Sc

KEY STAGE
3

TIERS
3–7

2009

Science tests

Mark scheme

for Papers 1 and 2



National curriculum assessments

Introduction

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 expected answers indicated by an asterisk
- additional guidance to assist markers in making professional judgements.

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:

- examples of answers which are insufficient or not acceptable
- information on the general requirement of the question
- a reminder, in questions involving calculations, that consequential marking may be used
- instructions on action in the event of consequential marking (see p5)
- guidance to markers where pupils have not followed the instructions in the question.

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 16 and from tier 5–7 paper 1 question 8, illustrates this.

Tier 3–6 5–7	Q No 16 8			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
a i *2/2n*	2	* fewer bacteria * less acid (is produced)	accept 'bacteria have nowhere to breed' **or** 'there are no bacteria' **or** 'bacteria cannot live' accept 'there is no acid' **or** 'no acid is produced' accept, for two marks, 'there are less bacteria producing acid'	answers that just repeat or restate the leaflet are insufficient

Brackets indicate part of an answer that is not necessary for it to be creditworthy. In the example, on the opposite page, 'less acid' is enough to gain the marks.

In the following example from part **a** of tiers 3–6 and 5–7 paper 1 question 12/4, an answer giving 'it has a flagellum' and 'it does not have a vacuole' should be awarded two marks. However, an answer which gives 'it has a tail to move' should be given only one mark, as 'tail' and 'it can move' are equivalent answers.

Part	Mark	Answer	Accept	Additional Guidance
a *2/1b*	2	any **two** from * it has a flagellum **or** tail to help it move * it does not have a (cell) wall * it does not have a vacuole * it has a reservoir (for taking in food)	accept 'can move **or** swim' accept 'it has a tail' accept 'it does not have a fixed shape' **or** 'it changes shape' accept 'it takes in **or** eats food' accept 'it has has a mouth-like structure'	'whip' is insufficient *do **not** accept* 'it does not have a membrane' 'it only has a membrane' is insufficient 'it has a mouth' is insufficient

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

The additional guidance column shows which answers are insufficient or not acceptable. **'Do not accept'** answers will negate a mark if given with an otherwise creditworthy answer. From the example above, the answer 'it doesn't have a cell wall or membrane' would not gain a mark. **'Insufficient'** answers do not provide enough information to be awarded the mark on their own, but can be credited if given with a correct answer. For example 'its whip helps it to swim' should be awarded one mark. Insufficient answers can also be irrelevant information.

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 should be marked and the mark for each part recorded in the mark box alongside that part. Half marks should not be given in any question.

The total number of marks awarded for all the parts of questions on a double page should 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 can 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 you 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, you should apply your professional judgement to decide if credit should be given. You should 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.

Marking misspellings of words

If a pupil misspells a word, you should 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 should 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 should be accepted and the mark awarded
- if specific scientific vocabulary is required in the answer, a misspelling must, in order to be creditworthy, 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 should 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 should 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 should 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 should be treated as the starting point for the second
- the pupil should be 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. You should 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 should be given credit for their responses.

Awarding levels

Level threshold tables, which show the mark ranges for the award of different levels, will be available on the NAA website *www.naa.org.uk/tests* from April 2009.

The 2009 key stage 3 science tests and mark schemes were developed by the National Foundation for Educational Research (NFER) on behalf of QCA.

Mark Allocation Grid: Tier 3–6

TIER 3–6 Paper 1

Q	Sc1		Sc2		Sc3		Sc4	
1						3		2
2		3		3				
3		2						4
4		2		5				
5		1				5		
6		5						
7		5						
8		2		1		2		
9		8						
10								5
11		2						2
12				5				
13		6						
14						6		
15						5		
16		3		2		1		
Total		**39**		**16**		**22**		**13**

TIER 3–6 Paper 2

Q	Sc1		Sc2		Sc3		Sc4	
1		6						
2		4				2		
3				8				
4		3				1		2
5		1		6				
6								6
7						1		5
8		2		2				
9						7		
10		1		4				1
11		6						
12						1		4
13		1				4		
14		3						3
15		6						
Total		**33**		**20**		**16**		**21**

Total P1 + 2		**72**		**36**		**38**		**34**

Overall

	180

Mark Allocation Grid: Tier 5–7

TIER 5–7 Paper 1

Q	Sc1	Sc2	Sc3	Sc4
1	8			
2				5
3	2			2
4		5		
5	6			
6			6	
7			5	
8	3	2	1	
9	5			
10	5	2		
11	2		4	
12	4			3
13		5		
Total	**35**	**14**	**16**	**10**

TIER 5–7 Paper 2

Q	Sc1	Sc2	Sc3	Sc4
1	2	2		
2			7	
3	1	4		1
4	6			
5			1	4
6	1		4	
7	3			3
8	6			
9	6			
10				5
11		7		
12	2		4	
13				6
Total	**27**	**13**	**16**	**19**

Total P1 + 2	Sc1	Sc2	Sc3	Sc4
	62	**27**	**32**	**29**

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.

Breadth of Study allocations are counted as Sc1 for the purposes of this table.

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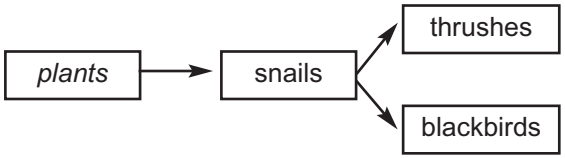
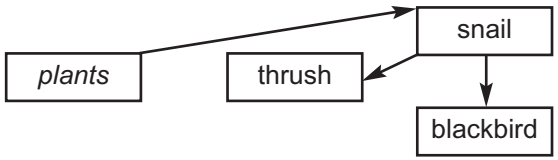
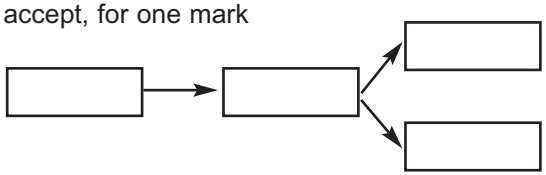
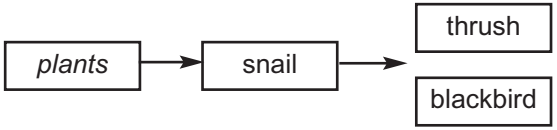
Tier 3–6	Q No 1

Part	Mark	Answer	Accept	Additional Guidance
a i *3/1a*	1	* *from a* solid *to a* liquid		**both** answers are required for the mark answers must be in the correct order
a ii *3/1a*	1	any **one** from * his nose is hot **or** hotter * the ground is colder	accept 'his nose is warm' accept 'his body (heat) melts the snow' accept 'heat' accept 'body temperature'	'the temperature is different' is insufficient
a iii *3/2a*	1	* yes no no		**all three** answers are required for the mark answers must be in the correct order
b i *4/2b*	1	* ↓	accept a downward arrow anywhere on or near the diagram	*do **not** accept* a response where the arrow is at a right angle to the board
b ii *4/2d*	1	* friction		'air resistance' **or** 'drag' is insufficient 'pushing force' is insufficient
Total	**5**			

Tier 3–6	Q No 2

Part	Mark	Answer	Accept	Additional Guidance
a i *1/2k* *2/4b*	1	any **one** from * the snail has a shell * the slug does not have a shell	 accept 'the shell' accept 'patch on back'	references to size are insufficient
a ii *1/2k* *2/4b*	1	any **one** from * antennae * stalked eyes * shape of body	 accept 'tentacles **or** feelers **or** horns' accept 'mouth' accept 'no legs' accept 'no internal skeleton' accept 'they both produce mucus **or** are slimy **or** have a wet body' accept 'they have a muscular foot' accept 'slither along'	references to size are insufficient
b *1/2m* *4/2d*	1	* mucus reduces friction ✔		if more than one box is ticked, award no mark

Tier 3–6	Q No 2

Part	Mark	Answer	Accept	Additional Guidance
c *2/5e*	2	*  	accept, for two marks, other arrangements of arrows that are correct, e.g.  accept, for one mark  accept, for one mark  	‘thrushes’ and ‘blackbirds’ may be in either order award one mark for the organisms in the correct place award one mark for the arrows showing the correct energy flow through the food web all **three** arrows are required for the mark
d *2/4a*	1	any **one** from * they are camouflaged * they blend into their background	accept ‘they are harder to see’ accept ‘birds or predators cannot see them’	‘it is easier for them to hide’ is insufficient ‘fewer will be eaten’ is insufficient as it does not refer to protection ‘they are disguised’ is insufficient
Total	**6**			

Tier 3–6	Q No 3

Part	Mark	Answer	Accept	Additional Guidance
a i *4/2c*	1	* *moves to the left* ☐ *moves to the right* ☑ *stays still* ☐		if more than one box is ticked in a row, award no mark for that row
a ii *4/2c*	1	* *moves to the left* ☐ *moves to the right* ☐ *stays still* ☑		
a iii *4/2c*	1	* *moves to the left* ☑ *moves to the right* ☐ *stays still* ☐		
a iv *4/2c*	1	* *moves to the left* ☐ *moves to the right* ☐ *stays still* ☑		
b i *1/2e*	1	*  ✔		if more than one box is ticked, award no mark
b ii *1/2e*	1	any **one** from * newton meter * forcemeter	accept 'spring balance'	'balance' is insufficient 'newtons' **or** 'N' is insufficient 'meter' is insufficient 'weighing scales' is insufficient
Total	**6**			

Tier 3–6	Q No 4

Part	Mark	Answer	Accept	Additional Guidance
a i *1/2k* *2/4a*	2	any **two** from * one has spots * one has upright **or** floppy **or** pointy ears * one has a straight **or** curvy **or** bent snout * different shaped body * one is darker **or** lighter	 accept 'the spots' **or** 'it has different markings' accept 'the ears' accept '(longer) nose **or** snout **or** face' accept 'shape of head' accept 'fatter' **or** 'thinner' accept 'they are different colours' accept 'length of legs'	 'different shaped' **or** 'bigger' are insufficient 'skin' is insufficient
a ii *2/4a*	1	* variations ✔		if more than one box is ticked, award no mark
b *2/4a*	1	any **one** from * upright ears * its snout is longer * its legs are longer	 accept 'the ears' accept 'shape of head **or** body' accept 'its snout' accept 'its legs' accept 'thinner' **or** 'it is thin'	 'smaller' is insufficient
c i *2/1e*	1 1	* egg cell ✔ * sperm cell ✔		if more than two boxes are ticked, deduct one mark for each incorrect tick minimum mark zero
c ii *2/2g*	1	* fertilisation ✔		if more than one box is ticked, award no mark
Total	**7**			

Tier 3–6	Q No 5			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
a *1/2m*	1	* roof tile statue	accept 'slate' accept 'marble'	**both** answers are required for the mark answers may be in either order
b *3/1d*	1	any **two** from * greenhouse **or** frame * gate * watering can	 accept 'aluminium' accept 'iron' accept 'steel'	**two** correct answers are required for the mark answers may be in either order
c i *3/3a*	1	* oxygen	accept 'water vapour **or** steam'	'water' is insufficient
c ii *3/3a*	1	* paint it	accept 'galvanise it' accept 'oil **or** grease it' accept 'varnish it' **or** 'put polish on it' accept 'wax it' accept 'coat it in plastic'	'use another metal' is insufficient 'polish it' is insufficient 'put a protective covering over it' is insufficient
d *3/1d*	2	* iron ✔ * steel ✔		if more than two boxes are ticked, deduct one mark for each incorrect tick minimum mark zero
Total	**6**			

Tier 3–6	Q No 6

Part	Mark	Answer	Accept	Additional Guidance
a *1/2k*	1	* 7 *days*		
b *1/2d*	1	* air temperature and soil moisture ✔		if more than one box is ticked, award no mark
c *1/2o*	1	any **one** from * he only carried out his experiment at a medium light level * he only used one light level * he did not change the (amount of) light	accept 'he did not try other levels'	'it was not a fair test' is insufficient
d *1/2l*	2	* <table><tr><th>tray</th><th>day 4</th></tr><tr><td>*A*</td><td>8</td></tr><tr><td>*B*</td><td>7</td></tr><tr><td>*C*</td><td>5</td></tr><tr><td>*D*</td><td>2</td></tr></table>	accept any whole number from 6 to 8 accept any whole number from 2 to 8 accept any whole number from 0 to 4	award two marks for all **four** correct answers award one mark for any **two** or **three** correct answers
Total	**5**			

Tier 3–6	Q No 7

Part	Mark	Answer	Accept	Additional Guidance
a *1/2i* *3/3d*	2	* 7 * orange * an answer in the range 1–3 * purple	accept '1–3'	for **all four** rows correct, award two marks for any **two** or **three** rows correct, award one mark answers must be in the correct column and row in the table
b *1/2i* *BS/2b*	1	any **one** from * they are corrosive * they burn **or** irritate	accept 'they can damage your skin **or** eyes'	'in case it touches your skin' is insufficient 'it is harmful **or** poisonous' is insufficient 'it can kill you' is insufficient 'wear gloves' is insufficient *do **not** accept* 'it is flammable'
c i *1/2i*	1	* time, in days	accept 'time' accept 'days'	*do **not** accept* 'hours' or 'minutes'
c ii *1/2j*	1	* it goes down **or** decreases	accept 'it becomes acidic' accept 'it goes from 6.5 to 2.5' accept 'the acid gets stronger'	'it goes red' is insufficient 'it goes sour' is insufficient if the label for X is incorrect in part (ci), do not penalise again in part (cii)
Total	**5**			

Tier 3–6	Q No 8			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
a i *1/2k* *2/4b*	1	* feathers	accept 'wings' accept 'beak' accept 'hollow **or** thin bones'	'it could fly' is insufficient
a ii *2/4b*	1	* scales		
b *1/2o*	1	any **one** from * only the imprint of feathers **or** bones are left **or** seen	accept 'they do not know whether it had feathers **or** scales' accept 'no feathers were found' accept 'its flesh **or** skin is not there' **or** 'only its bones are there'	'they do not know if it is a reptile or bird' is insufficient
		* not enough evidence **or** proof		'no evidence **or** proof' is insufficient
		* it is now extinct	accept 'there are no animals like it around today' accept 'they have not seen one'	'they do not know what it looked like' is insufficient 'they do not know what colour it was' is insufficient
c *3/2f*	1	* fossils		
d *3/2f*	1	* it is too hot	accept 'they burn **or** melt' accept 'it is hot' accept 'heat'	'they are destroyed' is insufficient
Total	**5**			

Tier	Q No
3–6	9
5–7	1

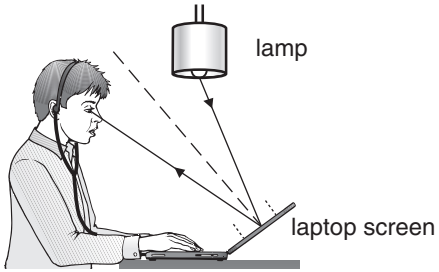
Part	Mark	Answer	Accept	Additional Guidance
a i *1/2d*	1	* (the type of) material	accept 'fabric'	
a ii *1/2d*	1	* the temperature after 20 minutes	accept 'temperature' accept 'temperature change' accept 'how hot the water is'	'temperature at start' is insufficient 'heat' is insufficient
b i *1/2k*	1	* B ✔		if more than one box is ticked, award no mark
b ii *1/2k*	1	* beaker B was warmer (at the end than the others)	accept the converse accept 'the temperature was higher' accept 'it dropped the least' accept 'it lost the least heat'	'B was 40 °C at the end' is insufficient
c *1/2d*	2	any **two** from * temperature in cold room * style **or** size of coat * the clothes he wears for each test * level of activity	 accept 'his temperature before he went in' accept 'amount of material' accept '(same) underclothes' accept 'he had eaten the same food before each test'	 'temperature' is insufficient 'the person' or 'the time' is insufficient

Tier	Q No
3–6	9
5–7	1

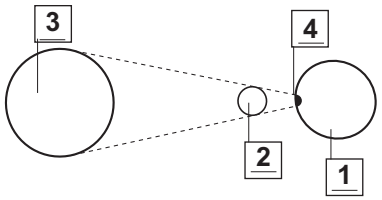
Part	Mark	Answer	Accept	Additional Guidance
d *1/2f*	1	* do not let the volunteer's body temperature go down too far	accept 'do not let him **or** the room get too cold' accept 'have a doctor nearby' accept 'monitor **or** check him' accept 'measure his heart rate **or** breathing rate' accept 'wear gloves' **or** 'keep his head warm' accept 'make sure the volunteer is healthy' **or** 'is not allergic to the material'	
e *1/2e* *1/2p*	1	any **one** from * monitor the temperature from outside the room * it gives you a continuous record (of the temperature) * it is more accurate **or** precise	accept 'remote sensing' accept 'you have to open the coat to read the thermometer' accept 'you do not have to write down the results' accept 'it eliminates human error' accept 'the experiment is more reliable'	'accurate' is insufficient 'more reliable' is insufficient
Total	**8**			

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Tier	Q No
3–6	10
5–7	2

Part	Mark	Answer	Accept	Additional Guidance
a i *4/3c*	1	* a continuous straight line from the lamp to the screen **and** from the screen to George's eye		
	1	* angle of incidence approximately equal to the angle of reflection	accept a reflection anywhere between the dotted lines on the laptop screen	
	1	* arrows in the correct direction on the incident and reflected ray	accept one arrow on a continuous ray showing reflection	
a ii *4/3c*	1	* the reflected ray **or** the light image misses George's eyes	accept 'the ray of light is reflected at a different angle' accept 'it moves down'	'the lamp is not shining in his eyes' is insufficient *do **not** accept* responses referring to scattering 'it changes' is insufficient *do **not** accept* 'the ray of light is reflected above his eye'
b *4/5e*	1	* *from* electrical *energy to* sound *energy*		**both** answers are required for the mark answers must be in the correct order
Total	**5**			

Tier	Q No
3–6	11
5–7	3

Part	Mark	Answer	Accept	Additional Guidance
a *4/4b* *1/2m*	2	* 		for **all four** numbers in the correct place, award two marks for any **two** or **three** numbers in the correct place, award one mark
b *1/2l* *1/2m* *4/4b*	1 1	any **one** from * 21st August * 22nd August * 23rd August * 2017	accept dates written in another format	
Total	**4**			

Tier	Q No
3–6	12
5–7	4

Part	Mark	Answer	Accept	Additional Guidance
a *2/1b*	2	any **two** from * it has a flagellum **or** tail to help it move * it does not have a (cell) wall * it does not have a vacuole * it has a reservoir (for taking in food)	 accept 'can move **or** swim' accept 'it has a tail' accept 'it does not have a fixed shape' **or** 'it changes shape' accept 'it takes in **or** eats food' accept 'it has a mouth-like structure'	 'whip' is insufficient *do **not** accept* 'it does not have a membrane' 'it only has a cell membrane' is insufficient 'it has a mouth' is insufficient
b *2/1b*	1	* it has chloroplasts	accept 'chlorophyll'	'it makes food' is insufficient
c *2/3b*	1 1	* water * oxygen	accept 'H_2O' accept 'O_2'	answers must be in the correct order
Total	**5**			

Tier	Q No
3–6	13
5–7	5

Part	Mark	Answer	Accept	Additional Guidance
a *1/2d*	2	any **two** from * same type of cardboard * same width (of cardboard) * same length (of cardboard) * same thickness of cardboard pieces * loaded in the centre * same (height of) blocks * same distance between blocks * measure in the same place	 accept ‘same cardboard **or** box’ accept, for one mark, ‘the same sized bridge’ if not given with ‘width’ **or** ‘length’ **or** thickness accept ‘equal-sized cardboard pieces’ accept ‘same height at the start’ accept ‘leave masses on for the same amount of time’ accept ‘masses of the same shape **or** type’	 ‘same height of bridge’ is insufficient
b i *1/2j*	1	* *bridge A:* any number from 0.0 to 2.9 *bridge B:* any number from 5.1 to 5.5		**both** answers are required for the mark
b ii *1/2n*	1	any **one** from * it collapsed * it broke * it folded * it reached the bench		

Tier	Q No
3–6	13
5–7	5

Part	Mark	Answer	Accept	Additional Guidance
c i *1/2k*	1	* bridge A ✔		if more than one box is ticked, award no mark **both** the bridge and a reason are required for the mark
		any **one** from		
		* it bends less (at 200 g)	accept 'there is a bigger gap to the bench' accept 'it is higher'	'it is stronger' is insufficient
		* bridge B bends more	accept 'bridge A is 7.0 cm and bridge B is **only** 6.5 cm'	'bridge A is 7.0 cm and bridge B is 6.5 cm' is insufficient
c ii *1/2k*	1	* bridge B ✔		if more than one box is ticked, award no mark **both** the bridge and a reason are required for the mark
		any **one** from		
		* it bends less (at 300 g)	accept 'there is a bigger gap to the bench' accept 'it is higher'	'it is stronger' is insufficient
			accept 'bridge B is 5.6 cm and bridge A is **only** 3.0 cm'	'bridge A was 3.0 cm, bridge B was 5.6 cm' is insufficient
		* bridge A bends more	accept 'bridge A is about to break'	'it is about to break' is insufficient
Total	**6**			

Tier	Q No
3–6	14
5–7	6

Part	Mark	Answer	Accept	Additional Guidance
a *3/2b*	2	* *true* *false* ☑ ☐ ☐ ☑ ☑ ☐		for **all three** correct boxes ticked, award two marks for any **two** correct, award one mark
b *3/1h*	1	* evaporate the water **or** evaporation	accept 'heat it' accept 'it goes from liquid to gas' accept 'boiling'	do ***not*** *accept* an incorrect use of evaporation, e.g. 'she evaporates salt from sand'
	1	* condense the water vapour **or** condensation	accept 'it goes from gas to liquid' accept, for two marks, 'distil **or** distillation' accept, for one mark, 'condensation then evaporation'	do ***not*** *accept* 'it condenses to water vapour'

Tier	Q No
3–6	14
5–7	6

Part	Mark	Answer	Accept	Additional Guidance
c i *3/1g*	1	*substance* *group* * seawater → compound salt → mixture oxygen → element		all **three** lines are required for one mark if more than one line goes from any one box, do not award the mark
c ii *3/1g*	1	*group* *description* * compound → Two or more types of atoms are chemically joined together. mixture → It contains two or more types of atoms or molecules which can be physically separated. element → It contains only one type of atom.		all **three** lines are required for one mark if more than one line goes from any one box, do not award the mark
Total	**6**			

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Tier 3–6 5–7	Q No 15 7

Part	Mark	Answer	Accept	Additional Guidance
a *3/1c*	1	* B ✔ C ✔		**both** answers are required for the mark if more than two boxes are ticked, award no mark
b *3/1d*	2	any **two** from * it conducts electricity * it conducts heat * it is ductile **or** malleable * it has a high melting **or** boiling point	one mark may be awarded for 'it is a good conductor' if a reference to heat or electricity is not given accept 'it is shiny' accept 'it is sonorous' accept 'it forms basic oxides'	'it bends' is insufficient 'it is strong **or** hard' is insufficient
c *3/3a*	1	* copper oxide	accept 'CuO'	*do **not** accept* 'copper dioxide'
d *3/2g* *3/2a*	1	* The atoms have combined in a different way to make a new substance. ✔		if more than one box is ticked, award no mark
Total	**5**			

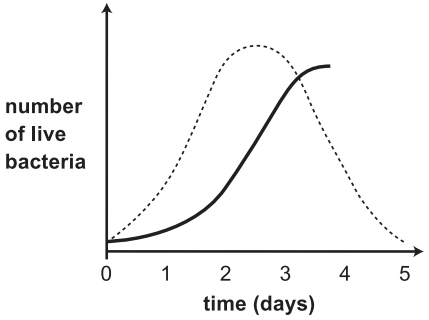
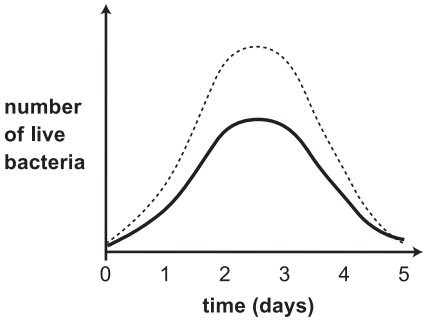
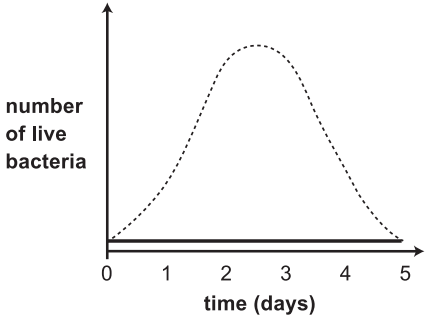
Tier	Q No
3–6	16
5–7	8

Part	Mark	Answer	Accept	Additional Guidance
a i *2/2n*	2	* fewer bacteria * less acid (is produced)	accept 'bacteria have nowhere to breed' **or** 'there are no bacteria' **or** 'bacteria cannot live' accept 'there is no acid' **or** 'no acid is produced' accept, for two marks, 'there are less bacteria producing acid'	answers that just repeat or restate the leaflet are insufficient
a ii *3/3f*	1	any **one** from * it neutralises acid * it raises the pH of the mouth	accept 'to make the acid neutral' accept 'it makes the mouth less acid'	'the alkali cancels out the acid' is insufficient 'it reacts with the acid' is insufficient *do **not** accept* 'alkali gets rid of plaque **or** kills bacteria' references to brushing are insufficient
b *1/2d*	1	any **one** from * it would show how effective brushing is in removing plaque * to compare the amount of plaque before and after * to see how much plaque is removed	accept 'to see the effect' accept 'to compare teeth before and after' accept 'to see if there was a change in the amount of plaque or red'	'how clean their teeth have become' is insufficient 'to show how much plaque there is on the teeth' is insufficient 'so they can see when the plaque is gone **or** removed' is insufficient *do **not** accept* 'to see how much decay is removed'

Tier	Q No
3–6	16
5–7	8

Part	Mark	Answer	Accept	Additional Guidance
c i *1/2e*	1	any **one** from * it is more precise * it is a better estimate * to see exactly how much	 accept 'more accurate' accept 'there are more squares fully shaded so you do not have to count as many fractions'	 'more reliable' is insufficient 'accurate **or** precise' is insufficient 'to see more clearly **or** more easily' is insufficient 'it is more detailed' is insufficient
c ii *1/2h*	1	* a number from 13 to 17 inclusive		
Total	**6**			

Tier 5–7	Q No 9			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
a i *1/2m* *2/2n*	1	any **one** from * the pH is too low * it is too acidic	 accept 'acid is killing the bacteria' accept 'the bacteria could be poisoned' accept 'not enough nutrients **or** sugar'	 'the milk goes off' is insufficient 'the bacteria were dying' is insufficient 'there is no sugar left' is insufficient
a ii *1/2m* *2/2n*	1	* the pH was still decreasing on day 5	accept 'it was going down' accept 'the acidity was increasing'	*do **not** accept* 'it has not reached 0' 'it has not reached the bottom of the graph' is insufficient 'the line continues' is insufficient

Tier 5–7	Q No 9			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
b i *1/2c* *1/2i*	1 1	* a line that starts at pH 6.5 and then falls * a response that decreases less than 3.5 over 5 days		
b ii *1/2c* *1/2i*	1	* a graph that indicates that the number of bacteria increases more slowly, starting at same point  	accept a lower graph over the same time  	the line must be below the dotted line for the first 2.5 days *do **not** accept* a horizontal line above the x axis as shown below 
Total	**5**			

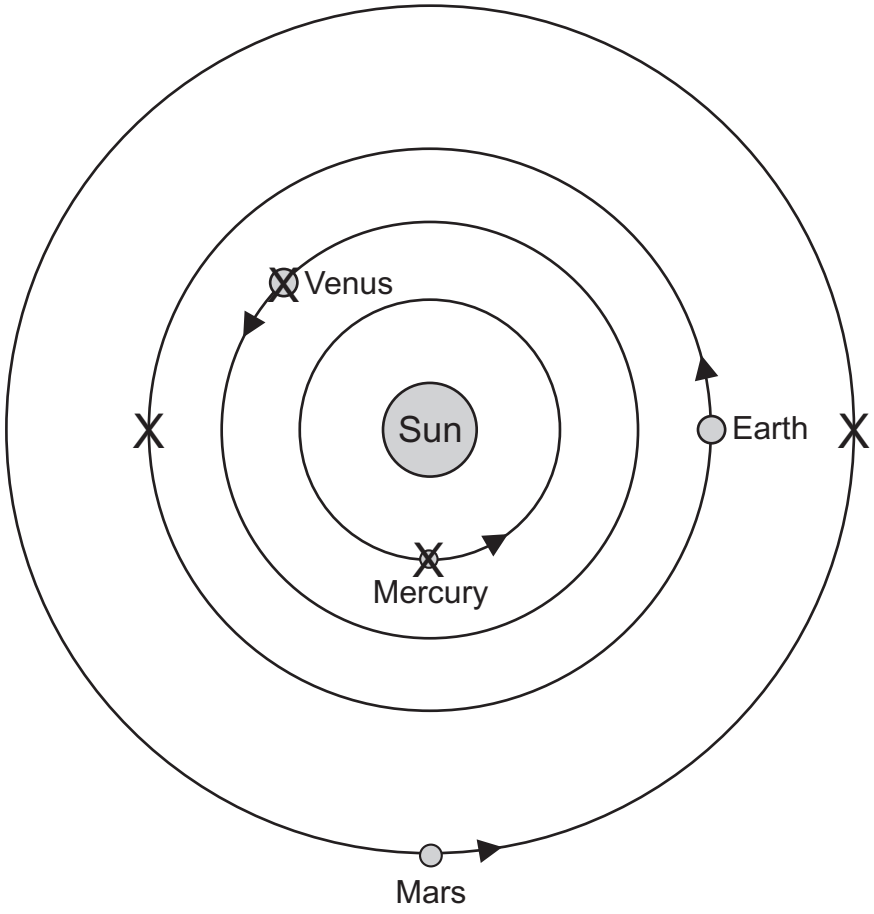
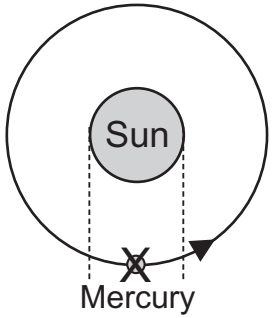
Tier 5–7	Q No 10

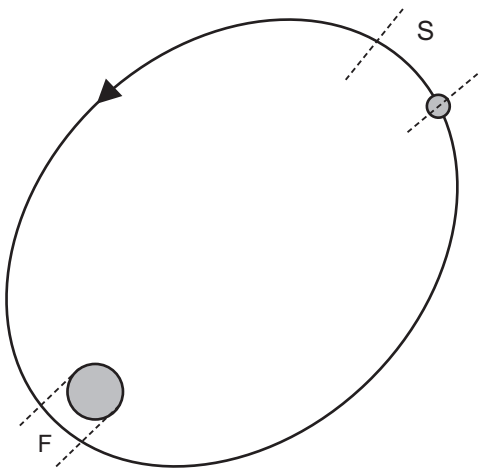
Part	Mark	Answer	Accept	Additional Guidance
a i *2/2b*	1	* enzyme(s)	accept '(hydrochloric) acid' accept 'biological catalyst' accept any named enzyme (e.g. amylase **or** protease)	*do **not** accept* other named acids 'catalyst' is insufficient 'saliva' is insufficient
a ii *2/2b*	1	* it is broken down (into smaller molecules)	accept 'forms amino acids' accept 'breaks up'	'it is absorbed' is insufficient *do **not** accept* 'it breaks down into glucose'
b i *1/2d*	1	any **one** from * as a control * to show that enzyme digested the jelly * to show that water does not digest the jelly	accept 'control' accept 'as a comparison' accept 'to show what would happen without the enzyme **or** pineapple'	'so that it is a fair test' is insufficient
b ii *1/2k* *2/2b*	1	any **one** from * it took less time to digest the jelly (than B) * chopped up jelly digested more quickly	accept 'it breaks it down **or** up more quickly' accept 'it **only** takes an hour to digest'	an explanation of why it is faster is insufficient 'it is easier to swallow' is insufficient 'it is easier to digest' is insufficient 'it digests in an hour' is insufficient
c i *1/2a*	1	* 5 g cube of (chopped up) jelly **and** same amount **or** 15 cm^3 of juice	accept 'use same amount of jelly and juice'	*do **not** accept* 'water'
	1	* boil the juice first	accept 'use (fresh) boiled juice'	*do **not** accept* 'boiling juice'
c ii *1/2c*	1	* the jelly was not digested	accept 'how much jelly had broken down' accept 'nothing happened' accept '5 g of jelly (cubes)' accept 'a small amount of jelly has dissolved'	'nothing' is insufficient as it implies nothing is left in the test tube 'the jelly has not dissolved' is insufficient
Total	**7**			

Tier 5–7	Q No 11

Part	Mark	Answer	Accept	Additional Guidance
a i *3/1f*	1	* sodium carbonate		'Na_2CO_3' is insufficient
a ii *1/2k* *3/2g*	1	* 18		
a iii *1/2k* *3/2g*	1	* 88		
b i *3/1a*	1	* carbon dioxide sinks	accept 'the density of carbon dioxide is greater'	'carbon dioxide is heavy' is insufficient 'carbon dioxide is heavier than air' is insufficient
	1	any **one** from * it prevents oxygen reaching the fire * carbon dioxide displaces (air containing) oxygen	accept 'fire is starved of oxygen'	*do **not** accept* 'air' in place of oxygen 'it takes away oxygen' is insufficient 'the carbon dioxide keeps oxygen away from the fire' is insufficient as this implies it is an active process 'it suffocates **or** covers the fire' is insufficient
b ii *3/2c*	1	* energy **or** heat is needed to evaporate the water	accept 'taking heat out of the fire'	'it makes the temperature less' is insufficient 'water cools the fire down' is insufficient
Total	**6**			

Tier 5–7	Q No 12

Part	Marks	Answer	Accept	Additional Guidance
a *1/2j*	2	* 		for all **four** correct, award two marks for any **two** or **three** correct, award one mark accept a cross drawn that lies within the width of the Sun for each planet, e.g. 

Tier 5–7	Q No 12			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
b *BS/1f* *4/4b*	1 1	* 42 * 258	accept '150-108' accept '150+108'	
c *4/2a*	1	* 500	accept '$\frac{150,000,000}{300,000}$ **or** $\frac{150 \text{ million}}{300,000}$' accept '8.3 minutes' accept 'about 8 minutes'	
d i *4/4c*	1	* 		**both** answers are required for the mark accept an answer within the dotted lines at either end of the ellipse
d ii *4/4c*	1	* attracted by the Sun's gravity	accept 'increased gravity near to Sun'	
Total	**7**			

Tier 5–7	Q No 13

Part	Mark	Answer	Accept	Additional Guidance
a *2/5c*	1	any **one** from * less cellulose is needed **or** fewer cell walls produced **or** less glucose changed to cellulose * less glucose **or** energy needed **or** used for growth * more glucose is available to be changed into starch	accept 'less stalk is made' accept 'less glucose used in respiration' accept 'it does not have to grow as much' accept 'more glucose goes to the grain' accept 'blown over less easily **or** less frequently'	'less starch is used for growth' is insufficient *do **not** accept* 'the glucose gets to the grain quicker'
b i *2/4c*	2	any **two** from * cross plants with short stalks and low grain mass with plants with long stalks and high grain mass * collect **or** plant the seeds * choose offspring with shortest stalks and which produce a high mass of grain	accept 'breed from varieties A and B' accept 'choose the best'	'mix varieties A and B' is insufficient
	1	* repeat with offspring **or** continue the whole process		a three mark answer must include two of the first three marking points and a reference to repeating or continuing the process

Tier 5–7	Q No 13

Part	Mark	Answer	Accept	Additional Guidance
b ii *2l4c*	1	any **one** from * disease resistance * pest resistance * drought tolerance * frost resistance * resistance to herbicides **or** weed killers * resistance to wind	 accept ‘strong stalk’ **or** ‘long roots’ accept ‘hardy’ accept ‘big **or** long leaves **or** lots of leaves’ accept ‘faster growing’	 ‘increased amount of grain’ **or** ‘number of ears of corn’ are insufficient ‘more stalks’ is insufficient accept ‘corn’ for ‘wheat’
Total	**5**			

Tier 3–6	Q No 1			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
a i *1/2e*	2	* thermometer → time; calendar → temperature; mass balance → length; ruler → mass		if **all four** lines are correct, award two marks if **two or three** lines are correct, award one mark if more than one line is drawn from any box, do not credit that line
a ii *BS/2a*	2	* time → days; temperature → °C; length → cm; mass → grams		if **all four** lines are correct, award two marks if **two or three** lines are correct, award one mark if more than one line is drawn from any box, do not credit that line

Tier 3–6	Q No 1			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
b *1/2g*	1 1	* C any **one** from: * A and D start at 25 and B does not have a mark at 15 * there are not enough marks on A, B or D **or** the others * precise * C has the finest **or** most accurate scale * it is accurate at 15 cm^3	accept 'it has a mark for 15' accept 'you don't have to estimate the measurement' accept 'the measurement is reliable' accept 'it is accurate' accept 'it is the most exact' accept 'it goes up in ones' accept 'it has the smallest units in it' accept 'there are more lines on the scale'	*do **not** award* a mark if C has not been selected or identified in either part of item (b) 'it is easy to read' is insufficient 'more measurements on it' is insufficient 'it measures in cm^3' is insufficient
Total	**6**			

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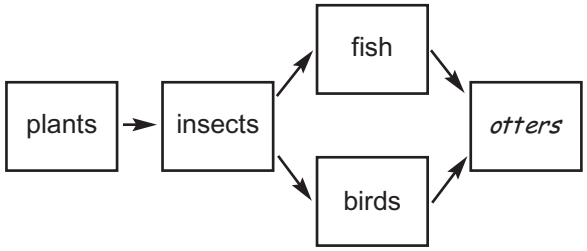
Tier 3–6	Q No 2

Part	Mark	Answer	Accept	Additional Guidance
a i *1/2j*	1	* 200 *g*		
a ii *1/2j*	1	* it decreased	accept 'it went down'	
a iii *1/2j*	1	any **one** from * the mass stayed the same **or** constant * it does not go down on day 7	 accept 'it is the same on day 7'	 'the graph **or** line is flat' is insufficient 'it stays the same' is insufficient
b *BS/2a*	1	any **one** from * it is flammable * it catches fire (easily)	 accept 'it is inflammable' accept 'it will burn' accept 'it is a fire hazard'	 'it explodes' is insufficient 'do not put it near the fire' is insufficient
c *3/2b*	1	* it dissolves ✔		if more than one box is ticked, award no mark
d *3/1b*	1	* it evaporated ✔		if more than one box is ticked, award no mark
Total	**6**			

Tier 3–6	Q No 3

Part	Mark	Answer	Accept	Additional Guidance
a *2/4b*	1	* fur **or** hair **or** whiskers	accept 'feed their young with milk' accept 'producing milk **or** has nipples' accept 'give birth to live young' accept 'external **or** visible ears'	'they are warm blooded' is insufficient 'feed their young' is insufficient 'they do not lay eggs' is insufficient 'ears' is insufficient
b *2/5c*	1	any **one** from * webbed **or** wide feet * streamlined	accept 'aerodynamic' accept 'smooth body' accept 'long and thin body' accept 'small ears' accept 'powerful **or** long tail' accept 'short fur'	'long body' **or** 'thin body' are insufficient 'tail' is insufficient 'they have fur' is insufficient
c i *2/5c*	1	* protection from predators **or** the weather **or** the cold	accept 'keeps them warm'	'it keeps them safe' is insufficient 'for protection' is insufficient
c ii *2/5c*	1	any **one** from * so otters can breathe * otherwise cubs would drown (if water entered the burrow) * so the water does not cause the burrow to cave in	accept 'otters breathe air' accept 'otherwise it could fill with water' accept 'cubs cannot swim' accept 'predators could be in the water' accept 'so the burrow does not collapse'	'otherwise water can get in' is insufficient 'so they do not get wet' is insufficient
d *2/5e*	1	* predator ✔		if more than one box is ticked, award no mark

Tier 3–6	Q No 3

Part	Mark	Answer	Accept	Additional Guidance
e *2/5e*	2	* 		if **all four** answers are correct, award two marks award one mark for either 'plants' **and** 'insects' in their correct places **or** for 'fish' **and** birds in their correct places 'fish' and 'birds' can be interchanged
f *2/5a*	1	any **one** from * so they reproduce * for breeding * so they mate	accept 'produce more otters' accept 'so they can have babies'	'to increase otter numbers' is insufficient 'so they protect each other' is insufficient
Total	**8**			

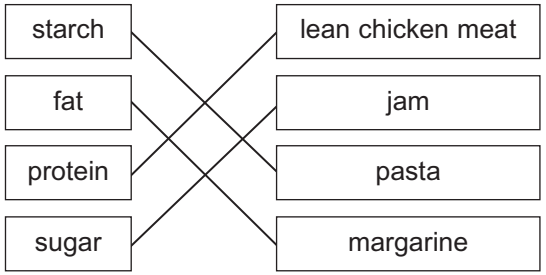
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Tier 3–6	Q No 4			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
a *1/2k*	1	* walls		
b i *4/5f*	1	* roof		
b ii *1/2k*	1	any **one** from * it now loses 700 (J) * the energy is less (than before) * the energy or heat is different * all the others do not change	accept 'it is only 700' accept 'it was 3 400 (J)' accept 'it has gone down' accept 'insulation reduces heat loss'	'it is 700' is insufficient 'insulation keeps heat in' is insufficient
c i *4/5a* *1/2j*	1	* coal		'solid' is insufficient '25 000 J' is insufficient
c ii *3/1b*	1	* it is a gas	accept 'physical state'	
c iii *1/2j*	1	* no sulphur dioxide (is given off)	accept 'it says no in the sulphur dioxide column' accept 'there is no sulphur in it'	*do **not** accept* 'it has no sulphur dioxide in it'
Total	**6**			

Tier 3–6	Q No 5

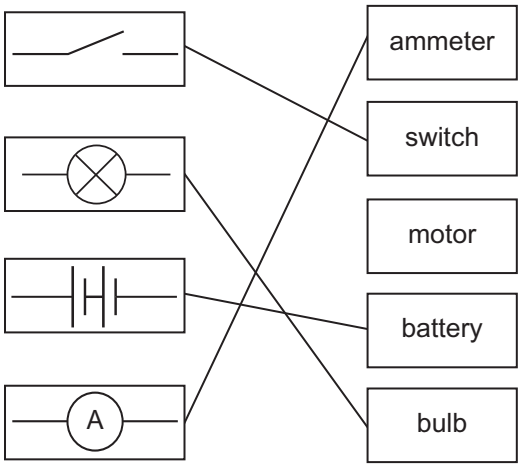
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<tr><th>Part</th><th>Mark</th><th>Answer</th><th>Accept</th><th>Additional Guidance</th></tr>
<tr><td>a
2/2a</td><td>1</td><td>* oranges ✔</td><td></td><td>if more than one box is ticked, award no mark</td></tr>
<tr><td>b
1/2j
3/2b</td><td>1</td><td>*<table><tr><td>amount of vitamin C</td><td>increases</td><td>decreases</td><td>stays the same</td></tr><tr><td>in the beans</td><td></td><td>✔</td><td></td></tr><tr><td>in the water</td><td>✔</td><td></td><td></td></tr></table></td><td></td><td>both ticks are required for the mark</td></tr>
<tr><td>c
2/2a</td><td>1</td><td>* for strong or hard teeth or bones</td><td>accept ‘to keep the skeleton strong’
accept ‘for (healthy) bones or teeth’</td><td>‘for toe or finger nails’ is insufficient</td></tr>
</table>

Tier 3-6	Q No 5

Part	Mark	Answer	Accept	Additional Guidance
d *2/2a*	2	* 		**all four** lines are required for two marks any **two or three** lines are required for one mark if more than one line is drawn from any nutrient, do not give credit for that nutrient
e i *2/2c*	1	* R		
e ii *2/2c*	1	* Q		
Total	**7**			

Tier 3–6	Q No 6			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
a i *4/2b*	1	any **one** from * weight * gravitational force	accept 'gravity'	
a ii *4/2c*	1	* the rope **or** elastic	accept 'bungee' accept 'upward force' accept 'tension'	*do **not** accept* 'air resistance' *do **not** accept* 'upthrust'
b *4/2b*	1	* less than		
c i *4/3i*	1	any **one** from * light travels faster than sound * sound travels slower than light	accept 'light travels faster' accept 'sound travels slower' accept 'light is faster than sound'	'light is fast' is insufficient 'sound is slow' is insufficient 'light travels before sound' is insufficient
c ii *4/3g*	1	* louder		
c iii *4/3g*	1	* eardrum	accept 'drum' accept 'hammer' **or** 'anvil' **or** 'stirrup' accept 'small bones' accept 'ossicles'	
Total	**6**			

Tier 3–6	Q No 7

Part	Mark	Answer	Accept	Additional Guidance
a *4/1a*	3	* 		**all four** lines are required for three marks any **three** lines are required for two marks any **two** lines are required for one mark if more than one line is drawn from a symbol, do **not** give credit for that symbol
b *4/1c*	1	* battery	accept 'cell' **or** 'cells' accept 'power supply' **or** 'power pack'	
c *4/1a*	1	*		**both** ticks are required for one mark if more than one box is ticked in any row, award no mark
d *3/1d*	1	* copper	accept 'aluminium' accept 'gold'	*do **not** accept* any other metal
Total	**6**			

	series	parallel
circuit 1	✔	
circuit 2		✔

Tier	Q No
3–6	8
5–7	1

Part	Mark	Answer	Accept	Additional Guidance
a *2/2e*	1	* As one muscle contracts, the other relaxes. ✔		if more than one box is ticked, award no mark
b *1/2j* *2/2i*	2	any **two** from * she gets more air **or** oxygen * it gets faster * it gets deeper	 accept ‘greater volume of air taken in **or** out’ accept ‘breathes out more carbon dioxide’ accept ‘speeds up’ **or** ‘she takes more breaths’ accept ‘she takes bigger breaths’ accept, for one mark, ‘she breathes more’ if not given with ‘it gets faster’ or ‘it gets deeper’	 ‘she needs more oxygen’ is insufficient ‘shorter **or** heavier **or** louder **or** harder breaths’ are insufficient ‘it increases’ is insufficient ‘the volume of air in her lungs increases’ is insufficient *do **not** accept* ‘the volume of her lungs increases’
c *2/2l*	1	* muscle cells → bloodstream → lungs → windpipe → nose ☐ ☐ ☑ ☐		if more than one box is ticked, award no mark
Total	**4**			

Tier	Q No
3–6	9
5–7	2

Part	Mark	Answer	Accept	Additional Guidance
a *3/3d*	1	* lemonade	accept '4.4'	
b i *3/3e* *1/2k*	1	any **one** from * it is less acidic	accept 'it is weaker' accept 'it decreases'	*do **not** accept* 'it has become more alkaline'
		* its pH has increased	accept 'it has gone from 1.0 to 2.5'	*do **not** accept* 'it increased' *do **not** accept* 'the acidity changed by pH 1.5'
b ii *3/3h* *1/2k*	1	any **one** from * ethanoic acid is less acidic than the hydrochloric acid * ethanoic acid has a higher pH * it has a pH of 3 compared with 1 * it is a weaker acid	accept the converse accept 'it is less acidic' accept 'partially neutralised'	'ethanoic acid is pH 3' is insufficient 'ethanoic acid is weak' is insufficient 'it is weaker' is insufficient
c i *3/1f*	1	* hydrogen		'H_2' **or** 'H' are insufficient
c ii *3/1f*	1 1	* sulphur * oxygen		answers can be in either order 'S' **or** 'O' **or** 'O_2' are insufficient
c iii *3/1e*	1	* 5		
Total	**7**			

Tier	Q No
3–6 5–7	10 3

Part	Mark	Answer	Accept	Additional Guidance
a *1/2m*	1	any **one** from * leaves **or** stems damaged by strong currents * roots could be pulled out	accept 'plants or seeds washed away' accept 'they cannot attach themselves to the water bed' accept 'leaves unable to float'	references to flowers are insufficient
b *2/5c*	1	any **one** from * there is insufficient light * the water is frozen * less **or** no photosynthesis occurs	accept 'too little sunshine' accept 'leaves may be damaged by frost **or** snow **or** ice' accept 'the plant freezes' accept 'not enough energy to produce leaves'	*do **not** accept* 'no light' 'too cold' is insufficient
c i *2/5c*	1	any **one** from * large leaves * flexible stems * waxy leaves * the leaves **or** flowers are able to float * air in the leaves or stems * roots that cover a wide area	accept 'flat leaves' accept 'thin **or** long stems' accept 'strong roots'	a mark may be awarded for part (ci) if the answer is given in part (cii) 'it **or** they can float' is insufficient
c ii *2/5c*	1	any **one** from * (large **or** floating leaves **or** thin **or** long stems) to collect sunlight * (large leaves **or** flexible stem **or** waxy leaves **or** air in the leaves) to make the leaves float * (thin **or** flexible stems) to allow the leaves to move * (floating flowers) for pollination * (roots that cover a wide area) to stop them being washed away	accept 'for photosynthesis' accept '(strong roots) to hold it firmly in the ground'	answers must give a function for the adaptation given in part (ci) a mark may be awarded for part (cii) if the answer is given in part (ci)

Tier	Q No
3–6	10
5–7	3

Part	Mark	Answer	Accept	Additional Guidance
d *2/5c*	1	any **one** from * (easily) seen by bees **or** insects * attract bees **or** insects * provide a landing platform for insects * they are more likely to be pollinated above water than underwater * they produce more seeds because they are more likely to be pollinated * animals are attracted to spread the seeds * they produce lots of pollen	accept 'bees **or** insects can get to them' accept 'flowers are above water where fish **or** water animals cannot eat them' accept 'they produce more seeds'	'they produce seeds' is insufficient
e *4/5f*	1	any **one** from * leaves absorb the heat **or** light * less heat **or** light reaches the pond	accept 'leaves block **or** reflect the sunlight **or** heat' accept 'leaves shade the pond'	'lilies take the heat' is insufficient references to the Sun are insufficient
Total	**6**			

Tier	Q No
3–6	11
5–7	4

Part	Mark	Answer	Accept	Additional Guidance
a *1/2a*	1	any **one** from * the effect of temperature on the amount dough expanded * the effect of temperature on volume	accept 'the best temperature for dough to rise' accept 'the best temperature at which the yeast works'	*do **not** accept* 'the effect of temperature on how quickly dough rises' 'does heat affect the volume of the dough' is insufficient
b i *1/2d*	1	any **one** from * left it for 30 minutes * used the same starting volume **or** mass of dough * used the same amount of water (in the water bath)	accept 'length of time' accept 'used same amount of dough' accept 'she did it at the same time' accept 'use the same size **or** type of measuring cylinder'	'same mixture' is insufficient 'use the same measuring cylinder' is insufficient
b ii *1/2d*	1	* the dough could contain a different amount of yeast **or** sugar **or** flour **or** water **or** ingredients	accept 'different doughs might rise differently' accept 'different doughs have different properties'	'it might have different ingredients' is insufficient

Tier	Q No
3–6	11
5–7	4

Part	Mark	Answer	Accept	Additional Guidance
c *1/2j*	1	* as the temperature increased, the volume of dough increased to 60°C	accept 'it increased up to a volume of 77 cm^3'	'it increased' is insufficient the unit of measurement is required for the mark
	1	* it does not rise as much (at temperatures higher than 60°C)	accept 'it decreases (after 60°C)' accept, for two marks, 'it has a maximum volume at 60°C' accept, for two marks, 'it increased to 60°C, then decreased' accept, for one mark, 'it increased then decreased'	
d *1/2l* *1/2m*	1	any **one** from * repeat the experiment without yeast in the mixture * change the amount of yeast	accept 'do it without yeast' accept 'increase the amount of yeast'	*do **not** accept* 'use just yeast'
Total	**6**			

Tier 3–6 5–7	Q No 12 5

Part	Mark	Answer	Accept	Additional Guidance
a *4/1d* *3/1d*	1	* iron		
	1	* nothing happens copper	accept 'nothing' **or** 'no force' **or** 'it does not attract or repel'	**both** answers are required for the mark
	1	* repel a magnet	accept 'move apart'	**both** answers are required for the mark *do **not** accept* 'magnetic'
b *4/1f*	2	any **two** from * more turns in the coil * increase the current **or** voltage * coils closer together	 accept 'more coils' accept 'increase power' accept 'add more cells **or** batteries' accept 'use thicker wire' accept 'make the coils tighter'	 'use another battery' is insufficient 'use more wire' is insufficient 'use less wire' is insufficient 'make the wire tighter' is insufficient references to the iron rod are insufficient
Total	**5**			

Tier	Q No
3–6	13
5–7	6

Part	Mark	Answer	Accept	Additional Guidance
a *1/1b*	1	any **one** from * there is a colour change * a new metal is formed	accept 'it goes green **or** orange' accept 'the iron filings change colour'	'the colour' is insufficient
b i *3/3b*	1	* copper	accept 'Cu'	
b ii *3/3b*	1	* iron sulphate	accept '$FeSO_4$'	
b iii *3/3b*	1	* no ✔ any **one** from * iron is more reactive than copper * copper is less reactive than iron	accept 'iron is higher on the reactivity series' accept 'copper does not displace iron'	**both** an indication that the reaction does not happen and the explanation are required for the mark
c *3/3c* *1/2c*	1	* calcium ✔ potassium ✔		if more than two boxes are ticked, award no mark **both** answers are required for the mark
Total	**5**			

Tier	Q No
3–6	14
5–7	7

Part	Mark	Answer	Accept	Additional Guidance
a i *4/4b* *1/2j*	1	* it orbits the Sun	accept 'it goes round the Sun'	'it has an orbit' is insufficient
a ii *4/4b* *1/2j*	1	any **one** from * it is not in the same plane as the other planets * the orbit is out of line **or** at a different angle	accept 'it is not in line with the others' accept 'the orbit **or** it is tilted'	'it has a different orbit' is insufficient *do **not** accept* 'it is too small' as this is not shown in the diagram
b *1/1a* *1/2j*	1	any **one** from * it has the smallest diameter * all the other planets are bigger	accept 'it is too small'	'it is very small' is insufficient
c *4/4b*	1	any **one** from * Charon is a moon **or** satellite * other planets have moons	accept 'it is a moon' accept 'the Earth **or** Saturn has a moon' accept 'moons do not orbit other moons' accept 'other planets have objects orbiting them'	'Charon orbits Pluto' is insufficient
d *1/1a* *1/2l*	1	any **one** from * both planets and moons have atmospheres * whether or not it has an atmosphere does not make it a planet * there is no pattern in the atmospheres * some planets do not have atmospheres	accept 'Venus has an atmosphere and Mercury does not' accept 'Earth's moon does not have an atmosphere and Titan does' accept 'Titan has an atmosphere and so does Neptune'	

Tier 3–6 5–7	Q No 14 7

Part	Mark	Answer	Accept	Additional Guidance
e *1/1c* *1/2l*	1	any **one** from * scientists cannot decide on what a planet is * if Pluto is a planet there could be more planets orbiting our Sun **or** in our solar system * there is evidence for and against Pluto being a planet	accept specific arguments for and against e.g. 'it goes around the Sun but it is too small'	'there are reasons for and against' is insufficient 'it has an atmosphere like the Moon but orbits the Sun' is insufficient as atmosphere is not sufficient to classify moons or planets
Total	**6**			

Tier 3–6 5–7	Q No 15 8

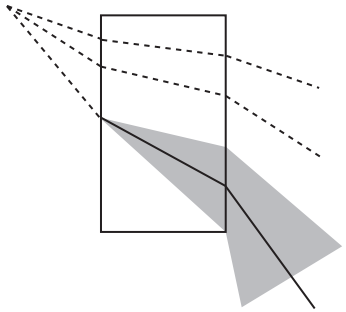
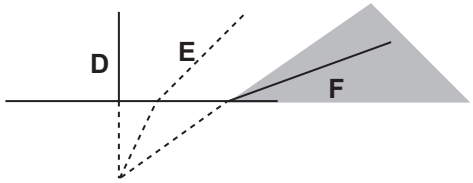
Part	Mark	Answer	Accept	Additional Guidance
a *1/2o* *1/2j*	2	*True* *False* *Cannot tell* * ☐ ☐ ☑ ☐ ☑ ☐ ☑ ☐ ☐ ☐ ☑ ☐		all **four** ticks are required for two marks any **two** or **three** correct ticks are required for one mark if more than one box is ticked in any row, do not give credit for that row
b i *1/2e*	1	any **one** from * there are a large number of observations * the observations are made over a wide area	accept 'lots of people made observations' accept 'people see them in a lot of different places' accept 'you do not have to pay them' accept 'it makes it more reliable' accept 'people knew where to look for conkers'	
b ii *1/2e*	1	any **one** from * they are not spread uniformly over the country * the data is not representative of the conker tree population * the people may not know what a (ripe) conker looks like **or** whether a conker is ripe * the results may not be very reliable	accept 'they could count the same conker twice' accept 'people can make it up' accept 'people may not respond'	if the response 'it makes it more reliable' is given in bi, do not credit 'it is less reliable' in bii unless they describe how it is more and less reliable
c *1/1a* *1/2p*	1	* they would need to collect data each year **or** for more than one year	accept 'repeat each year'	'repeat it' is insufficient

Tier	Q No
3–6	15
5–7	8

Part	Mark	Answer	Accept	Additional Guidance
d *1/2m*	1	any **one** from * it is warmer * there is more energy from the Sun	 accept 'it is cooler in the north' accept 'the Sun is brighter'	 'there is better weather in the south' is insufficient 'it is nearer the equator' is insufficient 'there is more sun' is insufficient as there are more hours of daylight in the north in summer
			accept 'they flower earlier'	'they ripen faster' is insufficient
Total	**6**			

Tier 5–7	Q No 9

Part	Mark	Answer	Accept	Additional Guidance
a i *1/2k*	1	* a number from 8.0 to 8.2 *s* (inclusive)		
a ii *1/2k*	1	* a number from 34 to 36 *m* (inclusive)		
a iii *1/2k*	1	* 4 *s*	accept response in the range 3.7–4.3	
b *1/2j*	1	* the slope or gradient is constant	accept 'it is a straight line' accept 'steady increase'	*do **not** accept* 'the line is flat'
c i *1/2i*	1	* points (0, 0) and (15, 30) joined by a straight line	accept points drawn to ± 1 mm	
c ii *1/2k* *4/2a*	1	* 50	accept '$\frac{100}{2}$'	
Total	**6**			

Tier 5–7	Q No 10			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
a *4/3d*	1	* refraction **or** refracting		
b *4/3d*	2	* a ray bending towards the normal at the first surface * an emerging ray bending away from the normal at the second surface 	accept a ray that is within the shaded area accept an emerging ray that is within the shaded area	**both** sections of the ray must be straight and continuous ignore any arrows the emergent ray does not have to be parallel to the incident ray
c *4/3d*	2	* a continuous straight line for ray D * a continuous ray F that bends away from the normal 	accept a ray drawn within the shaded area	ignore any arrows ignore any reflected rays *do **not** accept* an emergent ray that does not refract
Total	**5**			

Tier 5–7	Q No 11			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
a *2/2h*	1 1	any **one** from * the placenta provides **or** passes oxygen **or** food **or** gets rid of waste * the foetus needs oxygen **or** food **or** to remove waste * as the foetus develops it needs more (food **or** oxygen from the placenta)	 accept, for two marks, 'the placenta provides **more** oxygen **or** food **or** waste removal' accept, for two marks, 'the foetus needs **more** oxygen **or** food **or** waste removed as it grows'	 accept responses that refer to a baby rather than a foetus 'the foetus needs blood from the placenta' is insufficient 'it needs **or** provides more oxygen' is insufficient as the meaning in ambiguous a two mark answer must include one of the first two marking points and a reference to the foetus needing **more** food or oxygen from the placenta
b *2/2a*	1	any **one** from * the number **or** mass of red blood cells increases * iron is needed for the formation of red blood cells	accept 'they need (to make) more red blood cells' accept 'for haemoglobin'	'the mass of blood increases' is insufficient 'the number of blood cells increases' is insufficient 'for red blood cells' is insufficient
c *2/2h*	1	* placenta amniotic fluid		**both** answers are required for the mark 'umbilical cord' is insufficient answers may be in either order

Tier 5–7	Q No 11

Part	Mark	Answer	Accept	Additional Guidance
d i *2/2h* *2/2l*	2	* windpipe lungs *mother's red blood cells* * placenta umbilical cord blood of foetus	 accept 'umbilical' **or** 'cord' accept 'umbilical cord' and 'blood of foetus' in either order	all **five** answers are required for two marks award a mark for 'windpipe' and 'lungs' in the first places in the correct order award a mark for 'placenta', 'umbilical cord' and 'blood of foetus' in the last three places in an appropriate order
d ii *2/2h* *2/2j*	1	any **one** from * less oxygen passes through the placenta * less oxygen in the foetus' blood * smaller **or** brain damaged foetus * baby may be premature	 accept 'the foetus' heart beat rises' **or** 'the foetus' blood pressure goes up' accept 'less oxygen in the mother's blood' accept 'less oxygen for the foetus' accept 'the red blood cells of the foetus will contain carbon monoxide'	 accept responses that refer to a baby rather than a foetus *do **not** accept* 'no oxygen' *do **not** accept* 'only carbon monoxide passes through the placenta' 'it passes to the foetus' blood' is insufficient 'it poisons the foetus' is insufficient
Total	**7**			

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Tier 5–7	Q No 12

Part	Mark	Answer	Accept	Additional Guidance
a *3/3e* *3/1f*	1	* carbon dioxide	accept 'CO_2'	
b *1/2j*	1	* between 0 s *and* 30 s ✔		if more than one box is ticked, award no mark
c i *1/2j*	1	* any answer from 41 to 45		
c ii *3/2g*	1	* 33 *g*	accept '176 – 129 – 14' accept '176 – 143'	*do **not** accept* incorrect calculations, e.g. '176 – 129 – 14 = 34'
d *3/3e* *BS/1c*	1	* when the balls get wet the chemicals will react (and destroy the ball)	accept 'they are biodegradable' accept 'they will dissolve' accept 'the products are harmless'	accept converse answers regarding normal golf balls
e *3/1f*	1	* calcium citrate carbon dioxide	accept 'CO_2'	**both** answers are required for the mark answers can be in either order
Total	**6**			

Tier 5–7	Q No 13			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
a *4/5a* *4/5e*	1	* chemical	accept 'potential' accept 'kinetic **or** movement'	
b i *4/5g* *4/5e*	1	* 50 *J*		
b ii *4/2d* *4/5g*	1	any **one** from * energy is transferred as heat * energy is transferred as sound * friction **or** air resistance slows it down	accept 'some energy **or** heat **or** sound is wasted' accept 'as it is still falling, some is still gravitational'	'heat **or** sound **or** friction' are insufficient 'some of the energy is lost' is insufficient
c *4/2d* *4/5g*	2	any **two** from * lift it to a greater height * make the mass more streamlined **or** aerodynamic * push the mass down * put grease **or** oil on the rod (to decrease friction)	accept 'make the rod longer' accept 'push it' accept 'make the rod smoother' accept 'increase the mass'	'change the height **or** mass' is insufficient 'make the rod bigger' is insufficient 'drop it faster' is insufficient 'push the rod down' is insufficient 'use more force' is insufficient 'make the rod thinner' is insufficient

Tier 5–7	Q No 13			
Part	**Mark**	**Answer**	**Accept**	**Additional Guidance**
d *4/2g*	1	* A		**both** blade A, and the correct explanation are required for the mark
		if you divide the force by a smaller area, the pressure will be larger	accept 'it has a smaller area (at that point)' accept 'the force is more concentrated on a smaller area'	'it is more pointed' **or** 'is it sharper' are insufficient 'force is more concentrated' is insufficient *do **not** accept* 'there will be more force' *do **not** accept* responses that refer to 'concentrated pressure'
Total	**6**			



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