

"There are as many atoms in a single molecule of your DNA as there are stars in the typical galaxy. We are, each of us, a little universe."

-Neil Degrasse Tyson

NATURAL SCIENCES

LESSON PLAN
GRADE 9 TERM 1



NATIONAL EDUCATION COLLABORATION TRUST (NECT)

Dear Teachers

This learning programme and training is provided by the National Education Collaboration Trust (NECT) on behalf of the Department of Basic Education (DBE)! We hope that this programme provides you with additional skills, methodologies and content knowledge that you can use to teach your learners more effectively.

What is NECT?

In 2012 our government launched the National Development Plan (NDP) as a way to eliminate poverty and reduce inequality by the year 2030. Improving education is an important goal in the NDP which states that **90% of learners will pass Maths, Science and languages with at least 50% by 2030**. This is a very ambitious goal for the DBE to achieve on its own, so the NECT was established in 2015 to assist in improving education.

The NECT has successfully brought together groups of people interested in education to work together to improve education. These groups include the teacher unions, businesses, religious groups, trusts, foundations and NGOs.

What are the learning programmes?

One of the programmes that the NECT implements on behalf of the DBE is the 'District Development Programme'. This programme works directly with district officials, principals, teachers, parents and learners; you are all part of this programme!

The programme began in 2015 with a small group of schools called the **Fresh Start Schools (FSS)**. Curriculum **learning programmes** were developed for **Maths, Science and Language** teachers in FSS who received training and support on their implementation. The FSS teachers remain part of the programme, and we encourage them to mentor and share their experience with other teachers.

The FSS helped the DBE trial the NECT learning programmes so that they could be improved and used by many more teachers. NECT has already begun this scale-up process in its Universalisation Programme and in its Provincialisation Programme.

Everyone using the learning programmes comes from one of these groups; but you are now brought together in the spirit of collaboration that defines the manner in which the NECT works. Teachers with more experience using the learning programmes will deepen their knowledge and understanding, while some teachers will be experiencing the learning programmes for the first time.

Let's work together constructively in the spirit of collaboration so that we can help South Africa eliminate poverty and improve education!

www.nect.org.za

COVID – 19 INFORMATION:

What is COVID-19?

COVID-19 is a disease caused by a new strain of coronavirus. 'CO' stands for corona, 'VI' for virus, and 'D' for disease. Formerly, this disease was referred to as '2019 novel coronavirus' or '2019-nCoV.' The COVID-19 virus is a new virus linked to the same family of viruses as Severe Acute Respiratory Syndrome (SARS) and some types of common cold.

What are the symptoms of COVID-19?

Symptoms can include fever, cough and shortness of breath. In more severe cases, infection can cause pneumonia or breathing difficulties. More rarely, the disease can be fatal. These symptoms are similar to the flu (influenza) or the common cold, which are a lot more common than COVID-19. This is why testing is required to confirm if someone has COVID-19.

PSYCHOSOCIAL SUPPORT

It is natural for children to feel stress, anxiety, grief, and worry during an ongoing pandemic like COVID-19. Fear and anxiety about their own health and the health of loved ones can be overwhelming and cause strong emotions. In today's digital world, children also access different kinds of information and news through social media and digital platforms, some of them may not be factually true, causing further stress and anxiety. It is enhanced when children are not able to go out, play, attend school or interact freely. For those children and families who are subjected to quarantine or isolation there may be an increased risk of violence and abuse. When stress levels go up for adults and children, there is a greater risk of gender based violence and other forms of violence against children.

Role as parent or caregiver:

- To promote an environment where children can grow up and develop their full potential having fun and being safe and healthy.
- To facilitate a space where children are listened to, they can express their thoughts and feelings, and are free to ask any question and are answered honestly.

CONTENTS

PROGRAMME ORIENTATION	4
CAPS AND THE LESSON PLANS	8
TOPIC OVERVIEW CELLS AS THE BASIC UNITS OF LIFE 1A - 2C	14-16
Week 1 Lesson 1A THE STRUCTURE OF THE CELL	17
Week 1 Lesson 1B THE FUNCTIONS OF THE PARTS OF THE CELL	24
Week 1 Lesson 1C PLANT AND ANIMAL CELLS	32
Week 2 Lesson 2A SPECIALISED ORGANELLES IN PLANT CELLS	38
Week 2 Lesson 2B DIFFERENT TYPES OF ANIMAL CELLS	44
Week 2 Lesson 2C CELLS ARE THE BASIC UNIT OF ALL LIVING ORGANISMS	50
TOPIC OVERVIEW SYSTEMS IN THE HUMAN BODY 3A - 4C	57-59
Week 3 Lesson 3A THE DIGESTIVE SYSTEM	60
Week 3 Lesson 3B THE CIRCULATORY SYSTEM	68
Week 3 Lesson 3C THE RESPIRATORY SYSTEM	75
Week 4 Lesson 4A THE MUSCULOSKELETAL SYSTEM	83
Week 4 Lesson 4B THE EXCRETORY SYSTEM	89
Week 4 Lesson 4C THE NERVOUS SYSTEM	96
TOPIC OVERVIEW HUMAN REPRODUCTION 5A - 6C	102-104
Week 5 Lesson 5A THE REPRODUCTIVE SYSTEM	105
Week 5 Lesson 5B PUBERTY	111
Week 5 Lesson 5C HORMONES RESPONSIBLE FOR PUBERTY	117
Week 6 Lesson 6A REPRODUCTIVE ORGANS	123
Week 6 Lesson 6B THE MENSTRUAL CYCLE	129
Week 6 Lesson 6C FORMATION OF THE FOETUS	135
TOPIC OVERVIEW CIRCULATORY AND RESPIRATORY SYSTEMS 7A - 8B	141-143
Week 7 Lesson 7A BREATHING - INHALATION	144
Week 7 Lesson 7B DOUBLE CIRCULATORY SYSTEM	151
Week 7 Lesson 7C BLOOD VESSELS	157
Week 8 Lesson 8A THE PROCESS OF RESPIRATION	164
Week 8 Lesson 8B BREATHING - EXHALATION	169
TOPIC OVERVIEW DIGESTIVE SYSTEM 8C - 9C	175-178
Week 8 Lesson 8C A HEALTHY DIET	179
Week 9 Lesson 9A STARCH AND FATS IN FOODS	186
Week 9 Lesson 9B THE ALIMENTARY CANAL	192
Week 9 Lesson 9C MECHANICAL AND CHEMICAL DIGESTION	198
GRADE 9 ASSESSMENT	204
Term 1 Assessment	205

PROGRAMME ORIENTATION

Welcome to the NECT Natural Sciences learning programme!. This CAPS compliant programme consists of:

- A full set of lesson plans for the term (3 X 1- hour lessons per week)
- A resource pack with images to support the lesson plans
- A full colour poster
- An outline of the assessment requirements for the term
- A tracker to help you monitor your progress

Lesson Plan Structure

1. Term 3 lesson plans are structured to run for 9 weeks.
2. Each week, there are three lessons, of the following notional time:

3 x 1 hour

This time allocation of 3 hours per week is CAPS aligned.

Lesson Plan Contents

1. The lesson plan starts with a **CONTENTS PAGE** that lists all the topics for the term, together with a breakdown of the lessons for that topic. You will notice that lessons are named by the week and lesson number, for example, Week 8 Lesson 8C.
2. Every topic begins with a 2 - 4 pages **TOPIC OVERVIEW**. The topic overview pages are grey, making them easy to identify. The topic overview can be used to introduce the topic to learners. The topic overview includes:
 - a.** A **general introduction** to the topic that states how long the topic runs for, the value of the topic in the final exam and the number of lessons in the topic.
 - b.** A table showing the **position of the topic** in the term.
 - c.** A **sequential table** that shows the prior knowledge required for this topic, the current knowledge and skills that will be covered, and how this topic will be built on in future years. Use this table to give learners an informal quiz to test their prior knowledge. If learners are clearly lacking in the knowledge and skills required, you may need to take a lesson to cover some of the essential content and skills. It is also useful to see what you are preparing learners for next, by closely examining the 'looking forward' column.
 - d.** A glossary of **scientific vocabulary**, together with an explanation of each word or phrase. It is a good idea to display these words and their definitions somewhere in the classroom, for the duration of the topic. It is also a good idea to allow learners some time to copy down these words into their personal dictionaries or science exercise books. You must explicitly teach the words and their meanings as and when you encounter these words in the topic. A good way to teach learners new vocabulary is to use 'PATS':

PROGRAMME ORIENTATION

- POINT – if the word is a noun, point at the object or at a picture of the object as you say the word.
 - ACT – if the word is a verb, try to act out or gesture to explain the meaning of the word, as you say it.
 - TELL – if the word has a more abstract meaning, then tell the learners the meaning of the word. You may need to code switch at this point, but also try to provide a simple English explanation.
 - SAY – say the word in a sentence to reinforce the meaning.
- e. Understanding the uses / value of science.** It is very important to give learners a sense of how science applies to their daily lives, and of the value that science adds to their lives. Hold a brief discussion on this point when introducing the topic, and invite learners to elaborate on the uses and value that this topic will have to their lives.
- f. Personal reflection.** At the end of every topic, come back to the topic overview, and complete this table. In particular, it is important to note your challenges and ideas for future improvement, so that you can improve your teaching the next year.
- 3.** After the topic overview, you will find the **INDIVIDUAL LESSONS**. Every lesson is structured in exactly the same way. This helps you and the learners to anticipate what is coming next, so that you can focus on the content and skills. Together with the title, each lesson plan includes the following:
- a. Policy and Outcomes.** This provides you with the CAPS reference, and an overview of the skills that will be covered in the lesson. You can immediately see the science process skills that will be covered, and whether they are lower middle or higher order skills.
- b. Possible Resources.** Here, you will see the resources that you should ideally have for the lesson. If you need to use the poster or pages from the resource pack, this will be listed here. There is also a space for improvised resources, and you are invited to add your own ideas here.
- c. Classroom Management.** Every lesson starts in the same way. Before the lesson, you must write a question that relates to the previous lesson on the chalkboard. Train your learners to come in to the classroom, to take out their exercise books, and to immediately try to answer this question. This links your lesson to the previous lesson, and it effectively settles your learners.
Once learners have had a few minutes to answer, read the question and discuss the answer. You may want to offer a small reward to the learner who answers first, or best. Get your learners used to this routine.
Next, make sure that you are ready to begin your lesson, have all your resources ready, have notes written up on the chalkboard, and be fully prepared to start. Remember, learners will get restless and misbehave if you do not keep them busy and focused.
- d. Accessing Information.** This section contains the key content that you need to share with learners. Generally, it involves sharing some new information that is written on the chalkboard, explaining this information, and allowing learners some time to copy the information into their exercise books. Train learners to do this quickly and efficiently. Learners must anticipate this part of the lesson, and must have their books, pens, pencils and rulers ready.

PROGRAMME ORIENTATION

Explain to learners that this is an important resource for them, because these are the notes they will revise when preparing for tests and exams.

Checkpoint 1. Straight after 'Accessing Information', you will find two checkpoint questions. These questions help you to check that learners understand the new content thus far.

- e. Conceptual Development.** At this point, learners will have to complete an activity to think about and apply their new knowledge, or to learn a new skill. This is the most challenging part of the lesson. Make sure that you fully understand what is required and give learners clear instructions.

Checkpoint 2. Straight after 'Conceptual Development, you will find two checkpoint questions. These questions help you to check that learners understand the new concepts and skills that they have engaged with.

- f. Reference Points for Further Development.** This is a useful table that lists the relevant sections in each approved textbook. You may choose to do a textbook activity with learners in addition to the lesson plan activity, or even in place of the lesson plan activity. You may also want to give learners an additional activity to do for homework.

- g. Additional Activities / Reading.** This is the final section of the lesson plan. This section provides you with web links related to the topic. Try to get into the habit of visiting these links as part of your lesson preparation. As a teacher, it is always a good idea to be more informed than your learners.

4. At the end of the week, make sure that you turn to the **TRACKER**, and make note of your progress. This helps you to monitor your pacing and curriculum coverage. If you fall behind, make a plan to catch up.
5. **POSTER AND RESOURCE PACK.** You will have seen that the *Possible Resources* section in the lesson plan will let you know which resources you will need to use in a lesson.

Please note that you will only be given these resources once. It is important for you to manage and store these resources properly. Do this by:

- Writing your name on all resources
- Sticking Resources onto cardboard or paper
- Laminating all resources, or covering them in contact paper
- Filing the resource papers in plastic sleeves once you have completed a topic

Have a dedicated wall or notice board in your classroom for Natural Sciences.

- Use this space to display the resources for the topic
- Display the vocabulary words and meaning here, as well as the resources
- Try to make this an attractive and interesting space
- Display learners' work on this wall – this gives learners a sense of ownership and pride

PROGRAMME ORIENTATION

6. **ASSESSMENT.** At the end of the lesson plans, you will find the CAPS assessment requirements for the term. You should refer to your prescribed textbooks and departmental resources for examples of the relevant assessments.

Lesson Plan Routine

Train your learners to know and anticipate the routine of Natural Sciences lessons. You will soon see that a good knowledge of this routine will improve time-on-task and general classroom discipline and that you will manage to work at a quicker pace.

Remember, every Natural Sciences lesson follows this routine:

1. **Classroom Management:** settle learners by having two questions written on the chalkboard. Learners take out their exercise books and pens, and immediately answer the questions. Discuss the answers to the questions and reward the successful learner.
2. **Accessing Information:** have key information written on the chalkboard. Explain this to learners. Allow learners to copy this information into their books.
3. **Checkpoint 1:** ask learners at least two questions to check their understanding.
4. **Conceptual Development:** complete an activity to apply new knowledge or skills.
5. **Checkpoint 2:** ask learners at least two questions to check their understanding.
6. **Reference Points for Further Development:** links to textbook activities – you may choose to use these activities as additional classwork activities, or as homework activities.
7. **Tracker:** fill in your tracker at the end of the lessons to track your progress.

A vehicle to implement CAPS

Teaching Natural Sciences can be exciting and rewarding. These lesson plans have been designed to guide you to implement the CAPS policy in a way that makes the teaching and learning experience rewarding for both the teacher and the learners.

To support the policy's fundamentals of teaching Natural Sciences, these lesson plans use the CAPS content as a basis and:

- provide a variety of teaching techniques and approaches
- promote enjoyment and curiosity
- highlight the relationship between Natural Science and other subjects
- where appropriate, draw on and emphasise cultural contexts and indigenous knowledge systems
- show the relationship between science, learners, their societies and their environments
- aim to prepare learners for economic activity and self-expression

Content and Time Allocation

These lessons plans have been developed to comply with CAPS in respect of both content and time allocation. In developing these lesson plans, consideration of the realities of teachers was taken and to this end, some simple adjustments were made, without deviating from policy, to make the teaching of these lesson plans more achievable. The kinds of adjustments made include using some of the practical tasks in the lesson plans for assessment purposes; and building in time for revision and exams during terms 2 and 4.

CAPS assigns one knowledge strand to form the basis of content in each term. These strands are as follows:

- Term 1: ***Life and Living***
- Term 2: ***Matter and Materials***
- Term 3: ***Energy and Change***
- Term 4: ***Planet Earth and Beyond***

PROGRAMME ORIENTATION

Grade 9			
Term 1	Term 2	Term 3	Term 4
NS Strand	NS Strand	NS Strand	NS Strand
Life and Living	Matter and Materials	Energy and Change	Planet Earth and Beyond
Cells as the basic units of life	Compounds	Forces	The Earth as a system
Systems in the human body	Chemical reactions	Electric cells as energy systems	Mining of mineral resources
Human Reproduction	Reactions of metals with oxygen	Resistance	Atmosphere
Circulatory and respiratory systems	Reactions of non-metals with oxygen	Series and parallel circuits	Birth, life and death of stars
Digestive system	Acids, bases and pH value	Safety with electricity	
	Reactions of acids with bases	Energy and the national electricity grid	
	Reactions of acids with metals	Cost of electrical power	

These lesson plans have been designed against the stipulated CAPS requirements with topics being allocated for the time prescribed by CAPS. (Remember that some slight changes have been incorporated to accommodate time for revision, tests and examinations).

PROGRAMME ORIENTATION

The time allocation by topic is summarised in the table below.

Remember that one week equates to 3 hours or three lessons of 1 hour each.

	GRADE 7		GRADE 8		GRADE 9	
TERM	Topic	Time in weeks	Topic	Time in weeks	Topic	Time in weeks
Term 1: Life and Living	• The biosphere	1	• Photosynthesis and respiration	2	• Cells as the basic units of life	2
	• Biodiversity	3½	• Interactions and interdependence within the environment	5	• Systems in the human body	2
	• Sexual Reproduction	3½			• Human Reproduction	2
	• Variation	1	• Micro-organism	2	• Circulatory and respiratory systems	1½
					• Digestive system	1½
		(9 wks)		(9 wks)		(9 wks)
Term 2: Matter and Materials	• Properties of materials	2	• Atoms	2	• Compounds	1
	• Separating mixtures	2	• Particle model of matter	5	• Chemical reactions	1
		• Acids, bases and neutrals			2	• Reactions of metals with oxygen
	• Introduction to the periodic table of the elements	2	• Chemical reactions	1	• Reactions of non-metals with oxygen	1
					• Acids, bases and pH value	1
	• Reactions of acids with bases (I)	½				
	• Reactions of acids with bases (II)	1				
• Reactions of acids with bases (III)	½					
• Reactions of acids with metals	1					
		(8 wks)				(8 wks)

PROGRAMME ORIENTATION

Term 3: Energy and Change	• Sources of energy	1	• Static electricity	1	• Forces	2
	• Potential and Kinetic energy	2	• Energy transfer in electrical systems	3	• Electric cells as energy systems	½
	• Heat transfer	2	• Series and parallel circuits	2	• Resistance	1
	• Insulation and energy saving	2	• Visible light	3	• Series and parallel circuits	2
	• Energy transfer to surroundings	1			• Safety with electricity	½
	• The national electricity supply system	1			• Energy and the national electricity grid	1
		(9 wks)		(9wks)		(9 wks)
Term 4: Planet Earth and Beyond	• Relationship of the Sun and the Earth	4	• The Solar System	3	• The Earth as a system	1
	• Relationship of the Moon and the Earth	2	• Beyond the Solar System	3	• The Lithosphere	2
	• Historical development of astronomy	2	• Looking into space	2	• Mining of mineral resources	2
					• Atmosphere	2
				• Birth, life and death of stars	1	
		(8 wks)		(8 wks)		(8 wks)
TOTALS	34 weeks		34 weeks		34 weeks	

PROGRAMME ORIENTATION

REFLECTING ON THE LESSONS THAT YOU TEACH

It is important to reflect on your teaching. Through reflection, we become aware of what is working and what is not, what we need to change and what we do not. Reflecting on your use of these lesson plans will also help you use them more effectively and efficiently.

These lesson plans have been designed to help you deliver the content and skills associated with CAPS. For this reason, it is very important that you stick to the format and flow of the lessons. CAPS requires a lot of content and skills to be covered – this makes preparation and following the lesson structure very important.

Use the tool below to help you reflect on the lessons that you teach. You do not need to use this for every lesson that you teach – but it is a good idea to use it a few times when you start to use these lessons. This way, you can make sure that you are on track and that you and your learners are getting the most out of the lessons.

LESSON REFLECTION TOOL			
Preparation			
1.	What preparation was done?		
2.	Was preparation sufficient?		
3.	What could have been done better?		
4.	Were all of the necessary resources available?		
Classroom Management			
		Yes	No
5.	Was the question written on the board?		
6.	Was the answer written on the board?		
7.	Was the answer discussed with the learners in a meaningful way?		
8.	Overall reflection on this part of the lesson: What was done well? What could have been done better?		

PROGRAMME ORIENTATION

Accessing Information			
		Yes	No
9.	Was the text and/ or diagrams written on the chalkboard before the lesson started?		
10.	Was the work on the board neat and easy for the learners to read?		
11.	Was the explanation on the content easy to follow?		
12.	Was the information on the board used effectively to help with the explanations?		
13.	Was any new vocabulary taught effectively? (in context and using strategies like PATS)		
14.	Were the learners actively engaged? (asked questions, asked for their opinions and to give ideas or suggestions)		
15.	Were the checkpoint questions used effectively?		
16.	Overall reflection on this part of the lesson: What was done well? What could have been done better?		
Conceptual Development			
		Yes	No
17.	Was the information taught in the 'Accessing Information' part of the lesson used to foreground the activity?		
18.	Were clear instructions given for the conceptual development activity?		
19.	Were the outcomes/answers to the activities explained to the learners?		
20.	Could the learners ask questions and were explanations given?		
21.	Was a model answer supplied to the learners? (written or drawn on the board)		
21.	Were the checkpoint questions used effectively?		
22.	At the end of the lesson, were the learners asked if they had questions or if they needed any explanations?		
23.	Overall reflection on this part of the lesson: What was done well? What could have been done better?		

TOPIC OVERVIEW:

Cells as the basic units of life

Term 1, Weeks 1A – 2C

A. TOPIC OVERVIEW

Term 1, Weeks 1a – 2c

- This topic runs for 2 weeks.
- It is presented over 6 lessons.
- This topic's position in the term is as follows:

LESSON	WEEK 1			WEEK 2			WEEK 3			WEEK 4			WEEK 5		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B

LESSON	WEEK 6			WEEK 7			WEEK 8			WEEK 9			WEEK 10		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B

B. SEQUENTIAL TABLE

GRADE 8	GRADE 9	GRADE 10 - 12
LOOKING BACK	CURRENT	LOOKING FORWARD
<ul style="list-style-type: none"> • Interactions within an ecosystem are driven by the need for energy to sustain life. • Photosynthesis is the process whereby plants use carbon dioxide from the air, water from the soil and energy from the sun to produce glucose. • Respiration is the process by which energy is released from food in a series of reactions. 	<ul style="list-style-type: none"> • The cell is the basic structural and functional unit of living organisms. • Plants and animal cells have a cell membrane, cytoplasm, nucleus and mitochondria. • Plant cells differ from animal cells. 	<ul style="list-style-type: none"> • -

C. SCIENTIFIC AND TECHNOLOGICAL VOCABULARY

Ensure that you teach the following vocabulary at the appropriate place in the topic:

	TERM	EXPLANATION
1.	Cell	The basic unit of all living organisms
2.	Organelles	Specialised structures found inside living cells that perform specific functions for the cell
3.	Chlorophyll	The green pigment found in chloroplasts that gives plants their green colour and traps sunlight.
4.	Chloroplast	Organelle found in plant cells that is responsible for photosynthesis
5.	Ribosomes	Round structures in the cell responsible for creating proteins
6.	Photosynthesis	The process that plants use to convert the energy from the sun into sugars
7.	Unicellular	Organism consisting of a single cell
8.	Multicellular	Organisms consisting of many cells
9.	Specialize	To take on a particular function and only perform that function
10.	Microscope	An instrument used to view microscopic specimens
11.	Nucleus	Organelle found in both plant and animal cells responsible for controlling all activities within the cell
12.	Cytoplasm	Jelly-like liquid in the cell where reactions take place
13.	Mitochondria	Organelles that act like a digestive system which takes in nutrients, breaks them down, and creates energy rich molecules for the cell
14.	Vacuole	Organelle found in both plants and animal cells responsible for storage
15.	Cell wall	Organelle found only in plant cells, gives the cell its rigid shape
16.	Macroscopic	Large, viewed without a microscope.
17.	Allergens	Substances that cause allergies

D. UNDERSTANDING THE USES / VALUE OF SCIENCE

The value of knowing that the cell is the basic structural and functional unit of all living organisms. The value of knowing that plant and animal cells have a cell membrane, nucleus, mitochondria and cytoplasm. The value of understanding the differences between plant and animal cells. Plant cells have large vacuoles and chloroplasts. The value of knowing that different animal cells have different functions.

E. PERSONAL REFLECTION

Reflect on your teaching at the end of each topic:

Date completed:	
Lesson successes:	
Lesson challenges:	
Notes for future improvement:	

TOPIC: Cells as the basic units of life

Term 1, Week 1, Lesson A

1 A

Lesson Title: The Structure of the Cell

Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Cell Structure		
CAPS Page Number	56		
Lesson Objectives			
By the end of the lesson, learners will be able to:			
<ul style="list-style-type: none"> • explain that the cell is the basic unit of all living organisms • identify a microscope • describe the purpose of a microscope • identify the following organelles: cell membrane, nucleus, cytoplasm and mitochondria. 			
Specific Aims	1. DOING SCIENCE		
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS		✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE		

SCIENCE PROCESS SKILLS

1. Accessing & recalling Information	✓	6. Identifying problems & issues		11. Doing Investigations	
2. Observing		7. Raising Questions		12. Recording Information	✓
3. Comparing		8. Predicting		13. Interpreting Information	✓
4. Measuring		9. Hypothesizing		14. Communicating	
5. Sorting & Classifying		10. Planning Investigations		15. Scientific Process	

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 1: Diagram of an Animal Cell	
Projector and laptop with internet	
Microscope	

C CLASSROOM MANAGEMENT

1. Make sure that you are ready and prepared.
2. Write the following question onto the chalkboard before the lesson starts:

What are all animals, humans, bacteria and plants made up of?

3. Learners should enter the classroom and answer the question in their workbooks.
4. Discuss the answer with the learners.
5. Write the model answer onto the chalkboard.

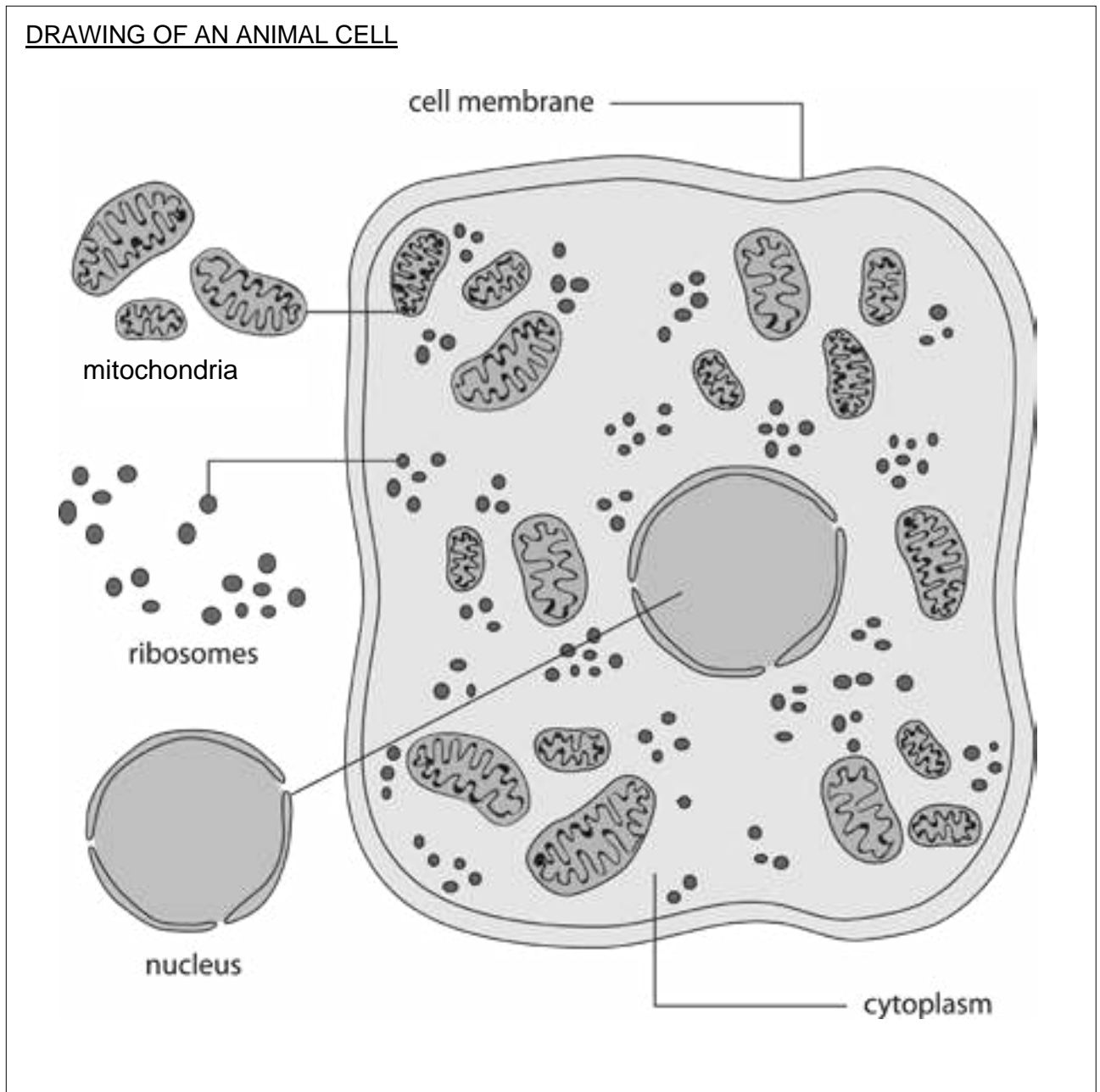
They are all made up of cells.

D

ACCESSING INFORMATION

1. Draw the following picture (or use Resource 1) and write the following information on the chalkboard (always try to do this before the lesson starts):

DRAWING OF AN ANIMAL CELL



2. Explain the following to the learners:
 - a. All animals, humans and plants are made up of very small structures called cells.
 - b. You can only see cells using a piece of equipment called a microscope.
 - c. Scientists use microscopes to learn about cells.
 - d. Humans are made up of many cells of different types.
 - e. All animal cells, including human cells, have the basic structure shown on the chalkboard.

TOPIC: Cells as the basic units of life

- f. All cells have a cell membrane, a nucleus, cytoplasm and many mitochondria and many ribosomes.
 - g. Each one of these structures looks different because they all have different functions or jobs to do.
3. Ask the learners if they have any questions.
 4. Give the learners some time to draw and label the animal cell in their workbooks. Their drawing should take up one whole page.

Checkpoint 1

Ask the learners the following questions to check their understanding at this point:

- a. What is the smallest unit found in all organisms?
- b. Name five structures found inside cells.

Answers to the checkpoint questions are as follows:

- a. The cell.
- b. Cell membrane, cytoplasm, nucleus, ribosomes and mitochondria.

E

CONCEPTUAL DEVELOPMENT

1. Write and draw the following onto the chalkboard (always try to do this before the lesson starts):

Table to show the functions of the different structures found in animal cells

Name	Description and Function
	The thin layer that surrounds the cell
	Shaped like a sausage; creates energy for the cell
	Found towards the centre of the cell and controls ALL activities inside the cell
	The jelly-like liquid in cells where reactions take place
	Many round structures responsible for creating proteins

TOPIC: Cells as the basic units of life

TASK 1

1. Read the information in the column called Description and Function.
2. Draw the table in your workbooks.
3. Using your drawing, try to work out the structures missing in the first column of the table.

TASK 2

1. Write the function of each structure next to the label in your drawing.
2. Explain Task 1 to the learners as follows:
 - a. The table drawn on the chalkboard has two columns.
 - b. The first column has the following heading: Name, and it is empty.
 - c. The second column has the following heading: Description and Function, and it is complete.
 - d. Working on your own, quietly read through the descriptions and functions.
 - e. Draw the table in your workbooks and leave the first column blank.
 - f. Using your drawing and the information given in the table, work out the missing names of the structures. Fill in the structures' name using a pencil.
3. Give learners some time to complete Task 1 in their workbooks.
4. Ask learners to share their answers to Task 1 with the class.
5. The completed table is shown below. Fill the missing names into the table on the chalkboard.

Name	Description and Function
cell membrane	The thin layer that surrounds the cell that controls what substances pass in and out of the cell
mitochondrion	Shaped like a sausage; creates energy for the cell
nucleus	Found towards the centre of the cell and controls ALL activities inside the cell
cytoplasm	The jelly-like liquid in cells where reactions take place
ribosomes	Many round structures responsible for creating proteins

TOPIC: Cells as the basic units of life

6. When the learners have completed Task 1, do Task 2 below.
 - a. Read through the instructions on the chalkboard with the class.
7. Task 2
 - a. Give the learners some time to complete Task 2 in their workbooks.
 - b. Ask learners to write the function of each of the five structures next to the label in your drawing.
 - c. They should not write a description.
8. Answers to Task 2 are shown in the table below.

Name	Function
<i>cell membrane</i>	<i>Controls the substances that enter and leave the cell</i>
<i>mitochondria</i>	<i>Creates energy for the cell</i>
<i>nucleus</i>	<i>Controls ALL activities inside the cell</i>
<i>cytoplasm</i>	<i>Where reactions take place</i>
<i>ribosomes</i>	<i>Responsible for creating proteins</i>

9. Discuss the answers with the learners.

Checkpoint 2

Ask the learners the following questions to check their understanding at this point:

- a. What is the function of the nucleus?
- b. What is the main structural difference between the cell membrane and the mitochondria?

Answers to the checkpoint questions are as follows:

- a. To control all activities that happen inside the cell
- b. Cell membrane is thin and covers the entire area of the cell; the mitochondria are short and wide.

10. Ask the learners if they have any questions and provide answers and explanations.

TOPIC: Cells as the basic units of life

F REFERENCE POINTS FOR FURTHER DEVELOPMENT

If you need additional information or activities on this topic, you can find these in your textbook on the following pages:

NAME OF TEXTBOOK	TOPIC	PAGE NUMBER
Step-by-Step	Cells as the basic units of life	3
Solutions for all	Cells as the basic units of life	2
Spot On	Cells as the basic units of life	2
Top Class	Cells as the basic units of life	2
Via Afrika	Cells as the basic units of life	7
Platinum	Cells as the basic units of life	2
Oxford Successful	Cells as the basic units of life	12
Pelican Natural Sciences	Cells as the basic units of life	4, 11-12, 14
Sasol Inzalo Bk A	Cells as the basic units of life	4

G ADDITIONAL ACTIVITIES/ READING

In addition, further reading, listening or viewing activities related to this sub-topic are available through the following web links:

1. http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa_pre_2011/cells/cells1.shtml [Interactive website on animal cells]
2. <https://www.youtube.com/watch?v=MfopLillOeA> (4min 17sec) [Animals' cells structure and functions animation]

TOPIC: Cells as the basic units of life

Term 1, Week 1, Lesson B

1 B

Lesson Title: The functions of the parts of the cell

Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	The concept of the biosphere		
CAPS Page Number	56		
Lesson Objectives			
By the end of the lesson, learners will be able to:			
<ul style="list-style-type: none"> • explain the function of the microscope • describe the important part that each structure plays • identify important structures in different cells. 			
Specific Aims	1. DOING SCIENCE		✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS		✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE		

SCIENCE PROCESS SKILLS

1. Accessing & recalling Information	✓	6. Identifying problems & issues		11. Doing Investigations	✓
2. Observing		7. Raising Questions		12. Recording Information	✓
3. Comparing	✓	8. Predicting		13. Interpreting Information	✓
4. Measuring		9. Hypothesizing		14. Communicating	✓
5. Sorting & Classifying	✓	10. Planning Investigations		15. Scientific Process	

TOPIC: Cells as the basic units of life

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 2	
A 3D model of the cell	<ul style="list-style-type: none">• Plastic bag (sandwich bag)• Newspaper (scrunch into a small ball)• Slightly runny dessert jelly• Cardboard box• String, sticky tape, elastic bands• Marbles

C CLASSROOM MANAGEMENT

1. Make sure that you are ready and prepared.
2. Write the following question onto the chalkboard before the lesson starts:

Which structure in the cell controls all activities in the cell?

3. Learners should enter the classroom and answer the question in their workbooks.
4. Discuss the answer with the learners.
5. Write the model answer onto the chalkboard.

Nucleus

D ACCESSING INFORMATION

1. Write the following onto the chalkboard (always try to do this before the lesson starts):

WHAT IS A MICROSCOPE?

1. A microscope is an instrument that contains one or more magnifying lenses.
2. It allows us to look at things that are too small to see with the naked eye.
3. Biologists and scientists study the structure of plant and animal cells using a microscope.

HOW DOES A MICROSCOPE WORK?

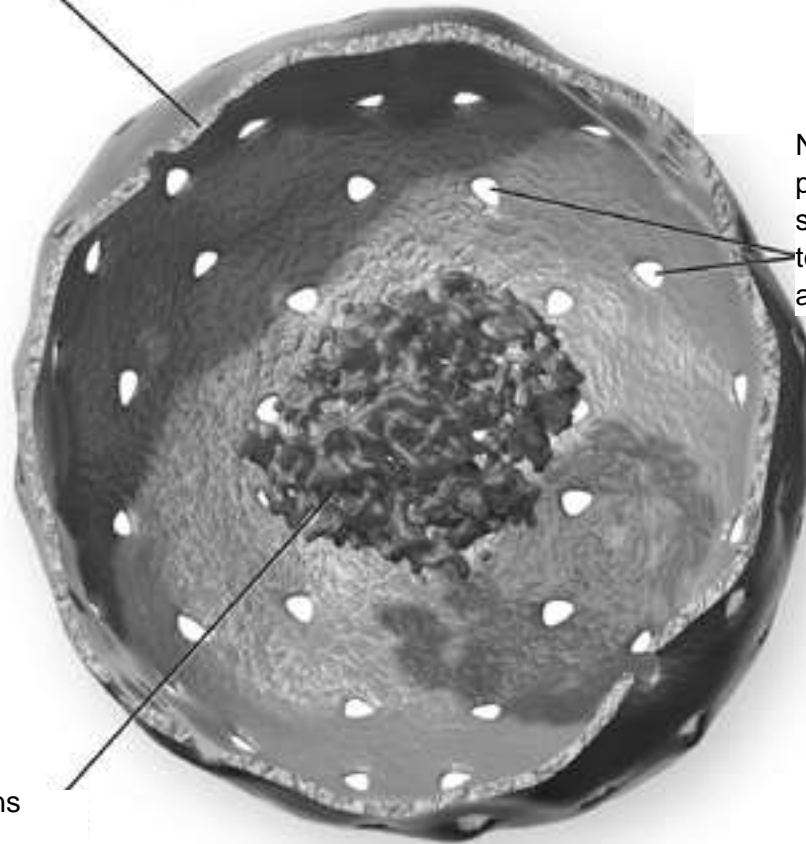
Structure	Function
Eye piece	Lens that you look through
Body tube	Has the lenses that enlarge (magnify) the object to be studied
Revolving nosepiece	Moves to allow one of the magnifying lenses to be used to view the object
Three magnifying lenses	Low magnification, medium magnification and high magnification
Slide clips	Hold the object in place
Bottom LED	Provides light up through the microscope
Base	Supports the lenses
Stage	The place where the object is placed for observation
Fine adjustment knob	Changes the distance between the stage and the magnifying lenses
Arm	Connects the body tube to the base and is used to carry the microscope

MICROSCOPIC VIEW OF THE NUCLEUS

Nuclear membrane surrounds nucleus

Nuclear pores allows substances to move in and out

Nucleolus contains DNA – contains characteristics passed on from your parents



2. Explain this drawing to the learners as follows (hold up Resource 2 while you go through the structures):
 - a. A microscope is an instrument that contains one or more magnifying lenses.
 - b. It allows us to look at things that are too small to see with the naked eye.
 - c. Microscopes are made up of many parts that work together to allow scientists to see large or magnified images of the object.
 - d. The eye piece is the lens that is closest to the eye when you look through the microscope.
 - e. The body tube contains the lenses to be used to view the object.
 - f. The revolving nosepiece rotates to allow one of the three different lenses to be used to view the object.
 - g. Magnifying lenses are attached to the rotating nosepiece. There are usually three lenses: low magnification, medium magnification and high magnification.

TOPIC: Cells as the basic units of life

- h. Magnification means to make the object look larger. The object does not physically become bigger but the scientist sees it as larger.
 - i. Slide clips hold the object in place underneath the magnifying lenses.
 - j. Bottom LED provides light to the microscope.
 - k. The base supports the lenses and all the parts of the microscope.
 - l. The fine adjustment knob changes the distance between the stage and the magnifying lenses.
 - m. The arm connects the body tube to the base and is used to carry the microscope. Microscopes are very expensive and have to be looked after very carefully.
3. Now point to your drawing of the nucleus and explain this to the learners as follows:
- a. The nucleus is responsible for controlling all activities in the cell.
 - b. The nucleus can do this because it contains a substance or a molecule called DNA.
 - c. DNA determines characteristics such as eye colour, height, weight, sporting ability, hair texture, right-handed or left-handed, allergens.
 - d. Each person has different DNA that is inherited from their parents.
4. Read through the information written on the chalkboard with the learners.
5. Ask the learners if they have any questions.
6. Tell the learners to copy the information and the drawing on the chalkboard into their workbooks.
7. Give the learners some time to complete this task.

Checkpoint 1

Ask learners the following questions to check their understanding at this point:

- a. What is the function of a microscope?
- b. Name seven characteristics that are determined by DNA.

Answers to the checkpoint questions are as follows:

- a. A microscope looks at objects that cannot be viewed with the naked eye.
- b. Eye colour, height, weight, sporting ability, hair texture, right-handed or left-handed, allergens.

E CONCEPTUAL DEVELOPMENT

Divide the learners into groups of 6.

1. The learners will be making a 3D model of an animal cell for this activity.
2. For this activity you will need the items that have been collected to build the model. These could include: newspaper, clear plastic bags or scraps of plastic, small stones, dried beans, dried mielie seeds, string or wool, pieces of sticks, cardboard boxes, polystyrene trays, dough or clay or Prestik, cardboard offcuts, paper, marker pens, sheets of paper, glue, cellotape, scissors, etc.
3. Each group will also need a piece of cardboard on which to construct the model. This needs to be 30cm x 50 cm big. It can be a new sheet of cardboard or a piece of cardboard from a box.
4. Each group will also need a sheet of lined paper for Task 2. If this is not available, they can use their workbooks.
5. Write the following onto the chalkboard (always try to do this before the lesson starts):

PRACTICAL TASK

1. This task will be done in groups.
 2. Each group is going to make a 3D (three dimensional) model of an animal cell.
 3. The model is going to be made out of the materials that have been collected.
 4. You will have to discuss, in your groups, what materials you are going to use to make your model.
 5. You will need to think creatively and work neatly as a team.
 6. You will be assessed as a group.
1. Read over the practical task with the learners.
 2. Remind the learners that they looked at the structure of the animal cell in the previous lesson.
 3. Have the learners open their workbooks to the drawing they did of the animal cell in the previous lesson.
 4. Tell the learners that they are going to make a three dimensional model of the animal cell, in groups.
 5. Explain what “three dimensional” means that something that has height, width and depth.

Instructions:

- Using the materials available, make a 3D model of the animal cell.
- The model should be no smaller than 30cm x 50cm
- As a group, identify the parts of the cell that you need to make using your drawing from the previous lesson.
- Choose suitable materials and construct your model.
- Be sure that you look at sizes and shapes when doing construction.
- All learners' names must be written on the back of the model AND on the answersheet for Task 2.

Task 1

1.1 Draw and cut out the shape of your basic animal cell.

1.2 Now add the cell membrane to the animal cell.

1.3 The next step is to add the following organelles:

- Mitochondria
- Ribosomes

1.4 Lastly label the following on your model:

- Cell membrane
- Cytoplasm
- Mitochondrion
- Ribosome
- Nucleus

13. Read through the task with the learners.

14. Ask the learners if they have any questions about what they need to do.

15. Tell the learners that they have 25 minutes to complete this task.

16. Tell learners to work neatly and to avoid wasting materials.

17. While the learners are working, supervise and answer any questions they may have.

18. After 25 minutes, call the learners to attention.

19. Tell the learners they will now do task 2.

20. This task will be a written task.

21. The group need only complete one set of answers together, and hand it in with their model.

22. Each group will need a piece of lined paper to complete the answers for Task 2.

23. Write the following on the chalkboard:

Task 2

2.1 What is the function of the cell membrane?

2.2 What is the function of the mitochondrion?

2.3 What is the function of the nucleus?

2.4 Describe what cytoplasm looks like.

2.5. What happens in the cytoplasm of the animal cell?

2.6 What do the ribosomes of the animal cell do?

TOPIC: Cells as the basic units of life

24. Read over the questions for Task 2 with the learners.
25. Tell the learners that they only need to hand in one set of answers per group.
26. The answers for Task 2 must be handed in with the model.
27. All learners in the group must have their names on the top of the page of answers for Task 2.
28. Ask the learners if they have any questions.
29. Tell the learners to complete the answers in their groups.
30. Have each group hand in the completed model (Task 1) and answers to Task 2.

F REFERENCE POINTS FOR FURTHER DEVELOPMENT

If you need additional information or activities on this topic, you can find these in your textbook on the following pages:

NAME OF TEXTBOOK	TOPIC	PAGE NUMBER
Solutions for All	Cells as the basic units of life	2
Via Afrika	Cells as the basic units of life	10, 16-17
Oxford Successful	Cells as the basic units of life	14
Pearson: Spot On	Cells as the basic units of life	2-3, 7-8
Pearson: Platinum	Cells as the basic units of life	3, 7
Shuters Top Class	Cells as the basic units of life	4, 9
Step-by-Step	Cells as the basic units of life	7-9, 11, 19-22
Pelican Natural Sciences	Cells as the basic units of life	11
Sasol Inzalo Bk A	Cells as the basic units of life	4

G ADDITIONAL ACTIVITIES/ READING

In addition, further reading, listening or viewing activities related to this sub-topic are available through the following web links:

31. <https://www.youtube.com/watch?v=ePnbkNVdPio> (6min 38sec) [Seeing the invisible: van Leeuwenhoek's first glimpses of the microbial world]
32. <https://www.purposegames.com/game/a19f404ad4> [Microscope labelling game]

TOPIC: Cells as the basic units of life

Term 1, Week 1, Lesson C

1C

Lesson Title: Plant and Animal Cells

Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Cells as the basic units of life		
CAPS Page Number	56		
Lesson Objectives			
By the end of the lesson, learners will be able to:			
<ul style="list-style-type: none"> • differentiate between plant and animal cells • identify the cell membrane and cell wall • describe the function of the cell wall. 			
Specific Aims	1. DOING SCIENCE		
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS		✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE		

SCIENCE PROCESS SKILLS

1. Accessing & recalling Information	✓	6. Identifying problems & issues		11. Doing Investigations	
2. Observing	✓	7. Raising Questions		12. Recording Information	✓
3. Comparing	✓	8. Predicting		13. Interpreting Information	
4. Measuring		9. Hypothesizing		14. Communicating	✓
5. Sorting & Classifying		10. Planning Investigations		15. Scientific Process	

TOPIC: Cells as the basic units of life

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Projector, computer and internet	
Resource 3	

C CLASSROOM MANAGEMENT

1. Make sure that you are ready and prepared.
2. Write the following question onto the chalkboard before the lesson starts:

Which structure in the cell is responsible for controlling what enters and exits the cell?

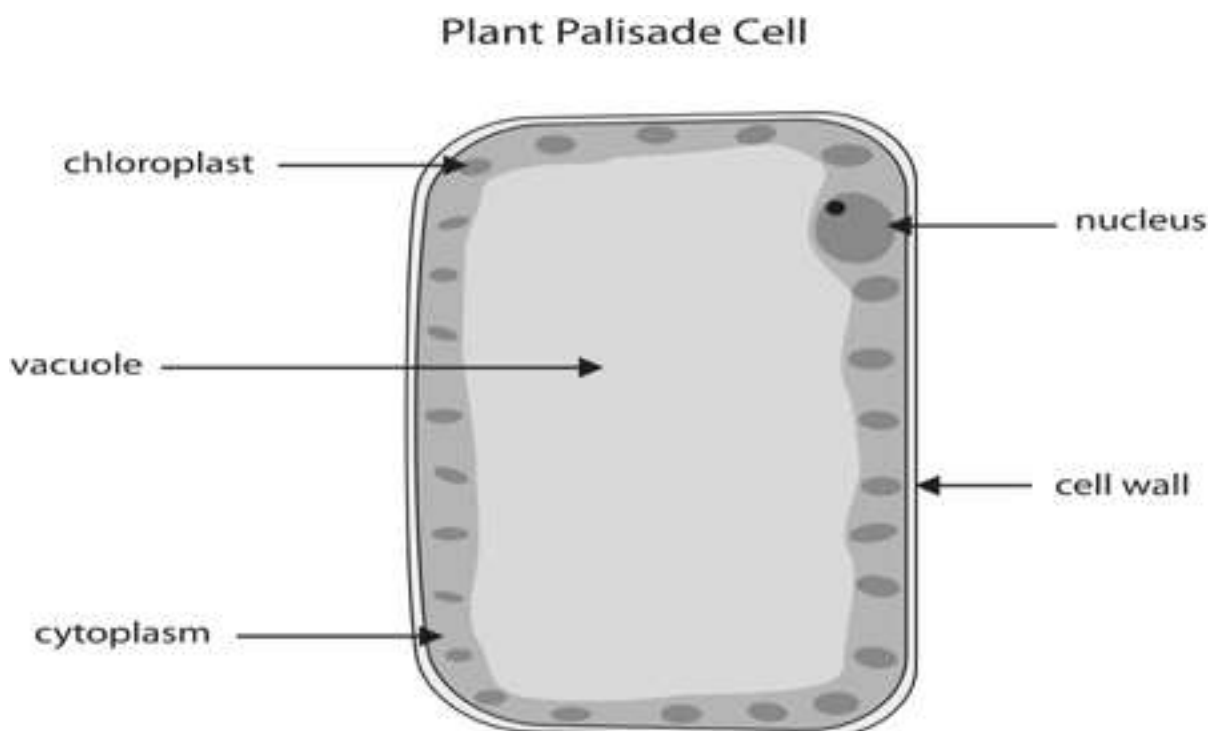
3. Learners should enter the classroom and answer the question in their workbooks.
4. Discuss the answer with the learners.
5. Write the model answer onto the chalkboard.

Cell membrane

D ACCESSING INFORMATION

1. Draw the following picture and write the following information onto the chalkboard (always try to do this before the lesson starts):

DRAWING OF A PLANT CELL



TOPIC: Cells as the basic units of life

2. Explain this to the learners as follows:
 - a. Plant cells are obviously different from animals and we can easily recognise if something is an animal or a plant.
 - b. Plant cells are different from animal cells in many important ways.
 - c. Plant cells always have a cell wall around the cell membrane.
 - d. The cell wall holds the plant cells more tightly together than animal cells.
 - e. The cell wall is very rigid and strong. Plant cells have a more regular rectangular shape than animal cells.
 - f. Many plants have a green substance called chlorophyll, found inside large structures called chloroplasts.
 - g. Plant cells also have a large watery bubble called the vacuole.
 - h. Each of these structures looks different because they all have different functions.
3. Ask the learners if they have any questions.
4. Tell the learners to copy the drawing written on the chalkboard into their workbooks.

Checkpoint 1

Ask the learners the following questions to check their understanding at this point:

- a. Is the cell wall found on the inside or outside of the cell membrane?
- b. Does an animal cell also have cytoplasm?

Answers to the checkpoint questions are as follows:

- a. Outside
- b. Yes, the structures float or are suspended in cytoplasm.

E CONCEPTUAL DEVELOPMENT

1. Write the following onto the chalkboard (try to do this before the lesson starts):

TABLE SHOWING THE FUNCTIONS OF THE DIFFERENT STRUCTURES FOUND IN PLANT CELLS

Structure	Description and Function
	Large bubble pumped full of water to make the cell firm
	Found towards the centre of the cell and controls ALL activities inside the cell
	Thin layer with fairly straight edges that makes the plant cell strong and hard
	Green in colour and uses energy from the sun to produce food
	The jelly-like liquid in cells where reactions take place

TASK 1

1. Read the information in the column called Description and Function.
2. Draw the table in your workbooks.
3. Using your table, try to work out the structures missing in the first column.

TASK 2

1. Write the function of each structure next to the label in your drawing.
-
2. Explain Task 1 to the learners as follows:
 - a. The table drawn on the chalkboard has two columns.
 - b. The first column has the following heading: Name, and it is empty.
 - c. The second column has the following heading: Description and Function, and it is complete.
 - d. Working on your own, quietly read through the descriptions and functions.
 - e. Draw the table in your workbooks and leave the first column blank.
 - f. Using the information given in the table, work out the missing names of the structures. Fill in the names of the structures using a pencil.

TOPIC: Cells as the basic units of life

3. Give learners some time to complete Task 1 in their workbooks.
4. Ask learners to share their answers to Task 1 with the class.
5. The completed table is shown below. Write the missing names into the table on the chalkboard.

TABLE SHOWING THE FUNCTIONS OF THE DIFFERENT STRUCTURES FOUND IN PLANT CELLS

Structure	Description and Function
<i>vacuole</i>	Large bubble pumped full of water to make the cell firm
<i>nucleus</i>	Found towards the centre of the cell and controls ALL activities inside the cell
<i>cell wall</i>	Thin layer with fairly straight edges that makes the plant cell strong and hard
<i>chloroplast</i>	Green in colour and uses energy from the sun to produce food
<i>cytoplasm</i>	The jelly-like liquid in cells where reactions take place

6. When the learners have completed Task 1, do Task 2.
7. Task 2
 - a. Give the learners some time to complete Task 2 in their workbooks.
 - b. Ask learners to write the function of each of the five structures onto their drawing.
 - c. They should not write a description of the functions.
8. Answers to Task 2 are shown in the table below.

Structure	Description and Function
<i>vacuole</i>	Large bubble pumped full of water to make the cell firm
<i>nucleus</i>	Found towards the centre of the cell and controls ALL activities inside the cell
<i>cell wall</i>	Thin layer with fairly straight edges that makes the plant cell strong and hard
<i>chloroplast</i>	Green in colour and uses energy from the sun to produce food
<i>cytoplasm</i>	The jelly-like liquid in cells where reactions take place

TOPIC: Cells as the basic units of life

9. Discuss the answers with the learners.

Checkpoint 2

Ask the learners the following questions to check their understanding at this point:

- a. What is the function of the chloroplast?
- b. What is the structural difference between the vacuole and the cell wall?

Answers to the checkpoint questions are as follows:

- a. To provide the plant cells with food
- b. A vacuole is large and round, and the cell wall is a thin layer that surrounds the whole cell.

10. Ask the learners if they have any questions and provide answers and explanations.

F REFERENCE POINTS FOR FURTHER DEVELOPMENT

If you need additional information or activities on this topic, you can find these in your textbook on the following pages:

NAME OF TEXTBOOK	TOPIC	PAGE NUMBER
Solutions for All	Cells as the basic units of life	10
Via Afrika	Cells as the basic units of life	10-12
Oxford Successful	Cells as the basic units of life	15
Pearson: Spot On	Cells as the basic units of life	4
Pearson: Platinum	Cells as the basic units of life	5-6
Shuters Top Class	Cells as the basic units of life	5
Step-by-Step	Cells as the basic units of life	10-12
Pelican Natural Sciences	Cells as the basic units of life	15-17
Sasol Inzalo Bk A	Cells as the basic units of life	7-11

G ADDITIONAL ACTIVITIES/ READING

In addition, further reading, listening or viewing activities related to this sub-topic are available through the following web links:

1. <http://www.enchantedlearning.com/subjects/plants/cell/> [Interactive website on Plant Cell Anatomy]
2. <http://www.sparknotes.com/biology/cellstructure/celldifferences/section1.rhtml> [Interactive website on cell differences]

TOPIC: Cells as the basic units of life

2A

Term 1, Week 2, Lesson A

Lesson Title: Specialised organelles in plant cells

Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Cells as the basic units of life	
CAPS Page Number	56	
Lesson Objectives		
By the end of the lesson, learners will be able to:		
<ul style="list-style-type: none"> • describe the structure of the chloroplast • explain the function of the chloroplast • describe the importance of photosynthesis and respiration • differentiate between plant cells and animal cells. 		
Specific Aims	1. DOING SCIENCE	
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS

1. Accessing & recalling Information	✓	6. Identifying problems & issues		11. Doing Investigations	
2. Observing	✓	7. Raising Questions		12. Recording Information	✓
3. Comparing		8. Predicting		13. Interpreting Information	✓
4. Measuring		9. Hypothesizing		14. Communicating	✓
5. Sorting & Classifying	✓	10. Planning Investigations		15. Scientific Process	

TOPIC: Cells as the basic units of life

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Projector, computer and internet	
Resource 4	

C CLASSROOM MANAGEMENT

1. Make sure that you are ready and prepared.
2. Write the following question onto the chalkboard before the lesson starts:

Which structure takes up most of the space inside a plant cell?

3. Learners should enter the classroom and answer the question in their workbooks.
 4. Discuss the answer with the learners.
 5. Write the model answer onto the chalkboard.
-

Vacuole

D ACCESSING INFORMATION

1. Write the following onto the chalkboard (always try to do this before the lesson starts):

WHERE DO PLANTS GET THEIR FOOD?

1. Plants are producers because they make sugar and starch (food) from water and carbon dioxide.
2. They use energy from the sun to carry out this process.
3. The process is called photosynthesis.
4. Photosynthesis takes place inside the green chloroplasts.
5. Plants sometimes store the food they make underground, e.g. potatoes and carrots.

WHERE DO ANIMALS GET THEIR FOOD?

1. Animals move around to look for food.
2. Animals eat plant material because it is healthy.
3. Animals use the mitochondria, found in their cells, to turn food into energy.
4. Energy is what allows you to perform all functions in your daily life, such as movement.

TOPIC: Cells as the basic units of life

2. Explain this to the learners as follows:
 - a. Plants and animals get their food and energy in different ways.
 - b. Plants use energy from the sun to create food.
 - c. They are called producers.
 - d. The chloroplast is the name of the cell structure where photosynthesis takes place.
 - e. Animal cells are unable to make food. Because of this they are called consumers.
 - f. Animals are able to turn food that they have eaten into energy.
 - g. The mitochondrion is the name of the cell structure that performs this process. The process is called respiration. If a cell has more than one mitochondrion, these are called mitochondria.
3. Ask the learners if they have any questions.
4. Tell the learners to copy the drawing written on the chalkboard into their workbooks.

Checkpoint 1

Ask the learners the following questions to check their understanding at this point:

- a. What is photosynthesis?
- b. Which cell structures are responsible for respiration?

Answers to the checkpoint questions are as follows:

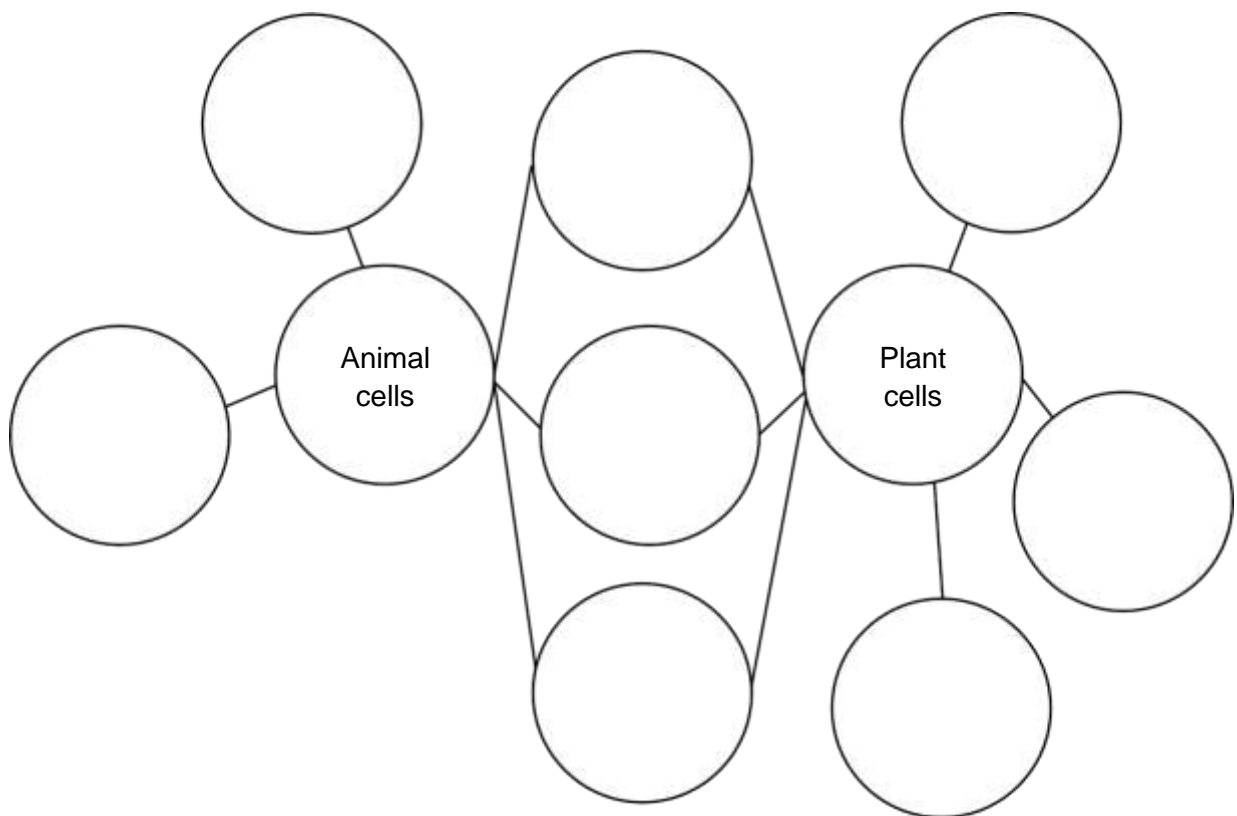
- a. Process that converts light energy from the sun into food
- b. Mitochondria.

E

CONCEPTUAL DEVELOPMENT

1. Explain the following to the learners (always try to do this before the lesson starts):
 - a. The structure of plant and animal cells differs because of the different functions of the organisms.
 - b. One way that they differ is because plants are producers and animals are consumers.
 - c. Plants have strong cell walls to keep them upright and animals have skeletons to keep them upright.
 - d. As a result of the strong cell wall, plants are shaped more like a rectangle than animal cells.
 - e. As you have learnt, there are many differences between plant and animal cells.
2. Write and draw the following on the chalkboard (always try to do this before the lesson starts):

DOUBLE-BUBBLE MAP TO SHOW THE SIMILARITIES AND DIFFERENCES BETWEEN PLANT AND ANIMAL CELLS



TASK

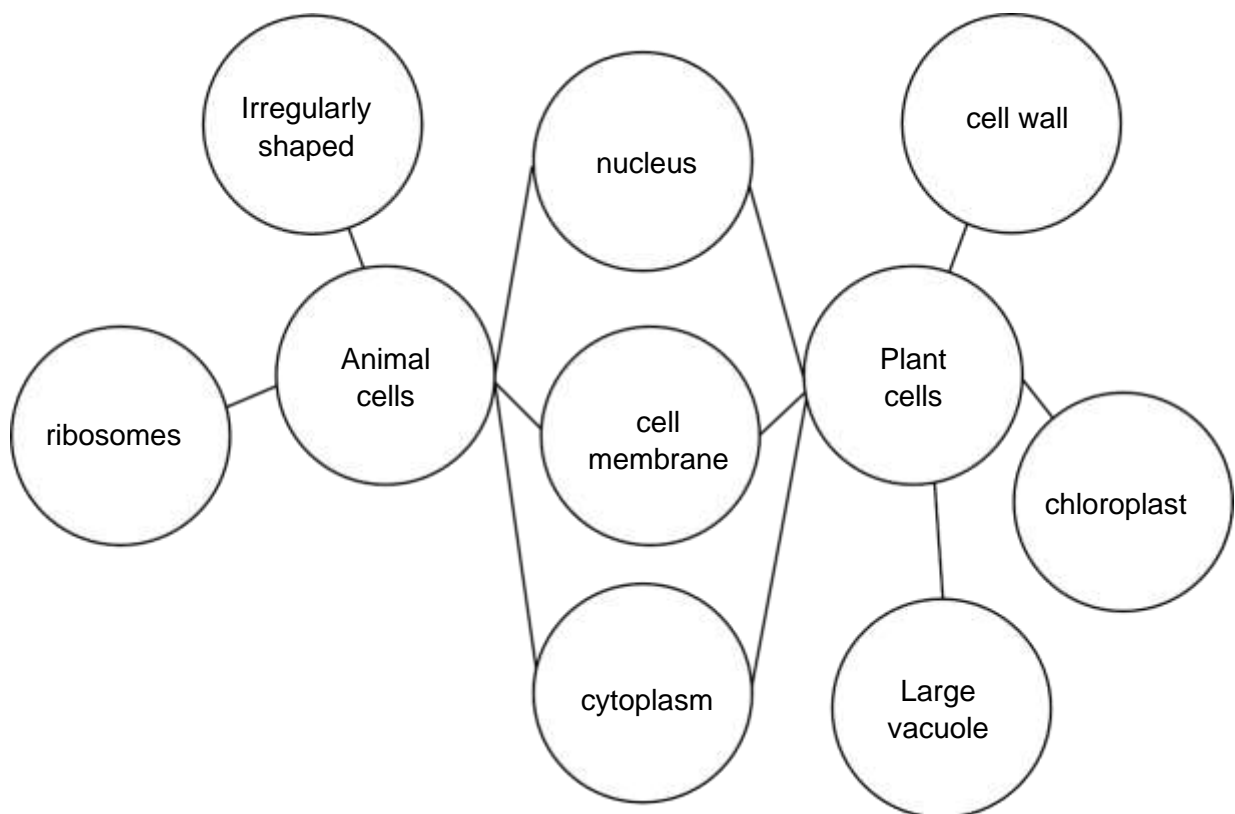
1. Draw a double-bubble map in your workbooks.
2. The bubbles in the middle of the map should be used to show the structures that are found in BOTH animal and plant cells.
3. The bubbles that are linked to plant cells should indicate the structures that are only found in plant cells.

TOPIC: Cells as the basic units of life

- The bubbles that are linked to animal cells should show the structures that are only found in animal cells.
- Use your drawing and notes from the past few lessons to complete the double-bubble map.

- Explain to the learners the activity as follows:
 - Draw a double-bubble map in your workbooks.
 - Learners must use the guidelines in the task above.
 - Show learners Resource 4. Ask them to carefully observe the photographs of animal and plant cells. They may use these photos to help them complete the double-bubble map.
- Allow the learners some time to complete this task.
- With the learners' input, complete the model answer on the chalkboard:

DOUBLE-BUBBLE MAP TO SHOW THE SIMILARITIES AND DIFFERENCES BETWEEN PLANT AND ANIMAL CELLS



- Discuss the answers with the learners.

TOPIC: Cells as the basic units of life

Checkpoint 2

Ask the learners the following questions to check their understanding at this point:

- a. Which three cell structures do plant and animal cells have in common?
- b. Why are plants called producers?

Answers to the checkpoint questions are as follows:

- a. Nucleus, cytoplasm and cell membrane.
- b. They use photosynthesis to make their own food.

7. Ask learners if they have any questions and provide answers and explanations.

F REFERENCE POINTS FOR FURTHER DEVELOPMENT

If you need additional information or activities on this topic, you can find these in your textbook on the following pages:

NAME OF TEXTBOOK	TOPIC	PAGE NUMBER
Solutions for All	Cells as the basic units of life	10
Via Afrika	Cells as the basic units of life	10-12
Oxford Successful	Cells as the basic units of life	15
Pearson: Spot On	Cells as the basic units of life	4
Pearson: Platinum	Cells as the basic units of life	5-6
Shuters Top Class	Cells as the basic units of life	5-6
Step-by-Step	Cells as the basic units of life	10-12
Pelican Natural Sciences	Cells as the basic units of life	15-17
Sasol Inzalo Bk A	Cells as the basic units of life	12-13

G ADDITIONAL ACTIVITIES/ READING

In addition, further reading, listening or viewing activities related to this sub-topic are available through the following web links:

1. <https://ed.ted.com/on/eBXQdPys> (1min 33sec) [Plant Cells Vs. Animal Cells]
2. <https://www.thoughtco.com/what-is-a-plant-cell-373384> [Learn about plant cell structures and organelles]

TOPIC: Cells as the basic units of life

Term 1, Week 2, Lesson B

2B

Lesson Title: Different types of animal cells

Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Cells as the basic units of life		
CAPS Page Number	57		
Lesson Objectives			
By the end of the lesson, learners will be able to:			
<ul style="list-style-type: none"> • explain why cells come in different shapes and sizes • describe the relationship between the structure and function of organelles • differentiate between muscle cells and cheek cells. 			
Specific Aims	1. DOING SCIENCE		
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS		✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE		

SCIENCE PROCESS SKILLS

1. Accessing & recalling Information	✓	6. Identifying problems & issues		11. Doing Investigations	
2. Observing	✓	7. Raising Questions		12. Recording Information	✓
3. Comparing	✓	8. Predicting		13. Interpreting Information	
4. Measuring		9. Hypothesizing		14. Communicating	✓
5. Sorting & Classifying	✓	10. Planning Investigations		15. Scientific Process	

TOPIC: Cells as the basic units of life

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Projector, computer and internet	
Resource 4	

C CLASSROOM MANAGEMENT

1. Make sure that you are ready and prepared.
2. Write the following question onto the chalkboard before the lesson starts:

What shape do animal cells have?

3. Learners should enter the classroom and answer the question in their workbooks.
 4. Discuss the answer with the learners.
 5. Write the model answer onto the chalkboard.
-

Irregularly shaped or no specific shape

D ACCESSING INFORMATION

1. Write the following onto the chalkboard (always try to do this before the lesson starts):

WHY DO ANIMAL CELLS LOOK DIFFERENT?

1. Specialised cells come in different shapes and sizes.
2. Different body cells are adapted to perform specific functions.
3. Each specialised group of cells will have the same shape and structure.

MUSCLE CELLS

1. Muscle cells are adapted for the special function of causing the body to move.
2. Each muscle cell contains tiny fibres that can contract and relax.
3. This process pulls on the bones and enables us to move.
4. There are over 350 different muscles in your body.
5. Muscle cells need lots of energy and so contain many mitochondria.
6. Mitochondria are responsible for producing energy.

TOPIC: Cells as the basic units of life

2. Explain this to the learners as follows:
 - a. **Macroscopic** organisms, such as plants and animals, are made of millions of cells. Macroscopic is the opposite of microscopic. Macroscopic means large and so macroscopic organisms can be seen without a microscope.
 - b. We call them multi-cellular organisms because 'multi' means many.
 - c. In multicellular organisms, different cells specialise in doing different jobs.
 - d. Different cells work together to ensure that the animal survives.
 - e. For example, muscle cells are able to contract and relax to enable your body to move.
 - f. As a result, muscle cells have lots of mitochondria.
 - g. Mitochondria create energy.
 - h. Show the learners Resource 5. Ask them to look at the difference in shape of cheek cells compared to muscle cells.
3. Ask the learners if they have any questions.
4. Tell the learners to copy the information written on the chalkboard into their workbooks.

Checkpoint 1

Ask learners the following questions to check their understanding at this point:

- a. What does multicellular mean?
- b. Why do muscle cells have lots of mitochondria?

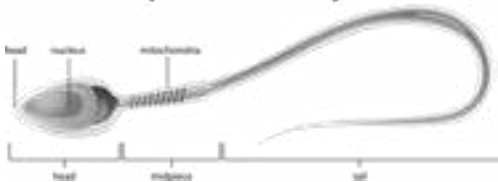


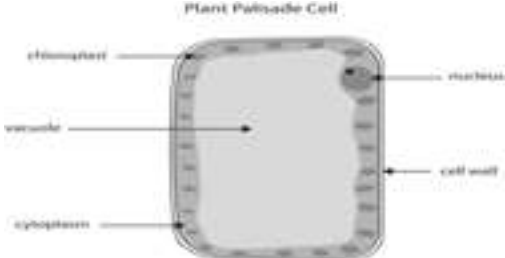
Answers to the checkpoint questions are as follows:

- a. Made up of many cells
- b. To create energy to help us to move.

E CONCEPTUAL DEVELOPMENT

1. Write the following onto the chalkboard (always try to do this before the lesson starts):

THE STRUCTURE AND FUNCTION OF SOME BODY CELLS

Name of cell	Function	How is its structure adapted to its function?
<p>Sperm cell (animal cell)</p> 	<p>Swims from male penis to the female egg cell for reproduction</p>	
<p>Root hair cell (plant cell)</p> 	<p>Takes up (absorbs) water and minerals for plant</p>	
<p>Red blood cell (animal cell)</p> 	<p>Carries oxygen from the lungs to body cells</p>	
<p>Palisade cell (cell found in leaves)</p> 	<p>Traps sunlight energy for photosynthesis</p>	

TOPIC: Cells as the basic units of life

TASK

1. Draw the table in your workbooks.
2. Look carefully at the drawings of the different cells.
3. Read the functions of each cell.
4. See if you can work out how the structure of the cell helps to carry out its function (job).

2. Explain the activity to the learners as follows:
 - a. You are going to complete the challenging task of working out how the structure of a cell allows it to carry out its function.
 - b. Function is another word for job or role.
 - c. You need to look very carefully at the drawing of each cell before filling in the third column.
 - d. You may use a pencil to write down what you see (observe) when you look at the drawing of the cell.
 - e. Read the function of the cell and try to work out how the structure allows it to perform its job.
 - f. Think of the muscle cell. Its function is to make you move by using energy. When you look at muscle cells, you will see that they have lots of mitochondria. Having lots of mitochondria allows muscle cells to do their job of moving your body.
 - g. You may work with a partner.
3. Allow the learners some time to complete this task.
4. With the learners' input, complete the model answer on the chalkboard:

Name of cell	Function	How is its structure adapted to its function?
Sperm cell (animal cell)	Swims from male penis to the female egg cell for reproduction	Tail allows it to swim to the egg. Many mitochondria give it energy to swim.
Root hair cell (plant cell)	Takes up (absorbs) water and minerals for plant	Long and thin so that it can reach far into the soil to search for far away water
Red blood cell (animal cell)	Carries oxygen from the lungs to body cells	Round flat shapes that have lots of space for oxygen to stick to the surface
Palisade cell (cell found in leaves)	Traps sunlight energy for photosynthesis	Many chloroplasts contain chlorophyll to trap sunlight.

TOPIC: Cells as the basic units of life

5. Discuss the answers with the learners.

Checkpoint 2

Ask the learners the following questions to check their understanding at this point:

- a. Why do different animal cells have different structures?
- b. What does macroscopic mean?

Answers to the checkpoint questions are as follows:

- a. Different animal cells have different functions.
- b. Can be seen with the naked eye; you do not need a microscope to view organisms.

6. Ask learners if they have any questions and provide answers and explanations.

F

REFERENCE POINTS FOR FURTHER DEVELOPMENT

If you need additional information or activities on this topic, you can find these in your textbook on the following pages:

NAME OF TEXTBOOK	TOPIC	PAGE NUMBER
Solutions for All	Cells as the basic units of life	15-17
Via Afrika	Cells as the basic units of life	13-14
Oxford Successful	Cells as the basic units of life	16
Pearson: Spot On	Cells as the basic units of life	10-12
Pearson: Platinum	Cells as the basic units of life	12
Shuters Top Class	Cells as the basic units of life	7
Step-by-Step	Cells as the basic units of life	13-14
Pelican Natural Sciences	Cells as the basic units of life	16-17
Sasol Inzalo Bk A	Cells as the basic units of life	22-24

G

ADDITIONAL ACTIVITIES/ READING

In addition, further reading, listening or viewing activities related to this sub-topic are available through the following web links:

1. <https://ed.ted.com/on/gyfZ8MW1> (4min 26sec) [Specialized Cells and Tissues]
2. http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa_pre_2011/cells/cells2.shtml [Interactive website on specialised cells]

TOPIC: Cells as the basic units of life

2C

Term 1, Week 2, Lesson C

Lesson Title: Cells are the basic unit of all living organisms

Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Cells as the basic units of life		
CAPS Page Number	57		
Lesson Objectives			
By the end of the lesson, learners will be able to:			
<ul style="list-style-type: none"> • differentiate between unicellular and multicellular organisms • explain that a group of cells forms a tissue, a group of tissues makes up an organ, and organs working together make up an organism • identify stem cells as cells that have the ability to divide and develop into many different cell types. 			
Specific Aims	1. DOING SCIENCE		
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS		✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE		✓

SCIENCE PROCESS SKILLS

1. Accessing & recalling Information	✓	6. Identifying problems & issues		11. Doing Investigations	
2. Observing	✓	7. Raising Questions		12. Recording Information	✓
3. Comparing		8. Predicting		13. Interpreting Information	
4. Measuring		9. Hypothesizing		14. Communicating	✓
5. Sorting & Classifying	✓	10. Planning Investigations		15. Scientific Process	

TOPIC: Cells as the basic units of life

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Projector, computer and internet	
Resource 6	

C CLASSROOM MANAGEMENT

1. Make sure that you are ready and prepared.
2. Write the following question onto the chalkboard before the lesson starts:

Why do sperm cells look different to muscle cells?

3. Learners should enter the classroom and answer the question in their workbooks.
4. Discuss the answer with the learners.
5. Write the model answer onto the chalkboard.

They have completely different jobs to perform. Sperm cells need to swim to the egg cell and muscle cells need to contract and relax to help us move.

D ACCESSING INFORMATION

1. Write the following onto the chalkboard (always try to do this before the lesson starts):

TISSUES, ORGANS AND SYSTEMS

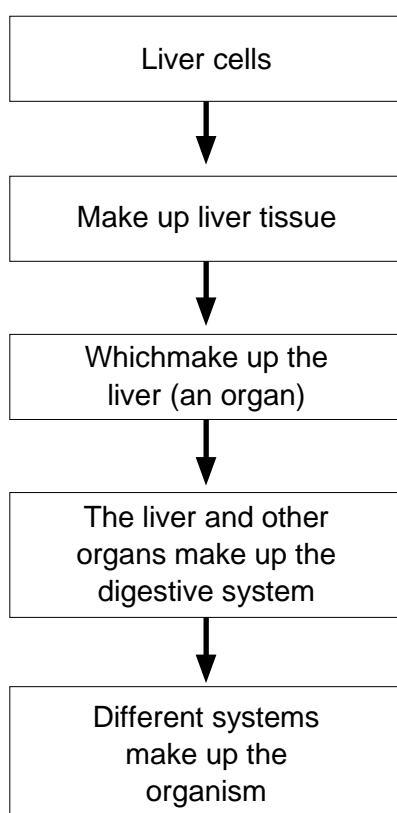
1. Similar cells group together to form tissues, such as nerve, blood or muscle tissues.
2. Different tissues form organs, such as the heart, brain and lungs.
3. These organs perform different roles in the human body.
4. Groups of organs work together to form systems within an animal and a plant.
5. Groups of systems working together form an organism, such as an animal or plant.
6. The body of any multicellular organism is made up of a number of systems.

D ACCESSING INFORMATION

1. Write the following onto the chalkboard (always try to do this before the lesson starts):

TISSUES, ORGANS AND SYSTEMS

1. Similar cells group together to form tissues, such as nerve, blood or muscle tissues.
2. Different tissues form organs, such as the heart, brain and lungs.
3. These organs perform different roles in the human body.
4. Groups of organs work together to form systems within an animal and a plant.
5. Groups of systems working together form an organism, such as an animal or plant.
6. The body of any multicellular organism is made up of a number of systems.



STEM CELLS

1. Stem cells are special cells found in humans, which are not specialised.
2. They have the ability to become many different cells, such as muscle or nerve cells.

TOPIC: Cells as the basic units of life

2. Explain this to the learners as follows:
 - a. Cells are specialised such that they perform certain functions and work together to keep the organism alive.
 - b. Examples of organisms include plants and animals.
 - c. Muscle cells must work together to keep the muscles alive.
 - d. A group of similar cells doing a specific function forms tissue.
 - e. Different tissues form an organ.
 - f. Several organs that work together form a system.
 - g. Organ systems all work together to form an organism.
 - h. In the next topic, we will look at seven systems in humans: the digestive system, circulatory system, respiratory system, musculoskeletal system, excretory system, nervous system and reproductive system.
 - i. Stem cells are groups of cells that are not specialised but can become many different cells.
3. Ask the learners if they have any questions.
4. Tell the learners to copy the information written on the chalkboard into their workbooks

Checkpoint 1

Ask learners the following questions to check their understanding at this point:

- a. What are stem cells?
- b. What is an organ made up of?

Answers to the checkpoint questions are as follows:

- a. A group of cells that are not specialised or the same
- b. A group of tissues that perform the same function.

E CONCEPTUAL DEVELOPMENT

1. Write and draw the following on the chalkboard (always try to do this before the lesson starts):

FROM CELL TO SYSTEM

leaf, kidney, heart, digestive system, stomach, rose tree, giraffe, blood, muscle cell, leg muscle, bone, brain, excretory system, nose, cartilage, white blood cell, bee

Cell	Tissue	Organ	System	Organism

2. Explain to the learners the activity as follows:
 - a. Draw the table in your workbooks.
 - b. Study the list of structures given above the table and place them in the correct columns in your table in your workbook.
 - c. Not every single block will be filled.
 - d. If you would like a challenge, you could try to fill in all the blocks.
 - e. Work on your own.
3. Allow the learners some time to complete this task.
4. With the learners' input, complete the model answer on the chalkboard:

FROM CELL TO SYSTEM

Cell	Tissue	Organ	System	Organism
		leaf		rose tree
		kidney	excretory system	giraffe
		stomach	digestive system	
white blood cell	blood	heart		bee
muscle cell	leg muscle			
	bone			
		brain		

5. Discuss the answers with the learners.

Checkpoint 2

Ask learners the following questions to check their understanding at this point.

- a. Name the seven systems in the human body.
- b. What unit makes up a system?

Answers to the checkpoint questions are as follows:

- a. Excretory system, digestive system, circulatory system, musculoskeletal system, nervous system, reproductive system, respiratory system
- b. A group of organs working together.

6. Ask the learners if they have any questions and provide answers and explanations.

F REFERENCE POINTS FOR FURTHER DEVELOPMENT

If you need additional information or activities on this topic, you can find these in your textbook on the following pages:

NAME OF TEXTBOOK	TOPIC	PAGE NUMBER
Solutions for All	Cells as the basic units of life	17
Via Afrika	Cells as the basic units of life	15, 19
Oxford Successful	Cells as the basic units of life	17-18
Pearson: Spot On	Cells as the basic units of life	13-14
Pearson: Platinum	Cells as the basic units of life	13
Shuters Top Class	Cells as the basic units of life	7-8
Step-by-Step	Cells as the basic units of life	13-14
Pelican Natural Sciences	Cells as the basic units of life	-
Sasol Inzalo Bk A	Cells as the basic units of life	25-26

G ADDITIONAL ACTIVITIES/ READING

In addition, further reading, listening or viewing activities related to this sub-topic are available through the following web links:

1. <http://www.bbc.co.uk/education/guides/zgcxsbk/revision> [Interactive website on Levels of Organisation]
2. <http://www.bbc.co.uk/education/guides/zgcxsbk/revision> (2min 3sec) [Cell to organism]