

Sc

KEY STAGE

2

LEVELS

3–5

Science sampling tests

Mark schemes

Tests A and B

2012

National sampling for science

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Marking the science tests

The Standards and Testing Agency (STA) is responsible for the development and delivery of statutory tests and assessments in 2012. The STA is an executive agency of the Department for Education (DfE).

This booklet contains the mark schemes for tests A and B. The test papers will be marked by external markers employed by the external marking agency under contract to STA. The markers will follow the mark schemes in this booklet, which is supplied to teachers for information.

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, question part and the area of the programme of study assessed.

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 marks
- examples of specific creditworthy responses demonstrating correct science
- examples of creditworthy responses that are 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 incorrect scientific knowledge is implied
- answers which are insufficient in themselves to gain credit, but are not incorrect science, and would therefore not lose credit if combined with a correct response.

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.

To ensure consistency of marking, the most frequent queries are listed below, along with the action the marker will take.

<i>What if...?</i>	<i>Marking procedure</i>
The pupil gives two or more responses to a particular question part.	a) If a pupil qualifies a scientifically correct answer with a scientifically incorrect statement, no mark will be awarded for that question part. 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.
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.
The pupil misspells a word.	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. 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. 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.

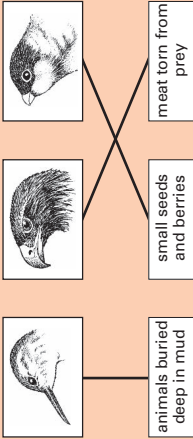
Recording marks awarded

The number of available marks is recorded in the margin of the test booklet, alongside each question part, and also in the second column of the mark scheme. Depending on the type of response made to each part of each question by the pupil, the marker will award one of the following:

2 or 1, as appropriate, for a creditworthy response
 0 for an incorrect response
 – if no response is made.

The marking is conducted online by external markers using scanned images of the pupils' work. Each paper has 40 marks available.

Test A question 1: Birds in their environments

Question	Mark	Requirements	Allowable answers	Additional guidance
1a 2/5c	1m	Award ONE mark for an indication that webbed feet help water birds to swim (a description of how they use their feet to swim may be given) or that webbed feet can help birds to walk on mud: ■ webbed feet are used to help the bird swim/move in the water ■ water birds have webbed feet for swimming ■ to help push back the water ■ so they can move better in the water ■ to stop them sinking in the mud.	ONE mark may be awarded for a response that describes how webbed feet help the bird to land on water from flight: ■ they act as brakes when the bird lands on water/help birds land on water.	Do not give credit for an insufficient response: ■ to give good grip [this is not specific to birds with webbed feet] ■ so they can walk on water ■ so they can move easily [webbed feet do not aid movement on land or in the air].
1b 2/5b, c	1m	Award ONE mark for correctly matching all three beaks with foods: 		
1c 2/5a 1/1a	1m	Award ONE mark for: ☐ ☐ so there are enough birds to reproduce ☐ ☐		

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

Test A question 2: In the kitchen

Question	Mark	Requirements	Allowable answers	Additional guidance												
2a 3/3a 1/2c	1m	Award ONE mark for: ☐  ☒ Sieve ☐ ☐														
2b 3/1e	1m	Award ONE mark for all five states correctly classified: <table><tr><th>Activity</th><th>Before</th><th>After</th></tr><tr><td>Baking a cake</td><td><i>liquid</i></td><td>solid</td></tr><tr><td>Melting butter</td><td>solid</td><td>liquid</td></tr><tr><td>Making ice cubes</td><td>liquid</td><td>solid</td></tr></table>	Activity	Before	After	Baking a cake	<i>liquid</i>	solid	Melting butter	solid	liquid	Making ice cubes	liquid	solid		
Activity	Before	After														
Baking a cake	<i>liquid</i>	solid														
Melting butter	solid	liquid														
Making ice cubes	liquid	solid														
2c 3/2d,f,g	2m or 1m	Award TWO marks for all five activities correctly classified: <table><tr><th>Activity</th><th>Does the activity cause a reversible change? Yes or no?</th></tr><tr><td>Baking a cake</td><td>No</td></tr><tr><td>Frying eggs</td><td>No</td></tr><tr><td>Dissolving sugar</td><td>Yes</td></tr><tr><td>Burning candles on a birthday cake</td><td>No</td></tr><tr><td>Making ice cubes</td><td>Yes</td></tr></table> If you are unable to award two marks, award ONE mark for any four activities correctly classified.	Activity	Does the activity cause a reversible change? Yes or no?	Baking a cake	No	Frying eggs	No	Dissolving sugar	Yes	Burning candles on a birthday cake	No	Making ice cubes	Yes		
Activity	Does the activity cause a reversible change? Yes or no?															
Baking a cake	No															
Frying eggs	No															
Dissolving sugar	Yes															
Burning candles on a birthday cake	No															
Making ice cubes	Yes															

Test A question 2: In the kitchen (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
2d 3/2b,d	1m	Award ONE mark for a response naming evaporation : ■ it/the water evaporates.		Do not give credit for a response that includes incorrect science: ■ boiling/boils. Do not give credit for an insufficient response where the process is described rather than named: ■ it turns into gas/water vapour/steam. Do not give credit for an insufficient response: ■ heat.
2e 3/2b	1m	Award ONE mark for: Condensation forms because the window is... ■ ☐ ☐ cold. ☒ ☐		

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

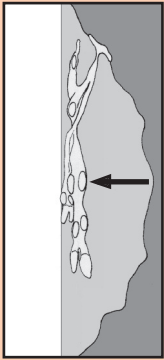
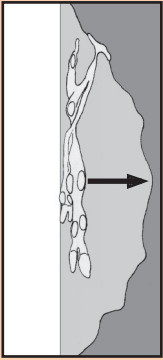
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Test A question 3: Animal heart rates

Question	Mark	Requirements	Allowable answers	Additional guidance
3a 1/2i	2m or 1m	Award TWO marks for all three correct responses: ■ (i) squirrel ■ (ii) 7 kg ■ (iii) 205 beats per minute. If you are unable to award two marks, award ONE mark for any two correct responses.		
3b 1/2j	1m	Award ONE mark for a general comparison describing the relationship between the mass of the animal and the heart rate : ■ the heavier the animal, the slower its heartbeat ■ the lighter the animal, the higher its heart rate.	ONE mark may be awarded for two specific comparisons describing the relationship: ■ the heaviest animal has the slowest heart rate and the lightest animal has the fastest heart rate. ONE mark may be awarded for a comparison describing the relationship between the size of the animal and the heart rate: ■ the bigger the animal, the slower/lower the heart rate.	Do not give credit for a response that changes a variable: ■ the heavier the animal, the shorter/smaller the heartbeat [incorrect science]. Do not give credit for an insufficient response giving a single comparison of the variables: ■ the heaviest animal has the slowest heart rate.
3c 1/2j	1m	Award ONE mark for an answer that is greater than 70 and less than 130 beats per minute, including decimals/fractions.		

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

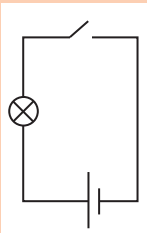
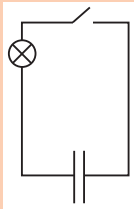
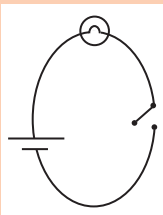
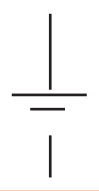
Test A question 4: Seaweed and trees

Question	Mark	Requirements	Allowable answers	Additional guidance
4a 2/4a	1m	Award ONE mark for all three seaweeds correctly identified: ■ Seaweed B is Gutweed Seaweed C is Sea lettuce Seaweed D is Serrated wrack.		
4b 4/2e	1m	Award ONE mark for an arrow pointing upwards anywhere on the diagram that is less than 45° either side of the vertical: ■ 		Do not give credit for a response that includes incorrect science showing a downward arrow: ■ 

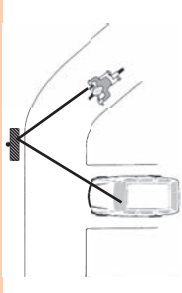
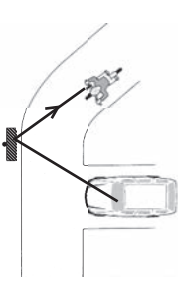
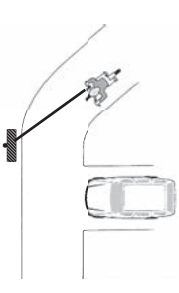
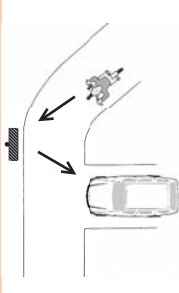
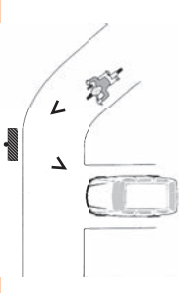
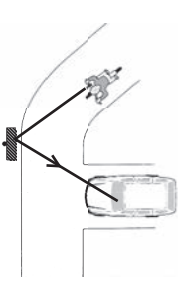
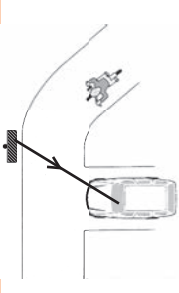
Test A question 4: Seaweed and trees (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
4c 2/5b, c	1m	Award ONE mark for: ■ trunk ☒ AND a description of how the trunk helps the leaves to get sunlight: ■ the trunk is tall, so the leaves are above other plants ■ it grows high, so the leaves are above things that might block the light. OR ■ branches ☒ AND a description of how the branches help the leaves to get sunlight: ■ they spread the leaves out (so they can take in more sunlight) ■ the branches spread out and get the leaves into clear spaces of light ■ the branches grow long so the leaves are further out.	ONE mark may be awarded for: ■ trunk ☒ AND ■ it is long, so the leaves are nearer to the Sun ■ holds them high. OR ■ branches ☒ AND ■ the branches grow upwards so the leaves are closer to the Sun ■ they hold the leaves up towards the sunlight ■ the branches help them stay high. ONE mark may be awarded if both or neither box is ticked, but the pupil gives a creditworthy response describing how the trunk and/or branches of a tree help its leaves to get sunlight.	Do not give credit for an insufficient response that does not refer to the leaves: ■ the trunk is tall. Do not give credit for a response that includes incorrect science implying branches are elastic: ■ the branches stretch out so the leaves get sunlight. Do not give credit for an insufficient response that does not refer to the leaves: ■ the branches spread/stick out (so they are in the light) ■ the branches are long/high. Do not give credit for an insufficient response: ■ the leaves are on the branches.
4d 2/3c	1m	Award ONE mark for all three correct boxes ticked: ■ ☐ to anchor the plant in the ground ■ ☒ to absorb water ■ ☒ to take up minerals ■ ☐		
When applying this mark scheme, please also refer to the General guidance given on pages 1 and 2.				

Test A question 5: Road safety

Question	Mark	Requirements	Allowable answers	Additional guidance
5a i 4/1c	2m or 1m	Award TWO marks for all of the components present and correctly drawn:  ■ If you are unable to award two marks, award ONE mark for a circuit which contains one error or omission in the drawing of the symbols:  ■ Award ONE mark for an indication of a cell or a battery.	TWO marks may still be awarded if obsolete symbols or a non-rectilinear circuit are used:  ■	Do not give credit for a response that includes incorrect science where a bulb or switch has been incorrectly drawn: ■  ■  ■  Do not give credit for a response that includes incorrect science with gaps between the wires and components of more than 2 mm: ■  Do not give credit for a response that includes incorrect science: ■ a bulb.
5a ii 4/1b	1m	Award ONE mark for an explanation that jacket B reflects more light than jacket A: ■ jacket B reflects light better than jacket A ■ jacket A is not such a good reflector of light as jacket B. ✦ Give credit for a correct response that goes beyond the key stage 2 programme of study: ■ jacket A absorbs more light than jacket B.	ONE mark may be awarded for an absolute response: ■ jacket B reflects the light ■ it reflects (light) ■ light bounces off jacket B ■ light reflects on jacket B.	Do not give credit for a response that includes incorrect science: ■ jacket B reflects light but jacket A does not ■ jacket B makes more light. Do not give credit for an insufficient response: ■ light reflects onto jacket B ■ jacket B is a lighter colour ■ jacket A is darker.
5b 4/3c	1m	Award ONE mark for an explanation that jacket B reflects more light than jacket A: ■ jacket B reflects light better than jacket A ■ jacket A is not such a good reflector of light as jacket B. ✦ Give credit for a correct response that goes beyond the key stage 2 programme of study: ■ jacket A absorbs more light than jacket B.	ONE mark may be awarded for an absolute response: ■ jacket B reflects the light ■ it reflects (light) ■ light bounces off jacket B ■ light reflects on jacket B.	Do not give credit for a response that includes incorrect science: ■ jacket B reflects light but jacket A does not ■ jacket B makes more light. Do not give credit for an insufficient response: ■ light reflects onto jacket B ■ jacket B is a lighter colour ■ jacket A is darker.

Test A question 5: Road safety (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
5c 4/3c, d, a	1m	Award TWO marks for two lines and two arrowheads showing the correct path and direction of light. Award the marks as indicated below: Award ONE mark for two lines (with or without correct arrowheads) showing the correct path of light. The lines must go from between Julia's hands on her bike to the mirror and then to the car windscreen:  [1 mark – lines]	ONE mark may be awarded for one continuous line even where the arrowhead is incorrect:  [1 mark – line]	Do not give credit for an insufficient response where only one line is drawn: 
	1m	Award ONE mark for two arrowheads accurately showing the direction of light. The arrows must go from between Julia's hands on her bike to the mirror and then to the car windscreen:  [1 mark – lines and 1 mark – arrowheads]  [1 mark – arrowheads]	ONE mark may be awarded for just one correct arrowhead on a continuous line:  [1 mark – line and 1 mark – arrowhead]	Do not give credit for an insufficient response where the direction of travel is shown only by one arrow: 

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

Test A question 6: Arms

Question	Mark	Requirements	Allowable answers	Additional guidance
6a 2/2e	1m	Award ONE mark for: ■ muscles.	ONE mark may be awarded for: ■ biceps/triceps.	Do not give credit for an insufficient response: ■ ligaments ■ tendons ■ bones ■ joints.
6b 2/2b,g,h	1m	Award ONE mark for an indication that humans should eat a balanced diet or should exercise or not smoke: ■ they should eat food from each food group ■ they should play football/go running regularly ■ they should keep fit ■ they should not start smoking. ONE mark may be awarded for responses which specify types of food which improve bone strength: ■ they should drink/eat milk/cheese. ❖ Give credit for a correct response that goes beyond the key stage 2 programme of study: ■ they should not drink too much caffeine/coffee/tea.	ONE mark may be awarded for a response describing supplement intake which may be beneficial with a deficient or unbalanced diet: ■ they should take mineral(s) (supplements of calcium/phosphorus sodium/potassium) ■ they should have vitamin (D/C/K) tablets.	Do not give credit for an insufficient response: ■ eat different types of food ■ eat five portions of fruit and vegetables a day ■ eat healthy food ■ do not drink alcohol [moderate amounts can improve bone strength] ■ drink lots of water [too much fluoride can decrease bone strength] ■ eat protein [can have a negative or positive effect on bone strength].

Test A question 6: Arms (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
6c 1/2d	2m or 1m	Award TWO marks for all three statements correctly classified: To make his investigation fair, Aziz must... make sure everyone rolls up their sleeves. True..... measure the arms of lots of children. False..... measure around the arms in the same place. True..... If you are unable to award two marks, award ONE mark for any two statements correctly classified.		Note: Measuring the arms of lots of children improves the reliability of the investigation, not the fairness.
6d 1/2i	1m	Award ONE mark for an understanding that the distance around the top of the arm increases when the arm is bent: When the children's arms are bent... ■ the distances around their arms are bigger ■ the measurements (around their arms) increase/are higher. ❖ Give credit for a correct response that goes beyond the key stage 2 programme of study: ■ the muscle contracts making it wider.	ONE mark may be awarded for a response implying the measurements of the arms increase: ■ their arms are bigger ■ their arms are fatter ■ they get wider ■ the muscle expands/gets bigger.	Do not give credit for a response that includes incorrect science: ■ their arms get longer/higher. Do not give credit for an insufficient response implying the measurements get smaller: ■ the muscle contracts [effect on width of muscle is needed]. Do not give credit for an insufficient response: ■ the muscle tenses up ■ it gets bigger/higher [could refer to the graph].

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

Test A question 7: Drinking chocolate

Question	Mark	Requirements	Allowable answers	Additional guidance
7a 3/1b	1m	Award ONE mark for: ☐ ☐ an insulator. ☐ ☐ ☐		
7b 1/2i	1m	Award ONE mark for an indication that the result at 10 minutes for the food wrap covered cup needs checking: ☐ 25 ☐ food wrap at 10 minutes.		Do not give credit for an insufficient response: ☐ food wrap ☐ 10 minutes.

Test A question 7: Drinking chocolate (continued)

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

Test A question 8: Germinating seeds

Question	Mark	Requirements	Allowable answers	Additional guidance
8a 1/2a, d	1m	Award ONE mark for giving the type of seed as the independent variable (IV): - the types of seed - different seeds.	ONE mark may be awarded for: - seeds (different) plants.	Do not give credit for a response that includes incorrect science giving a control variable: the amount of seeds.
8b 1/2d	1m	Award ONE mark for any two different acceptable control variables (CV): - type of soil - amount of soil - depth seeds planted - place where the seed trays are put - size of seed trays - how often she waters them - how much water she gives each seed - amount of light - put all the seeds in the dark - number/amount of seeds.	Marks may be awarded for: - the soil - temperature - water - light - trays - time she left them for.	Do not give credit for a response that includes incorrect science: - same food - same seeds [IV] - time [could be the dependent variable]. Do not give credit for a second CV that is a restatement or repetition of the first. Do not give credit for an insufficient response giving a variable that does not affect the investigation: - the same person watering it.
8c 1/2c	1m	Award ONE mark for an explanation recognising that the root would not be seen when it first appears as it is underneath the soil surface: - she would not be able to see the roots (without digging up the seeds) - the root is under the soil - you see the shoot first as it is above the soil.		Do not give credit for an insufficient response: she would see the shoot first [does not indicate the problem with seeing the root first].

Test A question 8: Germinating seeds (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
8d 1/2g	1m	Award ONE mark for identifying that it is important to plant several of each type of seed to allow the reliability of the results/test/conclusions to be improved: ■ to make her results/test (more) reliable ■ so she can check/make sure of her results ■ to check if her measurements were reliable ■ to get more evidence ■ to get an average (of how quickly each type of seed germinates) ■ to check if her results can be applied to all seeds of the same type. Award ONE mark for recognising that one seed may not germinate: ■ in case there is a problem with one of the seeds.	ONE mark may be awarded for a response indicating the results can be compared or will be more accurate: ■ so Sunita can compare her results ■ to see if they/the results are the same ■ to make sure her results were accurate ■ it will improve the accuracy (of the test). ONE mark may be awarded for a response indicating an error may have been made inadvertently (rather than there being a fault in the test design): ■ she might have done something wrong with one seed ■ to make sure there were no mistakes. ONE mark may be awarded for: ■ to see/check if her results/answers are correct/right.	Do not give credit for a response that includes incorrect science: ■ to make the test fair. Do not give credit for an insufficient response implying there is a correct/right answer/results: ■ to get the right answer/results ■ to make sure she has got it right. Do not give credit for an insufficient response: ■ in case the results are different ■ to check it [implies that the test should be checked] ■ to see if she gets it/the test right ■ to get more results. Do not give credit for an insufficient response that implies the investigation is comparing seeds of one type: ■ to see which one grows first.
8e 2/3d	1m	Award ONE mark for: ■ ☐ B ☒ ☐		

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 9: Filters

Question	Mark	Requirements	Allowable answers	Additional guidance										
9a 3/3c, b	1m	Award ONE mark for all three rows of the table completed correctly: <table><tr><th>Mixture</th><th>Can the mixture be separated by a filter? Yes or no?</th></tr><tr><td>Sand and stones</td><td>no</td></tr><tr><td>Soil and water</td><td>Yes</td></tr><tr><td>Sand and soil</td><td>No</td></tr><tr><td>Salt and water</td><td>No</td></tr></table>	Mixture	Can the mixture be separated by a filter? Yes or no?	Sand and stones	no	Soil and water	Yes	Sand and soil	No	Salt and water	No		
Mixture	Can the mixture be separated by a filter? Yes or no?													
Sand and stones	no													
Soil and water	Yes													
Sand and soil	No													
Salt and water	No													
9b 3/1a 1/2l	1m	Award ONE mark for an indication that the foil is not permeable: - the water will not go through the foil - all of the mixture will stay in the filter - there are no gaps/holes in the foil.	ONE mark may be awarded for a response stating that the sugar dissolves in water: the sugar dissolves in water.	Do not give credit for an incorrect response suggesting the foil will break/rip/tear: - the foil will tear and all the mixture will go through [given that it does not break]. Do not give credit for an insufficient response: - foil is not absorbent.										
9c 3/3d	1m	Award ONE mark for an indication that the water and sugar can be separated by evaporating (the water leaving the sugar behind): - by evaporation - evaporate the water (leaving the sugar).	ONE mark may be awarded for a response explaining the mixture should be moved to a warmer place and/or left to dry: - move the mixture onto a sunny/warm window sill - put it on a radiator - heat it - put it on a shelf and wait.	Do not give credit for a response that includes incorrect science implying the sugar will evaporate: - evaporate the mixture/solution. Do not give credit for an insufficient response where it is unclear what is being evaporated: - leave it out to evaporate the liquid - evaporate it. Do not give credit for an insufficient response: - leave it (out) - the water disappears.										

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

Test B question 1: Pond life

Question	Mark	Requirements	Allowable answers	Additional guidance
1a 3/1a	1m	Award ONE mark for an indication of transparency : ■ see-through ■ clear.		
1b 2/5d	1m	Award ONE mark for: ■ ☐ It eats other animals. ☒ ☐ ☐		
1c 2/5e 2/3b	1m	Award ONE mark for all three statements correctly classified: <i>Producers are at the start of the food chain.</i> True <i>Producers catch their food from the water.</i> False <i>Producers use sunlight to make new materials for growth.</i> True		

Test B question 1: Pond life (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
1d i 2/5f	1m	Award ONE mark for an indication that the micro-organisms are too small to be seen: ■ they are microscopic/too small ■ you can only see micro-organisms through a microscope.	ONE mark may be awarded for a response indicating micro-organisms are toward the extreme end of the size scale: ■ they are very/so/really small ■ they are tiny.	Do not give credit for an insufficient response: ■ they are little/small/micro ■ they cannot be seen/are not visible/are invisible to the naked eye [given] ■ they are invisible/see-through ■ you cannot see micro-organisms.
1d ii 2/5f	1m	Award ONE mark for a response that gives a benefit of having micro-organisms in a pond: ■ they recycle the waste into nutrients ■ they break down waste ■ they help reduce disease ■ they provide food for some animals. ✦ Give credit for a correct response that goes beyond the key stage 2 programme of study: ■ they (may) oxygenate the water.	ONE mark may be awarded for: ■ they keep the pond/water clear/clean ■ they eat/get rid of dead things/germs ■ they eat bad things in the pond.	

Test B question 2: Triangles

Question	Mark	Requirements	Allowable answers	Additional guidance																			
2a 4/3e	1m	Award ONE mark for any indication of vibrating: ■ (the triangle) vibrates.	ONE mark may be awarded for: ■ causing vibrations.	Do not give credit for an insufficient response: ■ moving (quickly) ■ shaking ■ the rod is vibrating.																			
2b 4/3f	1m	Award ONE mark for a response which orders all four triangles correctly: C A B D Highest Lowest																					
2c 4/3f BoS 2a	1m	Award ONE mark for: ■ pitch. ❖ Give credit for a correct response that goes beyond the key stage 2 programme of study: ■ frequency.																					
2d 1/2j 4/3f	1m	Award ONE mark for all three rows of the table completed correctly: ■ <table><tr><th rowspan="2">How hard the triangle was hit</th><th colspan="3">Volume (units)</th></tr><tr><th>Test 1</th><th>Test 2</th><th>Test 3</th></tr><tr><td>quite hard</td><td>12</td><td>15</td><td>14</td></tr><tr><td>gently</td><td>8</td><td>10</td><td>6</td></tr><tr><td>very hard</td><td>16</td><td>19</td><td>21</td></tr></table>	How hard the triangle was hit	Volume (units)			Test 1	Test 2	Test 3	quite hard	12	15	14	gently	8	10	6	very hard	16	19	21		
How hard the triangle was hit	Volume (units)																						
	Test 1	Test 2	Test 3																				
quite hard	12	15	14																				
gently	8	10	6																				
very hard	16	19	21																				

Test B question 2: Triangles (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
2e 1/2g	1m	Award ONE mark for a response indicating he needed to do the test more than once for the reliability of the results/test/ conclusions to be improved: ■ to make his results/test (more) reliable ■ to check/make sure of his results ■ to check if his measurements were reliable ■ to get an average ■ to get more evidence.	ONE mark may be awarded for a response indicating the results can be compared or will be more accurate: ■ to see if the results/they are the same ■ so Paul can compare his results ■ to make sure his results were accurate ■ to improve the accuracy (of the test). ONE mark may be awarded for a response indicating an error may have inadvertently been made (rather than there being a fault in the test design): ■ he might have done something wrong the first time ■ in case he got one odd result ■ to make sure there were no mistakes. ONE mark may be awarded for: ■ to see/check if the results/answers are correct/right.	Do not give credit for a response that includes incorrect science: ■ to make the test fair. Do not give credit for an insufficient response implying there is a correct answer/results: ■ to get the correct/right answer/results ■ to make sure he has got it right. Do not give credit for an insufficient response implying that all the results need to be the same: ■ to make sure the results are the same ■ in case the results are different. Do not give credit for an insufficient response: ■ to check it [implies the test should be checked] ■ to get more results ■ to see if he gets it/the test right.
2f 1/2m,g	1m	Award ONE mark for an indication that it is hard to hit the triangle with exactly the same force for each test: ■ Paul may have hit the triangle harder on different tests ■ he may have used different forces ■ it is hard to hit the triangle with exactly the same force (on each test) ■ Paul tried to hit the triangle gently each time, but did not.	ONE mark may be awarded for: ■ he does not know how hard he is hitting. ONE mark may be awarded for a response referring to the speed of one hit: ■ he did not hit it with the same pace/speed.	Do not give credit for an insufficient response which does not refer to the force: ■ he did not hit it the same each time. Do not give credit for an insufficient response which would not affect volume: ■ he may have hit it in a different place.

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

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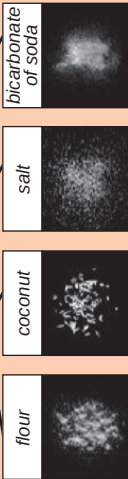
Test B question 3: Dandelion

Question	Mark	Requirements	Allowable answers	Additional guidance									
3a 1/2j	1m	Award ONE mark for: ☐☐☒ ■ 15–18 cm											
3b 1/2j	1m	Award ONE mark for: ■ 13.		Do not give credit for a response that includes incorrect science: ■ 11.									
3c 1/2k 2/1c	1m	Award ONE mark for both predictions correctly classified: <table><tr><th>Prediction</th><th>Supported by the evidence</th><th>Not supported by the evidence</th></tr><tr><td>Where dandelions grow makes a difference to the stem length.</td><td>✓</td><td></td></tr><tr><td>There will be more dandelions in the short grass than in the long grass.</td><td></td><td>✓</td></tr></table>	Prediction	Supported by the evidence	Not supported by the evidence	Where dandelions grow makes a difference to the stem length.	✓		There will be more dandelions in the short grass than in the long grass.		✓		
Prediction	Supported by the evidence	Not supported by the evidence											
Where dandelions grow makes a difference to the stem length.	✓												
There will be more dandelions in the short grass than in the long grass.		✓											
3d 2/3d 2/5b	1m	Award ONE mark for an indication that dandelion seeds are dispersed by the wind: ■ the wind (spreads these seeds) ■ the dandelion seed (acts like a parachute and) is spread by the wind.	ONE mark may be awarded for: ■ by (blowing) air ■ it is blown ■ the seeds float away.	Do not give credit for a response that includes incorrect science describing other methods of seed dispersal: ■ it sticks to animal fur. Do not give credit for an insufficient response: ■ it flies away ■ it falls off ■ it lands on the ground.									
3e 2/1b	1m	Award ONE mark for: ■ reproduction ☒ ☐ ☐											
When applying this mark scheme, please also refer to the General guidance given on pages 1 and 2.													

Test B question 4: Identifying solids

Question	Mark	Requirements	Allowable answers	Additional guidance
4a 3/2d	1m	Award ONE mark for a response naming dissolving. ❖ Give credit for a correct response that goes beyond the key stage 2 programme of study: ■ (it has formed) a solution ■ they are soluble.		
4b 3/3a	1m	Award ONE mark for a response indicating the pieces of solid A are larger than those of solid D or that the solids have different sized particles: ■ solid A is made of bigger bits than solid D ■ it has larger/thicker particles ■ D has smaller bits than A ■ the size of the bits.	ONE mark may be awarded for an absolute response: ■ A has big bits. ONE mark may be awarded for a response which does not refer to the constituent pieces of the solids: ■ solid A is bigger (than solid D) ■ solid A is bigger than the sieve holes ■ the size.	Do not give credit for an insufficient response which describes solid D without explicitly stating it refers to solid D: ■ it has smaller pieces.
4c 3/2f	1m	Award ONE mark for: ■ ☐ solid C ☒ AND a response indicating that a new material was made: ■ there were bubbles ■ the mixture fizzes ■ it made a gas.	ONE mark may be awarded if no box is ticked, but the creditworthy explanation indicates unambiguously that the pupil believes a new material is produced when solid C is mixed with vinegar.	Do not give credit if the 'solid B' box is ticked. Do not give credit for an insufficient response which gives a feature associated with non-reversible changes without giving the evidence Mia observed: ■ you cannot get solid C back.

Test B question 4: Identifying solids (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
4d 3/3b,a 3/2f,d	2m or 1m	Award TWO marks for correctly matching all four solids to their names: A B C D flour coconut salt bicarbonate of soda  If you are unable to award two marks, award ONE mark for correctly matching any two or three solids.		

Test B question 5: Celery

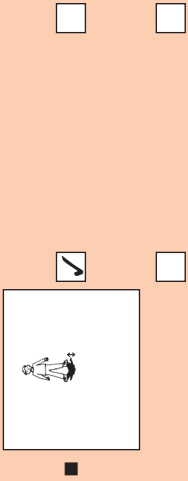
Question	Mark	Requirements	Allowable answers	Additional guidance
5a 2/3b	1m	Award ONE mark for a response stating that the leaves make new material for growth or take in light: ■ to make food ■ to produce sugar/food (for growth) ■ to absorb/take in (sun)light. ❖ Give credit for a correct response that goes beyond the key stage 2 programme of study: ■ to let water/O₂ escape ■ to take in CO₂/O₂ ■ to store food ■ to photosynthesise/respire ■ to absorb energy from the sun(light) ■ to produce chlorophyll ■ to store waste ■ to store water.	ONE mark may be awarded for: ■ to collect/catch (sun)light.	Do not give credit for a response that includes incorrect science: ■ to make energy ■ to feed (the plant). Do not give credit for an insufficient response: ■ to produce nutrients ■ to get food (from the Sun). Do not give credit for an insufficient response indicating the leaves carry water (to other parts of the plant): ■ they let water pass through. Do not give credit for an insufficient response detailing the function of the leaves for other organisms: ■ food for other creatures. Do not give credit for an insufficient response not stating the role of the leaves: ■ nutrition/nutrients.
Markers should read the answers to parts 5b–5d before marking the rest of this question. Parts 5b–5d must form a coherent investigation.				
5b 1/2a,d	1m	Award ONE mark for a response identifying an independent variable (IV) relating to temperature: ■ temperatures of the place/water ■ where he puts the celery – like in the fridge, in a warm room.	ONE mark may be awarded for: ■ heat.	Do not give credit for an insufficient response that does not indicate the temperature must be varied: ■ the place [could be all the same temperature] ■ the water [could be the amount].

Test B question 5: Celery (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
5c 1/2c	1m	Award ONE mark for a response naming a piece of equipment used to measure time: ■ stopwatch.	ONE mark may be awarded for: ■ clock/watch ■ timer.	
5d 1/2d	1m	Award ONE mark for giving any two appropriate control variables (CV): ■ length of celery ■ amount of (coloured) water (in the glass) ■ size of the glass ■ amount of food colouring (in the water) ■ size (surface area)/number of leaves.	ONE mark may be awarded for: ■ (amount of) celery/vegetable ■ the plant ■ the glass/container/cup ■ the amount of (sun)light ■ the colour of the water ■ the red water ■ (same) thermometer. ONE mark may be awarded for 'the same place' if temperature of the water is given as the IV in part 5b. ONE mark may be awarded for 'temperature of the water' if the temperature of the place is given as the IV in part 5b.	Do not give credit for a response that includes incorrect science stating the celery sticks should be in the water for the same length of time [time is the dependent variable]. Do not give credit for a second response that is a re-statement or repetition of the first. Do not give credit for a CV that is inconsistent with, or repeats a creditworthy IV in part 5b. Do not give credit for an insufficient response that could be the IV if the response given in part 5b is omitted or insufficient or incorrect: ■ the same place ■ (temperature of) the water. If an IV is omitted, the CV may gain credit provided it is consistent with the context of the investigation presented in the introduction. An appropriate CV can gain credit where the IV is insufficient or incorrect. Do not give credit for an insufficient response naming a piece of measuring equipment on which the calibration is unlikely to vary: ■ stopwatch.

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

Test B question 6: Jack's shadow

Question	Mark	Requirements	Allowable answers	Additional guidance
6a 4/4b	1m	Award ONE mark for: 		
6b 4/3b	1m	Award ONE mark for an explanation that light cannot pass through Jack. The response must make reference to the blocked light or opacity: - the light cannot go through Jack - Jack stops/blocks the light - the (sun)light is blocked - Jack is opaque.	ONE mark may be awarded for: it cannot go through Jack.	Do not give credit for an insufficient response that does not necessarily explain shadow formation: - the light goes around Jack - light travels in straight lines - the light cannot get past Jack [it passes on either side of him] - Jack is solid [a solid object can be transparent] - Jack is in the way of the light [does not necessarily mean he is blocking the light] - light cannot get behind Jack - the Sun cannot get through Jack [does not refer to light] - Jack's body blocks the Sun.
6c 4/4b <i>continued</i>	1m	Award ONE mark for an explanation that Jack's shadow changes position because the Earth spins on its axis: - the Earth rotating (on its axis) - the Earth spinning (on its axis) - the Earth turns/moves on its axis.	ONE mark may be awarded for: the Earth revolves.	Do not give credit for a response that includes incorrect science suggesting the Sun moves (across the sky). Do not give credit for an insufficient response: the Sun appears to move across the sky.

Test B question 6: Jack's shadow (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
6c continued			ONE mark may be awarded for a response correctly indicating that shadows change position because of the spin of the Earth, as well as describing the Earth's orbit around the Sun: - the Earth spins as it orbits the Sun - the Earth turns on its axis and moves around the Sun.	Do not give credit for an insufficient response implying Jack's shadow changes position because the Earth orbits the Sun: - the Earth orbits/turns around the Sun - the Earth spins/rotates/revolves around the Sun. Do not give credit for an insufficient response: - the Earth turns/moves (around) - the rotation [does not indicate what is rotating] - it spins on its axis [does not identify what 'it' is] - sometimes the Earth is facing the Sun and sometimes it is away from the Sun.
6d 4/3b 1/2m	1m	Award ONE mark for: ☐ Jack's shadow is difficult to see. ☒ ☐ ☐		
6e 4/3b	2m or 1m	Award TWO marks for all four correct: The colour of a car's shadow depends on the colour of the car. False You can tell if Jack's eyes are shut by looking at his shadow. False The shape of the shadow depends on the shape of the object. True Only light from the Sun causes a shadow. False If you are unable to award two marks, award ONE mark for classifying any three ideas correctly.		
When applying this mark scheme, please also refer to the General guidance given on pages 1 and 2.				

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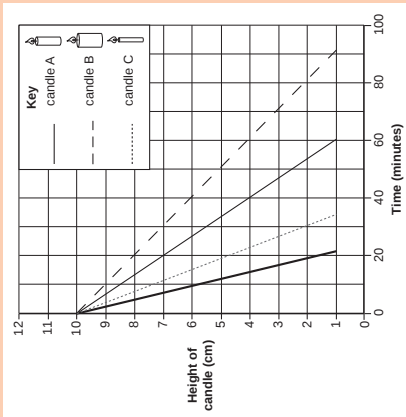
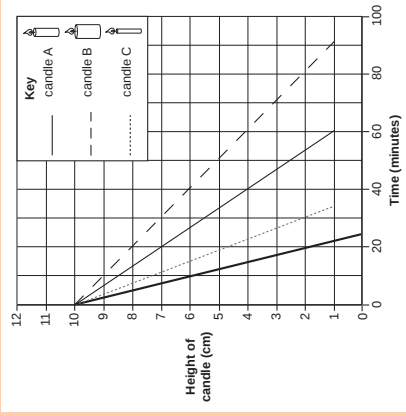
Test B question 7: Rolling marble

Question	Mark	Requirements	Allowable answers	Additional guidance																				
7a 1/2c	1m	Award ONE mark for: ■ ruler ■ metre rule ■ tape measure.	ONE mark may be awarded for: ■ measurement stick ■ metre stick.	Do not give credit for an insufficient response: ■ string.																				
7b 1/2d	2m or 1m	Award TWO marks for all four rows of the table completed correctly: <table><tr><th>Variable</th><th>Must be the same</th><th>Must be different</th><th>Makes no difference</th></tr><tr><td>surface of the ramp</td><td>✓</td><td></td><td></td></tr><tr><td>height of the ramp</td><td></td><td>✓</td><td></td></tr><tr><td>size of the marble</td><td>✓</td><td></td><td></td></tr><tr><td>mass of the marble</td><td>✓</td><td></td><td></td></tr></table> If you are unable to award two marks, award ONE mark for any three rows completed correctly.	Variable	Must be the same	Must be different	Makes no difference	surface of the ramp	✓			height of the ramp		✓		size of the marble	✓			mass of the marble	✓				
Variable	Must be the same	Must be different	Makes no difference																					
surface of the ramp	✓																							
height of the ramp		✓																						
size of the marble	✓																							
mass of the marble	✓																							
7c 1/2m,c	1m	Award ONE mark for recognising that the marble will not roll easily off such a steep ramp: ■ the marble will drop very quickly and might bounce ■ the marble might not touch the ramp ■ the marble might break ■ it will just drop/fall (straight down) ■ the marble will fall off the ramp.	ONE mark may be awarded for a response indicating the marble stops at the bottom of the ramp: ■ the marble will not roll far when the ramp is so steep.	Do not give credit for an insufficient response referring to the speed of the marble: ■ the marble will go too fast down the ramp.																				
7d 1/2h 4/2e	1m	Award ONE mark for a point plotted at the origin (0,0) of the graph.	ONE mark may be awarded for a response in which the centre of the cross is less than half a square from the origin of the graph.	Do not give credit for an insufficient response in which the graph line is extended through (0,0) without a correctly plotted cross at (0,0).																				
When applying this mark scheme, please also refer to the General guidance given on pages 1 and 2.																								

Test B question 8: Candles

Question	Mark	Requirements	Allowable answers	Additional guidance									
8a 3/2g,d	1m	Award ONE mark for both rows of the table completed correctly: <table><tr><th>Observation</th><th>This is evidence of a reversible change.</th><th>This is evidence of a non-reversible change.</th></tr><tr><td>The wax melts.</td><td>✓</td><td></td></tr><tr><td>Smoke is given off.</td><td></td><td>✓</td></tr></table>	Observation	This is evidence of a reversible change.	This is evidence of a non-reversible change.	The wax melts.	✓		Smoke is given off.		✓		
Observation	This is evidence of a reversible change.	This is evidence of a non-reversible change.											
The wax melts.	✓												
Smoke is given off.		✓											
8b 1/2j	1m	Award ONE mark for a general comparison describing the relationship between the height of the candle and the time it takes to burn down: - the taller the candle, the longer it takes (to burn down) - the shorter/smaller the candle, the shorter time it takes the candle to burn down.	ONE mark may be awarded for two specific comparisons describing the relationship: - the tallest candle takes longest to burn and the smallest candle is quickest. ONE mark may be awarded for referring to speed rather than time: - the taller/shorter the candle, the slower/faster it burns (down).	Do not give credit for a response that changes one or both variables: - the bigger the candle, the brighter it burns [incorrect science]. Do not give credit for a single comparison of the variables: - the biggest/tallest candle takes the longest time to burn down.									
8c 1/2i	1m	Award ONE mark for: 23 minutes.	ONE mark may be awarded for a response in the range of 21 to 26 minutes inclusive.										

Test B question 8: Candles (continued)

Question	Mark	Requirements	Allowable answers	Additional guidance
8d 1/2h,i	1m	Award ONE mark for a graph line starting at 10cm that is steeper than that of candle C and finishes at 1 cm height with no deliberate upwards trends: 	 ONE mark may be awarded for an otherwise correct line that continues lower than 1 cm:	

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

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