

Sc

Science tests

KEY STAGE

3

Mark scheme

for Papers 1 and 2

TIERS

3–7



2007

National curriculum assessments

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 12 and from tier 5–7 paper 1 question 4, illustrates this.

Tier	Q No			
3–6	12			
5–7	4			
Part	Mark	Answer	Accept	Additional guidance
a i 3/3a	1	* oxygen		answers may be in either order 'air' is insufficient 'moisture' or 'dampness' or 'wet' are insufficient
	1	* water		
a ii 3/3a	1	any one from * it prevents contact between the steel or the car and oxygen or water * it is waterproof or water runs off	accept 'it prevents air getting to the car' accept 'wax fills scratches or chips where paint is damaged'	'it forms a protective layer' is insufficient

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

In the following example from part **b** of tier 3–6 paper 1 question 15 and tier 5–7 paper 1 question 7, an answer giving ‘it has a longer orbit’ and ‘the Sun’s gravity is less’ will be awarded two marks. However, an answer which gives ‘it has a longer orbit’ and ‘it is further away’ will be given only one mark, as both points are correct answers for the same mark.

Part	Mark	Answer	Accept	Additional guidance
b 4/4c	2	any two from * it has a longer orbit * it is further from the Sun * the Sun’s gravity is less * it is slower	accept ‘it has a bigger orbit’ accept ‘it has a greater distance to cover’ accept ‘it is further out’ accept ‘Mars is closer to the Sun’ accept ‘there is a smaller gravitational pull on it’	‘it is further away’ or ‘it is further’ are insufficient

In the following example, from part **c** of tier 5–7 paper 1 question 9, 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
c 2/4a	1	any one from * eye colour is inherited or controlled by genes * eye colour is not affected by environmental factors		
	1	any one from * weight and skin colour are affected by environmental factors * weight is affected by diet or exercise and skin colour by the Sun	accept ‘weight and skin colour are not just controlled by genes’	answers must refer to both weight and skin colour ‘weight and skin colour are not controlled by genes’ is insufficient

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

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

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

- answers which are not acceptable

- a reminder, in questions involving calculations, that consequential marking may be used
- instructions on action in the event of consequential marking (see below)
- guidance to markers where pupils have not followed the instructions in 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 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 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 will not be awarded, irrespective of the order in which the answers are given. In some cases, a correct answer is given alongside other answers which, while correct, would be insufficient for the mark. In these cases, the mark will be given for the correct answer.

Marking questions containing calculations

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

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

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

Marking answers given in the wrong place

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

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

Awarding levels

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 Monday 25 June 2007. QCA will also send a copy to each school in July.

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.

Mark Allocation Grid: Tier 3–6

TIER 3–6 Paper 1

Q	Sc1	Sc2	Sc3	Sc4
1		6		
2	6			
3	1	4		
4			5	
5	6			
6			2	3
7				6
8				6
9		5		
10		5		
11	5			
12			7	
13	1		7	
14				4
15	1			5
16	2			3
Total	22	20	21	27

TIER 3–6 Paper 2

Q	Sc1	Sc2	Sc3	Sc4
1			3	2
2				6
3	5			
4				3
5			6	
6	1		5	
7		7		
8		7		
9				6
10				4
11	5			
12			5	
13	6			
14			6	
15	1	6		
16		6		
Total	18	26	25	21

Total P1 + 2	40	46	46	48
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Overall

180

Mark Allocation Grid: Tier 5–7

TIER 5–7 Paper 1

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

TIER 5–7 Paper 2

Q	Sc1	Sc2	Sc3	Sc4
1				6
2				4
3	5			
4			5	
5	6			
6			6	
7	1	6		
8		6		
9				5
10				5
11	4			
12	1		5	
13		5		
14	3	2		
Total	20	19	16	20

Total P1 + 2	36	39	37	38
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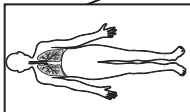
Overall

150

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

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

Tier 3–6	Q No 1			
Part	Mark	Answer	Accept	Additional guidance
a 2/1a	2	any two from * heart * lungs * windpipe or trachea * oesophagus or gullet	accept 'blood vessels' or 'arteries' or 'veins'	do not accept 'bronchiole'
b 2/2i	1	any one from * so the lungs can expand or get bigger * so we can breathe * so we can take in air or oxygen	accept 'so the pressure drops'	references to growth are insufficient

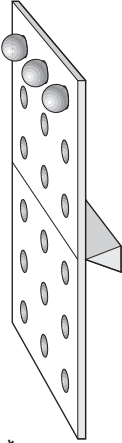
Tier 3–6	Q No 1	Part	Mark	Answer	Accept	Additional guidance
c	2/2b 2/2g 2/2i	1	1	 <p>*</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;">digestion of food</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">reproduction</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">control of the body</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">taking in oxygen from the air</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">movement of the body</div>	<p>if more than one line is drawn from any organ system, award no credit for that organ system</p>
Total			6			

Tier 3–6	Q No 2	Mark	Answer	Accept	Additional guidance												
a 1/2g	1	* 25		accept '2.5 cm'													
b 1/2k	1	* 21–25		accept 2.1 cm–2.5 cm													
c i 1/2i	1	* numbers from 1 to 5 written on the y-axis		accept numbers from 1 to 4 written on the y-axis	give credit for a correctly drawn bar to 3 squares when the axis is not labelled or is labelled incorrectly give credit for a bar drawn consistent with the labelling on the axis												
c ii 1/2i	1	* bar drawn in the chart to 3															
d 1/2o	2	* <table border="1"> <tr> <td>true</td> <td>false</td> <td>cannot tell</td> </tr> <tr> <td>✓</td> <td></td> <td>✓</td> </tr> <tr> <td></td> <td>✓</td> <td></td> </tr> <tr> <td></td> <td></td> <td>✓</td> </tr> </table>	true	false	cannot tell	✓		✓		✓				✓			if all four rows are correct, award two marks if three rows are correct, award one mark if more than one box is ticked in any row, award no credit for that row
true	false	cannot tell															
✓		✓															
	✓																
		✓															
Total	6																

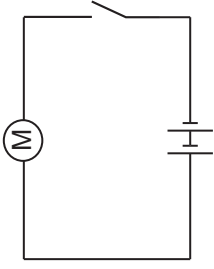






Tier 3–6	Q No 3	Part	Mark	Answer	Accept	Additional guidance
a	1/2k	1	1	* fat	accept 'cream'	
b i	2/2d	1	1	* calcium	accept 'plasma'	
b ii	2/2c	1	1	any one from * in the blood * in blood vessels	accept a named blood vessel accept 'arteries' or 'veins' or 'capillaries' or 'circulatory system' accept 'blood cells' or 'red cells' accept 'the heart pumps blood'	'pumped by the heart' is insufficient
c i	2/4b	1	1	* mammals ✓		if more than one box is ticked, award no mark
c ii	2/2n	1	1	* The milk contains antibodies. ✓		if more than one box is ticked, award no mark
Total			5			

Tier 3–6	Q No 4	Part	Mark	Answer	Accept	Additional guidance
	1	a 3/1h	1	any one from * ink dissolves in water * ink would smudge or run or move up the filter paper * pencil does not dissolve in water	accept 'ink dissolves' accept 'ink expands' accept 'pencil does not smudge'	
	1	b i 3/1h	1	* yellow		
	1	b ii 3/1h	1	* brown		
	1	c 3/1h	1	* red		
	1	d 3/1h	1	* chromatography ✓		if more than one box is ticked, award no mark
Total	5					

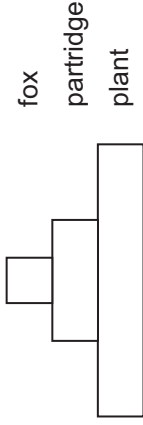
Tier 3–6	Q No 5	Mark	Answer	Accept	Additional guidance
a 1/2a	1 1		* Zoe ✓ any one from * <i>best</i> needs to be defined * <i>best</i> is not observable or measurable * <i>best</i> is subjective	accept ' <i>best</i> needs to be described' accept 'you do not know what <i>best</i> means' accept 'it is not doable' accept ' <i>best</i> is an opinion or judgement' accept ' <i>best</i> is not clear'	if more than one box is ticked, award no mark
b i 1/2d	1		any one from * use the same area of material each time * use the same volume of water	accept 'same amount of material' accept 'same size of rucksack' accept 'same amount of water' accept 'same liquid' accept 'same timing' accept 'allow the water to drip through the material for the same length of time' accept 'keep the temperature the same'	do not accept 'do it more than once'
b ii 1/2e	1		any one from * measuring cylinder * stopclock or stopwatch	accept 'measuring beaker' accept 'clock' or 'timer' or 'watch'	do not accept 'cylinder' or 'measuring tube' or 'measuring jug'
c 1/2k	1 1		* B ✓ * the smallest volume of water passes through the material	accept 'only 5 cm ³ passed through' accept 'less water passed through' accept 'not as much water gets through'	if more than one box is ticked, award no mark answers must include or imply a comparison '5 cm ³ passed through' is insufficient 'not much water gets through' is insufficient
Total		6			

Tier 3–6	Q No 6	Mark	Answer	Accept	Additional guidance
a	4/2e	1	* it will go down	accept 'it will tip anticlockwise' accept 'it will tip towards A' accept 'end B will go up'	'tip' is insufficient
b	4/2f	1	* 		all three balls are required for the mark ignore any shading and size
c	4/2f	1	* 100		
d i	3/1d	1	* carbon ✓		if more than one box is ticked, award no mark
d ii	3/1d	1	any one from * steel contains iron * brass does not contain iron * iron is magnetic or sticks to a magnet * copper and zinc are not magnetic or will not stick to a magnet	accept 'steel contains iron and carbon'	the answer must relate to the elements 'steel is magnetic' is insufficient 'copper is not magnetic' is insufficient 'zinc is not magnetic' is insufficient 'brass is not magnetic' is insufficient 'copper and zinc are not magnets' is insufficient
Total		5			

Tier 3–6	Q No 7	Mark	Answer	Accept	Additional guidance
a 4/5a	1		* coal	accept 'coal fire' or 'A'	answers may be in either order 'fire' is insufficient 'boiler' is insufficient 'generator' is insufficient
	1		* gas	accept 'gas boiler' or 'D'	
b i 4/5a	1		* the Sun	accept 'solar energy' or 'solar'	references to heat are insufficient
	1		any one from * it is dark * no light * the Sun has set	accept 'light' or 'sunlight'	references to heat are insufficient
c 4/5a	1		* wind	accept 'moving air' or 'air'	
				accept 'air currents'	
d 4/5a	1		any one from * Sun or solar energy * waves * wind	accept 'solar panel' or 'E'	'water' is insufficient
				accept 'wave turbine' or 'F'	
Total		6			

Tier 3–6	Q No 8	Mark	Answer	Accept	Additional guidance
a	4/1a	1	<p>* </p>	<p>accept a battery drawn as  or </p> <p>or </p>	<p>all three symbols must be connected in series all three symbols must be drawn correctly</p> <p>do not accept a switch drawn as </p> <p>do not accept a battery drawn as </p> <p>do not accept a motor drawn as </p>
b i	4/1c	1	* the battery or cell(s)	accept 'batteries'	
b ii	4/5g	1	* heat	accept 'thermal'	answers may be in either order
		1	* sound		
c i	4/1b	1	* it turned more slowly	<p>accept 'not as much energy'</p> <p>accept 'it was less powerful'</p> <p>accept 'it does not work as well'</p> <p>accept 'it would stop' or 'it would not go round'</p>	'it heats up' is insufficient
c ii	4/1b	1	* it was brighter	<p>accept 'blew it' or 'it went out'</p> <p>accept 'it became hotter' or 'it heated up'</p>	
Total		6			

Tier 3–6 5–7	Q No 9 1	Part	Mark	Answer	Accept	Additional guidance
	1	a 2/2h	1	* 9		
	1	b i 2/2h	1	any one from * it protects the baby * it helps to maintain a constant temperature * it allows the baby to move	accept 'it keeps it safe' accept 'it keeps the baby warm' accept 'it absorbs shocks' accept 'it protects against infection or disease'	
	1	b ii 2/2h	1	* muscles contract	accept 'contractions'	'the uterus or it contracts' is insufficient
	1	c 2/2h	1	any one from * (through the) placenta * (through the) umbilical cord * (from the) mother's blood		ignore references to food 'through the blood' is insufficient 'it gets everything from the mother' is insufficient do not accept 'the mother breathes for the child'
	1	d 2/2i	1	* alveolus		'air sac' is insufficient
	Total		5			

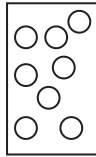

Tier 3–6 5–7	Q No 10 2	Mark	Answer	Accept	Additional guidance
a 2/5e	1	*	 <p>fox partridge plant</p>		answers must be in the correct order all three answers are required for the mark
b 2/5f	1		<p>* fewer foxes or they decrease</p> <p>any one from</p> <p>* fewer partridges (for foxes to eat)</p> <p>* the poison gets into the food chain</p> <p>* they move elsewhere to find food</p>	<p>accept 'there would be less'</p> <p>accept 'they would drop or go down'</p> <p>accept 'less food'</p> <p>accept 'partridges would be poisoned'</p> <p>accept 'some die of starvation'</p>	<p>both the answer and the correct explanation are required for the mark</p> <p>credit both correct answers written in the same space</p> <p>'foxes die' is insufficient</p> <p>do not accept 'the chemicals poison the foxes'</p> <p>do not accept 'they all die of starvation'</p> <p>do not accept 'they have nothing to eat'</p>
c 2/5d	1		<p>any one from</p> <p>* greater chance of survival</p> <p>* more would survive</p>	<p>accept 'the more eggs they lay the more partridges there will be'</p> <p>accept 'some eggs will be damaged or eaten'</p> <p>accept 'some eggs will not hatch'</p> <p>accept 'young partridges or chicks may be eaten or trampled on or die'</p> <p>accept 'so they will not become extinct or die out'</p>	'partridges will die' is insufficient

Tier 3–6 5–7	Q No 10 2	Mark	Answer	Accept	Additional guidance
d 2/5a	2		any two from * there would be a greater variety of plants * more plants or weeds * more insects * more nesting places * more cover * the partridges are not poisoned	accept 'there would be plants to eat' accept 'there would be insects to eat' accept 'protection from predators' accept 'more food' or 'they would have food' or 'partridges will come to feed' if none of the first three marking points are given	do not accept 'they had not been sprayed with chemicals'
Total	5				

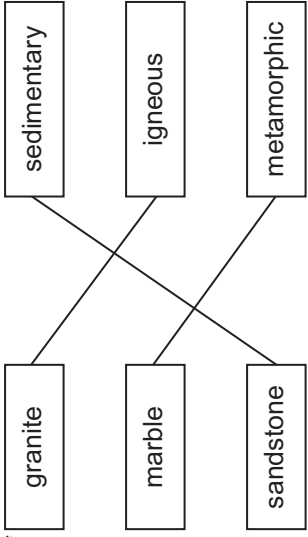
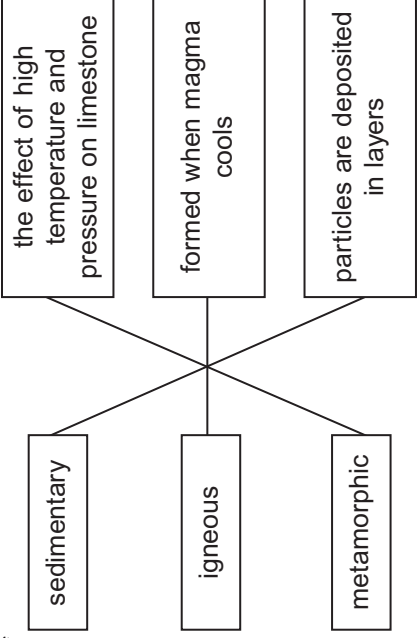
Tier 3–6 5–7	Q No 11 3	Mark	Answer	Accept	Additional guidance
a 1/2a	2	any two from * he used the same amount of pollen * he measured the concentration of the solutions or he used a range of strengths of solution * he observed the pollen grains after one hour * he worked out the percentage which germinated	accept 'he used the same number of pollen grains' or 'he controlled the number of pollen grains' accept 'he has given percentages' accept 'he used a range of sugar solutions' accept 'he used exact amounts' accept 'he looked at them after one hour' or 'he kept the time the same'	accept 'more detail' or 'more precise'	'more accurate' is insufficient 'it is a fair test' is insufficient accept answers formulated in terms of what Amy's plan does not do
b 1/2d	1	* the concentration of sugar solution	accept 'strength of solution' accept 'different sugar solutions' accept 'the sugar solution' accept 'the amount or percentage of sugar'		<i>do not accept</i> 'the amount of sugar solution'
c 1/2i	1	* a point at (20,10) plotted to \pm half a small square			

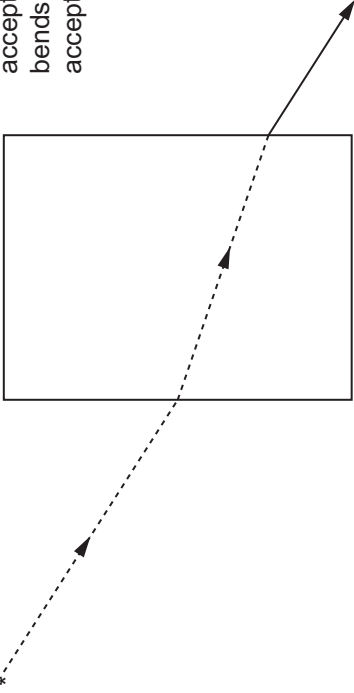
Tier 3–6 5–7	Q No 11 3	Mark	Answer	Accept	Additional guidance
d 1/20	1		<p>* no ✓ because the germination rate decreases after the concentration is 10%</p> <p>or * yes ✓ because the germination rate increases up to 10% sugar solution (but then starts to fall)</p>	<p>accept 'because the results go down' accept 'because the graph shows a peak or does not continue to rise' accept 'it only rises up to 10% or at first'</p>	<p>do not accept for either 'yes' or 'no' reading off one point in the chart if both boxes are ticked, award no mark</p> <p>if both boxes are ticked, award no mark do not accept 'the greater the concentration the fewer grains germinated' (if both boxes are ticked and the reason given explains why both could be correct, a mark may be awarded)</p>
Total	5				

Tier 3–6 5–7	Q No 12 4	Mark	Answer	Accept	Additional guidance
a i 3/3a	1	1	* oxygen * water		answers may be in either order 'air' is insufficient 'moisture' or 'dampness' or 'wet' are insufficient
		1	any one from * it prevents contact between the steel or the car and oxygen or water * it is waterproof or water runs off	accept 'it prevents air getting to the car' accept 'wax fills scratches or chips where paint is damaged'	
	1	any one from * paint * chrome	accept 'they are coated in zinc' or 'they are galvanised' accept 'polish'	'rust treatment' is insufficient 'cover it' is insufficient	
b 3/3g	1	* acid rain	accept 'sulphur dioxide' accept 'oxides of nitrogen' accept 'car exhaust fumes' accept 'burning fossil fuels' accept 'sea air' or 'salty air' or 'salt'	'carbon dioxide' is insufficient	

Tier 3–6 5–7	Q No 12 4	Mark	Answer	Accept	Additional guidance
c i 3/1b	1		<p>* <i>gas</i>: particles randomly arranged and most not touching</p> 	<p>accept black shaded circles if drawn correctly accept fewer or more than 8 circles if the arrangement is clear</p>	<p>ignore arrows attached to circles</p>
c ii 3/1b	1		<p>* <i>solid</i>: particles regularly arranged and all touching</p> 	<p>accept white circles if drawn correctly accept 2 rows of particles with at least 2 particles in the second row accept fewer or more than 8 circles if a regular arrangement is clear</p>	<p>ignore location of circles in box <i>do not accept</i> a single row of circles</p>
Total	7				

Tier 3–6 5–7	Q No 13 5	Mark	Answer	Accept	Additional guidance
a 1/2m 3/2e	1		any one from * it absorbed water * its mass or weight increased	accept 'it soaks up water' accept 'the mass or weight of the granite or marble did not increase or change'	'granite or marble did not change' is insufficient
b i 3/2d	1		any one from * it would crack * it would crumble or break up	accept 'the grains would move apart'	
b ii 3/2d	1		* weathering	accept 'freeze-thaw' accept 'erosion'	
c 3/3g	1		any one from * granite would not react with acid rain * marble reacts with acid rain	accept 'granite or it is not affected by acid rain or acid' accept 'granite would not erode or crumble or corrode' accept 'marble is affected by acid rain or rain' accept 'marble would erode' accept 'rain or pollution might have acid in it'	'granite does not react with air pollution' is insufficient do not accept 'it would erode'

Tier 3–6 5–7	Q No 13 5	Part	Mark	Answer	Accept	Additional guidance
d i 3/2f	2			<p>* </p>		<p>if all three lines are correct, award two marks if one or two lines are correct, award one mark if more than one line is drawn from a name of a rock, do not credit that line</p>
d ii 3/2f	2			<p>* </p>		<p>if all three lines are correct, award two marks if one or two lines are correct, award one mark if more than one line is drawn from a group of rocks, do not credit that line</p>
Total	8					

Tier 3–6 5–7	Q No 14 6	Mark	Answer	Accept	Additional guidance
a 4/3c	1	1	* 65 it is different from the angle of incidence or all the others are the same	accept 'number 4' or 'the fourth' accept 'it is not 60°' or 'it should be 60°' accept 'the angle of reflection and the angle of incidence should be the same' accept 'it is 5° out' accept 'they are not the same'	both the answer and the correct explanation are required for the mark award a mark for '60' if the explanation is correct 'they go up in tens' is insufficient 'it does not fit the pattern' is insufficient
b i 4/3d b ii 4/3d	1 1	1 1	* a number from 30 to 32 * greater than	accept 'greater' or 'bigger'	
c 4/3d	1	1	* 	accept a continuous straight line that bends away from the normal accept a line without an arrow	the ray need not be parallel to the incident ray
Total		4			

Tier 3–6 5–7	Q No 15 7	Mark	Answer	Accept	Additional guidance
a 4/4b	1 1		* X: the Sun * Y: Mercury		
b 4/4c	2		any two from * it has a longer orbit * it is further from the Sun * the Sun's gravity is less * it is slower	accept 'it has a bigger orbit' accept 'it has a greater distance to cover' accept 'it is further out' accept 'Mars is closer to the Sun' accept 'there is a smaller gravitational pull on it'	'it is further away' or 'it is further' are insufficient
c i 4/4c	1		any one from * the orbit times were the same * it came at regular intervals * they saw it every 76 years		
c ii 1/2k 4/4c	1		* 2062	accept 'he took 1531 from 1607 and 1607 from 1683'	
Total	6				

Tier 3–6 5–7	Q No 16 8	Mark	Answer	Accept	Additional guidance
a 4/1f	1	1	* both picked up the same number of four paper-clips	accept 'they both picked up the same number' accept 'same amount of paper-clips' accept 'there were 5 out of 9 paper-clips left for both' accept 'the same mass of paper-clips'	'they hold the same clips' is insufficient
b 4/1f	1	1	any one from * it does not stay magnetised * it can be turned off * objects do not stay attracted to it * iron loses its magnetism * steel stays magnetised	accept 'you cannot turn steel off'	

Tier 3–6 5–7	Q No 16 8	Part	Mark	Answer	Accept	Additional guidance
	1	c i 1/2j 4/1f	1	any one from * the greater the distance the lower the reading * the further away the smaller the reading	accept the converse accept 'at big distances the field is weaker' or the converse accept 'at 50 mm the reading is lower' accept the converse	do not accept 'the bigger the distance the smaller the amps or current'
	1	c ii 1/2j 4/1f	1	* the greater the current the stronger the electromagnet		
	1	c iii 4/1f	1	any one from * change the number of turns * change the thickness of the wire * change the diameter of the core	accept 'use more coils' accept 'use fewer or less coils' accept 'put the coils closer together' or the converse accept 'change the metal of the coils' accept 'use a different sized core' accept 'use nickel or cobalt core' accept 'use a different core'	'use bigger coils' is insufficient 'use more wire' is insufficient
	5	Total	5			do not accept 'add more batteries'

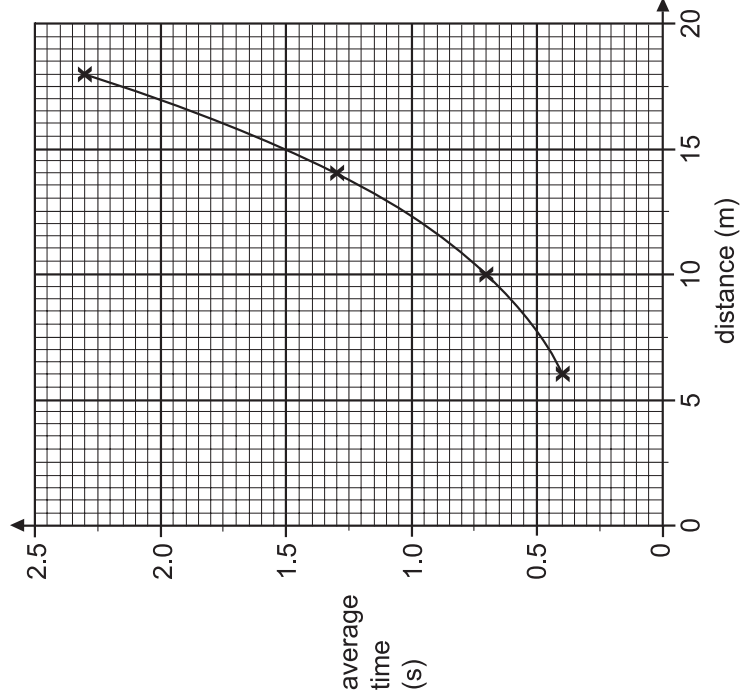
Tier 5–7	Q No 9	Mark	Answer	Accept	Additional guidance
a i 2/4a	1	1	* genes or DNA or chromosomes * in gametes or sex cells or eggs or sperm	accept 'at fertilisation'	'in the nucleus' is insufficient
	a ii 2/4a	1	* they have genes or DNA or chromosomes from both parents accept 'from eggs and sperm'	accept 'they have genetic information from both parents' accept 'from eggs and sperm'	
b 2/4a	1	* they have the same genetic information or genes or DNA or chromosomes	accept 'they are from the same egg and same sperm' accept 'the fertilised egg or zygote split in two' accept 'they are from the same fertilised egg'		'from the same egg' or 'from the same sperm' is insufficient accept references to the egg dividing if the answer makes clear that this is after fertilisation eg 'the egg divides after it has joined with a sperm' 'the egg divides in the uterus' is insufficient
c 2/4a	1	any one from * eye colour is inherited or controlled by genes * eye colour is not affected by environmental factors	any one from * weight and skin colour are affected by environmental factors * weight is affected by diet or exercise and skin colour by the Sun	accept 'weight and skin colour are not just controlled by genes'	answers must refer to both weight and skin colour 'weight and skin colour are not controlled by genes' is insufficient
Total		6			

Tier 5–7	Q No 10	Part	Mark	Answer	Accept	Additional guidance
a	2/1e 2/2i	2	any two from * mucus will build up * airways will be (partially) blocked * coughing * lungs can become infected or bacteria are not removed * particles or dust are not removed	accept 'cilia cannot move' accept 'narrower airways' or named part of the airway accept 'breathing will be more difficult'	'cilia do not work as well' is insufficient do not accept 'lungs will be blocked'	
b	2/2m	2	any two from * reduction in nicotine * she gets used to less nicotine * the patch or it provides her with nicotine so she does not need to smoke * it provides her with less nicotine than a cigarette	accept 'mass of nicotine goes down' accept 'it reduces the craving' or 'it reduces the amount she needs'		
c i	3/1e	1	* the elements are combined or joined or bonded	accept 'the atoms are joined' accept 'it has a definite composition'	'it has three elements' is insufficient as it is given in the question	
c ii	3/1e	2	any two from * carbon dioxide * water * carbon monoxide	accept 'CO ₂ ' accept 'hydrogen oxide' or 'steam' or 'H ₂ O' accept 'CO' accept 'carbon oxide' if neither 'carbon dioxide' nor 'carbon monoxide' is given		
Total		7				

Tier 5–7	Q No 11	Part	Mark	Answer	Accept	Additional guidance
a i	1/2/ 3/2b	2	<p>any two from</p> <ul style="list-style-type: none"> * (the solubility of) potassium chloride and sodium chloride increase * the difference is smaller at low temperatures or greater at higher temperatures * at lower temperatures potassium chloride is less soluble than sodium chloride or at high temperatures potassium chloride is more soluble than sodium chloride * sodium chloride changes less than potassium chloride <p>* at 25°C they are equally soluble</p>	<p>accept 'they both increase'</p> <p>accept the converse</p> <p>accept 'the line for potassium chloride is steeper' or 'the line for sodium chloride is flatter'</p> <p>accept 'sodium chloride is affected less' or 'potassium chloride is affected more'</p> <p>accept 'sodium chloride hardly changes but potassium chloride increases'</p> <p>accept 'between 23°C and 27°C they are the same'</p> <p>accept, for one mark, an answer stating the solubility of both salts at a given temperature other than 25°C</p> <p>accept for two marks 'the solubility of potassium chloride increases more than sodium chloride' or 'sodium chloride increases less than potassium chloride'</p>	<p>ignore references to calcium sulphate</p>	

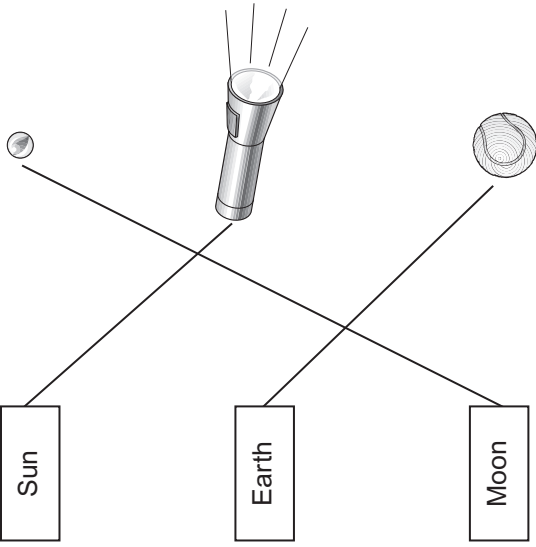
Tier 5–7	Q No 11	Mark	Answer	Accept	Additional guidance
a ii 3/2b	1		any one from * crystals or solid or particles would appear * potassium chloride (would be precipitated)	accept 'it goes cloudy or white'	
	1		any one from * cooler water cannot dissolve as much potassium chloride * solubility is less at a lower temperature * the solubility decreases	accept 'less dissolves' or 'at 90°C more dissolves'	
b i 3/2b	1		any one from * above 25°C sodium chloride is deposited before potassium chloride * below 25°C potassium chloride would be deposited before sodium chloride * below 25°C the order would be calcium sulphate, potassium chloride, sodium chloride * calcium sulphate is the least soluble followed by sodium chloride and then potassium chloride	accept 'below 25°C there would be a different order' accept 'because of the order in which they fell' accept 'below 25°C sodium chloride would be above potassium chloride' accept 'below 25°C sodium chloride would be at the top' accept 'the least soluble was deposited first'	
	1		* sodium chloride potassium chloride calcium sulphate	accept 'sodium' accept 'potassium' accept 'calcium'	answers must be in the correct order all three answers are required for the mark
Total	6				

Tier 5–7	Q No 12	Mark	Answer	Accept	Additional guidance
a 1/2n	1		any one from * variation in the way the person acts * variation in the way the toy works * variation in external conditions	accept 'he might not fire it so hard each time' accept 'human reaction time starting and stopping the stopwatch' accept 'less air in the toy' accept 'draught' accept 'the wind has affected it'	'the timer is not accurate' is insufficient
b 1/2i	1		any one from * time is the dependent variable * distance is the independent variable in this case	accept 'time is being tested' accept 'time is being measured' accept 'we chose the distance to use' accept 'we are changing the distance' accept 'we fixed or controlled the distance'	'time is the thing that changes' is insufficient 'because time is the axis that is changing' is insufficient

Tier 5-7	Q No 12	Part	Mark	Answer	Accept	Additional guidance
c i	1/2i		1	* all four points must be plotted to + or - one small square		
c ii	1/2j		1	* a smooth curve of best fit		the graph need not go through the origin
d	1/2k		1	* The pulse of air slows down as it travels. ✓		if more than one box is ticked, award no mark
Total			5			

Tier 5–7	Q No 13	Mark	Answer	Accept	Additional guidance
a 4/2a	1		* 960 000	accept ' $\frac{192\,000\,000}{200}$ '	
	1		* km/day or kilometres per day or km day ⁻¹	accept '40 000 km/hr' for two marks accept '11.1 km/s' for two marks accept '11 111 m/s' for two marks accept 'd' for 'day' and 'h' for 'hour'	do not accept 'km pday'
b 4/2b	1		* gravity on Mars is less	accept 'gravity is greater on Earth'	
c 4/4b	1		any one from * Mars is further from the Sun * less light reaches Mars	accept 'the Sun is closer to the Earth' accept 'the light rays have spread out more'	'Mars is further away' is insufficient do not accept 'less heat reaches Mars'
d 4/2g	1		* 1600	accept '40/0.025'	
	1		* N/m ² or Pa or Nm ⁻²	accept 'pascals'	do not accept lower case 'n'
Total	6				

Tier 3–6	Q No 1	Mark	Answer	Accept	Additional guidance		
a i 3/2g	1		* 52	accept '40 + 12'	both states are required for the mark		
	a ii 3/2a	1	* liquid <i>into a solid</i>				
b 3/1d	1		any one from * iron * steel	accept 'cobalt' or 'nickel'			
c i 4/1d	1		* <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>N</td><td>S</td></tr></table>	N	S		both poles are required for the mark
	N	S					
c ii 4/1d	1	* it would be repelled	accept 'pushed away' accept 'it would fall down or drop'	'they would not attract' is insufficient			
Total	5						

Tier 3–6	Q No 2	Part	Mark	Answer	Accept	Additional guidance									
a	4/4b 4/4d	2	*			<p>if all three lines are correct, award two marks if one or two lines are correct, award one mark if more than one line is drawn from any part of the solar system, award no credit for that part</p>									
b	4/4b	2	*	<table border="1"> <tr> <td>Sun</td> <td>Mercury</td> <td>Venus</td> <td>Earth</td> <td>Mars</td> <td>Jupiter</td> <td>Saturn</td> <td>Uranus</td> <td>Neptune</td> </tr> </table>	Sun	Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune		<p>award one mark for the Sun in the correct position award one mark for both Earth and Neptune in the correct positions</p>
Sun	Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune							

Tier 3–6	Q No 2	Part	Mark	Answer	Accept	Additional guidance
		c i 4/4e	1	any one from * weather forecasting * communications * telescopes * global positioning system * TV * spying * internet	accept 'weather' accept 'phone' or 'fax' accept 'GPS' accept 'taking photographs'	
		c ii 4/4c	1	* gravity ✓		if more than one box is ticked, award no mark
Total			6			

Tier 3–6	Q No 3	Mark	Answer	Accept	Additional guidance
a 1/2e	1	any one from * stopwatch * stopclock	accept 'timer'	'watch' is insufficient 'clock' is insufficient 'seconds' or 's' are insufficient	
b 1/2g BS/2a	1	* s ✓		if more than one box is ticked, award no mark	
c 1/2d	1	* the type of trainer ✓		if more than one box is ticked, award no mark	
d 1/2d	2	* the angle of the ramp ✓ * the length of the ramp ✓ * the surface of the ramp ✓		if all three answers are correct, award two marks if one or two answers are correct, award one mark if more than three boxes are ticked, deduct one mark for each incorrect tick minimum mark zero	
Total	5				

Tier 3–6	Q No 4	Mark	Answer	Accept	Additional guidance
a i 4/2c	1		* an arrow labelled R, to the right, drawn on the rope * an arrow labelled G, vertically downwards	accept a labelled arrow to the right, drawn parallel to the rope	
a ii 4/2b	1				
b 4/2d	1		any one from * snow is smoother * snow is more slippery	accept 'snow is slippery' accept 'concrete or the path is rough'	'snow is soft' or 'concrete is hard' are insufficient
Total	3				

Tier 3–6	Q No 5	Mark	Answer	Accept	Additional guidance
a 3/1d	1	*	base of a saucepan	It does not rust.	if more than one line is drawn from an object, award no mark for that object
	1	*	coin	It is a good conductor of electricity.	
	1	*	wires in a cable	It is a good conductor of heat.	
b 3/1d	1			It is not magnetic.	if more than two boxes are ticked, deduct one mark for each incorrect tick minimum mark zero
	1				
c 3/1a	1				if more than one box is ticked, award no mark
	Total	6			

Tier 3–6	Q No 6	Mark	Answer	Accept	Additional guidance
a i 3/1h	1		* filtration ✓		
a ii 3/1h	1		* A: sand	accept 'residue'	if more than one box is ticked, award no mark
a iii 3/1h	1		* B: filter paper	accept 'paper' or 'filter'	do not accept 'funnel' or 'filter funnel'
b i 1/2k	1		* 100		
b ii 3/2c	1		* it had evaporated	accept 'it went into the air'	do not accept 'it disappeared'
b iii 3/1h	1		* salt	accept 'sodium chloride' accept 'salts' or 'minerals' or 'crystals'	
Total	6				

Tier 3–6	Q No 7	Mark	Answer	Accept	Additional guidance
a i 2/5c	2		any two from * large or sharp claws or nails or talons * large or strong or sharp beak * large eyes or eyes that face forward * wings for hovering	accept 'curved beak' accept 'it can see in the dark' accept 'it can hover' accept 'it can fly silently'	'claws' or 'nails' or 'talons' are insufficient 'beak' is insufficient 'eyes' is insufficient 'it has wings' or 'it flies' are insufficient
		1	* <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">mouse</div> <div style="border: 1px solid black; padding: 2px 10px;">predator</div> </div>		if more than one line is drawn from an animal, award no mark for that animal
a ii 2/5e	1		* <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">barn owl</div> <div style="border: 1px solid black; padding: 2px 10px;">prey</div> </div>		
		1	* <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">producer</div> </div>		
b 2/5c	1		any one from * to keep warm * for insulation	accept 'protection from cold' accept 'for flight'	do not accept 'to keep the cold out'
c i 2/5d	1		any one from * fewer places to nest * fewer places to lay eggs * they lay fewer eggs * less food for owls * owls can be frightened by traffic or people * loss of habitat	accept 'nowhere to nest' or 'no home' accept 'nowhere to lay eggs' accept 'they cannot lay eggs' accept 'fewer mice' or 'no mice' or 'no food' accept 'it is too noisy'	
		1	* they catch or kill mice	accept 'to stop mice eating the crops' accept 'to keep mice away'	'to protect the crop or grain' is insufficient
Total		7			

Tier 3–6	Q No 8	Part	Mark	Answer	Accept	Additional guidance
a i	2/5a	BS/1a	1	any one from * it protects them from frost * the soil is kept moist * it protects them against birds or insects or animals	accept 'protects them from the cold or weather' accept 'it keeps them warm' accept 'it warms the soil' accept 'they do not dry out' accept 'it stops animals digging them up'	'protects them' is insufficient
a ii	2/3a		1 1 1	* light * air * water		answers may be in either order
b	2/5a		1	any one from * so (potato) plants can grow * it prevents pollution * it protects the environment * it will not get tangled with machinery or animals * it does not have to be picked up	accept 'more space to grow'	'more space' is insufficient
c i	2/5e		1	* ladybirds eat aphids	accept 'they eat them'	'they kill them' is insufficient
c ii	2/5a	2/5d	1	* insecticide ✓		if more than one box is ticked, award no mark
Total			7			

Tier 3–6 5–7	Q No 9 1	Part	Mark	Answer	Accept	Additional guidance
a	1	4/5e	1	any one from * she is not moving or falling * she is standing still	accept 'she has not dived or jumped' accept 'she is still'	award a mark for an answer which implies she is not moving
b i	1	4/5g	1	* 8		
b ii	1	4/5g	1	any one from * the total energy is the same * the gravitational potential and the kinetic energy add up to 8	accept 'they are the same' accept 'they all add up to 8'	
c i	1	4/2b	1	* gravity	accept 'gravitational' or 'gravitational pull' accept 'weight'	do not accept 'mass'
c ii	1	4/2a	1	any one from * the distance between stages or drawings increases * she falls further each time	accept 'they are further apart' accept 'the positions are further apart' accept 'the arrows get longer' accept 'her kinetic energy increases'	'by the position of her body' is insufficient
d	1	4/2d	1	any one from * friction * drag	accept 'water resistance' accept 'upthrust'	do not accept 'air resistance' 'resistance' is insufficient
Total	6					

Tier 3–6 5–7	Q No 10 2	Part	Mark	Answer	Accept	Additional guidance
		a 4/1a	1	* E		
		b 4/1a	1 1			award one mark for each correct row
		c 4/1b	1	* 0.8 0.8 ✓		if more than one box is ticked, award no mark
		Total	4			

P	Q	R
<i>off</i>	<i>off</i>	<i>off</i>
on	off	on
off	off	off

Tier 3–6 5–7	Q No 11 3	Part	Mark	Answer	Accept	Additional guidance
a	1/2k	1	any one from * the clock works * the time on the clock	accept 'when the light goes on' accept 'it shows 12.30'	'it is making electricity' is insufficient	
b	1/2e	1	* voltmeter		'multimeter' is insufficient	
c	1/2d	1	any one from * the fruit or lemon * condition of metal * temperature	accept 'the size or surface area of the metal' accept 'the distance between them' accept 'the amount of metal' accept 'how far they push them in'	do not accept 'the acid'	
d	1/2k	1	* copper <i>and</i> magnesium	accept 'most reactive with least reactive'	answers may be in either order both metals are required for the mark	
e	1/2k	1	any one from * no difference in reactivity * they produce zero voltage	accept 'there would be no reaction between them' accept 'it would not work' accept 'there would be no difference'		
Total		5				

Tier 3–6 5–7	Q No 12 4	Mark	Answer	Accept	Additional guidance
a i 3/3d	1		* a number less than 7		
	a ii 3/3e	1	* it would turn milky or cloudy	accept 'white or chalky'	
b 3/3h	1		* magnesium sulphate		
c i 3/3d	1		* a number less than 7		
	c ii 3/2f	1	* lava		do not accept 'magma'
Total	5				

Tier 3–6 5–7	Q No 13 5	Part	Mark	Answer	Accept	Additional guidance
a	1/2d	1	any one from * mass of salt (in the solution) * concentration	accept 'amount or weight of salt'	'salt' is insufficient	
b i	1/2n	1	* point at (10, 33) circled	accept 'she could have read the scale wrongly' accept 'she wrote the wrong result' accept 'she marked the wrong point on the graph' accept 'the wrong mass was added' accept 'not enough salt was added' accept 'too much water'	do not accept 'too much salt'	
c	1/2h	1	either * Abi need to check accuracy or correct an error or check an anomaly or * Robert you can predict the results from the pattern in the graph	accept 'to check whether it is right or wrong' accept 'she might have done it differently' accept 'it's a freak result' accept 'you can use the graph' accept 'you can ignore the point' accept 'there is enough evidence'	both the answer 'Abi' and the correct explanation are required for the mark 'it is a fair test' is insufficient or both the answer 'Robert' and the correct explanation are required for the mark award a mark if both Abi and Robert are ticked if the reason given explains why both could be correct	

Tier 3–6 5–7	Q No 13 5	Mark	Answer	Accept	Additional guidance															
d	1/2k	2	* <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>true</th> <th>false</th> <th>cannot tell</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> <td></td> </tr> </tbody> </table>	true	false	cannot tell	✓					✓	✓				✓			if all four rows are correct, award two marks if two or three rows are correct, award one mark if more than one box is ticked on any row, award no credit for that row
true	false	cannot tell																		
✓																				
		✓																		
✓																				
	✓																			
Total		6																		

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Tier 3–6 5–7	Q No 14 6	Part	Mark	Answer	Accept	Additional guidance
a	1	3/1e	1	any one from * the mixture glowed * there was a colour change * a black solid formed * a new substance has been formed	accept 'the temperature increased' accept 'a compound or iron sulphide was formed' accept 'there is no longer any sulphur or yellow or iron or grey'	
b	2	3/1d 3/1e	2	* <i>iron</i> : metallic element * <i>sulphur</i> : non-metallic element * <i>iron sulphide</i> : compound	accept 'metal' accept 'non-metal'	if all three answers are correct, award two marks if two answers are correct, award one mark
c	1	3/1d	1	* <i>sulphur</i> : no <i>iron</i> : yes		both answers are required for the mark
d i	1	3/3h	1	* zinc sulphide		<i>do not accept</i> 'zinc sulphate'
d ii	1	3/1e 3/2i	1	* sulphur dioxide	accept 'sulphur oxide' or 'sulphur trioxide'	
Total	6					

Tier 3–6 5–7	Q No 15 7	Part	Mark	Answer	Accept	Additional guidance
		a i 2/2a 2/2d	1	* fat		
		a ii 2/2a 2/2d	1	* carbohydrate		
		a iii 2/2a 2/2d	1	* protein		
		b 1/2k	1	* 200 g ✓		if more than one box is ticked, award no mark
		c 2/2a	1	any one from * vitamins * water * fibre	accept a named vitamin accept 'roughage' accept 'minerals' or a named mineral	<i>do not accept</i> 'calcium'

Tier 3–6 5–7	Q No 15 7	Part	Mark	Answer	Accept	Additional guidance
		d i 2/2d d ii 2/2d	1 1	* 1 100 any one from * to make milk * milk contains calcium * a breast-fed baby needs calcium for growth or for bones or teeth * she has to have enough calcium for herself and the baby	accept a number from 1000 to 1300 accept 'the baby needs calcium' accept 'to feed herself and the baby' accept 'the baby needs 600 and she needs 500' accept 'this is recommended for mother and baby'	'to feed the baby' is insufficient
Total			7			

Tier 3–6 5–7	Q No 16 8	Part	Mark	Answer	Accept	Additional guidance
		a 2/1b	1 1	* chloroplast any one from * photosynthesis * absorbs or traps light	accept 'chlorophyll' accept 'it produces food or glucose or sugar or carbohydrate'	'contains chlorophyll' is insufficient
		b 2/1b	1 1	* nucleus * it controls the cell	accept 'it tells the cell what to do' accept 'it transfers or contains genetic information or chromosomes'	'brain of the cell' is insufficient do not accept 'for reproduction' 'it controls substances entering or leaving the cell' is insufficient
		c 2/1b	1	any two from * A * B * D	accept 'chloroplast' or 'chlorophyll' accept 'vacuole' accept 'cell wall'	
		d 2/1b	1	* it has chloroplasts or chlorophyll	accept 'it is green'	'it is a different shape' is insufficient 'it does not have a hair' is insufficient
		Total	6			

Tier 5–7	Q No 9	Mark	Answer	Accept	Additional guidance
a i 4/3f	1		* only red light passes through the filter	accept 'the other colours are filtered out or absorbed'	'red light passes through' is insufficient a mark for this answer may be awarded in either a i or a ii provided there is no contradiction
	1		* the ball reflects red light	accept 'white objects reflect all colours'	
	1		* black	accept 'you cannot see it'	
	1		any one from * the green ball does not reflect red light or the light that passes through the filter * the ball absorbs red light	accept 'no green light reaches the ball'	
b 4/3f	1	* two red spots	accept 'red black red'	'two spots' is insufficient 'red spots' is insufficient <i>do not accept</i> 'only red light'	
Total	5				

Tier 5–7	Q No 10	Mark	Answer	Accept	Additional guidance
a i	1	* 100		accept '5 × 20'	do not accept lower case n
4/2f	1	* Ncm		accept 'cmN'	
				accept '1.0 Nm' for two marks	
a ii	1	* 100		accept 'the same'	the mark for the unit may be awarded in part a ii
4/2f				accept the numerical answer to part a i	if not given in part a i
					the unit is not required for the mark
a iii	1	* 10		accept the numerical answer to a ii ÷ 10	
4/2f					
b	1	* it decreased		accept 'it slowed down'	both the answer and the correct explanation are required for the mark
4/5e		any one from		accept 'less light to power plane'	do not accept 'it stopped'
		* less light energy changed to electrical energy		accept 'it received less energy'	'less light' is insufficient
		* the voltage produced by the solar cell was lower		accept 'less electrical or kinetic energy produced'	do not accept 'no light to provide energy'
Total	5				

Tier 5–7	Q No 11	Mark	Answer	Accept	Additional guidance
a 1/1a	1		* that water enters the cells in clusters of water molecules	accept 'that clusters of water molecules are too big to enter the cells' accept 'the size of the clusters matters' accept 'small clusters are more efficient' accept 'only their water would be absorbed by the cells'	do not accept 'tap water molecules are too large to be absorbed by the body' do not accept 'the size of the clusters does not matter'
b 1/2a	1		any one from * beauty cannot be measured * blood pressure can be measured	accept 'beauty is difficult to measure or judge or compare' accept 'feeling beautiful is subjective or an opinion'	
c 1/2d	1		any one from * so that judgement was not biased * to avoid influencing the outcome * to avoid influencing the researchers	accept 'so the company cannot rig the results' accept 'so you can trust it'	'bribing' is insufficient 'to make it fair' is insufficient
d 1/2d	1		any one from * if they believe there is a benefit they may report feeling better * so that they cannot prejudice the results * to get a more objective opinion * to prevent bias	accept 'so they cannot lie' accept 'so they do not just say what they believe about different types of water'	'to make it fair' is insufficient
Total	4				

Tier 5–7	Q No 12	Mark	Answer	Accept	Additional guidance										
a	3/3b	1	any one from * zinc displaces copper from the copper sulphate * zinc changes places with copper	accept 'copper is displaced by the zinc' accept 'the more reactive metal displaces or takes the place of the other one' accept 'zinc takes the sulphate'											
b	1/2e	1	* he only needed to find out the temperature rise or change												
c i	3/3c	1	any one from * magnesium is the most reactive metal used * the biggest difference in reactivity is between magnesium and copper	accept 'magnesium is above the others' accept 'magnesium is more reactive than iron and zinc'											
c ii	3/3c	1	any one from * the reactivity is nearly the same * they are next to each other in the reactivity series	accept 'zinc is slightly more reactive than iron'	'zinc is more reactive than iron' is insufficient										
c iii	3/3c	2	<table border="1"> <thead> <tr> <th><i>mixture</i></th> <th><i>Would there be a rise in temperature?</i></th> </tr> </thead> <tbody> <tr> <td><i>aluminium + sodium chloride</i></td> <td>no</td> </tr> <tr> <td><i>calcium + zinc sulphate</i></td> <td>yes</td> </tr> <tr> <td><i>lead + zinc chloride</i></td> <td>no</td> </tr> <tr> <td><i>magnesium + iron chloride</i></td> <td>yes</td> </tr> </tbody> </table>	<i>mixture</i>	<i>Would there be a rise in temperature?</i>	<i>aluminium + sodium chloride</i>	no	<i>calcium + zinc sulphate</i>	yes	<i>lead + zinc chloride</i>	no	<i>magnesium + iron chloride</i>	yes		award one mark for identifying the two reactions that take place award one mark for identifying the two mixtures of chemicals which do not react
<i>mixture</i>	<i>Would there be a rise in temperature?</i>														
<i>aluminium + sodium chloride</i>	no														
<i>calcium + zinc sulphate</i>	yes														
<i>lead + zinc chloride</i>	no														
<i>magnesium + iron chloride</i>	yes														
Total		6													

Tier 5–7	Q No 13	Mark	Answer	Accept	Additional guidance
a i	2/2g	1	any one from * menstruation * the lining of the uterus is shed	accept 'the period' accept 'the lining of the uterus breaks up' accept 'the wall of the uterus breaks down'	<i>do not accept</i> 'the uterus is shed' 'the wall of the uterus breaks' is insufficient
a ii	2/2g	1	* a day from day 14 to day 18 any one from * it is just after ovulation or day of ovulation * that is when an egg is likely to be in the oviduct or fallopian tube * that is just after an egg is released * an egg is released on day 14	accept 'in the middle' accept 'that is when an egg is released'	both the answer and the correct explanation are required for the mark <i>do not accept</i> 'around day 14' 'it is in the middle of the cycle' is insufficient
a iii	2/2g	1	any one from * so that a fertilised egg can be implanted * to receive an egg		
b i	2/2g	1	* a line which continues to rise or remains horizontal after day 28	accept a line rising or remaining horizontal after day 1	
b ii	2/2g	1	any one from * menstruation stops * so the ovum or embryo will implant	accept 'the embryo or foetus or baby needs a blood supply' accept 'the lining would become thicker or stay thick' accept 'the lining is not shed'	'provides support' is insufficient
Total		5			

Tier 5–7	Q No 14	Part	Mark	Answer	Accept	Additional guidance
a i	1/1c 1/2k	a i	1	<p>Award a mark for an answer that shows that maggots will only be found in meat that flies have had contact with, for example:</p> <p>any one from</p> <ul style="list-style-type: none"> * there were no maggots in container 2 * there were no maggots in container 3 * there were only maggots on the meat in container 1 or in the container that was open * the meat the flies could not reach had no maggots in it * there are maggots on the mesh but not on the meat 		<p>accept 'when the meat is sealed there are no maggots'</p> <p>'there are maggots on the mesh' is insufficient</p>
a ii	1/1c 1/2k	a ii	1	<p>Award a mark for an answer that shows that contact with air is not sufficient for maggots to develop, for example:</p> <p>any one from</p> <ul style="list-style-type: none"> * there were maggots in container 1 but no maggots in container 2 or 3 * air could get into container 3 * there is air in container 2 		<p>accept 'there were no maggots in container 2 or 3'</p> <p>accept 'there would have been maggots in all of them'</p>
b	1/2m	b	1	<p>any one from</p> <ul style="list-style-type: none"> * they had no food * they starved or died 		<p>accept 'maggots could not get to the food'</p> <p>accept 'maggots could not eat the meat'</p> <p>'maggots could not get to the meat' is insufficient</p>

Tier 5–7	Q No 14	Mark	Answer	Accept	Additional guidance
c 2/2n	2		any two from * flies or insects cannot reach the meat * too cold for bacteria or fungi to multiply or bacteria multiply more slowly * prevents meat rotting	accept 'microbes grow more slowly' accept 'keeps the meat or food fresh' or 'so it does not go off' or 'too cold for enzymes to work' accept 'eggs or maggots grow more slowly'	do not accept 'it kills bacteria' or 'stops the growth of bacteria' do not accept 'it is too cold or too cool' without qualification do not accept 'maggots are killed by the cold'
Total		5			



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