

Sc

KEY STAGE

3

LEVELS

3–7

2004

Science tests

Mark scheme for Papers 1 and 2

2004



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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 1 question 11 and from tier 5–7 paper 1 question 2, illustrates this.

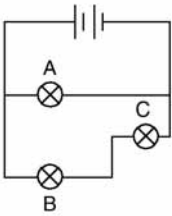
Tier 3–6 5–7		Q No 11 2		
Part	Mark	Answer	Accept	Additional guidance
a 1/2h	1	any one from: * to allow his resting pulse rate to be determined * to compare his pulse before and after drinking the cola * so he would know if it had changed	accept 'to get a reading of heart rate when relaxed' accept 'to make sure his heart rate was steady' accept 'to see if there was any change' accept 'so he could find out his normal heart rate' accept 'to get a reliable reading of his pulse rate' accept 'to find the average'	'he wanted to know his heart rate before he drank his cola' is insufficient as this is given in the question
b 1/2k	1	* his heart rate went up after he drank some cola	accept 'his heart rate or pulse went up' accept 'it shows his heart rate went up' accept 'the graph shows his heart rate changed' accept 'the line goes up or changed' accept 'the points get higher'	

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 (a) (ii) of tier 5–7 paper 2 question 13, an answer giving ‘alcohol increases the reaction time’ and ‘alcohol reduces co-ordination’ will be awarded two marks. However, an answer which gives ‘alcohol reduces co-ordination’ and ‘they would feel dizzy’ will be given only one mark, as both points are correct answers for the same mark.

Part	Mark	Answer	Accept	Additional guidance
a ii 2/2m	2	any two from: * alcohol increases the reaction time * alcohol reduces co-ordination * alcohol causes or increases errors of judgement * alcohol reduces concentration	accept ‘it slows reactions’ or ‘it slows the reaction time’ accept ‘they would feel dizzy’ accept ‘they would be sleepy or drowsy’ accept ‘alcohol makes them lose more heat’ accept ‘it causes blurred vision’	‘it slows them down’ is insufficient

In the following example, from part (a) of tier 3–6 paper 1 question 17 and tier 5–7 question 8, 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
a 4/1a	2	* one mark for B and C in series * one mark for A in parallel with B and C, for example 		both marks should only be awarded if the circuit is correct award one mark if all three bulbs are drawn in parallel or all in series

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.
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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**’ column;
- 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.

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 in July 2004.

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 2004 key stage 3 science tests and mark schemes were developed by the University of Cambridge Local Examinations Syndicate 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		5		
2	6			
3		4		
4			6	
5	2			2
6	5			
7				5
8			1	2
9				7
10	1	4		
11	4			
12		6		
13			5	
14			4	
15			5	1
16				8
17				4
18				3
Total	18	19	21	32

TIER 3–6 Paper 2

Q	Sc1	Sc2	Sc3	Sc4
1				4
2		2		3
3	4			
4			4	
5			5	
6			4	
7	6			
8		6		
9		7		
10				5
11	2			3
12	7			
13		1	6	
14		5		
15	5			
16		7		
17	4			
Total	28	28	19	15

**Total
P1 + 2**

	46		47		40		47	Overall
								180

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

Q	Sc1	Sc2	Sc3	Sc4
1	1	4		
2	4			
3		6		
4			5	
5			4	
6			5	1
7				8
8				4
9				3
10		4		
11	3	3		
12			6	
13			5	
14	4			
15				5
Total	12	17	25	21

TIER 5–7 Paper 2

Q	Sc1	Sc2	Sc3	Sc4
1				5
2	2			3
3	7			
4		1	6	
5		5		
6	5			
7		7		
8	4			
9				4
10	2			3
11	5			
12			6	
13		4		
14	5	1		
Total	30	18	12	15

**Total
P1 + 2**

42	35	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.

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Tier 3–6		Q No 1		
Part	Mark	Answer	Accept	Additional guidance
a i 2/4a	1	* Katie ✓ Becca ✓		both answers are required for the mark if more than two boxes are ticked, award no mark
a ii 2/4a	1	any one from * their mother or Pam has freckles * their father or David has freckles * their parents have freckles * their grandmother or Mary has freckles * only family B has freckles	accept 'Rachel and Bill do not have freckles' accept 'a grandparent has freckles' accept 'their family or the family on the right has freckles' accept 'freckles run in the family' accept 'family A does not have freckles'	
a iii 2/4a	1	* his parents or Bob and Emily do not have freckles	accept 'his family does not have freckles' accept 'his grandparents do not have freckles' accept 'he is not in family B' if the answer for a ii is 'only family B has freckles'	
b i 2/1e	1	* egg cell ✓ sperm cell ✓		both answers are required for the mark if more than two boxes are ticked, deduct one mark for each incorrect tick minimum mark zero if more than one box is ticked, award no mark
b ii 2/2g	1	* reproductive system ✓		
Total	5			

Tier 3–6		Q No 2		
Part	Mark	Answer	Accept	Additional guidance
a 1/2e	1	any one from * to make the measurements reliable * to make it fair * make sure the measurement is correct * to make it accurate	accept 'it is hard to measure a bent finger' accept 'the measurement would be wrong'	
b i 1/2g	1	* mm	accept 'millimetres'	
b ii 1/2i	1	any one from * some of the lengths appear in more than one bar * some people were counted twice * the range varies for the bars * some lengths are missed out	accept 'they did 65 twice or three times' accept correct references to specific numbers eg 'they could not record 55.5 or 60.5 mm' accept suggestions for improving the bar chart such as 'the last bar should be 71–75'	'the numbers are written wrongly' is insufficient
c 1/2b	1	* observe pupils' tongues ✓		if more than one box is ticked, award no mark
d 1/2i	1	* a bar drawn to 10		

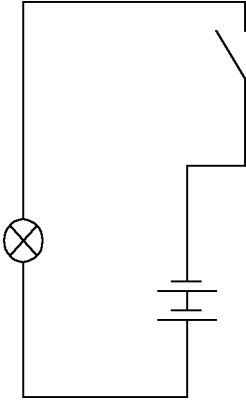
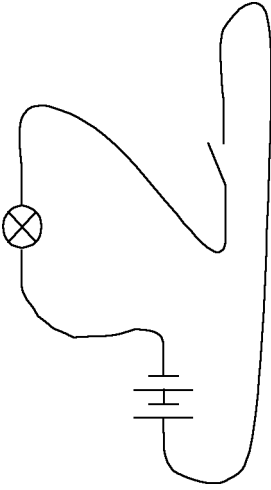
Tier 3–6	Q No 2
Part	Mark
e 1/2e	1
<p>* more children were recorded in investigation 1 than in investigation 2</p> <p>accept the converse accept '16 children recorded with measurements 50–60 mm. Only 14 children recorded in investigation 2' accept '36 people in the first investigation, but only 14 in the second' accept 'there are more higher bars' accept 'higher bars' accept 'they add up to different numbers'</p>	
Total	6

Tier 3–6 Q No 3				
Part	Mark	Answer	Accept	Additional guidance
a i 2/2/	1	* oxygen	accept 'O ₂ '	<i>do not accept</i> 'air'
a ii 2/2c	1	any one from * glucose * digested food * vitamins * minerals * water	accept 'sugar' accept 'amino acids' or 'fatty acids' or 'glycerol' accept 'food' or 'nutrients' accept a named vitamin accept a named mineral	
b 2/2c 2/2/	1	any one from * it prevents oxygen getting to the organ * it prevents food getting to the organ * it stops blood getting to the organ	accept 'it stops oxygen' accept 'it blocks the blood vessel' accept 'it causes a heart attack' or 'a stroke' or 'thrombosis' accept 'it stops the flow of blood' or 'it stops blood flowing around the body'	'you would die' is insufficient
c 2/2n	1	any one from * it stops bleeding * it prevents bacteria or viruses from entering	accept 'microbes' or 'germs' for bacteria accept 'it stops dirt getting in' accept 'it stops infection' accept 'it stops disease'	these less precise terms are accepted if the answer indicates that the scab acts as a barrier 'to keep it clean' is insufficient 'it stops diseases getting in' is insufficient
Total	4			

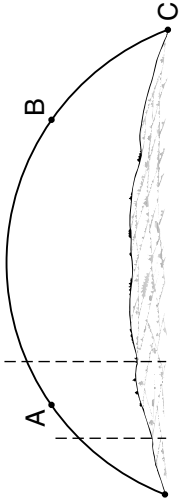
Tier 3–6		Q No 4		
Part	Mark	Answer	Accept	Additional guidance
a 3/1d	1	* It has a high melting point. ✓		if more than two boxes are ticked, deduct one mark for each incorrect tick minimum mark zero
	1	* It is a good conductor of heat and electricity. ✓		
b i 3/1h	1	* filtration or filtering	accept 'filter'	
b ii 3/1h	1	* A: black particles or solid or residue	accept 'particles' or 'solids'	<i>do not accept</i> 'blue particles' <i>do not accept</i> 'black solution'
	1	* B: blue solution or filtrate	accept 'solution' accept 'liquid'	
c 3/1h	1	* the water had evaporated	accept 'the liquid had evaporated' or 'it had evaporated' accept a description of evaporation eg 'it turned into gas'	'it had dried up' is insufficient <i>do not accept</i> 'the solution evaporated'
Total	6			

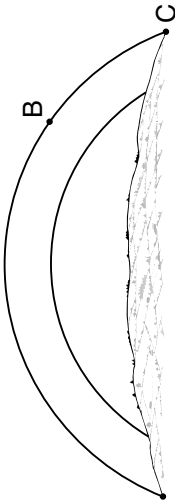
Tier 3–6		Q No 5		
Part	Mark	Answer	Accept	Additional guidance
a i 4/3g	1	* vibrate	accept 'move in and out'	'move' is insufficient
a ii 4/3g	1	any one from * it stops the sound waves or vibrations reaching our eardrums * it stops the eardrum vibrating * the eardrum vibrates less	accept 'it stops sound reaching our eardrum' accept 'it absorbs sound' accept 'it blocks the ear' accept 'it stops the eardrum moving in and out' accept 'soundwaves are reflected by the wax'	
b i 1/2k	1	* human <i>and</i> sparrow <i>and</i> rabbit	accept 'bird' for sparrow	answers may be in any order all three answers are required for the mark
b ii 1/2k	1	* cat		
Total	4			

Tier 3–6 Q No 6				
Part	Mark	Answer	Accept	Additional guidance
a 1/2a	1	any one from * it describes how they will carry out their investigation * it has more information or detail * it includes a fair test * it includes measurement	accept a description which identifies a factor to be kept constant accept 'the second plan includes apparatus to be used or a measurement or a comparison'	accept the converse of any marking point accept a statement referring to any of the points in the second plan accept answers which describe a consequence of the test not being fair
b 1/2f	1	* to avoid scalding or burning themselves	accept 'it is very hot' accept 'to avoid spilling'	credit may be given for answers which, although not accurate, imply that the water is at a high temperature eg 'it is nearly boiling'
c 1/2h	1	any one from * it allowed them to compare the times for different tea bags * it told them when the measurement was completed * so they knew when to stop	accept 'as soon as it has gone they stopped timing' accept 'so they know how long it takes' accept 'the cross let them see when the tea produced by the 3 bags was the same' accept 'so they could stop at the right time' accept 'it tells them when they have dissolved the same'	answers must indicate that the cross shows when the teas are the same colour or allows a measurement to be made 'it made it fair' is insufficient
d i 1/2i	1	* results ✓		if more than one box is ticked, award no mark
d ii 1/2k	1	* triangle circle square	accept a drawing of a triangle, a circle and a square	all three answers are required in the correct order
Total	5			

Tier 3–6 Q No 7		Additional guidance	
Part	Mark	Answer	Accept
a i 4/1a	1	any one from * it let the current or electricity flow * current could flow through the bulb * it completed the circuit	accept 'the contacts came together'
a ii 4/1a	1	* all three components must be correctly connected in series 	accept  a mark may be awarded for any correctly connected circuit drawn with straight or curved wires award a mark for a correct circuit diagram in which the pupil has drawn the symbols instead of connecting the printed symbols
b i 4/1b	1	any one from * the bulb is broken or blown * the filament is broken	accept 'the coil is broken'
b ii 4/1b	1	* turn one of the cells around	accept 'turn a battery round' accept 'turn the battery' accept 'put the batteries in the right way'
c 4/1b	1	any one from * it stopped current from flowing * paper does not conduct or is an insulator * the circuit was broken or incomplete * so that the circuit can be completed	accept 'to stop the batteries running down' accept 'to stop the contacts coming together'
Total	5		

Tier 3–6		Q No 8		
Part	Mark	Answer	Accept	Additional guidance
a 4/1d	1	* 		all four poles must be correct for the mark
b 4/1d	1	* 		all four poles must be correct for the mark
c 3/1d	1	any one from * nothing * they would both point towards magnetic north	accept 'they would not point to the aluminium' accept 'they would all point north or up or down' accept 'they would point the same way or in the same direction' accept 'they would go back to how they were'	do not accept 'the compasses or the experiment or it would not work'
Total	3			

Tier 3–6 Q No 9			
Part	Mark	Answer	Accept
a 4/4b	2	<ul style="list-style-type: none"> * <i>Earth</i>: B * <i>Sun</i>: A * <i>Moon</i>: C 	<p>Additional guidance</p> <p>answers must be in the correct order if all three answers are correct, award two marks if one or two answers are correct, award one mark</p>
b 4/4e	1	<p>any one from</p> <ul style="list-style-type: none"> * weather forecasting * communications * television or TV * spying * space telescope * global positioning system or GPS 	<p>accept 'to look at the weather' accept 'telephone' or 'internet'</p> <p>accept 'Hubble telescope' accept 'to find out more about the universe' accept 'navigation' accept 'monitoring the Earth' accept 'searching for meteors or comets'</p>
c 4/4d	1	* the Sun ✓	if more than one box is ticked, award no mark
d i 4/4a	1	<p>* point A marked halfway between 5.00 am and 1.00 pm</p> 	accept any point within the tolerances shown
d ii 4/4a	1	* 4 hours ✓	if more than one box is ticked, award no mark

Tier 3–6		Q No 9		
Part	Mark	Answer	Accept	Additional guidance
e 4/4a	1	<p>* a curve below the printed line at all points</p> 		ignore arrows the line must start and finish on the horizon do not accept a curve which begins or finishes at the same points as the existing curve
Total	7			

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Tier 3–6 5–7		Q No 10 1		
Part	Mark	Answer	Accept	Additional guidance
a 1/2k	1	* 3.5	accept answers from 3.4 to 3.6	
b 2/2m	1	* It increases the time taken to react. ✓		if more than one box is ticked, award no mark
c 2/2c	1	* small intestine	accept 'intestine'	do not accept 'large intestine'
d 2/2m	1	any one from * liver * kidney * brain * heart		
e 2/2h	1	any one from * brain damage * low birth weight * premature birth or miscarriage * less or not enough oxygen * less or not enough nutrients * build up of carbon dioxide or CO ₂ or waste	accept 'kill the foetus' accept 'not enough food'	'make the foetus ill' is insufficient do not accept 'the baby gets no oxygen' do not accept 'the baby gets no food' 'less blood to foetus' is insufficient
Total	5			

Tier 3–6 5–7		Q No 11 2		
Part	Mark	Answer	Accept	Additional guidance
a 1/2h	1	any one from * to allow his resting pulse rate to be determined * to compare his pulse before and after drinking the cola * so he would know if it had changed	accept 'to get a reading of heart rate when relaxed' accept 'to make sure his heart rate was steady' accept 'to see if there was any change' accept 'so he could find out his normal heart rate' accept 'to get a reliable reading of his pulse rate' accept 'to find the average'	'he wanted to know his heart rate before he drank his cola' is insufficient as this is given in the question
b 1/2k	1	* his heart rate went up after he drank some cola	accept 'his heart rate or pulse went up' accept 'it shows his heart rate went up' accept 'the graph shows his heart rate changed' accept 'the line goes up or changed' accept 'the points get higher'	
c 1/2o	1	any one from * Yasmin's conclusion describes how it affected his heart rate while Harry's just says it affected his heart rate * Yasmin's conclusion describes the direction of the change in his heart rate * Yasmin's conclusion describes how his heart rate changed	accept 'Yasmin is more specific or more detailed' accept 'Harry doesn't say what the effect is' accept 'Harry's conclusion could mean that his heart rate was slower'	

Tier 3–6 5–7		Q No 11 2		
Part	Mark	Answer	Accept	Additional guidance
d 1/2d	1	any one from * drinking fizzy water would be a control * it would enable them to see whether fizziness or sparkling drinks would have an effect * it would allow them to see if carbon dioxide or carbonation has an effect * it would show it was something else in cola that had an effect	accept 'you would know if it was bubbles that had an effect' accept 'using more or different drinks would give more evidence'	'to see if something else had an effect' is insufficient
Total	4			

Tier 3–6 5–7		Q No 12 3		
Part	Mark	Answer	Accept	Additional guidance
a 2/3d	1	* root hair		'root' is insufficient
b 2/5c	1	any one from * they prevent insects or flies from crawling out * insects slide in * they make it difficult for them to crawl out		'to attract insects' is insufficient
c 2/2n	1	* the more insects there are or food there is the more bacteria there will be	accept the converse	
d i 2/3b	1	* carbon dioxide + <i>water</i> → <i>glucose</i> + * oxygen		
d ii 2/2d	1	* to provide energy ✓		if more than one box is ticked, award no mark
Total	6			

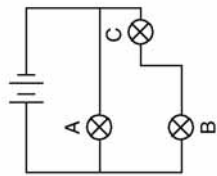
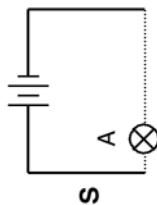
Tier 3–6 5–7		Q No 13 4		
Part	Mark	Answer	Accept	Additional guidance
a i 3/3d 1/2k	1	* carbon dioxide any one from it took more or most alkali to neutralise it or to change the colour of the indicator back to green	accept 'CO ₂ ' accept 'it took most drops' or 'it took 160'	both the answer and the reason are required for the mark
	1	* air it did not change the colour of the indicator or the pH of the solution	accept 'no drops or alkali were needed' accept 'there was no change'	both the answer and the reason are required for the mark
	1	any one from * neutralises it * it raises the pH	accept 'it makes it less acidic' accept 'it makes it pH 7' accept 'it forms a salt'	do not accept 'makes it more alkaline'
b 3/3a 3/1f	1 1	* zinc chloride + * hydrogen		answers may be in either order
Total	5			

Tier 3–6 5–7		Q No 14 5		
Part	Mark	Answer	Accept	Additional guidance
a i 3/1g	1	* a mixture ✓		if more than one box is ticked, award no mark
	1	* a compound ✓		if more than one box is ticked, award no mark
	1	any one from * they are denser than the liquid * the liquid is less dense than the solid	accept 'it is heavier than the liquid or the paint' accept 'the solid particles are more dense or heavier or too heavy' accept 'the solid is denser' accept 'the liquid is less dense' or 'the liquid is lighter'	<i>do not accept</i> 'solid particles are heavy' without a comparison or qualifier eg 'too heavy'
b 3/2b	1	any one from * it is insoluble in water * water is not a solvent for the paint * it dissolves in white spirit * white spirit is a solvent for the paint		'it is waterproof' is insufficient
Total	4			

Tier 3–6 5–7		Q No 15 6		
Part	Mark	Answer	Accept	Additional guidance
a i 3/2c	1	* B		
a ii 3/2c	1	* 55	accept answers from 54 to 56	
a iii 3/2c	1 1	* <i>point A</i> : solid * <i>point D</i> : liquid		
b 4/5f	1	* conduction ✓		if more than one box is ticked, award no mark
c 3/1a	1	any one from * the boiling point of water is less than that of stearic acid * water could not transfer enough energy * the maximum temperature of water is 100°C * it cannot get hot enough	accept 'the water is not hot enough' accept 'stearic acid has a very high boiling point'	
Total	6			

Tier 3–6 5–7		Q No 16 7		
Part	Mark	Answer	Accept	Additional guidance
a i 4/5e a ii 4/5e a iii 4/5e	1	* A and F		answers may be in either order both answers are required for the mark
	1	* A		
	1	* E		
b i 4/2c b ii 4/2d	1	* gravity or gravitational force	accept 'weight'	
	1	any one from * friction * drag * water resistance	accept 'air resistance'	
c 4/5e 4/5g	1	* kinetic		the last two answers may be in either order
	1	* sound		
	1	* thermal	accept 'heat'	
Total	8			

Tier 3–6 5–7	Q No 17 8	Part	Mark	Answer	Accept	Additional guidance
a	4/1a	1	1	* one mark for B and C in series * one mark for A in parallel with B and C for example		both marks should only be awarded if the circuit is correct award one mark if all three bulbs are drawn in parallel or all in series
b	4/1b	1		* A any one from * it has more current passing through it * A has 3 V across it and B and C have 1.5 V across them * A has twice the voltage of B or C * because it is directly connected to the supply	accept 'the others have less current passing through them' accept 'A has a greater voltage across it' accept 'B and C have less voltage across them' accept 'there is less resistance in the top or A branch of the circuit' accept 'the others are in series'	both the letter and the reason are required for the mark answers should convey the idea that energy or voltage is shared between B and C but A is not sharing energy or voltage
c	4/1a	1		* a letter S in any part of the circuit before it branches	accept a letter S in any part of the circuit if the three bulbs are drawn in series	
Total			4			



Tier 3–6 5–7		Q No 18 9		
Part	Mark	Answer	Accept	Additional guidance
a i 4/3c	1	* A and C		answers may be in either order both answers are required for the mark
a ii 4/3d	1	any one from * B * D		
b 4/5g	1	any one from * not all the light is reflected * some of the light is refracted * some of the light is absorbed * light is scattered by the glass	accept ‘it splits into two rays’ or ‘it splits’	
Total	3			

Tier 5–7		Q No 10
Part	Mark	Answer
a i 2/5e	1	<p>*</p>
a ii 2/5f	1	<p>any one from</p> <p>* each animal eats lots of the organism below it in the food chain</p> <p>* DDT is not easily excreted</p> <p>* DDT is not broken down</p>
b i 2/2h 2/5f	1	<p>* through the placenta</p>
b ii 2/2a 2/5f	1	<p>* in milk</p>
Total	4	

Additional guidance

four boxes must be drawn, decreasing in width towards the top, and all labels must be correct for the mark

accept 'DDT increases up the food chain'

accept 'the heron gets all the DDT in the other animals'

accept 'the heron is at the top of the food chain'

accept 'DDT is not excreted'

accept 'DDT remains in the body'

accept 'DDT is stored in the body'

accept 'through the umbilical cord'

accept 'from the mother's blood'

accept 'through the mammary glands'

accept 'the mother breastfeeds the pup'

accept 'the mother feeds the pup herself'

'the mother feeds the pup' is insufficient

Tier 5–7 Q No 11				
Part	Mark	Answer	Accept	Additional guidance
a i 1/2j	1	* 1000		
a ii 2/2j	3	any three from * she was using her muscles more * she needed more energy * her rate of respiration increased * more oxygen was used up * more carbon dioxide was produced	accept 'she was using her muscles' accept 'more respiration' accept 'more oxygen was needed' accept 'there was more carbon dioxide to remove' accept for the first two marking points 'her muscles need more energy'	
b i 1/2j	1	* it became faster		
b ii 1/2j	1	any one from * the breaths are closer together * there are more breaths in 10 s	accept 'the waves are closer together' accept 'there are more waves in 10 s' accept 'there are three breaths in the first ten seconds and five in the next ten seconds'	
Total	6			

Tier 5–7		Q No 12		
Part	Mark	Answer	Accept	Additional guidance
a i 3/1c 3/1g	1	* A		
a ii 3/1e 3/1g	1	* E		
a iii 3/1c 3/1e	1	* C		
b 3/1e 3/1g	1	any one from * a compound contains two or more elements chemically combined or bonded * a mixture contains two or more elements or compounds or substances not chemically combined or bonded	accept 'a compound contains different elements or atoms of different types joined together' accept 'a mixture can be separated by physical means'	<i>do not accept</i> 'a compound contains two or more atoms joined together' 'a mixture can be separated' is insufficient
c i 3/1f	1	any one from * name: oxygen formula: O ₂ * name: hydrogen formula: H ₂ * name: nitrogen formula: N ₂ * name: chlorine formula: Cl ₂	accept any other element which exists as diatomic molecules in the gaseous state	both the name and formula are required for the mark <i>do not accept</i> 'O' or 'H' or 'N' or 'Cl'
c ii 3/1f	1	any one from * name: carbon dioxide formula: CO ₂ * name: water formula: H ₂ O * name: sulphur dioxide formula: SO ₂ * name: nitrogen dioxide or nitrogen oxide formula: NO ₂	accept any compound with the formula XY ₂ , eg magnesium chloride MgCl ₂	both the name and formula are required for the mark
Total	6			

Tier 5–7	Q No 13			
Part	Mark	Answer	Accept	Additional guidance
a 3/1f	1 1	* CO ₂ + * CaO		answers may be in either order ignore multiples
b i 3/2i	1	* sulphur dioxide	accept 'SO ₂ ' accept 'sulphur trioxide' accept 'SO ₃ '	
b ii 3/3e 3/3g	1 1	* calcium sulphate + * carbon dioxide	accept 'CaSO ₄ ' accept 'CO ₂ '	answers may be in either order
Total	5			

Tier 5–7 Q No 14				
Part	Mark	Answer	Accept	Additional guidance
1/2d	1	* modified and unmodified plants	accept 'type of plant'	markers should read through the whole answer before marking this question '(flowers from) different plants' is insufficient
1/2a				
1/2d	1	* the number of days or weeks or months the flowers stayed fresh	accept 'how long they stayed fresh'	
1/2a				
1/2d	1	any one from		accept 'amount of sunlight should be the same' accept 'amount of water should be the same' accept 'nutrients added should be the same'
1/2a		* modified and unmodified plants should be the same variety		
		* conditions under which flowers are kept should be the same		
		* modified and unmodified plants should be the same starting age		
1/2e	1	A suitable time span (which will allow comparison) for example * 'until they have all wilted' or * 'until all ordinary plants have wilted'		award a mark for answers of 2 weeks or more
Total	4			

Tier 5–7		Q No 15		
Part	Mark	Answer	Accept	Additional guidance
a i 4/2f	1	* 75	accept ' 50×1.5 ' accept ' $\frac{50 \times 1.5}{0.1}$, or ' 50×15 ' accept the numerical answer to part a i $\div 0.1$	<i>do not accept</i> lower case n
	1	* Nm		
	1	* 750		
b 4/1f	1	any one from * a current flows in the coil * the coil or the iron core becomes magnetised	accept 'there is a magnetic field' or 'the electromagnet switches on'	<i>do not accept</i> 'the core becomes magnetic'
	1	any one from * the counterweight is attracted to the coil or core or the electromagnet * the electromagnet produces a bigger moment	accept 'the left-hand side of the barrier moves down'	'the right-hand side moves up' is insufficient
Total	5			

Tier 3–6		Q No 1
Part	Mark	Answer
a i 4/2b	1	* C
a ii 4/2c	1	* B
b 4/2a	1	* 20
c 4/2d	1	any one from * friction * air resistance or drag * reaction
Total	4	
		Accept
		Additional guidance
		accept 'upthrust'
		do not accept 'gravity'

Tier 3–6		Q No 2		
Part	Mark	Answer	Accept	Additional guidance
a i 4/1a	1	* series * all		answers must be in the correct order both answers are required for the mark
a ii 4/1a	1	* parallel * none		answers must be in the correct order both answers are required for the mark
b 4/3b	1	* they were reflected or scattered	accept 'some light was absorbed or refracted' accept 'they bounced off'	
c 2/3d	1 1	* They absorb water from the soil. ✓ * They absorb minerals from the soil. ✓		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	Accept	Additional guidance
a 1/2c	1	* predictions ✓		if more than one box is ticked, award no mark
b 1/2a	1	any one from * to make sure any effect of everyone jumping was detected * to make the effect as large as possible	accept 'so the sensor can detect the vibrations'	'fair test' is insufficient 'to get the best results' is insufficient
c i 1/1b	1	any one from * there are vibrations in recordings A and B only * no vibrations at C	accept 'there are more or bigger vibrations at A and B' accept 'wider lines in recordings A and B' accept 'bigger amplitude in A and B' accept 'no vibrations far away'	
c ii 1/2m	1	any one from * more people jumped near A * people jumped from a greater height near A * sensor A is nearer the site than sensor B	accept 'fewer jumped at B' accept the converse accept the converse accept 'the sensor is nearer site A than B' accept 'sensor A is closer to the pupils'	<i>do not accept</i> 'different numbers of people'
Total	4	* more sensitive detectors at A * the ground could be different	accept the converse accept 'one concrete the other grass'	'different sensors' is insufficient

Tier 3–6		Q No 4		
Part	Mark	Answer	Accept	Additional guidance
a 3/1h	1	* a magnet	accept 'an electromagnet'	do not accept 'a sieve' do not accept 'tweezers'
b 3/2b	1	any one from * they dissolved * they are soluble in water	accept 'they formed a solution' accept 'they are soluble'	
c i 3/1a	1	* bubbles formed		
c ii 3/1e	1	* It turned cloudy. ✓		if more than one box is ticked, award no mark
Total	4			

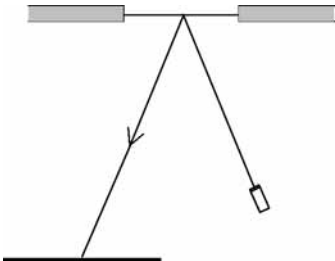
Tier 3–6 Q No 5			
Part	Mark	Answer	Accept
a 3/1d	1	<div>* copper for the base of a saucepan</div>	It is lighter than air.
	1	<div>* gold for a ring</div>	It is a good conductor of heat.
	1	<div>* helium in a balloon</div>	It is a good conductor of electricity.
	1	<div>* mercury in a thermometer</div>	It stays shiny because it does not react with oxygen.
			It is a liquid at room temperature.
b 3/1d	1	* helium ✓	if more than one line is drawn from any element, award no mark for that element minimum mark zero
Total	5		

Tier 3–6		Q No 6		
Part	Mark	Answer	Accept	Additional guidance
a i 3/2a 1/2k	1	* 4		
a ii 3/2a	1 1	* water * gas	accept H ₂ O accept 'carbon dioxide' or 'CO ₂ '	answers may be in either order
b 3/2b	1	* solvent ✓		if more than one box is ticked, award no mark
Total	4			

Tier 3–6 Q No 7			
Part	Mark	Answer	Accept
Additional guidance			
a 1/2a	1	* E D A B C	all five letters must be in the correct order
b 1/2e	1	* to measure volume	accept 'to make sure they used the same volume of water in each beaker' accept 'to measure amount of water' accept 'to measure the volume of salt or sugar' 'to measure salt or sugar' is insufficient
c 1/2d	1	any one from * they used the same volume of water	accept 'they used the same amount of water' accept 'they stirred the same number of times' accept 'they stirred at the same speed' accept 'they stirred for the same time'
d i 1/2g	1	any one from * you might not get the same mass each time * you will not know how much was added	accept 'you might not get the same amount of salt or sugar' accept 'it is not precise or a measurement'
d ii 1/2g	1	any one from * measure the mass * measure the number of grams	accept 'measure weight' or 'weigh it' accept 'use a balance or scales' accept 'use grams' accept 'use a measuring cylinder' accept 'level it with a knife'
e 1/2c	1	* from 1–31 inclusive	
Total	6		

Tier 3–6 Q No 8				
Part	Mark	Answer	Accept	Additional guidance
a 2/4b	1	* They produce milk to feed their young.	✓	if more than one box is ticked, award no mark
b 2/4b	1	any one from * they can fly * they have wings		
c 2/5c	1	any one from * it is streamlined * its limbs are like fins or paddles * it has a wide or powerful tail	accept 'its fur is smooth or fine or slopes backwards' accept 'it does not have legs' accept 'it has flippers'	'it can swim' is insufficient
d 2/5c	1	any one from * they protect it against predators * they make it difficult for other animals to eat it or catch it	accept 'they protect it' accept 'they stop it being eaten'	
e i 2/5c	1	any one from * it keeps them warm * it traps air	accept 'it insulates them' accept 'it prevents them getting cold'	do not accept 'it keeps the cold out'
e ii 2/5c	1	* foxes or predators cannot see them	accept 'they cannot be seen' accept 'they are camouflaged' accept 'they are the same colour as the snow'	
Total	6			

Tier 3–6		Q No 9		
Part	Mark	Answer	Accept	Additional guidance
a i 2/4b	1	* grasshopper		
a ii 2/5f	1	any one from * they eat the plants * the insects eat them	accept 'they eat them'	
b 2/5e	1	any one from * <i>predator</i> : partridge <i>prey</i> : grasshopper or snail * <i>predator</i> : fox <i>prey</i> : partridge * <i>predator</i> : stoat <i>prey</i> : partridge		both the predator and its prey are required for the mark
c 2/5e 2/3a	1	* They make food by photosynthesis. ✓		if more than one box is ticked, award no mark
d 2/5c 2/5d	1	any one from * they can see predators or foxes or stoats * it keeps them warm		
e i 2/5d	1	any one from * fewer will be found by predators * fewer will be eaten	accept 'they will not be seen' or 'they are camouflaged' accept 'they will not get eaten'	
e ii 2/5d	1	any one from * they may be trodden on or damaged * predators can get to them easily	accept 'they can be found easily'	
Total	7			

Tier 3–6 5–7	Q No 10 1			
Part	Mark	Answer	Accept	Additional guidance
a 4/3c	1	<p>* the angles of incidence and reflection must be equal</p> <p>* the ray must be continuous and straight with an arrow in the correct direction</p> 	accept one arrow in the correct direction on either the incident or the reflected ray	the ray must hit the screen in the middle 2 cm
	1			
b i 4/3g	1	any one from * sound waves travel to the window or glass * vibrations pass through the air * sound waves or vibrations hit the window	accept 'sound travels to the window' accept 'sound hits the window'	
b ii 4/3c	1	* the beam will vibrate or move or jump about	accept 'scatter' for vibrate accept 'it would go to other places in the room' accept 'it would go in different directions' accept 'it shakes' or 'it wobbles'	do not accept 'it is blurred' 'it goes in a different direction' is insufficient
c 4/3j 4/3k	1	* B ✓		if more than one box is ticked, award no mark
Total	5			

Tier 3–6 5–7		Q No 11 2		
Part	Mark	Answer	Accept	Additional guidance
a 4/2b 4/1d	1 1	* gravity * magnetic force or magnetism	accept 'weight' accept 'repulsion' or 'upthrust'	answers may be in either order do not accept 'air resistance'
b i 1/2j	1	* 12		
b ii 1/2k	1	any one from * the paper cup stopped moving * the paper cup reached the bottom magnet	accept 'it hit the bottom' accept 'the paper cup could not go any further'	
c 4/1d 3/1d	1	any one from * iron is magnetic * iron nails are attracted to a magnet * there is a magnetic force on the iron	accept 'aluminium is not magnetic' accept 'the rivets are not attracted to a magnet'	do not accept 'aluminium or rivets are less magnetic' do not accept 'iron or nails are more magnetic than aluminium or rivets'
Total	5			

Tier 3–6 5–7		Q No 12 3		
Part	Mark	Answer	Accept	Additional guidance
a 1/2d	2	any two from * initial temperature of water * exclusion of draughts * volume or mass of water * surface area (of water) * humidity	accept 'same amount of draughts' accept 'amount of water' accept 'shape or size or material of container' accept 'the time it is left for'	'temperature' is insufficient do not accept 'size of room'
b 1/2o	1	* they have not collected data about temperature * no data recorded about temperature	accept 'they did not measure temperature' accept 'no information about temperature' accept 'no temperature'	
c 1/2p	1	* the line is not straight (converse) * the line should be straight	accept 'the line is zig-zag' accept 'they joined up all the points' accept 'they didn't go between the points' accept 'the line does not need to go through all the points'	
d 1/2i	1	* 6 points correctly plotted to the nearest half square		
e 1/2i	1	* a straight line of best fit between some of the points		

Tier 3–6 5–7	Q No 12 3			
Part	Mark	Answer	Accept	Additional guidance
f 1/2k	1	<div><div></div><div>✓</div>room 2</div> <p>and</p> <ul style="list-style-type: none">* the points for room 2 are lower than room 1* the container in room 2 reaches 30g in 5 days, room 1 reaches 45g* more water evaporated in the same time <p>* the volume goes down more quickly</p>	<p>accept ‘there is less water in the container in room 2 than in room 1’</p> <p>accept ‘amount of water dropped more in the first three days’</p> <p>accept ‘the line for room 2 is steeper’</p> <p>accept ‘the numbers go down more quickly’</p> <p>accept ‘the mass goes down more quickly’</p>	
Total	7			

Tier 3–6 5–7		Q No 13 4		
Part	Mark	Answer	Accept	Additional guidance
a i 3/3d	1	* red or pink	accept 'orange' or 'yellow'	
	1	* any number greater than 0 and smaller than 7	accept '0'	
b i 3/3e	1	* carbon dioxide is gas	accept 'carbon dioxide or a gas is produced'	
	1	any one from * no more carbon dioxide or gas was produced * the reaction stopped * all the hydrochloric acid was used up * there was an excess of magnesium carbonate or carbonate	accept 'the acid had been neutralised'	<i>do not accept</i> 'all the magnesium carbonate was used up'
c 3/1e 3/3e	1	* a compound ✓		if more than two boxes are ticked, deduct one mark for each incorrect tick minimum mark zero
	1	* a salt ✓		
d 2/2b	1	any one from * without it digestion would stop or slow down * acid is needed for digestion * the enzymes only work in acid conditions or at a low pH * it is needed to kill bacteria or microbes	accept 'to break down food'	<i>do not accept</i> 'germs'
Total	7			

Tier 3–6 5–7		Q No 14 5		
Part	Mark	Answer	Accept	Additional guidance
a i 2/4b	1	* vertebrates		do not accept 'vertebrae'
a ii 2/4b	1	* reptiles		
b 2/2e	1	any one from * so that it can bend * to allow movement		
c 2/2e	1	any one from * to stop the bones rubbing together * to stop bones getting worn down * to cushion the bones	accept 'it reduces friction' accept 'it can be squashed' accept 'it absorbs shock'	
d 2/2e	1	* the biceps contracts the triceps relaxes		both answers are required for the mark
Total	5			

Tier 3–6 5–7		Q No 15 6		
Part	Mark	Answer	Accept	Additional guidance
a <i>1/2h</i>	1	any one from * a bigger sample * more data are collected in the survey	accept 'one person could make it up' accept 'one garden may not be typical'	
b <i>1/2d</i>	2	any two from * time of year or season * location or gardens * duration of the observation	accept 'the time' for one mark if 'time of year' or 'season' or 'duration' is not given	'the environment' is insufficient
c i <i>1/2e</i>	1	any one from * they would need to look at the pattern in the data for more than a year * they would need to compare data collected in another year with that available in 2002	accept 'data from another year or last year' accept 'more data or data from the time when his grandad was young' accept 'data from when his grandad was young is not available'	
c ii <i>1/1b</i>	1	* data would need to show fewer sparrows in 2002 than in earlier years	accept 'more sparrows would need to be recorded in earlier years than in 2002'	
Total	5			

Tier 3–6 5–7		Q No 16 7		
Part	Mark	Answer	Accept	Additional guidance
a i <i>2/1b</i>	1	* C and E		answers may be in any order both answers are required for the mark
a ii <i>2/1b</i>	1	* C		
a iii <i>2/1b</i>	1	any one from * to trap or absorb light * photosynthesis	accept 'to make glucose or sugar or starch or carbohydrate or food'	
b i <i>2/1c</i>	1	* A		accept 'lungs'
b ii <i>2/1c</i>	1	any one from * windpipe * trachea * airways * bronchus * bronchiole * oviduct or fallopian tube		
b iii <i>2/1e</i>	1	* to remove mucus	accept 'to remove bacteria' accept 'to move mucus along' accept 'to move or remove bacteria or dust particles' accept 'to move an ovum or egg along' if the oviduct or fallopian tube is given as the answer to part ii	
c <i>2/1c</i>	1	* B		
Total	7			

Tier 3–6 5–7		Q No 17 8		
Part	Mark	Answer	Accept	Additional guidance
a 1/1c	1	* He observed the environment. ✓		if more than one box is ticked, award no mark
b 1/1c	1	any one from * data from further away can be collected * data from fainter objects or smaller details can be collected * data is clearer because there is no atmospheric distortion * more information is collected * more detailed or more accurate information * wider spectrum of information including photographs or pictures of planet * other radiation can be detected	accept 'equipment can land on the planet' accept 'telescopes can be sited outside Earth's atmosphere'	a mark may be awarded for a description of a specific way information is different or a description of a specific way previous limitations are reduced
c 1/1a	1	any one from * our knowledge is increasing * our knowledge is changing	accept 'we probably do not know everything about the solar system'	
d 1/1c	1	any one from * new evidence which challenges ideas may be collected * there might be a new way of thinking about how the facts fit together * new interpretations of evidence * old ideas do not explain the observation	accept 'more observations' accept 'new evidence' accept 'old ideas do not work or fit data'	
Total	4			

Tier 5–7		Q No 9
Part	Mark	Answer
a i 4/2a	1	* 12.5 m/s
	1	* they are equal or the same
a ii 4/2c	1	accept ' $\frac{400}{32}$ m/s' accept 'metres per second' or 'ms ⁻¹ ' for m/s accept 'they are balanced'
		the unit is required for the mark <i>do not accept</i> 'mps'
b 4/2d 4/2c	1	* the forward force is greater than the backward force
	1	any one from * because air resistance or drag is smaller or reduced * because there is a smaller surface area
b 4/2d 4/2c	1	accept the converse accept 'the forward force is greater' or 'the backward force is smaller' accept 'less friction'
		<i>do not accept</i> 'the forward force becomes greater or increases' 'she is more streamlined' is insufficient as it is given in the question
Total	4	

Tier 5–7		Q No 10		
Part	Mark	Answer	Accept	Additional guidance
a i 4/4a	1	any one from * the Earth rotates	accept ‘the Sun appears to move across the sky’ accept ‘the Sun is in a different position at different times of day’ accept ‘different cloud cover’	
		* the amount of sunlight varies * the angle of the Sun varies	accept ‘in the middle of the day the energy received is greatest’	<i>do not accept</i> ‘in the middle of the day the Sun is hottest or brightest’
a ii 1/2j	1	* 6.0	accept any number from 5.8 to 6.2	
b i 4/4a	1	* a graph starting after 6 am and ending before 6 pm		
	1	* a line below the existing line and flat or reaching a maximum between 12 noon and 1 pm		
	b ii 1/2k	1	* 15	accept ‘ $\frac{180}{12}$ ’
Total	5			

Tier 5–7		Q No 11		
Part	Mark	Answer	Accept	Additional guidance
a <i>1/2i</i>	1	* volume or alkali in cm ³ on the x axis and pH of mixture on the y axis		pupils can gain credit for correct responses to other parts if the axes are wrongly labelled this mark cannot be awarded for a non-linear scale <i>do not accept</i> a line drawn from point to point
	1	* appropriate scales for volume of alkali and pH of mixture		
	1	* 11 points correctly plotted		
	1	* smooth curve of best fit		
b <i>1/2j</i>	1	* 9.0	accept '9'	
Total	5			

Tier 5–7		Q No 12		
Part	Mark	Answer	Accept	Additional guidance
a 3/1c	1	* <i>magnesium</i> : Mg		
	1	* <i>copper</i> : Cu		
b i 3/3c	1	* copper		accept 'almost zero' or 'very small'
b ii 3/3c	1	* 0		
	1	any one from * two blocks of the same metal have the same reactivity * there is no difference in reactivity	accept 'they are the same'	
b iii 3/3c	1	* nickel <i>and</i> tin		
Total	6			answers may be in either order both answers are required for the mark

Tier 5–7		Q No 13
Part	Mark	Answer
a i 2/2d	1	* football requires more energy than bowling
a ii 2/2m	2	any two from * alcohol increases the reaction time * alcohol reduces co-ordination * alcohol causes or increases errors of judgement * alcohol reduces concentration
b 2/2b 2/2c	1	any one from * glucose can be absorbed * starch molecules cannot be absorbed * it takes time for starch to be broken down * starch has to be digested or broken down
Total	4	
		Additional guidance
		<p>accept 'football is more energetic' accept 'you run more in football' accept 'she is using up more kJ' accept 'playing football uses 2260 kJ/hr and bowling uses 1030 kJ/hr'</p> <p>accept 'it slows reactions' or 'it slows the reaction time' accept 'they would feel dizzy'</p> <p>accept 'they would be sleepy or drowsy'</p> <p>accept 'alcohol makes them lose more heat' accept 'it causes blurred vision'</p> <p>accept 'glucose does not need to be digested'</p> <p><i>do not accept</i> 'football is energetic'</p> <p>'it slows them down' is insufficient</p>

Tier 5–7		Q No 14		
Part	Mark	Answer	Accept	Additional guidance
a 1/2d	1	* the size or area or dimensions of the plots	accept ‘the amount of land’	
b 1/2h	1	any one from * to increase the reliability of the results * to be more certain of his results	accept ‘to make the results more accurate’ accept ‘some of the plots could be unusual or different’	‘to find an average’ is insufficient
c 1/2d	1	* the number of plants or grasses and the mass of plants or grass		both answers are required for the mark ‘amount of plants’ is insufficient
d 1/2d	1	any one from * the number of species of grass * different species * type of plant or seed or grass	accept ‘species’	

Tier 5–7		Q No 14		
Part	Mark	Answer	Accept	Additional guidance
e 1/1c	1	any one from * his analysis would allow the effects of soil differences to be controlled or explained * to provide evidence of any difference between soils * the analysis would provide more evidence * to check whether soils were the same or different	accept 'to make sure or so it would be fair' accept 'to check whether soils had an effect on growth'	
f 2/5d 1/2m	1	any one from * different species have different requirements so they are not competing for the same resources * competition might stimulate more vigorous growth * one species may be better adapted to the plot or conditions * you would get continuous growth throughout the year		
Total	6			

First published in 2004

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