Cambridge Primary
Revise for Primary Checkpoint

Science

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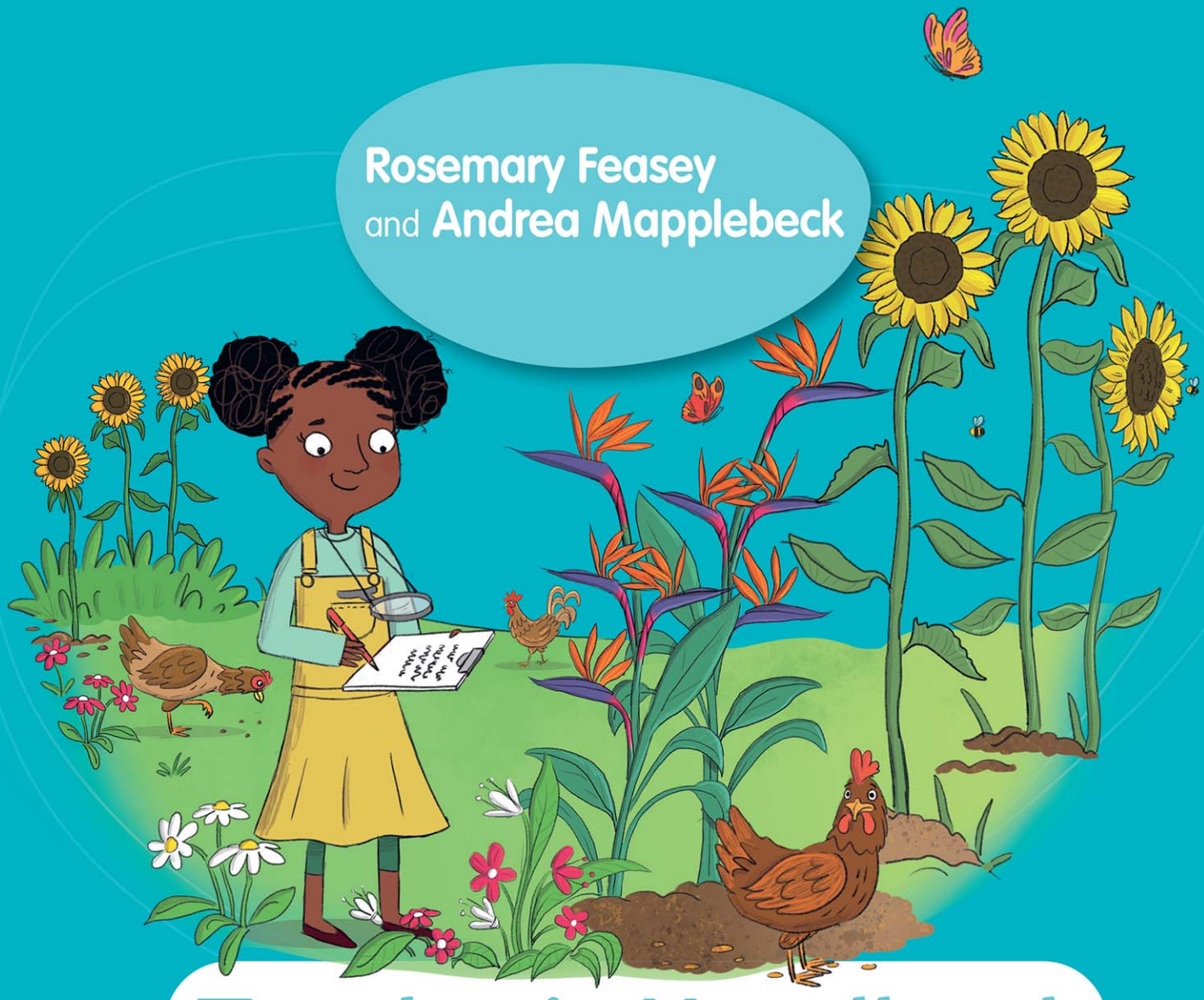
and Andrea Mapplebeck



Teacher's Handbook

HODDER EDUCATION

Contents

Introduction

What is the Study Guide about?

The aim of the Study Guide is to help learners to recall key information and ideas and develop their understanding about the science topics that they have been learning throughout Stage 6. It will help them to make sure that what they learn stays in their memory for a long time.

Learners can work through the Study Guide on their own or with a partner at school or at home, or both. Space is provided for learners to write their answers but the Study Guide also contains questions which demand that they communicate their revision in different and creative ways such as producing posters, mapping out their ideas on large sheets of paper and even making things, all of which are aimed at helping learners remember and deepen their understanding of the science that they have been learning.

Why is revision important?

Revision gives learners an opportunity to reflect on what they have learnt and remembered. It helps them to identify what they know, what they do not know and what they are still unsure about. Revision of course helps learners to develop learning in different topics, but it also helps to build confidence, not just in what they know, but developing their ability to use ways to access what they have learnt. By revising topics, learning is extended and deepened, meaning that learning is more thorough and so individuals are more able to apply their learning to new contexts and of course in the future to tests and exams.

Revising an area of science helps learners to access knowledge and understanding, at the beginning this can be quite superficial, but by accessing memory, learners are able to retrieve more and more as their brains make links and store information in the long-term memory.

What is important is revision should not be tedious; the aim of the Study Guide is to use approaches that will interest and engage learners to review their learning.

How can the Study Guide help learners?

Revision activities aim to support learners to remember facts, information, ways of working, and to make connections between ideas within a topic and across scientific areas of learning. In this way, the knowledge and understanding they develop is more likely to stay in their memory for longer. Engaging learners in revision activities is of course one way of eliciting what they know, identifying misconceptions and finding out how deep their understanding is are other ways too.

How can an adult help learners when using the Study Guide?

Encourage learners to be honest with themselves, discuss that if they do not know something it is important to admit it otherwise they cannot be helped to understand an idea or carry out a task. Equally if they think they know something but are unsure they should also acknowledge that and seek help or clarification. Sometimes, even after support, a learner may still not understand an idea or a word, in which case you might need to go back a few steps in their learning and/or help them to unpick what it is they do not understand. In this way, you can produce bespoke explanations or examples to help move their learning forward.

Revision should be seen as a collaboration between learners and the teacher. Reinforce the idea that it is okay to make mistakes and errors, especially when revising. Revision is about finding out what we know, are unsure about and what we either have forgotten or did not understand in the first place. Encourage learners to use their notebooks, as well as the *Cambridge Primary Science Stage 6 Learner's Book* to help remind them about what they have learnt.

When working through the Study Guide with learners, frequently ask them how they knew the right answer, just as you do in Mathematics, so that learners engage in metacognitive thinking (thinking about their thinking). In doing this, learners will articulate their thinking and you will be able to access the depth of their understanding through explanations and the scientific language that they use.

Learners should understand why strategies are useful to them, so that they can choose which approach to use in science, as well as in other subject areas.

Revision approaches

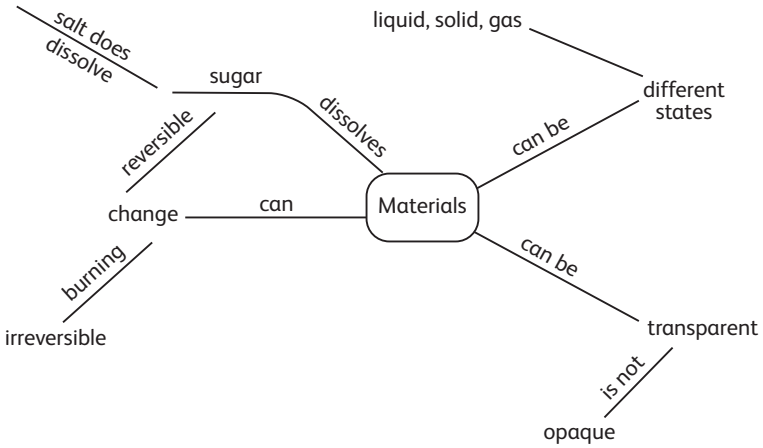
The Study Guide uses different approaches to revision and provides an explanation of them so that learners understand how they support the development of their understanding of science ideas and embed learning in memory. Different people learn and remember their science in different ways, so using a range of approaches helps to individualise revision. It is important that learners understand which approaches they find the most helpful and use them frequently to support their learning not just in science but across different subjects.

Some of the revision approaches used in the Study Guide are explained below, so that you know what they are, why they are used and how they can support learners' understanding.

Concept maps

A concept map is a type of memory map to help learners remember key words and ideas in a topic and make links between them.

With a concept map, learners map out key words and ideas and make links between them, displaying their understanding by drawing lines between ideas or words and then writing on the lines to explain the connections. It is the connections between words/ideas that are the most important aspect of a concept map because the learner can access their deeper understanding.



Definitions

Thinking about and writing down definitions for words can help learners to understand them better and give them confidence to use the words when speaking or writing about science.

Being able to use scientific vocabulary correctly is very important, so ensure that learners know how to use the glossary at the back of the *Cambridge Primary Science Stage 6 Learner's Book*, or dictionary and thesaurus to check if they are correct. Encourage learners to make their own personal science dictionary, writing the word, how to say it, a definition and even drawing or sticking a picture or sample of something, for example, a material (aluminium foil) to show understanding and support memory. Key word and fact file cards are two approaches that support learners in not only being able to read and spell scientific vocabulary but also to show that they know what words mean and their ability to give everyday examples and apply them to different contexts.

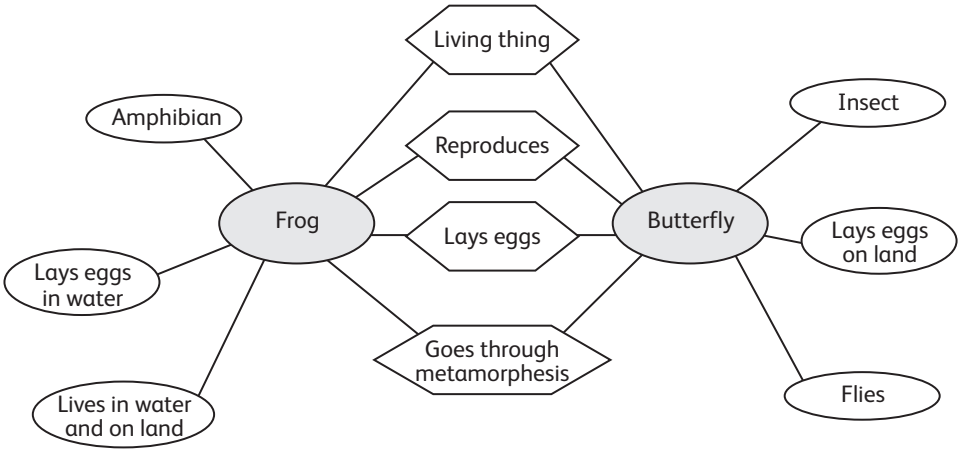
Double bubble

A double bubble is another type of memory map to access memory and assess if learners have understood key ideas and can make connections between them. The double bubble helps learners to look at two different ideas and compare them for similarities and differences, contrasting areas of learning involving objects, animals, plants, key concepts, events, and processes.

In the centre of the large circles learners write the name of, for example, the two ideas that they are comparing. Down the middle of the double bubble in the hexagons they note similarities. This means they will write one thing in each hexagon that is true for both ideas. In the outside circles they then consider

differences, these circles are coloured so that ideas in the same circle are connected. Learners will note things that are different for each of the ideas they are exploring.

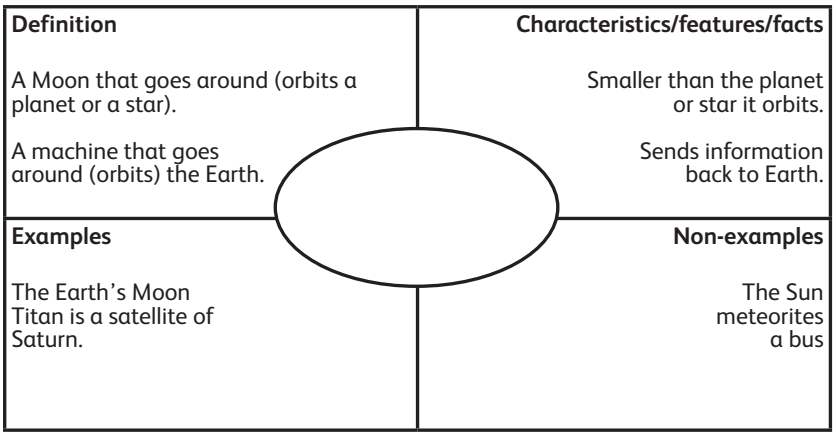
Drawing out their thinking using this type of memory map encourages learners to make connections and remember what they have been learning about.



Frayer map

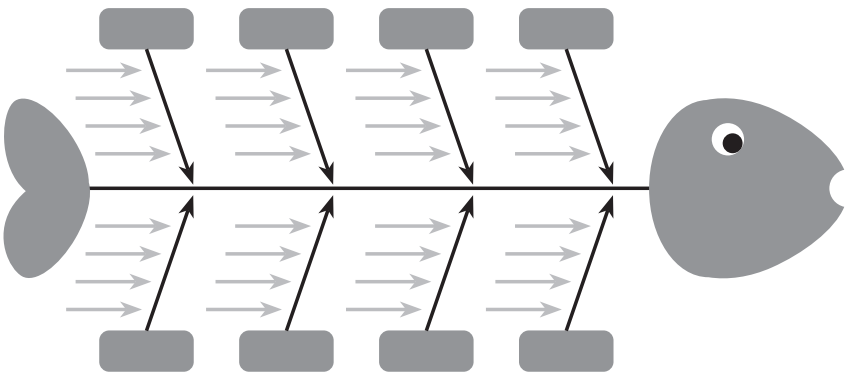
A Frayer map, is another thinking map that helps learners to identify and define concepts that they are familiar and unfamiliar with, related to key science vocabulary. Using a Frayer map supports the learning of vocabulary that is needed for learners to talk and write about their science. Using this approach scaffolds learning how to spell words and understand key scientific words so that they can read, spell, and explain scientific words and finally apply them to everyday life, the latter is evidence for formative assessment that learning is secure.

A Frayer map is used to focus on revising and learning about one word at a time.



Fishbone organiser

This is another type of thinking map. A fishbone organiser is a useful way of organising ideas and knowledge related to the same topic. It is a visual way to link many ideas that relate to the same issue and help record what learners know about a problem and how to solve it. The aim of a fishbone organiser is to help organise ideas in a simple way that helps learners to make links and solve problems. Encourage learners to use different colours on their fishbone organiser so they can pick out ideas that link.



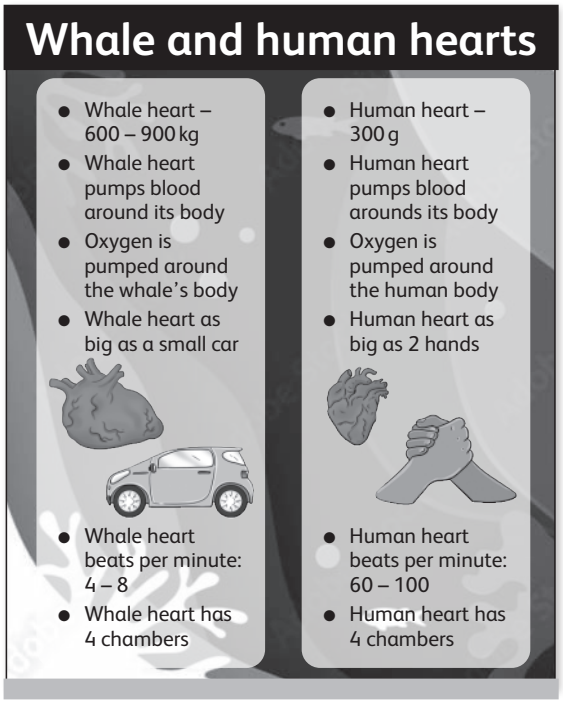
Infographics

The word infographic splits into two parts:

info (information) + **graphic** (visual)

An infographic is made using pictures, charts and graphs. It is a visual organiser designed so that information can be read easily.

Using infographics can help the brain remember information, as it draws on the idea of Dual Coding. 'Dual Coding' provides two different representations of the information, both visual and verbal at the same time. The idea is that learners look at the information on an infographic and also talk about it with others, this approach can make it easier for the brain to recall (remember) information.



Key word cards

The purpose of key word cards is to support learners in remembering words and to revise key scientific vocabulary so that they are confident in being able to read, spell, and know what the word means. Key word cards can be created and used in any topic and are frequently used throughout the Study Guide. On one side of the card learners write the key scientific word, on the other side the definition. To aid memory retention, learners could write words in different colours and split words up to help memorise them. While making the cards can be beneficial, it is the act of using the cards throughout a topic which will help learners to retain scientific vocabulary and embed it in long-term memory. Learners should use the cards to test each other, create a second set of cards and play pairs. The cards are turned upside down and they have to match pairs, for example, pairs of words, definitions or words to match definitions.

There must be two objects that touch. These can change the motion, direction and shape of the object they act on. They can be balanced or unbalanced.	**Contact force** 	There must be two objects that interact, these objects are not touching. Examples of non-contact forces are weight (gravity) and magnetism. They can be balanced or unbalanced.	**Non-contact force** 

Fact files

Fact files are another useful approach to revision to support learners in learning, memorising and recalling key information. They are quick and easy to make and each card has some or all of the following:

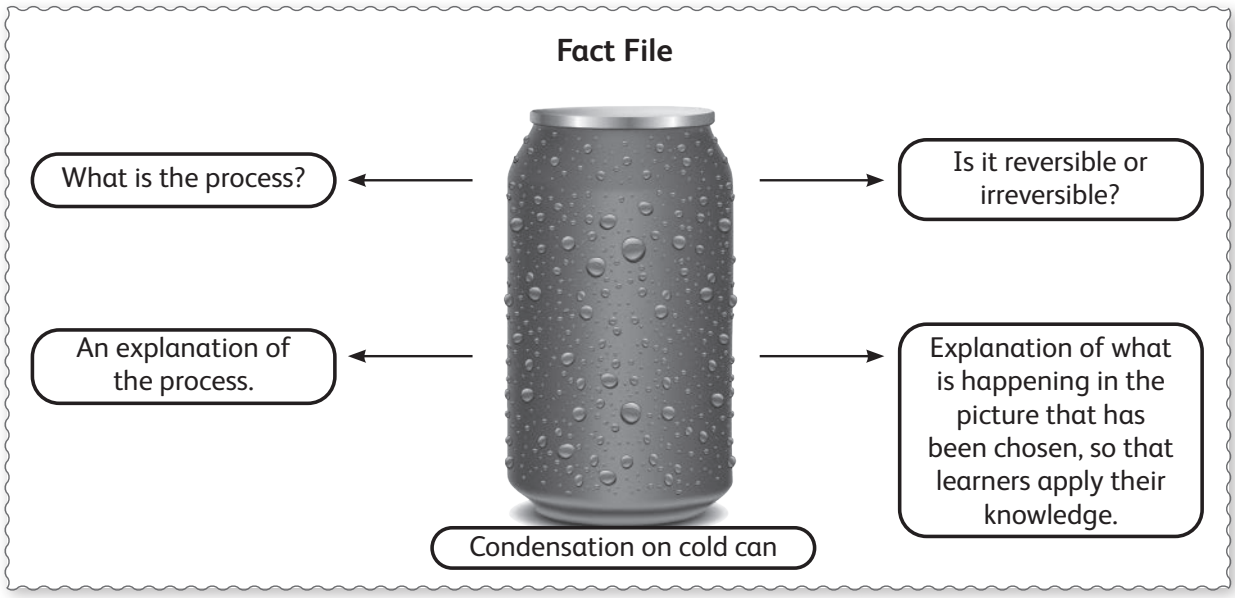
i key idea/concept

ii linked scientific vocabulary

iii examples of scientific idea/concept in everyday life.

It is the final point that provides an excellent formative assessment point for the teacher; where learners are able to apply an idea/vocabulary to a new context the learner is demonstrating whether learning is or is not secure.

As learners make the different fact files for a topic or different topics make sure that they keep them and use them to revise learning either themselves or giving them to friends and family to 'test' their science.



Learning flower

A learning flower is another memory aid to support learners in remembering and organising ideas and vocabulary. Visual approaches to revision such as this help learners to recall key ideas and organise them in such a way that they can make links between the different knowledge.

For example, learners could organise their revision of a topic by placing:

1 the topic title in the centre of the flower

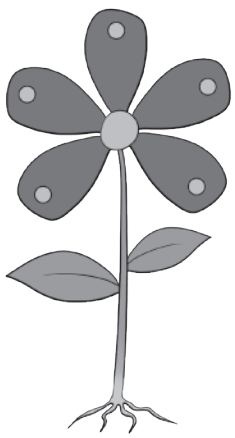
2 key words on the front of the petals

3 definitions of the words on the back of the petals

4 key learning on the stem

5 what they already knew prior to the topic on the roots

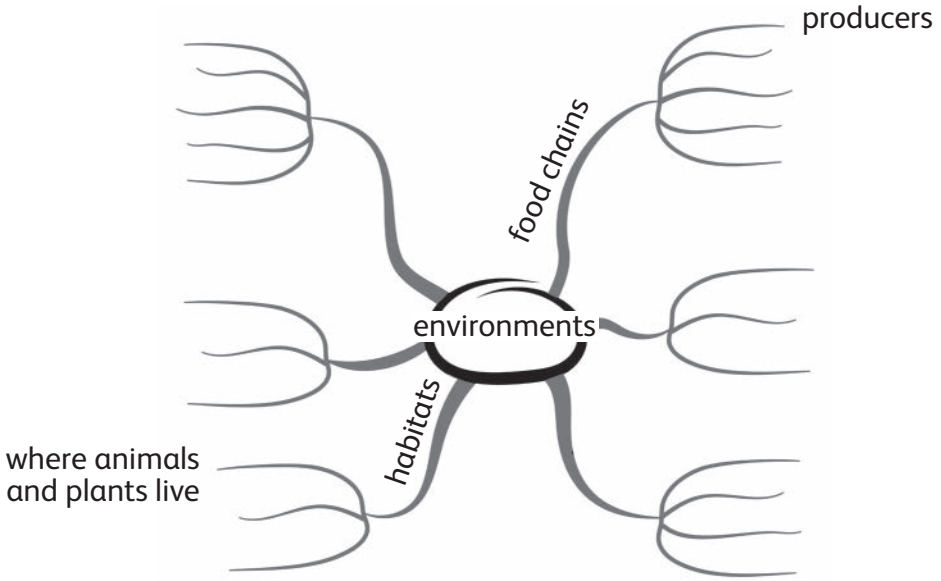
6 questions or things they do not fully understand on the leaves.



Memory maps

A memory map is a way for learners to organise information that they know. For example: Materials is a broad topic, it would help learners to organise learning into sub-areas: Properties of materials, Names of materials, Dissolving, Changes in state, Reversible and irreversible changes. Organising ideas in this way can help learners to retrieve connected information, as well as show what they know and where the gaps are, for example, if a learner writes very little under the heading Dissolving.

A memory map differs from a concept map, the latter requires that learners show the links between words and ideas using words or phrases written on the lines linking words.



Mnemonics

Mnemonics often use rhymes or a sentence to help learners to memorise information. As with all approaches seeking to support learners to retain and recall information, the aim is to develop 'sticky memory' so that learning literally sticks in their memory making it easier to retrieve information and ideas.

Mnemonics are useful not only to help learners remember a set of information, for example, the names of the planets in our solar system but they can also add another dimension such as the order of the planets as they orbit the Sun. By creating and using mnemonics learners are able to access one or more pieces of information from their memory.

Mnemonic for the planets:

My (Mercury) Very (Venus) Easy (Earth) Method (Mars) Just (Jupiter) Speeds (Saturn) Up (Uranus) Nothing (Neptune).

Model answer (Worked answer)

A model/worked answer can be an 'ideal' response to a question, or it could be one where there are errors that have been purposefully included to identify whether learners have the same difficulties. Looking at different answers to questions and thinking about how they can be improved demands that learners use their personal knowledge to make sense of an answer. Challenging learners to read and evaluate an answer demands that they access their personal knowledge in science and recall ideas from their memory, thus revising their science. By analysing the strengths and weaknesses of an answer, learners are engaging in a form of peer assessment. Requiring learners to edit or rewrite and improve an answer ensures that they apply learning and consider what constitutes a good answer. To further support learners, you could engage them in a discussion about the criteria for a good answer on a specific topic, and learners then write to those criteria.

Prefixes

A prefix is a group of letters added to the beginning of a word to change the meaning of the word. Teaching prefixes (and suffixes) in science helps learners to de-code words and understand their meaning. This is important because it helps learners to understand that some words in science can be broken down into parts which in turn helps them remember words and their meaning.

For example, the word 'microbe' begins with the root word **micro** which comes from the Greek word **mikros** which means 'small', whenever you come across a word where the root word is 'micro' the word has something to do with being small.

The word **microscope** is made up of the root word **micro** and the word **scope**. 'Scope' means to see, 'micro' means small. So, the prefix changes the meaning of 'to see', to 'to see very small (microscopic) things'.

Rich picture poster

A rich picture is a way of showing an idea, information, a process or for example, a habitat by using pictures, diagrams and individual words, phrases, and colour coding. Using a rich picture can sometimes be easier for learners to communicate what and how much they know than, for example, writing sentences or paragraphs, especially if some individuals find extended writing challenging.

The content of a rich picture does not have to be created in a specific order, it can just show the flow of ideas about, for example, how to solve a problem such as how to encourage people to recycle and reuse materials or a set of ideas linked to friction. A rich picture differs from an infographic because it does not have to be based on communicating data using graphs and charts alongside words and diagrams.

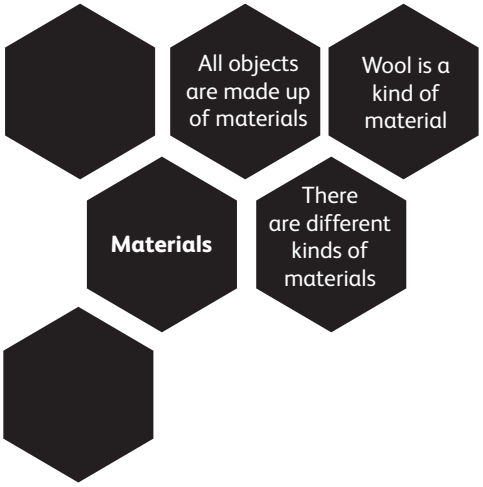
Revision hexagons

Using revision hexagons is a challenging approach as many connections can be made between ideas. Hexagons are specifically used because they tesselate, fit together with no gaps. The tessellated hexagons are used to structure thinking, the challenge for learners is to make sure that whatever words, facts, or ideas are placed in a hexagon, they must be able to articulate the links it makes to the other hexagons bordering on each side. This idea of linking is crucial to revision hexagons.

This revision approach helps learners to:

- think about what they know
- recall facts and ideas
- consolidate ideas
- make links between learning
- indicate depth and breadth of learning.

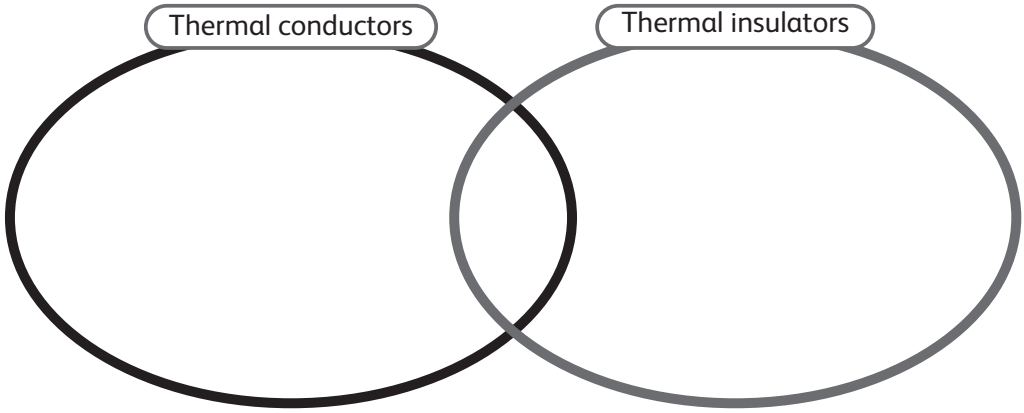
While most learners will write text into hexagons others could draw or cut and paste pictures into the hexagons.



Venn diagrams

A Venn diagram is another thinking map specifically designed to challenge learners to systematically arrange learning to show the relationships between items, similarities and differences.

For example, learners could use a Venn diagram to organise objects according to whether they are thermal conductors or insulators. Venn diagrams usually have 2 or 3 circles which overlap in the middle; where the circles overlap this shows similarities, and where they do not overlap shows differences.



Some activities have associated templates which can be downloaded and printed out for learners. These templates are available on www.hoddereducation.co.uk/cambridgeextras

Learners using these different approaches in their learning and revision:

As learners work through their Study Guide encourage them to personalise their learning by challenging them to think about which approaches they find the most useful to:

- access their memory and remember ideas and words
- make connections (see links) between learning
- remember the most ideas or information
- organise what they know
- identify gaps in their learning and understanding.

The final point is important for learners to consider, using approaches that they enjoy can make revising a topic more interesting, easier to learn and remember, which of course is the purpose of revision. By engaging learners in thinking about their own learning and identifying which approaches are most suited to them as individuals, you are helping them to identify bespoke approaches they can draw on throughout their lives as learners.

Unit 1 Systems and diseases

The circulatory system

Study Guide pages 12–16

Learner's Book pages 9–14

Objectives

Learners will revise:

- many vertebrates have similar circulatory systems
- how the heart works
- the function of the heart.

Science background information

It is important that learners are given time to reflect on what they already know about how the circulatory and respiratory systems work. Encourage them to refer to the Learner's Book and any exercise books that they might have worked in.

Listen to learners discussing their ideas and read their memory maps, checking to see if they have remembered ideas correctly, what they have missed out and any misconceptions. As you work with individuals or groups, note common omissions which might indicate areas where learners are unsure, or learning is not embedded.

A common misconception about the heart and circulatory system is that the circulatory system has a 'single loop'. Learners may think that the arteries carry blood from the heart to the body and the veins carry blood back to the heart from the body. In this misconception, learners are 'missing' the role of the lungs in the circulatory system.

Display a picture of the circulatory system and talk through the idea that blood is pumped from the left side of the heart to the body, it then returns to the right side of the heart. From there blood is pumped to the lungs, where carbon dioxide is exchanged for oxygen. This blood then returns to the left side of the heart, where it is pumped around the body.

Humans are vertebrates, so are monkeys, elephants, and mice, they all have similar circulatory and respiratory systems. The heart's main role is to make sure that blood travels around the body distributing oxygen and nutrients. Blood is pumped by the heart through the aorta to veins which carry the blood to capillaries which deliver the oxygen and nutrients to cells around the body. This system is circular, it has no end, it goes round and round. The returning blood goes to the lungs where it picks up oxygen and returns to the heart where the journey is repeated, all day and night. Most mammals, including humans, have this type of circulatory system.

Key to understanding, is that this system is closed, which means that blood is continually moving around human bodies and other vertebrates. In this activity, the circulatory systems of humans and whales are compared. Whales are vertebrates like humans, some learners might think, incorrectly, that they are fish because they live in water.

Revision approach background information

A memory map is a way of helping learners to think through and explore what they know about a topic. Learners can write words, phrases and draw symbols or pictures about facts and ideas and use lines to make links between different learning on their map. Key ideas can be placed in larger boxes, bubbles, or a specific colour, with other ideas and facts in smaller text or a different colour, showing a hierarchy in their ideas.

The benefit of using memory maps is the way in which the memory is stimulated, with one idea leading to another. The learner is able to build up different layers of information as the memory is prompted to remember more.

Memory maps can be changed, either because the learner recognises that what they have included needs to be amended or new learning is added. This means that memory maps should be seen as fluid pieces of work which can be modified at different points, including at the end of revision as a self-check.

Memory maps can be created by individual learners or by a group of learners who share ideas and facts, reminding each other of learning and sometimes sharing new ideas.

Some learners benefit from key vocabulary being displayed which helps to prompt their memories to locate information and ideas associated with those words.

Infographics are visual representations of information and data which allow the learner to access information quickly and easily. Infographics use visual communication, with less emphasis on text and more on pictures, charts, diagrams, and graphs. Infographics can capture the attention of learners, particularly those whose learning style is more visual.

Starter activity suggestions

- With learners, create a memory map related to a random topic which all learners will know something about, for example, a sport or an animal. Discuss how to construct the memory map and why it is useful for revising learning, for example prompting memory, free flow of ideas, can be added to and amended at any time. Then ask learners to construct their own memory map either working as individuals or in a group. Make sure that they keep their memory map and encourage them to amend and add to it at any point during this revision topic; using different colour pens helps them to compare before and after ideas.
- Alternatively, in small groups, learners draw around a member of the group on a large sheet of paper. In the body outline learners draw how they think blood is circulated around the body. This will help to elicit misconceptions about whether they see the system as a single or double loop.
- Ask learners to discuss why whales are classified as mammals, focusing on the following criteria:
  - they give birth to live young
  - they have hair (although it is very sparse on their body)
  - they have lungs and breath air
  - they provide milk for their young.
- Challenge learners to look at and read the infographic on page 16 of the Study Guide for 3 minutes, concentrating on remembering information. Learners should use strategies such as forming pictures in their minds and remembering words and numbers, for example, heart beats per minute: human 60, whale 4.

Activity notes and answers

Pages 12–13
Activity 1

Check that learners understand how to make their memory maps.

Page 13
Activity 2: Answers

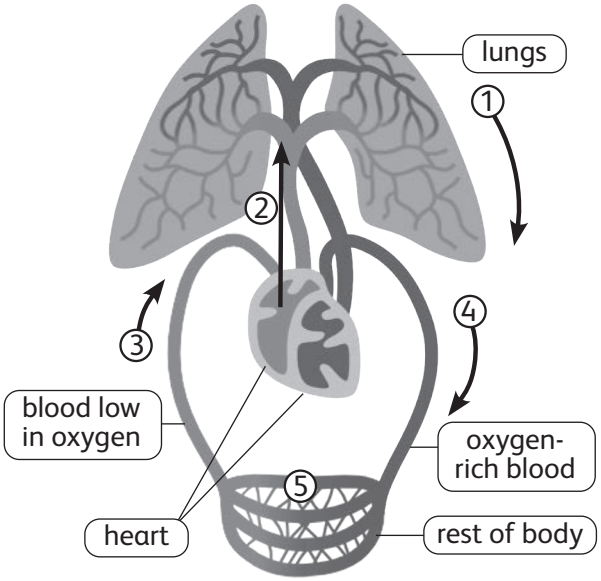
1 and **2** Responses should be similar to those in the table below.

Word	What do they do?
Arteries	Tubes that carry blood away from the heart.
Blood	The fluid in humans and other animals that delivers materials for life to the body's cells.
Blood vessels	Tubes that form a network that carries blood around the body as part of the circulatory system.
Capillaries	Tiny blood vessels that deliver water, oxygen and nutrients to the cells in the body and carry away waste.
Lungs	The internal organs that fill with air when you breathe in.
Veins	Blood vessels that carry blood from the capillaries back to the heart.

3 and **4** Give learners time to check their definitions, ensure that they use the glossary at the back of the *Cambridge Science Stage 6 Learner's Book* or a dictionary and test themselves and each other on how to spell each word correctly and make sure they understand what each word means.

Page 14

Activity 3: Answers



a Check that learners self-assess their own diagram; they could revisit page 10 of the *Cambridge Science Stage 6 Learner's Book*.

b Challenge learners to think about ways of remembering any labels that were incorrect, for example, sketch the diagram on a mini whiteboard or draw it in the air and talk it through.

c When they repeat the activity, use their idea from b) to help them to remember.

d For example:

The circulatory system makes sure that oxygen, water and nutrients are delivered to all parts of the body. The heart pumps the oxygen low blood to the lungs, which exhale carbon dioxide through the nose or mouth. When air is inhaled, oxygen rich blood is sent to the heart, which pumps the oxygen rich blood to the rest of the body.

Activity 4

At various points during this unit ask learners to revisit their memory map and add to or amend as appropriate, this could be done in a different colour pen to show progression in their learning. Discuss their additions and amendments and ask them to explain any new links they have made to check their understanding.

Page 15

Activity 5: Answers

For example:

i. The parts of the heart

ii. How the heart works

iii. How the circulatory system works

iv. How to take the diseased heart out

v. How to put the new heart in the body

vi. How to keep the person alive while the hearts are being swapped.

Pages 15–16
Activity 6: Answers

For example:

Similarities and differences between human heart and whale heart	
Similarities	**Differences**
Heart pumps blood around the body	Whale heart is weighed in kg not g
Oxygen is pumped around their bodies	Whale heart size of small car, human size of 2 hands
Both hearts have 4 chambers	A whale heartbeat is very slow, humans is faster per minute

Page 16
Activity 7

Check that learners choose facts that are similar.

Cross curricular

- Memory maps provide a focus on learners' ability to remember and apply key scientific vocabulary and the ability to use phrases and paraphrase ideas rather than write whole sentences.
- Learning scientific vocabulary is key to learners' understanding and being able to articulate their learning. Learners who struggle with the vocabulary, will of course, find it more difficult to communicate their ideas and understanding and less likely to attain at the appropriate level. Focusing on key vocabulary not only supports learners but also helps teachers to access and support any misconceptions that learners might hold. Encourage learners to use approaches that 'suit' them to learn key scientific vocabulary, for example:
  - break down polysyllabic words, for example: res – pi – ra – tion
  - family and friends testing them
  - mini dictionaries
  - hand signs
  - flip key word cards, choose a card, spell, and define word, then flip card over to check
  - highlight the part of the word that they find tricky. For example, diaphragm and focus on learning the part they find hard to remember.

Further activities

- Encourage learners to share their memory maps with others, so that they can:
  - compare their ideas
  - check and correct their own maps
  - add new information from someone else's map to their own to extend their learning.
- In those minutes between activities, or just before breaks or lunchtimes, engage learners in quick fire word activities such as spelling the word 'diaphragm', or engaging in the game 'I say…' where they have to do what you say quickly, for example, 'I say inhale', so the whole class inhales.

ICT links

- Learners use the internet to search for additional information on the heart, or to watch video clips which explain how the heart works. This can help embed ideas, or learners can check their own ideas against scientifically acceptable explanations and, where appropriate, amend.
- Learners use an online dictionary to check spelling and definitions. Research additional information on, for example, Christiaan Barnard.

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Teacher's Handbook

Focus revision where learners need most support with clearly identified success criteria and easy-to-follow teaching notes.

- Assess knowledge and progress with structured practice tests and whole-class activities.
- Improve understanding and technique with photocopiable resources.
- Introduce strategies for supporting recall and revision with rationale for use and further ideas.

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