark awarded allow (overall) decrease for **1** mark	1 1	AO3 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	better education on how to prevent the spread of HIV		1	AO3 4.3.1.1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	(C) → E → A → B → D	allow **1** mark for E → A link allow **1** mark for A → B link allow **1** mark for B → D link if no other mark awarded allow **1** mark for an answer of (C) → E → B → A → D	3	AO1 4.3.1.1 4.3.1.6 4.3.1.7 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	testing on healthy volunteers		1	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	drugs that destroy viruses also damage body tissues		1	AO1 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	**Drug** / **Plant the drug originated from** Aspirin Digitalis Foxglove Rose Tobacco Willow do **not** accept more than one line from a box on the left		1 1	AO1 4.3.1.1 4.3.1.9

Total Question 1		11

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	$\frac{1}{4}$		1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	10		1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	grows replicates divides	must be in this order	1 1 1	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	C		1	AO3 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	10%		1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	circulatory system		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	cardiovascular disease / CVD **or** (coronary) heart disease / CHD	allow heart attack allow any correctly named heart condition eg arrhythmia, hole in the heart	1	AO1 4.2.2.4 4.1.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	any **one** from: • unethical • (against) religious / cultural / personal beliefs • the method is not (fully) tested • risk of infection • (heart cells) may be rejected	 allow examples of unethical such as destroying a (potential) life allow against God's will ignore religion unqualified allow the method might not work allow may cause side effects	1	AO2 4.1.2.3 4.2.2.4

Total Question 2		10

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **two** from: • temperature • size of tomato plants **or** size / number of leaves • light • (volume of) water • (amount / type of) fertiliser / minerals / ions / nutrients (given to plants) • time before rate readings are taken	allow age of plant allow (amount of) water allow (type of) compost / soil allow named example of mineral ion such as nitrate / magnesium ignore time unqualified ignore type of tomato plant ignore type of greenhouse	2	AO3 4.4.1.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	from 0.02% to 0.04%		1	AO3 4.4.1.2

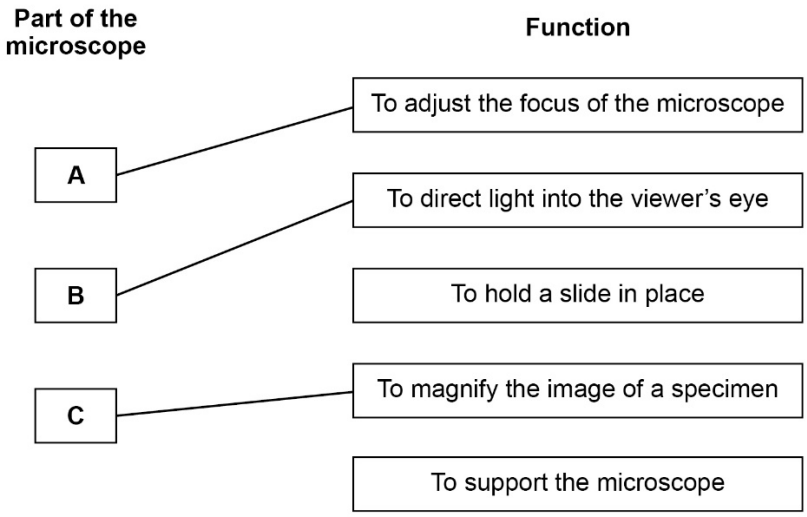
Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	repeat each reading three times and calculate a mean		1	AO3 4.4.1.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	(the rate of photosynthesis) increases (because) carbon dioxide is needed for photosynthesis	ignore values allow **2** marks for (there is) more carbon dioxide for (more) photosynthesis	1 1	AO2 4.4.1.1 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	any **two** from: • it would not increase the rate (of photosynthesis) • it would not increase the growth of tomatoes • it would cost more	allow it would not change the rate (of photosynthesis) allow photosynthesis would not increase allow idea of profit will not increase allow reference to avoiding global warming	2	AO3 4.4.1.2

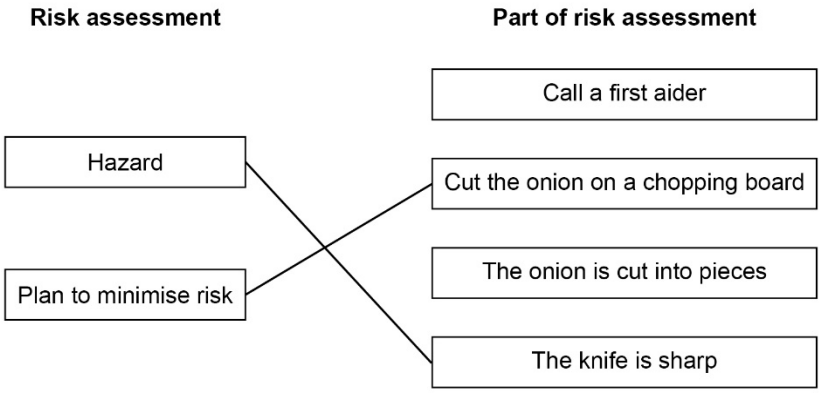
Total Question 3		**8**

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	 do **not** accept more than one line from a box on the left		1 1 1	AO2 4.1.1.2 RPA1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	to stain the cells		1	AO2 4.1.1.2 RPA1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	to allow light to pass through the cells		1	AO2 4.1.1.2 RPA1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	 do **not** accept more than one line from a box on the left		1 1	AO3 4.1.1.2 RPA1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	*student's measurement* 49 (mm)	allow in range 48 – 50 (mm)	1	AO2 4.1.1.5 RPA1
	conversion of student's measurement 49 000 (µm)	allow correct conversion using student's measurement	1	
	substitution $\frac{49\,000}{400}$	allow a correct substitution using incorrectly measured / converted length	1	
	122.5 (µm)	allow a correct answer from student's division using a magnification of ×400	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	the cells would look larger the cells would show more internal structures		1 1	AO1 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	complete the cell walls include the magnification		1 1	AO3 4.1.1.5 RPA1

Total Question 4		**15**

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1		in either order		AO1 4.4.1.1
	oxygen	allow O_2	1	
	glucose	allow $C_6H_{12}O_6$	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2		must be in this order		AO1
	xylem		1	4.1.1.3 4.2.3.1
	stomata		1	4.2.3.2
	phloem		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	$\frac{310}{254}$		1	AO2 4.2.3.2
	1.22047…		1	
	1.2	allow an answer of 0.82 if numerator and denominator reversed	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	each leaf of species **A** has more stomata		1	AO3 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	increased temperature		1	AO1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	C		1	AO2 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.7	(spines) stop the plant being eaten **or** (spines) prevent animals damaging the plant	 allow any named animal allow to reduce water loss	1	AO2 4.3.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.8	it looks like the hornet (so) animals avoid the risk of being stung	allow animals think it is a hornet allow (so) animals avoid the risk of pain	1 1	AO3 AO2 4.3.3.2

Total Question 5		**14**

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1 View with Table 4	$\frac{3\ 600}{1\ 200}$ 3	if no answer in answer space allow answer in **Table 4** allow 3:1 do **not** accept if a unit is given	1 1	AO2 4.1.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	as size increases, (surface area to volume) ratio decreases	allow as one increases, the other decreases allow as size decreases, (surface area to volume) ratio increases	1	AO3 4.1.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	any **one** from: • carbon dioxide • glucose / sugar • water • ions / minerals / salts	allow a correct chemical formula allow named ions allow other correct substances eg amino acids / fatty acids / glycerol ignore nutrients / food	1	AO1 4.1.3.2 4.1.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	any **two** from: • concentration gradient • surface area • thickness of exchange surface • presence of a blood / circulatory system • temperature	 allow description allow surface area : volume ratio ignore size unqualified allow thickness of skin	2	AO1 4.1.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	gills		1	AO1 4.1.3.1

Question	Answers	Mark	AO / Spec. Ref.
06.6	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO2
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	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	4.1.3.1 4.2.2.2
	Indicative content • large number of alveoli • large surface / area • alveolus and blood vessel / capillary are in close proximity • alveoli / capillaries have thin walls **or** alveoli / capillaries have walls that are one cell thick • to reduce diffusion distance • has a good blood supply **or** has a capillary network • to maintain concentration gradient • to remove oxygen quickly **or** to deliver carbon dioxide quickly • (capillary network) increases surface area (for diffusion) • lungs are ventilated **or** lungs continually move air in and out • (ventilation) brings in oxygen **or** removes carbon dioxide • to maintain concentration gradient Types of adaptation of the lungs are required for **Level 3.**		

Total Question 6		**13**

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1		must be in this order		AO1 4.1.1.1 4.1.1.2
	nucleus	allow chromosomes allow plasmid	1	
	(site of aerobic) respiration	allow makes ATP **or** releases energy do **not** accept produces / makes / creates energy do **not** accept anaerobic respiration	1	
	(cell) membrane		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	photosynthesis	allow produce glucose / sugar allow to absorb (sun) light ignore contains chlorophyll	1	AO1 4.1.1.2 4.4.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	root (hair)	allow xylem / phloem / epidermis / meristem	1	AO1 4.1.1.3 4.2.3.1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	concentration of salt solution		1	AO1 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	to make sure **only** the potato mass was measured **or** if water / solution / liquid was left on (the potato), the mass would be higher / affected	allow (to) remove **excess** water / solution / liquid do **not** accept if water / solution / liquid was left on (potato) the mass would be lower ignore to remove water / solution / liquid on the outside / surface (of potato)	1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	$\frac{0.2}{2.5} \times 100$ 8(%)	allow $\frac{2.7 - 2.5}{2.5} \times 100$ if no other mark awarded allow **1** mark for $\frac{2.5 - 2.7}{2.5} \times 100 = -8\ (\%)$	1 1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7 Mark with 07.8		max **3** marks for bar chart		AO2 4.1.3.2 RPA3
	correct scale **and** axis labelled (concentration (of salt solution) in mol/dm^3)	scale must take up at least 50% of grid	1	
	all points plotted correctly	allow a tolerance of ± ½ small square allow 3 or 4 correct plots for **1** mark	2	
	curved line of best fit	ignore line extended beyond 0.4 mol/dm^3 ignore line joined point to point with straight lines	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.8 Mark with 07.7	correct answer from their line drawn on **Figure 9**	allow a tolerance of ± ½ small square ignore line joined point to point with straight lines if a line of best fit is drawn if no line of best fit is drawn, allow an answer in the range 0.31 – 0.33 (mol/dm^3)	1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.9		allow 'pieces' for potato throughout		AO2 4.1.3.2 RPA3
	<u>water</u> moves out of cells / potato		1	
	by osmosis	allow by diffusion through a partially / selectively / semi permeable membrane	1	
	(because) the solution in the cells / potato is less concentrated than outside **or** (because) the solution in the cells / potato is more dilute than outside	allow (because) the solution outside the cells / potato is more concentrated than inside allow (because) the solution outside the cells / potato is less dilute than inside allow correct references to <u>water concentration</u> / <u>potential</u> ignore reference to amount of water or salt do **not** accept water moves from an area of high (solute) concentration to an area of low (solute) concentration	1	

Total Question 7		**17**

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	(cell) wall **or** (large / permanent) vacuole	ignore cellulose	1	AO3 4.1.1.1 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	rose black spot		1	AO1 4.3.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	$\frac{24 \times 60}{90}$ **or** $\frac{24}{1.5}$ 16	allow $\frac{1440}{90}$ do **not** accept if a unit is given	1 1	AO2 4.1.1.6 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	stomach		1	AO1 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	biuret reagent		1	AO1 4.2.2.1 RPA4

Question	Answers	Mark	AO / Spec. Ref.
08.6	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	AO2
	Level 1: Relevant points are made. They are not logically linked.	1–2	AO1
	No relevant content.	0	4.2.2.1 4.2.2.4 4.2.2.5 4.2.2.6

	Indicative content
	
	• meat-free burgers contain more fibre
	  • aids digestion **or** prevents constipation
	
	• meat burgers contain more protein
	  • for growth
	
	• meat burgers contain more fat
	  • can cause CHD **or** heart attack **or** narrowing of arteries
	  • may lead to needing a stent
	  • may lead to obesity
	  • obesity is a risk factor for (type 2) diabetes
	
	• meat burgers contain more cholesterol
	  • can cause narrowing of arteries **or** CHD **or** heart attack
	  • may lead to needing a stent
	  • may need to take statins
	
	• both burgers have similar amounts of carbohydrate
	  • good for providing energy
	
	• no information on vitamins / minerals provided for either burger
	
	• meat burgers require animals to be farmed
	  • increase in methane in atmosphere
	  • (methane) contributes to global warming
	
	• meat burgers require animals to be slaughtered
	  • ethical issues
	
	• some people won't eat meat-free burgers
	  • (because) some people don't like the idea of eating fungus
	  • (because) some people prefer the taste of meat
	
	For **Level 2**, comparisons and linked reasons using own knowledge are required.		

Total Question 8		**12**	