2016 national curriculum tests

Key stage 2

2016 science sampling tests

Commentary on selected questions

September 2017

Standards & Testing Agency

Contents

Summary

This publication highlights misconceptions in pupils' understanding in certain science topics, as uncovered by the 2016 key stage 2 science sample. It will give teachers an insight into teaching important topics and how best to use the questions released from the 2016 sample in their lessons.

Who is this publication for?

This publication is for:

- local authorities
- school leaders, teachers and other school staff and governing bodies in all maintained schools, academies and free schools

Introduction

In order to support teachers in interpreting the results of the 2016 science sampling tests, the Standards and Testing Agency (STA) is releasing 6 full booklets from the 2016 tests. The questions in these booklets will not be used in future science samples. This document provides an overview of performance across the 2016 sample and commentaries on how pupils performed on selected individual questions. From autumn 2017, 3 of the booklets will also be available in a modified format for pupils with a visual impairment.

The questions are drawn from a range of topics and demonstrate pupils' ability to respond to a number of question types and levels of demand. Non-creditworthy responses have been provided where they merit comment. It should be noted that pupils demonstrated inconsistent knowledge of scientific terms and how to apply them across the topics represented here. This information will enable teachers to review their current approaches to teaching particular topics from the primary science curriculum and determine whether changes should be made. This document does not provide support for teachers in how to teach particular topics. However, it will be shared with science organisations that provide such guidance to schools.

The 2016 science sample assessed the new national curriculum. It should be noted that pupils that took this sample test will not have experienced the new curriculum in full, given that key stage 2 lasts 4 years and the curriculum had been in place for 2 years.

Considerations in using this report and questions

Each pupil that took part in the science sampling tests took one of 30 different combinations of test booklets, meaning each question was not administered to the same group of pupils. As a result, the percentages shown in this document do not directly reflect the number of pupils who gained credit on the question in the sampling tests, but are an estimate calculated using weighted percentages. This enables STA to account for any differences in attainment between the groups of pupils that took each question, to provide an estimate of the proportion of pupils across the national cohort who would be expected to gain credit were they to attempt the question. For a small number of questions contained within the report, the total percentage of creditworthy and non-creditworthy responses does not add up to 100. This is due to rounding. For multiple choice questions, incorrect responses are ordered by their popularity, which may not be the order that featured in the question.

These questions have been released to help teachers understand common misconceptions occurring in the tests. These questions and those contained in *2016 Science sampling tests: selected test booklets* may be useful as part of classroom assessment activities. Please bear in mind that in the live sample tests, children answer predetermined combinations of questions carefully constructed to avoid one question giving the answer to another. It is therefore recommended that pupils sit no more than one booklet of each subject area (covering biology, chemistry and physics) at a time.

For an analysis relating to questions released from the 2014 science sample, see *2014 science sampling tests: commentary on selected questions*. Questions in this document were selected for their ongoing relevance to the 2016 science national curriculum and therefore to teachers' continuing professional development.

The content domain is taken from the 2016 national curriculum for England. The cognitive domain is explained in the Key stage 2: science sampling test framework.

Overview of performance

The sections below outline estimated whole-cohort performance in the 2016 science sampling tests (SST) by subject. They also describe the most common misconceptions arising from the sample for each subject. For a full breakdown of the statistical analysis, please see the Key stage 2 science sampling 2016 Methodology note and outcomes.

Biology

Across the disciplines pupils sitting the SST in 2016 performed better in biology than in physics or chemistry. Performance was similar from 2014 to 2016. The biology curriculum can be sub-divided into 4 topics: plants, living things and their habitats, animals including humans, and evolution and inheritance.

Pupils often tried to anthropomorphise plant processes, for example 'the roots suck up water', which resulted in responses containing incorrect science. This alludes to a more general lack of precision in the use of terminology in order to articulate scientific concepts. A particular weakness was also identified in pupils' ability to describe the functions of parts of the plant, such as the leaves, which many pupils suggested were for protection or water uptake. It is worth noting that pupils sitting the 2016 science sampling assessment may have not have received teaching on plants since year 3, nor might they have experienced the new curriculum content in full.

Chemistry

Performance in chemistry fell from 2014 to 2016. While the 2016 science curriculum saw minor updates to coverage in chemistry, the topics of rocks and states of matter remained broadly similar. However, the topic, properties and changes of materials explores concepts in more depth than the previous national curriculum. Performance was poor throughout this topic. The 2016 cohort experienced a crossover period between the old and new curriculums, with no chemistry content in year 6. This means they might not have experienced the entirety of the chemistry curriculum.

Pupils often confused the scientific terms for reversible changes, perhaps unable to recall what they learned, thus giving partial responses or answers which used incorrect terminology. This was particularly prevalent when the cohort attempted to distinguish dissolving and melting (when considering interactions between salt and water), and evaporation and condensation.

The 2016 cohort also found it difficult to select appropriate separation methods such as sieving and filtering to suit a given situation. This was true for both familiar and unfamiliar contexts. Pupils frequently offered incomplete separation techniques, such as 'picking out' one material from the other, or pouring away the liquid.

Physics

In physics, the 2016 cohort performed similarly to the 2014 cohort. The physics curriculum further divides into light, forces and magnets, electricity, sound, forces, and Earth and space. Pupils demonstrated a large number of misconceptions in the year 5 topic, Earth and space. Responses showed an inconsistent ability to describe the movement of the moon relative to the earth, and an inability to use the idea of the earth's rotation to explain day and night. Pupils limited themselves with questions of this type as crucially they often did not specify what was turning, for example 'it turns', or gave an egocentric answer such as 'we are spinning'. Neither response type referred to the Earth. Additionally, many pupils defined the Sun as a two-dimensional object, which is insufficient at key stage 2.

Pupils also demonstrated a lack of clarity around the terminology and function of magnets, forgetting key terms like 'poles' and describing these as 'positive' and 'negative' rather than 'North' and 'South'. They also struggled when describing attractive or repulsive forces.

The cohort encountered issues when attempting to describe materials that transmit light. Pupils could recall the terms translucent, transparent and opaque, but often confused or conflated their meaning.

In electricity, pupils struggled to draw circuit diagrams without gaps and using the correct symbols.

Working scientifically

Performance in 'working scientifically' skills dipped slightly from 2014 to 2016. Pupils were broadly able to select appropriate equipment to take precise measurements, and draw simple conclusions.

Some problems were encountered in the 'planning' skill, where pupils demonstrated an inconsistent understanding of fair testing and fair comparisons, and independent and control variables. Pupils also had difficulty with the 'recording' skill, where they were required to add information to tables or graphs. The cohort demonstrated an inconsistent ability to report the findings of their results, or read a table or graph to describe a trend. Pupils struggled to consider how a conclusion could be strengthened by suggesting potential further comparative or fair tests.

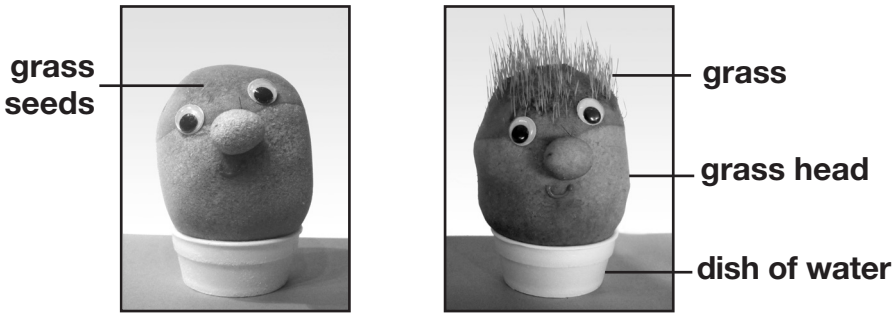
The following pages contain selected questions from the 2016 sampling exercise, followed by an analysis of pupil performance for each item. We have prioritised questions that contain content where pupils performed most poorly.

3 Grass heads

a Class 6 are investigating how grass grows.

They grow grass on grass heads filled with sand.

They keep their grass heads standing in dishes of water so they do not dry out.



All plants need water to grow.

Name **TWO** other things that all plants need to grow.

_____ and _____

a

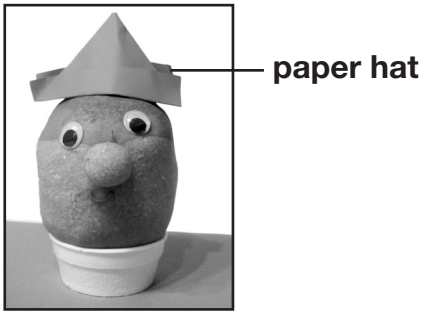
1 mark

S000226_01

b Some children give their grass head a hat.

They keep all other conditions the same.

The children **predict** that when the grass under the hat grows, it will look more yellow than the grass not covered by the hat.



Give **ONE** reason why the grass under the hat might look more yellow.

_____

b

1 mark

S000226_02

c

Class 6 use a ruler to measure the height of the grass every week.

The grass grows to different heights so it is difficult to know which piece of grass to measure.

Write **yes** or **no** next to each idea to show if it is a good way for class 6 to measure the height of the grass each week.

Class 6 could measure the height of the grass by...	**Yes** or **no**?
finding an average length of several pieces of grass.	
measuring the length of a different piece of grass each week.	

c

1 mark

S000226_03

d

Some other children put their grass head in a sealed, dry plastic bag.

They keep all other conditions the same.

They observe that droplets of water form on the inside of the bag.

Tick **ONE** box to explain why droplets of water form on the inside of the plastic bag.

Water…

- 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. ☐

d

1 mark

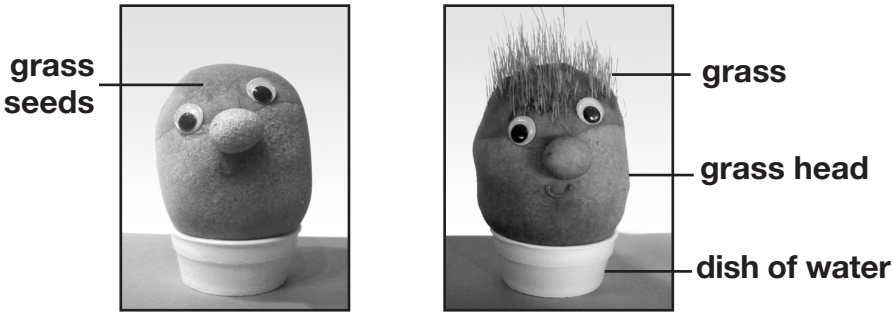
S000226_04

Grass heads (a)

a Class 6 are investigating how grass grows.

They grow grass on grass heads filled with sand.

They keep their grass heads standing in dishes of water so they do not dry out.



All plants need water to grow.

Name **TWO** other things that all plants need to grow.

_____ and _____

a

1 mark

S000226_01

Question	Mark	Requirements	Allowable answers
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

Additional guidance
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*

Grass heads (a)

Content domain reference	**B3b** Plants		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' understanding of the conditions required for plants to grow.			

Option	Commentary
Creditworthy 26%	
Examples: 'light' 'air' 'warmth' 'carbon dioxide'	**26%** of pupils successfully named two additional factors required for plant growth. A few responses went beyond the key stage 2 programme of study, identifying specific gases involved in plant growth.
Non-creditworthy 74%	
Examples: 'soil' 'Sun' 'water'	**73%** of pupils were unable to name two additional factors required for plant growth. They provided incorrect or insufficient responses, or only one correct response. Many pupils gave 'water' as their response, which was given in the question. Others gave 'Sun', which was considered insufficient as it is specifically the light from the Sun that is required for growth. Soil was infrequently given as a response. Pupils may have the misconception that soil is a requirement for all plants, not realising that some plants grow without soil. These pupils demonstrated a lack of understanding of the necessary factors that contribute to plant growth. **Fewer than 1%** omitted the question.

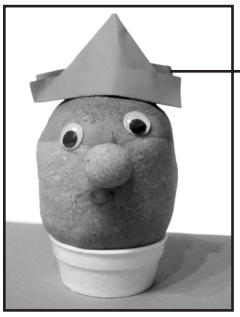
Grass heads (b)

b

Some children give their grass head a hat.

They keep all other conditions the same.

The children **predict** that when the grass under the hat grows, it will look more yellow than the grass not covered by the hat.



Give **ONE** reason why the grass under the hat might look more yellow.

_____ b

1 mark

S000226_02

Question	Mark	Requirements	Allowable answers
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

Additional guidance

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*

Grass heads (b)

Content domain reference	**B3b** Plants		
Cognitive domain strand	Knowledge and comprehension	Application and analysis	**Synthesis and evaluation**
This question is assessing pupils' understanding of how light affects plant growth and appearance.			

Response	Commentary
Creditworthy 53%	
Examples: 'the hat blocks the light' 'it doesn't get enough sunlight' 'the grass needs light to grow'	**53%** of pupils successfully indicated or implied that the grass would get less light, demonstrating appreciation of light as a key factor in plant growth and appearance.
Non-creditworthy 47%	
Examples: 'it doesn't get Sun' 'has too much shade' 'doesn't get oxygen'	**45%** gave an insufficient response. Many pupils in this category did not refer to light in their answer. Again, pupils did not use precise language to identify the plant's need for light, substituting the word 'Sun', which was insufficient. **2%** omitted the question.

Grass heads (c)

c Class 6 use a ruler to measure the height of the grass every week.

The grass grows to different heights so it is difficult to know which piece of grass to measure.

Write **yes** or **no** next to each idea to show if it is a good way for class 6 to measure the height of the grass each week.

Class 6 could measure the height of the grass by...	**Yes** or **no**?
finding an average length of several pieces of grass.	
measuring the length of a different piece of grass each week.	

c

1 mark

S000226_03

Question	*Mark*	*Requirements*	*Allowable answers*
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**	

Additional guidance

Grass heads (c)

Content domain reference	**WSUb** Measuring		
Cognitive domain strand	Knowledge and comprehension	Application and analysis	**Synthesis and evaluation**
This question is assessing pupils' ability to evaluate possible experimental methods to select the best option			

Response	Commentary
Creditworthy 66%	
'finding an average length of several pieces of grass'	**66%** of pupils successfully identified that the first statement was a viable method, while the second statement was not.
Non-creditworthy 34%	
'measuring the length of a different piece of grass each week'	**33%** gave an incorrect response. These pupils demonstrated a lack of understanding about planning experiments to give evidence that would support a conclusion. **Fewer than 1%** omitted the question.

Grass heads (d)

d

Some other children put their grass head in a sealed, dry plastic bag.

They keep all other conditions the same.

They observe that droplets of water form on the inside of the bag.

Tick **ONE** box to explain why droplets of water form on the inside of the plastic bag.

Water…

- 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. ☐

☐ d

1 mark

S000226_04

Question	Mark	Requirements	Allowable answers
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.* ☐	

Additional guidance
Do not *give credit if more than one box has been ticked.*

Grass heads (d)

Content domain reference	**C4c** States of matter **B3c** Plants		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing an understanding of evaporation and condensation, in the context of plant respiration (production of water).			

Response	Commentary
Creditworthy 51%	
'…evaporates from the grass head and condenses on the bag.'	**51%** of pupils successfully identified that the processes causing the water droplets to appear on the inside of the bag were evaporation and then condensation. These pupils demonstrated an ability to apply their knowledge of changes of state to the unfamiliar situation provided.
Non-creditworthy 49%	
'…condenses from the grass head and evaporates on the bag.' '…dissolves from the grass head and evaporates on the bag.' '…dissolves from the grass head and condenses on the bag.'	**26%** selected the first option, which contains the correct scientific terms, but the wrong way round. These pupils knew which words applied to changes of state between liquid and gas, but had confused which way they applied. **12%** selected the second option, suggesting that the water dissolves from the grass head and evaporates onto the bag. These pupils conflated the idea of dissolving with evaporation and condensation, and further were unable to recall condensation as the process by which water vapour turns into water droplets. **10%** selected the fourth option, which confuses evaporation and dissolving, but correctly identifies condensation as the second process. **Fewer than 1%** omitted the question.

2 Tree

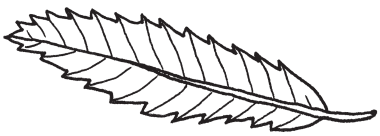
a Ella is looking at some leaves.

The key below identifies which tree each leaf comes from.

Key to tree leaves:

① Is the leaf long and thin? →	Yes: GO TO ② No: GO TO ③
② Is the edge of the leaf smooth? →	Yes: **Laurel** No: **Sweet chestnut**
③ Is the edge of the leaf smooth? →	Yes: **Lilac** No: **Silver birch**

Look at this picture of a leaf from one of the trees.



(i) Use the key above to identify the tree it comes from.

The leaf is from a _____ tree.

ai

1 mark

S000330_01

(ii) Tick **ONE** box to show why it is useful to identify plants and put them into groups.

so we know where to find a plant	☐	because there is a large variety of plants	☐
in case the plants become extinct	☐	so we can observe the plants in their habitats	☐

aii

1 mark

S000330_02

b Complete the sentences below to show the function of the leaves and roots.

(i) The tree uses its leaves to _____.

bi

1 mark

S000330_03

(ii) The tree has roots to _____.

bii

1 mark

S000330_04

c Ella finds a seed.

Why does the tree need to produce seeds?

_____

c

1 mark

S000330_05

d Squirrels live in trees.

Give **ONE** feature of the **squirrel** from the picture.
Describe how this feature helps the squirrel to live in a tree.

Feature of the squirrel that helps it live in a tree: _____

How the feature helps: _____

_____

d

1 mark

S000330_06

Tree (ai)

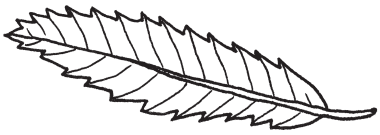
a Ella is looking at some leaves.

The key below identifies which tree each leaf comes from.

Key to tree leaves:

① Is the leaf long and thin? →	Yes: GO TO ② No: GO TO ③
② Is the edge of the leaf smooth? →	Yes: **Laurel** No: **Sweet chestnut**
③ Is the edge of the leaf smooth? →	Yes: **Lilac** No: **Silver birch**

Look at this picture of a leaf from one of the trees.



(i) Use the key above to identify the tree it comes from.

The leaf is from a _____ tree.

ai

1 mark

S000330_01

Question	Mark	Requirements	Allowable answers
ai	*1m*	Award **ONE** mark for: ■ (Sweet) chestnut	

Additional guidance

Tree (ai)

Content domain reference	**WSUc** **B4b** Plants		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' ability to use a key to categorise a leaf.			

Response	Commentary
Creditworthy 73%	
	73% of pupils successfully categorised the leaf as a sweet chestnut leaf using the key.
Non-creditworthy 27%	
	11% incorrectly categorised the leaf as a silver birch leaf. **7%** responded in an otherwise non-creditworthy way. **4%** incorrectly categorised the leaf as a laurel leaf. **2%** incorrectly categorised the leaf as a lilac leaf. **3%** omitted the question.

Tree (aii)

(ii) Tick **ONE** box to show why it is useful to identify plants and put them into groups.

so we know where to find a plant	☐	because there is a large variety of plants	☐
in case the plants become extinct	☐	so we can observe the plants in their habitats	☐

☐ aii

1 mark

S000330_02

Question	Mark	Requirements	Allowable answers
aii	***1m***	Award **ONE** mark for: ☐ ☑ ☐ ☐	

Additional guidance
Do not *give credit if more than one box has been ticked.*

Tree (aii)

Content domain reference	**B6b** Living things and their habitats		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' ability to recognise the utility of grouping plants.			

Response	Commentary
Creditworthy 42%	
'because there is a large variety of plants'	**42%** of pupils successfully identified that grouping plants is useful because a large variety exists.
Non-creditworthy 58%	
'so we know where to find a plant' 'in case the plants become extinct' 'so we can observe the plants in their habitats'	**32%** incorrectly selected 'so we can observe the plants in their habitats'. This can be achieved without grouping plants. **13%** incorrectly selected 'so we know where to find a plant'. This can again be achieved without grouping plants. **12%** incorrectly selected 'in case the plants become extinct'. Grouping plants would not help us in this case, as similar plants are not necessarily useful in the same way. **1%** selected more than one box, or were not clear in their choice. **Fewer than 1%** omitted the question.

Tree (bi)

b Complete the sentences below to show the function of the leaves and roots.

(i) The tree uses its leaves to _____.

bi

1 mark

S000330_03

(ii) The tree has roots to _____.

bii

1 mark

S000330_04

Question	Mark	Requirements	Allowable answers
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

Additional guidance

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*

Tree (bi)

Content domain reference	**B3a** Plants		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' knowledge of the function of parts of the plant.			

Response	Commentary
Creditworthy 24%	
Examples: 'produce food' 'respiration' 'catch sunlight'	**17%** of pupils gave a creditworthy response stating that the leaves make new materials for growth or take in light, demonstrating knowledge of the function of the leaves of a plant. **6%** correctly responded with reference to gathering or collecting sunlight.
Non-creditworthy 76%	
Examples: 'collect water from the rain' 'protect itself' 'produce seeds'	**63%** gave incorrect or insufficient responses. These pupils often made reference to collecting rainwater, which is the function of the roots. Some pupils described the function as protection, perhaps attributing the features of specific plants such as holly or cacti to all plants. These pupils did not demonstrate an understanding of the purpose of the leaves. **14%** omitted the question. This is surprisingly high given that only a one-word answer was required, suggesting an insecure understanding of the function of the leaves.

Please note: percentages on this page do not add to their expected sub-totals. This is due to rounding.

Tree (bii)

b Complete the sentences below to show the function of the leaves and roots.

(i) The tree uses its leaves to _____.

bi

1 mark

S000330_03

(ii) The tree has roots to _____.

bii

1 mark

S000330_04

Question	Mark	Requirements	Allowable answers
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.

Additional guidance

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'.*

Tree (bii)

Content domain reference	**B3a** Plants		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' knowledge of the function of parts of the plant.			

Response	Commentary
Creditworthy 41%	
Examples: 'absorb water' 'collect water' 'get nutrients' 'keep it upright'	**41%** of pupils successfully identified the main function of roots to be taking up water or minerals, or their role in supporting the plant.
Non-creditworthy 59%	
Examples: 'suck up water' 'drink water' 'hold it in' 'for balance' 'to get the goodness'	**13%** gave an incorrect response referring to the roots sucking up water, which is an anthropomorphism that does not accurately describe the process by which plants take up water. **1%** gave an insufficient response stating that the roots 'hold in' the plant. A further **41%** did not gain a mark because they gave other insufficient or incorrect responses which did not refer specifically to water, nutrients or support. An insufficient understanding of the function of the roots was shown. **4%** omitted the question.

Tree (c)

c Ella finds a seed.

Why does the tree need to produce seeds?

_____ c

1 mark

S000330_05

Question	Mark	Requirements	Allowable answers
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

Additional guidance

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*

Tree (c)

Content domain reference	**B3d** Plants **B5b** Plants		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing the pupils' understanding of reproduction in plants.			

Response	Commentary
Creditworthy 69%	
Examples: 'to reproduce' 'to make more new trees' 'so the species survives'	**69%** of pupils successfully identified the seed's role in reproduction and the continuation of the species.
Non-creditworthy 31%	
Examples: 'to disperse' 'to make the flowers' 'to continue the cycle' 'for survival'	**28%** gave an insufficient response, referring to the cycle in general or to other parts of the life cycle of the plant. These pupils did not display a clear understanding of the plant's reproductive cycle. **3%** omitted this question.

Tree (d)

d Squirrels live in trees.

Give **ONE** feature of the **squirrel** from the picture.
Describe how this feature helps the squirrel to live in a tree.

Feature of the squirrel that helps it live in a tree: _____

How the feature helps: _____

_____

d

1 mark

S000330_06

Question	Mark	Requirements	Allowable answers
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

Additional guidance

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*

Tree (d)

Content domain reference	**B6h** Evolution and inheritance		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' ability to identify and describe features of an animal (a squirrel) that help it to survive in its environment (a tree).			

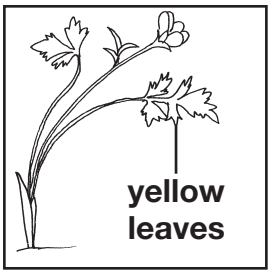
Response	Commentary
Creditworthy 50%	
Examples: 'tail helps it to balance' 'claws for gripping branches' 'it has sharp teeth for eating nuts'	**50%** of pupils successfully identified a feature of the squirrel and explained how it helps it to survive in a tree, demonstrating an ability to identify adaptations and describe their utility in the animal's environment.
Non-creditworthy 50%	
Examples: 'hands help it grip' 'fur keeps it warm' 'eats nuts to help it survive'	**45%** gave insufficient responses that did not refer to specific adaptations that were particular to the squirrel. To gain the mark, pupils were required to describe a physical feature that was advantageous in their habitat and explain why it was useful. Climbing was often referenced but without sufficient qualification. **5%** omitted this question.

5 Plants on the school field

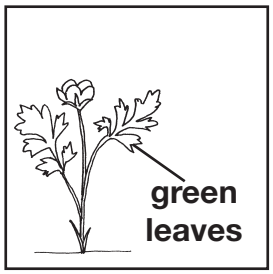
a

Some children are finding out about plants. They get three buttercup plants. They put each plant in a place with different conditions.

After two weeks, the buttercup plants look like this:



Place A



Place B

Place C

Write **A**, **B**, and **C** in the table below to match each place to the conditions found there.

Place	Conditions	
	Does the plant have light?	Does the plant have water?
	✓	✓
	✓	✗
	✗	✓

a

1 mark

S000289_01

b

There are differences between plants.
These differences help people sort plants into groups.

Write **true** or **false** next to each reason that explains why plants need to be sorted into groups.

Plants need to be sorted into groups...	**True** or **false**?
to stop plants becoming extinct.	_____
to help people identify plants.	_____
to help plants reproduce.	_____

b

1 mark

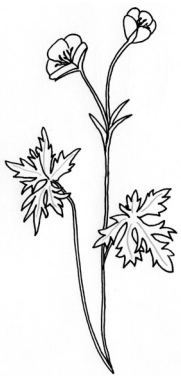
S000289_02

c

The children look at different plants on the school field.

They record the number of common plantain and buttercup plants in 1 m^2 in different places.

Common plantain



Buttercup

The children think they see a pattern in the place that the plants grow.

The table shows their results.

How many children are playing in each place?	Number of plants (in 1 m^2)	
	common plantains	buttercups
lots	12	0
some	4	3
few	1	9

Describe the relationship between **how many children** are playing in a place and the **number of common plantains** found there.

_____

_____

c

1 mark

S000289_03

d

The buttercup plant has a long thin stem.

The long thin stem of the buttercup plant stops it surviving in places where lots of children play. Explain why.

_____

_____

d

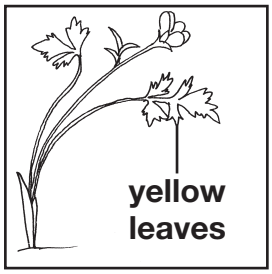
1 mark

S000289_04

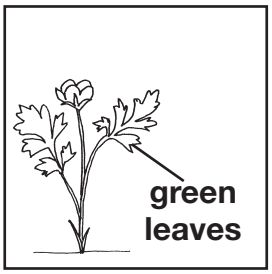
Plants on the school field (a)

a Some children are finding out about plants. They get three buttercup plants. They put each plant in a place with different conditions.

After two weeks, the buttercup plants look like this:



Place A



Place B

Place C

Write **A**, **B**, and **C** in the table below to match each place to the conditions found there.

Place	Conditions	
	Does the plant have light?	Does the plant have water?
	✓	✓
	✓	✗
	✗	✓

a

1 mark

S000289_01

Question	Mark	Requirements	Allowable answers
a	*1m*	Award **ONE** mark for:	

Place	*Conditions*	
	Does the plant have light?	*Does the plant have water?*
B	✓	✓
C	✓	✗
A	✗	✓

Additional guidance

Plants on the school field (a)

Content domain reference	**B3b** Plants		
Cognitive domain strand	Knowledge and comprehension	Application and analysis	**Synthesis and evaluation**
This question is assessing pupils' ability to synthesise their understanding of the conditions required for plant growth with a given series of outcomes.			

Response	Commentary
Creditworthy 28%	
	28% of pupils successfully matched the places in the diagrams to the conditions in the table, demonstrating their understanding of how light and water affect plant growth.
Non-creditworthy 72%	
	69% failed to match all three locations with their conditions correctly, and therefore did not score the mark. These pupils did not demonstrate a secure understanding of the conditions required for plant growth. Many pupils chose plant A as having both light and water, ignoring the yellow leaves. They may have interpreted the larger size of plant A alone as the indicator of its health. Some pupils incorrectly attributed plant C (droopy and green) to the wrong conditions (water but no light). These pupils confused the effects of a lack of light and a lack of water on plant growth. **3%** omitted the question.

Plants on the school field (b)

b There are differences between plants.
These differences help people sort plants into groups.

Write **true** or **false** next to each reason that explains why plants need to be sorted into groups.

Plants need to be sorted into groups...	**True** or **false**?
to stop plants becoming extinct.	_____
to help people identify plants.	_____
to help plants reproduce.	_____

b

1 mark

S000289_02

Question	*Mark*	*Requirements*	*Allowable answers*
b	***1m***	Award **ONE** mark for: *to stop plants becoming extinct.* **false** *to help people identify plants.* **true** *to help plants reproduce.* **false**	

Additional guidance

Plants on the school field (b)

Content domain reference	**B6b** Plants		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' ability to recognise the utility of grouping plants.			

Response	Commentary
Creditworthy 33%	
'to help people identify plants'	**33%** of pupils successfully recognised that grouping plants helps them to be identified more easily.
Non-creditworthy 67%	
'to help plants reproduce'	**63%** of pupils failed to classify all three statements correctly as true or false. The most convincing distractor was the third statement, 'to help plants reproduce': **50%** marked this statement as true. It is possible that pupils inferred physically grouping the plants near to each other, rather than notionally grouping (classifying) them. **4%** omitted this question.

Plants on the school field (c)

c

The children look at different plants on the school field.

They record the number of common plantain and buttercup plants in 1 m^2 in different places.

Common plantain

Buttercup

The children think they see a pattern in the place that the plants grow.

The table shows their results.

How many children are playing in each place?	Number of plants (in 1 m^2)	
	common plantains	buttercups
lots	12	0
some	4	3
few	1	9

Describe the relationship between **how many children** are playing in a place and the **number of common plantains** found there.

_____

_____

c

1 mark

S000289_03

Plants on the school field (c)

Question	Mark	Requirements	Allowable answers
c	*1m*	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	**ONE** mark may be awarded for two specific comparisons describing the relationship, for example: ■ there are most common plantains where most children play and least common plantains where fewest children play

Additional guidance
Do not *give credit for an insufficient response giving a single comparison of the variables, for example:* ■ *many common plantains grow where lots of children play* ***Do not*** *give credit for a response that changes one or both variables, for example:* ■ *the more plantains, the less buttercups*

Plants on the school field (c)

Content domain reference	**WSUe** Reporting		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' ability to describe a trend when given three data points.			

Response	Commentary
Creditworthy 28%	
Example: 'the more children, the more common plantains'	**28%** of pupils successfully described the relationship between the number of children playing in a location and the number of common plantain plants in a sample area. These pupils demonstrated their ability to draw simple conclusions based on a simple set of data.
Non-creditworthy 72%	
Examples: 'where there are lots of children there are lots of plantains' 'the more children the less buttercups' 'the more plantains, the less buttercups'	**49%** gave insufficient responses. Many pupils failed to give a comparison indicating a trend or pattern by only referring to one data point (many children = many plantains), or by referring to the wrong data (comparing with buttercups instead of number of children playing). **24%** omitted this question. There is a lot of information to interpret, with pupils being required to select the right data to compare and formulate an extended response.

Please note: percentages on this page do not add to their expected sub-totals. This is due to rounding.

Plants on the school field (d)

d The buttercup plant has a long thin stem.

The long thin stem of the buttercup plant stops it surviving in places where lots of children play. Explain why.

_____

_____

d

1 mark

S000289_04

Question	*Mark*	*Requirements*	*Allowable answers*
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

Additional guidance

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]*

Plants on the school field (d)

Content domain reference	**B6h** Evolution and inheritance		
Cognitive domain strand	Knowledge and comprehension	Application and analysis	**Synthesis and evaluation**
This question is assessing pupils' ability to synthesise their knowledge of how plants are adapted to their environments within the situation provided.			

Response	Commentary
Creditworthy 23%	
Examples: 'the stem breaks easily' 'the stem is weaker'	**23%** of pupils successfully indicated that the stem of the buttercup breaks easily, demonstrating their ability to explain why in this case a plant's adaptation makes it unsuitable for an environment.
Non-creditworthy 77%	
Examples: 'it could be trodden on' 'it gets squashed'	**62%** did not sufficiently describe what would happen to the buttercup stem, or that the damage would be irreversible. These pupils did not link the two variables, and therefore did not gain credit for this question. **15%** omitted this question. This is another extended response. Failure on the previous part may have caused some pupils to omit this question.

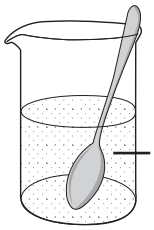
3 Separating sand and salt

a Class 6 are finding out about separating mixtures.

The teacher mixes sand and salt together.

She asks the children to separate the sand and salt.

First of all we should add water to the mixture of sand and salt and stir it.



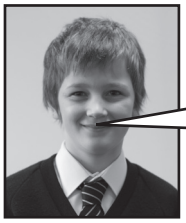
What happens to the salt when water is added to the mixture?

a

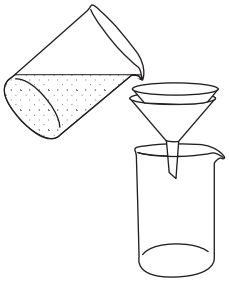
1 mark

S000350_01

b



We should now pour the mixture through paper in a funnel to separate the sand from the liquid.



(i) What is this method of separation called?

bi

1 mark

S000350_03

(ii) Describe how the sand is separated from the liquid.

The sand _____

The liquid _____

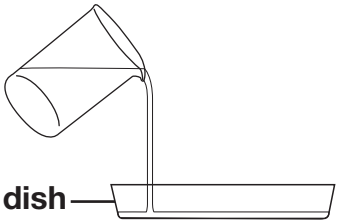
bii

1 mark

S000350_04

c

We should pour the liquid from the beaker into a dish and put it in a warm place for a few days.



Tick **TWO** boxes to show what will happen when the dish has been in a warm place a few days.

Tick **TWO** boxes.

The liquid will be less salty.	☐	Bubbles will be produced.	☐
The salt will melt.	☐	The water will change to gas.	☐
Salt crystals will form.	☐	A new material is made.	☐

☐ c

2 marks

S000350_05

d

The teacher mixes sand and iron nails together.

She asks the children to separate the sand from the iron nails.

Write **TWO** ways the sand could be separated from the iron nails.

1. _____

2. _____

☐ d

2 marks

S000350_06

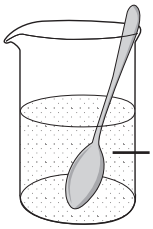
Separating sand and salt (a)

a Class 6 are finding out about separating mixtures.

The teacher mixes sand and salt together.

She asks the children to separate the sand and salt.

First of all we should add water to the mixture of sand and salt and stir it.



What happens to the salt when water is added to the mixture?

a

1 mark

S000350_01

Question	Mark	Requirements	Allowable answers
a	*1m*	Award **ONE** mark for any **one** correct from: ■ (it) dissolves ■ (it) forms a solution	

Additional guidance
Do not *give credit for a response that includes incorrect science:* ■ *it melts* ***Do not*** *give credit for an insufficient response:* ■ *it disappears*

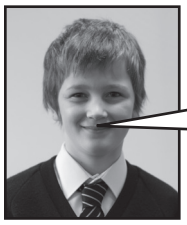
Separating sand and salt (a)

Content domain reference	**C5b** Properties and changes of materials		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' understanding of salt dissolving in water.			

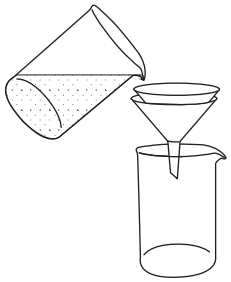
Response	Commentary
Creditworthy 49%	
Example: 'dissolves'	**49%** of pupils recognised that the salt would dissolve in the water, or that it forms a solution with the water.
Non-creditworthy 51%	
Examples: 'it melts' 'it disappears'	**48%** of pupils did not appreciate that the salt would dissolve. Most of these pupils made inaccurate observations, either naming an incorrect process such as melting, or describing the visual disappearance of the salt, but not the process that causes it. **3%** omitted this question.

Separating sand and salt (bi)

b



We should now pour the mixture through paper in a funnel to separate the sand from the liquid.



(i) What is this method of separation called?

bi

1 mark

S000350_03

Question	Mark	Requirements	Allowable answers
bi	***1m***	Award **ONE** mark for: ■ filtering/filtration	**ONE** mark may be awarded for: ■ filter

Additional guidance
Do not *give credit for a response that includes incorrect science:* ■ *funnelling*

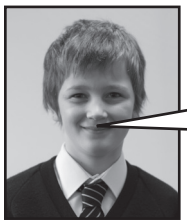
Separating sand and salt (bi)

Content domain reference	**C5c** Properties and changes of materials		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' knowledge of filtration.			

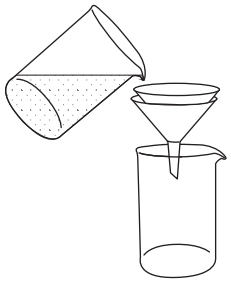
Response	Commentary
Creditworthy 17%	
Examples: 'filter' 'filtration'	Pupils found this question difficult. Only **17%** correctly described this process as filtering, gaining the mark.
Non-creditworthy 83%	
Examples: 'funnelling' 'sieving'	**53%** of pupils named the funnel but failed to appreciate the whole setup as a filter, or gave an otherwise insufficient or incorrect response. Pupils may be more familiar with a funnel, which may be used more often in the home when pouring liquids into bottles. Additionally, pupils may not have considered the funnel to be a part of the filter system. **30%** omitted this question.

Separating sand and salt (bii)

b



We should now pour the mixture through paper in a funnel to separate the sand from the liquid.



(i) What is this method of separation called?

bi

1 mark

S000350_03

(ii) Describe how the sand is separated from the liquid.

The sand _____

The liquid _____

bii

1 mark

S000350_04

Question	Mark	Requirements	Allowable answers
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

Additional guidance

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*

Separating sand and salt (bii)

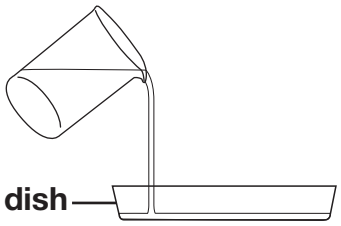
Content domain reference	**C5c** Properties and changes of materials		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' ability to analyse a familiar experiment and predict the outcome.			

Response	Commentary
Creditworthy 30%	
Example: 'the sand stays in the filter paper and the liquid goes through'	**30%** of pupils correctly described either the location of the sand and liquid or what happens to them during the filtration process.
Non-creditworthy 70%	
Examples: 'the sand sticks in the funnel and the liquid goes into the beaker' 'the sand stays in the filter paper and the liquid -'	**60%** of pupils gave either a partial or insufficient response, with many incorrectly referring to the sand staying in or not being able to pass through the funnel instead of the filter paper. These answers confirm pupils' earlier inability to recall the setup as a 'filter', as they rarely referred to the filter paper and instead spoke about the funnel and funnelling. **10%** omitted this question.

Separating sand and salt (c)

c

We should pour the liquid from the beaker into a dish and put it in a warm place for a few days.



Tick **TWO** boxes to show what will happen when the dish has been in a warm place a few days.

Tick **TWO** boxes.

The liquid will be less salty.	☐	Bubbles will be produced.	☐
The salt will melt.	☐	The water will change to gas.	☐
Salt crystals will form.	☐	A new material is made.	☐

☐ c

2 marks

S000350_05

Question	Mark	Requirements	Allowable answers
c	*2m*	Award **TWO** marks for: ☐ ☐ ☐ ☑ ☑ ☐	If **TWO** marks cannot be awarded, award **ONE** mark for **one** correct box ticked.
Additional guidance			

Separating sand and salt (c)

Content domain reference	**C5b** Properties and changes of materials		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' understanding of evaporation as a method of separation.			

Response	Commentary
Creditworthy 2m: 27%, 1m: 46%	
'the water will change to gas' 'salt crystals will form'	**27%** of pupils correctly identified both that the water will change to a gas and that salt crystals will form as a result, demonstrating their understanding of evaporation as a method of separation. **46%** of pupils were able to identify one of the two correct responses, but not both.
Non-creditworthy 27%	
'the salt will melt' 'the liquid will be less salty' 'bubbles will be produced' 'a new material is made'	**27%** of pupils failed to identify either of the correct statements. The most commonly chosen wrong answer was 'the salt will melt', which is a common misconception at this key stage. Only **16%** selected 'a new material is made', suggesting that the majority of pupils were able to identify evaporation as a reversible process. **Fewer than 1%** omitted this question.

Separating sand and salt (d)

d The teacher mixes sand and iron nails together.

She asks the children to separate the sand from the iron nails.

Write **TWO** ways the sand could be separated from the iron nails.

1. _____

2. _____

d

2 marks

S000350_06

Question	*Mark*	*Requirements*	*Allowable answers*
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.
Additional guidance			

Separating sand and salt (d)

Content domain reference	**C5c** Properties and changes of materials		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' ability to apply their knowledge of separation techniques to the given situation.			

Response	Commentary
Creditworthy 2m: 18%, 1m: 38%	
Examples: 'use a magnet' 'sieving' 'pick the nails out'	**18%** of pupils were able to give two methods of separating iron nails from sand, demonstrating their knowledge of separation techniques such as use of magnets and sieving. **38%** of pupils could give only one method, scoring one of the two marks.
Non-creditworthy 44%	
Examples: 'funnel' 'filter'	**31%** of pupils could not name or describe an appropriate method to separate the nails from the sand. 'Funnel' was a common response, which could be attributed to its earlier appearance in the question. **13%** omitted this question.

5 Mountains

a Class 6 find out about processes that happen on mountains.

Processes that happen on mountains

A – Water vapour in the air cools down to form water droplets.

B – Water droplets change into snow.

C – Snow on mountains changes into water.

D – Water changes into ice.

Tick **ONE** box in each row to match each process to its correct name.

Process	Name of process			
	melting	freezing	condensing	evaporating
A				
B				
C				
D				

a

2 marks

S000325_01

Mountains (a)

Tick **ONE** box in each row to match each process to its correct name.

Process	Name of process			
	melting	freezing	condensing	evaporating
A				
B				
C				
D				

a

2 marks

S000325_01

Question	Mark	Requirements	Allowable answers
a	*2m*	Award **TWO** marks for: Name of process… Process / melting / freezing / cond'sing / evap'ting A: ✓ (cond'sing) B: ✓ (freezing) C: ✓ (melting) D: ✓ (freezing)	If you are unable to award **TWO** marks, **ONE** mark may be awarded for any **three** ticks in the correct place.

Additional guidance

Do not *give credit if there is more than one tick in a row.*

Mountains (a)

Content domain reference	**C4c** States of matter **C4b** States of matter		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' ability to name the processes described in the question.			

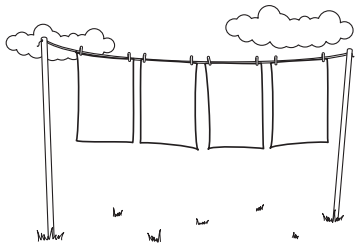
Response	Commentary
Creditworthy 2m: 12%, 1m: 24%	
Examples: Name of process… Process / melting / freezing / cond'sing / evap'ting A: cond'sing ✓ B: freezing ✓ C: melting ✓ D: freezing ✓	**12%** of pupils were able to classify all four processes as melting, freezing, condensing or evaporating. Process C, 'snow on mountains changes into water' was the easiest statement, with **79%** of pupils correctly naming it as melting. **24%** of pupils were able to classify three out of the four processes, scoring one mark.
Non-creditworthy 64%	
Examples: Name of process… Process / melting / freezing / cond'sing / evap'ting A: evap'ting ✓ B: cond'sing ✓ C: melting ✓ D: freezing ✓	**61%** of pupils were unable to classify at least three processes, and did not score a mark on this question. Only **35%** of pupils correctly identified process A, 'water vapour in the air cools down to form water droplets', as condensing. Despite the fact that none of the processes could be described as evaporation, **46%** of pupils identified process A as evaporation rather than condensation. Some pupils may have believed that each process could only be used once, despite freezing applying to both processes B and D. **3%** omitted this question.

Booklet 9C

1 Drying fabric

a

Kate wants to test how much time it takes for four different types of fabric to dry.



1. She soaks the different types of fabric in water.
2. She hangs the fabrics on a washing line outside.
3. She measures how much time it takes for the fabrics to dry.

Kate's results are shown in the table below.

Fabric type	silk	cotton	nylon	polyester
Drying time (minutes)	60	100	50	35

Which fabric dried the fastest?

_____

a

1 mark

S000367_01

b

Kate carried out a fair test.

Read the four statements below.

1. Use fabrics that cost the same amount of money.
2. Use fabrics that are the same size.
3. Hang the fabrics up at the same time.
4. Hang the fabrics in the same place.

Which of these things would have helped make Kate's test fair?
Tick **ONE** box.

1 only	☐	1 and 3 only	☐
2 and 4 only	☐	2, 3 and 4 only	☐

b

1 mark

S000367_02

c Drops of water fall from the bottom of very wet washing hanging on a washing line.

Write **true** or **false** for each of the statements about the drops of water.

The drops…	**True** or **false**?
form because liquids can flow.	_____
may change shape as they fall.	_____
form because the water becomes warm.	_____

c

1 mark
S000367_03

d Harry dries some T-shirts indoors on a radiator.

Name the process that happens to the water in Harry's T-shirts as they dry.

_____

d

1 mark
S000367_04

e Harry saw that liquid water formed on the windows in the room when the T-shirts were drying on the radiator.

Name the process that causes liquid water to form on the windows.

_____

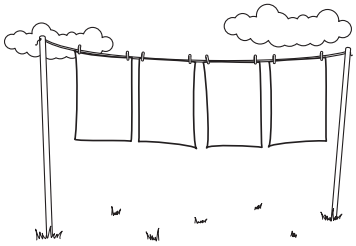
e

1 mark
S000367_05

Drying fabric (a)

a

Kate wants to test how much time it takes for four different types of fabric to dry.



1. She soaks the different types of fabric in water.
2. She hangs the fabrics on a washing line outside.
3. She measures how much time it takes for the fabrics to dry.

Kate's results are shown in the table below.

Fabric type	silk	cotton	nylon	polyester
Drying time (minutes)	60	100	50	35

Which fabric dried the fastest?

_____

a

1 mark

S000367_01

Question	*Mark*	*Requirements*	*Allowable answers*
a	***1m***	Award **ONE** mark for: ■ polyester	

Additional guidance

Drying fabric (a)

Content domain reference	**WSLg** Concluding		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' ability to analyse data and draw a simple conclusion.			

Response	Commentary
Creditworthy 96%	
Example: 'polyester'	**96%** of pupils were able to identify polyester as the material that had the fastest drying time by using the data in the table. These pupils demonstrated their ability to analyse data and draw a simple conclusion.
Non-creditworthy 4%	
Example: 'cotton'	**3%** of pupils selected a different fabric. The most common selection (**2%**) was cotton, which had the slowest drying time. This suggests a confusion between 'fastest' and 'biggest number'. **Fewer than 1%** omitted this question.

Drying fabric (b)

b Kate carried out a fair test.

Read the four statements below.

1. Use fabrics that cost the same amount of money.
2. Use fabrics that are the same size.
3. Hang the fabrics up at the same time.
4. Hang the fabrics in the same place.

Which of these things would have helped make Kate's test fair?
Tick **ONE** box.

1 only	☐	1 and 3 only	☐
2 and 4 only	☐	2, 3 and 4 only	☐

☐ b

1 mark

S000367_02

Question	*Mark*	*Requirements*	*Allowable answers*
b	***1m***	Award **ONE** mark for: ☐ ☐ ☐ ☑	

Additional guidance
Do not *give credit if more than one box has been ticked.*

Drying fabric (b)

Content domain reference	**WSUa** Planning		
Cognitive domain strand	Knowledge and comprehension	Application and analysis	**Synthesis and evaluation**
This question is assessing pupils' awareness of the factors that contribute to fair testing.			

Response	Commentary
Creditworthy 70%	
'2, 3 and 4 only'	**70%** of pupils realised that option 1 (cost of fabric) would not have an effect on the test, as it is a part of the independent variable. These pupils demonstrated an awareness of what contributes towards fair testing, and recognised that the cost of the fabric was an intrinsic part of the independent variable.
Non-creditworthy 30%	
'2 and 4 only'	**30%** of pupils gave an incorrect response, the most common (**16%**) being option 3, which omits the control, 'hanging the fabrics at the same time'. While this would not be a factor in a controlled environment, Kate is conducting her test outside, so time of day is an important control variable. **Fewer than 1%** omitted this question.

Drying fabric (c)

c Drops of water fall from the bottom of very wet washing hanging on a washing line.

Write **true** or **false** for each of the statements about the drops of water.

The drops…	**True** or **false**?
form because liquids can flow.	_____
may change shape as they fall.	_____
form because the water becomes warm.	_____

c

1 mark

S000367_03

Question	*Mark*	*Requirements*	*Allowable answers*
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**	

Additional guidance

Drying fabric (c)

Content domain reference	**C4a** States of matter		
Cognitive domain strand	Knowledge and comprehension	Application and analysis	**Synthesis and evaluation**
This question is assessing pupils' ability to apply knowledge of the properties of a liquid to water droplets dripping from clothing.			

Response	Commentary
Creditworthy 38%	
'the drops form because liquids can flow' 'the drops may change shape as they fall'	**38%** of pupils were able to identify the true statements about the drops of water, demonstrating their knowledge of the properties of liquids. The third statement refers to a different process involved in the drying of the clothes: evaporation.
Non-creditworthy 62%	
'the drops form because the water becomes warm'	**62%** of pupils failed to classify all three statements as true or false. The hardest statement to classify was the second: 'The drops may change shape as they fall', which **34%** incorrectly labelled as false. **Fewer than 1%** omitted this question.

Drying fabric (d)

d Harry dries some T-shirts indoors on a radiator.

Name the process that happens to the water in Harry's T-shirts as they dry.

_____ d

1 mark

S000367_04

Question	Mark	Requirements	Allowable answers
d	*1m*	Award **ONE** mark for a response that identifies that water evaporates from the clothes, for example: ■ the water has evaporated ■ evaporation	

Additional guidance
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*

Drying fabric (d)

Content domain reference	**C4c** States of matter		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' ability to name the process of evaporation when given a description.			

Response	Commentary
Creditworthy 44%	
Example: 'it has evaporated'	**44%** of pupils were able to identify the process as evaporation, demonstrating their understanding of the change of state that happens to water as the T-shirts are heated on the radiator.
Non-creditworthy 56%	
Examples: 'steam' 'drying' (given) 'water gets warmer'	**44%** of pupils gave an incorrect or insufficient response which otherwise failed to refer to evaporation. While turning into water vapour and going into the air were correct, they were insufficient as they failed to name the process involved. Steam is a common misconception that is scientifically incorrect in this case. The water has not boiled and evaporation produces water vapour, not steam, which refers specifically to a dense cloud of water vapour given off by boiling water. Some pupils repeated information given in the question (drying) or wrote that the water gets warmer, which was insufficient. **12%** omitted this question.

Drying fabric (e)

e Harry saw that liquid water formed on the windows in the room when the T-shirts were drying on the radiator.

Name the process that causes liquid water to form on the windows.

_____ e

1 mark

S000367_05

Question	Mark	Requirements	Allowable answers
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

Additional guidance
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]*

Drying fabric (e)

Content domain reference	**C4c** States of matter		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' ability to name the process of condensation when given a description.			

Response	Commentary
Creditworthy 39%	
Example: 'condensation'	**39%** of pupils were able to identify the process as condensation.
Non-creditworthy 61%	
Examples: 'steam' 'the heat' 'evaporation' 'dissolving'	**46%** of pupils gave an incorrect or insufficient response which failed to refer to condensation. These pupils demonstrated a lack of knowledge of the names of the processes that describe changes of state. **15%** omitted this question.

5 Science activity

a Sara adds vinegar to bicarbonate of soda and watches what happens.

The mixture fizzes and bubbles form.

Before mixing

After mixing

bicarbonate of soda **vinegar** **bubbles**

Explain why the **bubbles** show that a non-reversible change has happened.

_____

_____

a

1 mark

S000240_02

b Put a tick in each row of the table to show if each material is a **solid**, **liquid** or **gas**.

Material	Solid	Liquid	Gas
glass			
vinegar			
bicarbonate of soda			
the inside of a bubble			

b

2 marks

S000240_03

Science activity (a)

a Sara adds vinegar to bicarbonate of soda and watches what happens.

The mixture fizzes and bubbles form.

Before mixing

After mixing

bicarbonate of soda

vinegar

bubbles

Explain why the **bubbles** show that a non-reversible change has happened.

_____

_____

a

1 mark

S000240_02

Question	*Mark*	*Requirements*	*Allowable answers*
a	***1m***	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	**ONE** mark may be awarded for: ■ they cannot go back

Additional guidance
Do not *give credit for an insufficient response relating to bubbles being made [given].*

Science activity (a)

Content domain reference	**C5f** Properties and changes of materials		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' ability to describe an observation of the given reaction that indicates it is irreversible.			

Response	Commentary
Creditworthy 22%	
Examples: 'the gas won't go back into bicarbonate of soda' 'bubbles can't change back' 'a gas was made' 'bubbles mean a new material was formed'	**17%** of pupils correctly explained that the gas could not be turned back into bicarbonate of soda, or that the original materials could not be retrieved. **5%** of pupils were awarded the mark for correctly identifying that a new material was made. These pupils successfully demonstrated their ability to recognise irreversible reactions from their observations.
Non-creditworthy 78%	
Examples: 'bubbles were made' (given) 'fizzes up'	**57%** of pupils gave an incorrect or insufficient response. A large number of pupils repeated the given information without adding an interpretation. **21%** omitted this question. The high omission rate suggests that this topic is insecure for many pupils at the end of key stage 2.

Science activity (b)

b Put a tick in each row of the table to show if each material is a **solid**, **liquid** or **gas**.

Material	Solid	Liquid	Gas
glass			
vinegar			
bicarbonate of soda			
the inside of a bubble			

b

2 marks

S000240_03

Question	Mark	Requirements	Allowable answers
b	*2m*	Award **TWO** marks for: *Material* / *Solid* / *Liquid* / *Gas* *glass* ✓ *vinegar* ✓ *bicarbonate of soda* ✓ *the inside of a bubble* ✓	If you are unable to award **TWO** marks, **ONE** mark may be awarded for any **three** ticks in the correct place.

Additional guidance

Do not *give credit for any row where more than one column has been ticked.*

Do not *give credit for any row where no columns have been ticked.*

Science activity (b)

Content domain reference	**C4a** States of matter		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' ability to categorise four materials as solids, liquids or gases.			

Response	Commentary
Creditworthy 2m: 33%, 1m: 46%	
	33% of pupils were able to categorise all four materials as solids, liquids or gases. **46%** of pupils scored one mark for categorising three of the four materials correctly.
Non-creditworthy 21%	
	20% of pupils categorised two or more materials incorrectly and were not awarded a mark. The material most difficult to categorise was the bicarbonate of soda, which only **35%** of pupils correctly identified as 'solid'. The majority of incorrect responses (**34%**) were from pupils who thought that it was a gas, perhaps because of the word 'soda' which may have made them think of fizzy drinks; pupils are unlikely to know that it refers to the sodium in the compound. **2%** omitted this question.

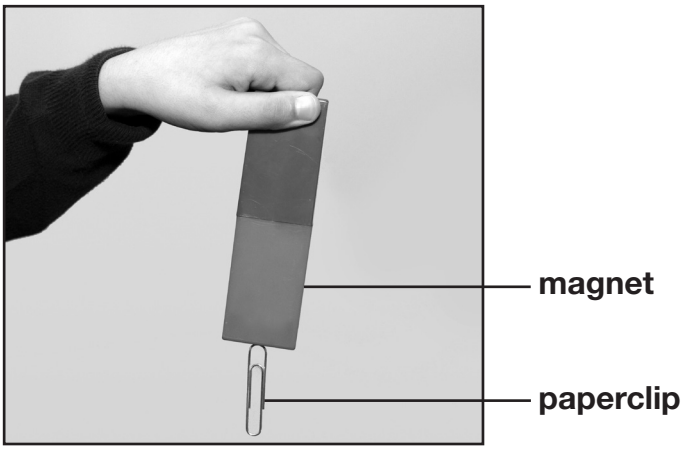
Please note: percentages on this page do not add to their expected sub-totals. This is due to rounding.

1 Magnetic forces

a Ali has four different magnets and some paperclips.

The paperclips are attracted to the magnets.

Draw **ONE** arrow on the photograph to show the direction of the magnet's force on the paperclip.



a

1 mark

S000278_01

b Name the force on the paperclip that pulls in the opposite direction to the magnet.

_____

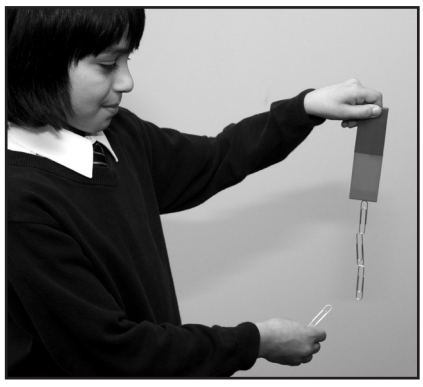
b

1 mark

S000278_02

c Ali wants to find the strongest magnet. He adds paperclips to a magnet one at a time so they make a chain. He stops when no more paperclips stick.

He repeats this with the other three magnets.



How will Ali know which magnet is the strongest?

_____

_____

c

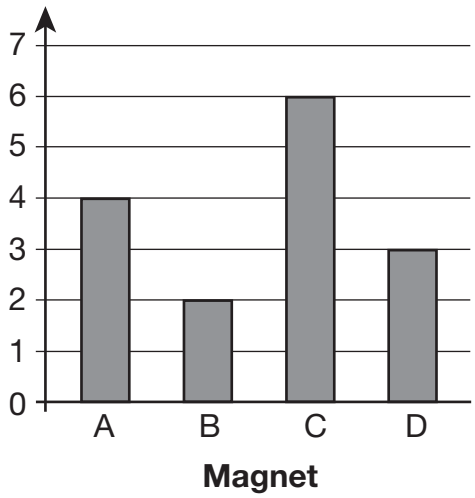
1 mark

S000278_03

d The graph below shows Ali's results.

One axis on the graph has been labelled.

Write the label for the **other** axis.



d

1 mark

S000278_04

e Ali moves magnet A towards magnet B.
Magnet B moves away from magnet A even though Ali does not touch magnet B.

Why did magnet B move away from magnet A?

e

1 mark

S000278_05

f Ali tries different ways of putting the magnets together.

Tick **ONE** box on each row of the table to show if the magnets move together, move apart or do not move.

The first one has been done for you.

Magnets	Move together	Move apart	Do not move
	✓		
			
			
			

f

1 mark

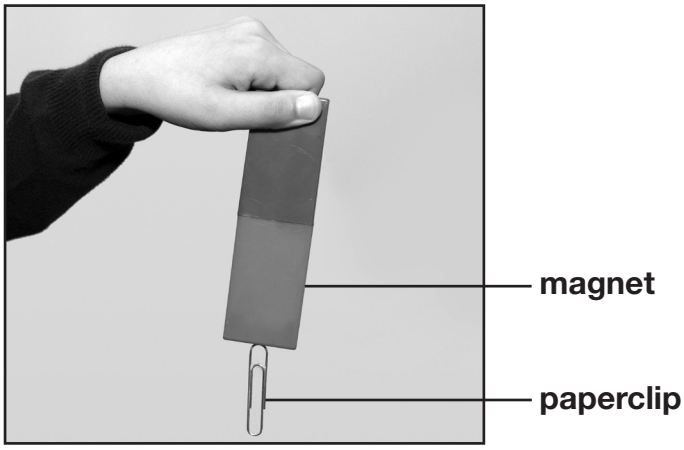
S000278_06

Magnetic forces (a)

a Ali has four different magnets and some paperclips.

The paperclips are attracted to the magnets.

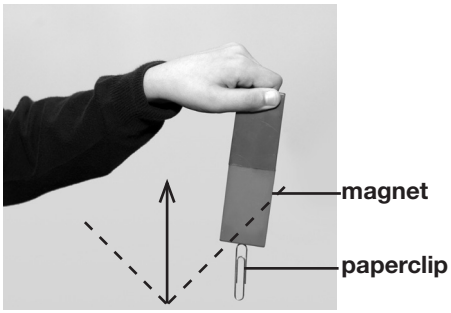
Draw **ONE** arrow on the photograph to show the direction of the magnet's force on the paperclip.



a

1 mark

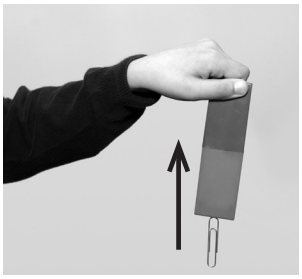
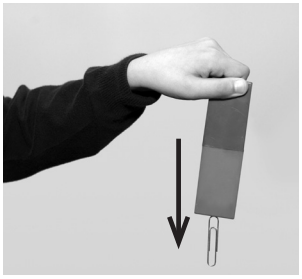
S000278_01

Question	Mark	Requirements	Allowable answers
a	*1m*	Award **ONE** mark for an arrow pointing upwards that is less than 45° either side of the vertical. 	

Additional guidance
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.*

Magnetic forces (a)

Content domain reference	**P3h** Forces and magnets		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' ability to draw an arrow to represent the correct pull force from the magnet on the paperclip.			

Response	Commentary
Creditworthy 55%	
Examples: 	**55%** of pupils correctly drew an upwards-pointing arrow on the photograph to represent the magnet's force. These pupils demonstrated an understanding of forces, including magnetic forces and force diagrams.
Non-creditworthy 45%	
Examples: 	**34%** of pupils drew an arrow outside of the permitted tolerance, many drawing a downwards arrow or an otherwise ambiguous representation such as a line without an arrowhead. **11%** omitted this question.

Magnetic forces (b)

b Name the force on the paperclip that pulls in the opposite direction to the magnet.

_____ b

1 mark

S000278_02

Question	Mark	Requirements	Allowable answers
b	*1m*	Award **ONE** mark for: ■ gravity ■ weight	**ONE** mark may be awarded for: ■ the pull of the Earth ■ gravitational attraction

Additional guidance

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*

Magnetic forces (b)

Content domain reference	**P5e** Forces		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' ability to recall the force that pulls objects towards the Earth.			

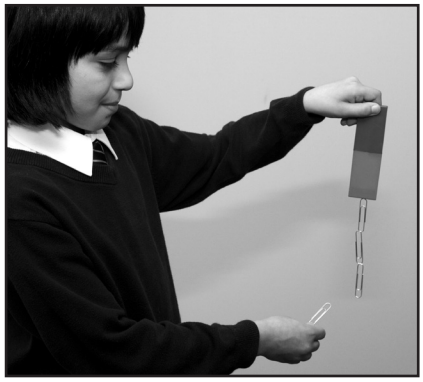
Response	Commentary
Creditworthy 26%	
Examples: 'gravity' 'the pull of the Earth' 'weight'	**26%** of pupils were able to name the force as 'gravity' or 'weight', or that it was otherwise due to the pull of the Earth. This was a more difficult question as it required pupils to recall the name of the pull force. Very few pupils gave the minimally acceptable answer, 'the pull of the Earth', which was credited because it implies an understanding of gravity.
Non-creditworthy 74%	
Examples: 'magnetic' 'pull' / 'push' 'attraction' 'friction' 'upthrust'	**53%** of pupils gave an insufficient response that did not recognise or imply that the force is due to the Earth. Many pupils simply wrote 'magnetic', indicating a lack of understanding of the question and about the Earth's gravitational force. **22%** omitted this question.

Please note: percentages on this page do not add to their expected sub-totals. This is due to rounding.

Magnetic forces (c)

c Ali wants to find the strongest magnet. He adds paperclips to a magnet one at a time so they make a chain. He stops when no more paperclips stick.

He repeats this with the other three magnets.



How will Ali know which magnet is the strongest?

_____

_____

c

1 mark

S000278_03

Question	Mark	Requirements	Allowable answers
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

Additional guidance

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*

Magnetic forces (c)

Content domain reference	**WSLc** Measuring		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' ability to plan how to measure the strength of a magnet using the given experimental context.			

Response	Commentary
Creditworthy 60%	
Examples: 'the best magnet holds the most paperclips' 'it has more paperclips'	**60%** of pupils correctly indicated that the strongest magnet would hold the most paperclips, demonstrating their understanding of the experimental setup provided.
Non-creditworthy 40%	
Examples: 'by the number of paperclips it holds' 'it's the biggest bar on the graph'	**38%** of pupils gave an insufficient response, often answering the question by referencing the graph rather than the data itself, or by not giving a specific comparison. **3%** omitted this question.

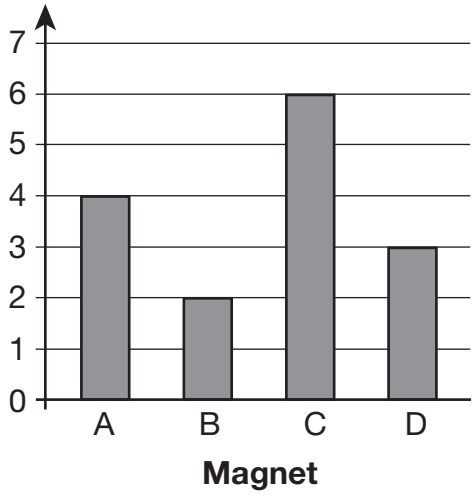
Please note: percentages on this page do not add to their expected sub-totals. This is due to rounding.

Magnetic forces (d)

d The graph below shows Ali's results.

One axis on the graph has been labelled.

Write the label for the **other** axis.



d

1 mark

S000278_04

Question	Mark	Requirements	Allowable answers
d	***1m***	Award **ONE** mark for correctly labelling the axis to indicate the number of paperclips.	**ONE** mark may be awarded for: ■ paperclips

Additional guidance

Magnetic forces (d)

Content domain reference	**WSLe** Recording		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' ability to record data by labelling the axes on a graph.			

Response	Commentary
Creditworthy 65%	
Examples: 'number of paperclips' 'paperclips'	**65%** of pupils correctly labelled the axis to indicate the number of paperclips.
Non-creditworthy 35%	
Example: 'y-axis'	**23%** of pupils wrote a different axis label that was not appropriate for the graph. Many pupils wrote the generic label, 'y-axis', demonstrating a lack of appreciation of the context of the question. **12%** omitted this question.

Magnetic forces (e)

e Ali moves magnet A towards magnet B.
Magnet B moves away from magnet A even though Ali does not touch magnet B.

Why did magnet B move away from magnet A?

_____ e

1 mark

S000278_05

Question	Mark	Requirements	Allowable answers
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

Additional guidance

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*

Magnetic forces (e)

Content domain reference	**P3k** Forces and magnets		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' ability to describe how the orientation of two magnets affects whether they attract or repel.			

Response	Commentary
Creditworthy 11%	
Examples: 'they repel each other' 'two N poles are facing each other' 'the same ends are facing each other'	Only **11%** of pupils correctly identified that the effect was a repulsion force or that two identical poles were facing each other to cause the effect. These pupils were able to apply their understanding of how magnets and magnetic forces work to explain why magnet B moved away from magnet A.
Non-creditworthy 89%	
Examples: 'negative and positive are facing' 'they are both North' 'magnetic force pushes it away' 'same sides' 'magnet A is stronger'	**81%** of pupils gave an insufficient or incorrect response. Pupils gave a wide range of incorrect responses to this question. Many gave an incorrect response using incorrect terminology (positive and negative), or an otherwise insufficient or incorrect response, often referring to the sides or the strength of the magnet(s). **8%** omitted this question.

Magnetic forces (f)

f Ali tries different ways of putting the magnets together.

Tick **ONE** box on each row of the table to show if the magnets move together, move apart or do not move.

The first one has been done for you.

Magnets	Move together	Move apart	Do not move
	✓		
			
			
			

f

1 mark

S000278_06

Question	Mark	Requirements	Allowable answers
f	*1m*	Award **ONE** mark for:	

Magnets	Move together	Move apart	Do not move
	✓		
		✓	
	✓		
		✓	

Additional guidance

Do not *give credit if more than one box has been ticked in a row.*

Do not *give credit if no ticks are given in a row.*

Magnetic forces (f)

Content domain reference	**P3k** Forces and magnets		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' understanding of magnetic poles, attraction and repulsion by asking them to select what happens for each possible orientation.			

Response	Commentary
Creditworthy 35%	
'move apart, move together, move apart'	**35%** of pupils correctly classified the orientations as repulsive or attractive.
Non-creditworthy 65%	
'move apart, move together, do not move'	**64%** of pupils failed to correctly classify all four orientations, demonstrating an insufficient understanding of magnetic forces. The most common error was to suggest that some orientations would not cause any movement, particularly the last orientation (two non-shaded poles facing). Perhaps these pupils (**41%**) incorrectly believed that only one side of a magnet works. **1%** omitted this question.

2 Famous scientist

a What shape is the Sun?

_____

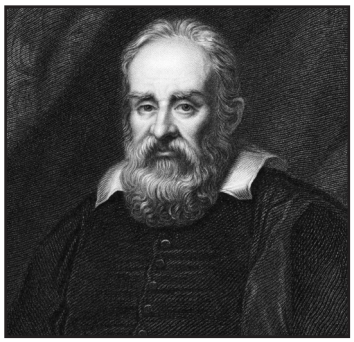
a

1 mark

S000219_01

b

Galileo developed the equipment that scientists use to see the Sun, Moon, stars and planets in more detail.



Galileo (1564–1642)

Name the equipment that scientists use to see into space.

_____

b

1 mark

S000219_02

c The Moon orbits the Earth.

Tick **ONE** box to show how much time the **Moon** takes to orbit the Earth.

1 day	☐	24 days	☐
28 days	☐	365 days	☐

c

1 mark

S000219_03

d People used to think the Sun orbited the Earth because the Sun seems to move across the sky every day.

What movement in space makes the Sun seem to move across the sky every day?

_____ d

1 mark
S000219_04

e Galileo believed the Earth orbited the Sun.

His observations into space gave evidence to support his idea.

Why is it important to get evidence to support a scientific idea?

_____

_____ e

1 mark
S000219_05

f Galileo said that the Earth stays in the same orbit as it travels around the Sun.

Write **true** or **false** next to each sentence to show what it would be like if the Earth's orbit was further away from the Sun.

If the Earth's orbit was further away from the Sun...	**True** or **false**?
the Earth would be colder.	_____
the Earth would be darker.	_____
the Earth would not have night-times.	_____
the Earth would have longer years.	_____

f

2 marks
S000219_06

Famous scientist (a)

a What shape is the Sun?

_____ a

1 mark

S000219_01

Question	Mark	Requirements	Allowable answers
a	*1m*	Award **ONE** mark for an indication that the Sun is spherical: ■ sphere	**ONE** mark may be awarded for: ■ (like a) ball

Additional guidance

Do not *give credit for an insufficient response:*

- *it is round/a circle*
- *it is round with lines/beams round the edge*

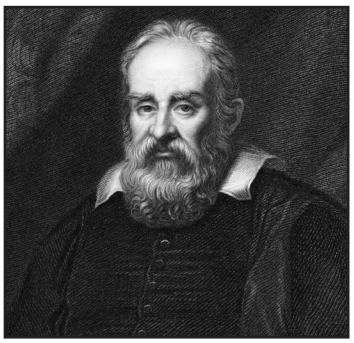
Content domain reference	**P5c** Earth and space		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' knowledge of the shape of objects in space.			

Response	Commentary
Creditworthy 60%	
Example: 'sphere'	**60%** of pupils correctly identified the shape of the Sun as spherical or ball-shaped.
Non-creditworthy 40%	
Example: 'circle'	**39%** of pupils gave an incorrect or insufficient response. Many of these pupils described the Sun as a two-dimensional shape, usually a circle. This may be a misconception that exists due to their perception of the Sun from Earth or could be due to children being more familiar with the names of 2 dimensional shapes. **Fewer than 1%** omitted this question.

Famous scientist (b)

b

Galileo developed the equipment that scientists use to see the Sun, Moon, stars and planets in more detail.



Galileo (1564–1642)

Name the equipment that scientists use to see into space.

_____ b

1 mark

S000219_02

Question	Mark	Requirements	Allowable answers
b	*1m*	Award **ONE** mark for for identifying the telescope: ■ telescope	

Additional guidance
Do not *give credit for an insufficient response:* ■ *binoculars* ■ *satellite*

Famous scientist (b)

Content domain reference	**WSUb** Carrying out		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' recall of the equipment used to see into space.			

Response	Commentary
Creditworthy 86%	
Example: 'telescope'	**86%** of pupils were able to correctly name the equipment used to see into space as a telescope.
Non-creditworthy 14%	
Examples: 'binoculars' 'satellite'	**12%** of pupils gave other incorrect responses, often naming pieces of equipment used to view objects at a distance on Earth. These pupils did not demonstrate the understanding that only telescopes have lenses powerful enough to be able to view objects in space. **3%** omitted this question.

Please note: percentages on this page do not add to their expected sub-totals. This is due to rounding.

Famous scientist (c)

c The Moon orbits the Earth.

Tick **ONE** box to show how much time the **Moon** takes to orbit the Earth.

1 day	☐	24 days	☐
28 days	☐	365 days	☐

☐ c

1 mark

S000219_03

Question	Mark	Requirements	Allowable answers
c	*1m*	Award **ONE** mark for: 1 day ☐ 24 days ☐ 28 days ☑ 365 days ☐	

Additional guidance
Do not *give credit if more than one box has been ticked.*

Famous scientist (c)

Content domain reference	**P5b** Earth and space		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' knowledge of the duration of the Moon's orbit.			

Response	Commentary
Creditworthy 28%	
'28 days'	**28%** of pupils correctly estimated the duration of the Moon's orbit as approximately 28 days.
Non-creditworthy 72%	
'1 day' '24 days' '365 days'	**38%** of pupils incorrectly selected '1 day', which is the length of time it takes for the Earth to rotate on its axis. **24%** of pupils incorrectly selected '365 days', which is the length of time it takes for the Earth to orbit the Sun. **9%** of pupils incorrectly selected '24 days'. The number 24 alludes to the number of hours it takes for the Earth to rotate on its axis. **Fewer than 1%** omitted this question.

Famous scientist (d)

d People used to think the Sun orbited the Earth because the Sun seems to move across the sky every day.

What movement in space makes the Sun seem to move across the sky every day?

_____ d

1 mark

S000219_04

Question	Mark	Requirements	Allowable answers
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

Additional guidance
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)*

Famous scientist (d)

Content domain reference	**P5d** Earth and space		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' understanding of the Earth's rotation to explain why the Sun appears to move across the sky.			

Response	Commentary
Creditworthy 23%	
Examples: 'the Earth spinning' 'the Earth rotates'	**23%** of pupils gave a correct response indicating that the Earth spinning on its axis causes the Sun's apparent movement across the sky.
Non-creditworthy 77%	
Examples: 'it spins' 'the Earth orbiting' 'the Moon orbits the Earth' 'the Moon comes up' 'we are spinning' 'sunrise and sunset'	**14%** of pupils gave an insufficient response that implied the apparent movement of the Sun was caused by the Earth's orbit. While the Earth's orbit does have an effect on the apparent movement of the Sun across the sky from day to day, the main factor is the Earth's spin on its axis. **55%** of pupils did not clearly indicate what was spinning, or gave another insufficient response, sometimes writing 'we are spinning' or attributing the Sun's movement to sunrise and sunset without qualifying how it moves. **8%** omitted this question.

Famous scientist (e)

e

Galileo believed the Earth orbited the Sun.

His observations into space gave evidence to support his idea.

Why is it important to get evidence to support a scientific idea?

_____

_____

e

1 mark

S000219_05

Question	Mark	Requirements	Allowable answers
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

Additional guidance

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*

Famous scientist (e)

Content domain reference	**WSUf** Concluding		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' appreciation of the need for scientific evidence to support an idea.			

Response	Commentary
Creditworthy 59%	
Examples: 'because without evidence they are just ideas' 'the more evidence, the more sure you can be' 'otherwise you can't know if the idea is right or not'	**59%** of pupils gave a correct indication that without evidence, scientific ideas have no credibility. These pupils appreciated that scientific evidence plays an important role in drawing an accurate conclusion.
Non-creditworthy 41%	
Examples: 'evidence supports science' (given) 'to be sure that he had the right answer' 'so you will believe him'	**36%** of pupils gave an insufficient response, often restating information given in the question, or generally referring to belief in a person's ideas. **5%** omitted this question.

Famous scientist (f)

f Galileo said that the Earth stays in the same orbit as it travels around the Sun.

Write **true** or **false** next to each sentence to show what it would be like if the Earth's orbit was further away from the Sun.

If the Earth's orbit was further away from the Sun...	**True** or **false**?
the Earth would be colder.	_____
the Earth would be darker.	_____
the Earth would not have night-times.	_____
the Earth would have longer years.	_____

f

2 marks

S000219_06

Question	Mark	Requirements	Allowable answers
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.
Additional guidance			

Famous scientist (f)

Content domain reference	**WSLi** Concluding		
Cognitive domain strand	Knowledge and comprehension	Application and analysis	**Synthesis and evaluation**
This question is assessing pupils' ability to apply their understanding of the Earth's position and orbit in space to describe the consequences of altering it.			

Response	Commentary
Creditworthy 2m: 37%, 1m: 50%	
'the Earth would be colder' 'the Earth would be darker' 'the Earth would have longer years'	**37%** of pupils correctly identified all four statements as true or false, gaining both marks. These pupils demonstrated secure understanding of the Earth's position and movement in space compared with those of further away planets (such as Mars), which are colder, darker, and take longer to orbit the Sun. **50%** of pupils correctly identified three out of the four statements as true or false, gaining one mark.
Non-creditworthy 13%	
'the Earth would not have night-times'	**12%** of pupils classified two or more statements incorrectly, scoring no marks. These pupils were unable to consider how being further away from the Sun would change the Earth's temperature, light and year length. **Fewer than 1%** omitted this question.

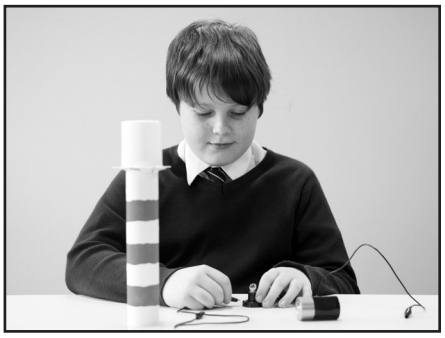
3 Lighthouse

a

George makes a model lighthouse using a cardboard tube and a yoghurt pot.

He makes a circuit to make his lighthouse light up.

The yoghurt pot lets some light through.



What is the name given to a material that lets only some light through?

_____

a

1 mark

S000216_01

b

George wants to make his lighthouse have a brighter light.

Tick **ONE** box to show what George could use instead of a yoghurt pot to make the lighthouse appear brighter.

plastic cup ☐

tin can ☐

china egg cup ☐

part of cardboard egg box ☐

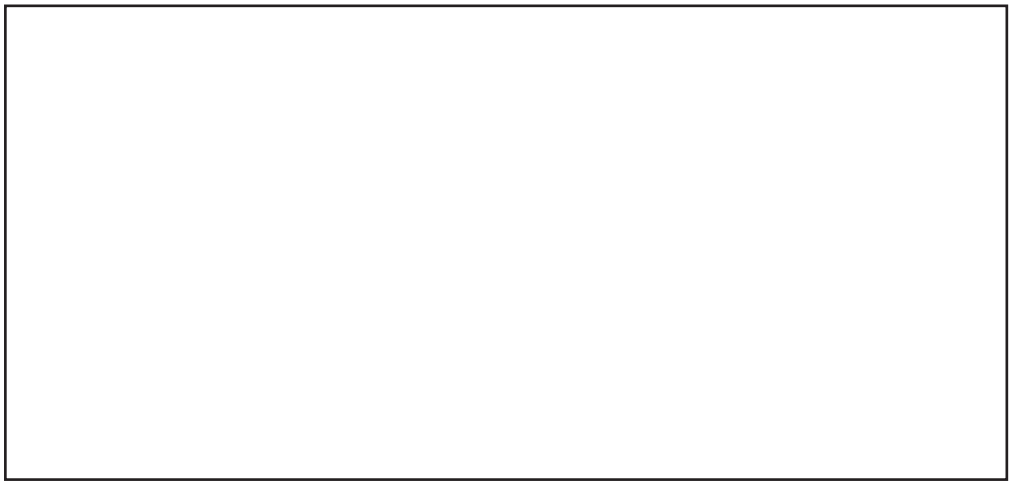
b

1 mark

S000216_02

c George uses one bulb, one cell (battery) and two wires to make the circuit for his lighthouse.

Draw the circuit diagram using the correct symbols for the lighthouse.



c

2 marks

S000216_03

d Write **true** or **false** next to each sentence about the circuit.

George's circuit will only work if...	**True** or **false**?
the cell is connected to the bulb.	_____
there are gaps in the circuit.	_____
he uses wires of the same length.	_____
the wires are connected to the same end of the cell.	_____

d

2 marks

S000216_04

e What component should George add to his circuit to make the light brighter?

_____

e

1 mark

S000216_05

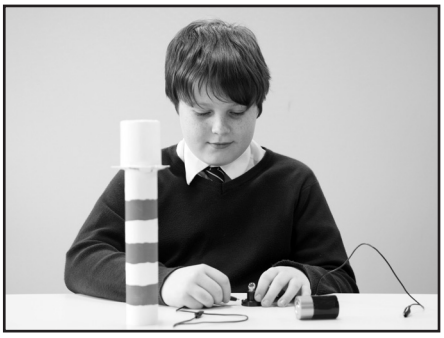
Light house (a)

a

George makes a model lighthouse using a cardboard tube and a yoghurt pot.

He makes a circuit to make his lighthouse light up.

The yoghurt pot lets some light through.



What is the name given to a material that lets only some light through?

_____

a

1 mark

S000216_01

Question	Mark	Requirements	Allowable answers
a	*1m*	Award **ONE** mark for translucent.	

Additional guidance
Do not *give credit for a response that includes incorrect science:* ■ *transparent* ■ *opaque*

Light house (a)

Content domain reference	**C5a** Properties and changes of materials		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' recall of the scientific term used to describe a material that partially lets light through.			

Response	Commentary
Creditworthy 28%	
'translucent'	Only **28%** of pupils correctly identified the property of a material that lets through some light as translucency. These pupils demonstrated their understanding of the terms associated with the passage of light through a substance.
Non-creditworthy 72%	
'transparent' 'opaque'	**19%** of pupils incorrectly gave 'transparent', which is the property of a material that lets through all light. **42%** of pupils incorrectly gave 'opaque', or another incorrect or insufficient answer that does not describe the passage of light through a substance. **12%** omitted this question.

Please note: percentages on this page do not add to their expected sub-totals. This is due to rounding.

Light house (b)

b George wants to make his lighthouse have a brighter light.

Tick **ONE** box to show what George could use instead of a yoghurt pot to make the lighthouse appear brighter.

plastic cup ☐

tin can ☐

china egg cup ☐

part of cardboard egg box ☐

☐ b

1 mark

S000216_02

Question	Mark	Requirements	Allowable answers
b	*1m*	Award **ONE** mark for:  plastic cup ☑  tin can ☐  china egg cup ☐  part of cardboard egg box ☐	

Additional guidance

Do not *give credit if more than one box has been ticked.*

Light house (b)

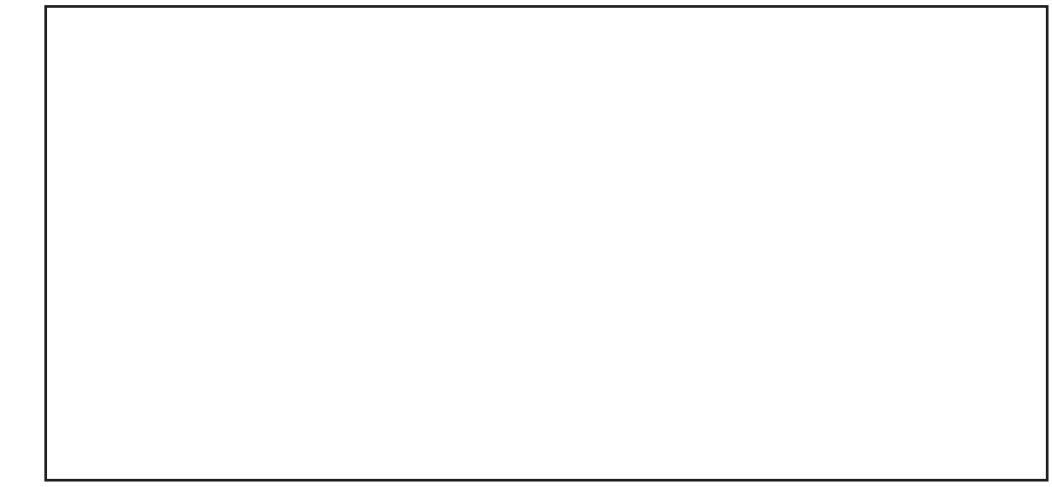
Content domain reference	**C5a** Properties and changes of materials		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' ability to apply their understanding of the properties of materials in selecting an appropriate item to improve a model lighthouse.			

Response	Commentary
Creditworthy 90%	
'plastic cup'	**90%** of pupils correctly identified the plastic cup as being the only transparent material present, which would let more light out of the lighthouse.
Non-creditworthy 10%	
'tin can' 'china egg cup' 'part of cardboard egg box'	**9%** of pupils chose an incorrect response. **7%** of pupils indicated the 'tin can', which was probably chosen because of its ability to reflect light. These pupils failed to understand that the light was coming from inside the can and needed to pass through the material. **Fewer than 1%** omitted this question.

Light house (c)

c George uses one bulb, one cell (battery) and two wires to make the circuit for his lighthouse.

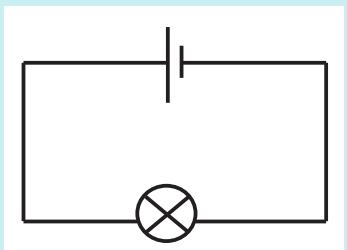
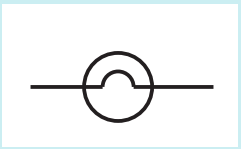
Draw the circuit diagram using the correct symbols for the lighthouse.



c

2 marks

S000216_03

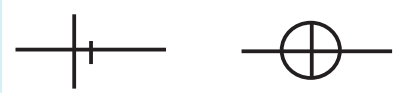
Question	Mark	Requirements	Allowable answers
c	*2m*	Award **TWO** marks for a correctly drawn circuit with one cell, wires and a bulb:  Award **ONE** mark for a circuit where **one** error/omission/mistake has been made but it is otherwise correct.	Credit may be given for an obsolete symbol for a bulb or for a non–rectilinear circuit. 

Additional guidance

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.*

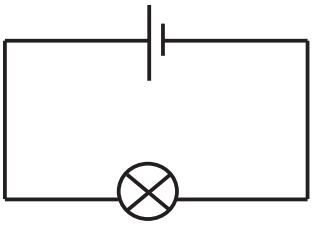
Do not *give credit for an error in the circuit that includes incorrect science:*

- *circuits containing gaps between components of more than 2 mm*
- *circuits with extra/fewer components*
- *circuits with incorrectly drawn components:*



Light house (c)

Content domain reference	**P6g** Electricity		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' ability to draw an accurate diagram of a given electrical circuit.			

Response	Commentary
Creditworthy 2m: 18%, 1m: 21%	
Examples: 	**18%** of pupils correctly drew a circuit diagram connecting the bulb and cell with two wires, gaining both marks. **21%** of pupils scored one mark for an otherwise correct circuit diagram containing one mistake, such as drawings of components, gaps between components, extra components or incorrectly drawn components.
Non-creditworthy 61%	
	54% of pupils made two or more mistakes in drawing their circuit diagram, scoring no marks. **7%** omitted this question.

Light house (d)

d Write **true** or **false** next to each sentence about the circuit.

George's circuit will only work if...	**True** or **false**?
the cell is connected to the bulb.	_____
there are gaps in the circuit.	_____
he uses wires of the same length.	_____
the wires are connected to the same end of the cell.	_____

d

2 marks

S000216_04

Question	*Mark*	*Requirements*	*Allowable answers*
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.

Additional guidance

Light house (d)

Content domain reference	**P4g** Electricity **P4h** Electricity		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' ability to analyse a circuit and apply their knowledge of what makes it work.			

Response	Commentary
Creditworthy 2m: 37%, 1m: 43%	
'the cell is connected to the bulb'	**37%** of pupils correctly classified all four statements as true or false, scoring both marks. **43%** of pupils correctly classified three out of four of the statements as true or false, scoring one mark.
Non-creditworthy 20%	
'there are gaps in the circuit' 'he uses wires of the same length' 'the wires are connected to the same end of the cell'	**19%** of pupils classified two or more statements incorrectly, and received no marks. The final two statements, 'he uses wires of the same length' and 'the wires are connected to the same end of the cell' proved to be the most difficult (**33%** and **32%** incorrectly selecting 'true' for each statement respectively). Using wires of different lengths can have an effect on the resistance of the circuit, but probably would not stop it working (unless an extreme length of wire was used). Connecting the wires to the same end of the cell will not allow the current to flow through the circuit. **1%** omitted this question.

Light house (e)

e What component should George add to his circuit to make the light brighter?

_____ e

1 mark

S000216_05

Question	Mark	Requirements	Allowable answers
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	

Additional guidance
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]*

Light house (e)

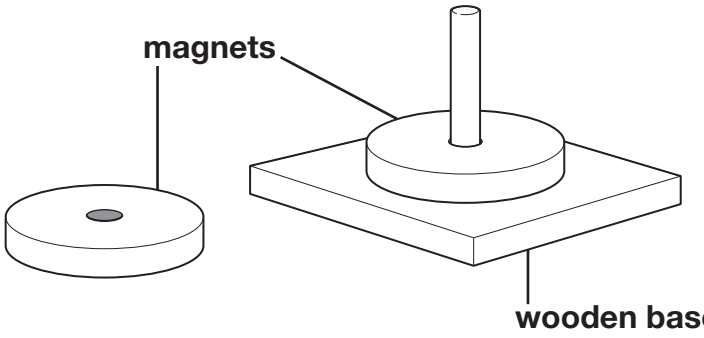
Content domain reference	**P6e** Electricity **P6f** Electricity		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' understanding of electrical components to identify a component that would increase the brightness of a bulb.			

Response	Commentary
Creditworthy 66%	
Examples: 'cell' 'battery' 'increase the voltage'	**64%** of pupils correctly identified that a cell or battery could be added to the circuit to increase the bulb's brightness. **2%** of pupils scored a mark by going beyond the key stage 2 programme of study. These pupils wrote about increasing the voltage of the cell. These pupils were able to demonstrate their understanding of the factors that affect the brightness of a bulb, in this case the number of cells (or voltage).
Non-creditworthy 34%	
Example: 'use a bigger battery'	**2%** of pupils gave an insufficient response about using a bigger battery, which was not sufficient to imply higher voltage. **23%** of pupils gave other insufficient or incorrect responses. **9%** omitted this question.

4 Magnets

a Avi has two magnets.

The magnets have holes in them so they can slide onto a base.
They can be put on a wooden base either way up.



Which of the following items could Avi pick up with the magnets?
Tick **ONE** box.

plastic pen	☐	iron nail	☐
glass marble	☐	rubber ball	☐

☐ a

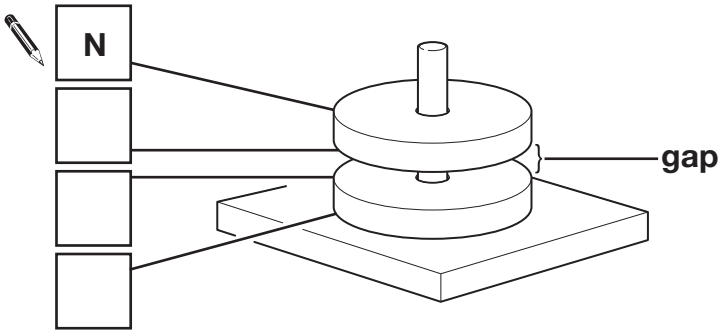
1 mark

S000372_01

b Avi puts the two magnets on the base. The magnets do not touch.
The top magnet hovers above the bottom magnet.

Write **N** (North) or **S** (South) in each box to show the poles of the magnets.

The first one has been done for you.



☐ b

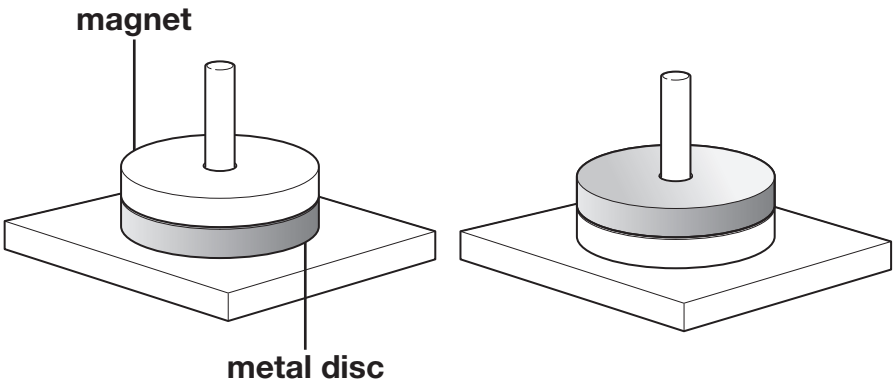
1 mark

S000372_02

c Avi has a metal disc. It is exactly the same size as the magnets.

He puts the metal disc and a magnet on the base in two ways.

Look at the pictures.



It is not possible to tell from the pictures if the disc is made of a magnetic metal.

Explain why you cannot tell if the metal disc is made of a magnetic metal.

_____

_____

c

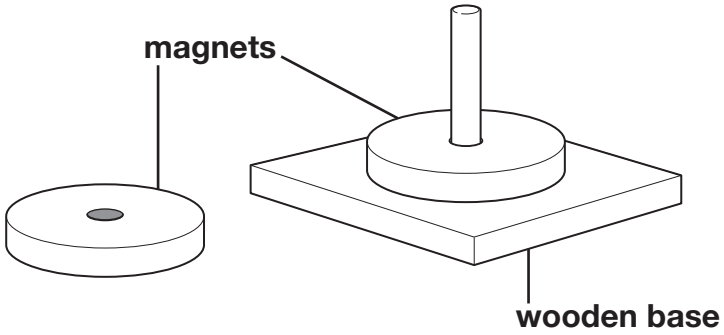
1 mark

S000372_04

Magnets (a)

a Avi has two magnets.

The magnets have holes in them so they can slide onto a base.
They can be put on a wooden base either way up.



Which of the following items could Avi pick up with the magnets?
Tick **ONE** box.

plastic pen	☐	iron nail	☐
glass marble	☐	rubber ball	☐

☐ a

1 mark

S000372_01

Question	Mark	Requirements	Allowable answers
a	*1m*	Award **ONE** mark for: plastic pen ☐ iron nail ☑ glass marble ☐ rubber ball ☐	

Additional guidance
Do not *give credit if more than one box has been ticked.*

Magnets (a)

Content domain reference	**P3i** Forces and magnets **P3h** Forces and magnets		
Cognitive domain strand	**Knowledge and comprehension**	Application and analysis	Synthesis and evaluation
This question is assessing pupils' understanding of magnetism and material properties to identify magnetic items.			

Response	Commentary
Creditworthy 91%	
'iron nail'	Pupils found this question easy, as **91%** correctly identified the only magnetic material as the iron nail. None of the distractors provided were of non-magnetic metals, which are normally the source of the majority of pupils' incorrect answers on this topic.
Non-creditworthy 9%	
'plastic pen' 'glass marble' 'rubber ball'	**8%** of pupils incorrectly chose a non-magnetic material or ticked more than one box. The most common incorrect response was the glass marble, which was selected by **4%** of pupils. **Fewer than 1%** omitted this question.

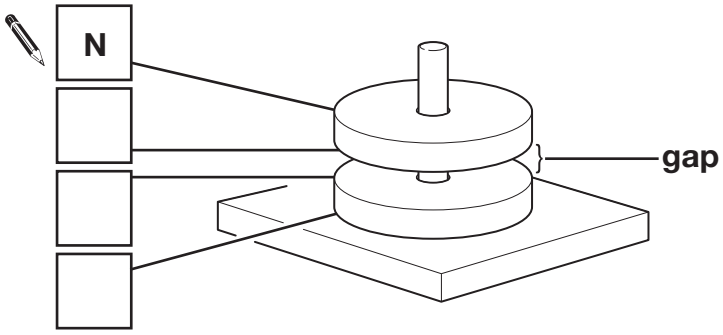
Magnets (b)

b

Avi puts the two magnets on the base. The magnets do not touch.
The top magnet hovers above the bottom magnet.

Write **N** (North) or **S** (South) in each box to show the poles of the magnets.

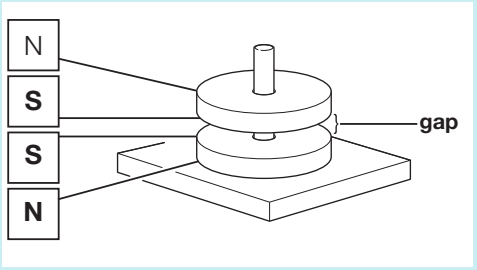
The first one has been done for you.



b

1 mark

S000372_02

Question	Mark	Requirements	Allowable answers
b	*1m*	Award **ONE** mark for:  	

Additional guidance

Magnets (b)

Content domain reference	**P3j** Forces and magnets **P3k** Forces and magnets		
Cognitive domain strand	Knowledge and comprehension	**Application and analysis**	Synthesis and evaluation
This question is assessing pupils' ability to assign the north and south poles to a pair of magnets to explain why one floats above the other.			

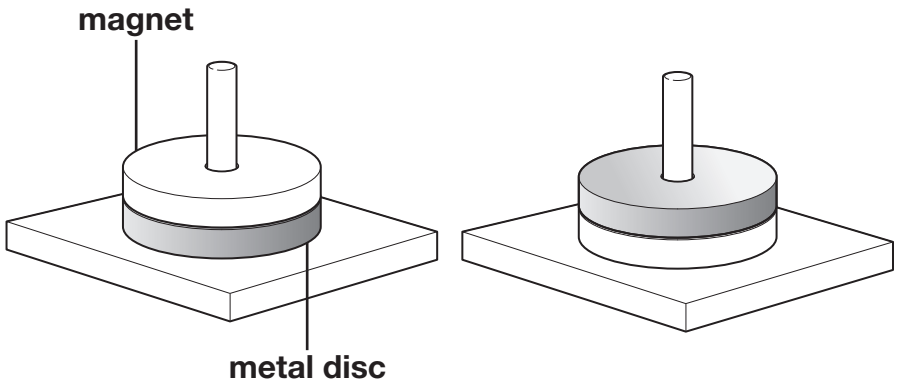
Response	Commentary
Creditworthy 44%	
Example: 'N-S, S-N'	**44%** of pupils correctly assigned the north and south poles of the pair of magnets, demonstrating an understanding of how similar poles repel each other.
Non-creditworthy 56%	
Examples: 'N-S, N-S' 'N-S, S-S' 'N-N, S-S'	**77%** of pupils wrote an 'S' in the second position, correctly identifying the reverse of the first magnet. The majority of errors came from the orientation of the second magnet. Some pupils wrote 'S' in both positions of the second magnet, indicating a lack of understanding that all magnets have two different poles. **5%** omitted this question.

Magnets (c)

c Avi has a metal disc. It is exactly the same size as the magnets.

He puts the metal disc and a magnet on the base in two ways.

Look at the pictures.



It is not possible to tell from the pictures if the disc is made of a magnetic metal.

Explain why you cannot tell if the metal disc is made of a magnetic metal.

_____

_____

c

1 mark

S000372_04

Magnets (c)

Question	Mark	Requirements	Allowable answers
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

Additional guidance
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*

Magnets (c)

Content domain reference	**P3k** Forces and magnets **P3i** Forces and magnets		
Cognitive domain strand	Knowledge and comprehension	Application and analysis	**Synthesis and evaluation**
This question is assessing pupils' ability to synthesise their understanding of forces with the given scenario to write an explanation of why the setup does not lead to a conclusion.			

Response	Commentary
Creditworthy 18%	
Examples: 'the magnet would just sit there anyway even if the disc wasn't magnetic' 'it would look like this if they were only being held by gravity' 'any material will just look like the pictures'	**15%** of pupils gave an appropriate explanation that indicated that you could not tell if the magnet was attracting the disc because it is being held in place by gravity. **3%** of pupils were awarded the mark for explaining that something needed to be done to the apparatus to test if the metal disc was magnetic, such as lifting the magnet.
Non-creditworthy 82%	
Examples: 'they look the same' 'the magnet is white and the metal is grey' 'we can't see it hovering'	**74%** of pupils gave an insufficient response. Many pupils described what they saw rather than explaining why the proof was insufficient. **7%** omitted this question.

Please note: percentages on this page do not add to their expected sub-totals. This is due to rounding.

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