2016 national curriculum tests

Key stage 2

2016 science sampling tests

Mark schemes

Standards
& Testing
Agency

Marking the science tests

The Standards and Testing Agency (STA) was responsible for the development and delivery of statutory science sampling tests in 2016. STA is an executive agency of the Department for Education (DfE).

This booklet contains the mark schemes for the selected questions released from the 2016 science sampling tests.

The questions were marked by external markers using these mark schemes, which are 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 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 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 exercised their professional judgement.

Key stage 2: additional marking guidance

The following guidance should be read carefully in conjunction with the specific mark scheme for each question.

General guidance

What if?	*Marking procedure*
The answer is written outside of the answer space.	Credit may be awarded if no answer is given in the designated answer space, but a correct response is written somewhere else and it is unambiguous which question is being answered.
A correct answer has been given and is crossed out and not replaced.	Credit may be given if the pupil has written the correct answer, crossed it out and not replaced it, provided that the response is clearly legible.
The pupil's response does not match closely any of the examples given.	Illustrative examples of pupils' responses to questions are sometimes given in the mark schemes. However, markers should always refer to the guidance given before the illustrative examples and apply their professional judgement as to which code to give. If uncertain, markers should escalate the issue to a more senior colleague.
The pupil gives two or more responses to a particular question.	**a)** If a pupil gives two creditworthy responses, for example one response from the requirements column and one from the allowable answers column, then the response should be deemed creditworthy. **b)** If a pupil gives two non-creditworthy responses, one of which is insufficient and the other is incorrect, then the response should be deemed non-creditworthy. **c)** If a pupil qualifies a scientifically correct answer with a scientifically incorrect statement then the response should be deemed non-creditworthy. **d)** 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 response can be marked as creditworthy.

What if?	*Marking procedure*
The pupil misspells a word.	**a)** If it is clear that the pupil has made a simple error, for example ‘son’ for ‘sun’, then the incorrect spelling will be accepted and credit can be given. **b)** 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.
The pupil uses the word ‘it’ in an answer without explicitly making clear what ‘it’ refers to. For example, ‘it dissolves faster’.	In these instances markers should refer to the question stem. If it is obvious from the question stem what the ‘it’ refers to, then you can assume that this is what the pupil means. In cases where the meaning of ‘it’ is ambiguous, then credit cannot be awarded and the response should be marked as directed in the mark scheme.

Single tick box questions

What if?	*Marking procedure*
The box is crossed rather than ticked.	This is an acceptable response, in the absence of ticks, as it is an unambiguous indication of the pupil’s answer.
The box is circled rather than ticked.	This is an acceptable response, in the absence of ticks, as it is an unambiguous indication of the pupil’s answer.
The answer contains a combination of ticks and crosses.	Ticks always take precedence over crosses and other alternative markings used by the pupil to indicate their selection.
The pupil places three crosses and leaves one box blank.	☐ ☒ ☒ ☒ In this case the response should be deemed non-creditworthy.

Circling the corrrect answer

What if?	*Marking procedure*
The pupil underlines their answer.	This is an acceptable response as it is an unambiguous indication of the pupil’s answer.

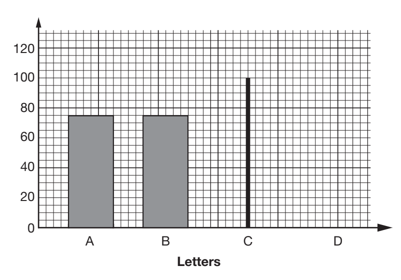
Matching questions

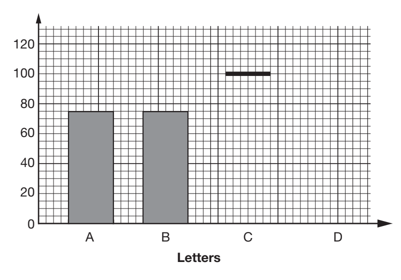
What if?	*Marking procedure*
Lines are drawn which do not touch the boxes.	Accept lines that do not touch the boxes provided that the intention is clear.
The pupil uses a numbering system instead of drawing lines.	Accept this as an unambiguous way for the pupil to indicate the correct answer.
Multiple lines are drawn to/from the same box.	This type of response will usually be non-creditworthy, although please refer to the mark scheme.

Table completion

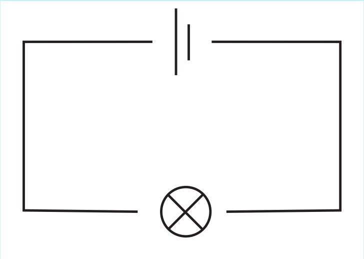
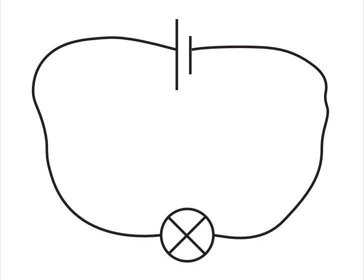
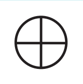
What if?	*Marking procedure*
A pupil indicates their selection using a tick in one row and a cross in another row.	Markers are to treat each row independently, as directed by the mark scheme.

Bar charts

What if?	*Marking procedure*
A pupil draws a vertical line from the x-axis to the correct data point instead of plotting a bar, for example: 	These responses should be credited provided they are plotted to the correct data point. Please refer to the mark scheme for the individual question for the tolerance levels permitted on the plotting of the data point.

What if?	*Marking procedure*
A pupil correctly draws a line on the data point but does not draw a bar, for example:  	These responses should be credited provided they are plotted at the correct data point. Please refer to the mark scheme for the individual question for the tolerance levels permitted on the plotting of the data point.

Electrical circuits

What if?	*Marking procedure*
A pupil draws a circuit diagram with gaps between the electrical components in the circuit, for example: 	If the gap between components in the circuit is 2 mm or less, then credit can be given. If the gap is greater than 2 mm then the response is deemed to be incorrect science and marked accordingly.
A pupil draws a non-rectilinear circuit diagram, for example: 	Provided that the electrical circuit is drawn correctly, non-rectilinear circuit diagrams are acceptable.
A pupil draws the symbol for a light bulb in the wrong orientation, for example: 	This symbol is not considered creditworthy as a representation of a bulb.

Key scientific terminology

Independent variable (IV) – the variable that is changed in an investigation.

Dependent variable (DV) – the variable that is measured in an investigation.

Control variable (CV) – the variables that are kept the same in an investigation to make the investigation a fair test.

So in an experiment which investigates the time it takes for sugar to dissolve in water at different temperatures, the **independent variable** would be the temperature of the water and the **dependent variable** would be the time taken for the sugar to dissolve. Examples of **control variables** would be the volume of the water used and the mass of sugar used.

Continuous variables – these are variables which can take any value, for example height or weight.

Discrete variables – these are variables which only take certain values from a fixed set, for example sex (male or female).

Anomalous results – a result which does not fit the pattern. In key stage 2 (KS2), pupils often use phrases such as 'the result looked odd' or 'the result looked different to the others' in order to describe an anomalous result.

Accuracy and reliability – these are two words which pupils often confuse and will sometimes use interchangeably:

- Accuracy – measurements are considered accurate if they are close to the 'true value'.
- Reliability – this refers to how similar the results are if you repeat the investigation multiple times. The more similar the results are, the more reliable they are and the greater confidence you can have in them.

Repeatable – a measurement is repeatable if the person doing the investigation repeats the investigation using the same method and equipment and the same results are obtained.

Reproducible – a measurement is reproducible if the investigation is repeated by **another person** and the same results are obtained.

At KS2 it is common that pupils will use the word 'reliable' to mean repeatable or reproducible.

Fair test and fair comparison – this is when only the **independent variable** has been allowed to affect the **dependent variable** and all other variables have been kept the same. A **fair test** has a continuous independent variable, such as height or temperature. A **fair comparison** has a discrete independent variable, such as when comparing different environments or objects.

Other points to note

Anthropomorphisms – responses of this nature are particularly common in questions on plants, for example pupils often refer to plants 'drinking water'. Anthropomorphisms of this nature should be treated as responses containing incorrect science and so should be marked accordingly.

The solar system – markers need to be very careful about marking the words pupils use to describe celestial movements, for example rotate/spin/turn/move. As there are two different types of movement for the Earth (rotation on its axis and its orbit around the Sun), it needs to be clear which type of movement pupils are referring to in their answers.

Magnetism – markers need to remember that a response which does not mention attraction does not automatically imply repulsion. The wording of the response needs to be considered carefully.

Magnets – if pupils refer to the poles as being 'positive' and 'negative', then this is considered to be incorrect science and so should be marked accordingly.

If pupils refer to the poles as 'ends' or 'sides', then this is considered to be an insufficient response as opposed to a response containing incorrect science.

Booklet 2B
Mark scheme

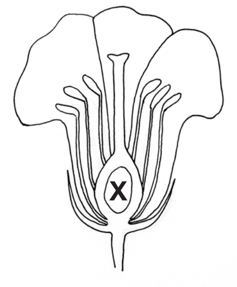
Question 1: **Duck pond**

Question	*Mark*	*Requirements*	*Allowable answers*	*Additional guidance*
a	***1m***	Award **ONE** mark for: ☐ ☑ ☐ ☑		
bi	***1m***	Award **ONE** mark for: ■ webbed ■ they are like paddles/flippers	**ONE** mark may be awarded for: ■ they are wide (to push back the water)	***Do not*** *give credit for an insufficient response, for example:* ■ *it helps them swim* ■ *they are large/larger* ■ *the feet are spread out*
bii	***1m***	Award **ONE** mark for recognising the female duck's colouration will mean it is camouflaged, for example: ■ it is brown so the same colour as the nest ■ brown so well camouflaged ■ duller colours than male so better camouflaged	**ONE** mark may be awarded for: ■ it is camouflaged ■ she is the same colour as the nest ■ she is not colourful so would blend in / not stand out	***Do not*** *give credit for an insufficient response, for example:* ■ *the duck is brown* ■ *it is hidden because it is brown [given that the duck is hidden and brown]*
biii	***1m***	Award **ONE** mark for identifying that the duck needs to stay hidden so she or her eggs/ducklings are safe from predators, for example: ■ to protect her eggs/ducklings/babies/young (allow chicks) from predators ■ so she cannot be seen by predators/hunters	**ONE** mark may be awarded for: ■ so her eggs/young don't get eaten ■ so she isn't eaten/shot ■ to protect her eggs/young	***Do not*** *give credit for an insufficient response, for example:* ■ *she stays hidden [given]* ■ *so she cannot be seen [unqualified]*

Question 1: **Duck pond**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
ci	***1m***	Award **ONE** mark for **one** feature identified and a description of how it helps the mole to live underground: ■ broad/wide legs; strong for digging ■ front legs; look strong/have large muscles ■ feet; are large and wide to push back soil ■ (front) claws; for breaking up the soil/dirt ■ sharp/long claws; for digging ■ whiskers; for sensing prey/where they are going when underground	**ONE** mark may be awarded for: ■ head/nose; it is pointed to move through the soil ■ fur; smooth to move through the soil ■ claws; for digging **ONE** mark may be awarded for a feature of a mole that is not clearly observable from the picture and a description of how that feature helps the mole to live underground: ■ tiny/invisible eyes; so dirt does not get in ■ small hind limbs; so do not get in the way to move easily through the soil	***Do not*** *give credit for an insufficient response:* ■ *claws; to live underground [given]*
cii	***1m***	Award **ONE** mark for: ☐ ☑ ☐ ☐		***Do not*** *give credit if more than one box is ticked.*

Question 2: **Seed dispersal**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
a	***1m***	Award **ONE** mark for the centre of a cross placed anywhere within the ovary [the inner circle]:  	**ONE** mark may be awarded if the centre of the cross is exactly on the line of the inner circle.	
b	***1m***	Award **ONE** mark for naming a piece of equipment that can be used to measure the distance: ■ tape measure ■ metre rule ■ ruler	**ONE** mark may be awarded for: ■ metre/measurement stick	***Do not*** *give credit for an insufficient response:* ■ *string*
c	***1m***	Award **ONE** mark for recognising that the blowing force from a fan is the same each time it is used **or** that the blowing force from the children may vary, for example: ■ because the fan/it will always blow the same way ■ people/they do not blow the same each time ■ the fan blows at the same speed ■ the fan uses the same amount of force	**ONE** mark may be awarded for a response indicating the children may blow a different number of times, for example: ■ (with their mouths), they might blow a different number of times	***Do not*** *give credit for an insufficient response describing an advantage of using a fan which does not address fair testing, for example:* ■ *a fan is more powerful* ■ *they may run out of breath* ■ *they will blow for a shorter time with their mouths* ***Do not*** *give credit for an insufficient response that implies the fan does not blow consistently, for example:* ■ *it blows differently each time ['it' refers to the fan]*

Question 2: **Seed dispersal**

Question	Mark	Requirements	Allowable answers	Additional guidance
d	***1m***	Award **ONE** mark for: ☐ ☐ ☑ ☐		***Do not*** *give credit if more than one box is ticked.*
e	***1m***	Award **ONE** mark for: ■ air resistance	**ONE** mark may be awarded for: ■ friction ■ wind resistance ■ drag	***Do not*** *give credit for a response that includes incorrect science:* ■ *gravity* ■ *weight* ***Do not*** *give credit for an insufficient response:* ■ *upthrust* ■ *an upwards push* ■ *wind* ■ *resistance*
f	***1m***	Award **ONE** mark for a response describing a method of seed dispersal other than the wind, for example: ■ they might get eaten by animals ■ they might get stuck in animals' fur ■ (washed away) by water ■ by a seed pod exploding	**ONE** mark may be awarded for: ■ the tree might be on a hill so the seed can roll down ■ by animal	***Do not*** *give credit for an insufficient responce, for example:* ■ *drops (from tree) (given)*

Question 3: **Grass heads**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
a	***1m***	Award **ONE** mark for naming **any two** of the following: ■ (sun)light ■ air ■ nutrients/minerals ■ warmth ✣ oxygen/O_2 (beyond key stage 2) ✣ carbon dioxide/CO_2 (beyond key stage 2)	**ONE** mark may be awarded for: ■ space	***Do not*** *give credit for an insufficient response, for example:* ■ *soil* ■ *fertiliser* ■ *Sun* ***Do not*** *give credit for a response that includes incorrect science:* ■ *food*
b	***1m***	Award **ONE** mark for an indication that the grass will get less light, for example: ■ the hat blocks the light to the grass ■ it doesn't get any/enough sunlight	**ONE** mark may be awarded if the understanding that the light is blocked is implicit, for example: ■ the grass needs sunlight to grow ■ photosynthesis cannot take place ■ because it's dark/in the shade	***Do not*** *give credit for a response that includes incorrect science:* ■ *there is no Sun(light)* ***Do not*** *give credit for an insufficient response that does not implicitly indicate light is blocked, for example:* ■ *it doesn't get the Sun* ■ *it blocks the Sun*
c	***1m***	Award **ONE** mark for: *finding an average length of several pieces of grass.* **yes** *measuring the length of a different piece of grass each week.* **no**		

Question 3: **Grass heads**

Question	Mark	Requirements	Allowable answers	Additional guidance
d	***1m***	Award **ONE** mark for: *condenses from the grass head and evaporates on the bag.* ☐ *dissolves from the grass head and evaporates on the bag.* ☐ *evaporates from the grass head and condenses on the bag.* ☑ *dissolves from the grass head and condenses on the bag.* ☐		***Do not** give credit if more than one box has been ticked.*

Question 4: **Small pox**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
ai	***1m***	Award **ONE** mark for: ☐ ☑ ☐ ☐		***Do not*** *give credit if more than one box has been ticked.*
aii	***2m***	Award **TWO** marks for describing that Dr Jenner must have infected James with smallpox **and** for identifying the evidence he needed to collect to show his statement was true, that James did then not develop smallpox, for example: ■ he gave James smallpox but James did not get ill ■ he infected the boy with smallpox and then saw that he did not get the disease ■ he must have infected James with smallpox but he wouldn't have caught it If you are unable to award two marks, award **ONE** mark for identifying either what Dr Jenner must have done next or the evidence needed to show his statement was true, for example: ■ he tried to give James smallpox ■ James didn't catch smallpox	**TWO** marks may be awarded for: ■ he could have put James close to people with smallpox and if James didn't get it, he would know he was right ■ he gave James smallpox but he stayed well [implies infected as then explains did not get ill] **ONE** mark may be awarded for: ■ he could have put James near lots of people with smallpox to see if he got it ■ he gave James smallpox [assumes means infected]	***Do not*** *give credit for an insufficient response that does not indicate smallpox, for example:* ■ *he infected him but James didn't get it* ■ *he didn't get ill*

Question 4: **Small pox**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
aiii	***1m***	Award **ONE** mark for indicating he needed to do the experiment again to improve the reliability of the results/test/conclusion, for example: ■ to make his results/test (more) reliable ■ to check/make sure of his (first set of) results ■ to get more evidence ■ to collect more data ■ to make sure his prediction/conclusion was correct/right Award **ONE** mark for indicating that people respond differently: ■ because people may be different (and have different results)	**ONE** mark may be awarded for a response indicating the results can be compared **or** will be more accurate: ■ to see/make sure if the results were the same ■ to see if they were similar to his first results ■ to see if the results followed the same pattern ■ so he 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), for example: ■ he might have done something wrong the first time ■ in case he got an odd result ■ to make sure his result was not a mistake	***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, for example:* ■ *to get the correct/right answer/results* ■ *to make sure he has got it right* ■ *to see/check if the results/answers are correct/right* ***Do not*** *give credit for an insufficient response, for example:* ■ *to check it* ■ *to see if he gets it/the test right*
b	***1m***	Award **ONE** mark for: ■ 98		

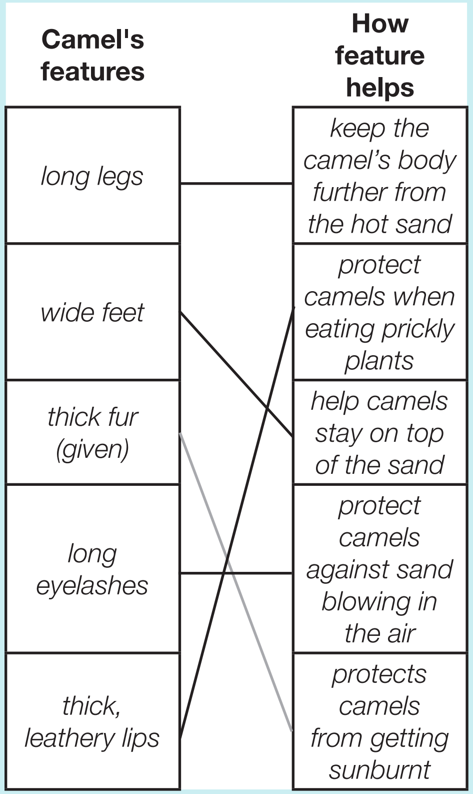
Question 4: **Small pox**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
c	***1m***	Award **ONE** mark for identifying that there are discrepancies that do not fit the pattern (that younger people were more likely to die) **or** that you would need more evidence of ages not given in the table to be sure of the pattern **or** that you would need to know how many people were in the total population for each age: ■ more people died at 20 years than 10 years ■ you only know what happens at every ten years ■ the number that died at 70 and 80 may be less because not many people lived that long then	**ONE** mark may be awarded for: ■ at 60 years it is higher than at 50 ■ fewer people die at 10 than at 20 years	***Do not*** *give credit for an insufficient response, for example:* ■ *50 years is too low [no comparison with an older age to demonstrate that it doesn't fit the pattern]* ***Do not*** *give credit for an insufficient response that just repeats data from the table with no interpretation:* ■ *240 people died at 20 years*

Booklet 5B

Mark scheme

Question 1: **Camel**

Question	Mark	Requirements	Allowable answers	Additional guidance
a	***2m***	Award **TWO** marks for:  Camel's features How feature helps long legs wide feet thick fur (given) long eyelashes thick, leathery lips keep the camel's body further from the hot sand protect camels when eating prickly plants help camels stay on top of the sand protect camels against sand blowing in the air protects camels from getting sunburnt	If **TWO** marks cannot be awarded, award **ONE** mark for any **two** correct lines drawn.	***Do not*** *give credit if more than one line is drawn from each camel's feature.*

Question 2: **Tree**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
ai	***1m***	Award **ONE** mark for: ■ (Sweet) chestnut		
aii	***1m***	Award **ONE** mark for: ☐ ☑ ☐ ☐		***Do not*** *give credit if more than one box has been ticked.*
bi	***1m***	Award **ONE** mark for a response stating that the leaves make new materials for growth or take in light, for example: *The tree uses its leaves to…* ■ produce sugar/food (for growth) ■ absorb light ✣ Award **ONE** mark for a correct response that goes beyond the key stage 2 programme of study, for example: ■ take in/release CO_2 / O_2 ■ release water ■ create/produce O_2 ■ store food/waste ■ respire/photosynthesise ■ absorb energy from the sun(light) ■ produce chlorophyll	**ONE** mark may be awarded for: ■ make/give it food **ONE** mark may be awarded for: ■ collect/gather/catch (sun)light	***Do not*** *give credit for a response that includes incorrect science:* *The tree uses its leaves to...* ■ *make energy* ■ *feed* ■ *get/take in food (from the Sun)* ■ *breathe in carbon dioxide/oxygen* ***Do not*** *give credit for an insufficient response, for example:* ■ *produce/make/get nutrients*

Question 2: **Tree**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
bii	***1m***	Award **ONE** mark for a response stating that the roots are used to anchor the plant in the soil **or** absorb water/minerals from the soil: *The tree has roots to…* ■ absorb/take up/soak up water/moisture/minerals	**ONE** mark may be awarded for: *The tree has roots to…* ■ stabilise the plant (keep it steady) ■ take in/get water/nutrients ■ draw/drain water (from the soil) ■ gather/collect water/nutrients ■ carry water **ONE** mark may be awarded for a response indicating a supporting function of the roots which may work in conjunction with the stem, for example: *The tree has roots to…* ■ support (the plant) ■ hold it up ■ make it stand straight/up **ONE** mark may be awarded for a response indicating that the roots can store water.	***Do not*** *give credit for a response that includes incorrect science indicating that water is taken up by 'drinking' or 'sucking'.* ***Do not*** *give credit for a response that includes incorrect science indicating that the root gives the plant food:* ■ *take/send up/bring/gather/absorb food* ■ *feed it* ■ *for nutrients/moisture [not clear they are taken in]* ***Do not*** *give credit for an insufficient response, for example:* ■ *the roots keep the plant balanced* ■ *hold it in* ***Do not*** *give credit for a response that includes incorrect science indicating that roots produce nutrients.* ***Do not*** *give credit for an insufficient response where 'goodness' is used in place of 'nutrients', 'water' or 'minerals'.*
c	***1m***	Award **ONE** mark for a response indicating seeds are produced so the tree can reproduce, for example: ■ for reproduction/to reproduce	**ONE** mark may be awarded for a response describing or implying reproduction, for example: ■ to grow/make more/new plants/trees **ONE** mark may be awarded for a response explaining the tree will not become extinct, for example: ■ so the species survives	***Do not*** *give credit for an insufficient response, for example:* ■ *so they can be dispersed* ■ *to produce the flowers* ■ *because trees grow from seeds [does not imply more/new trees]* ■ *to continue the cycle* ■ *so the tree survives*

Question 2: **Tree**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
d	***1m***	Award **ONE** mark for a response identifying a feature and describing how it helps the squirrel to live in a tree, for example: ■ (bushy) tail; it helps to keep balance ■ claws/long fingers and toes; to grip onto the branches/climb trees ■ (sharp) teeth; to eat nuts/seeds/fruits growing on trees	**ONE** mark may be awarded if the feature is given within the description, for example: ■ feet; clawing feet grasp the tree for climbing	***Do not*** *give credit for an insufficient response indicating hands or feet grip the tree, for example:* ■ *hands/feet; grip tree/branches* ***Do not*** *give credit for an insufficient response, for example:* ■ *fur; keeps them warm in winter [this is not specifically needed for tree living]* ■ *brown fur; for camouflage* ■ *good climber; helps it escape from predators/eat nuts* ■ *eat nuts/seeds; these grow in trees* ■ *hands/feet; climb/hold nuts* ■ *claws; for keeping balance*

Question 3: **Human life cycle and pulse rate**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
a	***1m***	Award **ONE** mark for: ■ toddler/infant/child **AND** ■ adult/grown-up	**ONE** mark may be awarded for: ■ middle age ■ man	***Do not*** *give credit for an insufficient response describing an adult as a parent:* ■ *dad*
b	***1m***	Award **ONE** mark for: *Pulse rate measures how quickly the* **heart** *pumps blood around the body.*		
c	***1m***	Award **ONE** mark for a recognition that the test will be unfair because exercise increases pulse rate or a control variable has not been controlled, for example: ■ if they have been exercising the pulse rate will be faster ■ their pulse rates will be higher than they should be after exercising ■ the people being tested haven't all done the same thing	**ONE** mark may be awarded for: ■ pulse rate is affected by exercise	***Do not*** *give credit for an insufficient response, for example:* ■ *she will be measuring the pulse rates under different conditions [given]* ■ *the test will be unfair [given in the lozenge the test will not be fair]*
d	***1m***	Award **ONE** mark for a response explaining how the result for old age does not fit the pattern, for example: ■ because the pulse rate for old age is faster than the rate for adults ■ the adults have lower pulse rates than the old-aged people ■ the pulse rate for the oldest person/old age is not the slowest	**ONE** mark may be awarded for: ■ the pulse rate for old age has increased **ONE** mark may be awarded for responses that refer to letters in the table rather than naming stages: ■ the pulse for E is higher than D ■ the pulse for E has got faster (again)	***Do not*** *give credit for an insufficient response which does not compare results, for example:* ■ *the pulse rate for adults is 72 and for old people it is 76* ■ *the pulse rate for old age is fast*

Question 3: **Human life cycle and pulse rate**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
e	***1m***	Award **ONE** mark for:		

Activity	*Will the activity affect the person's resting pulse rate? Yes or no?*
swim every day	**yes**
go for a walk every day	**yes**
read every day	**no**

Question 4: **Penicillin**

<table>
<tr><th>Question</th><th>Mark</th><th>Requirements</th><th>Allowable answers</th><th>Additional guidance</th></tr>
<tr>
<td>ai</td>
<td><i>1m</i></td>
<td>Award ONE mark for:
<table>
<tr><th><i>Living things</i></th><th><i>Non-living things</i></th></tr>
<tr><td><i>bacteria</i>
mould
human</td><td>glass dish
agar (jelly)</td></tr>
</table>
</td>
<td>Accept:
■ dish
■ glass
■ agar
■ jelly</td>
<td><i>Do not</i> <i>give credit if one thing has been placed in both columns.</i></td>
</tr>
<tr>
<td>aii</td>
<td><i>1m</i></td>
<td>Award ONE mark for a life process other than ‘growing’:
■ reproduction
■ movement
■ nutrition

✣ Award ONE mark for a correct response that goes beyond the key stage 2 programme of study:
■ excretion
■ respiration
■ sensitivity</td>
<td>ONE mark may be awarded for:
■ reproducing
■ moving

ONE mark may be awarded for a correct response that goes beyond the key stage 2 programme of study:
■ excreting
■ respiring</td>
<td><i>Do not</i> <i>give credit for an insufficient response describing a life process, for example:</i>
■ <i>having babies</i>
■ <i>eating</i>
■ <i>getting rid of waste</i>
■ <i>breathing</i></td>
</tr>
</table>

Question 4: **Penicillin**

Question	Mark	Requirements	Allowable answers	Additional guidance
b	***1m***	Award **ONE** mark for recognising that there are less bacteria in the second dish when the mould has grown **or** that the mould must be killing or stopping the bacteria from growing, for example: ■ the mould has killed the bacteria ■ the mould has stopped the bacteria growing ■ the medicine/penicillin kills the bacteria [referring to mould as medicine as indicated later in the question] ■ fewer groups of bacteria are in the dish with the mould ■ fewer bacteria on day 6 ■ no bacteria are near the mould on day 6	**ONE** mark may be awarded for: ■ there are no bacteria around the mould ■ fewer bacteria have grown in the dish with mould **ONE** mark may be awarded for a response that does not refer to the second dish (day 6) with the mould: ■ there are less bacteria in the dish ■ fewer bacteria are growing	***Do not*** *give credit for an insufficient response that implies the bacteria has moved away from the mould or that does not make it clear that the mould must be killing/stopping growth of the bacteria in some way, for example:* ■ *the bacteria stays away from the mould* ■ *the bacteria went away* ■ *the mould made the bacteria disappear* ■ *the mould took away some bacteria* ***Do not*** *give credit for a response that includes incorrect science implying the bacteria ate the mould.*
c	***2m***	Award **TWO** marks for: *The medicine had to be tested to make sure it was safe.* **true** *Scientists had to find a way of making lots of penicillin at a time.* **true** *It took 10 years for the mould to start growing.* **false** *Fleming needed to check that his ideas were correct.* **true**	If **TWO** marks cannot be awarded, award **ONE** mark for any **three** statements correctly identified as true or false.	

Question 5: **Plants on the school field**

<table>
<tr><th><i>Question</i></th><th><i>Mark</i></th><th><i>Requirements</i></th><th><i>Allowable answers</i></th><th><i>Additional guidance</i></th></tr>
<tr><td>a</td><td><i>1m</i></td><td>Award ONE mark for:
<table>
<tr><th rowspan="2"><i>Place</i></th><th colspan="2"><i>Conditions</i></th></tr>
<tr><th><i>Does the plant have light?</i></th><th><i>Does the plant have water?</i></th></tr>
<tr><td>B</td><td>✓</td><td>✓</td></tr>
<tr><td>C</td><td>✓</td><td>✗</td></tr>
<tr><td>A</td><td>✗</td><td>✓</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>b</td><td><i>1m</i></td><td>Award ONE mark for:
<table>
<tr><td><i>to stop plants becoming extinct.</i></td><td>false</td></tr>
<tr><td><i>to help people identify plants.</i></td><td>true</td></tr>
<tr><td><i>to help plants reproduce.</i></td><td>false</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>c</td><td><i>1m</i></td><td>Award ONE mark for a general comparison describing the relationship between the number of children playing in an area and the number of common plantains found there, for example:
■ the fewer children playing in a place, the lower the number of common plantains found there
■ the more children (playing in a place), the more common plantains (found there)
■ the bigger the number of common plantains found, the more children play there</td><td>ONE mark may be awarded for two specific comparisons describing the relationship, for example:
■ there are most common plantains where most children play <u>and</u> least common plantains where fewest children play</td><td><i>Do not</i> <i>give credit for an insufficient response giving a single comparison of the variables, for example:</i>
■ <i>many common plantains grow where lots of children play</i>
<i>Do not</i> <i>give credit for a response that changes one or both variables, for example:</i>
■ <i>the more plantains, the less buttercups</i></td></tr>
</table>

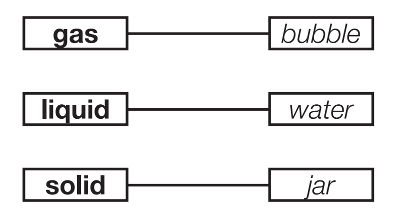
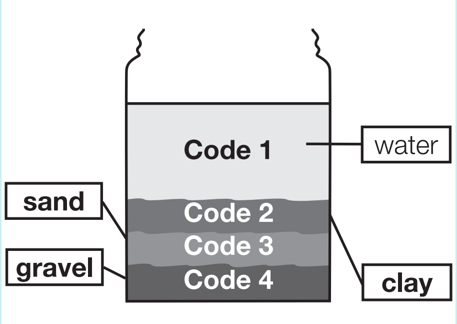
Question 5: **Plants on the school field**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
d	***1m***	Award **ONE** mark for an indication that the stem of the buttercup will break easily, for example: ■ the stem (is thin so it) breaks easily ■ the buttercup's stem could break	**ONE** mark may be awarded for: ■ it is less strong	***Do not*** *give credit for an insufficient response which does not describe what may happen to the buttercup stem specifically:* ■ *it could get trodden on* ***Do not*** *give credit for an insufficient response:* ■ *it gets squashed [smaller plants also get squashed but survive]*

Booklet 8C

Mark scheme

Question 1: **Soil**

Question	Mark	Requirements	Allowable answers	Additional guidance
a	***1m***	Award **ONE** mark for:  **gas** *bubble* **liquid** *water* **solid** *jar*		
b	***1m***	Award **ONE** mark for:  **Code 1** water **sand** **Code 2** **Code 3** **gravel** **Code 4** **clay**		

Question 2: **Tearing paper**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
a	***1m***	Award **ONE** mark for a heading in the left-hand column that indicates 'type of paper': ■ material ■ paper (type)		
	1m	Award **ONE** mark for a heading in the right-hand column that indicates 'force' (needed to tear the paper): ■ force (needed) ■ (size of the) pull		***Do not*** *give credit for a response that includes* *incorrect science:* ■ *weight* ***Do not*** *give credit for an insufficient response, for example:* ■ *forcemeter* ■ *rip*
b	***1m***	Award **ONE** mark for: ☐ ☑ ☐ ☐		***Do not*** *give credit if more than one box has been ticked.*
c	***1m***	Award **ONE** mark for: ☐ ☐ ☑ ☐		***Do not*** *give credit if more than one box has been ticked.*

Question 2: **Tearing paper**

<table>
<tr><th>Question</th><th>Mark</th><th>Requirements</th><th>Allowable answers</th><th>Additional guidance</th></tr>
<tr><td>d</td><td>1m</td><td>Award ONE mark for each row of the table as follows:
<table>
<tr><th rowspan="2">Change to newspaper</th><th colspan="3">The newspaper will be…</th></tr>
<tr><th>easier to tear
Code 1</th><th>harder to tear
Code 2</th><th>the same to tear
Code 3</th></tr>
<tr><td>box d1</td><td></td><td>✓</td><td></td></tr>
<tr><td>box d2</td><td>✓</td><td></td><td></td></tr>
<tr><td>box d3</td><td></td><td></td><td>✓</td></tr>
</table>
</td><td></td><td>Do not give credit if more than one tick in a row.</td></tr>
</table>

Question 3: **Separating sand and salt**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
a	***1m***	Award **ONE** mark for any **one** correct from: ■ (it) dissolves ■ (it) forms a solution		***Do not*** *give credit for a response that includes* *incorrect science:* ■ *it melts* ***Do not*** *give credit for an insufficient response:* ■ *it disappears*
bi	***1m***	Award **ONE** mark for: ■ filtering/filtration	**ONE** mark may be awarded for: ■ filter	***Do not*** *give credit for a response that includes* *incorrect science:* ■ *funnelling*
bii	***1m***	Award **ONE** mark for each part correct: ■ the *sand* stays in the filter paper **and** ■ the *liquid* goes through/into the beaker	**ONE** mark may be awarded for: ■ the *sand* stays/is trapped **and** the *liquid* goes through ■ the *sand* gets stuck in the paper **and** the *liquid* gets through	***Do not*** *give credit for an insufficient response or omitted response:* ■ *the sand stays in the filter paper the liquid…* ■ *the sand… the liquid goes into the beaker* ***Do not*** *give credit for an insufficient response:* ■ *the sand sticks to the container [the sand doesn't stick]* ■ *the sand gets stuck in the funnel [implies the sand has got through the paper]* ■ *the sand stays in the funnel*

Question 3: **Separating sand and salt**

Question	*Mark*	*Requirements*	*Allowable answers*	*Additional guidance*
c	***2m***	Award **TWO** marks for: ☐ ☐ ☐ ☑ ☑ ☐	If **TWO** marks cannot be awarded, award **ONE** mark for **one** correct box ticked.	
d	***2m***	Award **TWO** marks for any **two** correct responses: ■ with a magnet (to attract the nails) ■ use a sieve ■ pick out the nails	If you are unable to award **TWO** marks, award **ONE** mark for any **one** correct response.	

Question 4: **Pond depth**

Question	*Mark*	*Requirements*	*Allowable answers*	*Additional guidance*
a	***1m***	Award **ONE** mark for the correct heading: ■ depth of water **AND** for the correct unit: ■ cm	**Accept**: ■ water ■ depth	
b	***1m***	Award **ONE** mark for: Friday **AND** for a response that clearly indicates that the water has got deeper, for example: ■ the depth (of water) increased ■ the water is higher/deeper ■ the water was higher by Friday ■ Friday was the deepest ■ it is deeper	**Accept**: ■ there is more water	***Do not*** *give credit for an insufficient response indicating the bar is higher than the others with no interpretation:* ■ *the bar is highest* ■ *the bar is higher than the others/Thursday* ***Do not*** *give credit for an insufficient response that does not make it clear they are referring to the highest water level:* ■ *it is higher [could refer to air temperature]* ■ *there is more* ■ *it went up* ■ *the bar is higher*
ci	***1m***	Award **ONE** mark for: ■ the Sun		

Question 4: **Pond depth**

Question	Mark	Requirements	Allowable answers	Additional guidance
cii	***1m***	Award **ONE** mark for describing the relationship between the two variables **air temperature** and **depth of water**, for example: ■ the higher the air temperature, the lower the depth of water in the pond ■ the higher the temperature, the less deep the pond ■ the lower the air temperature, the deeper the water	**ONE** mark may be awarded for: ■ lower (temperature), deeper/higher water ■ the hotter (it is), the less deep (the water) ■ the higher the temperature, the lower the water **ONE** mark may be awarded for two specific comparisons describing the relationship: ■ if the air temperature is low, the water is deep, and if high, the water is shallower	***Do not*** *give credit for a single comparison of the variables:* ■ *at 12 °C the water is deep* ***Do not*** *give credit for a response that includes incorrect changing of one of the variables:* ■ *the lower the temperature the bigger the water [implies size of pond]*
di	***1m***	Award **ONE** mark for identifying that the jam jar has a wider neck so can collect more water or it is likely to be more stable as wider, for example: ■ the opening is wider to collect the rain ■ it is less likely to fall over	**ONE** mark may be awarded for: ■ it has a wider neck/opening ■ it can collect more water (as it is wider)	***Do not*** *give credit for an insufficient response:* ■ *it is thicker* ***Do not*** *give credit* for *an insufficient response that does not indicate that a wider neck is an advantage, for example:* ■ *it is wider* ■ *it is bigger/larger*
dii	***1m***	Award **ONE** mark for identifying the measuring cylinder has gradations on it to give an instant record of the volume of water collected, for example: ■ it has measurements on the side to record the amount of water ■ you can measure the amount/volume of water collected	**ONE** mark may be awarded for: ■ it has measurements on the side ■ it shows how much water is collected ■ you will be able to check how much it rained straight away	

Question 5: **Mountains**

<table>
<tr><th>Question</th><th>Mark</th><th>Requirements</th><th>Allowable answers</th><th>Additional guidance</th></tr>
<tr>
<td>a</td>
<td>2m</td>
<td>Award TWO marks for:
<table>
<tr><th rowspan="2">Process</th><th colspan="4">Name of process…</th></tr>
<tr><th>melting</th><th>freezing</th><th>cond'sing</th><th>evap'ting</th></tr>
<tr><td>A</td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>B</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>C</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>D</td><td></td><td>✓</td><td></td><td></td></tr>
</table>
</td>
<td>If you are unable to award TWO marks, ONE mark may be awarded for any three ticks in the correct place.</td>
<td>Do not give credit if there is more than one tick in a row.</td>
</tr>
</table>

Booklet 9C

Mark scheme

Question 1: **Drying fabric**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
a	***1m***	Award **ONE** mark for: ■ polyester		
b	***1m***	Award **ONE** mark for: ☐ ☐ ☐ ☑		***Do not*** *give credit if more than one box has been ticked.*
c	***1m***	Award **ONE** mark for: *…form because liquids can flow.* **true** *…may change shape as they fall.* **true** *…form because the water becomes warm.* **false**		
d	***1m***	Award **ONE** mark for a response that identifies that water evaporates from the clothes, for example: ■ the water has evaporated ■ evaporation		***Do not*** *give credit for an insufficient response that describes rather than names the process, for example:* ■ *it has turned to (water) vapour* ■ *the water has become a gas* ***Do not*** *give credit for an insufficient response:* ■ *the water has been blown away/dried* ■ *it has gone into the air* ***Do not*** *give credit for incorrect science:* ■ *steam*

Question 1: **Drying fabric**

Question	*Mark*	*Requirements*	*Allowable answers*	*Additional guidance*
e	***1m***	Award **ONE** mark for a response that identifies that liquid water is formed by condensation: ■ condensation	**ONE** mark may be awarded for: ■ condense	***Do not*** *give credit for an insufficient response describing the process:* ■ *it has turned into a liquid [given]* ■ *water vapour turns into drops of (liquid) water* ***Do not*** *give credit for incorrect science:* ■ *steam* ■ *water condenses [it is the water vapour that condenses, not the water]*

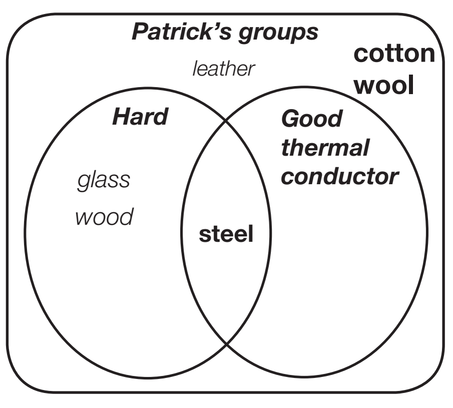
Question 2: **Flowing oil**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
a	***1m***	Award **ONE** mark for: ■ 22	**ONE** mark may be awarded for a response from 21.9 to 22.1 seconds inclusive.	
b	***1m***	Award **ONE** mark for a general comparison describing the relationship between the **temperature** of the oil, and the **time** taken for the oil to drip out of the cup, for example: ■ the higher the temperature, the less time the oil takes to drip out of the cup ■ the cooler the oil, the more time it takes	**ONE** mark may be awarded for references to the rate of dripping rather than time taken, for example: ■ the cooler the oil, the slower it drips **ONE** mark may be awarded for **two** specific comparisons describing the relationship, for example: ■ at the lowest temperatures it took a long time to drip out, and at the highest, it took a short time ■ at the highest temperature, it was quickest, and at the lowest, it was slowest	***Do not*** *give credit for a change of variable, for example:* ■ *the hot oil is runnier* ■ *the hotter the oil, the easier it flows* ■ *the hotter the oil, the less there is in the cup* ***Do not*** *give credit for an insufficient response that refers to water instead of oil, for example:* ■ *hotter water takes less time* ***Do not*** *give credit for an insufficient response giving a single comparison of the variables, for example:* ■ *at the highest temperature, it was quickest* ■ *at 20°C, the oil took the longest time*

Question 2: **Flowing oil**

Question	*Mark*	*Requirements*	*Allowable answers*	*Additional guidance*
c	*1m*	Award **ONE** mark for a recognition of any one of the following controlled variables **or** a recognition that only the temperature of the oil was changed: ■ they let the oil drip from the same cup (each time) ■ they only changed the oil temperature ■ they used the same (type of) oil ■ they only used cooking oil ■ they used the same amount of oil (in the cup) ■ they only changed one variable ■ keep the hole the same size ■ timed until the same volume had dripped out	**ONE** mark may be awarded for: ■ they used the same cup	***Do not*** *give credit for an insufficient response referring to the reliability of results or accuracy of measurements rather than fair testing:* ■ *they used the same timer* ■ *they repeated the test* ■ *they used the same pot for collecting* ***Do not*** *give credit for an insufficient response that identifies a variable but does not indicate that the conditions were kept the same [except for the temperature]:* ■ *oil* ■ *cup* ***Do not*** *give credit for an insufficient response:* ■ *they made sure that the cup always had oil in [the amount of oil must be controlled, as it affects the rate of dripping]* ■ *they used the same water/honey [they used oil]*
d	*1m*	Award **ONE** mark for an indication that the hot oil is flammable: ■ the oil might catch fire ■ it would get too hot (and burn you)	**ONE** mark may be awarded for reference to dangers associated with a direct heat source: ■ the container might crack/burn ■ you might burn yourself on the flame ■ the flame might set something on fire ■ the (hot) oil could spit	***Do not*** *give credit for any reference to explosion:* ■ *the oil could explode* ***Do not*** *give credit for an insufficient response:* ■ *you could get hurt*

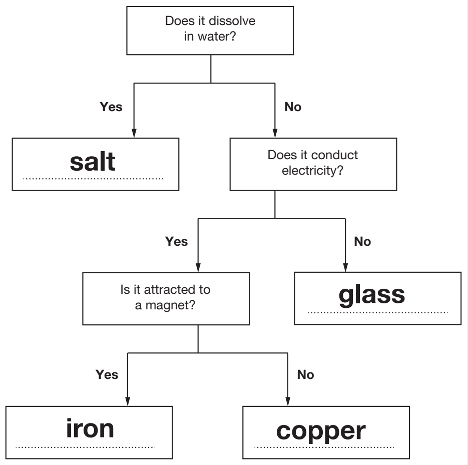
Question 3: **Grouping materials**

Question	*Mark*	*Requirements*	*Allowable answers*	*Additional guidance*
a	***1m***	Award **ONE** mark for:  Patrick's groups leather cotton wool Hard Good thermal conductor glass wood steel		
b	***1m***	Award **ONE** mark for identifying that the impermeable plastic does not let water through: ■ it is waterproof ■ it stops your feet getting wet ■ water cannot get inside the boot	**ONE** mark may be awarded for describing an advantage of the boot being waterproof without explicitly explaining why: ■ (it is useful) for stepping in mud and puddles ■ you will not get your feet muddy ■ it stops your legs getting dirty	***Do not*** *give credit for an insufficient response:* ■ *it keeps the rain off [rain will go on the boot]* ■ *dirt/rain* ■ *you will not get muddy* ■ *they are good for when it is raining or snowing*

Question 3: **Grouping materials**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
c	***2m***	Award **TWO** marks for identifying **any two** properties of the tea towel material: ■ absorbent ■ flexible ■ insulating ■ strong If you are unable to award **TWO** marks, **ONE** mark may be awarded for **any one** property.	**Accept**: ■ light (weight) **Accept** a description of the property: ■ it soaks up water ■ it dries things up ■ it stops hot things burning your hands ■ it curls around the dishes	***Do not*** *give credit for a second response that is a repetition or restatement of the first:* ■ *it soaks up water* ■ *it is good for drying things* ***Do not*** *give credit for an insufficient response that identifies properties that are not relevant to its use as a tea towel:* ■ *electrical insulator* ***Do not*** *give credit for an insufficient response:* ■ *soft [given]* ■ *not hard [implied]* ■ *you can wash it* ■ *it dries quickly* ■ *drying* ***Do not*** *give credit for an insufficient response that describes a use of the property rather than the property itself:* ■ *you can use it to take hot things out of the oven* ■ *you can wipe wet things*

Question 4: **Materials**

Question	Mark	Requirements	Allowable answers	Additional guidance
a	***2m***	Award **TWO** marks for:  Does it dissolve in water? Yes No salt Does it conduct electricity? Yes No Is it attracted to a magnet? glass Yes No iron copper	If **TWO** marks cannot be awarded, award **ONE** mark for any **two** materials in their correct places.	***Do not*** *give credit if more than one response is given in any one box.*

Question 5: **Science activity**

<table>
<tr><th>Question</th><th>Mark</th><th>Requirements</th><th>Allowable answers</th><th>Additional guidance</th></tr>
<tr>
<td>a</td>
<td><i>1m</i></td>
<td>Award ONE mark for a response that indicates a new material has been formed, for example:
■ a gas was made
■ a new material has been formed
■ bubbles show a new material is made

Award ONE mark for a response that indicates you cannot get the original materials back again, for example:
■ you cannot turn the gas back into vinegar and bicarbonate of soda
■ bubbles can’t change back</td>
<td>ONE mark may be awarded for:
■ they cannot go back</td>
<td><i>Do not give credit for an insufficient response relating to bubbles being made [given].</i></td>
</tr>
<tr>
<td>b</td>
<td><i>2m</i></td>
<td>Award TWO marks for:
<table>
<tr><th><i>Material</i></th><th><i>Solid</i></th><th><i>Liquid</i></th><th><i>Gas</i></th></tr>
<tr><td><i>glass</i></td><td>✓</td><td></td><td></td></tr>
<tr><td><i>vinegar</i></td><td></td><td>✓</td><td></td></tr>
<tr><td><i>bicarbonate of soda</i></td><td>✓</td><td></td><td></td></tr>
<tr><td><i>the inside of a bubble</i></td><td></td><td></td><td>✓</td></tr>
</table>
</td>
<td>If you are unable to award TWO marks, ONE mark may be awarded for any three ticks in the correct place.</td>
<td><i>Do not give credit for any row where more than one column has been ticked.</i>

<i>Do not give credit for any row where no columns have been ticked.</i></td>
</tr>
</table>

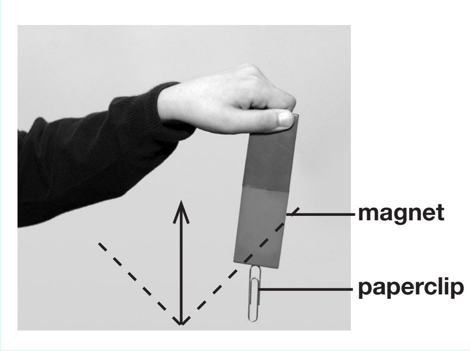
Question 6: **Soils**

Question	Mark	Requirements	Allowable answers	Additional guidance
a	***1m***	Award **ONE** mark for: - *Soil A is* **peat** - *Soil B is* **sand** - *Soil C is* **clay**		
b	***1m***	Award **ONE** mark for: ☐ ☐ ☐ ☑		***Do not*** *give credit if more than one box has been ticked.*
c	***1m***	Award **ONE** mark for 3.		***Do not*** *give credit for a response that is an incorrect answer:* - *47* - *50* - *2*
d	***1m***	**Code 1–2** to show the soil circled in each conclusion. **Code 1**: sand **Code 2**: clay - *Water takes longer to pass through* **box d1** *soil than through peat soil* - *More water stays in* **box d2** *soil than in peat soil*		

Booklet 12P

Mark scheme

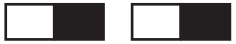
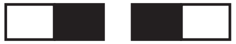
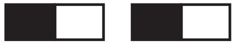
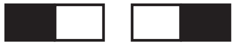
Question 1: **Magnetic forces**

Question	Mark	Requirements	Allowable answers	Additional guidance
a	**1m**	Award **ONE** mark for an arrow pointing upwards that is less than 45° either side of the vertical.  		***Do not*** *give credit for a response that includes* *incorrect science* *showing an arrow pointing downwards.* ***Do not*** *give credit for an insufficient response where a line, rather than an arrow, is drawn.*
b	**1m**	Award **ONE** mark for: ■ gravity ■ weight	**ONE** mark may be awarded for: ■ the pull of the Earth ■ gravitational attraction	***Do not*** *give credit for an insufficient response that does not recognise the force is due to the Earth, for example:* ■ *a pulling force towards the Earth* ■ *downwards pull* ***Do not*** *give credit for an insufficient response that may refer to the magnet's force, for example:* ■ *attraction*

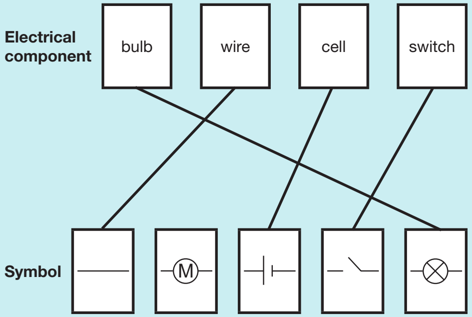
Question 1: **Magnetic forces**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
c	***1m***	Award **ONE** mark for an indication that the strongest magnet will hold the largest number of paperclips, for example: ■ it has more paperclips ■ the best magnet holds the most paperclips	**ONE** mark may be awarded for: ■ the magnet/it holds the most	***Do not*** *give credit for an insufficient response in which no comparison is given:* ■ *by the amount of paperclips it holds* ■ *magnet C holds 6 clips* ***Do not*** *give credit for an insufficient response referring to the results on the graph:* ■ *it is the biggest bar on the graph*
d	***1m***	Award **ONE** mark for correctly labelling the axis to indicate the number of paperclips.	**ONE** mark may be awarded for: ■ paperclips	
e	***1m***	Award **ONE** mark for an indication that the magnets are repelling each other **or** that like poles are together, for example: ■ they repel each other ■ they are repelling ■ the same poles are facing each other ■ two North/N poles/ends are facing ■ two South/S poles/ends are facing	**ONE** mark may be awarded for: ■ the same ends are facing each other	***Do not*** *give credit for a response that includes incorrect science that uses incorrect terminology:* ■ *negative and positive are facing* ***Do not*** *give credit for an insufficient response that implies each magnet is the same pole:* ■ *they are both North* ■ *they are the same poles* ***Do not*** *give credit for an insufficient response:* ■ *the poles are the same [does not imply the facing poles]* ■ *the same sides are facing*

Question 1: **Magnetic forces**

<table>
<tr><th>Question</th><th>Mark</th><th>Requirements</th><th>Allowable answers</th><th>Additional guidance</th></tr>
<tr><td>f</td><td>1m</td><td>Award ONE mark for:
<table>
<tr><th>Magnets</th><th>Move together</th><th>Move apart</th><th>Do not move</th></tr>
<tr><td></td><td>✓</td><td></td><td></td></tr>
<tr><td></td><td></td><td>✓</td><td></td></tr>
<tr><td></td><td>✓</td><td></td><td></td></tr>
<tr><td></td><td></td><td>✓</td><td></td></tr>
</table></td><td></td><td><i>Do not give credit if more than one box has been ticked in a row.</i>
<i>Do not give credit if no ticks are given in a row.</i></td></tr>
</table>

Question 2: **Electricity investigation**

Question	Mark	Requirements	Allowable answers	Additional guidance
a	*2m*	Award **TWO** marks for: *Do different cells affect the brightness of a bulb?* ☑ *How many bulbs can be lit by one cell?* ☐ *Does the number of cells affect the brightness of a bulb?* ☑ *Does the number of switches affect the brightness of a bulb?* ☐ *Does the direction of cells affect the brightness of a bulb?* ☑	If **TWO** marks cannot be awarded, award **ONE** mark for any **two** correct boxes ticked.	
b	*1m*	Award **ONE** mark for:  Electrical component bulb wire cell switch Symbol M		

Question 2: **Electricity investigation**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
c	***1m***	Award **ONE** mark for an indication that Lena should make the wires the same length, for example: ■ she should cut them to the same size ■ she should use wires that are the same length	**ONE** mark may be awarded for a response recognising why the test is not fair: ■ the wires are not the same length	***Do not*** *give credit for an insufficient response indicating that the independent variable should be changed, for example:* ■ *she should make the wires out of the same metal [the metal the wires are made from must be different]* ***Do not*** *give credit for an insufficient response, for example:* ■ *cut the wires* ■ *make the wires the same*
d	***1m***	Award **ONE** mark for: how quickly the bulb lights up ☐ how bright the bulb is ☑ how many wires there are ☐ what metals the wires are made of ☑		***Do not*** *give credit if the whole item is omitted and no boxes are ticked.*

Question 3: **The solar system**

Question	Mark	Requirements	Allowable answers	Additional guidance
a	***2m***	Award **TWO** marks for: *The Sun is a light source.* **true** *The Sun orbits the Earth.* **false** *The Sun is smaller than the Earth.* **false** *The Sun is a circle.* **false**	If **TWO** marks cannot be awarded, award **ONE** mark for any **three** statements correctly identified as true or false.	
bi	***1m***	Award **ONE** mark for Jupiter.		
bii	***1m***	Award **ONE** mark for Mercury.		***Do not*** *give credit for the ambiguous response:* ■ *M*

Question 3: **The solar system**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
c	***1m***	Award **ONE** mark for selecting **no AND** for a response identifying that some planets with short days have long years or that some planets with long days have short years, for example: ■ Jupiter has the shortest day but the longest year ■ Venus has a very long day but one of the shortest years	**ONE** mark may be awarded for selecting **no AND** for identifying data in the table which contradicts Joe's prediction if a clear comparison with other planets is implied, for example: ■ Jupiter has a day of 0.4 but a year of 4329 days ■ Jupiter has a short day but a long year ■ Venus has a day of 243 Earth days but a year of only 225 Earth days **ONE** mark may be awarded for selecting **no AND** for a response repeating two results from the table that show Joe's prediction is not true but no explicit comparison is made, for example: ■ Mars has a day of 1 Earth day and a year of 687 Earth days and Jupiter has a day of 0.4 Earth days and a year of 4329 Earth days **ONE** mark may be awarded if neither 'yes' or 'no' box is ticked but a creditworthy explanation indicates unambiguously that Joe's prediction is *not* true.	***Do not** give credit for an insufficient response in which only one result is repeated from the table with no comparison with the other planets, for example:* ■ *Jupiter has a long year* ■ *Jupiter has a day of 0.4 and a year of 4329 days* ***Do not** give credit for an insufficient response in which only partial evidence is identified or described and there is no clear comparison between day and year length, for example:* ■ *Jupiter has a shorter day than Mars*

Question 3: **The solar system**

Question	Mark	Requirements	Allowable answers	Additional guidance
d	***1m***	Award **ONE** mark for an indication that day and night are caused by the spin of the Earth, for example: ■ the Earth/it spins/rotates (on its axis) ■ the Earth/it turns on its axis	**ONE** mark may be awarded for: ■ the Earth/it revolves (on/about its axis) **ONE** mark may be awarded for a creditworthy response accompanied by an insufficient response describing the orbit of the Earth 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 day and night are caused by the orbit of the Earth around the Sun:* ■ *the Earth's orbit* ■ *the Earth going around the Sun* ■ *the Earth spins/rotates/revolves around the Sun* ***Do not*** *give credit for an insufficient response:* ■ *the Earth/it moves around* ■ *the Earth/it turns* ■ *the rotation [does not indicate what is rotating]* ■ *during the day, the Earth faces the Sun, at night the Earth faces away from the Sun/ faces the Moon*

Question 4: **Investigating grip**

Question	*Mark*	*Requirements*	*Allowable answers*	*Additional guidance*
a(i)	***1m***	Award **ONE** mark for a unit of time: ■ minutes ■ seconds ■ hours		
a(ii)	***1m***	Award **ONE** mark for a unit of mass or weight: ■ g ■ kg ■ newtons/N	**ONE** mark may be awarded for naming a unit of imperial measures: ■ stones ■ pounds	
b	***1m***	Award **ONE** mark for an indication of why Jun's plan is better: *Jun's plan is better because…* ■ he will (always) get a set of results ■ he is less likely to hurt himself ■ they might not fall over in Andy's test	**ONE** mark may be awarded for responses highlighting factors in Andy's plan that are not possible to control: ■ it might not be the shoes that make them fall over **ONE** mark may be awarded for: ■ it is quicker to do ■ Andy's plan could take a very long time to do	***Do not*** *give credit for an insufficient response:* *Jun's plan is better because…* ■ *it is longer* ■ *it has more details* ■ *it is more accurate [both plans have measurements that can be taken accurately]* ■ *it is a fair test*

Question 4: **Investigating grip**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
c	***1m***	Award **ONE** mark for identifying that shoe D has the smoothest sole: ■ it has a less bumpy sole than the others ■ it is flatter ■ it has the smoothest surface	**ONE** mark may be awarded for an absolute response: ■ it has no bumps/grooves ■ it has a flat surface ■ the sole has got no ridges/is smooth **ONE** mark may be awarded for: ■ it has less friction	***Do not*** *give credit for an insufficient response:* ■ *the sole has got less grip [given]* ■ *the sole is plain/has no pattern [does not imply texture]* ***Do not*** *give credit for a response that includes incorrect science:* ■ *it has no friction*
d	***1m***	Award **ONE** mark for **yes AND** for explaining that shoe D was moved by the least amount of weight, for example: ■ it moved with only 25 ■ it needed the least/less weight/force (to start moving) ■ the other shoes needed more weights before they moved	**ONE** mark may be awarded if neither box is ticked, but it is clear that the pupil believes the results support the prediction, and gives a creditworthy response	***Do not*** *give credit for an insufficient response which repeats the results without interpretation or comparison:* ■ *shoe D needed 25 (and shoe B needed 100)* ■ *shoe D moved after a small amount of weight* ***Do not*** *give credit for an insufficient response:* ■ *shoe D started to move more quickly*

Booklet 14P

Mark scheme

Question 1: **Car**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
a	***1m***	Award **ONE** mark for: ■ ruler ■ tape measure ■ metre stick	**ONE** mark may be awarded for: ■ measuring stick	***Do not*** *give credit for a response that includes* *incorrect science**:* ■ *a timer* ***Do not*** *give credit for an insufficient response naming units:* ■ *metres*
b	***1m***	Award **ONE** mark for a response indicating that the accuracy would be improved, the measurements would be quantified or that it would be easier to compare the results, for example: ■ the results would be more accurate ■ the results would be more reliable ■ you can tell the exact distance ■ you can be precise in how far it goes ■ measuring tells you how much, but if you look, you guess ■ when you are looking, you are only estimating ■ it is difficult to estimate the distance (by looking) ■ it is better to compare numbers ■ it would be easier to compare their results	**ONE** mark may be awarded for: ■ so you can be sure ■ you will know the real distance ■ (if you measure) you will know how far it went ■ if you do not measure, you might not be able to tell which went further ■ if you look, you will not know how far it went ■ your eyes cannot tell how far they go	***Do not*** *give credit for an insufficient response suggesting measuring provides a 'correct' answer, for example:* ■ *so you can get the right answer* ■ *so you can know the real answer* ***Do not*** *give credit for an insufficient response, for example:* ■ *it makes it a fair test* ■ *to make it fair* ■ *to see which is faster* ■ *if you look, you will not know which went furthest [it would be possible to see which went the furthest, but not the distance]*

Question 1: **Car**

Question	*Mark*	*Requirements*	*Allowable answers*	*Additional guidance*
c	***1m***	Award **ONE** mark for an explicit or implicit indication that the children would not be able to compare their results, for example: ■ they could not compare their results (if John pushes his car) ■ others have not pushed theirs ■ pushing will make the car go further/ make it different ■ pushing will give it more energy (than the others) ■ he has only done it with one car and not all four cars ■ because then he will be changing two variables	**ONE** mark may be awarded for: ■ pushing will give it a boost ■ pushing will make it go faster ■ he should let it roll in the same way, (not push it) ■ he should let it go down like the others **ONE** mark may be awarded for a response implying that **all** the cars are pushed and that the size of the push will cause the cars to travel for different distances or at different speeds **or** that the size of the push cannot be controlled.	***Do not*** *give credit for an insufficient response, for example:* ■ *it will not be a fair test* ■ *because he pushed it [given]* ■ *the car will be different*
d	***1m***	Award **ONE** mark for identifying the independent variable (IV) as the cars: ■ the cars		***Do not*** *give credit for a response that includes incorrect science indicating a controlled variable or the dependent variable, for example:* ■ *the slope* ■ *who pushes it* ■ *time of push* ■ *car speed* ■ *the angle* ■ *distance travelled*

Question 1: **Car**

<table>
<tr><th>Question</th><th>Mark</th><th>Requirements</th><th>Allowable answers</th><th>Additional guidance</th></tr>
<tr><td>e</td><td>1m</td><td>Award ONE mark for each row to show which box is ticked:
<table><tr><th></th><th>True</th><th>False</th><th>Can't tell</th></tr><tr><td>Car C went…</td><td>✓</td><td></td><td></td></tr><tr><td>Car C was…</td><td></td><td></td><td>✓</td></tr><tr><td>Car D went…</td><td></td><td>✓</td><td></td></tr></table></td><td></td><td>Do not give credit if more than one tick in a row.</td></tr>
</table>

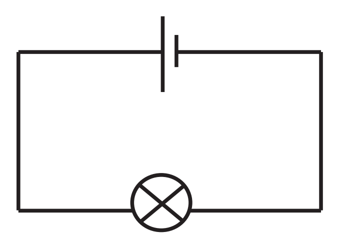
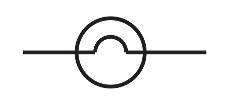
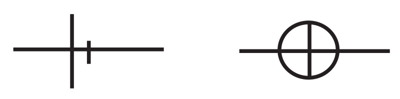
Question 2: **Famous scientist**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
a	***1m***	Award **ONE** mark for an indication that the Sun is spherical: ■ sphere	**ONE** mark may be awarded for: ■ (like a) ball	***Do not*** *give credit for an insufficient response:* ■ *it is round/a circle* ■ *it is round with lines/beams round the edge*
b	***1m***	Award **ONE** mark for for identifying the telescope: ■ telescope		***Do not*** *give credit for an insufficient response:* ■ *binoculars* ■ *satellite*
c	***1m***	Award **ONE** mark for: 1 day ☐ 24 days ☐ 28 days ☑ 365 days ☐		***Do not*** *give credit if more than one box has been ticked.*
d	***1m***	Award **ONE** mark for a response indicating that the Sun's apparent movement is caused by the spin of the Earth, for example: ■ 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 revolving **ONE** mark may be awarded for a response correctly indicating that the apparent movement of the Sun is caused by the spin of the Earth, as well as describing the Earth's orbit around the Sun [given]: ■ the Earth spins as it orbits the Sun ■ the Earth turning on its axis and moving round the Sun	***Do not*** *give credit for an insufficient response implying the apparent movement of the Sun is caused by the Earth orbiting the Sun, for example:* ■ *the Earth orbiting* ■ *the Earth turning/spinning round the Sun* ***Do not*** *give credit for an insufficient response that does not clearly indicate that it is the Earth that spins, for example:* ■ *it turns/rotates/spins/revolves (on its axis)*

Question 2: **Famous scientist**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
e	***1m***	Award **ONE** mark for an indication that without evidence, scientific ideas have no credibility/certainty, for example: ■ because without evidence they are just someone's ideas ■ evidence shows if the ideas are likely to be true/right/correct ■ the more evidence, the more sure Galileo could be ■ otherwise you can't know if the idea is right or not	**ONE** mark may be awarded for: ■ so you can be (more) sure/certain ■ to know for sure ■ to check his ideas ■ to see if your ideas are true/right/correct/work ■ if he just guessed he could be wrong ■ so everyone will believe it/the idea	***Do not*** *give credit for an insufficient response, for example:* ■ *evidence supports scientific ideas [given]* ■ *to be sure that he had the right answer [implies the ideas had been previously determined]* ■ *so you will believe in him*
f	***2m***	Award **TWO** marks for: *the Earth would be colder*. **true** *the Earth would be darker*. **true** *the Earth would not have night-times.* **false** *the Earth would have longer years.* **true**	If **TWO** marks cannot be awarded, award **ONE** mark for any **three** statements correctly identified as true or false.	

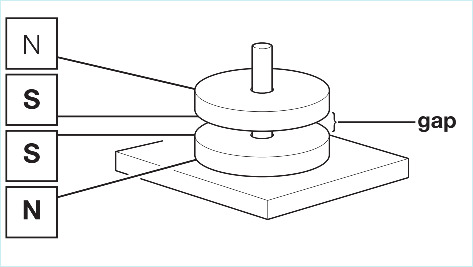
Question 3: **Lighthouse**

Question	Mark	Requirements	Allowable answers	Additional guidance
a	***1m***	Award **ONE** mark for translucent.		***Do not*** *give credit for a response that includes incorrect science:* ■ *transparent* ■ *opaque*
b	***1m***	Award **ONE** mark for: plastic cup ☑ tin can ☐ china egg cup ☐ part of cardboard egg box ☐		***Do not*** *give credit if more than one box has been ticked.*
c	***2m***	Award **TWO** marks for a correctly drawn circuit with one cell, wires and a bulb:  Award **ONE** mark for a circuit where one error/omission/mistake has been made but it is otherwise correct.	Credit may be given for an obsolete symbol for a bulb or for a non–rectilinear circuit. 	***Do not*** *give credit for an otherwise correct circuit (i.e. a complete loop) where the pupil has attempted to draw an actual picture of a cell and/or a bulb instead of the symbol.* ***Do not*** *give credit for an error in the circuit that includes incorrect science:* ■ *circuits containing gaps between components of more than 2 mm* ■ *circuits with extra/fewer components* ■ *circuits with incorrectly drawn components:* 

Question 3: **Lighthouse**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
d	***2m***	Award **TWO** marks for: *the cell is connected to the bulb*. **true** *there are gaps in the circuit*. **false** *he uses wires of the same length.* **false** *the wires are connected to the same end of the cell.* **false**	If **TWO** marks cannot be awarded, award **ONE** mark for any **three** statements correctly identified as true or false.	
e	***1m***	Award **ONE** mark for: ■ cell/battery ✣ Award **ONE** mark for a correct response that goes beyond the key stage 2 programme of study: ■ use a cell with a higher voltage		***Do not*** *give credit for an insufficient response:* ■ *(use) a bigger/different cell/battery [does not indicate an increase in voltage and implies they are replacing the cell in the circuit]*

Question 4: **Magnets**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
a	***1m***	Award **ONE** mark for: plastic pen ☐ iron nail ☑ glass marble ☐ rubber ball ☐		***Do not*** *give credit if more than one box has been ticked.*
b	***1m***	Award **ONE** mark for: 		

Question 4: **Magnets**

Question	***Mark***	***Requirements***	***Allowable answers***	***Additional guidance***
c	***1m***	Award **ONE** mark for an appropriate explanation indicating that you cannot tell if the disc is being attracted by the magnet (as well as being held in place by gravity), for example: ■ the magnet would just sit on the disc even if the disc wasn't magnetic ■ the disc would be in that position whatever it is made of ■ the disc and magnet would look like this if they were only being held in place by gravity	**ONE** mark may be awarded for a response that implies you cannot tell that the magnet is attracting or that you would only be able to tell if the magnet was repelling: ■ any material will just look like the pictures, you don't know if they are attracting/sticking ■ the disc isn't being pushed by the magnetic force ■ the magnet is not repelling the disc ■ you would only know if you see if they are repelling each other **ONE** mark may be awarded for explaining that something needs to be done to the apparatus to test if the metal disc is magnetic: ■ you could tell if you lifted the magnet to see if the metal disc is attracted to it or not	***Do not*** *give credit for an insufficient answer with no reference to magnetism or no explanation given:* ■ *they look the same* ■ *the magnet is white and the metal disc is grey* ■ *the disc is not floating above the magnet* ■ *gravity is pulling the metal disc downwards*

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