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GCSE  
**BIOLOGY**  
**8461/1F**

Paper 1 Foundation Tier

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**Mark scheme**

June 2020

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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 his or her judgement
- the Assessment Objectives, level of demand 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 not accept

Do 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.

Question	Answers	Extra information	Mark	AO / Spec. Ref.												
01.1	bacterium		1	AO2 4.1.1.1												
01.2	to strengthen the cell		1	AO1 4.1.1.1 4.1.1.2												
01.3	chloroplast		1	AO2 4.1.1.2 4.2.3.1												
01.4	<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: left;">Structure</th> <th style="width: 50%; text-align: left;">Function</th> </tr> </thead> <tbody> <tr> <td style="border: 1px solid black; padding: 5px;">Cell membrane</td> <td style="border: 1px solid black; padding: 5px;">Controls transport of substances into the cell</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">Mitochondria</td> <td style="border: 1px solid black; padding: 5px;">Where energy is released</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">Ribosomes</td> <td style="border: 1px solid black; padding: 5px;">Where proteins are made</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;"></td> <td style="border: 1px solid black; padding: 5px;">Where glucose is made</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;"></td> <td style="border: 1px solid black; padding: 5px;">Where photosynthesis takes place</td> </tr> </tbody> </table> <p>additional line from a box on the left negates the mark for that box adjust the focus knob</p>	Structure	Function	Cell membrane	Controls transport of substances into the cell	Mitochondria	Where energy is released	Ribosomes	Where proteins are made		Where glucose is made		Where photosynthesis takes place		3	AO1 4.1.1.2 4.1.3.1
Structure	Function															
Cell membrane	Controls transport of substances into the cell															
Mitochondria	Where energy is released															
Ribosomes	Where proteins are made															
	Where glucose is made															
	Where photosynthesis takes place															
01.5			1	AO3 4.1.1.2 RPA1												
01.6	(A =) 15 (mm) (B =) 60 (mm)	allow a tolerance of $\pm 1\text{mm}$	1 1	AO2 4.1.1.2 RPA 1												
01.7	$\frac{60}{4} = 15$ 4(.0) =	allow ecf from question 01.6	1	AO2 4.1.1.2 RPA 1												

01.8	$\frac{40}{0.1}$ 400	do not accept if a unit is given	1 1	AO2 4.1.1.5 RPA 1
Total			12	



Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	mitosis		1	AO1 4.1.2.2
02.2	<p>all lines correct = 2 marks 1 or 2 lines correct = 1 mark</p> <p><b>Stage of cell cycle</b></p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 150px; text-align: center;">Stage 1</div> <div style="border: 1px solid black; padding: 5px; width: 250px;">One set of chromosomes is pulled to each end of the cell</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 150px; text-align: center;">Stage 2</div> <div style="border: 1px solid black; padding: 5px; width: 250px;">The cytoplasm and cell membrane divide to form two new cells</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 150px; text-align: center;">Stage 3</div> <div style="border: 1px solid black; padding: 5px; width: 250px;">The cell grows and the chromosomes replicate</div> </div> <p>additional line from a box on the left negates the credit for that box</p>		2	AO1 4.1.2.2
02.3	$\frac{7}{10} \times 100$ <p>70(%)</p>	<p>252 — allow — × 100 300</p> <p>allow answer calculated from angle in range 250° to 254°</p> <p>if no other mark awarded, allow 0.7 for 1 mark</p>	1  1	AO2 4.1.2.2
02.4	3		1	AO2 4.1.2.2
02.5	DNA	allow deoxyribonucleic acid	1	AO1 4.1.2.1 4.1.2.2
02.6	a gene		1	AO1 4.1.2.1

02.7	(bone marrow) cells differentiate into many / other types of (named) cell	allow (bone marrow) cells can become many / other types of (named) cell	1	AO1
	(so) will cure diseases where new cells are needed or will cure diseases where cells are damaged	allow (so) will cure anaemia / leukaemia or blood cancer or blood disorders allow (so) will cure paralysis / diabetes	1	AO2 4.1.2.3
Total			10	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any one from: • bacteria • fungi • protists	allow singular allow names of pathogens e.g. Salmonella ignore virus / germ	1	AO1 4.3.1.1 4.3.1.3 4.3.1.5
03.2	hydrochloric acid is produced by the stomach		1	AO1 4.2.2.1
	the skin is a barrier covering the whole body <del>white blood cells engulf the</del>		1	4.3.1.6
03.3	microorganisms.		1	AO1 4.2.2.3 4.3.1.6
03.4	weakened	in this order only	1	AO1 4.3.1.7
	fast		1	
03.5	by coughs / sneezes	allow 'by droplets in the air' do not accept other means of transmission e.g. touch	1	AO1 4.3.1.1 4.3.1.2
03.6	(from day) 10 (to day) 18	allow (from day) 18 (to day) 10	1	AO2 4.3.1.2
03.7	14 (days)	allow in the range 13 to 15 (days)	1	AO3 4.3.1.2
03.8	any one from: • they had been vaccinated • they already had antibodies • they were immune • they had had it before • they did not get any / enough virus from infected child • they did not play (much) with the infected child	ignore they were resistant  ignore they wore a mask unqualified	1	AO3 4.3.1.2 4.3.1.7

03.9	antibiotics do not kill viruses	allow antibiotics do not work on viruses allow antibiotics only kill bacteria	1	AO3 4.3.1.8
Total			11	

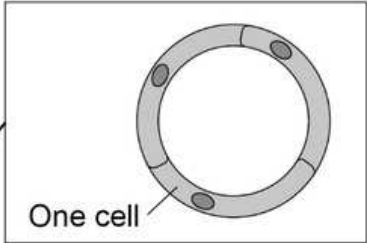
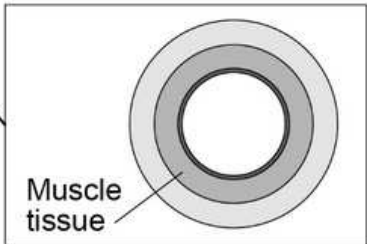
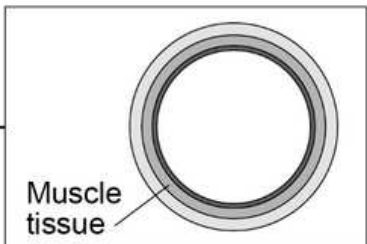
Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	increased (at first)  until 4 minutes or 50 breaths per minute  (then) stayed constant (from 4 minutes or at 50 breaths per minute)		1  1  1	AO2 4.4.2.2
04.2	175 (beats per minute)		1	AO2 4.4.2.2
04.3	140 (beats per minute)		1	AO2 4.4.2.2
04.4	because his rate is lower than the maximum safe rate	allow ecf for incorrect values in question 04.2 and question 04.3	1	AO3 4.2.2.2 4.4.2.2

04.5	Level 3: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	A03
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	A02
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	A02
	No relevant content	0	
	Indicative content		4.2.2.2
	<ul style="list-style-type: none"> <li>• heart rate increased               <ul style="list-style-type: none"> <li>o to increase blood flowing to muscles / lungs</li> <li>o to provide more oxygen (to muscles)</li> <li>o to provide more glucose (to muscles)</li> <li>o to remove carbon dioxide more quickly (from the muscles / blood)</li> <li>o to remove lactic acid more quickly (from the muscles)</li> </ul> </li> <li>• breathing rate increased               <ul style="list-style-type: none"> <li>o supplies more oxygen / air to lungs</li> <li>o so more oxygen to blood</li> <li>o more carbon dioxide removed</li> </ul> </li> <li>• more oxygen to muscles               <ul style="list-style-type: none"> <li>o needed for (increased) respiration</li> <li>o to release / provide energy</li> <li>o for muscle contraction</li> </ul> </li> <li>• anaerobic respiration occurs               <ul style="list-style-type: none"> <li>o due to lack of oxygen</li> <li>o which causes a build-up of lactic acid</li> <li>o oxygen debt</li> <li>o muscle fatigue / pain</li> </ul> </li> </ul> <p>To reach Level 3, there must be reference to heart rate, breathing rate and respiration</p>		4.2.2.3 4.4.2.1 4.4.2.3 4.4.2.2
Total			12

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	will stop animals / herbivores eating it	it will not be eaten	1	AO3 4.3.3.2
05.2	chemical		1	AO1 4.3.3.2
05.3	thorns / spikes / spines / prickles (to stop animals / herbivores eating it)		1	AO3 4.3.3.2
05.4	for respiration to store as starch		1 1	AO1 4.4.1.3 4.4.2.1
05.5	add Benedict's (solution / reagent to the liquid) boil / heat allow any temperature of 65 °C or above (if glucose is present the blue) colour changes to yellow / green / orange / brown / (brick)red (nitrate ions are needed) to allow to make chlorophyll / DNA		1 1 1	AO1 4.2.2.1 RPA 4
05.6	make proteins / amino acids / ATP / nucleic acid which are needed for growth / allow correct process for named enzymes / new cells molecule in mp1		1 1	AO1 AO2 4.1.3.3 4.4.1.3 4.4.2.3
05.7	in / on the (soil) water	allow through air (spaces) in the soil	1	AO3 4.3.1.1 4.3.1.4
05.8	dosage toxicity		1 1	AO1 4.3.1.9

05.9	placebos		1	AO1 4.3.1.9
Total			14	



Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	<p>all lines correct = marks 1 or 2 lines correct = mark</p> <p><b>Type of blood vessel</b></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <div data-bbox="328 568 536 651" style="border: 1px solid black; padding: 5px; width: 100px;">Artery</div> <div data-bbox="328 860 536 943" style="border: 1px solid black; padding: 5px; width: 100px;">Capillary</div> <div data-bbox="328 1151 536 1234" style="border: 1px solid black; padding: 5px; width: 100px;">Vein</div> </div> <div style="text-align: center;"> <p><b>Structure of blood vessel</b></p> <div data-bbox="785 490 1152 732" style="border: 1px solid black; padding: 5px; width: 150px; height: 100px;">  </div> <div data-bbox="785 781 1152 1023" style="border: 1px solid black; padding: 5px; width: 150px; height: 100px;">  </div> <div data-bbox="785 1072 1152 1314" style="border: 1px solid black; padding: 5px; width: 150px; height: 100px;">  </div> </div> </div>		2	AO2 4.2.2.2

additional line from a box on the left negates the credit for that box

06.2	<p>any one from:</p> <ul style="list-style-type: none"> <li>• thick(er) (muscle) walls / tissue (1)</li> </ul> <p>to push blood (all) around the body (1)</p> <p>or</p> <ul style="list-style-type: none"> <li>• thick(er) elastic walls / tissue (1)</li> </ul> <p>to maintain / withstand high (blood) pressure or to retain / regain shape (1)</p> <p>or</p> <ul style="list-style-type: none"> <li>• narrow lumen (1)</li> </ul> <p>to maintain high (blood) pressure (1)</p> <p>(A) – white (blood) cell(s)</p>	<p>allow to withstand high (blood) pressure do not accept to pump blood (all) around the body</p>	2	AO1 4.2.2.2
06.3	<p>(B) – platelet(s)</p> <p>(no nucleus) more space for haemoglobin / oxygen</p>	<p>allow any named white (blood) cell(s)</p>	1 1	AO2 4.2.2.3
06.4	<p>(has haemoglobin) to bind / carry oxygen</p> <p>plasma</p>	<p>allow to carry more oxygen</p> <p>ignore carries carbon dioxide</p>	1 1	AO3 4.1.1.2 4.1.1.3 4.2.2.3
06.5			1	AO1 4.2.2.3
06.6	platelets		1	AO3 4.2.2.3

06.7	<p>any one from:</p> <ul style="list-style-type: none"> <li>• (continued) bleeding</li> <li>• (more) bruising</li> </ul>	<p>allow described allow blood does not clot (at cuts)</p> <p>allow ecf from answer to question 06.6</p>	1	AO3 4.2.2.3
Total			11	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	<p><i>before arrow</i></p> <p>carbon dioxide and water</p> <p><i>after arrow</i></p> <p>glucose</p>	<p>allow correct chemical symbols</p> <p>ignore any attempt at balancing equation</p> <p>ignore light / chlorophyll</p> <p>either order</p> <p>ignore sugar / carbohydrate</p> <p>do not accept starch</p>	<p>1</p> <p>1</p>	<p>AO1</p> <p>4.4.1.1</p>
07.2	<p>light</p> <p>_____</p> <p>(light) is captured / trapped / absorbed by chlorophyll / chloroplasts</p>	<p><del>ignore description of subsequent</del></p> <p>parts of the photosynthesis reaction</p> <p>allow sunlight</p> <p>ignore sun _____</p> <p>allow (light) is used by chlorophyll / chloroplasts</p>	<p>1</p> <p>1</p>	<p>AO1</p> <p>4.1.1.2</p> <p>4.4.1.1</p>
07.3	<p>(18.5</p> <p><u>+ 19.3 + 19.5) 3</u></p> <p>or</p> <p><math>\frac{57.3}{3}</math></p> <p>19.1 (cm<sup>3</sup>/hour)</p>	<p>allow an answer correctly calculated using only two correct values</p> <p>allow clear indication of correct result</p>	<p>1</p> <p>1</p>	<p>AO2</p> <p>4.4.1.2</p> <p>RPA 6</p>
07.4	<p>a ring around 14.2</p>		<p>1</p>	<p>AO3</p> <p>4.4.1.2</p> <p>RPA 6</p>

07.5	<p>any one from:</p> <ul style="list-style-type: none"> <li>• scale / value was misread             <ul style="list-style-type: none"> <li>• there was air / oxygen in the syringe / measuring cylinder / apparatus</li> </ul> </li> <li>the lamp / light was moved</li> </ul> <p>temperature changed</p> <ul style="list-style-type: none"> <li>• had different mass / length of pondweed</li> </ul> <p>pondweed had not acclimatised</p>	<p>ignore human error ignore references to counting bubbles or time</p> <p>allow measurement error</p> <p>allow light intensity changed ignore different bulb / lamp unqualified</p>	1	<p>AO3 4.4.1.2 RPA 6</p>
07.6	<p>did not use it in calculation (of mean)</p>		1	<p>AO3 4.4.1.2 RPA 6</p>
07.7	<p>any one from:</p> <ul style="list-style-type: none"> <li>• light (intensity)</li> <li>• carbon dioxide (concentration)</li> <li>• pondweed size / amount • pondweed species</li> </ul>	<p>do not accept temperature ignore time allow distance / power / colour of lamp / light</p> <p>allow same (piece of) pondweed</p> <p>allow enzyme(s) (start to)</p>	1	<p>AO3 4.4.1.2 RPA 6</p>
07.8	<p>enzyme(s) lose the shape of the active site</p>	<p>denature allow enzyme(s) destroyed / damaged do not accept enzyme(s) killed</p>	1	<p>AO2 4.2.2.1</p>

07.9	y-axis labelled '(rate of) photosynthesis in cm <sup>3</sup> /hour'		1	AO2 4.4.1.2 RPA 6
	suitable scale on y-axis	must take up half or more of grid provided	1	
	all points plotted to within $\pm \frac{1}{2}$ small square	allow 3 or 4 correct plots for 1 mark ignore any attempt to plot a point at 20 °C	2	
	correct curved line of best fit	ignore line joined point to point with straight lines ignore extrapolation	1	
Total			16	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	<p>movement / spreading out of molecules / particles</p> <p>from (an area of) high(er) concentration to (an area of) low(er) concentration</p>	<p>allow movement / spreading out of (named) substances / chemicals / gases / liquids</p> <p>ignore reference to membranes / cells</p> <p>allow down / with the concentration gradient</p> <p>ignore along / across the concentration gradient</p> <p>do not accept movement from / to a concentration gradient</p>	<p>1</p> <p>1</p>	<p>AO1</p> <p>4.1.3.1</p>
08.2	<p>increased carbon dioxide concentration in the air</p> <p>increased number of stomata that are open</p>		<p>1</p> <p>1</p>	<p>AO2</p> <p>4.1.3.1</p> <p>4.2.3.2</p>

08.3	Level 3: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 4.1.3.1 4.2.2.2 4.2.2.3
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	
	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	
<p>Indicative content</p> <ul style="list-style-type: none"> <li>• (many) alveoli <ul style="list-style-type: none"> <li>• provide a large(r) surface area (: volume)</li> </ul> </li> <li>• capillaries are thin or alveoli / capillary walls are thin or one cell thick or capillaries are close to the alveoli <ul style="list-style-type: none"> <li>• which provides short diffusion path (for oxygen / carbon dioxide)</li> </ul> </li> <li>• breathing (mechanism) moves air in and out or lungs are ventilated <ul style="list-style-type: none"> <li>• to bring in (fresh) oxygen</li> <li>• to remove carbon dioxide</li> <li>• to maintain a concentration / diffusion gradient`</li> </ul> </li> <li>• large capillary network (around alveoli) or good blood supply <ul style="list-style-type: none"> <li>• to remove oxygen(ated blood) quickly</li> <li>• to bring carbon dioxide to the lungs quickly</li> <li>• to maintain a concentration / diffusion gradient</li> </ul> </li> </ul>			



08.4	Osmosis	allow diffusion	1	AO1 4.1.3.1 4.2.3.2 4.1.3.2
08.5	active transport  (because) energy is needed  (to move nitrate ions) from a low(er) concentration (in the soil) to a high(er) concentration (in the root / cell)	allow (to move nitrate ions) against / up the concentration gradient  allow (because) there is a lower concentration (of nitrate ions) in the soil or (because) there is a higher concentration (of nitrate ions) in the root / cell  ignore reference to amount / number of nitrate ions ignore along / across the concentration gradient do not accept if reference to molecules / atoms moving	1  1  1	AO3  AO2  AO2  4.1.1.3 4.2.3.2 4.1.3.3
Total			14	