

Sc

KEY STAGE

2

LEVELS

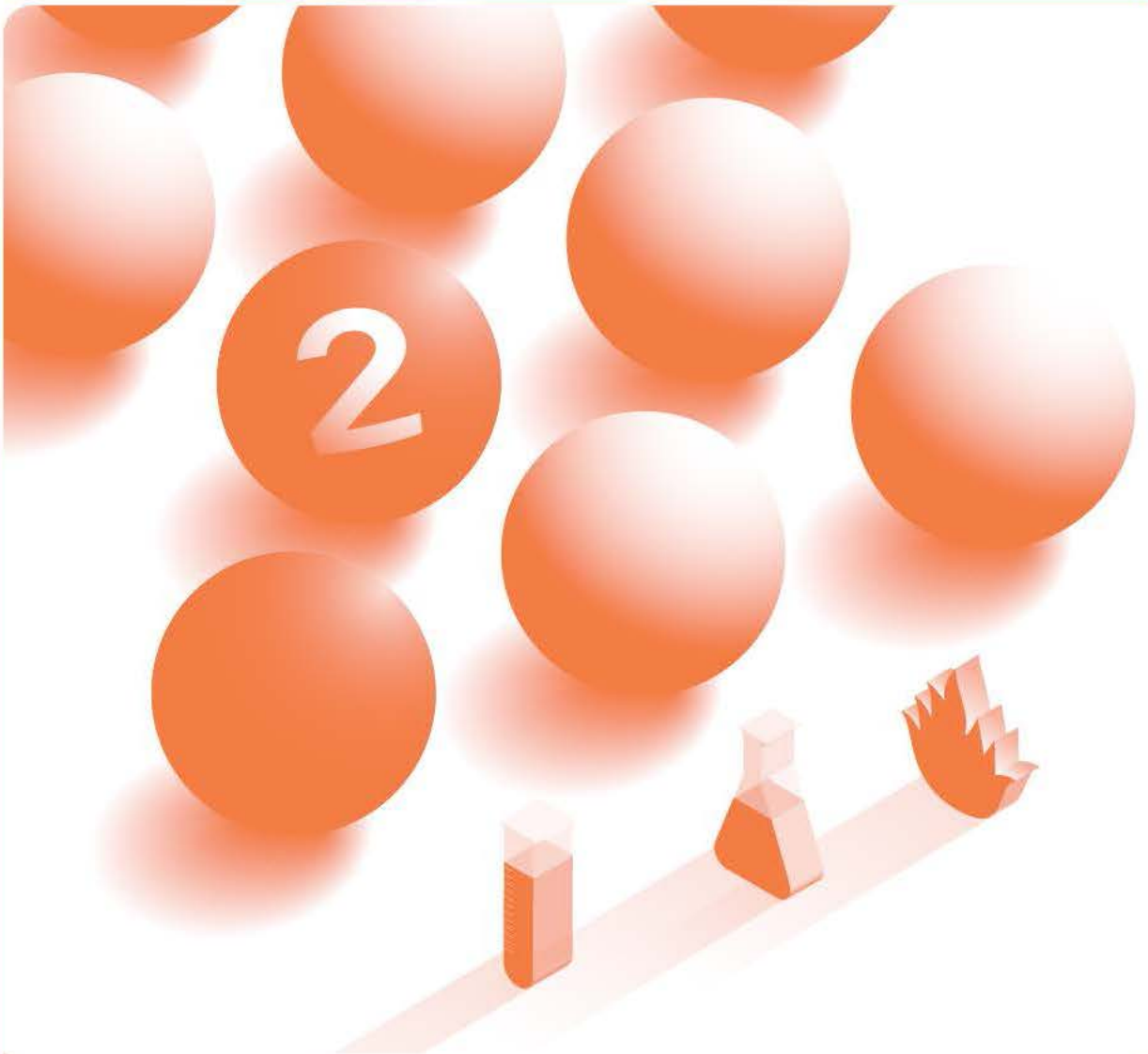
3–5

Science tests

Mark schemes

Tests A and B, levels 3–5

2009



National curriculum assessments

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Marking the science tests

As in 2008, external markers, employed by the external marking agencies under contract to QCA, will mark the test papers. The markers will follow the mark schemes in this booklet, which is supplied to teachers for information.

This booklet contains the mark schemes for the levels 3–5 tests A and B. Level threshold tables will be posted on the NAA website (www.naa.org.uk/tests) on 22 June 2009.

General guidance

The structure of the mark schemes

The marking information for each question is set out in the form of tables. The ‘**question**’ column on the left-hand side of each table provides a quick reference to the question number and question part. The ‘**mark**’ column gives the number of marks available for each question part.

The ‘**requirements**’ column may include three types of information:

- a general statement describing what is required for the award of the mark
- examples of specific creditworthy responses showing correct science
- examples of creditworthy responses beyond the key stage 2 programme of study.

The ‘**allowable answers**’ column gives examples of allowable creditworthy responses, showing correct science which may not be as clearly expressed.

The ‘**additional guidance**’ column may include different types of information:

- specific responses which are not creditworthy either because information from the question has been rephrased, or because the responses imply incorrect scientific knowledge
- answers which are insufficient in themselves to gain credit, but are not incorrect science, and would therefore not lose credit if used with a correct response.

Where **two** marks are available for a question which requires the **relationship between two continuous variables** to be described, the following will apply:

- *two* marks will be awarded for a creditworthy general comparison of the variables in question, eg the *bigger* the grains, the *longer* the sugar takes to dissolve
- *one* mark will be awarded for a pair of creditworthy specific comparisons, eg big grains dissolve *slowly* and small grains dissolve *fast*
- *one* mark will be awarded for a single creditworthy comparison, eg the *biggest* grains dissolve *most slowly*.

Where **one** mark is available for a question which requires the **relationship between two continuous variables** to be described, the following will apply:

- *one* mark will be awarded for a creditworthy general comparison of the variables in question, eg the *bigger* the grains, the *longer* the sugar takes to dissolve
- *one* mark will be awarded for a pair of creditworthy specific comparisons, eg big grains dissolve *slowly* and small grains dissolve *fast*.

Applying the mark schemes

The mark schemes give scientifically correct answers to each question as well as providing guidance on, and examples of, other answers which are allowable. In cases of alternative wording or where an answer is drawn rather than written, external markers will exercise their professional judgement.

In order to ensure consistency of marking, the most frequent queries are listed below, with the action the marker will take.

What if...?	Marking procedure
The pupil gives two or more responses to a particular question part.	<p>a) If a pupil qualifies a scientifically correct answer with a scientifically incorrect statement, no mark will be awarded for that question part.</p> <p>b) If a pupil qualifies a scientifically correct answer with an incorrect statement which is not relevant to the context of the question, the latter response is regarded as 'neutral' and the mark will be awarded.</p>
The pupil has not used ticks to indicate the correct response in a multiple-choice question.	Any unambiguous positive indication of the correct answer will be accepted. Ticks take precedence over any other form of response. Therefore, when ticks and any other sort of response are given together, the boxes with ticks will be assumed to be the pupil's response. If the correct boxes are left blank, no marks will be awarded.
The pupil ticks more than the required number of boxes.	One mark will be deducted for each incorrect answer. Negative marks will not be awarded.
In a planning question, no answer is given in the expected place but the correct answer is given in the drafting box.	Where a pupil has shown understanding of the question, the mark(s) will be given.
The pupil misspells a word.	<p>a) 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.</p> <p>b) 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.</p> <p>c) If specific scientific vocabulary is required in the answer, a creditworthy misspelling must be a phonetic equivalent of the required word, with the major syllables of the correct word represented in the answer.</p>

Recording marks awarded

In the margin, alongside each question part, there is a mark box for each question part.

Depending on the type of response made to each part of each question by the pupil, the external marker will put one of the following into each box:

- '1' for an acceptable/allowable response
- '0' for an incorrect response
- '-' if no response is made.

The number of marks gained on each double page will be written in the box at the bottom of the right-hand page. The total number of marks gained on each paper will be recorded on the front of the test paper.

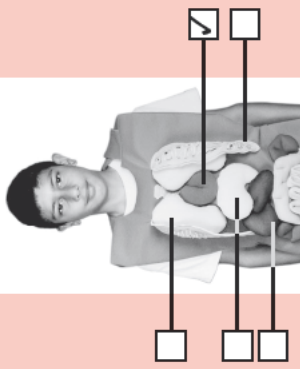
Each paper has the following number of marks available:

- Test A has 40
- Test B has 40.

The 2009 key stage 2 science tests and mark schemes were developed by the National Foundation for Educational Research (NFER) on behalf of QCA.

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Test A question 1: Human body

Question	Mark	Requirements	Allowable answers	Additional guidance
1a i 2/2c	1m	<p>Award ONE mark for:</p>  <p>■</p>		
1a ii 2/2c	1m	<p>Award ONE mark for an indication that the function of the heart is to pump blood (around the body):</p> <ul style="list-style-type: none"> ■ the heart/it pumps blood (around the body). <p>❖ Give credit for a correct response that goes beyond the key stage 2 programme of study, indicating other materials the heart pumps around the body:</p> <ul style="list-style-type: none"> ■ the heart pumps oxygen/carbon dioxide (around the body) ■ it pumps hormones ■ the heart pumps antibodies ■ it pumps sugar/nutrients. 	<p>ONE mark may be awarded for:</p> <ul style="list-style-type: none"> ■ it makes blood move ■ it pushes/sends/circulates blood. 	<p>Do not give credit for an insufficient response:</p> <ul style="list-style-type: none"> ■ pumps ■ it runs/takes blood around the body.
1b 2/2g	1m	<p>Award ONE mark for:</p> <ul style="list-style-type: none"> ■ <input type="checkbox"/> smoking cigarettes <input checked="" type="checkbox"/> ■ <input type="checkbox"/> <input type="checkbox"/> 		

Test A question 1: Human body (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
1c 2/2a	1m	Award ONE mark for an understanding that brushing removes plaque/food/bacteria/acid/sugar from teeth: <ul style="list-style-type: none"> it does not let sugar build up it helps get rid of micro-organisms/plaque/acid. 	ONE mark may be awarded for: <ul style="list-style-type: none"> it makes the teeth clean the fluoride in the toothpaste prevents tooth decay. 	Do not give credit for a response that includes incorrect science: <ul style="list-style-type: none"> it brushes the decay off. Do not give credit for an insufficient response describing the cause of tooth decay: <ul style="list-style-type: none"> (if you do not brush) sugar will rot your teeth. Do not give credit for an insufficient response that does not show awareness of the cause of decay: <ul style="list-style-type: none"> it makes teeth whiter/brighter it makes teeth healthy it fights/stops bacteria use toothpaste.
1d i 2/2e	1m	Award ONE mark for: <ul style="list-style-type: none"> The skeleton is moved by the muscles when the body moves. 		
1d ii 3/1a	1m	Award ONE mark for: <ul style="list-style-type: none"> The bones in the skeleton are rigid so that they can support the body. 		

When applying this mark scheme, please also refer to the General guidance given on pages 1 and 2.

Test A question 2: Toy truck

Question	Mark	Requirements	Allowable answers	Additional guidance
2a 1/2d	1m	<p>Award ONE mark for both correct boxes ticked:</p> <ul style="list-style-type: none"> toy truck <input checked="" type="checkbox"/> the surface the truck is on <input checked="" type="checkbox"/> 		
2b 1/2i,j	1m	<p>Award ONE mark for a general comparison describing the relationship between the number of turns of the key and the distance the truck travels:</p> <ul style="list-style-type: none"> the more the key is turned, the further the truck will travel the less the key is turned, the less distance the truck goes. 	<p>ONE mark may be awarded for two specific comparisons describing the relationship:</p> <ul style="list-style-type: none"> when the key is turned a lot of times the truck goes a long way, but if it is turned once it does not move at all when the key was turned three times the truck went 150 cm, but it did not move with one turn. <p>Award ONE mark for a general comparison or two specific comparisons using the term 'longer' to indicate the truck travels further:</p> <ul style="list-style-type: none"> the more turns, the longer it will go. 	<p>Do not give credit for an insufficient response giving a single comparison of the variables:</p> <ul style="list-style-type: none"> the truck travels a long way when the key is turned a lot the largest number of turns makes it go far. <p>Do not give credit for an insufficient response using the term 'longer' to describe the number of turns of the key:</p> <ul style="list-style-type: none"> the truck goes further when you wind the key up for longer. <p>Do not give credit for an insufficient response that changes a variable:</p> <ul style="list-style-type: none"> the truck travels for a longer amount of time the more the key is turned the more the key is turned, the faster the truck goes.

Test A question 2: Toy truck (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
2c 1/2k,j	1m	<p>Award ONE mark for:</p> <ul style="list-style-type: none"> ■ <input type="checkbox"/> no <input checked="" type="checkbox"/> <p>AND</p> <p>a response indicating that the toy travels further on the wooden floor than on the carpet (for the same number of turns of the key):</p> <ul style="list-style-type: none"> ■ with three turns the truck went 363 cm on wood but only 150 cm on carpet ■ (if the key is turned the same number of times) the truck travels further on the wood than the carpet ■ on one turn the truck went 110 cm but it did not move at all on carpet. 	<p>Award ONE mark for:</p> <ul style="list-style-type: none"> ■ <input type="checkbox"/> no <input checked="" type="checkbox"/> <p>AND</p> <p>a response which does not explicitly state that the truck travelled further on wood: (if the key is given two turns) the truck travels 66 cm on carpet and 242 cm on wood.</p> <p>ONE mark may be awarded if neither box is ticked, but the creditworthy explanation indicates unambiguously that the pupil believes the measurements do not support the prediction.</p>	<p>Do not give credit if the 'yes' box is ticked.</p> <p>Do not give credit for an insufficient response that explains why the truck travels further on wood than on carpet:</p> <ul style="list-style-type: none"> ■ wood is smooth so there is less friction.
2d 4/2c 1/2l	1m	<p>Award ONE mark for explaining that there is more friction with the carpet (because it is rougher) or that there is less friction with wood (because it is smoother):</p> <ul style="list-style-type: none"> ■ the wood is smoother than the carpet so there is less friction ■ the carpet is soft so there is more friction ■ there is less friction with/on the (smooth) wood ■ the friction is greater with/on the carpet. 	<p>ONE mark may be awarded for a response indicating the presence of greater friction:</p> <ul style="list-style-type: none"> ■ the carpet has more friction. <p>ONE mark may be awarded for:</p> <ul style="list-style-type: none"> ■ the friction on the carpet and wood is different. 	<p>Do not give credit for a response that includes incorrect science:</p> <ul style="list-style-type: none"> ■ there is more friction on the wood ■ the carpet is smoother than wood. <p>Do not give credit for an insufficient response that omits reference to the force or friction:</p> <ul style="list-style-type: none"> ■ the wood/carpet is smoother/rougher ■ the carpet is soft.

When applying this mark scheme, please also refer to the General guidance given on pages 1 and 2.

Test A question 3: In the garden

Question	Mark	Requirements	Allowable answers	Additional guidance
3a 2/4b	1m	Award ONE mark for: <input type="checkbox"/> <input type="checkbox"/> ■ <input type="checkbox"/> key. <input checked="" type="checkbox"/>		
3b 1/2h 2/4b	2m or (continued on following page)	Award TWO marks for a response which identifies a feature that could be used to sort the plants AND for sorting the plants consistently: ■ Plants with yellow flowers and four petals <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ■ Plants with yellow flowers and five petals <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ■ Plants with yellow flowers and heart-shaped/round petals <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ■ Plants with yellow flowers and sharp/pointy petals <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ■ Plants with yellow flowers and smooth/curved leaves <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ■ Plants with yellow flowers and jagged/spiky leaves <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	TWO marks may be awarded for a response where the description of one group is slightly ambiguous, but when taken in conjunction with a description of the other group, and the correct sorting, the meaning becomes apparent: ■ Plants with yellow flowers and fine leaves <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ■ Plants with yellow flowers and rough/prickly/pointy/sharp leaves <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ■ smooth leaves <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ■ ridged leaves <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Do not give credit for an insufficient response where the plants have been sorted into two groups (even if correct) but no appropriate classification rule has been given: ■ Plants with yellow flowers and..... <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ■ Plants with yellow flowers and..... <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Do not give credit for an insufficient response which groups the plants by a relative term, such as size: ■ big/little leaves ■ short/long stem ■ has long leaves. Do not give credit for an insufficient response using inappropriate vocabulary to describe the groups: ■ rigid ■ soft.

Test A question 3: In the garden (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
3b (cont.)	1m	<p>If you are unable to award two marks, award ONE mark for a response giving a correct classification rule for grouping the plants. The flowers may not have been grouped consistently to the rule given, or may not have been grouped at all:</p> <ul style="list-style-type: none"> Plants with yellow flowers and four petals B D Plants with yellow flowers and five petals C D <p>Award ONE mark for a response giving a correct classification rule for one group and sorting the two plants for this group appropriately. The classification rule and sorting of the other group may be inappropriate, inconsistent or not given:</p> <ul style="list-style-type: none"> Plants with yellow flowers and four petals A D Plants with yellow flowers and (no response)/jagged leaf C B 		
3c 2/4c	1m	<p>Award ONE mark for:</p> <ul style="list-style-type: none"> because there are many types of plant <input checked="" type="checkbox"/> 		


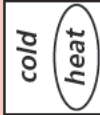
When applying this mark scheme, please also refer to the General guidance given on pages 1 and 2.

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Test A question 4: Ice melting

Draft box

Markers should read the answers to all parts before marking this question. The draft box can be consulted when marking parts 4b–4e for clarification of any ambiguity in the marked response, or when no answer is given. If an answer is correct, ignore contradictory statements written in the draft box. Parts 4b–4e must form a coherent investigation.

Question	Mark	Requirements	Allowable answers	Additional guidance
4a 3/1b 1/2c	1m	<p>Award ONE mark for both correct words circled:</p> <p>The best bag will  well.</p> <p>It will stop  passing from the air to the ice.</p>		
4b 1/2a,d	1m	<p>Award ONE mark for giving the type of bag as the independent variable (IV):</p> <ul style="list-style-type: none"> the type of) bag (the type of) material (the bag is made of). 	<p>ONE mark may be awarded for a response describing a property of a bag which may affect how it insulates:</p> <ul style="list-style-type: none"> the thickness/size of the material/bag. 	<p>Do not give credit for a response that includes incorrect science giving a dependent variable or a control variable.</p>
4c 1/2c,d	1m	<p>Award ONE mark for an acceptable dependent variable (DV) identified, which could be measured:</p> <p>Measuring cylinder</p> <ul style="list-style-type: none"> the volume of liquid (melted) the amount of melted ice how much the ice has melted. <p>Stopwatch</p> <ul style="list-style-type: none"> how long it takes for all the ice to melt. 	<p>ONE mark may be awarded for:</p> <ul style="list-style-type: none"> how much ice is left. 	<p>Do not give credit for an insufficient response which gives a DV that is observed, not measured:</p> <ul style="list-style-type: none"> has the ice melted? <p>Do not give credit for an insufficient response that does not specify which property of the melted ice will be measured:</p> <ul style="list-style-type: none"> ice melted the ice.

When applying this mark scheme, please also refer to the General guidance given on pages 1 and 2.

Test A question 4: Ice melting (continued)


Question	Mark	Requirements	Allowable answers	Additional guidance
4d 1/2d	2m or 1m	<p>Award TWO marks for two acceptable control variables (CV) that are not already used as an IV or DV in the investigation:</p> <ul style="list-style-type: none"> ■ the amount of ice at the start ■ the size of the bag ■ the same starting (room) temperature ■ (same) (size of) tub ■ the time [if time is not given as the DV]. <p>If you are unable to award two marks, award ONE mark for any one correct control variable.</p>	<p>ONE mark may be awarded for:</p> <ul style="list-style-type: none"> ■ temperature/heat. <p>ONE mark may be awarded for a response implying the outside temperature must be kept constant:</p> <ul style="list-style-type: none"> ■ (the same) place ■ do all the bags at the same time. 	<p>Do not give credit for a CV that is inconsistent with, or repeats, a creditworthy IV or DV offered in parts 4b or 4c respectively.</p> <p>If neither an IV or DV is offered, a CV may gain credit, provided it is consistent with the context of the investigation presented in the introduction and it is not a possible IV or DV.</p> <p>Appropriate CVs can gain credit where both the IV and DV are insufficient or incorrect.</p> <p>Do not give credit for an insufficient response identifying a CV which could also be an IV or DV and where there is no correct IV or DV for clarification.</p> <p>Do not give credit for an insufficient response indicating the amount of ice, without specifying at the start [the quantity of ice is the DV]:</p> <ul style="list-style-type: none"> ■ the (same) amount of ice (cubes) ■ the size of the ice cubes ■ (the same) ice. <p>Do not give credit for an insufficient response that is a repetition or restatement of the first:</p> <ul style="list-style-type: none"> ■ the same (outside) temperature ■ the place/time of day. <p>Do not give credit for an insufficient response naming specific measuring equipment on which the calibration varies very little:</p> <ul style="list-style-type: none"> ■ (measuring) cylinder ■ stopwatch.

When applying this mark scheme, please also refer to the General guidance given on pages 1 and 2.



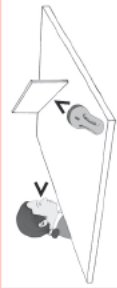


Test A question 4: Ice melting (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
<p>4e 1/2g</p>	<p>1m</p>	<p>Award ONE mark for a response indicating that repeating the test will allow the reliability to be improved:</p> <ul style="list-style-type: none"> ■ I can check my results ■ the results/test will be more reliable ■ to make sure of the results. 	<p>ONE mark may be awarded for a response indicating the measurements can be compared:</p> <ul style="list-style-type: none"> ■ to check/see if the results/answers are correct/right ■ to see if there is a difference in the results ■ to get more evidence ■ so you can compare results ■ it will improve the accuracy (of the results/test). <p>ONE mark may be awarded for a response indicating the calculation of an average:</p> <ul style="list-style-type: none"> ■ then I can find the average. <p>ONE mark may be awarded for a response indicating that there may have been an error in the results/method:</p> <ul style="list-style-type: none"> ■ the first time it might go wrong ■ to make sure there were no mistakes. 	<p>Do not give credit for an insufficient response implying there is a correct answer/result:</p> <ul style="list-style-type: none"> ■ to get the right answer ■ to make sure the result/answer is correct. <p>Do not give credit for an insufficient response:</p> <ul style="list-style-type: none"> ■ to make the test fair ■ to improve the accuracy of the measurements ■ to check it (again) [could refer to method]. <p>Do not give credit for an insufficient response that could imply that all the results need to be the same:</p> <ul style="list-style-type: none"> ■ you might get a different answer/result ■ the result might change each time. <p>Do not give credit for an indication that there may be a change in temperature:</p> <ul style="list-style-type: none"> ■ the temperature might change.

Test A question 5: Torch light

Question	Mark	Requirements	Allowable answers	Additional guidance
<p>5a 4/3c</p>	<p>2m or 1m</p>	<p>Award TWO marks for both correct boxes ticked:</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <input type="checkbox"/> <input checked="" type="checkbox"/> Metal spoon </div> <div style="text-align: center;"> <input type="checkbox"/> <input checked="" type="checkbox"/> Compact disc </div> </div> <p>If you are unable to award two marks, award ONE mark for any one correct box ticked.</p>		
<p>5b 4/3b</p>	<p>1m</p>	<p>Award ONE mark for:</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input type="checkbox"/> <input checked="" type="checkbox"/> glass jar </div> </div>		

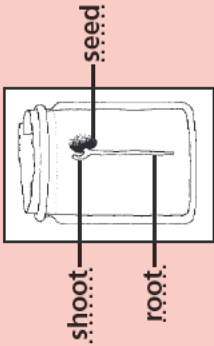
Test A question 5: Torch light (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance	
5c i 4/3d,c,a	1m	Award ONE mark for two lines (with or without the correct arrowheads) showing the correct path of light. The lines must go from the torch to the mirror and from the mirror to Sanna's eyes (between tip of nose and hairline on forehead): [1 mark]	 [1 mark]	 Do not give credit for an insufficient response where the direction of travel is shown only by one non-reflected arrow: ■	
5c ii 4/3c,d,a	1m	Award ONE mark for two arrowheads showing the direction of light travel from the torch to the mirror and from the mirror to Sanna's eyes (between tip of nose and hairline on forehead): [1 mark]	 [1 mark]	 [2 marks]	ONE mark may be awarded for one correct arrowhead together with ONE mark for a continuous line: ■
		 [2 marks]			

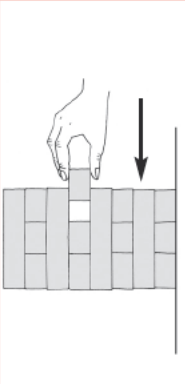
Test A question 6: Quiz board

Question	Mark	Requirements	Allowable answers	Additional guidance
6a 4/1a	1m	Award ONE mark for: <ul style="list-style-type: none"> ■ <input type="checkbox"/> ■ <input type="checkbox"/> ■ <input type="checkbox"/> ■ D <input checked="" type="checkbox"/> 		
6b 4/1b	1m	Award ONE mark for an indication that the bulb will shine less brightly: <ul style="list-style-type: none"> ■ the bulb will be (a bit) dimmer ■ it is not as bright. 	ONE mark may be awarded for: <ul style="list-style-type: none"> ■ it will dim/fade. 	Do not give credit for an insufficient response: <ul style="list-style-type: none"> ■ it will change the brightness [does not indicate whether the brightness increases or decreases] ■ the bulb/it is not so powerful ■ the bulb will not light [given that it is lit].
6c 3/1c	1m	Award ONE mark for an explanation that shows that sticky tape does not conduct electricity: <ul style="list-style-type: none"> ■ the electricity cannot pass through the sticky tape ■ it is an (electrical) insulator ■ the metal clips conduct electricity but sticky tape does not ■ the current cannot flow ■ the circuit is (now) incomplete/broken. 	ONE mark may be awarded for: <ul style="list-style-type: none"> ■ it blocks the electricity ■ it has stopped the electricity. 	Do not give credit for an insufficient response: <ul style="list-style-type: none"> ■ the sticky tape is not made of metal ■ it cannot pass through the tape ['it' is ambiguous] ■ the sticky tape covers the metal bits [does not indicate the effect on electricity].

Test A question 7: Growing beans

Question	Mark	Requirements	Allowable answers	Additional guidance
7a 1/2c 2/3a,d	1m	<p>Award ONE mark for:</p> <p><input type="checkbox"/> Length of root: 0 cm <input type="checkbox"/></p> <p>▪ Length of shoot: 0 cm <input checked="" type="checkbox"/></p>		
7b 2/3d	1m	<p>Award ONE mark for correctly labelling all three plant parts:</p> <p>▪</p> 	<p>ONE mark may be awarded for a response in which 'stem' or 'stalk' is used in place of 'shoot', and 'bean' is used in place of 'seed'.</p>	
7c 2/3a,d 1/2j	1m	<p>Award ONE mark for:</p> <p>▪ (day) 6.</p>		<p>Do not give credit for the insufficient response:</p> <p>▪ (day) 5.</p>
7d 1/2h	1m	<p>Award ONE mark for both parts of the key completed correctly:</p> <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p><input type="checkbox"/> (length of the) root</p> <p><input checked="" type="checkbox"/> (length of the) shoot</p> </div>	<p>ONE mark may be awarded for a response that uses the label 'stem' or 'stalk' in place of 'shoot'.</p>	
7e 2/3d	1m	<p>Award ONE mark for:</p> <p><input type="checkbox"/> <input type="checkbox"/></p> <p>▪ <input type="checkbox"/> pollination <input checked="" type="checkbox"/></p>		
<p>When applying this mark scheme, please also refer to the <i>General guidance</i> given on pages 1 and 2.</p>				

Test A question 8: Block tower game

Question	Mark	Requirements	Allowable answers	Additional guidance
8a 1/2c BoS 2a	1m	Award ONE mark for: <ul style="list-style-type: none"> ■ <input type="checkbox"/> an observation <input checked="" type="checkbox"/> ■ <input type="checkbox"/> 		
8b 4/2e	1m	Award ONE mark for an arrow pointing to the left anywhere on the diagram: <ul style="list-style-type: none"> ■  	ONE mark may be awarded for an arrow pointing to the left within 45° of the horizontal.	
8c 4/2e 1/2c	1m	Award ONE mark for: <ul style="list-style-type: none"> ■ force meter ■ newton meter. 	ONE mark may be awarded for: <ul style="list-style-type: none"> ■ spring balance. 	Do not give credit for an insufficient response: <ul style="list-style-type: none"> ■ force measurer ■ newton.
8d 4/2b	1m	Award ONE mark for: <ul style="list-style-type: none"> ■ gravitational attraction ■ weight. 	ONE mark may be awarded for: <ul style="list-style-type: none"> ■ the pull of the Earth ■ gravity. 	Do not give credit for an insufficient response which does not recognise the force is due to the Earth: <ul style="list-style-type: none"> ■ a pulling force toward the Earth ■ downwards pull.
8e 3/1e,a	1m	Award ONE mark for: <ul style="list-style-type: none"> ■ All solids keep their shape. <input checked="" type="checkbox"/> ■ <input type="checkbox"/> 		
When applying this mark scheme, please also refer to the General guidance given on pages 1 and 2.				

Test A question 9: Identifying rocks

Question	Mark	Requirements	Allowable answers	Additional guidance
<p>9</p> <p>3/1d 2/4a</p>	<p>2m</p> <p>or</p> <p>1m</p>	<p>Award TWO marks for correctly identifying all five rocks:</p> <ul style="list-style-type: none"> ■ chalk B ■ marble E ■ graphite D ■ granite A ■ obsidian C <p>If you are unable to award two marks, award ONE mark for any three or four rocks correctly identified.</p>		

Test B question 1: Making soup

Question	Mark	Requirements	Allowable answers	Additional guidance
1a 3/1a	1m	<p>Award ONE mark for describing/naming transparency or impermeability or rigidity as a property of glass which makes it suitable as a material for a measuring jug:</p> <ul style="list-style-type: none"> ■ it is transparent/clear (to see the level of liquids) ■ you can see how much water it contains ■ it is waterproof ■ it does not let water through ■ it holds the water ■ it is rigid and will not bend. 	<p>ONE mark may be awarded for:</p> <ul style="list-style-type: none"> ■ it does not melt/crack when hot. 	<p>Do not give credit for an insufficient response:</p> <ul style="list-style-type: none"> ■ it is strong ■ you can see the numbers/measurements clearly.
1b 3/1b	1m	<p>Award ONE mark for:</p> <p><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p> <ul style="list-style-type: none"> ■ It insulates his hand from the heat. 		
1c 3/2b 3/1a	1m	<p>Award ONE mark for describing/naming a property of metal that makes it suitable as a material for a saucepan:</p> <ul style="list-style-type: none"> ■ metals do not melt as easily (as plastic) ■ metals can become hotter (than plastics) before they melt. 	<p>ONE mark may be awarded for a response that describes how plastic may be less suitable than metal for a saucepan:</p> <ul style="list-style-type: none"> ■ plastic is more likely to melt ■ plastic gives off fumes when burned/ heated. <p>ONE mark may be awarded for an absolute response indicating that plastic melts/burns or metal does not melt/burn:</p> <ul style="list-style-type: none"> ■ plastic melts (but metal does not) ■ plastic would catch fire ■ metal does not catch fire/burn. 	<p>Do not give credit for an insufficient response:</p> <ul style="list-style-type: none"> ■ metal gets hot easily [conduction is given] ■ metal is stronger ■ plastic is not as strong as metal. <p>Do not give credit for an insufficient response referring to the conduction of plastic:</p> <ul style="list-style-type: none"> ■ because plastic does not conduct heat. <p>Do not give credit for an insufficient response expanding on given information:</p> <ul style="list-style-type: none"> ■ metal heats up more quickly and so you can cook food more quickly.

Test B question 1: Making soup (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
1d 3/1a	1m	<p>Award ONE mark for describing/naming a property of plastic which makes it suitable as a material for a washing-up bowl:</p> <ul style="list-style-type: none"> ■ it is light ■ it is waterproof/not absorbent ■ it is strong ■ it will not rust like some metals ■ it does not scratch things ■ it is flexible, (so it is less likely to cause a glass to break if you drop it) ■ it does not decay ■ it is insoluble ■ it can be moulded into shape. 	<p>ONE mark may be awarded for:</p> <ul style="list-style-type: none"> ■ it is unbreakable ■ it is easily washed. 	<p>Do not give credit for an insufficient response:</p> <ul style="list-style-type: none"> ■ it does not get hot/conduct ■ it is cheap [given] ■ it is hard. <p>Do not give credit for an insufficient response that makes reference only to the unsuitability of a different material:</p> <ul style="list-style-type: none"> ■ glass breaks too easily. <p>Do not give credit for an insufficient response expanding on given information:</p> <ul style="list-style-type: none"> ■ if there is hot water in the bowl, the bowl does not get hot so if you pick it up it will not burn your hands.

Test B question 2: Heart rate

Question	Mark	Requirements	Allowable answers	Additional guidance
2a 1/2c	1m	Award ONE mark for indicating measurement of the starting heart rate: <ul style="list-style-type: none"> ■ to find the starting measurement ■ so that they would know if there was a change when they chewed gum. 	ONE mark may be awarded for: <ul style="list-style-type: none"> ■ so they all started their investigation at their resting rate ■ so they could compare ■ to find out how the heart beats normally ■ to find their usual heart rate. 	Do not give credit for an insufficient response: <ul style="list-style-type: none"> ■ to make it a fair test ■ to find the heart rate when they were resting [given] ■ to see how long it can go.
2b 1/2h	1m	Award ONE mark for: <ul style="list-style-type: none"> ■ <input type="checkbox"/> results <input checked="" type="checkbox"/> ■ <input type="checkbox"/> <input type="checkbox"/> 		
2c 1/2d	1m	Award ONE mark for: <ul style="list-style-type: none"> ■ heart rate. 	ONE mark may be awarded for: <ul style="list-style-type: none"> ■ pulse (rate) ■ heart beat ■ beats per minute. ONE mark may be awarded for heart rate/beat with an indication of when the measurement is taken: <ul style="list-style-type: none"> ■ the children's heart rate after they have chewed gum ■ their pulse rates at rest and when they chew gum. 	Do not give credit for an insufficient response where the dependent variable is not clear: <ul style="list-style-type: none"> ■ if chewing gum makes your heart beat faster.

Test B question 2: Heart rate (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
2d 1/1b	1m	<p>Award ONE mark for indicating data in the table which supports Alice's conclusion</p> <p>OR actual data of one or more children discussed comparatively:</p> <ul style="list-style-type: none"> the measurements at rest are all lower than the measurements after chewing gum they are all at least two higher after chewing all the measurements increased when they chewed gum Robert's heart rate was 84 at rest but it went up to 94 beats per minute after he chewed gum the number of beats increased when they chewed gum after chewing for one minute the heart rates went up. 	<p>ONE mark may be awarded for two results repeated from the table that support Alice's conclusion without comparative discussion:</p> <ul style="list-style-type: none"> a normal heart rate is 84 and when chewing it is 94 beats per minute. 	<p>Do not give credit for a response that includes incorrect science where one or both variables are changed:</p> <ul style="list-style-type: none"> the faster they chew the gum, the more the heartbeat increases the more children chew on gum, the more beats per minute. <p>Do not give credit for an insufficient response that repeats the conclusion and does not refer to results from the table:</p> <ul style="list-style-type: none"> when they chew gum their heart rate goes up. <p>Do not give credit for an insufficient response that does not specify under what conditions the heart rate increases:</p> <ul style="list-style-type: none"> the heart rate goes from 84 to 96 the rates go up <p>[could be comparing the different children at rest].</p>
2e 1/1a	1m	<p>Award ONE mark for:</p> <ul style="list-style-type: none"> chew something else chew with no gum in mouth leave gum in the mouth but do not chew. 	<p>ONE mark may be awarded for:</p> <ul style="list-style-type: none"> pretend to chew. 	<p>Do not give credit for an insufficient response suggesting that the investigation should be repeated:</p> <ul style="list-style-type: none"> do it again.

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Test B question 3: Mixing and observing

Question	Mark	Requirements	Allowable answers	Additional guidance
3a 3/1a	1m	Award ONE mark for both correct boxes ticked: <ul style="list-style-type: none"> flexible <input checked="" type="checkbox"/> stretchy <input type="checkbox"/> 		
3b 3/2a,f	1m	Award ONE mark for a response indicating that a gas is produced. <ul style="list-style-type: none"> Give credit for a correct response that goes beyond the key stage 2 programme of study: <ul style="list-style-type: none"> carbon dioxide. 	ONE mark may be awarded for: <ul style="list-style-type: none"> bubbles/froth the bicarbonate of soda has changed into a gas a new material. 	Do not give credit for a response that includes incorrect science: <ul style="list-style-type: none"> air oxygen. Do not give credit for an insufficient response: <ul style="list-style-type: none"> fizzy/fizziness force a chemical reaction.
3c i 1/2j	1m	Award ONE mark for identifying any two from water, milk and cooking oil (in any order).		
3c ii 1/2l	1m	Award ONE mark for a response indicating that the height of the bars did not change: <ul style="list-style-type: none"> the height of the bars/they stayed the same there was no change. 	ONE mark may be awarded for a response implying the bars for one liquid are the same: <ul style="list-style-type: none"> the line was at the same height both lines are the same. 	Do not give credit for an insufficient response describing the relationship between the size of the bars and the distance around the balloon [this implies liquids with the smallest bars caused the balloon to blow up to some degree]: <ul style="list-style-type: none"> the smaller the bars, the less the balloon blew up. Do not give credit for an insufficient response: <ul style="list-style-type: none"> they were all the same size [suggests all the bars on the graph are the same] they are the smallest bars.

When applying this mark scheme, please also refer to the *General guidance* given on pages 1 and 2.

Test B question 4: Falling paper

Question	Mark	Requirements	Allowable answers	Additional guidance
4a 4/2b	1m	Award ONE mark for: The force of gravity... <ul style="list-style-type: none"> <input type="checkbox"/> pulls downwards. <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 		
4b 1/2i	1m	Award ONE mark for an unambiguous indication of: <ul style="list-style-type: none"> three times the third time 3. 		Do not give credit for an insufficient response: <ul style="list-style-type: none"> the last one 1 second.
4c 1/2j,i	1m	Award ONE mark for a general comparison describing the relationship between the two variables of area of paper and time taken to land: <ul style="list-style-type: none"> the smaller the area the less time it takes as the size increases, the time taken increases. 	<p>ONE mark may be awarded for a reference to the rate of falling in place of time taken:</p> <ul style="list-style-type: none"> the smaller the area the faster it falls. <p>ONE mark may be awarded for a reference to the size of paper or number of folds in place of area:</p> <ul style="list-style-type: none"> the smaller the paper, the less time it takes to land the more they fold it, the quicker it falls. <p>ONE mark may be awarded for two specific comparisons describing the relationship:</p> <ul style="list-style-type: none"> the largest area takes longer to fall and the smallest area takes less time small folded paper falls fast and large unfolded paper falls slowly. 	<p>Do not give credit for an insufficient response giving a single comparison of the variables:</p> <ul style="list-style-type: none"> the paper with the smallest area falls fastest when it is folded the most times it takes the least time to fall. <p>Do not give credit for a response that changes a variable:</p> <ul style="list-style-type: none"> the heavier the paper, the quicker it falls the flatter it is, the faster it lands the smaller the volume, the quicker it falls.

Test B question 4: Falling paper (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
4d 1/2/ 4/2c	1m	Award ONE mark for an unambiguous indication of: ■ Luke.		

Test B question 5: Shadows and space

Question	Mark	Requirements	Allowable answers	Additional guidance
5a 4/3b	1m	<p>Award ONE mark for an indication that a shadow is formed because the pole is opaque/blocks the light:</p> <ul style="list-style-type: none"> the (sun)light cannot pass through the pole the pole stops/blocks the light. 	<p>ONE mark may be awarded for:</p> <ul style="list-style-type: none"> the light is blocked. 	<p>Do not give credit for an insufficient response that does not fully explain shadow formation:</p> <ul style="list-style-type: none"> light goes round the pole light travels in straight lines light cannot get past the pole [it passes on either side] the pole is solid [a solid object can be transparent] the pole is in the way of the light light cannot get to the playground behind the pole [does not explain why]. <p>Do not give credit for an insufficient response saying the pole blocks the Sun without an indication of light:</p> <ul style="list-style-type: none"> the pole blocks the Sun/Sun's rays/sunshine it blocks the Sun's path.
5b 4/4b	1m	<p>Award ONE mark for a vertical shadow starting at the base of the pole that is four grid squares long or shorter:</p>	<p>ONE mark may be awarded for a straight line shadow that falls within the shaded area under the pole as indicated below:</p>	<p>Do not give credit for a straight line shadow that falls entirely between the grid lines indicated, but extends beyond four grid squares:</p>

Test B question 5: Shadows and space (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
5c 4/4b	1m	Award ONE mark for: <ul style="list-style-type: none"> the Earth spinning <input checked="" type="checkbox"/> <input type="checkbox"/> 		
5d 1/2/ 4/4d	1m	Award ONE mark for: <ul style="list-style-type: none"> the Moon orbiting the Earth <input checked="" type="checkbox"/> <input type="checkbox"/> 		
5e 4/4d 1/2/	1m	Award ONE mark for an indication that the tennis ball should be moved around the football: <ul style="list-style-type: none"> the football is still while the tennis ball goes around it the tennis ball orbits the football. 	<p>ONE mark may be awarded for:</p> <ul style="list-style-type: none"> the Earth goes around the Sun the football is still while the Earth goes around. <p>ONE mark may be awarded for a response describing the Earth/tennis ball spinning as it orbits the Sun/football:</p> <ul style="list-style-type: none"> the tennis ball must go around the football, spinning as it goes. 	<p>Do not give credit for an insufficient response:</p> <ul style="list-style-type: none"> they must run around each other move them slowly.

Test B question 6: Cakes

Question	Mark	Requirements	Allowable answers	Additional guidance
6a 3/2b	1m	Award ONE mark for both correct ingredients identified: <ul style="list-style-type: none"> chocolate and butter [given in either order]. 		Do not give credit for an insufficient response identifying only one correct ingredient: <ul style="list-style-type: none"> chocolate and eggs.
6b 3/2b	1m	Award ONE mark for: <ul style="list-style-type: none"> air gas. Give credit for a correct response that goes beyond the key stage 2 programme of study: <ul style="list-style-type: none"> carbon dioxide/CO₂ [the spaces contained carbon dioxide before the cake was cut; cutting the cake allowed other gases to mix with it]. 	ONE mark may be awarded for: <ul style="list-style-type: none"> air bubbles. 	Do not give credit for a response that includes incorrect science: <ul style="list-style-type: none"> nothing. Do not give credit for an insufficient response: <ul style="list-style-type: none"> raisins chocolate particles oxygen.

Test B question 6: Cakes (continued)

Question

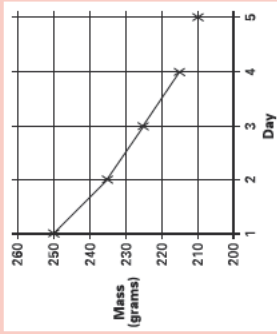
6c i
1/2h

Mark

1m

Requirements

Award **ONE** mark for a cross marked on the graph at 210 g on day 5 [the graph line does not need to be extended]:



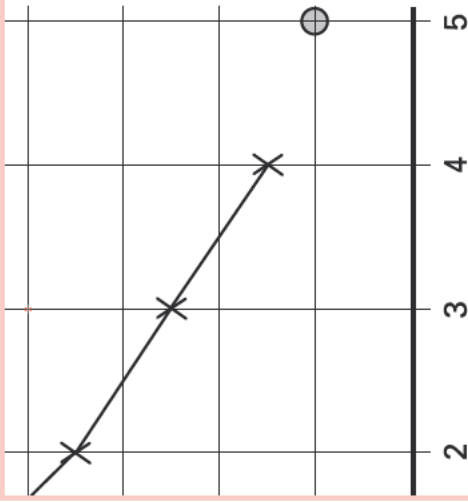
6c ii
1/2j

1m

Award **ONE** mark for:
 ■ 235 g (± 2 g).

Allowable answers

ONE mark may be awarded for a response in which the centre of the cross falls within 2 mm of the day 5/210 g intersection as indicated by the shaded circle below:



ONE mark may be awarded for a response where the graph line is extended to 210 g on day 5 even in the absence of an 'X'.

Additional guidance

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Test B question 7: Plant

Question	Mark	Requirements	Allowable answers	Additional guidance
7a 2/3d	1m	<p>Award ONE mark for a response indicating that the sepals protect the flower:</p> <ul style="list-style-type: none"> the sepals protect the flower (inside the bud) they stop the bud getting damaged for protection. 	<p>ONE mark may be awarded for a response indicating the sepals protect the plant or named flower parts:</p> <ul style="list-style-type: none"> they protect the plant to protect the ovary/stamens. 	<p>Do not give credit for an insufficient response:</p> <ul style="list-style-type: none"> they cover the bud [given].
7b 2/3a	1m	<p>Award ONE mark for a response indicating that the plant needs light from the Sun:</p> <ul style="list-style-type: none"> (sun)light. <p>❖ Give credit for a correct response that goes beyond the key stage 2 programme of study:</p> <ul style="list-style-type: none"> energy. 		<p>Do not give credit for a response that includes incorrect science suggesting the Sun gives the plant nutrients.</p> <p>Do not give credit for an insufficient response:</p> <ul style="list-style-type: none"> warmth/heat [given] photosynthesis sunshine sunrays.
7c 2/3b	1m	<p>Award ONE mark for indicating that the plant makes new materials for growth in its leaves:</p> <ul style="list-style-type: none"> leaf/leaves. 	<p>ONE mark may be awarded for naming any green part of a plant:</p> <ul style="list-style-type: none"> stem/stalk. 	<p>Do not give credit for a response that includes incorrect science:</p> <ul style="list-style-type: none"> roots.
7d 2/3d	1m	<p>Award ONE mark for an indication that the petals are used to attract insects:</p> <ul style="list-style-type: none"> so bees go to the flower. 		<p>Do not give credit for an insufficient response:</p> <ul style="list-style-type: none"> for pollination for the insects.

When applying this mark scheme, please also refer to the *General guidance* given on pages 1 and 2.

Test B question 8: Ice cubes

Question	Mark	Requirements	Allowable answers	Additional guidance
8a 1/2/ 3/2b	1m	Award ONE mark for a response that indicates the temperature gets colder: <ul style="list-style-type: none"> the water/it gets colder the temperature goes down. 	<p>ONE mark may be awarded for a response stating that the temperature of the freezer is colder but not referring to the temperature of the water:</p> <ul style="list-style-type: none"> it is colder in the freezer. <p>ONE mark may be awarded for a response that implies a change of temperature:</p> <ul style="list-style-type: none"> it will get cold the temperature will go to (below) 0°C. 	<p>Do not give credit for a response that includes incorrect science suggesting that the water gets warmer:</p> <ul style="list-style-type: none"> it gets warmer in the freezer. <p>Do not give credit for an insufficient response that is an absolute statement that the water/temperature is cold:</p> <ul style="list-style-type: none"> the temperature is cold. <p>Do not give credit for an insufficient response stating that the water freezes:</p> <ul style="list-style-type: none"> it freezes it turns to ice. <p>Do not give credit for an insufficient response stating that the temperature changes:</p> <ul style="list-style-type: none"> the temperature is not the same.
8b 1/2c	1m	Award ONE mark for: <ul style="list-style-type: none"> thermometer temperature sensor. 	<p>ONE mark may be awarded for: <ul style="list-style-type: none"> heat sensor. </p>	<p>Do not give credit for an insufficient response: <ul style="list-style-type: none"> sensor. </p>
8c 3/1e 3/2d,b	1m	Award ONE mark for all three statements correctly classified: <i>Water freezes at 100°C.</i> False. <i>Freezing water is a reversible change.</i> True. <i>Freezing is a change from solid to liquid.</i> False.		

Test B question 8: Ice cubes (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
8d 3/2d	1m	Award ONE mark for: <ul style="list-style-type: none"> ■ melting ■ melt. 		Do not give credit for a response that includes incorrect science: <ul style="list-style-type: none"> ■ dissolve.

Test B question 9: Magnets

Question	Mark	Requirements	Allowable answers	Additional guidance
9a 1/2c,g	2m or 1m	Award TWO marks for all four statements correctly classified: Take a <i>practice measurement to find out roughly when the magnets separate.</i> Yes. Pull the forcemeter very quickly. No. Take the measurement three times. Yes. Use a different horseshoe magnet each time. No. If you are unable to award two marks, award ONE mark for any two or three statements correctly classified.		
9b BoS 2a	1m	Award ONE mark for: ■ newton(s).		Do not give credit for a response that includes incorrect science: ■ neutrons. Do not give credit for an insufficient response: ■ newton meter.
9c 1/2i	1m	Award ONE mark for: ■ 5.0 cm.	ONE mark may be awarded for: ■ 5 cm	Do not give credit for an incorrect response: ■ 50 cm. Do not give credit for an insufficient response indicating the magnet or the force to pull the magnets apart: ■ 1.8 ■ B.

Test B question 9: Magnets (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
9d 1/2k	1m	<p>Award ONE mark for identifying that some of the longer magnets required less force to separate them from the bar magnet than some of the shorter ones:</p> <ul style="list-style-type: none"> the longest magnet was not the strongest one the weakest magnet was not the shortest the longest magnet only needed 3.0 N to pull it off the other magnet. 	<p>ONE mark may be awarded for identifying data in the table which can be used to argue against Callum's prediction if a clear comparison with other magnets is implied:</p> <ul style="list-style-type: none"> magnet C needed the most force to pull it apart the 7.5 cm magnet needed less force than some of the other magnets. <p>ONE mark may be awarded for a response repeating two results from the table that show Callum's prediction is not true but no explicit comparison is made:</p> <ul style="list-style-type: none"> magnet C was 7 cm and it took 7 N and magnet D was 7.5 cm and it took 3 N. 	<p>Do not give credit for an insufficient response where only one result is repeated from the table but no comparison is made with other magnets:</p> <ul style="list-style-type: none"> magnet C took 7.0 N.
9e 1/2a,c	1m	<p>Award ONE mark for all three questions correctly identified:</p> <p>How many layers of paper will stop each magnet attracting a pin? True</p> <p>How many types of materials will the magnets attract? False</p> <p>How many paperclips will each magnet hold? True</p>		



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