**Unit planning guidance**

**Unit context**

New materials are being discovered all the time. Throughout history, materials have changed the way that humans live. The first ever tools made by humans were made from stone. Then humans discovered different metals and how to use them to make objects like swords and pipes. More recently, the invention of the silicon chip has become the most influential invention of our time. It powers our smartphones, scans brains, and can even fly planes! Discovering new materials changes the world.

This unit is designed to expand pupils’ knowledge of materials and what they are used for. It builds on what pupils learned in Year 1. The first session is a revision session of the work completed in Year 1, designed to remind pupils of the names of common materials and their properties. Pupils then go on to consider the suitability of different materials, testing different materials, and completing an investigation. Pupils learn about recycling and single-use plastics and consider how they can help to stop plastic pollution. Finally, pupils learn about three scientists who have invented new materials which have changed the world.

**General resources**

The *Additional resource: Knowledge quizzes* contains all the knowledge quizzes for Year 2, as well as the charts where pupils record their scores for each quiz. You could print and make these into a small booklet to hand out to pupils every lesson.

The *Subject knowledge guidance* and *Knowledge organiser* for the unit are available as printable documents on Oxford Owl.

The full curriculum can be viewed in the *Science progression document* for Years 1–6.

***Pupils are not expected to read the text in the pupil workbook independently; it should be read as part of a guided reading exercise with an adult.***

***Each lesson has been designed for a two-hour duration.***

**Links to previous and future learning**

The knowledge from previous and future units which closely link with this current unit are shown below. For more information about how this unit fits into the wider sequence of learning, please see the Science progression document.

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| **Year 1** | **Year 3** | **Year 4** |
| **Everyday materials:*** There are many different materials.
* A material is something we can use to make different objects.
* There are different materials around our school.
* There are many different objects around us.
* An object is something that we can see and touch.
* Some objects are made from one material.
* Some objects are made from more than one material.
* Different materials have different properties.
* We can find out some of those properties by investigating how materials look and feel.
* We can describe materials by talking about their properties.
* Some properties of materials are not easy to see or feel.
* Absorbent materials soak up water easily.
* Waterproof materials do not allow water to soak into them.
* Materials that you can see through are called transparent.
* Objects are made from different materials.
* The materials are chosen because of their properties.
* Some materials are a good choice to make an object.
* Some materials are a bad choice to make an object.
* Materials can have many properties.
* We can sort and group objects using the properties of their materials.
 | **Rocks and fossils:*** Earth’s crust is made of rock.
* The mantle below the crust is mostly molten rock.
* Rocks are made of minerals.
* There are three types of rock: sedimentary, igneous, and metamorphic.
* Each type of rock is formed in a different way.
* Weathering if the breaking down of rocks by water, plant roots, or chemicals.
* Erosion is the transport of those sediments away by ice, the wind, or water.
* Some rocks are more durable (hard-wearing) than others.
* Different rocks have different properties.
* You can investigate the properties of different types of rock.
* The properties of different rocks make them suitable for different uses.
* You can research the uses of different types of rock.
* Fossils are the remains or trace of a plant or an animal from a long time ago.
* Most fossils only occur in sedimentary rock, but some are found in other natural materials.
* They can help us to find out about the organisms that lived in the past.
* A palaeontologist searches for and investigates fossils.
* Soil is made up of small bits or grains of rock.
* The small bits of rock combine with decaying organisms (mostly decaying plants).
* There are different types of soil.
* The type of soil depends on the type of rock from which it is formed.
* Different types of soil absorb different amounts of water.
* Fossils are the shape of or remains of a plant or animal.
* Fossils are found in rocks and other natural materials.
* They can help us to find out about the organisms that lived in the past.
* A palaeontologist searches for and investigates fossils.
* Mary Anning is known as an early fossil hunter.
* Her findings hugely supported our understanding that animals can become extinct.
* Most animals and plants do not become fossils when they die.
* Most fossils only occur in sedimentary rock.
* These fossils are a result of bones dissolving and the shape being replaced by minerals.
* The depth a fossil is found within rock can help us to work out how old that fossil is.
* There are also other types of fossils.
 | **States of matter:*** All materials are either a solid, liquid, or gas.
* Solids have a firm shape that can be measured in length, width, and height.
* Liquids flow easily and change shape to fit their container.
* Gases have no fixed shape and fill the space they are contained in.
* Freezing is the change of state from liquid to a solid.
* Liquids freeze as they get cooler.
* Water freezes at 0°C.
* Viscosity is how thick a liquid is or how easily it can flow.
* The thicker the liquid, the longer it takes to freeze.
* Melting is the change of state from a solid to a liquid.
* Some solids melt when they get warm.
* A material is the substance or substances a thing is made from.
* It is important to know what an object will be used from to decide what it should be made from.
* The melting point is the temperature when a solid changes to a liquid.
* The greater the temperature, the quicker the change of state.
* The greater the amount of ice, the slower the change of state to liquid water.
* Ice melts at 0°C.
* Evaporation is the change of state from liquid to gas.
* The greater the temperature, the quicker evaporation will occur.
* The greater the amount of water, the slower it will evaporate.
* Water at the surface of seas, rivers, etc. evaporates into water vapour (a gas).
* Condensation is the change of state from gas to liquid.
* Water vapour is a gas. It changes state to a liquid when it gets colder.
* The water cycle is the continuous journey that water takes from lakes, rivers, and the sea to the sky, then to the land, and then back to the lakes, river, and sea.
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| **Unit overview** |
|  | **Key knowledge** | **Key vocabulary** |
| **Lesson 1:*****Can we identify the materials that different objects are made from?*** | * Materials are used to make objects.
* The same materials are used to make lots of different objects (for example, metal can be used to make coins, cans, and cars).
* Different materials are sometimes used for the same object (for example, spoons can be made from plastic, wood, and metal).
* Materials have different properties. ‘Properties’ describe the materials (for example, the properties of wood are that it is *hard* and *strong*).
* A material is chosen to make an object because of its properties.

**Working scientifically*** Make careful observations.
* Record findings using simple scientific language, drawings, and labelled diagrams.
* Report on findings from research, including oral and written explanations.
 | * **materials**
* objects
* properties
 |
| **Lesson 2:*****Can we identify how materials are used in our local area?*** | * Materials are used to make objects.
* The same materials are used to make lots of different objects.
* Different materials are used for the same object.
* Different materials have different properties.
* A material is chosen to make an object because of its properties.

**Working scientifically*** Ask relevant questions and use different types of scientific enquiries to answer them.
* Make careful observations.
* Record findings using simple scientific language, drawings, and labelled diagrams.
 | * materials
* objects
* **properties**
 |
| **Lesson 3:*****Can we compare the suitability of different materials?*** | * Different materials have different properties.
* A material is chosen to make an object because of its properties.
* The properties of a material make it either suitable or unsuitable.
* Some materials are more suitable than others.

**Working scientifically*** Make careful observations.
* Record findings using simple scientific language, drawings, and labelled diagrams.
* Report on findings from enquiries, including oral and written explanations.
 | * absorbent
* **suitability**
* suitable
* unsuitable
 |
| **Lesson 4:*****How can the shapes of objects made from some materials be changed?*** | * Objects that can be squashed, bent, twisted, or stretched are all made from flexible materials.
* Flexible materials can change shape.
* Objects that cannot be squashed, bent, twisted, or stretched are all made from rigid materials.
* Rigid materials cannot change shape.
* Both flexible and rigid materials are important and used for different things.

**Working scientifically*** Make careful observations.
* Record findings using simple scientific language, drawings, and labelled diagrams.
 | * bend
* **flexible**
* rigid
* shape
* squash
* stretch
* twist
 |
| **Lesson 5:*****How can we help to stop plastic pollution?*** | * Recycling is when materials can be reused and made into new items.
* Plastic does not rot and not all plastic can be recycled.
* There are special symbols on packaging to tell you if something can be recycled.
* Lots of plastic ends up in the ocean.
* Animals can be hurt by plastic, especially if they mistake it for food and eat it.

**Working scientifically*** Ask relevant questions and use different types of scientific enquiries to answer them.
* Make careful observations.
* Record findings using simple scientific language, drawings, and labelled diagrams.
 | * pledge
* pollution
* **recycle**
* rubbish
 |
| **Lesson 6:*****How are new materials discovered?*** | * Throughout history, materials have changed the way that humans live.
* George Washington Carver invented new uses for the peanut, which helped struggling farmers to make a living.
* Stephanie Kwolek discovered a new material called Kevlar which has saved thousands of lives.
* Charles Macintosh invented the first waterproof fabric to keep people dry in the rain.
 | * **discover**
* invention
* inventor
* scientist
 |

Further to the standard lesson resources, additional resources are provided.

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| Lesson question | Key knowledge | Learning resources | Key vocabulary |
| Lesson 1:*Can we identify the materials that different objects are made from?* | * Materials are used to make objects.
* The same materials are used to make lots of different objects (for example, metal can be used to make coins, cans, and cars).
* Different materials are used for the same object (for example, spoons can be made from plastic, wood, and metal).
* Materials have different properties. ‘Properties’ describe the materials (for example, the properties of wood are that it is *hard* and *strong*).
* A material is chosen to make an object because of its properties.

**Working scientifically*** Make careful observations.
* Record findings using simple scientific language, drawings, and labelled diagrams.
* Report on findings from enquiries, including oral and written explanations.
 | Pupil workbookKnowledge organiserTeaching slidesSubject knowledge guidanceWorksheet:Material hunt  | * **materials**
* objects
* properties
 |
| Outcomes/Assessment | **Disciplinary and substantive concept/s** | **Key term** | **Key takeaway** |
| Pupil workbookExit questions | * **DC4:** Make careful observations.
* **DC5:** Record findings using simple scientific language, drawings, and labelled diagrams.
* **DC7:** Report on findings from enquiries, including oral and written explanations.

**SC:** Everyday materials include wood, metal, plastic, glass, brick, rock, paper, and cardboard.**SC:** The material chosen to make an object or device is based on the suitability of its properties.**SC:** The shapes of solid objects made from some materials can be changed by squashing, bending, twisting, and stretching. | materials | **Materials** are what objects are made of. |
| Teaching notes* Existing knowledge: Gauge pupils’ current knowledge of the uses of materials. Collect responses on sticky notes and add to working wall.
* Introduction: Share the learning journey and lesson question. Then share key knowledge and other key vocabulary with pupils.
* Talk task: Ask pupils to answer the questions ‘How many different objects can you spot in the classroom?’ and ‘Which materials are the objects made from?’ with their partner. Pupils could make a note of their discussion on a mini whiteboard. See if pupils can remember what they learned in the Year 1 unit: *Everyday materials* and the names of different materials they can see.
* Investigation: Explain to pupils that they will be taking part in an investigation where they walk around the school on a material hunt. Pupils should search for objects made from the different materials in the table and list them. You may wish to select a couple of objects from the classroom to model writing up before pupils begin. Come back together and discuss findings as a class. Pupils can take the *Worksheet: Material hunt* with them to fill in, which they can then copy into their pupil workbooks.
* Investigation: Pupils should then answer the investigation questions about their findings. This could be done as a whole class, small groups, or independently. Pupils can write the answers on their worksheets.
* Read: ‘Same object, different materials’. Read through the information on the corresponding slide and ask pupils to think of objects that are made from different materials. The example the slide gives is a spoon which can be made from plastic, wood, and metal which are all suitable materials for a spoon. Another example may be a chair (frame) which can be made from wood, metal, or plastic.
* Write: Ask pupils to fill in the ‘Materials and their properties’ table in their pupil workbooks.
* Talk task: Talk to the class about properties and ask them why spoons aren’t made of paper.
* Read: Using the teaching slides, read about which material is most suitable and define the word ‘suitable’.
* Write: Pupils to tick boxes to choose which material is most suitable for each object.

Exit questions: Talk partners tell each other a response to the main lesson question: ‘Can we identify the materials that different objects are made from?’. Add further review questions if you wish to. Urge pupils to use their key knowledge and vocabulary to answer the question. Pairs can try to improve one another’s understanding (peer assess). Take some examples of answers to discuss as a class. Use this as an assessment opportunity. Should you wish to, you might ask pupils to write a short independent response to the main lesson question. Ask pupils to answer the multiple-choice exit questions by holding up one, two, or three fingers. The exit questions can be found on the final teaching slides for this lesson. You may need to adapt the exit questions to suit your local walk.*\*The next session involves a walk around the local area, which will need to be planned in advance.* |

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| Lesson question | Key knowledge | Learning resources | Key vocabulary |
| Lesson 2:*Can we identify how materials are used in our local area?* | * Materials are used to make objects.
* The same materials are used to make lots of different objects.
* Different materials are used for the same object.
* Different materials have different properties.
* A material is chosen to make an object because of its properties.

**Working scientifically*** Ask relevant questions and use different types of scientific enquiries to answer them.
* Make careful observations.
* Record findings using simple scientific language, drawings, and labelled diagrams.
 | Pupil workbookKnowledge organiserTeaching slidesSubject knowledge guidancePhotocopy of the worksheetWorksheet: Materials in the local areaOptional: clipboards for use on local walk | * materials
* objects
* **properties**
 |
| Outcomes/Assessment | **Disciplinary and substantive concept/s** | **Key term** | **Key takeaway** |
| Pupil workbookKnowledge quiz 1.1 Exit questions | * **DC1:** Ask relevant questions and use different types of scientific enquiries to answer them.
* **DC4:** Make careful observations.
* **DC5:** Record findings using simple scientific language, drawings, and labelled diagrams.

**SC:** Everyday materials include wood, metal, plastic, glass, brick, rock, paper, and cardboard.**SC:** The material chosen to make an object or device is based on the suitability of its properties.**SC:** The shapes of solid objects made from some materials can be changed by squashing, bending, twisting, and stretching. | properties | A material is chosen to make an object because of its **properties**. |
| Teaching notes* Knowledge quiz 1.1: Pupils complete this in the *Additional resource: Unit 1 Knowledge* quizzes to assess their knowledge retention from the previous lesson. They write their score in the chart also provided in the additional resource.
* Learning journey: Revisit learning journey so far.
* Introduction: Share the knowledge and other key vocabulary with pupils.
* Talk task: Tell pupils that you are going to go on a hunt around your local area. Explain that they need to identify objects in the local area that are lots of different shapes and sizes. Explain that back in the classroom you’ll then group the objects based on their materials. Ask pupils to discuss the questions ‘What objects do you think we'll find?’ and ‘What materials do you think they'll be made from?’ with their partners.
* Investigation: Take pupils on a walk around your local area to find a variety of objects and their materials. Show pupils the *Worksheet: Materials in the local area* and remind pupils they are hunting for objects of all shapes and sizes. Model using the worksheet before leaving. You may wish to take photos of objects made from a variety of different and similar materials so pupils are reminded of what they found back in the classroom. Try to find at least one type of object that is made from different materials, e.g., a metal fence and a wooden fence.
* Group task: Ask pupils what they found on their walk. Explain to pupils they need to sort through the different objects they found and group them according to their material by writing the object name into the correct circle in their pupil workbooks. Model this activity before pupils begin. Some objects may be made of more than one material and suggest to pupils that the material that is used the most could be the group that object is sorted into.
* Write: Pupils should respond to their investigation findings by answering the questions on the worksheet/slide. To support pupils on these questions, provide the photographs of objects you found on your local walk that were made from different materials. To challenge pupils and extend the activity, ask them to redesign an object they saw that needed repairing or replacing with new materials.

Exit questions: Talk partners tell each other a response to the main lesson question: ‘Can we identify how materials are used in our local area?’. Add further review questions if you wish to. Urge pupils to use their key knowledge and vocabulary to answer the question. Pairs can try to improve one another’s understanding (peer assess). Take some examples of answers to discuss as a class. Use this as an assessment opportunity. Should you wish to, you might ask pupils to write a short independent response to the main lesson question. Ask pupils to answer the multiple-choice exit questions by holding up one, two, or three fingers. The exit questions can be found on the final teaching slides for this lesson.*\*The next session involves an investigation, the resources for which will need to be prepared in advance.* |

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| Lesson question | Key knowledge | Learning resources | Key vocabulary |
| Lesson 3:*Can we compare the suitability of different materials?* | * Different materials have different properties.
* A material is chosen to make an object because of its properties.
* The properties of a material make it either suitable or unsuitable.
* Some materials are more suitable than others.

**Working scientifically*** Make careful observations.
* Record findings using simple scientific language, drawings, and labelled diagrams.
* Report on findings from enquiries, including oral and written explanations.
 | Pupil workbookKnowledge organiserTeaching slidesSubject knowledge guidanceInvestigation apparatus: towels, sponges, cloths, kitchen roll, stopwatch, measuring beaker, water | * absorbent
* **suitability**
* suitable
* unsuitable
 |
| Outcomes/Assessment | **Disciplinary and substantive concept/s** | **Key term** | **Key takeaway** |
| Pupil workbookKnowledge quiz 1.2 Exit questions | * **DC4:** Make careful observations.
* **DC5:** Record findings using simple scientific language, drawings, and labelled diagrams.
* **DC7:** Report on findings from enquiries, including oral and written explanations.

**SC:** Everyday materials include wood, metal, plastic, glass, brick, rock, paper, and cardboard.**SC:** The material chosen to make an object or device is based on the suitability of its properties.**SC:** The shapes of solid objects made from some materials can be changed by squashing, bending, twisting, and stretching. | suitability | The properties of a material determine its **suitability** for use in an object. |
| Teaching notes*\*This lesson involves an investigation, the resources for which need to be prepared in advance.** Knowledge quiz 1.2: Pupils complete this in the *Additional resource: Unit 1 Knowledge quizzes* to assess their knowledge retention from the previous lesson. They write their score in the chart also provided in the Additional resource.
* Learning journey: Revisit learning journey so far.
* Introduction: Share the key knowledge and other key vocabulary with pupils.
* Talk task: Ask pupils to discuss the questions ‘What materials are these objects made from?’ and ‘Which materials would be unsuitable to make these objects and why?’ with their partners. Remind pupils that suitable means whether that material is right for that object. A previous example would be that paper is not a suitable material for a spoon but metal, plastic, and wood are. Take feedback as a whole class, spending time on discussing why certain materials aren’t suitable for certain jobs. You could take this activity a step further by asking pupils to pick an object from the room and explain why the material it is made from is suitable. Then pupils give an explanation to describe which materials would not be suitable for that same object.
* Read: ‘Solve the problem!’. Read through the character Tom’s problem and go through each object he could use to mop up the water. As you talk through each image, pass around the physical version for pupils to examine.
* Group task: Ask pupils to think about their answer to the question ‘Which of the objects do you think would work the best and why?’ before discussing their thoughts with their partner. You may wish to do a class vote after pupils have made a decision and tally the results to display.
* Talk task: Explain to pupils they are going to help Tom work out which object is most suitable and that to do this they must work out which one is most absorbent. Ask pupils to discuss the questions ‘What does absorbent mean?’ and ‘How can we find out which object is best at absorbing water?’ with their partner. Highlight that absorbent refers to a material that can soak up liquid. Discuss the various ideas pupils came up with to test which material is most absorbent.
* Investigation: Tell pupils they will carry out an investigation to test which material is most absorbent for Tom. Carry out the investigation in the pupil workbooks and model on the slides. Run through the apparatus and method. Then split pupils into groups to complete the investigation, completing the results table as they go. Bring pupils back together to discuss their results, before asking them to make a conclusion.
* Group task: Ask pupils to reflect on their investigation, and discuss the following questions in groups: ‘Was your prediction accurate?’, ‘Do you think your results were accurate?’, and ‘How could your investigation be improved?’.

Exit questions: Talk partners tell each other a response to the main lesson question: ‘Can we compare the suitability of different materials?’. Add further review questions if you wish to. Urge pupils to use their key knowledge and vocabulary to answer the question. Pairs can try to improve one another’s understanding (peer assess). Take some examples of answers to discuss as a class. Use this as an assessment opportunity. Should you wish to, you might ask pupils to write a short independent response to the main lesson question. Ask pupils to answer the multiple-choice exit questions by holding up one, two, or three fingers. The exit questions can be found on the final teaching slides for this lesson.*\*The next lesson includes demonstrating the action of bending, stretching, squashing, and twisting a flexible object. We recommend that these actions are demonstrated with physical objects. The lesson will also require access to playdough, an elastic band, a tea towel, cotton wool, a tape measure, paper, a plastic bag, and a sponge.*  |

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| Lesson question | Key knowledge | Learning resources | Key vocabulary |
| Lesson 4:*How can the shapes of objects made from some materials be changed?* | * Objects that can be squashed, bent, twisted, or stretched are all made from flexible materials.
* Flexible materials can change shape.
* Objects that cannot be squashed, bent, twisted, or stretched are all made from rigid materials.
* Rigid materials cannot change shape.
* Both flexible and rigid materials are important and used for different things.

**Working scientifically*** Make careful observations.
* Record findings using simple scientific language, drawings, and labelled diagrams.
 | Pupil workbookKnowledge organiserTeaching slidesSubject knowledge guidanceAdditional resource: Flexible or rigidObjects to explore: playdough, elastic bands, tea towels, cotton wool, tape measures, paper, plastic bags, sponges(one set per group)Flexible and rigid items for pupils to sort | * bend
* **flexible**
* rigid
* shape
* squash
* stretch
* twist
 |
| Outcomes/Assessment | **Disciplinary and substantive concept/s** | **Key term** | **Key takeaway** |
| Pupil workbookKnowledge quiz 1.3Exit questions | * **DC4:** Make careful observations.
* **DC5:** Record findings using simple scientific language, drawings, and labelled diagrams.

**SC:** Everyday materials include wood, metal, plastic, glass, brick, rock, paper, and cardboard.**SC:** The material chosen to make an object or device is based on the suitability of its properties.**SC:** The shapes of solid objects made from some materials can be changed by squashing, bending, twisting, and stretching. | flexible | If a **flexible** object is squashed, bent, twisted, or stretched it can change shape. |
| Teaching notes*\*This lesson includes demonstrating the action of bending, stretching, squashing, and twisting a flexible object. We recommend that these actions are demonstrated with physical objects. The lesson will also require access to playdough, an elastic band, a tea towel, cotton wool, a tape measure, paper, a plastic bag, and a sponge.* * Knowledge quiz 1.3: Pupils complete this in the *Additional resource: Unit 1 Knowledge quizzes* to assess their knowledge retention from the previous lesson. They write their score in the chart also provided in the additional resource.
* Learning journey: Revisit learning journey so far.
* Introduction: Share the key knowledge and other key vocabulary with pupils.
* Read: ‘How can we change the shape of some objects?’ Model the actions described on the slide with different items in the classroom and then give pupils the opportunity to have a go.
* Group task: Give each small group of pupils access to playdough, an elastic band, a tea towel, cotton wool, a tape measure, paper, a plastic bag, and a sponge. You may wish to do this activity as a carousel rather than providing multiple objects of each. Pupils should analyse the objects to see if they are flexible or rigid by answering the questions, ‘Can you squash it?’, ‘Can you bend it?’, ‘Can you twist it?’, and ‘Can you stretch it?’. Pupils should record their findings in the table in their pupil workbooks. Review the answers as a class and address any misconceptions that may have arisen.
* Read: ‘Flexible objects’. Explain to pupils that objects that can be squashed, bent, twisted, or stretched are all made from flexible materials. Go on to explain how you could try to stretch or bend non-flexible items, known as rigid items, but this would cause them to break. Flexible items don’t break from squashing, bending, twisting, or stretching. Emphasise how important it is that some objects are made from flexible materials, for example a sponge.
* Talk task: Ask pupils to discuss the questions ‘Why are flexible materials important to us?’ and ‘Which objects need to be flexible? Why?’ with their partners. Feed back as a whole class. Ideas may include clothes, beds, trampolines, etc.
* Read: ‘Rigid objects’. Explain to pupils that objects that cannot be squashed, bent, twisted, or stretched are all made from rigid materials. Emphasise how important it is that some objects are made from rigid materials and use the example of a brick wall for a house. Ask pupils what other objects need to be rigid and why. Ideas may include, chairs, tables, cups, doors, pencils, etc.
* Write: Show pupils the collection of rigid and flexible items on the *Additional resource: Flexible or rigid*. You could print these off and hand out one between two to allow pupils to examine in closer detail. Model how to complete the sorting activity by using ‘think aloud’ to sort one flexible and one rigid item into the correct group. Model writing that object into the table. Pupils to then sort the objects themselves into ‘flexible’ or ‘rigid’ in their pupil workbooks. Ideally, before pupils begin the pupil workbook task, as a whole class you sort a box of physical items into the groups ‘flexible’ or ‘rigid’ to support understanding. To support pupils, give them examples in their pupil workbooks to refer to and if possible, physical items. Pupils could also cut out the images from the Additional resource to stick instead of writing the object name. To challenge pupils ask them to think of their own objects that would go in either group. Review as a class and go through the answers.

Exit questions: Talk partners tell each other a response to the main lesson question: ‘How can the shapes of objects made from some materials be changed?’. Add further review questions if you wish to. Urge pupils to use their key knowledge and vocabulary to answer the question. Pairs can try to improve one another’s understanding (peer assess). Take some examples of answers to discuss as a class. Use this as an assessment opportunity. Should you wish to, you might ask pupils to write a short independent response to the main lesson question. Ask pupils to answer the multiple-choice exit questions by holding up one, two, or three fingers. The exit questions can be found on the final teaching slides for this lesson.*\*The next session involves pupils looking at recycling. You will need to gather food packaging, which has different recycling symbols on it, for pupils to sort.* |

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| Lesson question | Key knowledge | Learning resources | Key vocabulary |
| Lesson 5:*How can we help to stop plastic pollution?* | * Recycling is when materials can be reused and made into new items.
* Plastic does not rot and not all plastic can be recycled.
* There are special symbols on packaging to tell you if something can be recycled.
* Lots of plastic ends up in the ocean.
* Animals can be hurt by plastic, especially if they mistake it for food and eat it.

**Working scientifically*** Ask relevant questions and use different types of scientific enquiries to answer them.
* Make careful observations.
* Record findings using simple scientific language, drawings, and labelled diagrams.
 | Pupil workbookKnowledge organiserTeaching slidesSubject knowledge guidanceA range of food packaging, with different recycling symbols on, for pupils to sort | * pledge
* pollution
* **recycle**
* rubbish
 |
| Outcomes/Assessment | **Disciplinary and substantive concept/s** | **Key term** | **Key takeaway** |
| Pupil workbookKnowledge quiz 1.4Exit questions  | * **DC1:** Ask relevant questions and use different types of scientific enquiries to answer them.
* **DC4:** Make careful observations.
* **DC5:** Record findings using simple scientific language, drawings, and labelled diagrams.

**SC:** Everyday materials include wood, metal, plastic, glass, brick, rock, paper, and cardboard.**SC:** The material chosen to make an object or device is based on the suitability of its properties.**SC:** The shapes of solid objects made from some materials can be changed by squashing, bending, twisting, and stretching. | recycle | If an object or material can be **recycled**, it can be reused to make something new. |
| Teaching notes* Knowledge quiz 1.4: Pupils complete this in the *Additional resource: Unit 1 Knowledge quizzes* to assess their knowledge retention from the previous lesson. They write their score in the chart also provided in the Additional resource.
* Learning journey: Revisit learning journey so far.
* Introduction: Share the key knowledge and other key vocabulary with pupils.
* Write: Before completing this activity in the pupil workbook, this would be a great opportunity to physically sort items as a class. Label five boxes with the materials ‘Plastic, Glass, Food, Metal, Paper’ and either ask pupils to suggest items in the classroom that need to be sorted into the bin or provide a pile of objects that pupils should discuss in partners before deciding which ‘bin’ it should go into. Pupils should then complete the activity in their pupil workbooks by writing the object into the correct bin. Challenge pupils to think up their own objects to sort into the bins.
* Talk task: Explain to pupils that the images on the slide are all of rubbish. Ask pupils the question ‘What do they all have in common?’ to discuss with their partner. Pupils should conclude that all the images are objects made of plastic.
* Read: ‘Plastics’. Explain how plastic can come in a variety of shapes and sizes. This could be another opportunity to physically provide these objects for pupils to examine to show the multitude of properties plastic has. Go on to explain how plastic is non-biodegradable/does not rot. You may wish to show pupils additional images of plastic left in the environment. Next, explain how single-use plastics are plastics that we only use once. Read the examples on the slide and ask pupils if they can think of any other examples of single-use plastics. Ideas will likely include a range of different food wrappers.
* Talk task: Ask pupils to discuss the questions 'Which objects are single-use plastics?' and 'Which plastic objects do we use more than once?' by looking at the images on the corresponding slide. This is a great opportunity to address any misconceptions that may have arisen.
* Read: ‘Plastic recycling symbols’. Read through the information on the different recycling symbols that can be found on the back of packaging. If possible, show a physical example of each symbol on some packaging for pupils to examine. You could provide pupils with ‘recycling bins’ and ‘regular bins’ for pupils to practise reading the symbols and working out which part of the packaging goes where. Encourage pupils to look for these symbols when at home and to ensure they are helping their family to recycle correctly.
* Talk task: Ask pupils to discuss the question ‘What is happening in these photos?’ with their partners before feeding back as a class. Explain to pupils that all animals, whether they live on land or in the sea, can be hurt by plastic, especially when they mistake it for food and eat it. Eating plastic is bad for animals and can make them very ill. Explain that animals can also get tangled in plastic.
* Read: ‘How does plastic end up in the ocean?’. Explain to pupils that rubbish gets into the ocean not just from people dropping it in but because of our drainage system. Explain that this is why we must be careful when we throw away rubbish and to make sure we recycle as much as possible.
* Talk task: Ask pupils to discuss the questions ‘Do you ever drop rubbish or see other people dropping it?’ and ‘How could we stop people from dropping rubbish?’. Ask pupils to feedback to the class and write up their different ideas.
* Write: Explain to pupils how they are going to make a ‘plastic pledge’. Explain that a pledge is similar to a promise. Ask pupils the question ‘What could we do at home, at school or in a club to reduce the amount of plastic that we use?’. Pupils can discuss in partners before feeding back and helping you to model writing your own ‘plastic pledge’. Pupils should then write their own pledge into their pupil workbooks or design a poster/leaflet on the importance of recycling.

Exit questions: Talk partners tell each other a response to the main lesson question: ‘How can we help to stop plastic pollution?’. Add further review questions if you wish to. Urge pupils to use their key knowledge and vocabulary to answer the question. Pairs can try to improve one another’s understanding (peer assess). Take some examples of answers to discuss as a class. Use this as an assessment opportunity. Should you wish to, you might ask pupils to write a short independent response to the main lesson question. Ask pupils to answer the multiple-choice exit questions by holding up one, two, or three fingers. The exit questions can be found on the final teaching slides for this lesson. |

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| Lesson question | Key knowledge | Learning resources | Key vocabulary |
| Lesson 6:*How are new materials discovered?* | * Throughout history, materials have changed the way that humans live.
* George Washington Carver invented new uses for the peanut, which helped struggling farmers to make a living.
* Stephanie Kwolek discovered a new material called Kevlar which has saved thousands of lives.
* Charles Macintosh invented the first waterproof fabric to keep people dry in the rain.
 | Pupil workbookKnowledge organiserTeaching slidesSubject knowledge guidanceAdditional resource: Problems and solutionsWorksheet: Invention | * **discover**
* invention
* inventor
* scientist
 |
| Outcomes/Assessment | **Disciplinary and substantive concept/s** | **Key term** | **Key takeaway** |
| Pupil workbookKnowledge quiz 1.5Knowledge quiz 1.6 | **SC:** Everyday materials include wood, metal, plastic, glass, brick, rock, paper, and cardboard.**SC:** The material chosen to make an object or device is based on the suitability of its properties.**SC:** The shapes of solid objects made from some materials can be changed by squashing, bending, twisting, and stretching. | discover | Scientists and inventors **discover** new materials which change the way humans live. |
| Teaching notes* Knowledge quiz 1.5: Pupils complete this in the *Additional resource: Unit 1 Knowledge quizzes* to assess their knowledge retention from the previous lesson. They write their score in the chart also provided in the Additional resource.
* Learning journey: Revisit learning journey so far.
* Introduction: Share the key knowledge and other key vocabulary with pupils.
* Read: ‘How are new materials discovered?’. Explain to pupils that new materials are being discovered all the time and that throughout history, materials have changed the way that humans live. Ask pupils to imagine what life would be like if electricity/phones/radiators hadn’t been invented and ask them how those inventions have changed the way that humans live.
* Read: ‘George Washington Carver (1864–1943)’. Read through the information on George Washington Carver as a class or in pairs. To check and consolidate understanding ask pupils to discuss questions in their partners such as, ‘Where was George Washington Carver born?’, ‘What food did he invent many things from?’, ‘How did his inventions help farmers?’, etc.
* Read: ‘Stephanie Kwolek (1923–2014)’. Read through the information on Stephanie Kwolek as a class or in pairs. To check and consolidate understanding ask pupils to discuss questions in their partners such as, ‘What material did Stephanie Kwolek invent?’, ‘What is that material used for?’, ‘How has it helped people?’, etc.
* Read: ‘Charles Macintosh (1766–1843)’. Read through the information on Charles Macintosh as a class or in pairs. To check and consolidate understanding ask pupils to discuss questions in their partners such as, ‘What country was Charles Macintosh from?’, ‘What did he invent?’ ‘How did his invention help people?’, etc.
* Talk task: Ask pupils to discuss in pairs the questions ‘Out of the three inventors we have learned about this lesson, whose invention do you think is the most important? Why?’. You could open this discussion into a class vote or debate.
* Retrieval: Using what they have learned this lesson, pupils should complete the problems and solutions table in their pupil workbooks. You may wish to read through the problems and solutions on the *Additional resource: Problems and solutions*. To support pupils, they could use the information on the additional resource to write up each inventors’ problem and solution. For additional support, pupils could cut and stick the cards into the correct boxes. As a challenge, remove the additional resource and ask pupils to write the problems and solutions in their own words.
* Group task: Ask pupils to think back to the lesson on plastic and all the problems that plastic pollution causes. Ask them to discuss the questions ‘Can you think of any solutions to the plastic problems? Can you invent something to help solve plastic pollution?’ with their partners and feed back as a class. Hand out the *Worksheet: Invention* on which pupils can draw and label the invention they come up with.
* Knowledge quiz 1.6: Pupils complete this in the *Additional resource: Unit 1 Knowledge quizzes* to assess their knowledge retention from this lesson. They write their score in the chart also provided in the additional resource.
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