

Sc

KEY STAGE
3

LEVELS
3–7

2006

Science tests

Mark scheme for Papers 1 and 2

2006



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Introduction

The test papers will be marked by external markers. The markers will follow the mark scheme in this booklet, which is provided here to inform teachers.

This booklet includes the mark scheme for paper 1 and paper 2 in both tiers.

The structure of the mark scheme for tiers 3–6 and 5–7

The mark scheme for each question shows:

- the teaching points from the key stage 3 programme of study
- the marks available for each part of the question
- the total marks available for the question
- the answer or answers expected, indicated by an asterisk
- additional guidance to assist markers in making professional judgements.

When a question appears in an identical form in both tiers, the answers to the question are given only once in the mark scheme. For clarity, both question numbers are given. The following example, from tier 3–6 paper 2 question 15 and from tier 5–7 paper 2 question 7, illustrates this.

Tier 3–6 5–7	Q No 15 7			
Part	Mark	Answer	Accept	Additional guidance
b i 2/5c	1	any one from * it protects it * it stops it being damaged * it stops it drying out * it prevents infection * it keeps out disease organisms	accept 'it stops it being eaten' accept 'it keeps the contents in' accept 'it stops bacteria or viruses or germs getting in' accept 'it allows oxygen in or carbon dioxide out'	<i>do not accept 'it keeps it warm'</i>

Where more than one answer is acceptable, this is indicated in the mark scheme by 'any **one** from'. Each possible correct answer is marked with an asterisk. In some cases, alternative answers are indicated by 'or'.

In the following example, from part **b** of tier 3–6 paper 1 question 3, an answer giving ‘water’ and ‘minerals’ will be awarded two marks. However, an answer which gives ‘minerals’ and ‘nutrients’ will be given only one mark, as both points are correct answers for the same mark.

Part	Mark	Answer	Accept	Additional guidance
b 2/3d	2	any two from * water * minerals * oxygen	accept ‘H ₂ O’ accept ‘moisture’ accept a named mineral award two marks for two named minerals accept ‘nutrients’ or ‘salts’	<i>do not accept ‘food’</i>

In the following example, from part **d iii** of tier 5–7 paper 1 question 13, the statement in **bold type** in the **Additional guidance** column is given in order to indicate the general requirement of that part of the question.

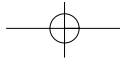
Part	Mark	Answer	Accept	Additional guidance
d iii 4/2c	1	any one from * up to 10 seconds the weight is greater than the (upward) force * after 10 seconds there is a resultant or net (upward) force * after 10 seconds the (upward) force is greater than the weight	accept the converse	answers must be in terms of a comparison ‘it does not have a great enough upward force’ is insufficient ‘at 10 seconds the forces are equal’ is insufficient

In the **Accept** column there may be:

- examples of answers which are acceptable, although they do not correspond exactly to the expected answers
- some examples of higher level answers, which could be given by higher attaining pupils answering questions on the lower levels in the tier.

In the **Additional guidance** column there may be:

- answers which are not acceptable
- a reminder, in questions involving calculations, that consequential marking may be used
- instructions on action in the event of consequential marking (see below)
- guidance to markers where pupils have not followed the instructions on the question.



Marking

The number of marks available for each part of a question and the maximum number of marks for the question as a whole are shown on the question paper. Every part of a question which has been attempted by a pupil will be marked and the mark for each part recorded in the mark box alongside that part. Half marks will not be given in any question.

The total number of marks awarded for all the parts of questions on a double page will be written in the box at the bottom of the right-hand page. In some instances, this will be the sum of marks awarded for two questions. The total number of marks obtained on the paper will be recorded on the front of the test paper.

The total number of marks available is 180 in tier 3–6 and 150 in tier 5–7.

Using professional judgement in marking

The instructions given in the mark scheme will enable the markers to decide whether pupils have correctly answered a particular question. However, there will be instances where an answer given by a pupil does not correspond to any of the possible responses shown in the mark scheme. In such cases, markers will apply their professional judgement to decide if credit should be given. They will consider whether the response:

- is equivalent to those listed
- conveys the ideas underlying the question as outlined in the statement in **bold type** in the mark scheme, if one is given.

If any doubt persists, markers will consult with their supervisors for guidance.

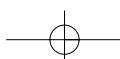
Marking misspellings of words

If a pupil misspells a word, markers will apply the following procedures:

- if it is clear that the pupil has made a simple error, eg ‘tow’ for ‘two’ or ‘Son’ for ‘Sun’, then the incorrect spelling will be accepted and the mark awarded
- if a pupil misspells a word copied from the text of the question or from a selection given, and the new word does not have any inappropriate meaning, the incorrect spelling will be accepted and the mark awarded
- if specific scientific vocabulary is required in the answer, a creditworthy misspelling must be a phonetic equivalent of the required word, with the major syllables of the correct word represented in the answer.

Marking lists of alternative answers

In some instances, pupils give more than one answer to a single question. If any of the answers given is incorrect, the mark will not be awarded, irrespective of the order in which the answers are given. In some cases, a correct answer is given alongside other answers which, while correct, would be insufficient for the mark. In these cases, the mark will be given for the correct answer.



Marking questions containing calculations

Some questions require pupils to perform calculations. Where two marks are available, they are advised to show their working. Pupils who do not show their working but give the correct answer will be awarded full marks.

The result of one calculation may be required in order to carry out further calculations. In such instances:

- the term ‘consequential marking’ appears in the **Additional guidance**
- a pupil’s result for the first calculation is treated as the starting point for the second
- the pupil is awarded full credit for the second calculation if it is carried out correctly, even if the result of the first calculation was wrong.

Marking answers given in the wrong place

In some cases, pupils may write correct answers in the wrong part of the question. Markers will use professional judgement to decide whether a pupil has correctly understood the question and simply written the answer in the wrong place. Similarly, if pupils identify an answer by a cross or other indication when a tick is required, they will be given credit for their responses.

In a planning question, if no answer is given in the expected place but the correct answer is given in the drafting box, the mark(s) will be given.

Awarding levels

The sum of the marks gained on both papers determines the level awarded. A copy of the level threshold tables which show the mark ranges for the award of different levels will be sent to each school by QCA on 30 June 2006.

Schools will be notified of pupils’ results by means of a marksheet, which will be returned to schools by the External Marking Agency with the pupils’ marked scripts. The marksheet will include pupils’ scores on the test papers and the levels awarded.

The 2006 key stage 3 science tests and mark schemes were developed by the Oxford, Cambridge and RSA Examinations (OCR) and the Centre for Research into Primary Science and Technology (CRIPSAT) on behalf of QCA.

Mark Allocation Grid: Tier 3–6**TIER 3–6 Paper 1**

Q	Sc1	Sc2	Sc3	Sc4
1		6		
2		7		
3		4		
4	5			
5	2		5	
6			2	2
7				6
8				6
9		7		
10	2	3		
11		4		
12	1		4	
13			4	
14	4			
15				4
16				7
17				5
Total	14	31	15	30

TIER 3–6 Paper 2

Q	Sc1	Sc2	Sc3	Sc4
1				4
2	5			
3				5
4			4	2
5			5	
6			5	
7	7			
8		8		
9				4
10				5
11	6			
12			5	
13		2	4	
14		2	5	
15	2	3	1	
16	6			
Total	26	15	29	20

Total
P1 + 2

40	46	44	50
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Overall

180

Mark Allocation Grid: Tier 5–7**TIER 5–7 Paper 1**

Q	Sc1	Sc2	Sc3	Sc4
1		7		
2	2	3		
3		4		
4	1		4	
5			4	
6	4			
7				4
8				7
9				5
10		7		
11	4			
12			5	
13	1		3	2
14	8			
Total	20	21	16	18

TIER 5–7 Paper 2

Q	Sc1	Sc2	Sc3	Sc4
1				4
2				5
3	6			
4			5	
5		2	4	
6		2	5	
7	2	3	1	
8	6			
9				5
10			1	4
11			5	
12	5			
13		5		
14		5		
Total	19	17	21	18

Total
P1 + 2

39

38

37

36

Overall

150

The requirements of the Introduction to the Programme of Study apply across Sc1, Sc2, Sc3 and Sc4.

The Mark Allocation Grids on this pair of pages show the context of these questions in relation to Sc1, Sc2, Sc3 and Sc4.

Tier 3–6		Q No
		1
Part	Mark	Answer
a 2/5e	2	any two from * crabeater seal * cod * squid
b i 2/5e	1	* producers ✓
b ii 2/5e	1	* herbivores ✓
c i 2/5d	1	any one from * it would decrease * there would be fewer seals
c ii 2/5d	1	any one from * leopard seals eat other animals or food * leopard seals eat cod or fish or squid or penguins * crabeater seals or they only eat krill
Total	6	

Additional guidance

'seal' is insufficient

accept 'crabeater'
accept 'fish'

if more than one box is ticked, award no mark

if more than one box is ticked, award no mark

'they would all die' is insufficient

accept 'they eat other animals **or** other food **or** other things'

'they eat krill' is insufficient

Tier 3–6		Q No
		2
Part	Mark	Answer
a i 2/1c	1	* sperm
a ii 2/2g	1	* testis
b i 2/1c	1	* ovum or egg
b ii 2/2g	1	* ovary
c 2/1d	1	* fertilisation
d i 2/2h	1	* foetus
d ii 2/2h	1	* uterus
Total	7	

Additional guidance

accept 'testes'

accept 'ovaries'

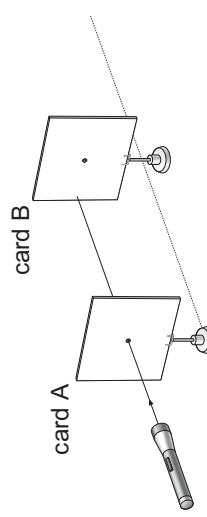
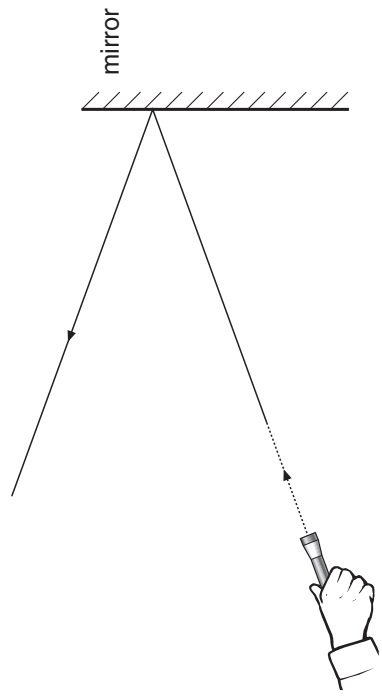
Tier 3–6		Q No 3		
Part	Mark	Answer	Accept	Additional guidance
a i 2/3a	1	any one from * it is long and spindly * the leaves are far apart * the leaves are white or pale	accept 'it is tall' or 'it has grown more' accept 'it is thinner' or 'it is thin' accept 'the leaves are yellow' accept 'it is lighter' accept 'it has no chlorophyll' accept 'its leaves are a different colour'	'they are shrivelled or crinkled' is insufficient
a ii 2/3a	1	any one from * it has wilted * it has drooped * the leaves are floppy	accept 'it is not turgid' accept 'leaves pointing down' accept 'it is floppy' accept 'it has shrivelled'	'it has dried out' is insufficient 'it has died' is insufficient 'it is discoloured' is insufficient
b 2/3d	2	any two from * water * minerals * oxygen	accept 'H ₂ O' accept 'moisture' accept a named mineral award two marks for two named minerals accept 'nutrients' or 'salts'	do not accept 'food'
Total	4			

Tier 3–6		Q No 4
Part	Mark	Answer
Additional guidance		
a 1/2e	1	any one from * stopwatch * stopwatch accept 'timer' <

Tier 3–6		Q No
		5
Part	Mark	Answer
a 1/2k	1	<p>* <i>water</i>: increased or went up</p> <p><i>wax</i>: decreased or went down</p>
		<p>Accept 'expanded'</p> <p>accept a reading greater than 7 (cm³) and less than or equal to 8 (cm³)</p> <p>accept 'contracted'</p> <p>accept a reading lower than 7 (cm³) and greater than or equal to 5.5 (cm³)</p>
b 3/2c	1 1	<p>* <i>water</i>: liquid</p> <p>* <i>wax</i>: solid</p>
		Additional guidance
c i 1/2k	1	<p>any one from</p> <p>* the liquid had turned blue</p> <p>* crystals or copper sulphate or solid could not be seen</p> <p>* there was no solid left</p>
c ii 3/2b	1	<p>accept 'the colour changed'</p> <p>accept 'the water was blue or coloured or grey'</p> <p>accept 'the crystals disappeared'</p> <p>accept 'shake it' or 'mix it'</p> <p>accept 'use hotter water'</p> <p>accept 'add more water'</p> <p>do not accept 'put less in'</p>
d i 3/1h	1	* it evaporated
d ii 3/1h	1	* copper sulphate
Total	7	

Tier 3–6		Q No
		6
Part	Mark	Answer
a 4/1d	1	<div><div>*</div><div><div>N</div><div>S</div></div></div>
		both poles are required for the mark
b i 4/1d	1	<div><div>*</div><div><div>N</div><div>S</div><div>N</div><div>S</div></div></div>
		all four poles are required for the mark
b ii 3/1d	1	<div>any one from * iron * steel</div> <div>accept 'cobalt or nickel'</div>
c 3/1d	1	<div>any one from * wood or it is not magnetised * wood or it is not magnetic</div> <div>accept 'the wood does not have any poles' accept 'wood is not a magnet' accept 'the magnet does not attract wood' accept 'magnetism cannot pass through wood'</div> <div>* it increases the distance between the magnets * the magnets are too far apart * the magnets are weak</div>
Total	4	

Tier 3–6		Q No 7		
Part	Mark	Answer	Accept	Additional guidance
a 4/3h	1	any one from * loud sounds can damage hearing * to protect his ears * loud sounds can burst the eardrum	accept 'they could damage his hearing' accept 'loud sounds can damage the ear' accept 'it could make him deaf' accept 'they are very loud'	'they are loud' is insufficient as 'loud' is given in the question
b 4/5g	1	any one from * the further the sound travels the quieter it gets * she was furthest away	accept 'the sound or energy spreads out' accept 'she was further away' or 'she was far away' accept 'some of the sound is absorbed'	
c 4/3i	1	any one from * the speed of light is greater than the speed of sound * light travels faster than sound	accept 'sound travels more slowly' accept 'light travels faster' accept 'light gets there before sound'	
d i 4/5e d ii 4/5e	1 1	* light * sound		
e 4/2b	1	* gravity	accept 'weight'	
Total	6			

Tier 3–6		Q No 8		
Part	Mark	Answer	Accept	Additional guidance
a 4/3a	1	* Light travels in straight lines. ✓		if more than one box is ticked, award no mark
b 4/3a	1		accept a continuous line drawn across card A and reaching card B	award a mark for a straight line from the existing ray passing through the hole in card A and reaching card B the ray must not go beyond card B
c 4/3c	3	* 		award one mark for a continuous straight line that reflects off the mirror award one mark for an angle of reflection approximately equal to the angle of incidence award one mark for a correct arrow on the reflected ray
d 4/1b	1	* Add another battery. ✓		if more than one box is ticked, award no mark
Total	6			

Tier 3–6 5–7	Q No 9 1			
Part	Mark	Answer	Accept	Additional guidance
a 2/5b	2	any two from * less or no food * fewer or no places to nest or shelter * less or no cover	accept 'trees are producers' accept 'they have lost their home' accept 'their habitat is destroyed' accept 'they cannot hide from predators'	'they have lost their territory' is insufficient 'it spoils the environment' is insufficient
b 2/3a	1 1	any one from * more light * more water * more space * more nutrients * more photosynthesis can take place	 accept references to nutrients from trees left to rot accept 'photosynthesis can take place'	
c 2/3c	1	any one from * to replace minerals or nitrates that have been removed (by plants) * plants absorb the minerals or nitrates * plants need minerals or nitrates to grow * minerals or nitrates or they are plant nutrients	accept 'minerals or nitrates get washed out of the soil' accept 'so that plants can grow' accept 'plants can grow more'	'plants feed on the nutrients' is insufficient

Tier 3–6 5–7		Q No 9 1		
Part	Mark	Answer	Accept	Additional guidance
d 2/5a 2/5b	2	any two from * to provide food for animals * to provide shelter or nesting sites or habitats for birds or animals * trees absorb carbon dioxide * trees produce oxygen * the roots bind soil or prevent soil washing away	accept 'to provide homes for animals' accept 'provides trees to be cut down in the future' accept 'they need trees for paper' or 'to get paper'	'it is good for the environment' is insufficient 'to help animals or birds survive' is insufficient
Total	7			

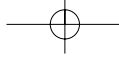
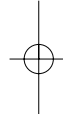
Tier 3–6 5–7	Q No 10 2			
Part	Mark	Answer	Accept	Additional guidance
a i 1/2k	1	* United States	accept 'US' or 'USA' accept 'America' accept lower case letters for 'US'	
a ii 1/2j	1	* the less starch eaten, the more people get cancer	accept the converse accept 'starch helps to prevent cancer' accept 'you should eat a lot of starch'	do not accept 'people with cancer eat less starch' 'eat starch' is insufficient
b i 2/2a	1 1	* bread ✓ * pasta ✓		if more than two boxes are ticked, deduct one mark for each incorrect tick minimum mark zero
b ii 2/2c	1	* fibre ✓		if more than one box is ticked, award no mark
Total	5			

Tier 3–6 5–7	Q No 11 3			
Part	Mark	Answer	Accept	Additional guidance
a 2/2e	1	* The biceps contracts and the triceps relaxes. ✓		if more than one box is ticked, award no mark
b 2/2e	1	* to allow movement or bending	accept 'otherwise they would snap'	'to allow our arms to stretch' is insufficient
c i 2/2e	1	any one from * for smooth movement * to avoid or reduce friction * to prevent bones rubbing together or wearing down * to lubricate the joint	accept 'to protect the bones' accept 'to absorb shocks'	'so you can move or bend' is insufficient 'for protection' is insufficient
c ii 2/2e	1	any one from * the bones would rub together or wear down * pain * stiffness * movement would be difficult	accept 'more friction' accept 'arthritis' accept 'you cannot move or bend'	'friction' is insufficient

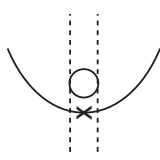
Tier 3–6 5–7		Q No 12 4
Part	Mark	Answer
a 3/1d	1	* steel
b 3/1d	1	* brass * solder
c 1/2j	1	* 80
d i 3/3a	1	* it does not contain iron
d ii 3/3a	1	* oxygen
Total	5	

Part	Mark	Answer	Additional guidance
a 3/1d	1	* steel	do not accept 'stainless steel' do not accept 'carbon'
b 3/1d	1	* brass * solder	answers may be in either order both answers are required for the mark
c 1/2j	1	* 80	accept '100 – 20'
d i 3/3a	1	* it does not contain iron	accept 'it does not contain steel' accept 'only iron rusts' or 'only steel rusts' accept 'it is made of tin, copper and zinc'
d ii 3/3a	1	* oxygen	accept 'O ₂ '
Total	5		

Tier 3–6 5–7	Q No 13 5			
Part	Mark	Answer	Accept	Additional guidance
a i 3/1h	1	* pale blue yellow red		answers may be in any order all three answers are required for the mark do not accept 'blue' for 'pale blue'
a ii 3/1h	1	* 2 because there are two spots on the paper	accept 'there are two colours from the green ink' accept 'because they are straight up from the green ink' accept 'it has dark blue and yellow' accept 'it shows two'	both the answer and the correct explanation are required for the mark
a iii 3/1h	1	* pencil any one from * because ink from the felt-tip pen is soluble or will dissolve in water * because pencil will not spread out or dissolve or run or smudge	accept 'the ink will also produce colours' accept 'the ink expands'	both the answer and the correct explanation are required for the mark 'the pencil has no ink in it' is insufficient
b 3/2b	1	any one from * the ink would not dissolve in water * the ink would dissolve in ethanol * ethanol is a solvent for the ink	accept 'the ink was water resistant or permanent or waterproof' accept 'ethanol is a suitable solvent' accept 'ethanol can absorb the ink' accept 'ethanol washes out the ink' accept 'some substances will dissolve in one solvent but not another'	
Total	4			

[illegible]

Tier 3–6 5–7	Q No 15 7				
Part	Mark	Answer	Accept	Additional guidance	
4/3a 4/4a 4/4c	1	*	A ship going out to sea goes out of sight.	The Earth spins on its axis.	if more than one line is drawn from an observation, award no mark for that observation
	1	*	We have day and night.	The Earth is a sphere.	
	1	*	We have summer and winter.	The Earth orbits the Sun and the Earth's axis is tilted.	
	1	*	One year on Earth is 365 days.	Gravity attracts objects towards the Earth.	
				The Earth orbits the Sun.	
Total	4				

Tier 3–6 5–7	Q No 16 8			
Part	Mark	Answer	Accept	Additional guidance
a 4/2b	1	* Mars	accept '6 kg'	do not accept '24 N'
b 4/2b	1	any one from * 4 kg weighs more on Earth * the weight of the object is greater on Earth	accept the converse accept the converse accept 'Earth is 40 N and Venus is 36 N' accept 'Earth is 40 and Venus is 36' accept 'more newtons on Earth' or 'less newtons on Venus' accept 'there is a greater force on Earth'	'different weights' is insufficient do not accept 'it has more mass on the Earth'
c 4/2b	1 1	* less (than) or smaller (than) or lower (than) * the same (as) or equal (to)		answers must be in the correct order
d i 4/4b	1	* the greater the distance the greater the time for one orbit	accept 'it increases'	
d ii 1/2j 4/4b	1	* an answer from 1.6 to 6 inclusive		
e 4/4c	1			award a mark for X marked on the orbit within the tolerances shown
Total	7			

Tier 3–6 5–7		Q No 17 9
Part	Mark	Answer
a 4/2d	1	* B
b i 4/2c	1	* A and C
b ii 4/2c	1	* D and B
c i 4/2c	1	* Force D is greater than force B. ✓
c ii 4/2c	1	* Force A is greater than force C. ✓
Total	5	

Tier 5–7		Q No 10														
Part	Mark	Answer	Accept	Additional guidance												
a i 2/1c 2/2g	1	* oviduct or fallopian tube														
a ii 2/1c	1	* cilia move in a wave or from side to side	accept 'they waft or carry it along' accept 'the hairs move it along' accept 'the hairs or cilia waft or move'	'the hairs' or 'the cilia' are insufficient												
b i 2/2h	1	* <i>embryo</i> : stage 3 <i>foetus</i> : stage 4	accept '3' accept '4'	both answers are required for the mark												
b ii 2/2h	1	* uterus	accept 'womb'													
c i 2/4a	2	any two from * a reference to genes or genetic material or DNA or chromosomes * it has a different combination (of genes) * it is made from an egg and sperm * (it gets genetic information) from both parents	accept for one mark 'to be the same as someone else you need exactly the same genes' accept for two marks 'it only has half the DNA or chromosomes from each parent'	all three ticks are required for the mark if there is more than one tick in any row, award no mark												
c ii 2/4a	1	<table><tr><th>human characteristic</th><th>inherited only</th><th>inherited and affected by environmental conditions</th></tr><tr><td>eye colour</td><td>✓</td><td></td></tr><tr><td>skin colour</td><td></td><td>✓</td></tr><tr><td>weight</td><td></td><td>✓</td></tr></table>			human characteristic	inherited only	inherited and affected by environmental conditions	eye colour	✓		skin colour		✓	weight		✓
human characteristic	inherited only	inherited and affected by environmental conditions														
eye colour	✓															
skin colour		✓														
weight		✓														
Total	7															

Tier 5–7	Q No 11				
Part	Mark	Answer	Accept	Additional guidance	
		markers should read the answers to parts a and b before marking this question parts a and b should be marked together			
a 1/2d	1	* temperature of the water	accept 'temperature'	<i>do not</i> accept responses that describe rates of heating	
	1	any one from * rate of evaporation * time taken for all the water to evaporate * volume or mass or amount of water lost in a fixed time	accept 'room temperature' accept 'the time for it to evaporate' accept 'measure how much water is left after a certain time'	answers must refer to both time taken and amount of water lost 'time taken' is insufficient	
	1	any one from * starting volume of water * shape of container * same ambient conditions	accept 'the amount of water' accept a specified volume of water accept 'room temperature' if the independent variable is 'water temperature'	'same heater' and 'same starting measurement' are insufficient	
b 1/2i	1	* a column or row indicating temperature and a column or row indicating time or volume lost or volume remaining	accept a column or row indicating 'rate of evaporation' accept 'amount lost' or 'amount remaining'	both headings are required for the mark the units of measurement are not necessary for the mark the second column or row should be consistent with the dependent variable identified in part a ignore other columns in the table	
Total	4				

Tier 5–7		Q No 12																						
Part	Mark	Answer	Accept	Additional guidance																				
a 3/3c	1	*	<table><thead><tr><th></th><th>copper</th><th>iron</th><th>magnesium</th><th>zinc</th></tr></thead><tbody><tr><td>calcium nitrate</td><td>X</td><td>X</td><td>X</td><td>X</td></tr><tr><td>copper nitrate</td><td></td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>iron nitrate</td><td>X</td><td></td><td>✓</td><td>✓</td></tr></tbody></table>		copper	iron	magnesium	zinc	calcium nitrate	X	X	X	X	copper nitrate		✓	✓	✓	iron nitrate	X		✓	✓	award one mark for each correct row
		copper	iron	magnesium	zinc																			
	calcium nitrate	X	X	X	X																			
	copper nitrate		✓	✓	✓																			
iron nitrate	X		✓	✓																				
b 3/3a 3/3e	2	*	<div>calcium carbonate + hydrochloric acid</div> <div>magnesium + hydrochloric acid</div> <div>copper + hydrochloric acid</div> <div>no reaction</div> <div>a chloride, carbon dioxide and water are formed</div> <div>a chloride and hydrogen are formed</div>	if all three answers are correct, award two marks if one or two answers are correct, award one mark if more than one line is drawn from a pair of reactants, award no credit for that pair																				
	Total	5																						

Tier 5–7		Q No 13		
Part	Mark	Answer	Accept	Additional guidance
a 3/1b	1	any one from * liquids or they take up less space * liquids or they are denser	accept 'particles are closer together in a liquid' accept 'particles are further apart in a gas'	do not accept 'liquids are heavier' 'liquids are easier to transport' is insufficient
b 3/1e	1	* there is no oxygen in space	accept 'there is no air in space' accept 'space is a vacuum'	
c 3/1e	1	any one from * the weight of the fuel decreases * there is less fuel on board * fuel is being used up * water is released	accept 'hydrogen and oxygen or oxygen is being used up' accept 'waste gas is given off'	'gravity gets weaker' is insufficient
d i 1/2k	1	* 27 * 16.5	accept a number from 16.3 to 16.7	both answers are required for the mark
d ii 4/2c	1	* 10.5	accept the difference between the numbers given in d i	consequential marking applies
d iii 4/2c	1	any one from * up to 10 seconds the weight is greater than the (upward) force * after 10 seconds there is a resultant or net (upward) force * after 10 seconds the (upward) force is greater than the weight	accept the converse	answers must be in terms of a comparison 'it does not have a great enough upward force' is insufficient 'at 10 seconds the forces are equal' is insufficient
Total	6			

Tier 5–7		Q No 14
Part	Mark	Answer
a 1/2i	1	* X-axis: mass of magnesium (g) Y-axis: mass of magnesium oxide (g)
	1	* reasonable scales
	1	* reasonably accurate plotting of all points
	1	* a line of best fit drawn
		accept a scale of 1 g or 2 g per 5 small squares all points plotted to ± 1 small square
b i 1/2n b ii 1/2n	1	* E
	1	any one from * ignore it in drawing the line of best fit * they could predict the figure from the line of best fit * they should repeat the reading
		accept 'ignore it' accept 'they could use the graph line' accept 'check it'
		pupils can gain credit for a response which suggests they should predict the correct value from the pattern or ignore the anomalous results or repeat the reading
c 1/2l	1	* a number from 11 to 13 accept a value consistent with the line of best fit the unit is not required for the mark

Tier 5–7	Q No 14			
Part	Mark	Answer	Accept	Additional guidance
d 1/2k	1	any one from * the greater the mass of magnesium burned the greater the mass of oxide formed * the magnesium and oxygen react in fixed proportions * the mass of magnesium oxide formed is proportional to the mass of magnesium burned * the greater the mass of magnesium the greater the mass of oxygen that combines with it		
Total	8			

2006 KS3 Science Mark Scheme

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Tier 3–6		Q No 1												
Part	Mark	Answer												
Additional guidance		Accept												
a 4/1a	1	<table><tr><td>P</td><td>off</td></tr><tr><td>Q</td><td>on</td></tr><tr><td>R</td><td>on</td></tr></table> <p>*</p>	P	off	Q	on	R	on						
P	off													
Q	on													
R	on													
		accept '1' for 'on' and '0' for 'off'												
		all three answers are required for the mark												
b 4/1c	1	any one from * battery * cell												
		accept 'batteries' accept 'cells'												
c 4/1a	2	<p>*</p> <table><tr><td>on</td><td></td></tr><tr><td>off</td><td>✓</td></tr></table> <table><tr><td>on</td><td>✓</td></tr><tr><td>off</td><td></td></tr></table> <table><tr><td>on</td><td></td></tr><tr><td>off</td><td>✓</td></tr></table>	on		off	✓	on	✓	off		on		off	✓
on														
off	✓													
on	✓													
off														
on														
off	✓													
		if all three answers are correct, award two marks if two answers are correct, award one mark if more than one box is ticked for any circuit, award no credit for that circuit												
Total	4													

if all three answers are correct, award two marks
if two answers are correct, award one mark
if more than one box is ticked for any circuit,
award no credit for that circuit

Tier 3–6		Q No 2		
Part	Mark	Answer	Accept	Additional guidance
a <i>1/2i</i>	1	* bar for material A drawn to 40 decibels		allow a tolerance of one small square for the drawn line, either above or below 40 decibels
b <i>1/2i</i>	1	* 4		
c <i>1/2k</i>	1	* D	accept '35'	
d <i>1/2d</i>	1 1	* Use the same box each time. ✓ * Keep the distance between the sound sensor and the bell the same each time. ✓		if more than two boxes are ticked, deduct one mark for each incorrect tick minimum mark zero
Total	5			

Tier 3–6		Q No
		3
Part	Mark	Answer
a 4/2c	1	any one from * the forces are balanced * the forces are equal or the same * the forces are both 1000 N * they pull with the same force or equally hard
b 4/2c	1	* an arrow drawn to the right
c 4/2c	1	any one from * team A pulled harder than team B * team A was stronger * team A was pulling with more than 1000 * team B was pulling with less than 1000 * there was more force to the left
d 4/2c	1	* 1200 N ✓
e 4/2d	1	* friction
Total	5	
		Additional guidance
		ignore references to gravity if the answer is in terms of balanced forces 'the sides are equal' is insufficient do not accept 'both teams weigh 1000 N' accept 'the forces are both 1000' accept 'the newtons are even' accept 'both teams have the same strength'
		accept an arrow drawn to the right anywhere on the drawing
		accept 'team A pulled harder' or 'team A pulled more' or 'they pulled harder' accept the converse accept 'they used more strength' accept 'there are more newtons to the left'
		if more than one box is ticked, award no mark

Tier 3–6		Q No		
		4		
Part	Mark	Answer	Accept	Additional guidance
a i 3/2d 3/3g	1	* weathering ✓		if more than one box is ticked, award no mark
a ii 3/2e 3/3g	1	any one from * it is hard or harder * it is resistant to acid rain * it is less permeable or porous * it is less easily weathered	accept 'limestone is softer' accept 'it is resistant' accept 'limestone is affected by acid rain' accept 'limestone is more permeable or porous' accept 'granite is stronger' accept 'granite does not weather or erode'	'granite or it is solid' is insufficient
b i 4/5a	1	any one from * coal * gas * oil * peat	accept 'methane' accept 'petrol' or 'diesel' or 'kerosene' accept 'turf'	
b ii 4/5a	1	* All fossil fuels are a source of energy. ✓		if more than one box is ticked, award no mark
b iii 3/3g	1	* corrosion ✓		if more than one box is ticked, award no mark
b iv 3/2i	1	* paint	accept 'grease' or 'oil' accept 'plastic' or 'wax' or 'polish' accept 'varnish' accept 'zinc' or 'galvanise it'	'waterproof coating' is insufficient 'something to stop them reacting' is insufficient
Total	6			

Tier 3–6		Q No 5		
Part	Mark	Answer	Accept	Additional guidance
a i 3/1h	1	* filtration ✓		if more than one box is ticked, award no mark
a ii 3/1h	1	* chromatography ✓		if more than one box is ticked, award no mark
b i 3/3d	1	* it is alkaline	accept 'alkali'	
b ii 3/3d	1	* red		
c 3/3d	1	* indicator ✓		if more than one box is ticked, award no mark
Total	5			

Tier 3–6		Q No 6
Part	Mark	Answer
a i 3/1d	1	* It is flexible. ✓
	1	* It is strong. ✓
a ii 3/1d	1	* It becomes rusty.
b i 3/1e BS/2b	1	any one from * it is flammable * it may explode
	1	* helium
b ii 3/1a	1	
Total	5	

Additional guidance

if more than two boxes are ticked, deduct one mark for each incorrect tick
minimum mark zero

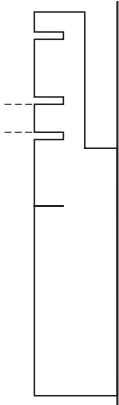
accept 'it is inflammable' **or** 'it catches fire' **or** 'it burns'
accept 'it explodes'
accept 'it is reactive **or** very reactive'
accept 'it reacts with air **or** oxygen'

'it is poisonous' is insufficient

Tier 3–6		Q No 7												
Part	Mark	Answer	Accept	Additional guidance										
a 1/2g	1	* 10.5 or 10½	accept '105 mm'											
b 1/2k	1 1	* its teeth * its shape		answers may be in either order										
c 1/2k	1	* the cut on its body	accept 'fish cannot fly' accept 'it fell out of the sky' accept 'it dropped onto his boat'											
d 1/2b	1	any one from * use a key * use the Internet * ask an expert or fisherman or scientist or teacher * look in a book	accept 'use a computer' accept 'take it to a museum' accept 'look it up' accept 'look at the features'											
e 1/1a	2	<table><tr><th>supported by evidence</th><th>not supported by evidence</th></tr><tr><td>✓</td><td></td></tr><tr><td>✓</td><td></td></tr><tr><td></td><td>✓</td></tr><tr><td>✓</td><td></td></tr></table>	supported by evidence	not supported by evidence	✓		✓			✓	✓			if all four ticks are correct, award two marks if two or three ticks are correct, award one mark if there is more than one tick in any row, award no credit for that row
supported by evidence	not supported by evidence													
✓														
✓														
	✓													
✓														
Total	7													

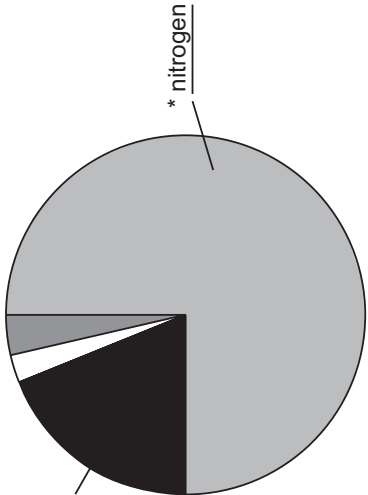
Tier 3–6		Q No 8			
Part	Mark	Answer	Accept	Additional guidance	
a i 2/5d	1 1	* they decreased or went down any one from * more were eaten * the mink ate them * more animals to eat them	accept 'more were killed' accept 'some died'	do not accept 'they all died'	
a ii 2/5d	1	any one from * they decreased or went down * they had less food or rabbits * the mink ate their food	accept 'there were fewer of them' accept 'they had no food' accept 'they had to share their food or rabbits'		
b 2/5e	1	* prey			
c i 2/5d	1	any one from * fox * snake * badger * bird of prey	accept a named bird of prey such as 'owl' or 'hawk' or 'eagle' accept 'cat'		
c ii 2/5d	2	any two from * different climate * disease * not enough food * shot or run over or trapped or poisoned * injury due to fighting * different habitat	accept 'no food' or 'they starved' or 'competition for food' accept 'people killed them'	references to old age are insufficient	

Tier 3–6		Q No
		8
Part	Mark	Answer
d 2/4b	1	any one from * they have fur or hair * they have external ears
Total		8
		Accept
		Additional guidance
		accept 'they give birth to live young' accept 'they feed their young on milk'
		'they are warm-blooded' is insufficient

Tier 3–6 5–7	Q No 9 1			
Part	Mark	Answer	Accept	Additional guidance
a i 4/2e	1	* it is between 20 g and 40 g	accept a number greater than 20 and less than 40	‘more than 20’ or ‘less than 40’ are insufficient
a ii 4/2f	1	any one from * cut a slot between 20 and 40 * cut more slots	accept ‘add a mark for 30’ accept ‘add more weights’	award a mark for an answer referring to cutting a slot for any mass between 20 g and 40 g
b i 4/2f	1	any one from * it is on the wrong side of the pivot * it would not make the scale tip	accept ‘it is past the pivot line’ accept ‘the scale is supported on this side’ accept ‘it does not produce a clockwise moment’	award a mark for an answer indicating that it is on the wrong side of the pivot <i>do not accept</i> ‘because the cardboard would tilt the other way’ ‘it would not work’ is insufficient
b ii 4/2f	1	* a line drawn between the 40 g and 100 g slots 		accept answers which clearly indicate the correct position on the diagram the line must not touch the slots for 40 g or 100 g
Total	4			

Tier 3–6 5–7	Q No 10 2			
Part	Mark	Answer	Accept	Additional guidance
a 4/3j	1	* pluck them harder	accept ‘make the strings vibrate more or move more’	<i>do not accept</i> ‘make the strings vibrate more quickly’
b 4/3k	1	* The sound has a higher pitch. ✓		if more than one box is ticked, award no mark
c 4/3k	1	* the sound from the thicker string has a lower pitch or a lower frequency	accept ‘it has a lower pitch or a lower frequency’ accept ‘the sound from the thicker string is louder’ or ‘it is louder’	answers must include a comparison ‘it is lower’ is insufficient
d i 4/3k	1	* the sound in A has a higher pitch or a higher frequency	accept ‘it has a higher pitch or higher frequency’	answers must show a comparison ‘the vibrations are quicker’ is insufficient ‘it is higher’ is insufficient
d ii 4/3j	1	* the sound in A is louder	accept ‘it is louder’ accept ‘the sound in C is quieter’ accept ‘it has a greater amplitude’	‘the vibrations are stronger or of greater amplitude’ is insufficient <i>do not accept</i> ‘it is higher’
Total	5			

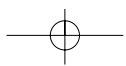
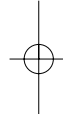
Tier 3–6 5–7	Q No 12 4			
Part	Mark	Answer	Accept	Additional guidance
a i 3/1d	1	any one from * iron * copper	accept 'calcium'	
a ii 3/1d	1	any one from * sulphur * chlorine	accept 'oxygen' or 'carbon'	answers may be in either order both answers are required for the mark
a iii 3/1e	1	any two from * calcium carbonate * calcium oxide * carbon dioxide * iron sulphide	accept 'copper chloride'	
b 3/1e	1	any one from * the iron reacted or combined with sulphur * the sulphur had mass	accept 'the iron gained sulphur' or 'sulphur was added to the iron' accept 'the iron has joined with the sulphur' accept 'the sulphur weighed 0.8 g'	<i>do not</i> accept 'iron has mixed with the sulphur' <i>do not</i> accept 'sulphur or iron added a new layer'
c 3/1f	1	* copper chloride		
Total	5			

Tier 3–6 5–7	Q No 13 5			
Part	Mark	Answer	Accept	Additional guidance
a 3/1g	2	 <p>* oxygen</p> <p>* nitrogen</p>		
b 3/2c	1 1	* water vapour * condenses	accept 'vapour' accept 'turns into water or a liquid' accept 'forms condensation'	'water' or 'moisture' are insufficient
c i 2/2k c ii 2/2j	1 1	* respiration * Air breathed out has more carbon dioxide and less oxygen than air breathed in. ✓		if more than one box is ticked, award no mark
Total	6			

Tier 3–6 5–7	Q No 14 6													
Part	Mark	Answer	Accept	Additional guidance										
a i 2/3c	1	* magnesium												
a ii 2/3c	1	any one from * a potted plant has a limited amount of soil or minerals * less chance of minerals being returned to the soil by dying or decaying plants or by microbes or fungi or bacteria or worms * no room for roots to extend and find more minerals	accept the converse accept 'no room for roots to grow'	answers must indicate that the soil available to the potted plant is limited or may not be replenished 'the garden has more minerals' is insufficient 'lack of sunlight' is insufficient										
b i 3/1c	3	*		if all four answers are correct, award three marks if three answers are correct, award two marks if one or two answers are correct, award one mark										
		<table><tr><th>mineral</th><th>letter of fertiliser</th></tr><tr><td><i>magnesium</i></td><td>B</td></tr><tr><td><i>nitrogen</i></td><td>A or C</td></tr><tr><td><i>phosphorus</i></td><td>D</td></tr><tr><td><i>potassium</i></td><td>C</td></tr></table>	mineral	letter of fertiliser	<i>magnesium</i>	B	<i>nitrogen</i>	A or C	<i>phosphorus</i>	D	<i>potassium</i>	C	accept 'Epsom Salts' or 'MgSO ₄ ' or 'magnesium sulphate' accept 'A and C' or 'Easy Grow' or 'NH ₄ NO ₃ ' or 'ammonium nitrate' or 'Saltpetre' or 'KNO ₃ ' or 'potassium nitrate' accept 'Superphosphate' or 'Ca(H ₂ PO ₄) ₂ ' accept 'Saltpetre' or 'KNO ₃ ' or 'potassium nitrate'	
mineral	letter of fertiliser													
<i>magnesium</i>	B													
<i>nitrogen</i>	A or C													
<i>phosphorus</i>	D													
<i>potassium</i>	C													
b ii 3/1f	1	* 3												
b iii 3/1f	1	* 9												
Total	7													

Tier 3–6 5–7		Q No 15 7		
Part	Mark	Answer	Accept	Additional guidance
c i 1/2k	1	any one from * keep the eggs between 26°C and 30°C * keep the temperature at or below 30°C * keep the eggs at 26°C	accept any temperature from 26°C to 30°C accept 'use the three lower temperatures' or 'the lower temperatures in the table'	'make it cooler' or 'use lower temperatures' are insufficient
c ii 1/2j	1	* between 32°C and 34°C ✓		if more than one box is ticked, award no mark
Total	6			

Tier 3–6 5–7	Q No 16 8			
Part	Mark	Answer	Accept	Additional guidance
a 1/2a	1	any one from * the distance the ruler dropped * where the hand grabbed the ruler	accept 'how far until they caught it' accept 'length or measurement on the ruler' accept 'where she caught it' accept 'mm' or 'cm'	'ruler' is insufficient 'length of ruler' is insufficient
b 1/2e	1	any one from * to avoid the effect of his own reaction time * the time is too short to measure with a stopwatch	accept 'he might stop the watch before or after she reacted' accept 'you cannot stop a stopwatch straightaway' accept 'it might be too fast for the stopwatch'	'the time keeper would not have been as accurate' is insufficient 'you can time incorrectly' is insufficient 'the ruler is more precise' is insufficient
c 1/2d	1	* pupils	accept 'pupil' or 'friend' or 'person' or 'human'	
d 1/2d	2	any two from * the position of the ruler above the hand * the way the ruler is released * the ruler * distance between finger and thumb * the conditions in the room * measure to same finger of catcher	accept 'height of ruler' accept 'the height it is dropped from' accept 'handedness' accept 'the same person dropping it' accept 'position of hand' or 'position of ruler' accept examples of possible distractions	'where he put his hand on the ruler' is insufficient
e 1/2h	1	* repeat the investigation or it	accept 'do more than one test with each person'	do not accept 'use more people'
Total	6			

[illegible]

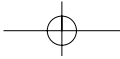
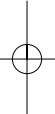
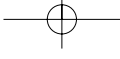
Tier 5–7		Q No 10
Part	Mark	Answer
a i 4/2g	1	* 100
	1	* N/cm ²
a ii 4/2g	1	* 800
		the unit is not required for the mark
b i 3/1b 4/2g	1	any one from * air or gas can be compressed * water or liquids cannot be compressed * gaps between particles of air or gas can be reduced
b ii 4/2g	1	any one from * less force would be transmitted to the brakes * less pressure at B * piston B would not move
Total	5	
		Accept
		accept '200 ÷ 2.0'
		accept '10 ⁶ N/m ² ' or '10 ⁶ Pa' for two marks
		accept '100 × 8'
		accept the numerical answer to a i × 8
		Additional guidance
		accept 'gases are easier to compress'
		accept 'atoms can be compressed together'
		'air or gas provides less resistance' is insufficient
		accept 'the brakes have less effect'
		accept 'less pressure could be produced'
		accept 'less or no resistance to the brakes'
		accept 'the air bubbles could be compressed'
		'the brakes are spongy' is insufficient

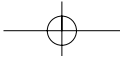
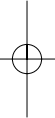
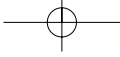
Tier 5–7		Q No 11		
Part	Mark	Answer	Accept	Additional guidance
a 3/2f	1	any one from * it cools more slowly * large volume of magma * magma is insulated by rock * heat is transferred more slowly to rock than to air * lava cools more quickly	accept 'it cools slowly' or 'it is cooler above ground' accept 'there is a lot of it' accept 'magma is surrounded by rock' accept 'it is hotter underground'	
b i 3/2e	1	* crystals formed underground will be larger	accept the converse accept 'they will be larger'	
b ii 3/2e	1	any one from * magma cools more slowly than lava * lava cools more quickly than magma	accept 'magma cools slowly' accept 'lava cools quickly' accept 'there is no rock above the lava'	<i>do not accept</i> 'bigger crystals cool more slowly'
c i 3/2f	1	any one from * high temperatures * high pressure	accept 'heat' or 'hot' accept 'pressure'	
c ii 3/2f	1	* marble		
Total	5			

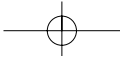
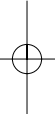
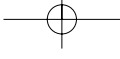
Tier 5–7	Q No 12			
Part	Mark	Answer	Accept	Additional guidance
a i 1/2e	1	any one from * the effect of adding no extra insulation to the windows and roof * it provides a baseline measure * the temperature without any effort to reduce the heat loss	accept 'effect of not adding insulation' accept 'as a comparison or control' accept 'how much energy is normally lost' accept 'how much heat single glazing keeps in' accept 'what would happen if we did nothing'	
a ii 1/2a	1	* double glazing <i>and</i> roof without insulation and a roof with insulation <i>and</i> single glazing		answers may be in either order both answers are required for the mark
b 1/1b	1	any one from * a longer time (roof insulation) to fall between two temperatures * smaller temperature fall (roof insulation) in a given time	accept 'slower heat loss for insulation' accept 'faster heat loss for double glazing' accept 'more heat loss for double glazing' accept 'roof insulation stays warmer than double glazing' accept 'if it is quicker for the house to reach a given temperature'	
c 1/2j	1 1	* both lines or curves starting from the same temperature, descending and approaching (not crossing) the room temperature line * the solid line or curve descending more steeply than the other		allow a difference of 5 small squares at the start accept correctly labelled curves which do not use solid and dotted lines as required by the question
Total	5			

Tier 5–7		Q No 13		
Part	Mark	Answer	Accept	Additional guidance
a 2/1c	1	any one from * it is streamlined * it has a pointed head * it does not have much cytoplasm	accept 'there are enzymes in the head'	do not accept 'it is slimline' 'its shape' is insufficient 'it has a nucleus' is insufficient as it is not a specific adaptation of a sperm cell
b i 2/1b	1	any one from * in the cytoplasm of the bacterium * in a nucleus or within a membrane in the cell from the intestine	accept 'the bacterium does not have a nucleus or nuclear membrane' accept 'in the bacterium it is not enclosed'	
b ii 2/1b 2/4a	1	any one from * it determines the characteristics of the cell * it transfers information	accept 'gives the cell instructions' accept 'it tells the cell what to do' accept 'to control the cell' accept 'allows the cell to reproduce'	
c 2/1c	1	any one from * it has a large surface area * the folds increase the surface		
d 2/1a	1	* they are independent cells or they do not work together or do not work in a group	accept 'each sperm cell is individual or works individually'	'the cells are not joined together' is insufficient
Total	5			

Tier 5–7		Q No 14		
Part	Mark	Answer	Accept	Additional guidance
a 2/3a 2/5b	3	any three from * plants or algae need light for photosynthesis * photosynthesis or algae or plants supply or produce oxygen * plants or animals need oxygen * photosynthesis supplies glucose or carbohydrate or biomass * carbon dioxide is produced by plants or animals	accept 'for photosynthesis' accept 'oxygen is used for respiration' accept 'glucose is a source of energy for the plant' accept 'the herbivores eat the plants' or 'animals eat plants' or 'snails eat plants'	
b 2/5b	1	any one from * materials can be recycled * makes nutrients available * makes minerals available		
c 2/2j	1	any one from * at 27°C the oxygen concentration would drop too low * at 15°C there is more oxygen	accept 'the higher the temperature the less oxygen is dissolved' accept 'at a higher temperature they would suffocate' accept 'the lower the temperature the more oxygen there is'	'there would be more oxygen' is insufficient
Total	5			







EARLY YEARS

NATIONAL
CURRICULUM
5–16

GCSE

GNVQ

GCE A LEVEL

NVQ

OTHER
VOCATIONAL
QUALIFICATIONS

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