7A
Cells, tissues, organs and systems

This unit starts by reminding students about the features of organisms, and then looks at organs, tissues and cells. These ideas are then built back up in order to look at organs once again, in the context of organ systems. Throughout the unit, students are encouraged to compare what we know now about the structure of organisms with what people believed in the past. The theme of Ancient Egypt helps to thread these ideas together.

Recommended teaching time for unit: 7.5–10 hours

Topic 7Ab provides an opportunity to look at how material in this unit is used by doctors, with a focus on STEM skills (problem-solving). Topic 7Ac contains additional work on scientific skills (using microscopes and preparing slides). You may wish to spend additional time on these topics should you feel that your students would benefit from these skills development opportunities.

From primary most students will be able to:

- identify and describe the functions of different parts of flowering plants: roots, stem, leaves and flowers
- describe the simple functions of the basic parts of the digestive system in humans
- describe the life cycles common to a variety of animals, including humans (birth, growth, development, reproduction and death), and to a variety of plants (growth, reproduction and death)
- identify and name the main parts of the human circulatory system, and explain the functions of the heart, blood vessels and blood (including the pulse and clotting)
- describe the life process of reproduction in some plants and animals
- use results from experiments as evidence.

Topic 7Aa introduces the unit with a reminder of what an organ is and how scientists look at evidence from which to draw conclusions. The topic then goes on to explore what makes an organism.

Topic 7Ab covers plant and animal organs, which should be familiar to most students from primary work. There is an opportunity to find out more about STEM and the skills associated with being a medical doctor (with a focus on problem-solving).

Topic 7Ac introduces the idea of tissues. There is an opportunity for students to develop their practical skills, which covers using a microscope. It also introduces various skills involved with making slides for microscopic examination.

Topic 7Ad formally introduces the idea of cells and the differences between plant and animal cells.

Topic 7Ae completes this unit by looking at organ systems. There is an optional investigation on tissues in leaves. A set of descriptions to assign developing, securing or exceeding to the work is provided in the ASP.

Curriculum coverage

This unit covers the following:

- the seven shared characteristics of living things
- cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope
- the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts
- the similarities and differences between plant and animal cells
- the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms
- organs in the major systems in humans and the water transport system in plants.

This unit also has a focus on the following aspects of Working Scientifically/Scientific Enquiry:

- manipulate a light microscope to observe specimens under different magnifications
- safely prepare biological slides that can be successfully viewed using a light microscope (including the careful use of stains)
- identify problems with viewing specimens under a microscope, both with the microscope and with the slide (e.g. air bubbles, poor light source).

STEM skills

This unit explores these STEM skills and how they are used:

- problem-solving (how scientists solve problems, including thinking up ideas to test and basing conclusions on evidence).

Cross-curricular opportunities

7Aa – History – Ancient Egypt
7Ab – English – conventions and ordering in scientific writing
– History – Ancient Egypt
7Ac – History – Ancient Egypt/Greece/Rome
– English – Shakespeare, Julius Caesar

7Ad – History – Ancient Egypt
7Ae – History – Ancient India

Maths skills

- use symbols for units.

7A Background information

7Aa Doctors past and present/Life processes
Something is deemed to be alive when it is capable of both metabolism and reproduction. Metabolism is the set of chemical reactions that allow something to grow and produce energy.

Scientists consider something to be alive if it carries out the following processes: movement, reproduction, sensitivity (the ability to detect and respond to changes in the surroundings), growth, respiration (the use of materials to release energy for the organism to use), excretion (the removal of waste products generated by metabolism of the organism), nutrition (the intake of materials necessary for metabolism and growth).

At this stage it is safe to assume that by 'respiration' we mean respiration involving the use of oxygen – aerobic respiration. Other organisms do, however, use other forms of respiration. Note that respiration is a series of chemical reactions; it is not the same as breathing. This common misconception is caused by the use of the word 'respiration' in everyday English to mean anything to do with breathing.

Excretion is another bone of contention. Although we talk about excrement, faeces is mainly undigested food matter, has therefore not been generated by metabolism inside the body, and so is not an excretory product. However, it does contain excretory products from the liver, such as bilirubin made from the breakdown of red blood cells. This substance is responsible for the brown colour of faeces.

Some students may think that fires and the Sun are alive. Students must be guided into thinking about all of the life processes if this confusion arises. Fires and the Sun do not reproduce and they cannot react to things of their own accord. Picked fruits are also an area of confusion. Whilst the fleshy part of something like an orange is dead once picked, the seeds inside are alive.

A further point of confusion surrounds viruses, although it is unlikely that students will bring up this subject. Viruses are not considered to be 'living things' since although they are capable of reproduction they are not capable of producing their own energy, and rely on the metabolic machinery in another living cell to carry out this function.

7Ab Organs/Medical doctors
Many students will be familiar with the positions of the major organs in the human body. The heart is traditionally thought of as lying on the left of the body. It is in fact in a fairly central position but more of it lies on the left of the body. There is much more muscle in the left side of the heart since this side has to pump blood around the whole body whereas the right side only has to pump blood to the lungs. Students often ask questions about pacemakers. The heart is kept beating by a series of nerves that tell it when to contract. Sometimes these get damaged and out of step, resulting in one half of the heart trying to beat at a different time from the other. A pacemaker gives small electrical signals to the heart muscle to keep both halves contracting at the same time.

There is often confusion about whether the liver is found in front of or behind the stomach. The answer is a bit of both, and a human torso model is useful to demonstrate this. One of the lobes of the liver lies over the intestinal end of the stomach. The liver is also the most difficult organ to give a precise function to at this stage. It is described in the student materials as 'making and storing some substances and destroying other substances'. In fact its role is much more complicated. A brief list of functions is given here to help when answering students' questions: it makes a substance called bile that helps with the digestion of fats; it makes and stores glycogen from glucose (glucose being released again when blood sugar levels fall); it converts unwanted amino acids into urea, which is removed from the blood by the kidneys; it produces blood proteins; it produces blood clotting agents; it stores vitamin B12 and iron; it destroys old red blood cells; it can turn saturated fats into unsaturated ones; it produces heat to help maintain a constant body temperature.

The pancreas is another interesting organ that is not dealt with at this stage, but may be brought up in class if there are any students with diabetes. The pancreas produces digestive enzymes for use in the small intestine. It also produces two hormones (insulin and glucagon) that control blood sugar (glucose) levels. Basically, insulin causes the blood sugar to be lowered and glucagon does the opposite (the liver is able to convert glucose to glycogen and vice versa). In type 1 diabetes, insufficient insulin is produced, resulting in extremely high glucose levels. This means that glucose is excreted in the urine, and a urine test for glucose is the test for the disease. The condition is controlled by regular insulin injections.

The student materials introduce the idea of a plant storage organ, in addition to the standard stem, roots and leaves. Storage organs take many forms, the most common being tubers, rhizomes, corms and bulbs. Also note that flowers contain a variety of reproductive organs and so are not considered as a single organ here. A flower is an organ system.

7Ac Tissues/Microscopes
There is often some confusion as to what is a tissue and what is not. In this topic, a tissue is simply presented as being a part of an organ, with different tissues making up an organ. In the next topic this will be further refined so that students understand that a tissue is composed of cells of the same type working together to perform a common function.

With this definition in mind, we will describe blood and skin as being organs.

In animals there are four general classes of tissue: connective (which joins tissues, provides support or separates tissues), epithelial (which secretes substances, absorbs, protects or senses things), muscle (which moves) and nerve (which allows communication and control). There are subtypes of all of these. For example, fat and bone tissue are types of connective tissue.

In plants there are three general classes of tissue: epidermis (which forms coverings and prevents water loss, regulates gas exchange, secretes substances and absorbs water and mineral salts), vascular tissue (which transports materials) and ground tissue (which consists of less specialised forms of cells and has a variety of functions). Again, there are subtypes of these. Root hair tissue is an example of epidermal tissue. Xylem tissue (which carries water) and phloem tissue (which carries dissolved organic substances) are types of vascular tissue. There are three main types of ground tissue: sclerenchyma (dead tissue for support), collenchyma (living tissue for support), parenchyma (of which there are many subtypes, including cambium for the provision of undifferentiated cells, mesophyll for photosynthesis, storage tissues and secretory tissues). Note that the term cortex refers to the outer layer of a stem or root and is composed of different tissues (usually parenchyma and collenchyma) – it is not a single tissue type.

A huge range of microscopes are used in schools, and the ones shown in the Student Book and on worksheets or skills sheets may not resemble the ones you use, although the basic design will be similar. In some microscopes, the stage is moved using the focusing wheel and in others the lens barrel will move. Instructions are written in such a way that it does not matter which type is used. The principle is that you start with the smallest objective lens and move the stage and the objective lens as close as possible (without touching). The students then move the slide and lens away from each other to focus. This principle helps to prevent students driving the objective lenses into the slides and breaking them whilst looking down the microscope.

Air bubbles are a problem when students make their own slides. These stand out as thick, dark rings. If you are unfamiliar with the appearance of air bubbles, place a few grains of sand/dirt in a small drop of water on a slide. Drop a coverslip on it. Do not try to squash down the coverslip. Air bubbles will be found near the sand/dirt. Students often report ‘huge round things’ or ‘enormous vacuoles’ in their slides. These are usually air bubbles and students can waste time focusing in on them, missing the real cells completely. If using onion skin, it may be worth explaining the problem of air bubbles, and pointing out that real onion skin cells are in a sheet of cells, so they should be able to see many cells joined together, not just one on its own.

7Ad Cells

Only the major parts of animal and plant cells are covered in this topic. Some students may, however, do further research and find other parts. There is, for example, no mention of vacuoles in animal cells in the student materials but animal cells do have small vacuoles for storage. However, these are small, not permanent and may be found scattered throughout the cell.

Cell adaptations to their functions are briefly mentioned in this topic but the specialisations of individual cells will be looked at more closely in relevant units (e.g. sperm cells and egg cells in Unit 7B). For this topic it is sufficient that students appreciate that some cells are different in an organism because they have certain functions.

It should be noted that the root hair is not a hair in the sense of a human hair. It is an extension of the cell wall that increases the surface area of the cell, allowing more efficient absorption of water from the soil.

7Ae Organ systems/Transplants

Individual organ systems will be considered in more detail later in the course, and new ones (e.g. the reproductive system) introduced. Flowers are also organ systems containing male and female reproductive organs.

Some might dispute that the water transport system is an organ system but it does conform to the standard definition – that an organ system is a group of organs working together to perform an important function. Water transport in plants is usually known as the ‘transpiration stream’. This terminology is not used in the student materials.

Most students will have an understanding of what a transplant is. They may not, however, realise that when an organ donor ‘dies’ it is only the brain that needs to be declared dead. The heart and lungs are often kept working with machines until the transplant is ready to go ahead, in order to keep the time that the heart is not supplied with blood to the bare minimum. After an organ is ‘harvested’ it is chilled on ice and raced to the patient who needs it. Hearts and lungs need to be used within about 5 hours of harvest, livers can last up to 34 hours, a pancreas up to 20 and kidneys up to 72. Corneas last 10 days and can be harvested 12 hours after the circulatory system of the donor has stopped working.

7Aa
Life processes

Objectives
Developing:

1. Recall the life processes shown by living organisms: movement, reproduction, sensitivity, growth, respiration, excretion, nutrition. (iLS only)

Securing:

2. Describe the life processes and use them to justify whether something is an organism or is non-living. (iLS only)
3. Identify ways in which an organism shows each life process. (iLS only)

Exceeding:

Exceeding objectives are designed to broaden students' skills and knowledge beyond what is required, often introducing a higher level of challenge.

4. Compare life processes in a range of different organisms.

Student materials

Topic notes

- Some students will have misconceptions from primary about what makes a living thing. Be watchful for students who think that fires and stars are living.
- It is important that teachers review all materials that they intend to use with students before use, to ensure suitability.
- It is envisaged that in the course of studying the biology component of this topic, students will use one Starter idea, Explaining 1, one further Exploring or Explaining idea, and one of the plenaries. Additional activities can be added as time allows.

Be prepared
Exploring 4 requires tree trunk/branch sections to analyse (varnished if needed for reuse).
Explaining 4 requires a potato that has started to sprout.

STARTERS

1: Quick Quiz

BA

Use the 7A Quick Quiz for baseline assessment. Students can use the 7A Quick Quiz Answer Sheet to record their answers. You could use all of the Quick Quiz as a starter for the whole unit, and then again at the end of the unit to show progress. Or just use the first four questions, which relate to this topic. These questions could be revisited formatively in a plenary for this topic. There is more information on Quick Quizzes in the ASP.

Course resources
ASP: 7A Quick Quiz; 7A Quick Quiz Answer Sheet.

2: Items card sort

BA

Use this activity to assess how much students remember about life processes. Students cut out the drawings on Worksheet 7Aa-3 and put them into groups. After a few minutes ask them to share what groups they have come up with. Then ask them to re-sort the cards into just two groups. Ask the students to share their thoughts. Then ask them to re-sort the cards into 'living' and 'non-living' items. Ask students how they made their choices, gradually building up a list of 'things that all living things do' on the board.

Course resources
AP: Worksheet 7Aa-3.

Equipment
Scissors.

3: At the doctor's

BA **WS**

Use this activity to assess how much students remember about evidence and conclusions. Divide the class into groups (groups of four work well). On paper, each student writes down one thing that doctors look at or measure when examining patients (e.g. temperature, skin, throat, cough, rash, spots, pulse). Students pass their papers on to their neighbours. Each student then writes down a symptom that a doctor may find when looking at/measuring the thing written at the top of the sheet (e.g. there is a rash, high temperature). Students pass on their papers. Each student writes down an idea for what is wrong with a patient based on the information on the sheet so far. Students pass on their papers. Each student writes down whether additional evidence would be needed to make sure the doctor knew that this was the problem and why additional evidence would be needed. Select some students to read out their papers in the following way: For my patient, the doctor looked at _____

and found the symptom ___. This is evidence that the patient had ____. I would need more evidence because some problems have the same symptoms.

Consider helping students by using the **AL** interactive *Symptoms and disease*, which asks students which symptoms could diagnose a cold.

Course resources
AL: Interactive *Symptoms and disease.*

Equipment
Paper.

EXPLORING TASKS

1: Evidence for life

WS

Cut up the pictures on Worksheet 7Aa-3 and ask students to take two of them from a 'hat'. Students stick their chosen pictures onto Worksheet 7Aa-4 and then complete that sheet using their knowledge of life processes. They should appreciate that they are using their knowledge of what the items can and cannot do as evidence for whether those things are living or non-living.

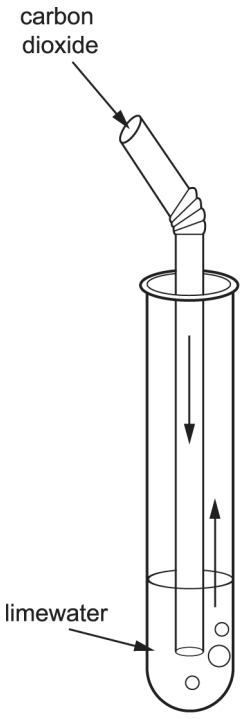
Course resources
AP: Worksheets 7Aa-3; 7Aa-4.

Equipment
Glue.

2: Respiration and excretion

WS

Tell students that a gas produced by respiration in humans is called carbon dioxide and that carbon dioxide turns limewater milky. Ask students to blow *gently* through a disposable straw into a test tube of limewater and write down what they observe. Ask them to write down conclusions, using the term 'evidence'.



Limewater hazard in mouth. Wear eye protection.

Equipment
Test tube with small amount of limewater (approx. 1 cm in depth), fresh bendy disposable straw.

3: Life processes in seedlings

WS

Worksheet 7Aa-2 details a simple practical to see whether germinating seeds respire and therefore excrete a waste product (carbon dioxide). The limewater should turn milky after 2–4 days (depending on seeds and temperature), but the flasks may need swirling from time to time to allow mixing of carbon dioxide with the limewater. In some cases, this experiment may need to be monitored for 7 or more days in order for a change in the limewater to be observed.

You can extend this practical to look at the other life processes. You can explain that seeds are what many plants use to reproduce. Also point out that seeds contain a store of nutrition for the growing seedlings. Germinated seedlings (particularly cress) will bend towards light if illuminated from one side. This shows sensitivity and movement (although this movement is technically a growth response). This experiment demonstrates respiration and excretion. Note that the experiment is done with seedlings so that the complication of photosynthesis is avoided.

You can increase the level of demand of the worksheet by covering/removing the word box before photocopying/printing.

Limewater and pesticide coatings on seeds are hazardous. Wear eye protection.

Course resources
AP: Worksheet 7Aa-2.

Equipment
Bung for conical flask, conical flask, damp cotton wool, eye protection, limewater, 100 cm^3 measuring cylinder, muslin bag, seeds (e.g. cress, bean, pea).

4: Tree rings and growth

WS

Explain to students that as a tree grows it adds rings to its trunk. Provide students with tree trunk sections and ask them to count the rings to determine how old the sections are. If you know which year the tree was felled in, you can ask students to work out which years were the best for growth and what evidence they are using to draw their conclusions (the more growth, the wider the ring). Note that the growth in 1 year consists of a wide light-coloured ring and a thin dark ring. Tree trunk sections can be obtained from timber merchants, garden centres or the Forestry Commission. If they need to be reused, they can be varnished and students can use white board markers to assist with counting.

Worksheet 7Aa-5 provides an introduction and three sets of tree rings to analyse. The worksheet diagrams could be used instead of tree sections.

Course resources
AP: Worksheet 7Aa-5.

Equipment
Tree trunk/branch sections to analyse (varnished if needed for reuse), white board markers.

EXPLAINING TASKS

1: 7Aa Doctors past and present (Student Book)

BA

This unit starts with a brief introduction to the way that Ancient Egyptian doctors worked, which provides a way of revising some primary ideas (using evidence and organs). This may be the first page that students use in the book, and so you could challenge students to look up the words in bold (to introduce them to the glossary) and find out in what other parts of the book you can find out about evidence (to introduce the index).

Some questions allow a degree of rough baseline assessment. (Question 1 on reading and text comprehension, Question 2 on everyday background knowledge, Question 3 on material from primary).

The AL interactive link opens *Symptoms and disease*. See Starter 3.

Course resources
AL: Interactive *Symptoms and disease*.

2: 7Aa Life processes (Student Book)

FA

This spread introduces the seven life processes and considers how we tell organisms apart from non-living things. Worksheet 7Aa-1 is the Access Sheet.

Question 7 can be used for formative assessment, with students working in groups to answer the questions. See the ASP Introduction for ideas on how to run the feedback and action components for this formative assessment. This also contains mini-plenary ideas.

The AL video *Life processes* contains footage to illustrate life processes. After showing students the video, ask them why a certain piece of footage has been used to illustrate a certain process. Challenge students to spot other life processes in the videos, and name them.

Course resources
AP: Worksheet 7Aa-1.
AL: Video *Life processes.*

3: Sensitive plants

Show sensitive plants (e.g. *Mimosa pudica*) or Venus flytraps to students. Sensitive plants will shut their leaves when touched. To make the trap on a Venus flytrap shut, generally there are three bristles inside the trap, all of which need to be touched. Having demonstrated movement and sensitivity, explain how these plants reproduce, grow, respire, excrete and need nutrition.

If these plants are not to hand, there is plenty of video material on Internet video storage sites that can be used instead.

Refer to a leading safety organisation for practical science teaching for recommended plants to use.

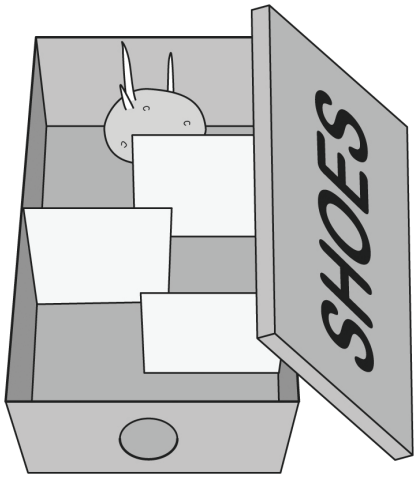
Equipment
Sensitive plant(s): e.g. *Mimosa pudica* and/or Venus flytrap plants.

4: Potato maze

WS

This takes a few days to work but the results can be considered when teaching about organs (the potato is a storage organ) in the next topic. Make a hole several centimetres in diameter in the short side of a shoebox (or similar). Stick rectangles of cardboard (three or four) so they jut out from either side of the

inside of the box. Place a sprouting potato at the end opposite the hole. With the lid on the box and the hole being illuminated, a potato stem should grow through the maze towards the light. If the lid is not snugly fitting, light may leak in where it meets the sides of the box; a rectangle of felt glued to the inside of the lid will prevent this. If you wish to use the box again, place the potato in a shallow dish to prevent it rotting the base of the box.



Ask students what life processes they can see happening in this demonstration. What is happening as the potato grows (it is sensing the light) and why is this useful (the plant will need light to make food by photosynthesis)?

Equipment
Shoebox, cardboard, sprouting potato (use a seed potato or a normal potato that has been left in a warm place for a couple of weeks to sprout), scissors, sticky tape, felt, glue, shallow dish (e.g. evaporating basin).

PLENARIES

Most plenaries can be used for formative assessment. Suggested assessment, feedback and action strands of formative assessment can all be modified. See the ASP for further information and ideas on formative assessment.

1: Quick Check

FA

Assessment: Students complete the Quick Check sheet for this topic, which consists of a range of pictures to label with a life process. There is one 'trick' one – a rock, which shows no life processes.

Feedback: Students work in pairs to check one another's answers. They agree correct answers for any that they have wrong.

Action: Hold a class vote on which life process should be revisited next lesson (based on the one that students found most difficult). The next topic looks at organs, so pay extra attention to this life process in the context of the appropriate organ (e.g. if students choose nutrition, remind them about life processes and nutrition when talking about the stomach or small intestine).

Course resources
ASP: 7Aa Quick Check.

2: Thinking skills

FA

Assessment:
Odd One Out: growth, reproduction, respiration. (Possible answers: respiration releases energy the other two use energy; growth does not begin with 'r'; organisms reproduce and respire in different ways but they all grow by getting bigger.)

Consider All Possibilities: It has four legs. (Possible answers: it is an animal with four legs; it is an animal that had more than four legs but lost some; it is a 'couple'; it is a table.)

Plus, Minus, Interesting: Humans need nutrition. (Possible answers: **Plus** – we enjoy eating food; **Minus** – food can be expensive, we could do more things if we didn't have to stop to eat; **Interesting** – how much food is wasted? Some reports say that we waste up to half of the world's food.)

Feedback: Students answer the thinking skills questions in groups, thereby feeding back their thoughts to one another. Ask students to write down their best answers and consider why they think they are the best.

Action: Ask a spokesperson from a number of groups to read out their best answers. Identify any ideas that are missing and share them with the class, reinforcing ideas that students are having difficulties with.

The (AL) presentation *7Aa Thinking skills* can be used for this activity.

Course resources
AL: Presentation *7Aa Thinking skills*.

3: Life process whispers

FA

Assessment: Each student writes the name of a life process at the top of a sheet of paper. Students pass their papers on to their neighbours. Each student then draws the life process in any way they think fit.

Students then fold over the paper so that the name of the life process cannot be seen but the drawing is still visible. They pass their papers on to their neighbours, who write down which life process they think the drawing shows. They then open up the papers to reveal the original life process. If you are worried about potential silliness, you could limit the options of life processes from which students can choose (for example, not reproduction or excretion).

Feedback: Students discuss how good their drawings were.

Action: Hold a class vote to find out which life process was the most difficult to depict. Point out depictions of this life process in further work in this unit.

Equipment
Paper.

HOMEWORK TASKS

1: Living and non-living
Worksheet 7Aa-6 contains straightforward questions about life processes.

Course resources
AP: Worksheet 7Aa-6.

2: Life processes and robots
Worksheet 7Aa-7 asks students to compare robots and humans in terms of life processes. Ensure students understand km/h as a unit symbol.

Course resources
AP: Worksheet 7Aa-7.

3: Comparing life processes
Ask students:

1. Which life processes happen in the following things?
   car, cow, fish, river, robot
2. How do we know that these processes happen?
3. Which life process never happens in non-living things?

They should consider how best to present their work.

7Ab Organs

Objectives
Developing:

1. Identify and describe the functions of the major human and plant organs.

Securing:

2. Describe the functions of a large range of human, animal and plant organs.
3. Recall what happens in photosynthesis.

Exceeding:

4. Identify similarities between the functions of different organs (including common life processes).

Student materials

Topic notes

- It is important that teachers review all materials that they intend to use with students before use, to ensure suitability.
- It is envisaged that in the course of studying the biology component of this topic, students will use one Starter idea, Explaining 1, one further Exploring or Explaining idea, and one of the plenaries. Additional activities can be added as time allows.

STARTERS

1: Symbols

BA

Students will meet many symbols during their study of science, and will have encountered some at primary. The major ones that they will meet in this unit are unit symbols (such as mm). It may be useful to make sure students know what these sorts of units mean by using this brief starter activity.

Ask students to draw a commonly found symbol on a piece of paper and hold it up. Ask a few students at random what their symbols mean, where they would find them and why the symbols are used. Establish that symbols are used to convey information about what something is or does in a way that as many people as possible will understand.

Equipment
Paper.

2: What's in your body?

BA

Ask students to contribute to a list of 'things found inside your body'. Write the list on the board (saving a copy). Go through the list and ask students what each 'thing' does. This list can then be revisited as a plenary (Plenary 4).

3: Organs card sort

BA

Cut out the cards on Worksheet 7Ab-2 and hand one to each student. Some cards contain a picture, others an organ name and others a function. Without telling students about the nature of the different things on the cards, ask them to arrange themselves into groups.

Course resources
AP: Worksheet 7Ab-2.

Equipment
Scissors.

EXPLORING TASKS

1: Investigation reports

You may wish to familiarise students with the idea of writing a report on any practical investigations that they do. Worksheet 7Ab-6 has a series of sentences from investigation reports. Students decide which section of an investigation report each sentence belongs in. They could be asked to give their reasons. Then ask why it is useful that all investigation reports are written in a similar way (it makes it easy to find information, it makes it easy to compare things in different reports).

The level of this activity can be reduced by giving students access to Skills Sheets RC 6 and/or RC 7.

Course resources
AP: Worksheet 7Ab-6, Skills Sheets RC 6; RC 7.
AL: Interactive *Investigation terminology*.

Equipment
Scissors.

2: Scientific paper analysis

You may wish to familiarise students with the idea that scientists write reports on the practical investigations that they do.

Ask students to work in groups to look at a scientific research paper and ask directed questions. Ask the questions below, one question

at a time, giving students 30–60 seconds to find the information, and then ask random groups to give their answers. The last two questions are more difficult and will depend on the paper chosen.

- Who has written the report and how do you know?
- How many words are in the title? Is there a way to use fewer?
- What is the Method section called in this report?
- How easy is it to find the Results section? What makes it easier to find?
- What did the investigation set out to discover? Is there one sentence that sets out the aim clearly?
- What were the main conclusions? Is there one sentence that sets this out clearly?

Equipment
Scientific journal or academic research paper.

3: Cut-and-stick human organs

WS

Students use Worksheets 7Ab-4 and 7Ab-5 to stick organs on a human body.

Course resources
AP: Worksheets 7Ab-4; 7Ab-5.

Equipment
Scissors, glue.

4: Skin and sensitivity

WS

Remind students of the seven life processes and that sensitivity is one of them. Introduce the idea that the skin is an organ that helps us to sense touch, heat, pressure and pain.

The experiment involves finding out on which parts of the body two points can be felt (as opposed to one) when two points are gently pushed on the skin.

Developing: Go through Worksheet 7Ab-3 with students part by part, making sure they understand what they are doing before allowing them to do each part.

Securing: When students have used Worksheet 7Ab-3: challenge students to devise a way of avoiding 'cheat' results (e.g. only one point to be occasionally placed on the skin to 'catch out' those who say they can feel two points).

Exceeding: Students plan their own methods. Many suggestions will be qualitative only. Discuss the strengths and weaknesses of the plans and decide on a single approach. Then ask students to carry out the investigation, record their results and draw conclusions based on their evidence. This could be turned into a levelled outcome exercise.

Before starting the practical, establish some no-go areas, such as around the eyes and mouth, chest, abdomen and upper legs.

Course resources
AP: Worksheet 7Ab-3.

Equipment
Two pencils taped together or a U-shaped piece of thick wire.

5: Design a stethoscope (STEM)

At the end of the STEM pages, there is a practical activity in which students build and test simple stethoscopes. If you have one, show students a real stethoscope and demonstrate how it is used. Tell students that the earliest stethoscopes were simply rolled-up tubes of paper, and that some types today are very simple (e.g. the Pinhard horn, which is used to listen to a baby's heartbeat during pregnancy). Ask students to work together to design and make two or three different stethoscope designs. They should try out their devices (observing the safety rules listed below) and decide on the best design, with a reason for why it was the best. This could be ease of use or be the one that allowed the heart to be heard the clearest or loudest. If time is short, students could make one design and then try out the designs of other groups.

If students ask, point out that the 'lub dub' sounds that they hear when listening to someone's heart are caused by flaps inside the heart (valves) opening and closing. Refer students to diagram B on the Student Book spread 7Cb Muscles and blood and point out the positions of the valves between the atria and ventricles.

Ensure that all use of stethoscopes is appropriate. In mixed sex classes, ensure that boys are paired with boys and girls with girls. Clothing must not be removed. If students are using earpieces or standard stethoscopes, they should not be shared (each student should use fresh, sterile earpieces). Ensure that all earpieces are sterilised in disinfectant and dried before use.

Equipment
Some of all of: paper, newspaper, cardboard tubes, small funnels, large funnels, sticky tape, rubber tubing (e.g. Bunsen hoses). Optional: earpieces.

EXPLAINING TASKS

1: Writing investigation reports
Introduce the idea that during their science studies students may be writing investigation reports or filling in worksheets when they do practical work. Show them Worksheet 7Aa-2 or 7Ab-3, which some of them may have completed. Point out the different headings used to split up the different sections of the worksheet. Explain that this basic convention is used by all scientists. Illustrate this by looking at a research paper in a scientific journal and/or Skills Sheets RC 6, RC 7 and RC 8.

Course resources
AP: Skills Sheets RC 6; RC 7; RC 8. Worksheets 7Aa-2; 7Ab-3.
AL: Interactive *Investigation terminology*

Equipment
Scientific journal or academic research paper.

2: 7Ab Organs (Student Book)
FA
This spread revises the main organs of the human body and plants from primary. It goes on to introduce a variety of organs that will be new to students, together with their locations and functions. Worksheet 7Ab-2 is the Access Sheet.

Question 8 can be used for formative assessment, with students working in groups to answer the questions. See the ASP Introduction for ideas on how to run the feedback and action components for this formative assessment. This also contains mini-plenary ideas. AL links allow you to turn the labels on and off on diagram D.

AL interactive activities allow students to match human and plant organs to their function.

Course resources
AP: Worksheet 7Ab-2.
AL: Interactives *Human organs and their functions*; *Plant organs and their functions*. Labels on/off *The organs found in most plants*.

3: Human torso model
WS
Demonstrate a model of a human torso to students, showing where all the various organs are and how they fit together.

Equipment
Human torso model.

4: 7Ab STEM – Medical doctors (Student Book)
This spread looks at the jobs that medical doctors do, and the skills and training that they need. There is a particular focus on problem-solving, and the steps that doctors use to do this. This process is related to the method that scientists use to problem-solve – the scientific method.

PLENARIES

Most plenaries can be used for formative assessment. Suggested assessment, feedback and action strands of formative assessment can all be modified. See the ASP for further information and ideas on formative assessment.

Course resources
ASP: 7Ab Quick Check Literacy.

1: Quick Check
FA
Assessment: The 7Ab Quick Check sheet poses questions to test how well students have linked ideas about organs.

Feedback: Read out the correct answers and allow time for students to look again at their work and make corrections as necessary.

Action: Read out all the organs on Student Book spread 7Ab Organs and ask students to put up their hands if they think an organ has a function that is difficult to remember. Recap the functions of these organs now and in the next topic. Then ask for a vote to find the most popular organ that students want to know more about (Question 7c). Challenge students to find out what 'tissues' this organ is made of and use this example as a starter in the next topic.

Course resources
ASP: 7Ab Quick Check.

2: Thinking skills

FA

Assessment:

Plus, Minus, Interesting: Humans should have two of every organ (e.g. two livers). (Possible answers: **Plus** – if one went wrong you would have a back-up; **Minus** – more space would be needed in the body, the body would require more energy, there would be more things to go wrong; **Interesting** – what would a pulse be like with two hearts beating; some people are born with doubles of some organs.)

Consider All Possibilities: What might happen if you had a problem with your kidneys? (Possible answers: the body might not be able to filter and absorb important substances from fluids; the body might not be able to eliminate waste products in urine, which might lead to illness; the body would get bigger since water could not be removed; urine might not be produced.)

Consider All Possibilities: A plant has no leaves. (Possible answers: it is a cactus; it is a tree that loses its leaves in winter; it is a seedling that has yet to form its first leaves; it is a dead plant and has lost its leaves.)

Odd One Out: kidney, liver, heart. (Possible answers: there are two kidneys; the heart is the only one that pumps blood; the heart is the only one that is not part of the excretory system.)

Odd One Out: leaf, intestines, brain. (Possible answers: the leaf is only found in plants; the brain needs nutrition but the leaf and the intestines help the organism get nutrition.)

Feedback: Students answer the thinking skills questions in groups, thereby feeding back their thoughts to one another through discussion. Ask students to agree on what the best answers are and write them down.

Action: Ask a spokesperson from a number of groups to read out their best answers. Identify any ideas that are missing and share them with the class, reinforcing ideas that students are having difficulties with.

The (AL) presentation *7Ab Thinking skills* can be used for this activity.

Course resources
AL: Presentation *7Ab Thinking skills*.

3: Mnemonics

FA

Ask students to work in groups to remember all the human organs that they can. Explain to them how a mnemonic works and see if they can come up with any good mnemonics. Make it clear that this is a memory technique.

4: What's in your body? Revisited

FA

Repeat Starter 2, revisiting the list.

HOMEWORK TASKS

1: Where the organs are

Worksheet 7Ab-7 contains straightforward questions on organs.

Course resources
AP: Worksheet 7Ab-7.

2: Organ evidence

Worksheet 7Ab-8 contains questions on organs, together with some work on the relationship between conclusions and evidence, and organising lists. Ensure students understand the use of solidus to mean per 100 000, and that they understand the terms 'conclusion' and 'evidence' before starting the sheet.

Course resources
AP: Worksheet 7Ab-8.

3: A new organ

Worksheet 7Ab-9 contains questions on organs in the context of blue whale feeding. These questions are of an increased cognitive demand.

Course resources
AP: Worksheet 7Ab-9.

7Ac Tissues

Objectives
Developing:

1. State the use of a microscope and identify the basic parts of a light microscope.
2. Identify the basic parts of a prepared light microscope slide.
3. Identify and recall named tissues in human and plant organs.

Securing:

4. Describe how to use a light microscope to examine a slide and calculate the magnification.
5. Describe how to prepare a microscope slide.
6. Describe the functions of different tissues in an organ (e.g. heart, root).

Exceeding:

Exceeding objectives are designed to broaden students' skills and knowledge beyond what is required, often introducing a higher level of challenge.

7. Estimate sizes under a microscope.
8. Identify similarities between the functions of different organs (including common life processes).

Focused Working Scientifically/Scientific Enquiry objectives

1. Manipulate a light microscope to observe specimens under different magnifications.
2. Safely prepare biological slides that can be successfully viewed using a light microscope (including the careful use of stains).
3. Identify problems with viewing specimens under a microscope, both with the microscope and with the slide (e.g. air bubbles, poor light source).

Student materials

Topic notes

- The word 'slide' is used to describe the glass sheet onto which a specimen is placed and also the finished product (slide, specimen and coverslip). This can cause confusion.
- The proper name for the microscopes used in schools is 'light microscopes'. Some students misunderstand this to mean that they are 'not very heavy' microscopes, as opposed to microscopes that rely on light to produce images.
- It is important that teachers review all materials that they intend to use with students before use, to ensure suitability.
- It is envisaged that in the course of studying the biology component of this topic, students will use one Starter idea, Explaining 1, one further Exploring or Explaining idea, and one of the plenaries. Additional activities can be added as time allows.

Be prepared
Starter 2 requires fresh fruit and/or vegetables.
Exploring 2 requires pre-prepared slides of e.g. fish scales, hair, newsprint.
Explaining 2 requires leaves.

STARTERS

1: Box of tissues

BA

Show students a box of tissues and ask them what is inside. Most will know! Then ask students what an organ is (as a reminder from the last topic) before asking how a box of tissues is like an organ. Write down some of their responses to save for later (Plenary 4), rather than giving the answer.

Equipment
Box of tissues.

2: Chopped fruit and veg

BA

Chop open a range of fruits and vegetables (especially root vegetables and stems, since students have learnt about these as organs). Illustrate that in many cases you can see differences between the different parts. Tell students that the different parts are called tissues.

Equipment
Chopping board, knife, range of fruits and vegetables that when chopped will show a clear variation in internal structure (e.g. carrot, parsnip, onion, celery, tomato).

3: 'Tissues in an organ' challenge

BA

If you challenged students to find out the names of tissues in an organ in Plenary 2 in the last topic, ask for their suggestions. Write a list of the tissues on the board and ask students to define what is meant by a 'tissue'. Elicit the idea that organs are made

of different parts called tissues. You may find the answers to Homework 5 useful (below).

4: What makes things bigger?

BA

Ask students to write a list of things that make things look bigger and to identify a use for each. Then show them a piece of onion skin and ask which of their items would be best to use to examine it.

Equipment
Onion, forceps/tweezers.

EXPLORING TASKS

1: Card sort on using a microscope

WS

Worksheet 7Ac-4 contains a series of squares with assorted instructions on microscope use. Ask students to cut out the squares and arrange them in the correct order. This could be done without students looking in the Student Book.

There is an **AL** interactive version of this activity called *The sequence of how to set up a microscope*.

Course resources
AP: Worksheet 7Ac-4.
AL: Interactive *The sequence of how to set up a microscope*.

Equipment
Scissors, glue.

2: Looking through a microscope

WS

In this practical students look at prepared slides, which serves as a good introduction to microscope work that can be further developed using some of the other activities suggested here.

It is suggested that students keep both eyes open whilst looking down the microscope. This will take practice but will mean that their eyes will become less tired and stories of strange objects swimming across the slides (eyelashes) will be less common! Practice using the microscope could involve looking at hair, fish scales, newsprint, etc. Encourage students to draw or write about what they see.

If using microscopes with mirrors then it is best to use an adjustable lamp that students can angle towards the mirrors; overhead lighting is rarely bright enough. Many microscopes have a small fine-focusing wheel in addition to the larger coarse-focusing wheel. The fine control should be used at higher magnifications (objective lenses ×10 and above) to prevent the lens being driven into the slide and breaking it. More complex microscopes will have a diaphragm under the stage to control the light intensity. This is best altered by the teacher, if necessary.

Confusion may be caused if using microscopes with pointers in the eyepiece lens. Students should be warned about this before using the microscopes, and should avoid drawing in the pointers. Skills Sheet UE 3 can be used to help students understand how to use a light microscope.

Do not allow students to angle the mirrors towards the Sun, as this can seriously damage eyesight.

Course resources
AP: Skills Sheet UE 3.

Equipment
Microscope, selection of pre-prepared slides (e.g. fish scales, hair, newsprint).

3: Celery stems and xylem

WS

Students place celery stems in beakers of water dyed with blue or red food dye. The dye clearly moves up through the xylem tissue in the stem. Using celery stems with the leaves still intact will make the process occur more rapidly.

After students have seen the effect, they should break a stem of celery in half and peel off a small section of stained material. This is easily done with fingers and nails. A thin, short section of stained material is then placed in a cavity slide and a slide preparation is made, which students then examine under a microscope. Worksheet 7Ac-3 can be used to help them record their results, and Skills Sheets UE 2 and UE 3 can be used to help students make slides and examine them.

Do not allow students to angle the mirrors towards the Sun, as this can seriously damage eyesight. A mounted needle is a better way of lowering a coverslip onto a slide than tweezers/forceps, but teachers will need to consider how safe it is to use mounted needles with some students. The use of knives may not be appropriate for some students.

Course resources
AP: Skills Sheets UE 2; UE 3. Worksheet 7Ac-3.

Equipment
Celery stem (preferably with leaves), forceps/tweezers, cavity slide, coverslip, water with blue or red food dye added, pipette, microscope. Optional: mounted needle, scalpel.

4: Estimating size

WS

Higher-attaining students could use microscopes and measure the diameter of the field of view, and therefore estimate the size of an object seen through the microscope. Full instructions are given on Skills Sheets UE 3 and UE 4. Prepared slides should be used for this, with water fleas, hair or other reasonably large specimens. Students could look at their own hair, by pulling out a hair and fixing it to a microscope slide using sticky tape.

Do not allow students to angle the mirrors towards the Sun, as this can seriously damage eyesight.

Course resources
AP: Skills Sheets UE 3; UE 4.

Equipment
Microscope, selection of pre-prepared slides of quite large specimens (e.g. fish scales, hair, newsprint), transparent ruler with millimetre scale or eyepiece graticules and stage micrometers (the latter can be eyepiece graticules secured to microscope slides). Optional: sticky tape.

5: Onion skin tissue

WS

Students follow the guidelines given on Student Book spread 7Ac Microscopes (or Skills Sheet UE 2) to prepare slides of onion skin. Students should not try to flatten their slides by pressing on the coverslip. This often results in the coverslip breaking. Explain to students that what they will be looking at is a tissue called epithelial tissue.

Methylene blue or iodine are suitable stains to use instead of plain water. It will help the cell walls to show up better (although at this stage students will not appreciate that this is what they are actually looking at). Alternatively, use red onions.

Students then examine their slides following the guidelines given in the Student Book (or Skills Sheet UE 3). Students should be encouraged to draw what they see and to record the magnification used. Worksheet 7Ac-3 can be used to help students record their results.

Do not allow students to angle the mirrors towards the Sun, as this can seriously damage eyesight. A mounted needle is a better way of lowering a coverslip onto a slide than tweezers/forceps, but teachers will need to consider how safe it is to use mounted needles with some students.

Course resources
AP: Skills Sheets UE 2; UE 3. Worksheet 7Ac-3.

Equipment
Forceps/tweezers, slide, coverslip, water or 10% methylene blue stain or iodine stain (dissolve 10 g potassium iodide (KI) in 10 cm^3 of water, then add 2.5 g of iodine crystals; shake until the crystals have all dissolved and dilute this with water to make 1.1 dm^3; store in a brown bottle), pipette, microscope. Optional: mounted needle.

6: More tissues

WS

Exploring 5 can be repeated using a variety of other tissues. Encourage students to try a range of different tissues and to discover which is the easiest to view clearly, and to explain why this is the easiest to view. Worksheet 7Ac-3 can be used to help students record their results. Sheets of rhubarb cells can be obtained by snapping a rhubarb leaf stalk in half and peeling away thin layers. Inner layers will show xylem cells. Leaf cells can be examined using a whole moss leaf or painting clear nail varnish onto the surface of a leaf. Once the nail varnish is dry, peel it away from the rest of the leaf with a pair of forceps and this will leave a thin section of epithelial tissue. (This procedure is used in Worksheets 7Ae-2 and 7Ae-3.) Also consider root hair tissue from freshly germinated

Do not allow students to angle the mirrors towards the Sun, as this can seriously damage eyesight. A mounted needle is a better way of lowering a coverslip onto a slide than tweezers/forceps, but teachers will need to consider how safe it is to use mounted needles with some students.

radish/mustard/cress seeds. Raw beef braising or stewing steak can be used to tease out muscle fibres in 0.5 mol dm^{-3} NaCl solution.

Thicker specimens are best examined using cavity slides.

Course resources
AP: Skills Sheets UE 2; UE 3. Worksheet 7Ac-3.

Equipment
Microscope, clear nail varnish, moss leaves/ plant leaves, rhubarb stem, braising/ stewing steak, roots from freshly germinated radish/mustard/cress seeds with root hairs, 0.5 mol dm^{-3} NaCl solution, forceps/tweezers, flat or cavity slides, coverslip, water (or 10% methylene blue stain or iodine stain), pipette. Optional: mounted needle.

EXPLAINING TASKS

1: 7Ac Tissues (Student Book)

FA

This spread introduces students to the idea that organs are made up of different parts called tissues. Worksheet 7Ac-1 is the Access Sheet.

Question 9 can be used for formative assessment, with students working in groups to plan the experiment. To save time, consider asking students to say what they would include in their plans and how they would set out their plans, rather than students preparing formal written plans. See the ASP Introduction for ideas on how to run the feedback and action components for this formative assessment. This also contains mini-plenary ideas.

The AL interactive *Match the tissues* allows students to match tissues to the relevant organs.

The AL video *Open heart surgery* illustrates that the heart contains different tissues.

The AL presentation *7Ac Thinking skills* also includes questions about tissues; see Plenary 3.

Course resources
AP: Worksheet 7Ac-1.
AL: Interactive *Match the tissues*. Presentation *7Ac Thinking skills*. Video *Open heart surgery*.

2: Leaf skeletons

As a teacher demonstration only, prepare leaf skeletons to show the xylem tubes in a leaf. Thin leaves such as oak work best. Add 150 g of sodium carbonate to 500 cm^3 of water. Then add 136 g of calcium hydroxide. Boil for 15 minutes. Pour the liquid through a sieve to remove any bits. Pour the liquid back into the pan/beaker and add the leaves. Boil for one hour (making sure that the solution does not boil dry) and then remove the leaf skeletons with forceps – they are very delicate.

⚠ Calcium hydroxide is an irritant. Avoid raising dust. Wear eye protection. Refer to a leading safety organisation for practical science teaching for plants to use/not use.

Equipment
Thin leaves (e.g. oak), large glass beaker or pan, 150 g sodium carbonate, 136 g calcium hydroxide, sieve, heating apparatus.

3: Sheep's heart

Show students a sheep's heart (or similar) and ask them to identify different tissues. This could be done using a real sheep's heart or using pictures from the Internet. At this stage, the outside of the sheep's heart will clearly show areas of muscle and fat tissues (similar to photo B on Student Book spread 7Ac Tissues). If you cut the heart in half, the obvious tissues inside are muscle (in the walls) and strings of 'connective tissue' that hold various parts of the heart in place. Ask students what sort of tissue is being eaten when people eat 'meat'.

⚠ Refer to a leading safety organisation for practical science teaching for guidance on dissecting hearts.

Equipment
Sheep's heart (or similar), scalpel, dissection board.

4: 7Ac Microscopes (Student Book)

FA WS

This spread introduces the use of the microscope and slide preparation. Worksheet 7Ac-2 is the Access Sheet.

Questions 2, 9 and 10 can be used for formative assessment, with students working in groups to answer the questions. See the ASP Introduction for ideas on how to run the feedback and action components for this formative assessment. This also contains mini-plenary ideas.

AL interactives can be used to show students the parts of a light microscope, how to set up a microscope, and how to calculate magnifications.

The AL presentation *7Ac Thinking skills* includes questions about microscopes; see Plenary 3.

Course resources
AP: Worksheet 7Ac-2.
AL: Interactives *Calculating magnifications*; *Parts of a microscope*; *The sequence of how to set up a microscope*. Presentation *7Ac Thinking skills*.

5: Slide demonstration

WS

Demonstrate making a slide. If a video camera is available this is conveniently done using real slides. If this is not the case, consider using a model to show slide preparation and point out to students that you are modelling the process. A sheet of card might represent the slide, with a Perspex safety screen as the coverslip. Use tissue paper as the sheet of onion skin and a pair of tongs as the forceps (or an old broom handle or retort stand as the mounted needle). It is suggested that water is not used in this model, although the use of a pipette may need to be demonstrated – use a real pipette or an extra large one, such as a turkey baster!

Equipment
For video demonstration: video camera, slide, coverslip, section of onion, forceps/tweezers, water/stain, pipette. Optional: mounted needle. For model demonstration: sheet of card, Perspex safety screen, tissue paper, broom handle or retort stand and/or tongs, turkey baster.

PLENARIES

Most plenaries can be used for formative assessment. Suggested assessment, feedback and action strands of formative assessment can all be modified. See the ASP for further information and ideas on formative assessment.

1: Quick Check

FA

Assessment: Ask students to construct a simple concept map showing (with examples) how organs and tissues are related. The 7Ac Quick Check sheet has the beginnings of a concept map. Ask students to complete it as best they can.

Feedback: Ask students to check each others' maps and tell each other two things that were good with the maps and one area where things could be improved (e.g. additional information could be added).

Action: Ask students to write down a sentence that best describes what they need to concentrate on in their further study of tissues and organs.

Course resources
ASP: 7Ac Quick Check.

2: Quick Check WS

FA WS

Assessment: The 7Ac Quick Check WS sheet for this topic contains 10 true or false questions. Give students 2 minutes to fill in the sheet. Lower-attaining students need only do questions 1–5. The sheet could be displayed on an interactive whiteboard, with students being asked to vote whether each sentence is true or false.

Feedback: Go through the answers.

Action: Ask students to write down a key point that they must not forget about microscopes and slides.

Course resources
ASP: 7Ac Quick Check WS.

3: Thinking skills

FA

Assessment:
Consider All Possibilities: An organ contains xylem tissue. (Possible answers: stem; root; storage organ; flower; leaf.)

Plus, Minus, Interesting: The heart should contain more fat tissue. (Possible answers: **Plus** – it would be better protected; **Minus** – it might interfere with the beating of the heart; **Interesting** – is the amount of fat on the heart associated with heart disease?)

Odd One Out: stage, objective lens, eyepiece lens, slide. (Possible answers: the slide is not part of a microscope; the stage does not contain any glass; the eyepiece lens is the only part you look through.)

Consider All Possibilities: Ravi cannot see an image when looking down his microscope. (Possible answers: the specimen is too thick; the light is not on; the mirror is pointing in the wrong direction.)

Consider All Possibilities: The overall magnification of a microscope is x60. (Possible answers: any two numbers that when multiplied together come out to 60 – one for the eyepiece lens and one for the objective lens.)

Plus, Minus, Interesting: Slides should be made out of plastic. (Possible answers: **Plus** – they would be less likely to break, you would be less likely to cut yourself; **Minus** – they would not be as clear as glass, they would scratch more easily; **Interesting** – are plastic slides cheaper?)

Feedback: Students answer the thinking skills questions in groups, thereby feeding back their thoughts to one another.

Action: Ask students to choose a best answer from their group and consider why they think it is the best.

The **AL** presentation *7Ac Thinking skills* can be used for this activity.

Course resources
AL: Presentation *7Ac Thinking skills*.

4: Second box of tissues
Ask students again how a box of tissues is like an organ. You could ask them to choose from a series of answers, selected from some of the suggestions that students gave in Starter 1. Then tell students that explaining something by comparing it to something else familiar is called making an analogy. Ask students to suggest ways in which this is a good analogy (e.g. an organ is made of many tissues and the box and tissues inside represent this) and in what ways it is a poor analogy (e.g. all the tissues inside the box are the same, whereas organs are made of many different tissues).

Equipment
Box of tissues.

5: Calculating magnifications
FA
The **AL** interactive *Calculating magnifications* is an activity in which students have to work out microscope magnifications. Students could take turns to contribute answers.

Course resources
AL: Interactive *Calculating magnifications*.

HOMEWORK TASKS

1: Tissues and organs – crossword
Worksheet 7Ac-5 contains a crossword, in which students need to answer straightforward questions about tissues and organs.

Course resources
AP: Worksheet 7Ac-5.

2: Using microscopes
WS
Worksheet 7Ac-6 contains straightforward questions about using microscopes and preparing slides.

Course resources
AP: Worksheet 7Ac-6.

3: Organs and tissues
Worksheet 7Ac-7 contains questions on organs and their component tissues.

Course resources
AP: Worksheet 7Ac-7.

4: Microscope problems
WS
Worksheet 7Ac-8 asks students to spot mistakes in the use of a microscope and to calculate microscope magnifications.

Course resources
AP: Worksheet 7Ac-8.

5: Organs and their tissues
Ask students to carry out their own research to find out what main tissues are found in these organs: heart, brain, skin and plant stem. Ask them to describe the functions of each different type of tissue and to present their research as a table.

6: Microscopes and magnification
WS
Worksheet 7Ac-9 asks students to spot mistakes in the use of a microscope and to calculate microscope magnifications, together with calculating the real size of something based on a magnification.

Course resources
AP: Worksheet 7Ac-9.

7Ad Cells

Objectives
Developing:

1. Identify the cell nucleus, cell membrane, cytoplasm, cell wall, permanent vacuole and chloroplasts on diagrams of cells.
2. Distinguish between animal cells and plant cells, and list their common parts.

Securing:

3. Describe the functions of the nucleus, cell membrane, cytoplasm, cell wall, permanent vacuole and chloroplasts.
4. Identify mitochondria and describe their function.

Exceeding:

Exceeding objectives are designed to broaden students' skills and knowledge beyond what is required, often introducing a higher level of challenge.

5. Justify the classification of an organism as an animal or a plant based on cell structure.
6. Suggest reasons for differences between different animal cells and between different plant cells (in terms of their functions).

Student materials

Topic notes

- It is important that teachers review all materials that they intend to use with students before use, to ensure suitability.
- It is envisaged that in the course of studying the biology component of this topic, students will use one Starter idea, Explaining 1, one further Exploring or Explaining idea, and one of the plenaries. Additional activities can be added as time allows.

Be prepared
Exploring 5 requires pre-prepared slides of plant and animal tissues.

STARTERS

1: Introducing cells
BA
Display a microscope and ask students at random to name the part that you are pointing to and to say what it does. Then ask students to describe the sorts of things that they saw under their microscopes. Some may have drawn pictures (e.g. on Worksheet 7Ac-3) that could be displayed. Ask students what they think they were seeing under the microscope and introduce the idea of cells.

Equipment
Microscope.

2: What is a cell?
BA
Write the word 'cells' on the board. Ask students if they have ever heard of cells in organisms and if so what they know. Write a list on the board and then ask students (with a show of hands) how sure they are of each statement (using (un)smiley face emoticons to show the level of confidence). This list could be kept for Plenary 4. Then ask students to think up one thing that they need to know more about (in terms of cells). Ask students to tell the class about their suggestions. Skills Sheets TS 5 and TS 6 may prove useful for this exercise.

Course resources
AP: Skills Sheets TS 5; TS 6.

3: The story so far
BA
Ask students to devise a sentence or two to summarise what they have learnt so far in this unit. They must use the following terms in their sentences: life processes, organs, tissues, cells.

EXPLORING TASKS

1: Animal and plant cells
Developing: Ask students to watch the **AL** video *Inside an animal cell* and to note down all the key words. At the end ask students to write the meanings for each key word they have noted. Ask for suggestions and establish the names of the parts of an animal cell and their functions. This can be repeated with the videos about plant cells.

Securing: Ask students to watch the **AL** video *Inside an animal cell* several times with the sound muted, and write a voice-over script together with timings. Once finished, selected students could read out their voice-overs along with the video. Students could watch the video with the sound turned on, to compare their scripts with the one provided. This can be repeated with the video about plant cells.

Course resources
AL: Videos *Inside an animal cell*; *Inside a plant cell*.

2: Animal cell 'claymation'
If you have video recording and editing equipment capable of creating stop-frame animation (or students have phone apps with this capability), challenge students to produce a stop-frame 'claymation' animation showing the different parts of an animal cell.

Equipment
Video recording and editing equipment for stop-frame animation, modelling clay or equivalent in different colours.

3: 3D plant cell model
WS
Developing: Set out the items of equipment listed below and challenge students to use them to build a model of a plant cell. You may need to discuss what a model is, and Skills Sheet SI 4 can be used to support this.

Students will probably use the plastic take-away box and lid for the cell wall. The box is lined with cling film for the cell membrane (hopefully leaving enough extra film to cover the surface of the contents of the container). The box is then filled with the runny jelly and items placed inside this: a small sealable plastic bag with water added (vacuole), cherry tomato/ball of modelling clay (nucleus), green sweets/buttons or pieces of green pepper (chloroplasts), black rice (mitochondria).

Ask students how they could use their models to make a model of some plant tissue from a leaf. Establish the idea that they can stack the models together.

Ask students to use their models to explain why you will not always see a nucleus in a plant cell in a microscope slide section.

Securing: Ask students to suggest other ways in which the model is good and not so good. Point out that a live cell differs from the model in some important ways, including:

- there is constant movement of structures in the cytoplasm
- some materials, such as water and dissolved substances, are able to cross the cell wall and cell membrane into and out of the cell
- the cell wall is more flexible than this model would make us believe.

Exceeding: Ask students to consider the importance of these facts for a living cell, and suggest whether the model could be adapted to show this as well.

Note that with some groups the use of runny jelly may get rather messy. Consider this before attempting this practical. Make sure that students do not eat any of the components.

Course resources
AP: Skills Sheet SI 4.

Equipment
Plastic take-away box and lid, small and fully sealable plastic bag, water, green sweets/buttons/pieces of green pepper, black rice, cherry tomato/ball of modelling clay, 300 cm^3 (but depends on size of take-away box) clear or lime jelly made up with 1.5–2× the recommended amount of water so that it remains runny when cold, cling film.

4: Paper models of plant and animal cells
WS
Developing: Worksheets 7Ad-5 and 7Ad-6 allow students to construct simple paper models of animal and plant cells. Highlight the fact that they are making models. You may need to discuss what a model is, and Skills Sheet SI 4 can be used to support this.

Securing: Ask students to suggest strong and weak points about the models.

Exceeding: Ask students to evaluate the plant model here and the one in Exploring 3. Encourage students to think up some criteria by which to judge both models. They could produce a reasoned piece of writing to explain which model they think is the best and why.

Course resources
AP: Skills Sheet SI 4. Worksheets 7Ad-5; 7Ad-6.

Equipment
Scissors, glue.

5: Looking at cells
WS
Students examine two or three slides of prepared plant and animal tissues. Skills Sheet UE 3 can be used to remind students how to use a light microscope. Worksheet 7Ad-2 can be used to record results.

Developing: Students are given the names of the organisms and tissues.

Securing: Students examine the tissues and justify whether they think they are plant or animal tissues. Consider labelling the slides with letters and giving students a list of the possible organisms and/or tissues to match to each lettered slide.

Exceeding: Having identified the organism and tissue, students are challenged to find out something more about the cells that they examine, using books and/or the Internet.

Course resources
AP: Skills Sheet UE 3. Worksheet 7Ad-2.

Equipment
Selection of pre-prepared plant and animal tissue slides (either named or lettered if students need to decide which is which), microscope.

6: Human cheek cells

WS

Challenge students to plan an investigation to look at some of their own cells. Encourage students to plan for staying safe. It is expected that most students should be able to produce their own plans, basing them on work done in Topic 7Ac. Lower-attaining students may need to follow the plan on Worksheet 7Ad-3. To obtain cheek cells, no real scraping of the inside of the cheek is required – the cells come off very easily if only lightly touched with a clean cotton bud. Skills Sheets UE 2 and UE 3 may be useful.

All contaminated items (buds, microscope slides) should be placed in a beaker and autoclaved (preferable) or placed into disinfectant (e.g. 1% Virkon®).

Course resources
AP: Skills Sheets UE 2; UE 3. Worksheet 7Ad-3.

Equipment
Clean cotton bud, microscope slide, coverslip, 10% methylene blue stain, pipette, microscope.

7: Which stain is best?

WS

Some students could conduct a simple investigation to determine which stain is best. They could do this using their own cheek cells from Exploring 6, or use onion cells. They should be able to plan the investigation for themselves. Stains that may be used are methylene blue (stains nuclei blue), iodine/potassium iodide solution (stains nuclei, cell walls and starch in chloroplasts), toluidine blue (blue nuclei), eosin Y (pink cytoplasm, red cell walls). Skills Sheets UE 2 and UE 3 may be useful. Worksheet 7Ad-4 can be used for results, consideration and evaluation.

Methylene blue, iodine, eosin and toluidine are all harmful or irritants as solids. Eye protection should be worn when stains are being handled.

Course resources
AP: Skills Sheets UE 2; UE 3. Worksheet 7Ad-4.

Equipment
Source of animal/plant cells, forceps/tweezers, slides, coverslips, pipettes, selection of stains (iodine solution, 1% methylene blue, 1% toluidine blue, 1% eosin Y), eye protection, microscope.

EXPLAINING TASKS

1: 7Ad Cells (Student Book)

FA

This spread introduces the idea of the cell, the final part in the examination of what makes up an organ. Worksheet 7Ad-1 is the Access Sheet.

Question 8 can be used for formative assessment, with students working in groups to agree what parts should be drawn and labelled on the cell. See the ASP Introduction for ideas on how to run the feedback and action components for this formative assessment. This also contains mini-plenary ideas.

Use the **AL** videos to see inside animal and plant cells.

An **AL** interactive lets students match animal cells or plant cells with their specialised functions based on given information.

An **AL** presentation invites students to think about how microscope images relate to 3D cells.

Course resources
AP: Worksheet 7Ad-1.
AL: Interactive *Identifying cells*. Presentation *A 3D plant cell*. Videos *Inside an animal cell*; *Inside a plant cell*.

2: 3D cell model

WS

Show students a 3D model of a cell, either one that you have made yourself (see Exploring 3) or one from an educational supplier. Explain that, in science, models are used to help see or explain complicated things in a simpler way. Explain to students that when a slide is made you very often only see a section through a cell, and if that section is in the wrong place you will not see some of the components that you expect to find (e.g. nucleus). Ask students to imagine what they would see if certain sections were cut through your model. This idea is further explored in Exploring 3.

This activity can be supported by using the AL presentation *A 3D plant cell*.

Course resources
AL: Presentation *A 3D plant cell*.

Equipment
Plant or animal cell model.

3: Displaying tissues

WS

Attach a video camera to a microscope and examine various prepared slides of tissues. Vertical sections through leaves and stems will show palisade and xylem tissues. Ciliated epithelial, muscle and nerve tissue sections are also useful. Explain to students that the tissues look different from each other because they contain different cells, but that each tissue contains a group of the same cells. Show students individual cells and explain their functions.

Equipment
Video microscope and display screen, prepared slides of plant and animal tissues (e.g. vertical stem and leaf sections, ciliated epithelial tissue, nerve tissue, fat tissue).

PLENARIES

Most plenaries can be used for formative assessment. Suggested assessment, feedback and action strands of formative assessment can all be modified. See the ASP for further information and ideas on formative assessment.

1: Quick Check

FA

Assessment: The 7Ad Quick Check sheet poses questions about cell parts, their locations and functions. There is also one question on tissues.

Feedback: Ask students to draw smiling, unsmiling or sad faces in the circles to show how confident they are of each answer. Students work in groups to find out the questions they are least confident about. Ask a spokesperson from each group to say which question had the fewest happy faces.

Action: Revise the parts that students were less confident about in the next topic.

Course resources
ASP: 7Ad Quick Check.

2: Thinking skills

FA

Assessment:
Plus, Minus, Interesting: A cell should have more mitochondria. (Possible answers: **Plus** – it could release more energy from food more quickly; **Minus** – the mitochondria might take up too much space; **Interesting** – which cells have the most mitochondria? Liver cells contain up to 2000 mitochondria per cell, which can take up 20% of the cell's volume.)

Consider All Possibilities: When looking at a cell using a microscope, the nucleus is not seen. (Possible answers: too low a magnification; the wrong stain was used; the section cut through the cell missing out the nucleus; the cell does not have a nucleus (some cells, like human red blood cells and plant phloem cells, do not have nuclei).)

Consider All Possibilities: When looking at a cell using a microscope, no chloroplasts are seen. (Possible answers: too low a magnification; there are no chloroplasts (e.g. the cell is from a root); it is an animal cell.)

Feedback: Challenge students to work in groups and think of answers that other groups will not think of. Get the agreed answers from each group's spokesperson.

Action: Correct any misconceptions evident from student answers.

The AL presentation *7Ad Thinking skills* can be used for this activity.

Course resources
AL: Presentation *7Ad Thinking skills*.

3: What is a cell? Revisited

FA

Show students the list made in Starter 2. Read out each statement and ask whether students think it is correct. Amend incorrect statements. Then ask

students (with a show of hands) how sure they are of each statement (using (un)smiley face emoticons to show the level of confidence). Skills Sheets TS 5 and TS 6 can be used to remind students about thinking skills. Use Student Book spread 7Ad Cells to go over any points that students are still uncertain about.

Course resources
List of statements from Starter 2.
AP: Skills Sheets TS 5; TS 6.

HOMEWORK TASKS

1: Discovering cells
Worksheet 7Ad-7 contains straightforward questions on cell parts and the development of the microscope.

Course resources
AP: Worksheet 7Ad-7.

2: Plant and animal cells
Worksheet 7Ad-8 contains straightforward questions on cells and cell parts.

Course resources
AP: Worksheet 7Ad-8.

3: Plant or animal?
Worksheet 7Ad-9 invites students to use their knowledge of cells and cell parts to examine unfamiliar cells, including *Euglena*.

Course resources
AP: Worksheet 7Ad-9.

4: Cells and organelles
Worksheet 7Ad-10 challenges students to suggest functions for different types of animal and plant cells based upon their internal structures. The term ‘organelle’ is also introduced, as is the concept of resolution for microscopes.

Course resources
AP: Worksheet 7Ad-10.

7Ae
Organ systems

Objectives
Developing:

1. Describe how organs work together as organ systems.
2. Describe the functions of the following organ systems, and identify and recall their main organs: plant water transport system, digestive system, circulatory system, breathing (respiratory) system.
3. Describe the hierarchical organisation of multicellular organisms from cells to tissues to organs to organ systems to organisms.

Securing:

4. Describe the functions of the following organ systems, and identify and recall their main organs: urinary system, nervous system.

Exceeding:

Exceeding objectives are designed to broaden students' skills and knowledge beyond what is required, often introducing a higher level of challenge.

5. Compare benefits and drawbacks of organ transplants compared with other forms of treatment.
6. Explain why some people need dialysis, and compare the function of the kidney with a dialysis machine.

Student materials

Topic notes

- Muscles, bones, blood vessels and nerves are all composed of more than one tissue and are therefore classified as organs. Although not mentioned in the student materials, blood would be considered to be a liquid organ.
- The breathing system is otherwise known as the respiratory system, pulmonary system and ventilation system. The last two are not mentioned in this course. If your curriculum uses the term 'respiratory system' ensure that students do not muddle this with respiration (which is a chemical reaction inside cells).
- It is important that teachers review all materials that they intend to use with students before use, to ensure suitability.
- It is envisaged that in the course of studying the biology component of this topic, students will use one Starter idea, Explaining 1, one further Exploring or Explaining idea, and one of the plenaries. Additional activities can be added as time allows.

Be prepared
Starter 1 requires building bricks.
Exploring 1 requires clear nail varnish.

STARTERS

1: Modelling organs

BA

Establish with students that organs are made of different tissues and that tissues are made of cells of the same type. Explain that, in science, models are used to help see or explain complicated things in a simpler way. Give students some building bricks and ask them to build a model to illustrate this concept. The shapes of the models do not matter, only the fact that the organ model consists of two or three different colours of bricks (gathered in discrete areas) that represent tissues. Each area of tissue is composed of bricks of the same colour (the bricks represent the cells of the same type). Once students have got the hang of what the models show, gather together two or three of the models and stick them together. Tell students that this is a set of organs working together – otherwise known as an organ system.

Equipment
Building bricks in two or three colours (each colour being composed of bricks of the same size).

2: Introducing organ systems

BA

Ask students what organs are needed to break down food. They could look back at Student Book spread 7Ab Organs or a human torso model. Establish with them that more than one organ is needed to break down food. Ask students whether they know what a set of organs like this, all working together, is called. Introduce the idea of the digestive system being an organ system.

Equipment
Human torso model (optional).

3: Organs and their systems

BA

Cut out the pictures of the organs on Worksheet 7Ae-4. Ask each student to take a card. Students then need to organise themselves into groups based on what they think is a link between the

various cards. Ask students about the links that they have made, and establish that more than one organ is often needed to complete a process in our bodies. Introduce the idea that organs working together are called organ systems.

Course resources
AP: Worksheet 7Ae-4.

EXPLORING TASKS

1: Leaves and water evaporation

FA **WS**

Students plan an investigation to find out which side of a leaf (upper or under) has more 'holes' in it and therefore from which side the most water evaporates. Skills Sheets UE 2 and UE 3 may be useful to remind students about preparing slides and how to use light microscopes. Skills Sheets RC 6, RC 7 and RC 8 may also be useful. It is best to choose leaves from a well-watered plant that has been left under a strong light source for three or four hours before the lesson, to ensure that the stomata are open. It is also useful if the leaves can be picked just before use. This practical can be used to carry out a Working Scientifically investigation. A set of descriptions to assign developing, securing or exceeding to the work is provided in the ASP. Even if this is not formally assessed, the descriptions could be used for students to mark each others' work and to provide formative feedback to each other. Note that the use of worksheets will limit the scope of the assessment.

Developing: Students follow the instructions on Worksheet 7Ae-2.

Securing: Students plan their investigations using Worksheet 7Ae-3 to aid their thinking.

Exceeding: Students need to do their own research and planning, based only on the information given in Question 8 on Student Book spread 7Ae Organ systems.

Course resources
AP: Skills Sheets UE 2; UE 3; RC 6; RC 7; RC 8. Worksheets 7Ae-2; 7Ae-3.
ASP: 7A WS Investigations.

Equipment
Microscope, two slides, two coverslips, pipette, forceps/tweezers, water, two freshly picked leaves from a well-watered plant that has been under a strong light source for at least 3 hours, clear nail varnish in a bottle with a brush, sticky labels (to label the slides).

2: Looking back at organ systems

Students who have constructed the human organ model from Exploring 4 in Topic 7Ab could be encouraged to shade organs in different systems in different colours.

3: Research organ systems

WS

In groups, students find out about one of the organ systems on Student Book spread 7Ae Organ systems. You could give each group an organ system or ask them to choose their own. Ask each group to decide on the jobs that need doing and to divide up those jobs between themselves. This should include the function(s) of the system, the organs involved, and one or two common problems with the system and how they can be treated. They could use books and/or the Internet. Ask students to present their findings as a poster to be displayed in a doctor's surgery. Be aware that images downloaded from the Internet may be under copyright. Skills Sheets RC 1, RC 2 and RC 3 may be useful.

Teacher or peer assessment is more easily achieved if a set of criteria on which posters are to be judged is shown to or agreed upon by students before work starts. Examples include: accuracy of information, inclusion of organ system function, inclusion of organs in the system, inclusion of problems with the organs/system, inclusion of treatments for those problems, explanations of difficult words or words that people may not be familiar with, spelling, grammar, organisation into (for example) paragraphs or sections to aid clarity, logical ordering/grouping of ideas.

Course resources
AP: Skills Sheets RC 1; RC 2; RC 3.

Equipment
Internet/library access.

4: Kidney transplant spreadsheet

WS

The **AL** spreadsheet *Kidney transplants* gives students data on kidney transplants in the UK. Students need to follow the instructions given and create a graph from the data before answering some questions about the data.

Course resources
AL: Spreadsheet *Kidney transplants*.

5: Transplants and organs – the debate

WS

You could hold a class debate based on the question at the bottom of the last page of this unit in the Student Book. Skills Sheet RC 5 may be useful.

Course resources
AP: Skills Sheet RC 5.

EXPLAINING TASKS

1: 7Ae Organ systems (Student Book)

FA

This spread looks at how organs work together as systems, in both plants and animals. Worksheet 7Ae-1 is the Access Sheet.

Question 8 can be used for formative assessment, with students working in groups to design an investigation plan. An agreed plan could be carried out as part of Exploring 1. See the ASP Introduction for ideas on how to run the feedback and action components for this formative assessment. This also contains mini-plenary ideas.

The AL video, which you may have used in 7Ac, contains footage of open heart surgery allowing students to see the different tissues in a heart.

There are AL presentations for the human circulatory and digestive systems, in which the basic parts and function of each organ system are explored.

An AL animation is also available to illustrate the water transport system in plants.

The AL interactive link allows students to match the correct functions and organs to different organ systems.

The AL presentation *7Ae Thinking skills* contains questions about organ systems; see Plenary 1.

Course resources
AP: Worksheet 7Ae-1.
AL: Animation *Plant water transport*. Interactive *Matching organ systems to functions.* Presentations *The human circulatory system*; *The human digestive system*; *7Ae Thinking skills.* Video *Open heart surgery*.

2: Water loss by plants

WS

A good way to demonstrate water loss in whole plants is to put a small plant into the top of a water-filled conical flask, so that its roots are in the water but most of the stem and the leaves are not. The stem of the plant is supported by putting sponge inside the neck of the flask. You may like to add a food colour to the water. The water is covered with a layer of cooking oil (to prevent evaporation) and the water level is marked on the side of the flask. Readings of the water level could be taken over a period of days, or each plant could be placed on a balance linked to a datalogging device. The volume of water lost is 1 cm^3 for each 1 g mass decrease.

If students have looked at where the stomata are on leaves (Exploring 1) then you could demonstrate that more water is lost through the undersides of the leaves by using two plants. Cover the upper sides of the leaves of one plant and then the under sides of the leaves of the other plant with petroleum jelly. The first plant will lose more water because the stomata are not blocked by the jelly. This will provide further evidence for the students' own conclusions from Exploring 1.

Equipment
One or two conical flasks, one or two small plants, one or two sponge stoppers, marker pen, cooking oil, petroleum jelly. Optional: balance, datalogger.

3: 7Ae Transplants (Student Book)

FA

This page completes the unit by challenging students to use the knowledge and skills that they have developed in this unit in a slightly different context – organ transplants.

Question 2 can be used for formative assessment, with students working on their own individual answers before exchanging papers and asking their peers to point out two good features of their work and one area that could be improved. See the ASP Introduction for ideas on how to run the action component for this formative assessment. This also contains mini-plenary ideas.

There is also an AL spreadsheet on kidney transplants; see Exploring 4.

Course resources
AL: Spreadsheet *Kidney transplants*.

PLENARIES

Most plenaries can be used for formative assessment. Suggested assessment, feedback and action strands of formative assessment can all be modified. See the ASP for further information and ideas on formative assessment.

1: Quick Check

FA

Assessment: The 7Ae Quick Check sheet provides a set of cards for a question loop activity that can be used to summarise the whole unit, and act as a

starting point for revision. Thirty cards are provided. Hand out the cards so that each student gets one. Ask one student to read the question on his or her card. The student with the answer stands up and reads out the answer before reading out the next question. The loop is closed when the first student stands up again to give the answer on his/her card.

Feedback: Watch out for mistakes made, allow students to correct them and make a note.

Action: Write your notes on the board so that students can see a summary of things that some are still not sure about. Ask them to copy the list down under the heading 'Things to watch out for'.

Course resources
ASP: 7Ae Quick Check.

2: Thinking skills

FA

Assessment:
Odd One Out: stem, xylem, bladder, blood vessel. (Possible answers: xylem is a tissue and the others are organs; blood vessel carries a thick liquid, the others carry thin liquids; the bladder stores a liquid, the others do not.)

Plus, Minus, Interesting: Sandra is going to have a heart transplant. (Possible answers: **Plus** – she will hopefully feel better; **Minus** – she will need to take medicine for the rest of her life, the operation may not work, operations are dangerous; **Interesting** – how many heart transplants are carried out in a year around the world? There are about 5400 heart transplants a year around the world [source: WHO].

Consider All Possibilities: Priti has only one kidney. (Possible answers: she donated one; one kidney got a disease; she was born with only one.)

Consider All Possibilities: Tony does not release very much urine when he pees. (Possible answers: he does not drink much; his bladder does not empty properly; his kidneys are not working properly.)

Feedback: Students answer the thinking skills questions in groups, thereby feeding back their thoughts to one another through discussion. Ask students to agree on what the best answers are and write them down.

Action: Ask a spokesperson from a number of groups to read out their best answers. Identify any ideas that are missing and share them with the class, reinforcing ideas that students are having difficulties with.

The AL presentation *7Ae Thinking skills* can be used for this activity.

Course resources
AL: Presentation *7Ae Thinking skills*.

3: Cells, tissues, organs and organ systems: Open-ended Assessment Task

FA

Assessment: Ask students to draw a diagram of any organ and to write its name underneath. Then ask questions that can be answered by students holding up their drawings, pointing at others who have drawn certain organs or arranging themselves into groups (e.g. of similar organs). If you wish to include the last of these types of questions, consider doing the assessment with students standing.

The 7A Open-ended Assessment Task sheet in the ASP has a grid of assessment criteria, together with suggested questions for each criterion. The same questions together with some pictorial ones are available as an AL presentation *7Ae Open-ended assessment*.

Feedback: Feedback is direct to you, as you watch which pictures are being held up, etc. Note down and correct misunderstandings as they occur. You can assess this activity by using the 7A Open-ended Assessment Task sheet or students can rate their own performance by using the 7A Assess Yourself! sheet (see the ASP).

Action: Ask students to write a sentence to say what they might do to improve were they given a similar assessment again.

Course resources
ASP: 7A Assess Yourself!; 7A Open-ended Assessment Task.
AL: Presentation *7Ae Open-ended assessment*.

4: Organ systems wordsearch

FA

Worksheet 7Ae-5 provides simple consolidation work. You could time limit the exercise and then get students to work in groups to check each others' work.

Course resources
AP: Worksheet 7Ae-5.

5: Quick Quiz

FA

Revisit the 7A Quick Quiz to test students' knowledge of the content of this unit. Students could fill in their answers on the 7A Quick Quiz Answer Sheet. Encourage students to identify for themselves areas where their understanding is still weak and decide how they are going to remedy this.

Course resources
ASP: 7A Quick Quiz; 7A Quick Quiz Answer Sheet.

6: End of Unit Test

FA

Use the End of Unit Test. A Mark Scheme is given in the ASP. Encourage students to identify areas that are still weak and to formulate plans to strengthen those areas. Summary Sheets are provided to help students with revision.

Course resources
ASP: 7A End of Unit Test; 7A Mark Scheme; 7A Summary Sheets.

7: Progression Check

FA

Students should circle the stars next to each statement on the Progression Check to record what they feel they know, and how certain they are of it. Encourage students to plan how to do further work on the things about which they remain unsure.

Course resources
ASP: 7A Progression Check.

HOMEWORK TASKS

1: Organs in systems
Worksheet 7Ae-7 contains straightforward questions about organ systems.

Course resources
AP: Worksheet 7Ae-7.

2: Human organ systems
Worksheet 7Ae-8 contains questions about organ systems and ordering text, linking back to work that may have been done in 7Ab.

Course resources
AP: Worksheet 7Ae-8.

3: Kidney failure
Worksheet 7Ae-9 provides some text on kidneys and kidney failure, which students interpret using their knowledge.

Course resources
AP: Worksheet 7Ae-9.

4: Planning Exploring 1
If students are to produce their own plans for Exploring 1, consider setting the planning for homework.

Securing: Students plan their investigations using Worksheet 7Ae-3 to aid their thinking.

Exceeding: Students need to do their own research and planning, based only on the information given in question 8 on Student Book spread 7Ae Organ systems.

Course resources
AP: Worksheet 7Ae-3.