

# Science Key Stage 2

Curriculum map





# 1. Philosophy

## Six underlying attributes at the heart of Oak's curriculum and lessons.

Lessons and units are **knowledge and vocabulary rich** so that pupils build on what they already know to develop powerful knowledge.

Knowledge is **sequenced** and mapped in a **coherent** format so that pupils make meaningful connections.

Our **flexible** curriculum enables schools to tailor Oak's content to their curriculum and context.

Our curriculum is **evidence informed** through rigorous application of best practice and the science of learning.

We prioritise creating a **diverse** curriculum by committing to diversity in teaching and teachers, and the language, texts and media we use, so all pupils feel positively represented.

Creating an **accessible** curriculum that addresses the needs of all pupils is achieved to accessibility guidelines and requirements.



## 2. Units



KS2 Science is formed of 24 units and this is the recommended sequence:

Unit Title	Recommended year group	Number of lessons
1 Practical skills	Year 3	6
2 Raw and synthetic materials	Year 3	6
3 Plants	Year 3	6
4 Adaptations	Year 3	6
5 Light & dark	Year 3	6
6 Magnetism	Year 3	6
7 States of matter	Year 4	6
8 Rock cycle	Year 4	6
9 Human anatomy	Year 4	6



<b>10 Ecosystems</b>	<b>Year 4</b>	<b>6</b>
<b>11 Electrical circuits</b>	<b>Year 4</b>	<b>6</b>
<b>12 Sound</b>	<b>Year 4</b>	<b>6</b>
<b>13 Separating mixtures</b>	<b>Year 5</b>	<b>6</b>
<b>14 Physical and chemical changes</b>	<b>Year 5</b>	<b>6</b>
<b>15 Reproductive cycles</b>	<b>Year 5</b>	<b>6</b>
<b>16 Notable scientists</b>	<b>Year 5</b>	<b>6</b>
<b>17 Forces</b>	<b>Year 5</b>	<b>6</b>
<b>18 Space</b>	<b>Year 5</b>	<b>6</b>
<b>19 Particles in physical and chemical changes</b>	<b>Year 6</b>	<b>6</b>
<b>20 Sustainability</b>	<b>Year 6</b>	<b>6</b>
<b>21 Humans and animals over time</b>	<b>Year 6</b>	<b>6</b>

**22** Diet and lifestyle

**Year 6**

**6**

**23** Light

**Year 6**

**6**

**24** History of science

**Year 6**

**6**





# 3. Lessons

## Unit 1 Practical skills

6 Lessons

Lesson number	Lesson question	Pupils will learn
1.	What is a variable?	<ul style="list-style-type: none"><li>• Define a dependent, independent and control variable</li><li>• Know how to plan a 'fair test'</li><li>• Identify the variables in a range of experiments</li></ul>
2.	How do you draw a scientific diagram?	<ul style="list-style-type: none"><li>• Know the difference between a diagram and an illustration</li><li>• Identify good scientific diagrams</li><li>• Draw a range of scientific diagrams</li></ul>
3.	Why is a method important?	<ul style="list-style-type: none"><li>• Identify a good method</li><li>• Follow the instructions in a method</li><li>• Write a method for an investigation</li></ul>



- 4. What can we do with data we collect?**
- Describe how to collect results
  - Draw a results table
  - Know how to present results
- 

- 5. How can we communicate our results?**
- Know how to interpret results
  - Write a conclusion
  - Know how to present a conclusion
- 

- 6. How can we record an entire investigation?**
- Draft an investigation report
  - Know how to edit an investigation report
  - Redraft an investigation report
-



Lesson  
number

Lesson question

Pupils will learn

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<b>1.</b>	<b>What is a raw material?</b>	<ul style="list-style-type: none"><li>• Explain what a raw material is.</li><li>• Sort raw materials based on where they come from</li><li>• Describe the uses of some raw materials</li></ul>
<b>2.</b>	<b>What is a synthetic material?</b>	<ul style="list-style-type: none"><li>• Explain what a synthetic material is</li><li>• Sort materials into synthetic and raw materials</li><li>• Describe the uses of some synthetic materials</li></ul>
<b>3.</b>	<b>How are synthetic materials made from raw materials?</b>	<ul style="list-style-type: none"><li>• Explain that raw materials change properties when made into synthetic materials</li><li>• Describe how glass is made from sand</li><li>• Describe how the properties of sand change to the properties of glass</li></ul>

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#### **4. How is paper made?**

- Describe how paper is made from wood
  - Describe a range of uses of paper
  - Explain why it is a good thing to recycle paper
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#### **5. What is recycling and why is it important?**

- Describe what the process of recycling involves
  - Explain that making synthetic materials takes energy
  - Explain the negative impact of using raw materials
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#### **6. What does it mean to live sustainably?**

- State what 'sustainably' means
  - Describe ways to live sustainably
  - Explain some difficulties with living sustainably
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Lesson number	Lesson question	Pupils will learn
1.	<b>What conditions could we change to investigate the growth of a plant?</b>	<ul style="list-style-type: none"><li>• The 3 main types of variables</li><li>• What a plant needs to survive</li><li>• How to plan an investigation into the factors that affect plant growth</li></ul>
2.	<b>What are the parts and functions of a plant?</b>	<ul style="list-style-type: none"><li>• The main parts and functions of a plant</li><li>• How to draw a scientific diagram</li><li>• How to write a conclusion for an investigation</li></ul>
3.	<b>What are the parts and functions of a flower?</b>	<ul style="list-style-type: none"><li>• The main parts of a flower</li><li>• The functions of each of the main parts of a flower</li><li>• How to identify the parts on a real flower</li></ul>
4.	<b>What are the parts of a plant's life cycle?</b>	<ul style="list-style-type: none"><li>• The parts of a flowering plant's life cycle</li><li>• The conditions required for germination</li><li>• Three ways in which seed dispersal takes place</li></ul>

## 5. How does a plant transport water?

- Describe what transpiration is
  - The three main steps of water transport in plants
  - How to prove that water moves up a plants stem
- 

## 6. How do plants adapt to different environments?

- What a plant adaptation is
  - How plants adapt to extreme hot and cold
  - How plants adapt to attract animals or keep them away
- 





Lesson  
number

Lesson question

Pupils will learn

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<b>1.</b>	<b>What is an adaptation?</b>	<ul style="list-style-type: none"><li>• Define an adaptation</li><li>• Understand that adaptations are not a 'choice'</li><li>• Learn a range of common adaptations e.g. camouflage</li></ul>
<b>2.</b>	<b>How are organisms adapted to hot environments?</b>	<ul style="list-style-type: none"><li>• Describe the conditions of hot and dry environments</li><li>• Adaptations of desert animals</li><li>• Adaptations of desert plants</li></ul>
<b>3.</b>	<b>How are organisms adapted to cold environments?</b>	<ul style="list-style-type: none"><li>• Describe the conditions of cold environments</li><li>• Common adaptations of animals to cold environments e.g. insulation</li><li>• Make comparisons between organisms from different cold environments</li></ul>

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**4. What adaptations do nocturnal animals have?**

- Describe the conditions of night time environments
  - Compare the eyes of nocturnal and diurnal animals
  - How echolocation works
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**5. How are organisms adapted to live underwater?**

- Describe the conditions of underwater environments
  - Common adaptations of fish
  - Common adaptations of marine mammals
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**6. How are organisms adapted to live in the deep sea?**

- Describe the conditions of deep sea environments
  - Common deep sea adaptations
  - Deep sea conservation
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Lesson number	Lesson question	Pupils will learn
1.	What is light?	<ul style="list-style-type: none"><li>• Define light and dark</li><li>• Identify different light sources</li></ul>
2.	How can we see objects?	<ul style="list-style-type: none"><li>• Describe how we see objects</li></ul>
3.	What is the difference between night and day?	<ul style="list-style-type: none"><li>• State that Earth rotates on an axis</li><li>• How the spin of the Earth creates night and day</li></ul>
4.	Which materials are reflective?	<ul style="list-style-type: none"><li>• What happens to light when it is reflected</li><li>• Differences between reflective and non-reflective materials</li><li>• Sorting reflective and non-reflective materials</li></ul>
5.	How are shadows formed?	<ul style="list-style-type: none"><li>• Compare transparent and opaque objects</li><li>• How to make shadows</li></ul>

**6.**

**How can you change the size of a shadow?**

- Making a shadow puppet theatre
  - Exploring how to change the size of a shadow by moving it further from/closer to the light source
- 





Lesson  
number

Lesson question

Pupils will learn

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<b>1.</b>	<b>What are non-contact forces?</b>	<ul style="list-style-type: none"><li>• What are forces?</li><li>• What are contact and non-contact forces?</li><li>• Name contact and non-contact forces</li></ul>
<b>2.</b>	<b>What are magnets?</b>	<ul style="list-style-type: none"><li>• Know what magnets are</li><li>• Describe when magnets attract and repel</li><li>• Describe how to test the strength of a magnet</li></ul>
<b>3.</b>	<b>How does a compass work?</b>	<ul style="list-style-type: none"><li>• Explain what a compass is</li><li>• Describe what a compass does</li><li>• Describe how to make a compass</li></ul>
<b>4.</b>	<b>How can we see a magnetic field?</b>	<ul style="list-style-type: none"><li>• Describe how field lines help us to understand the effect of an invisible force</li><li>• Use a diagram of field lines to see where the force will be strongest and where it will be weakest</li></ul>

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**5. How can we tell if a material is magnetic or not?**

- Describe how to find out if a material is magnetic or not
- State the difference between permanent magnets and temporary magnets
- Name examples of magnetic and non-magnetic materials



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**6. What are some uses of magnetic materials?**

- State what an electromagnet is
  - Describe how to make an electromagnet
  - Give examples of uses of magnets and electromagnets
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Lesson  
number

Lesson question

Pupils will learn

1.

**What are the properties of solids, liquids and gases?**

- Describe what is meant by the property of a substance
- Name the properties of solids, liquids and gases
- Explain which state of matter a substance is in based on its properties

2.

**How do particles behave inside solids, liquids and gases?**

- Describe what a particle is
- Describe how particles are arranged in solids, liquids and gases
- Explain how we know particles in liquids and gases are moving

3.

**What happens when you heat or cool each state of matter?**

- Describe what happens to particles when a substance is heated or cooled
- Predict what happens to a solid, liquid or gas when it is heated or cooled
- Give evidence to show that each state expands when heated and contracts when cooled



**4. What are changes of state and why do they take place?**

- Describe what happens to the arrangement of particles when a substance changes state
  - Name each of the changes of state
  - Give an example of each change in state
- 

**5. What are melting points and boiling points?**

- Describe what is meant by melting point and boiling point
  - Describe how it is possible to measure the melting point and boiling point of a substance
  - Suggest which state of matter a substance will be in given its temperature
- 

**6. Which substances do not fit into one state of matter?**

- Give examples of substances that do not show typical properties of any state of matter
  - Explain how some substances do not show typical properties of one state of matter
  - Describe what a non-Newtonian fluid is
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Lesson  
number

Lesson question

Pupils will learn

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<b>1.</b>	<b>How is igneous rock formed?</b>	<ul style="list-style-type: none"><li>• Describe how igneous rock is created</li><li>• Explain what intrusive and extrusive igneous rocks are</li><li>• Know how to classify different types of igneous rock</li></ul>
<b>2.</b>	<b>How is metamorphic rock formed?</b>	<ul style="list-style-type: none"><li>• Describe what metamorphosis is</li><li>• Describe how metamorphic rock is formed</li><li>• Give the properties and uses of different metamorphic rock</li></ul>
<b>3.</b>	<b>How is sedimentary rock formed?</b>	<ul style="list-style-type: none"><li>• Describe how sedimentary rock is formed</li><li>• Describe how fossils are formed</li><li>• Explain how we can tell the age of a sedimentary rock</li></ul>
<b>4.</b>	<b>How can we identify different types of rock?</b>	<ul style="list-style-type: none"><li>• Describe what a geologist is</li><li>• Describe how geologists classify rocks</li><li>• Draw an identification key for rocks</li></ul>

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**5. How do the rocks on our Earth's surface change?**

- Describe the effect that water can have on rocks
- Describe what chemical weathering is and what it does
- Explain how large earth movements can cause rocks to change



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**6. What are the steps in the rock cycle?**

- Understand how the processes in the rock cycle fit together
  - Know how to correctly order the processes in the rock cycle
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Lesson  
number

Lesson question

Pupils will learn

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<b>1.</b>	<b>What are organs and why do we need them?</b>	<ul style="list-style-type: none"><li>• Label major organs in human body</li><li>• Describe the functions of the major human organs</li><li>• Explain why organ donation is so important</li></ul>
<b>2.</b>	<b>What are the major bones in the human body?</b>	<ul style="list-style-type: none"><li>• Label the human skeleton</li><li>• Describe the functions of the skeleton</li><li>• Describe the difference between an endoskeleton and an exoskeleton</li></ul>
<b>3.</b>	<b>How does human anatomy compare to other animals?</b>	<ul style="list-style-type: none"><li>• Describe variation within the animal kingdom</li><li>• Compare the human skeleton to other animals</li><li>• Compare human organs to other animals</li></ul>
<b>4.</b>	<b>Are all teeth the same?</b>	<ul style="list-style-type: none"><li>• Compare the teeth of different animals</li><li>• Identify the types of human teeth</li><li>• Describe the function of different types of teeth</li></ul>

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**5. How is oxygen transported around our bodies?**

- Explain why we need oxygen
- Give the components of the circulatory system
- Describe how the circulatory system works



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**6. How do humans digest food?**

- Can label the major components of the digestive system
  - Describe the function of the different parts of the digestive system
  - Describe the journey food takes through our digestive system
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Lesson number	Lesson question	Pupils will learn
1.	What is an ecosystem?	<ul style="list-style-type: none"><li>• Define a habitat and an ecosystem</li><li>• Describe different components of ecosystems</li></ul>
2.	How do we classify the diets of animals?	<ul style="list-style-type: none"><li>• Define carnivore, omnivore and herbivore</li><li>• Give examples of carnivores, omnivores and herbivores</li></ul>
3.	Why are producers so important?	<ul style="list-style-type: none"><li>• How plants make their own food and why they are important</li></ul>
4.	How do we construct a food chain?	<ul style="list-style-type: none"><li>• Label and construct food chains</li><li>• Show energy transfer between organisms</li></ul>
5.	How do we construct a food web?	<ul style="list-style-type: none"><li>• Show energy transfer on food webs</li><li>• Draw a food web</li></ul>

6.

**What can cause disruptions to food webs?**

- Describe how removing one organism can have knock-on effects
  - Disruptions to food webs e.g. pesticides, deforestation, hunting
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Lesson  
number

Lesson question

Pupils will learn

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<b>1.</b>	<b>What is static electricity?</b>	<ul style="list-style-type: none"><li>• Describe what static charge is</li><li>• Describe how to create a build up of static charge</li><li>• How a build up of charge can lead to sparks through the air</li></ul>
<b>2.</b>	<b>What are the different components in an electrical circuit?</b>	<ul style="list-style-type: none"><li>• Describe the parts of an electrical circuit</li><li>• Explain how electricity in a circuit is different to static electricity</li><li>• State the conditions for electricity to flow in a circuit</li></ul>
<b>3.</b>	<b>What are circuit diagrams?</b>	<ul style="list-style-type: none"><li>• Explain what a circuit diagram is</li><li>• Identify components based on their circuit symbols</li><li>• Build a basic circuit based on a circuit diagram</li></ul>

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#### **4. What are insulators and conductors?**

- Describe what electrical insulators and conductors are and give examples.
  - Describe how to test whether a material is an insulator or a conductor
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#### **5. What happens in a circuit when we change the components?**

- Can write a prediction for what will happen when we change the components in a circuit
  - Carry out an investigation to test your prediction
  - Evaluate whether your prediction was correct or not using your results
- 

#### **6. How much do we rely on electricity?**

- Create a circuit with a buzzer that can be turned on and off
  - Design a game that uses the buzzer
  - Build the buzzer game
-



**Lesson  
number**

**Lesson question**

**Pupils will learn**

**1.**

**What is sound?**

- Describe what sound waves are
- Describe how we can see sounds
- Explain how we can stop sound

**2.**

**How are different sounds produced?**

- Describe how sounds are produced in general
- Describe ways that different sounds can be made
- Make your own musical instrument

**3.**

**What are pitch and frequency?**

- Describe what the pitch of a sound is
- Describe ways to change the pitch of a sound
- Give example of objects that produce high and low pitch sounds



**4. What do we mean by amplitude of sound?**

- Describe what we mean by the amplitude of sound
  - Describe how to change the amplitude of a sound
  - Give examples of high amplitude and low amplitude sound
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**5. What is acoustics?**

- Describe the science of acoustics
  - Describe how scientists dampen unwanted noise
  - Describe how engineers build venues to improve sound quality
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**6. How can you make a string telephone?**

- Explain how a string telephone works
  - Follow and write a method
-



Lesson  
number

Lesson question

Pupils will learn

**1.**

**What makes something pure?**

- Define a pure substance
- Give examples of pure substances
- Explain how we can tell if something is pure or not

**2.**

**What makes something a mixture?**

- Know what a mixture is
- Give examples of mixtures of substances from the same state of matter
- Give examples of mixtures of substances from different states of matter

**3.**

**What is a formulation?**

- Describe what a formulation is and give examples
- Explain why formulations are useful



**4. How can we separate mixtures into pure substances?**

- Describe how to remove large solids from a mixture
  - Describe how to remove insoluble substances from a mixture
  - Describe how to remove soluble substances from a mixture
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**5. How can you separate a mixture of sand, salt and water?**

- Define 'solution', 'solute', 'solvent', 'soluble' and 'insoluble'
  - Describe how to use filtration to separate some mixtures
  - Describe how you can use evaporation to separate some mixtures
- 

**6. How can we separate river water into separate substances?**

- Separate substances in river water
  - Evaluate the method for separating substances in river water
  - Suggest how an environmental scientist could check the water quality in a river
-



Lesson  
number

Lesson question

Pupils will learn

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<b>1.</b>	<b>What happens during a state change?</b>	<ul style="list-style-type: none"><li>• Describe how particles are arranged in solids, liquids and gases</li><li>• Explain what happens to particles in substances that change state</li><li>• Identify phase changes present in a range of examples</li></ul>
<b>2.</b>	<b>What is a physical change and how can we identify them?</b>	<ul style="list-style-type: none"><li>• Know what a physical change is</li><li>• Describe signs that a physical change has taken place</li><li>• Give examples of physical changes</li></ul>
<b>3.</b>	<b>What is a chemical reaction and how can we identify them?</b>	<ul style="list-style-type: none"><li>• Know what a chemical reaction is</li><li>• Describe signs that a chemical reaction has taken place</li><li>• Give examples of chemical reactions</li></ul>

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**4. What is the difference between physical and chemical changes?**

- Describe the similarities and differences between physical and chemical changes
  - Identify whether a physical or chemical change has taken place
  - Suggest when a physical or chemical change may be useful
- 

**5. What can we do to investigate chemical reactions?**

- Explain how to tell which reaction is larger
  - Identify the variables in an acids and metals investigation
  - Write a method for investigating a reaction between acids and metals
- 

**6. What happens when we place metals into acid?**

- Complete an investigation into acid and metal reactions
  - Evaluate evidence to make a conclusion
  - Know how to compare your results with other sets of results
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Lesson  
number

Lesson question

Pupils will learn

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<b>1.</b>	<b>Why do plants have flowers?</b>	<ul style="list-style-type: none"><li>• Label parts of a flower</li><li>• Describe the stages of the life cycle of a flower plant</li><li>• Describe different methods of pollination and seed dispersal</li></ul>
<b>2.</b>	<b>How do you clone a potato?</b>	<ul style="list-style-type: none"><li>• Know how some new plants can be grown from cuttings and bulbs</li><li>• Know how to take a cutting</li><li>• Compare sexual and asexual reproduction in plants and talk about the advantages and disadvantages of both</li></ul>
<b>3.</b>	<b>How does the life cycle of an insect compare to an amphibian?</b>	<ul style="list-style-type: none"><li>• Describe metamorphosis</li><li>• Describe the main stages of the life cycle of an insect and an amphibian</li><li>• Compare similarities and differences between the life cycles of amphibians and insects</li></ul>

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**4. Are the life cycles of mammals all the same?**

- Describe the process of sexual reproduction
  - Describe and compare the life cycles of different types of mammal
- 

**5. Why do birds lay eggs?**

- Identify the stages of a bird's life cycle
  - Label the parts of an egg
  - Describe how some birds attract a mate
- 

**6. How do lifecycles compare across the animal kingdom?**

- Explain the differences in the life cycles of different animals
  - Know how to report and present scientific findings
-



Lesson  
number

Lesson question

Pupils will learn

**1.**

**Who was Katherine Johnson?**

- Katherine Johnson's life story and contributions to science
- How maths was used to safely send rockets to space and back

**2.**

**Who was Alexander Graham Bell?**

- Alexander Graham Bell's life story and contributions to science
- Describe how a basic telephone works
- Look at the controversy over the telephone patent

**3.**

**Who was Rachel Carson?**

- Rachel Carson's life story and contributions to science
- Describe how Carson's writing about pesticides helped inspire the creation of the US Environmental Agency
- Write a letter about an environmental cause



#### 4. Who was George Washington Carver?

- George Washington Carver's life story and contributions to science
  - Describe how Carver's research on crop rotation helped to improve crop yields globally
- 

#### 5. Who was Stephen Hawking?

- Stephen Hawking's life story and contributions to science
  - Describe how Hawking's research helped explain the Big Bang and black holes.
  - Present on a science topic of your choice
- 

#### 6. Who was Marie Curie?

- Marie Curie's life story and contributions to science
  - Describe Curie's discovery of radium and polonium and how her work paved the way for modern cancer treatments
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Lesson  
number

Lesson question

Pupils will learn

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<b>1.</b>	<b>What are forces?</b>	<ul style="list-style-type: none"><li>• Define a force</li><li>• Describe the effect forces can have on an object</li><li>• Name the forces acting on a range of objects</li></ul>
<b>2.</b>	<b>How can we measure the size of forces?</b>	<ul style="list-style-type: none"><li>• Describe what Newton discovered about forces</li><li>• Explain what a Newtonmeter is and what it does</li><li>• Explain how to measure the size of a range of forces</li></ul>
<b>3.</b>	<b>What are contact forces?</b>	<ul style="list-style-type: none"><li>• Define contact forces</li><li>• Explain what causes a range of contact forces</li><li>• Describe ways of changing the size of a frictional force</li></ul>
<b>4.</b>	<b>What are non-contact forces?</b>	<ul style="list-style-type: none"><li>• Define non-contact forces</li><li>• Describe the cause and effect of gravitational forces</li><li>• Describe how a magnetic force may lead to attraction or repulsion</li></ul>

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**5. Which factors affect an object's ability to float?**

- Describe the forces acting on an object floating in water
- Explain why the forces acting on an object may lead to it floating or sinking
- Describe features of an object that enable it to float



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**6. What impact do gears, levers and pulleys have on forces?**

- Describe what gears, levers and pulleys are
  - Explain why gears, levers and pulleys are helpful, and give some examples
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Lesson  
number

Lesson question

Pupils will learn

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<b>1.</b>	<b>What are solar and lunar eclipses?</b>	<ul style="list-style-type: none"><li>• Describe how the Moon, Earth and Sun move around each other</li><li>• Describe what happens during a lunar eclipse</li><li>• Describe what happens during a solar eclipse</li></ul>
<b>2.</b>	<b>What is the solar system?</b>	<ul style="list-style-type: none"><li>• Describe what the solar system is</li><li>• Name the parts of the solar system</li><li>• Explain the difference between comets, meteors and meteorites</li></ul>
<b>3.</b>	<b>How do the planets in the solar system differ?</b>	<ul style="list-style-type: none"><li>• Name the planets of the solar system in order</li><li>• Describe the difference between the inner and outer planets</li><li>• Explain why Pluto is no longer considered a planet</li></ul>
<b>4.</b>	<b>What are stars and star constellations?</b>	<ul style="list-style-type: none"><li>• Describe what different types of stars are</li><li>• Describe what star constellations are</li></ul>

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**5. What is the universe and what is it made from?**

- Describe what we mean by the universe
- Describe what a galaxy is, including the Milky Way



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**6. What do astronomers do?**

- Describe what the work of an astronomer is
  - Name famous astronomers and what they discovered
  - Describe what astronomers are currently trying to find out about the universe
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Lesson  
number

Lesson question

Pupils will learn

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<b>1.</b>	<b>How do particles in solids, liquids and gases behave?</b>	<ul style="list-style-type: none"><li>• Draw particle diagrams to represent states of matter</li><li>• Name the physical changes that convert substances between states of matter</li><li>• Describe the physical properties of solids, liquids and gases</li></ul>
<b>2.</b>	<b>What do particles in pure substances and mixtures look like?</b>	<ul style="list-style-type: none"><li>• Define pure, impure and mixture</li><li>• Draw particle diagrams to represent pure and impure materials</li><li>• Give examples of useful mixtures</li></ul>
<b>3.</b>	<b>What happens to particles during dissolving?</b>	<ul style="list-style-type: none"><li>• Define solvent, solute and solution</li><li>• Draw particle diagrams to represent a solution</li><li>• Describe what happens to particles during dissolving</li></ul>

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#### 4. How can mixtures be separated?

- State three methods of separating mixtures
  - Select an appropriate separation technique for a given mixture
  - Plan an experiment to isolate components of a mixture
- 

#### 5. How can we tell a chemical reaction has taken place?

- Define 'chemical reaction' and 'physical process'
  - State the 5 indicators of a chemical reaction
  - Identify examples of chemical reactions and physical changes
- 

#### 6. What happens to particles during burning?

- Define the words combustion, fuel, reactant and product
  - Write a word equation for the combustion of common fuels
  - Compare different fuels using experimental data
-



Lesson number	Lesson question	Pupils will learn
1.	<b>What are everyday materials made from?</b>	<ul style="list-style-type: none"><li>• Describe the properties of glass, ceramics and plastics and how they are made.</li><li>• Describe what happens to glass, ceramics and plastics in landfill sites</li></ul>
2.	<b>Why is recycling important?</b>	<ul style="list-style-type: none"><li>• Know the definition of recycling</li><li>• Describe how to identify plastics that can and can't be recycled</li><li>• Explain why recycling plastic is important for the environment</li></ul>
3.	<b>What is a life cycle assessment?</b>	<ul style="list-style-type: none"><li>• Give the definition of a life cycle assessment</li><li>• Know how to use data to make a life cycle assessment</li><li>• Compare reusable and one-use plastic bags over their lifetime</li></ul>



#### 4. What happens when fuels are burnt?

- Define what is meant by fuel and combustion
  - Represent combustion reaction using word equations
  - Describe the impact of burning fuels on the environment
- 

#### 5. What is global warming?

- Describe what global warming is
  - Describe the evidence for global warming
  - Describe what scientists think are the causes of global warming
- 

#### 6. What is climate change?

- Describe what climate change is
  - Describe the effects of climate change
  - Suggest how humans can reduce their impact on climate change
-



Lesson  
number

Lesson question

Pupils will learn

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<b>1.</b>	<b>What is the Theory of Evolution?</b>	<ul style="list-style-type: none"><li>• How random changes in characteristics can lead to an advantage in an organism</li><li>• How the survival of these organisms leads to evolution</li><li>• How Charles Darwin came up with the theory of evolution</li></ul>
<b>2.</b>	<b>How do fossils provide evidence for evolution?</b>	<ul style="list-style-type: none"><li>• What a fossil is and how it is made</li><li>• What fossils show us about changes in species over time</li><li>• Why fossils do not give us a complete record of past organisms</li></ul>
<b>3.</b>	<b>What are the different animal kingdoms?</b>	<ul style="list-style-type: none"><li>• Name of each of the animal kingdoms</li><li>• Key traits of each animal kingdom</li><li>• How the evolutionary tree shows us how animal kingdoms are related</li></ul>

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**4. Which organisms lived during each era of time?**

- Which groups of organisms existed in each period
  - Which groups of organisms existed in each period
  - The reasons why some organisms became extinct
- 

**5. What impact have humans had on plants and animals?**

- Key stages in the development of Homo sapiens
  - Describe the impact of Homo sapiens on plants
  - Describe the impact of Homo sapiens on animals
- 

**6. What impact are humans likely to have on life in the future?**

- Describe the decline in numbers of species over the last 200 years
  - Describe the impact of Homo sapiens hunting animals and cutting down forest
  - Know what a conservationist is and what they are trying to do
-



Lesson number	Lesson question	Pupils will learn
1.	<b>What are the key parts of a healthy diet?</b>	<ul style="list-style-type: none"><li>• Describe the key parts of a healthy diet</li><li>• Describe the effect of each food group</li><li>• Give examples of nutritional deficiencies</li></ul>
2.	<b>Why do people with different lifestyles need different diets?</b>	<ul style="list-style-type: none"><li>• Describe what is meant by different lifestyles</li><li>• Explain why different people may need different diets</li><li>• Design a diet for two people with different lifestyles</li></ul>
3.	<b>What effect does exercise have on the muscles?</b>	<ul style="list-style-type: none"><li>• Describe how muscles enable movement</li><li>• Describe what happens to muscles during exercise</li><li>• Describe how muscles can change over time due to exercise</li></ul>



#### **4. What happens to the circulatory system during exercise?**

- Describe the parts of the circulatory system
  - Describe the changes that will occur during exercise
  - Describe how an athlete's body will respond differently to exercise
- 

#### **5. What are medicinal drugs?**

- Describe what is meant by medicinal drugs
  - Give some examples of common medicinal drugs
  - Describe how medicinal drugs may affect the body
- 

#### **6. What are nicotine and alcohol?**

- Define nicotine and alcohol
  - Explain how nicotine and alcohol came to be used by humans
  - Describe some effects of using nicotine and alcohol to excess
-



Lesson number	Lesson question	Pupils will learn
1.	What is light and where does it come from?	<ul style="list-style-type: none"><li>• Define light and dark</li><li>• Describe different light sources</li><li>• Test transparent, translucent and opaque materials</li></ul>
2.	What is reflection and how can we use it?	<ul style="list-style-type: none"><li>• What happens to light when it is reflected</li><li>• Describe different types of reflection</li><li>• Describe different uses of reflection</li></ul>
3.	What is refraction and how can we use it?	<ul style="list-style-type: none"><li>• What happens to light when it refracts</li><li>• Identify whether reflection or refraction has taken place</li></ul>
4.	How do we see light?	<ul style="list-style-type: none"><li>• Name the parts of the eye</li><li>• Describe how the lenses in glasses work</li></ul>

- 5. Where do different colours come from?**
- How white light is split into different colours
  - Primary and secondary colours of light
  - How a rainbow is made
- 

- 6. What are some uses of light?**
- Build a shadow puppet theatre
  - How a periscope works
  - How different types of lenses work
- 





Lesson  
number

Lesson question

Pupils will learn

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<b>1.</b>	<b>How do scientific ideas change?</b>	<ul style="list-style-type: none"><li>• Describe the scientific process</li><li>• How scientific ideas are challenged in science</li><li>• How knowledge builds over time - using sound and the invention of the iphone as an example</li></ul>
<b>2.</b>	<b>How has our understanding and use of electricity developed?</b>	<ul style="list-style-type: none"><li>• Timeline of major discoveries and inventions in relation to electricity</li><li>• Describe the contributions of Lewis Howard Latimer, Michael Faraday and Mildred Dresselhaus to our understanding of electricity</li></ul>
<b>3.</b>	<b>How has human use of materials changed over time?</b>	<ul style="list-style-type: none"><li>• Timeline of material use</li><li>• Compare raw vs synthetic materials</li><li>• Debate whether humans have changed materials or have materials changed humans?</li></ul>

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**4. How has our understanding of the human body changed over time?**

- Timeline of our understanding of human anatomy
- How increased knowledge of our anatomy has led to medical advances
- Describe the role of Charles Drew in the development of blood banks



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**5. How has the discovery of DNA changed science?**

- Describe what DNA is
- Story of the discovery of DNA
- Scientific developments as a result of the discovery of DNA

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**6. How have our ideas about the universe changed over time?**

- Compare the geocentric and heliocentric models
  - Describe elliptical orbits
-

# 4. Learn More



## Contents

Section number	Section contents
1.	Introduction to Oak's key stage 2 science curriculum
2.	Coherence and flexibility
3.	Knowledge organisation
4.	Knowledge selection
5.	Inclusive and ambitious
6.	Pupil engagement
7.	Motivation through learning
8.	KS2 sequence recommendations
9.	Key stage 2 science working scientifically links

### 1. Introduction to Oak's key stage 2 science curriculum



Each unit of work is 6 lessons long and designed to last roughly one half term. The following curriculum map provides complete coverage of statutory topics contained within the national curriculum. Further units that go beyond the national curriculum are also included, to help pupils better understand the subject and the world, as well as preparing them for the next stage of study. In sections 2 to 7, you will find a set of principles we have sought to apply in our curriculum planning of both primary and secondary science.

## **2. Coherence and flexibility**

We strive to support schools by giving them an online learning offer that can be flexible, to fit alongside their existing curriculum. We need to balance this together with coherence, as complete flexibility would imply only standalone lessons, where none can build upon any other. In striking this balance, we will lean towards giving the maximum flexibility possible where this does not compromise coherence. Where disciplinary knowledge (working scientifically) is woven into the units there will be reminders of previously used scaffolds and prompts. For KS2, we have tried to provide flexibility. However, there are more sequencing constraints in this key stage. In general, prior knowledge from KS1 has been assumed when planning KS2 units. However, prior knowledge will always be recapped within a lesson if required for that particular lesson. Within the disciplines of biology, chemistry and physics there are more sequencing constraints at KS2.

## **3. Knowledge organisation**

The units in the science curriculum are grouped by key stage, with a suggested route organised within year groups. The substantive knowledge (i.e. the science content) will be taught in units, and the disciplinary knowledge (i.e. working scientifically) is taught in context. Hierarchical elements of working scientifically will be reflected in the units and therefore this will be built up accordingly.

## **4. Knowledge selection**

We are seeking to support schools to deliver the national curriculum to children who cannot attend school. Our choice of what to teach will primarily be guided by the content specified in the national curriculum, but we have also chosen to broaden this to increase challenge and build aspiration (e.g., include more physics at KS2, include units in KS2 on a diverse range of influential scientists).

## **5. Inclusive and ambitious**



We want Oak to be able to support all children. Our units will be pitched so that children with different starting points can access them. Pupils need to have a large amount of subject knowledge stored in their long-term memory in order to become competent at any subject, and this is especially true of science, where application is often an application of knowledge. For this reason, these lessons are designed to teach science in a clear and deliberate fashion, emphasising secure content knowledge before moving on to tasks. In this approach, the teacher is the subject expert and the emphasis is on instruction and explanation, followed by deliberate practice supported by modelling, guided practice and scaffolding. Models and analogies will be used where appropriate to allow pupils to visualise or contextualise abstract ideas

## **6. Pupil engagement**

We need pupils to be thinking during science lessons - both to engage with the subject and to strengthen memory of what is being learnt. Our lessons will not be video lectures. We seek to exercise pupils' minds throughout their lessons. This will involve questions and tasks throughout instruction, just as we would with classroom teaching. We will aim to include purposeful practical science in as many of our lessons as possible.

## **7. Motivation through learning**

Like all teachers, we recognise that good presentation helps pupils keep participating in our lessons. However, we are teachers, and not entertainers. We seek to motivate children through our subjects. We believe that what we teach is inherently interesting, and that the joy of learning is our primary motivator. In science, we will provide opportunities where possible for pupils to engage in home experimentation. We will include learning about relevant careers for that unit in many of our units. The scientists that we have chosen to study will reflect the diversity of backgrounds of our pupils. Finally, we will try to be explicit about the real-life relevance of each unit so that it is clear why this knowledge is important.

## **8. KS2 sequence recommendations**

At the front of this document, we listed the sequence in which we suggest teaching the key stage 2 science units. Teachers should note that whilst this sequence adheres to the National Curriculum in terms of teaching content within the correct key stage, not all content is taught in the year group suggested by the National Curriculum. Where that is the case, the rationale is below. The affected units have been deliberately designed so that they can be taught in any sequence, and so schools can place these units wherever they prefer.

For KS2, we have also tried to provide flexibility wherever possible. However, there are more sequencing constraints in this key stage.

Wherever possible we have tried to assume no prior knowledge but in units where this is not possible, we will ensure that this knowledge is retaught. The suggested sequence in the table below is just one of many options that schools could consider.



### **KS2 sequencing suggestions:**

- We would advise that the 'States of matter' unit be taught before 'separating mixtures', 'Physical and chemical changes' and 'Particles in physical and chemical changes'.
- We have suggested 'Rock cycle' is taught in Year 4 after the 'States of matter' as there are lots of references to changes of state in this unit.
- We would advise that 'Light & dark' and 'Forces' be taught before 'Space'.
- We would advise that 'Plants' is taught before 'Ecosystems' and 'Adaptations'.
- 'Notable scientists' could be taught in any year group. This unit has been designed to teach children about a diverse group of scientists in a range of different fields. In the suggested sequence of units this has been placed in Year 3 but we would recommend including this unit in all year groups. Each lesson will be designed to be standalone so that lessons could be taught in isolation if there is not enough time in your school's plans to include the whole unit. For example, if teaching the unit 'Space', then the lesson on Katharine Johnson from the 'notable scientists' unit could be taught in conjunction as there are many links.
- 'History of Science' is a unit that could be placed flexibly but it covers ideas taught in 'Space', 'Raw and synthetic materials', 'Electricity' and 'Human anatomy'. While the lessons will be accessible without the knowledge from these units, it would be better suited for UKS2 as it will provide knowledge from these units to be consolidated.
- The 'Electrical circuits' unit is in Year 4 but can also be used for Year 6 as it includes all of the statutory requirements of electricity on the Year 6 national curriculum.
- The 'Practical skills' unit could be taught in any year group. It goes through each stage of conducting a scientific investigation and writing a report of the investigation. Each lesson from this unit could also be taught in isolation and included in curriculum plans to suit the needs of your pupils. For example, the lesson on writing a method could be taught as a refresher if this is a skill you think your pupils need more practise on. Or the lesson on scientific conclusions could be taught before undergoing an investigation in a different unit or topic.

## **9. Key stage 2 science working scientifically links**

## Unit title

Practical skills

## Working scientifically links

- Performing tests
- Using equipment
- Observing and measuring
- Gathering and recording data
- Reporting, presenting and communicating data/findings

Raw and synthetic materials

- Identifying and classifying
- Reporting, presenting and communicating data/findings

States of matter

- Observing and measuring
- Identifying and classifying
- Gathering and recording data

Rock cycle

- Identifying and classifying

Separating mixtures

- Reporting, presenting and communicating data/findings

Physical and chemical changes

- Planning and setting up different types of enquiries
- Observing and measuring
- Gathering and recording data
- Reporting, presenting and communicating data/findings



Particles in physical and chemical changes

- Performing tests
- Observing and measuring

Sustainability

- Identifying and classifying
- Reporting, presenting and communicating data/findings

Plants

- Asking questions
- Performing tests
- Observing and measuring
- Gathering and recording data
- Reporting, presenting and communicating data/findings

Adaptations

- Identifying and classifying

Ecosystems

- Asking questions
- Identifying and classifying

Human anatomy

- Identifying and classifying

Reproductive cycles

- Identifying and classifying

Humans and animals over time

N/A

Diet and lifestyle

- Observing and measuring



Light & dark

- Observing and measuring
- Using equipment
- Identifying and classifying

Magnetism

- Performing tests
- Observing and measuring
- Identifying and classifying
- Gathering and recording data

Electrical circuits

- Planning and setting up different types of enquiries
- Using equipment
- Gathering and recording data
- Observing and measuring
- Identifying and classifying

Sound

- Asking questions
- Performing tests
- Observing and measuring
- Identifying and classifying
- Gathering and recording data

Forces

- Performing tests
- Gathering and recording data





Space

- Observing and measuring

N/A

Light

- Performing tests
- Gathering and recording data
- Observing and measuring
- Identifying and classifying

History of science

- How scientific ideas and evidence change over time

Notable scientists

- Observing and measuring