Interesting Science fact #12

Electric eels can produce strong electric shocks of around 500 volts for both self-defence and hunting.

NATURAL SCIENCES & TECHNOLOGY

LESSON PLAN
GRADE 6 TERM 3

A MESSAGE FROM THE NECT

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 and to help the DBE reach the NDP goals.

The NECT has successfully brought together groups of relevant people so that we can work collaboratively 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 embedding process.

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

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PROGRAMME ORIENTATION

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

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

Lesson Plan Structure

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

   1 x 1 hour 30 minutes

   2 x 1 hour

   This time allocation of 3.5 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 page **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 and technological 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':

- 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 natural sciences & technology****.* 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 AND DESIGN SKILLS that will be covered, and whether they are lower 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 focussed.

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.

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 Resource* section in the lesson plan will let you know which poster or reference pages 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 Resource 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 Science and Technology.

   - 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

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 Science and Technology 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 Science and Technology 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 two questions to check their understanding.
4. **Conceptual Development:** complete an activity to apply new knowledge or skills.
5. **Checkpoint 2:** ask learners 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 week to track your progress.

PROGRAMME ORIENTATION

A vehicle to implement CAPS

Teaching Natural Sciences & Technology 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 & Technology, 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 Technology 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, we took into consideration the realities of teachers and to this end, we made some simple adjustments, 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***

In most terms, there are Technology knowledge strands that complement the Natural Sciences strands. There are three Technology strands, they are:

- ***Structures***
- ***Systems and Control***
- ***Processing***

The distribution of these strands across the year is summarised in the tables below:

Grade 6							
Term 1		**Term 2**		**Term 3**		**Term 4**	
Strands NS & Tech		**Strands NS & Tech**		**Strands NS & Tech**		**Strands NS & Tech**	
Life and Living	**Processing**	**Matter and Materials**	**Processing**	**Energy and Change**	**Systems and Control**	**Planet Earth and Beyond**	**Systems and Control**
Photosynthesis Nutrients in Food Nutrition Eco Systems and food webs	Food Processing	Solids, liquids and gases Mixtures Solutions as special mixtures Mixtures and water resources	Processes to purify water	Electric circuits Electrical conductors and insulators Mains electricity	Systems to solve problems	The solar system Movements of the earth and planets The movement of the Moon	Systems looking into space Systems to explore the Moon and Mars
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

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).

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

Remember that one week equates to 3,5 hours or three lessons: two lessons of 1 hour each; and one lesson of 1½ hours.

	GRADE 4		GRADE 5		GRADE 6	
TERM	**Topic**	**Time in weeks**	**Topic**	**Time in weeks**	**Topic**	**Time in weeks**
Term 1: Life and Living	• Living and non-living things • Structures of plants and animals • What plants need to grow • Habitats of animals • Structures for animal shelters	2 2½ 1 1 2½ (10 wks)	• Plants and animals on Earth • Animal Skeletons • Food Chains • Life cycles • Skeletons and Structures	2½ 1½ 2½ 1½ 2 (10 wks)	• Photosynthesis • Nutrients in Food • Nutrition • Food Processing • Eco Systems and food webs	2½ 1½ 1½ 2½ 2 (10 wks)
Term 2: Matter and Materials	• Materials around us • Solid materials • Strengthening materials • Strong frame structures	3½ 2 2 2½ (10 wks)	• Metals and non-metals • Uses of metals • Processing materials • Processed materials	2 2½ 3½ 2 (10 wks)	• Solids, liquids and gases • Mixtures • Solutions as special mixtures • Dissolving • Mixtures and water resources • Processes to purify water	½ 1 2½ 1 2½ 2½ (10 wks)

Term 3: Energy and Change	• Energy and Energy transfer • Energy around us • Movement energy in a system • Energy and sound	2½ 2½ 2½ 2½ (10 wks)	• Stored energy in fuels • Energy and electricity • Energy and movement • Systems for moving things	3 3 1 3 (10 wks)	• Electric circuits • Electrical conductors and insulators • Systems to solve problems • Mains electricity	2½ 2 2½ 3 (10 wks)
Term 4: Planet Earth and Beyond	• Planet Earth • The Sun • The Earth & the Sun • The Moon • Rocket Systems	2 1 1 2 2 (8 wks)	• Planet Earth • Surface of the Earth • Sedimentary Rocks • Fossils	1 2½ 2 2½ (8 wks)	• The solar system • Movements of the earth and planets • The movement of the Moon • Systems looking into space • Systems to explore the Moon and Mars	2½ 1 1 1 2½ (8 wks)
TOTALS	38 weeks		38 weeks		38 weeks	

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 each – 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?		

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 checklist questions used effectively?		
16.	Overall reflection on this part of the lesson: What was done well? What could have been done better?		

PROGRAMME ORIENTATION

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 checklist 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:

Electric circuits

Term 3, Weeks 1A – 2C

A. TOPIC OVERVIEW

TERM 3, WEEKS 1A – 2C

- This topic runs for 2 weeks.
- It is presented over 6 lessons.
- This topic counts for 12% in the end-of--year exam.
- 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	C

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	C

B. SEQUENTIAL TABLE

GRADE 4	GRADE 5	GRADE 6&7
LOOKING BACK	**CURRENT**	**LOOKING FORWARD**
• Cells and batteries: in torches • A circuit is a system that transfers electrical energy to where it is needed • Connecting a cell, wires, a light bulb to make a simple circuit • Mains electricity: electricity is transferred from the power station to our homes and back again	• A simple circuit is a system for transferring energy • A circuit has three components: a source of energy; conducting material such as wires; a device like a light bulb; buzzers and motors for changing electricity to a useful output energy • A circuit is an unbroken pathway for electricity • A switch can be added to break or complete the circuit pathway • Investigate how to make a simple circuit with a switch	• Energy transfer in electrical systems: circuits and current electricity, components of a circuit • Series and parallel circuits: series circuits, parallel circuits • Output devices

	• Identify symbols used in circuit diagrams • Draw simple closed-circuit diagrams with a switch	

C. SCIENTIFIC AND TECHNOLOGICAL VOCABULARY

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

	TERM	EXPLANATION
1.	blades	The flat, wide section of a device like a fan or an oar
2.	source	Where a thing comes from or starts
3.	device	Something that changes one type of energy into a different type
4.	output energy	The type of energy after it has gone through a device
5.	components	Different parts of something
6.	pathway	A track that someone can walk along; a track that electricity can travel along
7.	control device	A switch which controls whether a device is on or off

D. UNDERSTANDING THE USES / VALUE OF SCIENCE

Modern life depends on the availability of electrical energy, so it is important for us to understand simple electrical circuits. Most of us use electricity every day to run appliances, give us light and heat, and to make things move. Understanding how to read and draw circuit diagrams is an important skill for anyone working with electrical devices.

E. PERSONAL REFLECTION

Reflect on your teaching at the end of each topic:

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

1 A

Term 3, Week 1, Lesson A
Lesson Title: A simple circuit
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Components of a simple circuit
CAPS Page Number	57

Lesson Objectives

By the end of the lesson, learners will be able to:

- name the three necessary components of a circuit
- state the purpose of each of these components.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS

1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing	✓	8. Predicting		14. Designing	
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 3: A simple circuit	

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 is the output energy of an electric stove?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

An electric stove's output energy is heat.

D ACCESSING INFORMATION

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

THE THREE COMPONENTS OF A CIRCUIT

1. A circuit has at least three components:
   a. a source of electrical energy
   b. conducting material such as wire, made from a metal
   c. a device that transfers energy for a useful purpose, such as a light bulb.
2. A cell or battery is a source of electrical energy.
3. The conducting wire connects the cell to the other components of the circuit.
4. The output device converts electrical energy to useful energy.
5. The conducting wire then connects the output device back to the cell.
6. This provides a closed sytem for the electrical energy to be transferred from the cell to the output device, and back to the cell.
7. This is called a circuit.

2. Explain fuels and petrol to the learners as follows:
   a. A circuit must have three components: a source of electrical energy, conducting wire and an output device.
   b. These three components must connect to make a circuit.
   c. Cells and batteries provide electrical energy.
   d. Electric wire is metal wire covered with insulator material.

e. The electric wire connects the source of energy to the output device.
f. The output device converts electrical energy to some form of useful energy.

3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. Name the three components that a circuit must have?
b. What does conducting wire do?

Answers to the checkpoint questions are as follows:

a. A circuit must have a source of energy, conducting material, and a device for changing electrical energy into useful output energy.
b. Conducting wire connects the source of energy to the output device and back to the source of energy.

E CONCEPTUAL DEVELOPMENT

1. TASK: FUELS AS SOURCES OF USEFUL ENERGY

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

OUTPUT DEVICES

1. Light bulbs are used in torches and lamps.
2. A light bulb changes electrical energy to light energy.
3. Buzzers are used for doorbells and in cell phones.
4. A buzzer changes electrical energy to sound energy.
5. Motors are used in washing machines and drills.
6. A motor changes electrical energy to movement energy.
7. These devices come in different sizes.

2. Explain this to the learners as follows:

a. Components are human products.
b. They are made to do a specific job.
c. Components change electrical energy to some other useful energy.
d. Show learners Resource 3.

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

ACTIVITY: COMPONENTS OF CIRCUITS

Copy and complete the following sentences. Choose words from the list below:
electrical, motors, wire, light bulb, cell.

1. A ____ is a source of energy of a simple circuit.
2. Electrical ____ is used to connect the different components of a circuit.
3. A ____ ____is an output device that changes ____ energy to light energy.
4. ____ are used as output devices in washing machines and drills.

4. Model answer:

ACTIVITY: COMPONENTS OF CIRCUITS

1. *A cell is a source of energy of a simple circuit.*
2. *Electrical wire is used to connect the different components of a circuit.*
3. *A light bulb is an output device that changes electrical energy to light energy.*
4. *Motors are used as output devices in washing machines and drills.*

Checkpoint 2

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

a. What output device changes electrical energy to movement energy?
b. What output device changes electrical energy to sound energy?

Answers to the checkpoint questions are as follows:

a. A motor changes electrical energy to movement energy.
b. A buzzer (or bell) changes electrical energy to sound energy.

5. 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
Study & Master	Electric circuits	98-100
Viva	Electric circuits	112
Platinum	Electric circuits	114-115
Solutions for All	Electric circuits	187-188
Day-by-Day	Electric circuits	-
Oxford	Electric circuits	87
Spot On	Electric circuits	53
Top Class	Electric circuits	93-94
Sasol Inzalo Bk B	Electric circuits	6-8

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://goo.gl/9LUNqD (3min 58sec) [How circuits and its components work]
2. https://goo.gl/zX2tBr [Parts of a simple circuit]

1 B

Term 3, Week 1, Lesson B
Lesson Title: A simple circuit
Time for lesson: 1½ hours

A POLICY AND OUTCOMES

Sub-Topic	A flow of energy in an electric circuit
CAPS Page Number	57

Lesson Objectives

By the end of the lesson, learners will be able to:

- draw a circuit with a cell, switch, light bulb and connecting wire
- understand that electrical energy flows along a path
- describe how a switch can make a break in the pathway
- make an on/off switch.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing		8. Predicting		14. Designing	✓
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	✓
5. Sorting & Classifying		11. Doing Investigations	✓	17. Communicating	
6. Identifying problems & issues		12. Recording Information	✓		

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 3: A simple circuit	
A paper clip, two drawing pins, electrical wire, a small piece of cardboard, a cell, a light bulb (if possible in a light bulb holder)	

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 is an output device in a circuit that produces sound energy?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

A buzzer produces sound energy.

D ACCESSING INFORMATION

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

A CIRCUIT IS A PATHWAY

1. When you connect all three different **components** (source, conducting wire and device) you make a circuit.
2. Wires connect the source of energy (cell) to the component and back to the source of energy.
3. This is an electrical system.
4. This system allows electrical energy to flow through it.
5. The electrical energy flows along a **pathway**.
6. When the pathway is unbroken and complete, we say it is closed.
7. This pathway is called a circuit.

2. Explain this to the learners as follows:
   a. An electric circuit is made up of different circuit components.
   b. If there is not break in the pathway, electrical energy will flow.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What electrical component connects a cell to an output device?
b. What is a closed pathway?

Answers to the checkpoint questions are as follows:

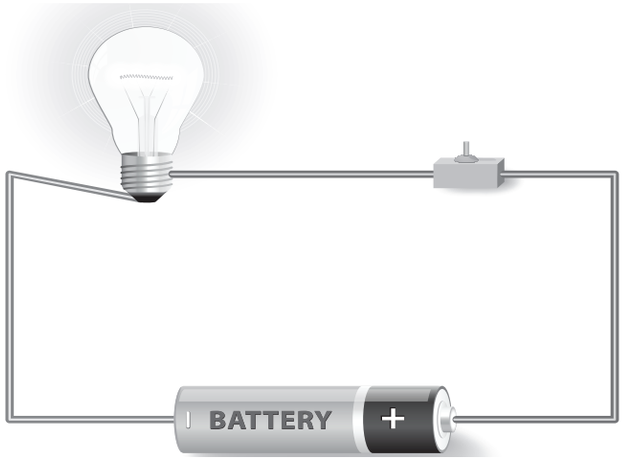
a. Wire will connect a cell to an output device.
b. It is a pathway that is unbroken and complete.

E CONCEPTUAL DEVELOPMENT

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

AN ELECTRICAL PATHWAY WITH A SWITCH

1. Electrical energy will flow through an unbroken and complete pathway.
2. The light bulb will light up.
3. If the switch is off, it will create a break in the pathway.
4. If the switch is on, it will create a closed circuit.
5. A switch is called a **control device**, as it controls the flow of energy.



2. Explain this to the learners as follows:
   a. how learners Resource 3: 'A simple circuit'.
   b. With your finger point to the cell.
   c. Explain that the electrical energy will flow from the '+' side of the cell.
   d. Trace the pathway with your finger to show the learners that the pathway is unbroken and complete.
   e. Trace from the cell, along the wire to the switch, along the wire to the light bulb, and along the wire back to the cell.
   f. The light bulb will change the electrical energy to light energy.
   g. The switch can make a break in the pathway.
   h. If the switch is off, it will make this break.
   i. The electrical energy cannot flow then.
   j. The light bulb will not turn on.

3. Give learners time to copy this information into their workbooks.
4. Activity: make a switch

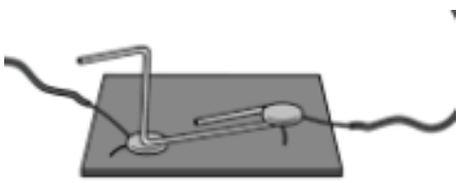
ACTIVITY: MAKE A SWITCH

YOU WILL NEED:

a metal paper clip
two drawing pins
two pieces of electrical wire
a small piece of cardboard.

METHOD

1. Take 1cm piece of plastic off each end of the two electrical wires.
2. Twist one end of the wire around the bottom of the drawing pin.
3. Twist one end of the second piece of wire around the bottom of the second drawing pin.
4. Press the drawing pins down into the cardboard.
5. Take the paper clip and put it around the pin of one of the drawing pins.
6. Press the drawing pin down into the cardboard.



TO TEST YOUR CIRCUIT

YOU WILL NEED:

one more piece of wire stripped of plastic at each end insulation tape.

1. Tape one end of the wire from one drawing pin to the positive (+) side of the cell.
2. Take the other wire from the other drawing pin and attach it to the light bulb.
3. Take the third piece of wire and attach one end to the other side of the light bulb.
4. Attach the other side to this wire, to the negative (-) side of the cell.
5. This will create a circuit with a complete pathway.
6. If the switch is working, the light bulb will go on when you touch both drawing pins with the paper clip.

5. Explain this to the learners as follows:
   a. This will be a teacher-led demonstration.
   b. Demonstrate to the learners how to make a switch.
   c. Test the switch by attaching a light bulb and a cell to the switch.
   d. Leave these instructions on the chalkboard for learners to follow in the next lesson.
   e. They will be making a switch in the next lesson.

Checkpoint 2

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

a. What component controls the flow of electrical energy in a circuit?
b. If there is a break in the pathway, will the switch be 'on' or 'off'?

Answers to the checkpoint questions are as follows:

a. A switch controls the flow of electrical energy in a circuit.
b. The switch will be 'off'.

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
Study & Master	Electric circuits	99
Viva	Electric circuits	111
Platinum	Electric circuits	115-117
Solutions for All	Electric circuits	189-191
Day-by-Day	Electric circuits	116-117
Oxford	Electric circuits	87-89
Spot On	Electric circuits	54
Top Class	Electric circuits	95
Sasol Inzalo Bk B	Electric circuits	6-8

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.tomnewbyschool.co.za/wp-content/uploads/2017/07/Grd-6-NS-Tech-T3-2017-approved.pdf [Unit 1 - Electric circuits]
2. https://goo.gl/RhUAXX (23sec) [Paper clip switch]
3. https://goo.gl/jq9TvY (4min 48sec) [A paper-clip switch]

1 C

Term 3, Week 1, Lesson C
Lesson Title: A system for transferring energy
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	A simple circuit
CAPS Page Number	57

Lesson Objectives

By the end of the lesson, learners will be able to:

- describe energy as a system
- follow the pathway of electrical energy from its source to the output energy of an appliance and back.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing	✓	8. Predicting		14. Designing	
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	
6. Identifying problems & issues		12. Recording Information	✓		

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 1: A torch	
Resource 2: A fan	

C CLASSROOM MANAGEMENT

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

Can you name one method that can be used to remove all harmful organisms from cleaned water?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

Either of the following two answers: boiling, or adding chemicals such as chlorine.

D ACCESSING INFORMATION

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

A SYSTEM FOR TRANSFERRING ENERGY

1. Electricity is a form of energy.
2. Electrical appliances change electrical energy into another form of energy.
3. This energy could be light, heat, sound or movement.
4. Chemical potential energy is stored in cells and batteries.
5. An electric circuit is a system for transferring energy from cells or batteries to where it is needed, and then back to the cells or batteries.
6. Circuits can be very large, like the circuit that brings electrical energy to our homes and businesses.
7. These large circuits transfer electrical energy from the power station to our homes and businesses, and back again to the power station.
8. Circuits, like a torch, can be very small.
9. A circuit in a torch will transfer chemical energy to other forms depending on the component.

2. Explain this to the learners as follows:
    a. Electricity is a form of energy.
    b. A circuit provides a pathway for electrical energy to flow from a **source** such as a cell, battery or mains electricity, to where it is needed, and back to the source.
    c. The circuit must be a closed system for the energy to be transferred to where it is needed.
    d. Show learners Resource 1: 'A torch'.
    e. The torch will convert electrical energy to light energy and a small amount of heat energy.
    f. The energy is transferred along the wires from the cells to the light bulb and back again.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. Where is electrical energy stored?
b. What is an electric circuit?

Answers to the checkpoint questions are as follows:

a. Electrical energy is stored in cells and batteries.
b. An electric circuit transfers energy from cells and batteries to where it is needed and back.

E CONCEPTUAL DEVELOPMENT

1. Explain the following to the learners:

TRANSFER OF ENERGY TO WHERE IT IS NEEDED

1. Electric appliances need electrical energy to work.
2. A circuit will transfer electric energy from the source of energy to the appliance, and back again to the source of energy.
3. The appliance will then change (convert) some of the electrical energy to another energy, such as light, sound, heat or movement.
4. The electric energy then travels back to the source.

2. Explain this to the learners as follows:
    a. An electric circuit transfers electrical energy from its source, a cell or battery, to the output **device** (light bulb, buzzer, heater, fan).
    b. The appliance will change (convert) the electrical energy to another orm of energy.
    c. A torch converts electrical energy to light and heat energy.
    d. A fan converts electrical energy to movement energy.
    e. Show learners Resource 2: 'An electric fan'.

f. The energy is transferred from mains electricity to the fan.
g. The fan changes (converts) the electrical energy to movement energy.
h. The blades on the fan move to make the air move.
i. A doorbell converts (changes) electrical energy to sound energy.
j. A heater converts electrical energy to heat energy.

3. Give learners time to copy this information into their workbooks.
4. Activity: Identify output energy of appliances

IDENTIFY THE OUTPUT ENERGY

Each of the appliances below changes (converts) electrical energy to some other useful, output energy.

Copy and complete the table below:

APPLICANCE	**OUTPUT ENERGY**
electric stove	
electric light	
vacuum cleaner	
electric kettle	
head-lights on a car	
door bell	

5. Model answer:

IDENTIFY THE OUTPUT ENERGY

APPLICANCE	***OUTPUT ENERGY***
electric stove	*heat*
electric light	*light and small amount of heat*
vacuum cleaner	*movement*
electric kettle	*heat*
head-lights on a car	*light*
doorbell	*sound*

Checkpoint 2

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

a. If an electric fan is plugged into a wall socket, where is the fan receiving its source of electricity from?
b. With a fan, the electrical energy is converted to what type of energy?

Answers to the checkpoint questions are as follows:

a. It is receiving its source of electricity from mains electricity.
b. Electrical energy is converted to movement energy.

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
Study & Master	Electric circuits	97-98
Viva	Electric circuits	106-108
Platinum	Electric circuits	114
Solutions for All	Electric circuits	186-187
Day-by-Day	Electric circuits	116
Oxford	Electric circuits	86
Spot On	Electric circuits	52
Top Class	Electric circuits	92-93
Sasol Inzalo Bk B	Electric circuits	4-6

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://goo.gl/3Btjyw (5min 46sec) [Science for Kids: Energy Transformations Video]
2. https://goo.gl/k51yz7 (4min 18sec) [What is energy – types of energy?]
3. https://goo.gl/ssG978 (4min 35sec) [What is energy?]

2 A

Term 3, Week 2, Lesson A
Lesson Title: A simple circuit
Time for lesson: 1½ hours

A POLICY AND OUTCOMES

Sub-Topic	Open and closed switch
CAPS Page Number	57

Lesson Objectives

By the end of the lesson, learners will be able to:

- make a switch with a paper clip
- make a circuit according to a circuit diagram
- test the circuit.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing		8. Predicting		14. Designing	✓
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations	✓	17. Communicating	✓
6. Identifying problems & issues		12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 3: A simple circuit	
Resource 4: A switch made with a paper clip	
For each group, for the circuit: A 1,5V light bulb, a light bulb holder, a 1,5V cell, masking tape, one metre of electric wire, pair of scissors	
For each group for the switch: A metal paper clip, two drawing pins, electrical wire, a small piece of cardboard, a cell, a light bulb (if possible in a light bulb holder)	

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 is a switch called a control device?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

The flow of energy.

D ACCESSING INFORMATION

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

MAKE A CIRCUIT WITH A SWITCH

1. A circuit must have at least three components.
2. It must have a source of electrical energy (a cell), connecting wire, and a light bulb.
3. A switch can be added to a circuit.
4. A switch can create a break in the pathway so that the output device will not go on.

2. Explain this to the learners as follows:
   a. It is important to know that a circuit must have at least three components: a cell, connecting wire, and an output device.
   b. When all of these are connected, a pathway will be made.
   c. This is a circuit.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What connects the source of electrical energy in a circuit to the output device?
b. What control component can be added to a circuit which would make a break in the circuit?

Answers to the checkpoint questions are as follows:

a. Connecting wire will connect the source of electrical energy to the output device.
b. A switch can be added to a circuit. It will make a break in the circuit.

E CONCEPTUAL DEVELOPMENT

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

MAKE A CIRCUIT WITH A SWITCH

FOR THE SWITCH, YOU WILL NEED:

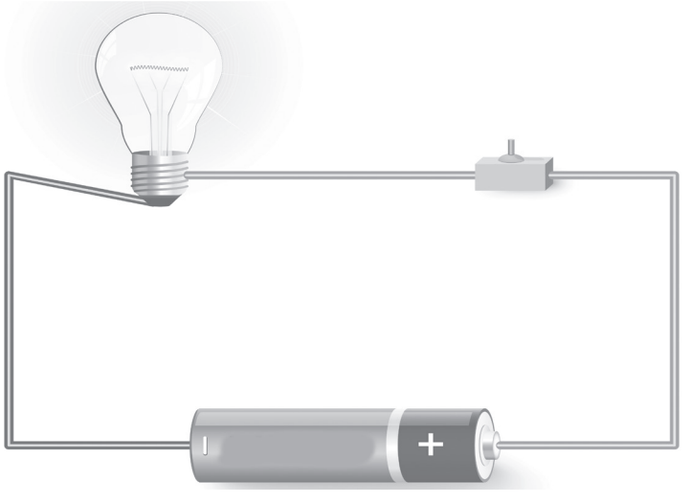
a metal paper clip
two drawing pins
60cm electrical wire
a small piece of cardboard.

METHOD

1. Gather all the materials to make the switch.
2. Make the switch according to the teacher's demonstration in the previous lesson.
3. Test the switch to see if it works.

FOR THE CIRCUIT, YOU WILL NEED:

a 1,5V light bulb
a light bulb holder
a 1,5V cell
masking tape
30cm electrical wire.



1. Gather all the materials to make the circuit.
2. Follow the circuit diagram.
3. Place the light bulb in the holder.
4. Take the plastic off 1cm at each end of the piece of wire. Use a pair of scissors carefully for this purpose.
5. Attach one piece of wire to the positive (+) side of the cell with masking tape.
6. Attach the other end to the light bulb holder (some light bulb holders have screws to wrap the wire around, otherwise use masking tape).
7. Attach one end of one of the wires from the switch to the other light bulb holder screw.
8. Attach one end of the second piece of wire from the switch to the negative (-) side of the cell.
9. Test your circuit by placing the paper clip across both drawing pins.
10. The light bulb should switch on.
11. If it does not switch on, check that all the connections are good.

2. Explain this to the learners as follows:
   a. Learners must work in groups of 4-6 for this activity.
   b. One member from each group must collect the materials to make a switch.
   c. Each group must make a switch.
   d. Each group should test their switch to see if it is working.
   e. The teacher will set up a cell and a light bulb in the front of the class for testing the switches.
   f. One member from each group must collect the materials needed to make the circuit.
   g. Learners must follow the instructions carefully.
   h. Read through the instructions with the learners before they start to make their circuit.
   i. Each group must test their circuit.
   j. If it does not work, check the connections, and check whether the cell still has electrical energy stored (it is not dead).
   k. Each group must tidy up their work space.
   l. Keep the circuit for the next lesson.

Checkpoint 2

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

a. If your circuit does not work, what should you check?
b. What is the output device in this circuit?

Answers to the checkpoint questions are as follows:

a. We must check that all the connections are good and that the cell is charged with electrical energy.
b. The output device is a light bulb.

3. 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
Study & Master	Electric circuits	101
Viva	Electric circuits	114-116
Platinum	Electric circuits	119-120
Solutions for All	Electric circuits	191-193
Day-by-Day	Electric circuits	118
Oxford	Electric circuits	89
Spot On	Electric circuits	55
Top Class	Electric circuits	95-98
Sasol Inzalo Bk B	Electric circuits	13-15

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://goo.gl/u2yPKP (2min 7sec) [How to make a simple circuit with on/off switch for a light bulb]
2. https://goo.gl/hSPEXW [Build a circuit]
3. https://goo.gl/4YCVDs [How to make a simple circuit with a light bulb]

2 B

Term 3, Week 2, Lesson B
Lesson Title: Circuit symbols
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	A simple circuit
CAPS Page Number	57

Lesson Objectives

By the end of the lesson, learners will be able to:

- identify the correct symbol for the electrical component it represents
- describe the function of each component.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing	✓	8. Predicting		14. Designing	
3. Comparing	✓	9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying	✓	11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES

C CLASSROOM MANAGEMENT

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

Can you give one reason why a circuit would not work when switched on or it is closed?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

There could be a bad connection or the cell could be dead.

D ACCESSING INFORMATION

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

CIRCUIT SYMBOLS

1. Each component in a circuit has its own symbol.
2. Here is a table that shows circuit symbols:

Component	Symbol	Function (purpose)
cell		a source of electrical energy
battery		a source of electrical energy
light bulb		converts electrical energy to light energy
open switch		stops the flow of electrical energy by making a break in the pathway
wire		gives electrical energy a path to travel along

2. Explain this to the learners as follows:
   a. Each component has its own symbol.
   b. This is the same around the world.
   c. This is very important because everyone, no matter what language they speak, can follow a circuit.
   d. Read through the functions of each component and make sure the learners understand these functions.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What component has the symbol? 
b. What is the function of this component?

Answers to the checkpoint questions are as follows:

a. This is the symbol for a light bulb.
b. A light bulb converts electrical energy to light energy.

E CONCEPTUAL DEVELOPMENT

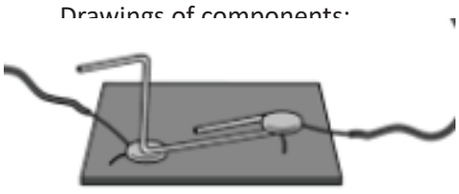
1. Write the following on the chalkboard (always try to do this before the lesson starts):
   Activity: Match components with their circuit diagram symbols.

ACTIVITY: MATCH THE COMPONENTS TO THE CORRECT SYMBOL

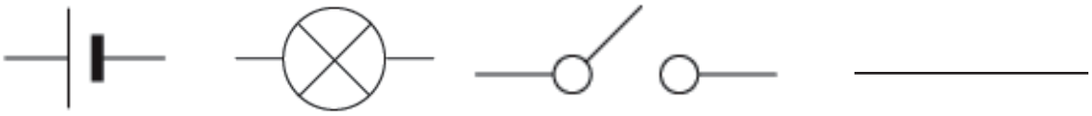
1. Copy the table and fill in the answers from the information given below: Provide learners with components

Component	Drawing of component	Symbol
switch		
cell		
light bulb		
wire		

Drawings of components:

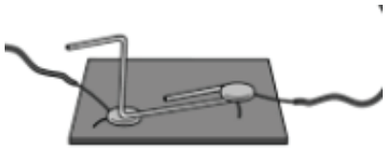
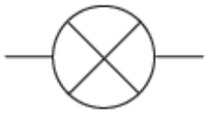


Symbols of components:



2. Explain this to the learners as follows:
   a. Copy the table into your workbooks.
   b. Using the drawings and symbols, copy these into the correct places in the table.
   c. Check your answers with a partner.
   d. Give the learners the correct answers.
3. Model answer:

MATCH THE COMPONENTS TO THE CORRECT SYMBOL

Component	***Drawing of component***	***Symbol***
switch		
cell		
light bulb		
wire		

Checkpoint 2

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

a. Is the following a symbol for a cell or a bulb? 
b. Why do we have symbols for electrical components?

Answers to the checkpoint questions are as follows:

a. It is the symbol for a battery.
b. We have symbols so that everyone, no matter what language they speak, can understand them.

4. 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
Study & Master	Electric circuits	102
Viva	Electric circuits	112
Platinum	Electric circuits	121-122
Solutions for All	Electric circuits	194-195
Day-by-Day	Electric circuits	119
Oxford	Electric circuits	90-91
Spot On	Electric circuits	56
Top Class	Electric circuits	99
Sasol Inzalo Bk B	Electric circuits	23

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://itcteacheronthetrail.files.wordpress.com/2015/10/circuit-symbols-pdf.pdf [Circuit diagrams and symbols]
2. https://goo.gl/xtSekf (1min 40sec) [Symbols of electric circuit components]
3. https://goo.gl/G7Nwuw (1min 9sec) [How to draw an electric circuit]

2 C

Term 3, Week 2, Lesson C
Lesson Title: Drawing circuit diagrams
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	A simple circuit
CAPS Page Number	57

Lesson Objectives

By the end of the lesson, learners will be able to:

- describe a circuit from a circuit diagram
- draw a circuit representing an existing circuit.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing		8. Predicting		14. Designing	✓
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information			

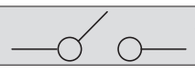
B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resources 5-10: A circuit with two light bulbs	

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 electrical component represnted by the following symbol:  ?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

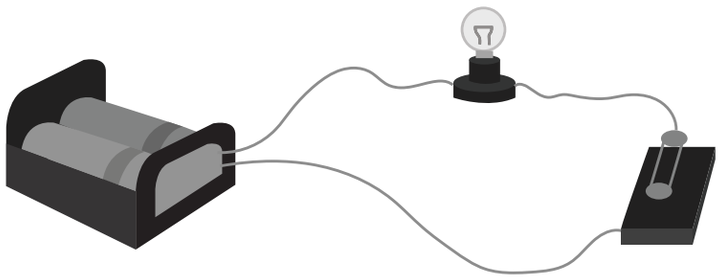
This symbol is for a switch.

D ACCESSING INFORMATION

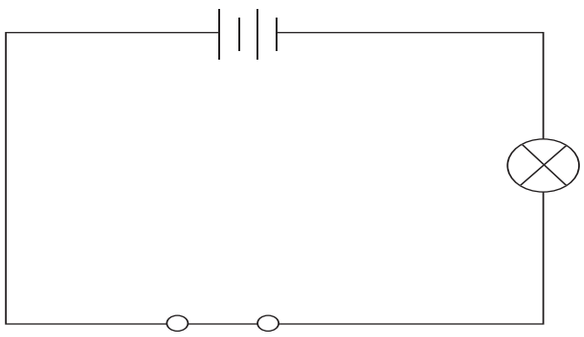
1. Write the following onto the chalkboard (always try to do this before the lesson starts):

DRAWING ELECTRICAL CIRCUIT DIAGRAMS

1. We draw circuit diagrams with symbols.
2. We do this so that everyone can understand the circuit.
3. Here is a drawing of a circuit with two cells, a light bulb and a switch.



4. Here is a circuit diagram for this circuit.



2. Explain this to the learners as follows:
    a. We draw circuit diagrams as not everyone can draw well.
    b. If we do this, everyone can understand.
    c. Point out the two cells in the drawing.
    d. Show learners what this looks like on the circuit diagram.
    e. Point out the light bulb in the drawing.
    f. Show learners what this looks like on the circuit diagram.
    g. Point out the closed switch in the drawing.
    h. Show learners what this looks like on the circuit diagram.
3. Write the following on the chalkboard (always try to do this before the lesson starts):

DRAWING CIRCUIT DIAGRAMS

1. To draw a circuit diagram, start with the symbol for the cell/ battery at the top.
2. Use straight lines to represent the wires that connect the components.
3. This is always drawn as a rectangle.
4. Now draw the symbol for the next component on the side.
5. Continue until all the components have been drawn.

4. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. Is this statement true or false: A circuit diagram uses symbols of components?
b. Is this statement true or false: We use symbols so that everyone can understand them?

Answers to the checkpoint questions are as follows:

a. False: A circuit diagram uses symbols for components.
b. True

E CONCEPTUAL DEVELOPMENT

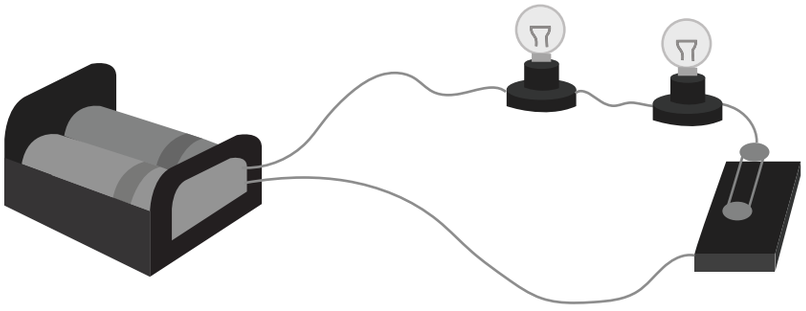
1. Write the following on the chalkboard (always try to do this before the lesson starts):
   Activity: Match components with their circuit diagram symbols.

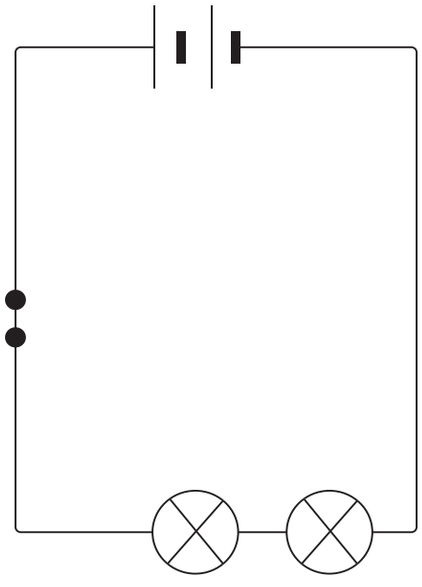
DRAWING CIRCUIT DIAGRAMS

1. Draw a circuit diagram, use resources 5 and 6.
2. Give your circuit a title.
3. Use the correct symbols for the components.

2. Explain this to the learners as follows:
   a. Give learners Resources 5-10.
   b. This shows the circuit drawing.
   c. Learners will draw a circuit diagram of this drawing.
   d. Remind learners about the correct way to draw circuit diagrams from the previous section.
   e. Learners must use a ruler and sharp pencil.
3. Model answer

A CIRCUIT DIAGRAM OF TWO LIGHT BULBS





Checkpoint 2

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

a. Is this statement true or false: A circuit diagram shows the order in which components are placed in the circuit?
b. Is this statement true or false: A circuit will work when the switch is closed?

Answers to the checkpoint questions are as follows:

a. False
b. True

4. 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
Study & Master	Electric circuits	103
Viva	Electric circuits	113-114
Platinum	Electric circuits	123
Solutions for All	Electric circuits	195
Day-by-Day	Electric circuits	120-121
Oxford	Electric circuits	91-92
Spot On	Electric circuits	57
Top Class	Electric circuits	98
Sasol Inzalo Bk B	Electric circuits	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://goo.gl/7RnGBA [Simple electrical circuit]
2. https://goo.gl/oC92fd [Electric circuits]

TOPIC OVERVIEW:

Electrical conductors and insulators

Term 3, Weeks 3A – 4B

A. TOPIC OVERVIEW

TERM 3, WEEKS 3A – 4B

- This topic runs for 1½ weeks.
- It is presented over 5 lessons.
- This topic counts for 10% in the end-of-year exam.
- 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	C

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	C

B. SEQUENTIAL TABLE

GRADE 4&5	GRADE 6	GRADE 7&8
LOOKING BACK	**CURRENT**	**LOOKING FORWARD**
• Energy can be transferred from a source to where it is needed	• Conductors: most metals conduct electricity • Test different materials in an electric circuit to see if they are good conductors; record results in a table • Insulators: most non-metals do not conduct electricity • Test different materials in an electric circuit to see if they are insulators; record results in a table • Identify uses for when electrical insulators are used; insulating wires, ceramics on power lines	• Insulation and energy saving: using insulating materials

C. SCIENTIFIC AND TECHNOLOGICAL VOCABULARY

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

	TERM	EXPLANATION
1.	insulator	Material that does not allow electricity to pass through it
2.	conductor	Material that allows electricity to pass through it
3.	record	To write down what you observe
4.	filament	The metal wire inside a light bulb

D. UNDERSTANDING THE USES / VALUE OF SCIENCE

A knowledge of insulating materials enables electricians to work safely. Electricity can be dangerous, so it is important to understand which materials conduct electricity and which do not.

E. PERSONAL REFLECTION

Reflect on your teaching at the end of each topic:

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

3 A

Term 3, Week 3, Lesson A
Lesson Title: Conductors
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Some materials conduct electricity
CAPS Page Number	58

Lesson Objectives

By the end of the lesson, learners will be able to:

- describe the meaning of conductivity
- identify materials that conduct electricity.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing	✓	8. Predicting		14. Designing	
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information	✓		

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 11: An electrical pylon	
Resource 12: Electrical wires	

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 electrical component connects the source of electrical energy (a cell or battery) to the output device?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

> *Electrical wire connects the source of electrical energy to the output device.*

D ACCESSING INFORMATION

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

> CONDUCTIVITY
>
> 1. Electricity can pass through some materials but not others.
> 2. If electrical energy can pass through a material, the material is a **conductor** of electricity.
> 3. Most metals are good conductors.
> 4. Water conducts electricity.
> 5. Electrical appliances should not be situated near water.

2. Explain this to the learners as follows:
   a. A material is a good conductor of electricity, if it allows electrical energy to pass through it.
   b. Metals are good conductors of electricity.
   c. Water is also a good conductor of electricity.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What is a conductor?
b. Is water a conductor of electricity?

Answers to the checkpoint questions are as follows:

c. A conductor is a material that electrical energy can pass through.
d. b. Yes, water is a good conductor of electricity.

E CONCEPTUAL DEVELOPMENT

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

ELECTRICAL SYSTEMS THAT USE CONDUCTORS

1. In electrical systems, metals are used to transfer electrical energy from one part of the system to another.
2. Electrical wire that is used to connect electrical components in a circuit is usually made from copper.
3. Copper is a very good conductor.
4. This electrical wire transfers electrical energy from one component to another.
5. Other metals, like gold, silver and iron, are also good conductors.
6. Copper is cheaper than gold or silver.
7. Metal is used in electric plugs.
8. Metal is also used in a light bulb.
9. The metal filament conducts electricity and causes the light bulb to light up.

2. Explain this to the learners as follows:
   a. Electrical wire is normally made from copper wire.
   b. Wire is a good conductor of electricity.
   c. Electric plugs use metal to conduct electrical energy from the socket to the wire.
   d. Show learners Resource 11: ‘An electrical pylon’.
   e. These wires held up by a pylon carry electrical energy.
   f. Show learners Resource 12: ‘Electrical wire made from copper’.
   g. Inside the plastic coating is copper wire.
   h. Electrical energy travels along this copper wire.
   i. Show learners Resource 13: ‘A light bulb’.
   j. Explain that the filament (the metal wire part inside the light bulb) conducts electrical energy and changes to light energy.
3. Give learners some time to copy this information into their workbooks.
4. ACTIVITY: Conductors

TOPIC: Electrical conductors and insulators

ACTIVITY: CONDUCTORS

Copy and complete the following sentences by using words from the list below:

conductor, iron, plug, water, silver, wire.

1. Electrical ____ is normally made from copper.
2. This is because copper is a ____ of electricity.
3. ____ is a good conductor of electricity.
4. The prongs on an electric ___ are made from metal.
5. Gold, ____ and ___ are metals that are good conductors.

5. Model answer

ACTIVITY: CONDUCTORS

1. *Electrical wire is normally made from copper.*
2. *This is because copper is a conductor of electricity.*
3. *Water is a good conductor of electricity.*
4. *The prongs on an electric plug are made from metal.*
5. *Gold, silver and iron are metals that are good conductors.*

Checkpoint 2

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

a. What metal is used in electrical wire?
b. Name two other metals that are good conductors?

Answers to the checkpoint questions are as follows:

a. Copper is used in electrical wire.
b. Either of the following two metals: gold, silver, iron.

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
Study & Master	Electrical conductors and insulators	104
Viva	Electrical conductors and insulators	117
Platinum	Electrical conductors and insulators	126
Solutions for All	Electrical conductors and insulators	203-204
Day-by-Day	Electrical conductors and insulators	125
Oxford	Electrical conductors and insulators	93; 95
Spot On	Electrical conductors and insulators	59
Top Class	Electrical conductors and insulators	101
Sasol Inzalo Bk B	Electrical conductors and insulators	32

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://goo.gl/n9t0J4 (3min 19sec) [Conductors and insulators]
2. https://goo.gl/hZ7OrF (10min 10sec) [Conductors and insulators – Electricity]

3 B

Term 3, Week 3, Lesson B
Lesson Title: Conductors
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Test materials for conductivity
CAPS Page Number	58

Lesson Objectives

By the end of the lesson, learners will be able to:

- set up a test for conductivity
- record these results in a table.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing		8. Predicting		14. Designing	
3. Comparing	✓	9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying	✓	11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information	✓		

TOPIC: Electrical conductors and insulators

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Two 1,5V cells, a cell holder, a 1,5V bulb, three 15 cm pieces of wire	
Metal paper clips, nail, metal teaspoon, plastic teaspoon, china cup, paper, elastic band, chalk.	
Resources 14-18: A circuit to test for conductivity	

C CLASSROOM MANAGEMENT

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

Is copper a good conductor of electricity?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

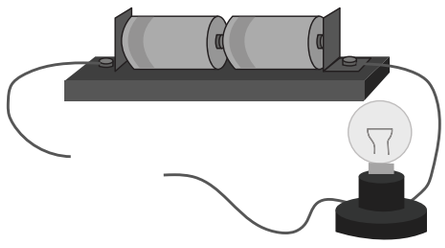
Yes, copper is a good conductor of electricity.

D ACCESSING INFORMATION

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

TESTING FOR CONDUCTIVITY

1. You will set up a circuit with a light bulb.
   You will need:
   two 1,5V cells
   a cell holder
   a 1,5V bulb
   three 15 cm pieces of wire.
2. Make the circuit according to the drawing below.



3. To test for conductivity, touch the two wires an either side of the object.
4. If the light bulb lights up, the object is a conductor of electricity.

2. Explain this to the learners as follows:
    a. Read through the information on the chalkboard.
    b. Explain to the learners that they will place the object they are testing for conductivity between the two wires.
    c. If the light bulb lights up, then the material that the object is made from will be a conductor.
    d. We know this as the object will have created a pathway for the electrical energy to travel.
    e. If the object is not a conductor, electrical energy will not have a pathway along which to travel – there will be a break in the pathway.
    f. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What is a cell holder?
b. In the circuit you have drawn, what type of object will make the light bulb light up?

Answers to the checkpoint questions are as follows:

a. A cell holder holds two cells.
b. The light bulb will light up when an object that is a conductor of electricity is placed between the two wires.

E CONCEPTUAL DEVELOPMENT

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

MAKE A CIRCUIT TO TEST FOR CONDUCTIVITY

1. Gather the materials from the list.
2. Make the circuit according to the drawing.
3. Draw the following table in your workbooks:

TABLE TO RECORD CONDUCTIVITY RESULTS

Object	Material of object	Did bulb light up?	Is the material a conductor of electricity?
metal paper clips			
nail			
metal teaspoon			
plastic teaspoon			
china cup			
piece of paper			
elastic band			

chalk			
stick			
pencil sharpener (metal)			

4. Take each object and touch both wires to either side of the object.
5. **Record** your results.
6. Find two other objects of your choice and insert them in the table.
7. One should be a conductor and one not.
8. Record your results.

2. Explain this to the learners as follows:
   a. Ask learners to copy the table into their workbooks.
   b. Put learners into groups of four to six.
   c. One member from each group needs gather the materials for the circuit.
   d. Learners must make the circuit according to the drawing.
   e. Learners must then take each object and place it between the two wires.
   f. They must touch the object on each side with the wires.
   g. Learners must record their results in the table.
   h. The material will be a conductor of electricity when the light bulb lights up.
   i. When the light bulb lights up it means that a complete pathway has been made.
3. A model answer:

TABLE TO RECORD CONDUCTIVITY RESULTS

Object	**Material of object**	**Did bulb light up?**	**Is the material a conductor of electricity?**
metal paper clips	*metal*	*Yes*	*Yes*
nail	*metal*	*Yes*	*Yes*
metal teaspoon	*metal*	*Yes*	*Yes*
plastic teaspoon	*plastic*	*No*	*No*
china cup	*china*	*No*	*No*
piece of paper	*paper*	*No*	*No*
elastic band	*rubber*	*No*	*No*
chalk	*chalk*	*No*	*No*
stick	*wood*	*No*	*No*
pencil sharpener (metal)	*metal*	*Yes*	*Yes*

Checkpoint 2

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

a. Is a metal teaspoon a conductor of electricity?
b. Is a wooden stick a conductor of electricity?

Answers to the checkpoint questions are as follows:

a. Yes, it is made of metal.
b. No, wood is not a conductor of electricity.

4. 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
Study & Master	Electrical conductors and insulators	105
Viva	Electrical conductors and insulators	118
Platinum	Electrical conductors and insulators	128-129
Solutions for All	Electrical conductors and insulators	205-206
Day-by-Day	Electrical conductors and insulators	126-127
Oxford	Electrical conductors and insulators	93-95
Spot On	Electrical conductors and insulators	58-59
Top Class	Electrical conductors and insulators	102
Sasol Inzalo Bk B	Electrical conductors and insulators	33-37

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://goo.gl/CKDBaL [Teacher Vision: Investigate activity: testing electrical conductivity]
2. ttps://www.sciencelearn.org.nz/documents/406-testing-for-conductivity [Testing conductivity]
3. https://goo.gl/PRm7nd (4min 15sec) [Electrical conductivity]

3 C

Term 3, Week 3, Lesson C
Lesson Title: Insulators
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Some materials are insulators
CAPS Page Number	58

Lesson Objectives

By the end of the lesson, learners will be able to:

- describe the meaning of insulating
- identify materials that insulate electrical energy.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing	✓	8. Predicting	✓	14. Designing	
3. Comparing	✓	9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 12: Electrical wire made from copper	
Resource 19: Men working safely on a pylon with insulators	
Resource 20: An insulator for a pylon	

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 must you be careful with electrical appliances when working near water?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

Yes, because water is a good conductor of electricity, and therefore you can get shocked.

D ACCESSING INFORMATION

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

INSULATORS

1. Some materials do not let electrical energy travel through them. These are known as **insulators**.
2. Plastic, wood, glass and rubber are insulators. These materials are used to cover other materials that carry electricity.

2. Explain this to the learners as follows:
   a. Remind learners that materials that let electrical energy pass through them are called conductors.
   b. Tell them that materials that do not let electrical energy travel through them are called insulators.
3. Show and explain the following photographs to the learners:
   a. Show learners Resource 12: ‘Electrical wire made from copper’.
   b. Point out the plastic coating on the wires.
   c. The wire conducts electrical energy, and the plastic coating insulates against electrical energy.
   d. This means you will not get shocked by the electricity.
   e. Show learners Resource 19: ‘Men working safely on an electric pylon’.

f. Show learners Resource 20: 'An insulator for a pylon'.
g. Men can work on an electric pylon as there are insulators on these pylons that protect them.
h. The insulators will be made of ceramics, an insulating material.

3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. Is glass an insulator of electrical energy?
b. Is copper wire an insulator of electrical energy?

Answers to the checkpoint questions are as follows:

a. Yes, glass is an insulator of electrical energy.
b. No, copper wire is not an insulator of electrical energy.

E CONCEPTUAL DEVELOPMENT

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

INSULATORS OR CONDUCTORS

1. Copy and complete the table below:

Material	**Is this material an insulator?**
glass	
gold	
water	
plastic	
rubber	
aluminium	
wood	

2. Explain this to the learners as follows:
   a. Learners must copy the table into their workbooks.
   b. They must then decide whether each material is an insulator or not.
   c. When they have finished, they must check their answers with a partner.
   d. Go over the model answer with the learners.
   e. Discuss examples of products made with these materials.
3. Model answer:

INSULATORS OR CONDUCTORS

Material	***Is this material an insulator?***
glass	*Yes*
gold	*No*
water	*No*
plastic	*Yes*
rubber	*Yes*
aluminium	*No*
wood	*Yes*

4. ACTIVITY: Insulators
5. Explain it to the learners as follows:

INSULATORS

Copy and complete the following sentences. Use the words from the list below.

glass, copper, insulators, gold, rubber, stop, plastic, aluminium

1. Materials that ____ the flow of electrical energy are called ____.
2. Examples of materials that are insulators are ____, ____ and ____.
3. Examples of materials that are not insulators are ____, ____, and ____.

6. Explain this to the learners as follows:
   a. Learners must copy and complete the sentences in their workbooks.
   b. When they are finished, they should compare their answers with a partner.
   c. Go over the model answer with the learners.
7. Model answer:

INSULATORS

1. *Materials that stop the flow of electrical energy are called insulators.*
2. *Examples of materials that are insulators are glass, rubber and plastic.*
3. *Examples of materials that are not insulators are copper, gold, and aluminium.*

Checkpoint 2

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

a. Is the following statement True or False: 'A insulator stops the flow of electrical energy'?
b. Is the following statement True or False: 'Glass, metal and rubber are materials that are insulators'?

Answers to the checkpoint questions are as follows:

c. True
d. False. Metal is a conductor of electrical energy, not an insulator.

8. 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
Study & Master	Electrical conductors and insulators	105-106
Viva	Electrical conductors and insulators	119-122
Platinum	Electrical conductors and insulators	132
Solutions for All	Electrical conductors and insulators	204-205
Day-by-Day	Electrical conductors and insulators	124-125
Oxford	Electrical conductors and insulators	96-97
Spot On	Electrical conductors and insulators	60
Top Class	Electrical conductors and insulators	103-105
Sasol Inzalo Bk B	Electrical conductors and insulators	37-38

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://goo.gl/n9t0J4 (3min 19sec) [Conductors and insulators]
2. https://goo.gl/N5hZfU (8min 34sec) [Conductors and insulators – Animation for kids]

4 A

Term 3, Week 4, Lesson A
Lesson Title: Insulators
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Test materials for insulation
CAPS Page Number	58

Lesson Objectives

By the end of the lesson, learners will be able to:

- identify materials that are insulators.
- define insulator / insulation.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing		8. Predicting	✓	14. Designing	
3. Comparing	✓	9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations	✓	17. Communicating	✓
6. Identifying problems & issues		12. Recording Information	✓		

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Two 1,5V cells, a cell holder, a 1,5V bulb, three 15 cm pieces of wire	
Resources 14-18: A circuit to test for conductivity	

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 material is used to make a light bulb which protects us from getting electrical shocks?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

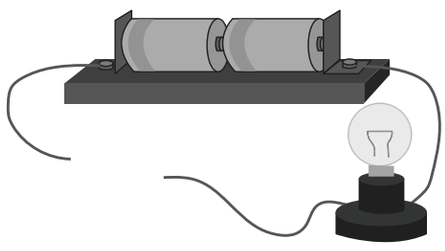
This light bulb is made from glass.

D ACCESSING INFORMATION

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

TESTING FOR CONDUCTIVITY

1. Set up a circuit with a light bulb.
   You will need:
   two 1,5V cells
   a cell holder
   a 1,5V bulb
   three 15 cm pieces of wire.
2. Make the circuit according to the drawing.



3. To test for insulation, touch the two wires an either side of the object.
4. If the light bulb lights up, the object is a conductor of electricity.

2. Explain this to the learners as follows:
    a. This is the same circuit that was set up to test for conductivity.
    b. Read through the information on the chalkboard.
    c. Explain to the learners that they will place the object they are testing for insulation between the two wires.
    d. If the light bulb does not light up, then the material that the object is made from is an insulating material.
    e. We know this as the object will have made a break in the pathway for the electrical energy to travel.
    f. If the object is not an insulator and it is a conductor, electrical energy will be able to travel along a pathway – there will not be a break in the pathway.
3. Give learners time to copy this information and draw the diagram into their workbooks.

Checkpoint 1

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

a. In the circuit you have drawn, what type of object will not make the light bulb light up?
b. Why will the light bulb not light up if an object made from insulating material is placed between the two wires?

Answers to the checkpoint questions are as follows:

a. The light bulb will not light up when an insulated object is placed between the two wires.
b. An object made from insulating material will cause a break in the pathway.

E CONCEPTUAL DEVELOPMENT

1. This will be a demonstated activity.
2. If it is possible to access materials to build more than one circuit, then this can be done as a group activity.
3. To do this activity,you will need the following:
    - a circuit with a lightbulb (see Section D of Lesson 3B on instructions on how to make a circuit)
    - a coke can
    - an eraser
    - a plasic pen
    - a metal cup or kettle
    - a glass cup or bowl
    - a stick
    - a coin
    - tinfoil

    (NOTE: Use a selection of materials that may be available)

4. Ensure you have these materials prepared for each group before the lesson starts.
5. Tell the learners that they are going to be doing an investigation where they will be exploring the conductivity of electricity.
6. If you are doing group work, divide the learners into groups so that each group will have access to the required materials.
7. If you are doing a demonstration, make sure all the learners can see the demonstation.
8. Write the following onto the chalkboard (always try to do this before the lesson starts)

PRACTICAL TASK

1. We are going to be exploring the conductivity of materials using a circuit.
2. We are going to test various materials to see if they are conductors or insulators of electricity.
3. Each test will start with a prediction and then we will test the materials to see if they are conductors or insulators of electricity.

9. Read through the practical task with the learners.
10. Remind the learners that conductors of electricity allow electricity to pass through them.
11. Remind learners that insulators do not allow electricity to pass thgrough them.
12. Show the learners the lightbulb circuit and ask them to identify the:
    - battery/ies
    - cell holder
    - wire
13. The following will need to be written onto the chalkboard:

Task 1: (6 marks)

1.1. Draw a diagram of the open circuit that you have been shown.
- Use the correct circuit symbols
- Use a sharp pencil

1.2. Why do you think the lightbulb not lighting up?

1.3. How do you think could we get the lightbulb to light up?

14. Read through task 1 with the learners.
15. Ask them if they have any questions.
16. Tell the learners they have 5 minutes to complete this task.
17. Supervise the learners whilst they complete the task and answer any questions they may have.

18. After 5 minutes call the learners back to attention.

19. Tell the learners that they are now going to complete task 2.

20. The following will need to be written on the chalkboard:

Task 2: (2 marks)

- The aim of this experiment is to see which materials are conductors of electricity and which are insulators.
  Draw the following table in your workbook:

Item to be tested	Predict: conductor/ insulator	Test result: conductor/insulator	Was my prediction correct?
coke can			
eraser			
plastic pen			
metal cup/kettle			
glass			
stick			
coin			
tinfoil			
wire coat hanger			

21. Give the learners 2 minutes to draw the table into their workbooks.

22. Show the learners all the items that are going to be tested.

23. Tell the learners that they now need to predict if the item will conduct or insulate electricity.

24. Tell them to write ‘conductor’ or ‘insulator’ in the first column, next to the item we are going to test.

25. Ask them if they have any questions.

26. Tell the learners they have 2 minutes to complete this task.

27. Supervise the learners whilst they complete the task and answer any questions they may have.

28. After 2 minutes call the learners back to attention.

29. Tell the learners that they are now going to observe the testing of their predictions.

30. Ensure that all the learners can see the test.

31. Remind the learners that if the lighbulb switches on, the electricity is flowing through and that item is a conductor of electricity.

32. If the lightbulb does not switch on, the electricity is not flowing through, and the item is an insulator.

33. Demonstrate the closing of the circuit using the items one-by-one by touching the wires on either end of the object.

34. Tell learners to record the result: ‘conductor’ or ‘insulator’ in the second column.

35. Tell the learners to mark off in the third column if their predictions were correct or incorrect.

36. After the demonstation, the following will need to be written on the chalkboard:

Task 3: (7 marks)

Looking at the table you completed whilst observing the experiment, answer the following questions:

3.1. What do you observe about most of the materials that are conductors of electricity?

3.2. Which material did you not know was an insulator?

3.3. Which material did you not know was a conductor?

3.4. Why is it important to know why materials are conductors or insulators?

3.5. Why are the wires of the circuit wrapped in plastic?

3.6. Name two dangers that you can think of that could be caused by electricity.

37. Read through task 3 with the learners.

38. Ask them if they have any questions.

39. Tell the learners they have 10 minutes to complete task 3 in their workbooks.

40. Supervise the learners whilst they complete the task and answer any questions they may have.

41. After 10 minutes call the learners back to attention.

42. Tell the learners to return all equipment and to tidy their work areas.

43. Collect books for assessment.

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
Study & Master	Electrical conductors and insulators	107
Viva	Electrical conductors and insulators	118
Platinum	Electrical conductors and insulators	128-129
Solutions for All	Electrical conductors and insulators	205-206
Day-by-Day	Electrical conductors and insulators	126
Oxford	Electrical conductors and insulators	93-95
Spot On	Electrical conductors and insulators	59
Top Class	Electrical conductors and insulators	102
Sasol Inzalo Bk B	Electrical conductors and insulators	33-37

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://goo.gl/Hqtliw (2min) [Conductors and insulators]
2. https://goo.gl/o9aaVK (2min 30sec) [School experiment to test conductors and insulators]
3. https://goo.gl/PYJrKR (1min 09sec) [Insulators and conductors]

4 B

Term 3, Week 4, Lesson B
Lesson Title: Insulators
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Uses of insulators
CAPS Page Number	58

Lesson Objectives

By the end of the lesson, learners will be able to:

- identify where electrical insulators are used
- identify the materials used in these products.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing	✓	8. Predicting		14. Designing	
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 12: Electrical wire made from copper	
Resource 19: Men working safely on an electric pylon	
Resource 21: Rubber soles	
Poster: Electric circuits	

C CLASSROOM MANAGEMENT

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

Is rubber an insulator or conductor of electricity?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

Rubber is an insulator.

D ACCESSING INFORMATION

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

USE OF PLASTIC AND RUBBER FOR ELECTRICAL INSULATION

1. Insulating materials are used to keep the electricity in a circuit where it is useful.
2. This stops the electrical energy from injuring a person or causing a fire.
3. All electrical wires, switches and appliances are insulated in a building.

USE OF GLASS AND CERAMICS FOR ELECTRICAL INSULATION

1. Transmission lines are attached to pylons by insulators that are made from ceramics or glass.
2. This stops the electrical energy going from the cables into the metal pylons.

2. Explain this to the learners as follows:
   a. Insulating material is very useful when working with electricity.
   b. Insulators can protect us from getting shocked, and fires.
   c. Show learners Resource 12: 'Electrical wires made from copper'.
   d. The plastic coating on the wires insulates the electrical energy.
   e. Show learners Resource 19: 'Men working safely on electric pylons'.
   f. The insulators on the pylons are made from glass or ceramics.
   g. Ceramics are the material that pottery is made from.
   h. Show learners Resource 21: 'Rubber soles'.
   i. People working with electricity should wear boots with rubber soles.
   j. This protects them from getting shocked.
   k. Electricians will also wear rubber gloves to protect themselves.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What type of shoes should you wear when working with electricity?
b. Why is there a plastic coating on electric wire?

Answers to the checkpoint questions are as follows:

a. You should wear rubber-soled shoes.
b. The plastic coating on electric wire keeps the electrical energy where it is useful, and protects people from getting shocked, and fires from starting.

E CONCEPTUAL DEVELOPMENT

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

ACTIVITY: USES OF INSULATORS

1. Work in pairs to answer the following questions:
   b. Why would a pair of pliers have plastic-coated handles?
   c. Why do electricians wear rubber gloves?
2. Work in pairs to list objects in your home and school environments that are insulators or conductors.

3. Explain this to the learners as follows:
   a. Learners must work in pairs for this activity.
   b. Each learner must write the answers in their workbooks.
   c. Conductors are found where electrical energy needs to travel in a pathway, for example, a plug will have prongs made from metal.

d. Insulators are found where electrical energy needs to be kept available. Insulators are also used to protect people, for example, a plug has a plastic cover, so that when you pull the plug out of a socket you do not get shocked.
e. Put the poster up on the wall.
f. Point out the examples of insulators and conductors on the poster.
g. When learners have finished, go over the answers to Question 1.
h. Discuss the insulators and conductors that the learners identified in their home and school environments.

3. Model answer

USES OF INSULATORS

1.
   a. *Pliers have handles covered in plastic so that when an electrician is fixing electrical equipment, he will not get shocked.*
   b. *Electricians wear rubber gloves to protect them from electrical energy when they are working with electricity.*
2. *Examples of insulators: switches are made of plastic, the cover of a plug is plastic, shoes have rubber soles and should be worn when working with electricity, a screwdriver has plastic handles an example of a conductor is electrical wire that has copper wiring.*

Checkpoint 2

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

c. What is the output component in a torch?
d. When the switch is switched on, does this make the pathway complete?

Answers to the checkpoint questions are as follows:

a. The output component is the light bulb.
b. Yes, it does.

4. 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
Study & Master	Electrical conductors and insulators	108
Viva	Electrical conductors and insulators	119-122
Platinum	Electrical conductors and insulators	132-133
Solutions for All	Electrical conductors and insulators	-
Day-by-Day	Electrical conductors and insulators	127
Oxford	Electrical conductors and insulators	97
Spot On	Electrical conductors and insulators	60
Top Class	Electrical conductors and insulators	103-105
Sasol Inzalo Bk B	Electrical conductors and insulators	38-39

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://goo.gl/1xuNbb (45sec) [Why is it important to have insulators?]
2. https://goo.gl/mmVLMf [Electrical conductors and insulators]

TOPIC OVERVIEW:
Systems to solve problems
Term 3, Weeks 4C – 6B

A. TOPIC OVERVIEW

TERM 3, WEEKS 4C – 6B

- This topic runs for 2 weeks.
- It is presented over 6 lessons.
- This topic counts for 12% in the end-of-year exam.
- 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	C

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	C

B. SEQUENTIAL TABLE

GRADE 5	GRADE 6	GRADE 7
LOOKING BACK	**CURRENT**	**LOOKING FORWARD**
• Input and output energy: machines and appliances • Mains electricity as a source of energy	• Using electric circuits to solve problems occurring with street lighting, alarms, electric gates • Electric circuits can be used in models and toys • Investigate circuits used to solve problems • Design, make, evaluate and present a system that uses a circuit to solve a problem	• Circuits and current electricity • Components of a circuit • Effects of an electric circuit

C. SCIENTIFIC AND TECHNOLOGICAL VOCABULARY

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

	TERM	EXPLANATION
1.	transferred	Moved from one place to another
2.	evaluate	Make a judgement about something; to look critically at a product, idea or work

D. UNDERSTANDING THE USES / VALUE OF SCIENCE

Using the design process of investigating, designing, making, evaluating and presenting is a useful process for any problem solving. Being able to make a circuit to solve a problem combines a knowledge of electrical circuits with the design process.

E. PERSONAL REFLECTION

Reflect on your teaching at the end of each topic:

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

4 C

Term 3, Week 4, Lesson C
Lesson Title: Using electric circuits
Time for lesson: 1½ hours

A POLICY AND OUTCOMES

Sub-Topic	Circuits as solutions to problems
CAPS Page Number	58

Lesson Objectives

By the end of the lesson, learners will be able to:

- describe how electric circuits are used to solve problems
- give examples of electric circuits used to solve specific problems

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing		8. Predicting		14. Designing	✓
3. Comparing		9. Hypothesizing		15. Making/ constructing	✓
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	✓
5. Sorting & Classifying		11. Doing Investigations	✓	17. Communicating	✓
6. Identifying problems & issues		12. Recording Information	✓		

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 22: Street Lighting	

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 does a screwdriver have a plastic handle?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

A screwdriver has a plastic handle so that the electrician will not get shocked if he uses it to fix electrical appliances

D ACCESSING INFORMATION

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

USING ELECTRIC CIRCUITS

1. Electric circuits are used to solve problems that require energy.
2. Circuits are used for street lights, traffic lights, alarms, electric gates, fans and heaters.
3. Electric circuits need at least three components.
4. They need a source of electrical energy, conducting wire, and an output device.
5. The output device changes electrical energy to another useful energy.
6. These output energies are light, movement, sound and heat.
7. A light bulb changes electrical energy to light energy.
8. A motor changes electrical energy to movement energy.
9. A buzzer changes electrical energy to sound energy.
10. A heater changes electrical energy to heat energy.

2. Explain this to the learners as follows:
   a. Remind learners that they learnt about the three necessary components for an electric circuit in Lesson 1B.
   b. These three components are a source of electrical energy (cell/battery), conducting wire and an output device.
   c. Learners have made circuits to test for conductivity and insulation.
   d. Circuits solve problems. Explain each component to the learners.
   e. It is important to identify the correct output device to solve a problem.

f. This is done by looking at the energy needed as the output energy: light, sound, movement or heat.
g. Show learners Resource 22.
h. This circuit changes electrical energy to light energy.
i. Street lights make your area safer at night.
j. Light bulbs were chosen as the output device, as light energy is needed.

3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. Can you name three examples of where electric circuits are used?
b. What does an output device do?

Answers to the checkpoint questions are as follows:

a. Any three of: street lights, traffic lights, alarms, electric gates, fans or heaters.
b. An output device changes electrical energy to a useful output energy.

E CONCEPTUAL DEVELOPMENT

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

CIRCUITS USED TO SOLVE PROBLEMS

1. Some circuits produce movement.
2. A fan's blades turn very fast.
3. A fan changes electrical energy to movement energy.
4. Some circuits produce light.
5. A torch bulb changes electrical energy to light energy.
6. Some circuits produce heat.
7. An electric stove changes electrical energy to heat energy.
8. A stove uses a heating element to do this.
9. Some circuits produce sound.
10. A doorbell changes electrical energy to sound energy.

2. Explain this to the learners as follows:

a. Circuits solve problems by changing electrical energy to some other useful energy.
b. This change happens in the output device.
c. For example, a fan's blades turn around and around.
d. A fan converts (changes) electrical energy to movement energy.
e. The output device that does this is a motor.

3. ACTIVITY: Using electrical circuits to solve problems

ACTIVITY: USING ELECTRICAL CIRCUITS TO SOLVE PROBLEMS

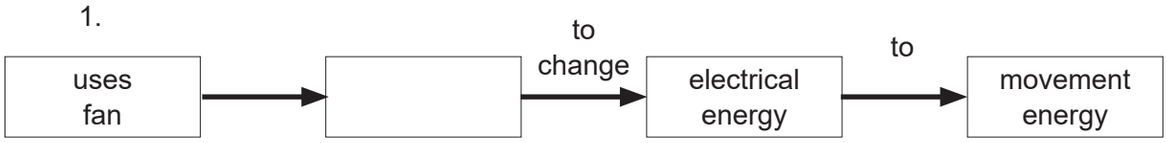
Draw a flow diagram for a fan, a torch, a doorbell and a stove. The first one has been done for you. You need to write:

the name of the device

the output component of the circuit

the output energy of the circuit.

1.



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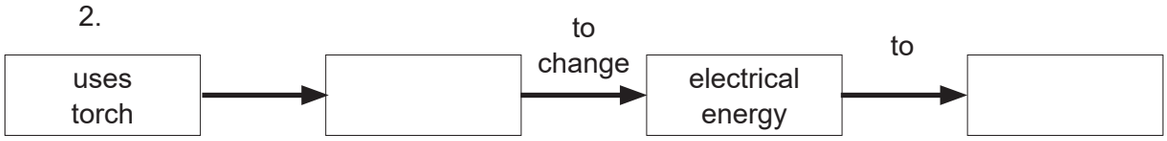

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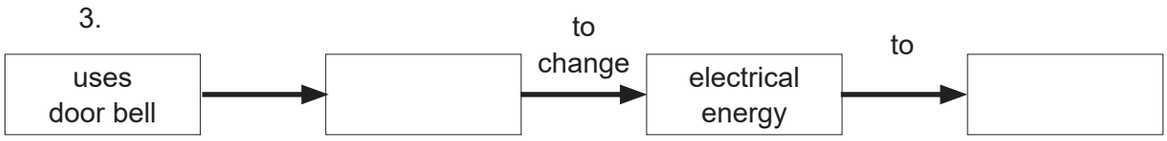

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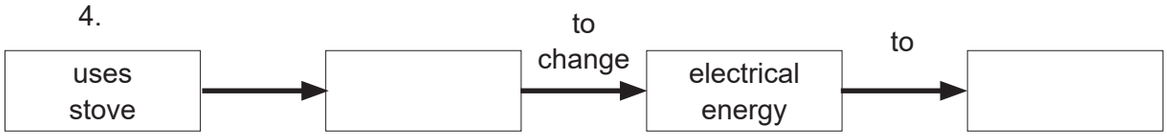
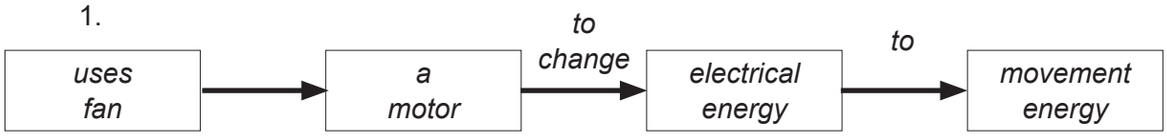


4. A model answer:

ACTIVITY: USING ELECTRICAL CIRCUITS TO SOLVE PROBLEMS

1.



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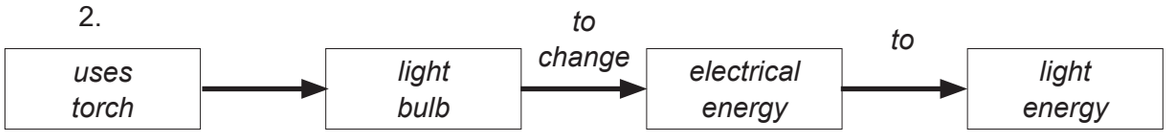

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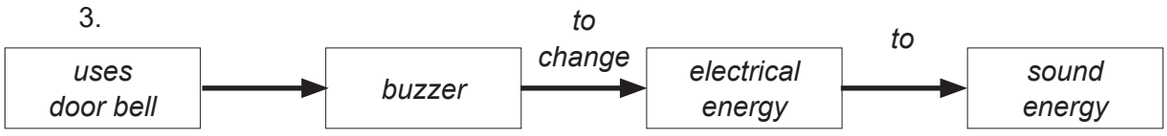

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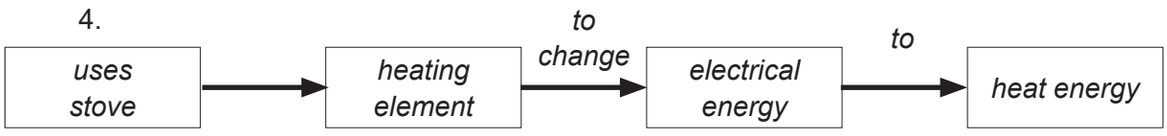


Checkpoint 2

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

a. What is the output energy for a motor?
b. What is the output energy for a buzzer?

Answers to the checkpoint questions are as follows:

a. A motor produces movement energy.
b. A buzzer produces sound energy.

5. 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
Study & Master	Systems to solve problems	109-110
Viva	Systems to solve problems	124
Platinum	Systems to solve problems	137-140
Solutions for All	Systems to solve problems	213-214
Day-by-Day	Systems to solve problems	130-131
Oxford	Systems to solve problems	98-99
Spot On	Systems to solve problems	61
Top Class	Systems to solve problems	106
Sasol Inzalo Bk B	Systems to solve problems	44-48

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://goo.gl/irm49Q [Electrical circuits]
2. https://goo.gl/DEtQ2F [Systems to solve problems]

5 A

Term 3, Week 5, Lesson A
Lesson Title: Using electric circuits
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Investigate circuits
CAPS Page Number	58

Lesson Objectives

By the end of the lesson, learners will be able to:

- investigate electric circuits
- give examples of where electric circuits are useful.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing	✓	8. Predicting		14. Designing	✓
3. Comparing	✓	9. Hypothesizing		15. Making/ constructing	✓
4. Measuring	✓	10. Planning Investigations	✓	16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations	✓	17. Communicating	✓
6. Identifying problems & issues		12. Recording Information	✓		

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Poster: Electric circuits	

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 is the output energy of a fan?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

The output energy of a fan is movement energy.

D ACCESSING INFORMATION

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

INVESTIGATE CIRCUITS THAT MAKE LIGHT

1. Electrical energy is **transferred** from a source to where it is needed.
2. This is done by making a closed circuit.
3. An electrical circuit needs a source of energy (cell/ battery), conducting wires, and an output device.
4. Light energy is a useful energy.
5. Light bulbs change electrical energy into light energy.
6. Switches can be added to a circuit to control the flow of electrical energy.
7. Electrical circuits can be shown by drawing circuit diagrams.
8. These circuit diagrams use symbols for the electrical components.

2. Explain this to the learners as follows:
   a. Learners should know all the above information which has been taught previously.
   b. Learners must revise this knowledge before they start the activity below.
   c. Show learners the Poster: Electric circuits.
   d. Go over all the symbols for electrical components on the poster.
   e. Go over the drawing of a circuit with a light bulb as the output device.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What are the three components a circuit must have in order to work?
b. What electrical component is used to control the flow of electrical energy?

Answers to the checkpoint questions are as follows:

a. A circuit must have a source of electrical energy, conducting wires, and an output device.
b. A switch is used to control the flow of electrical energy.

E CONCEPTUAL DEVELOPMENT

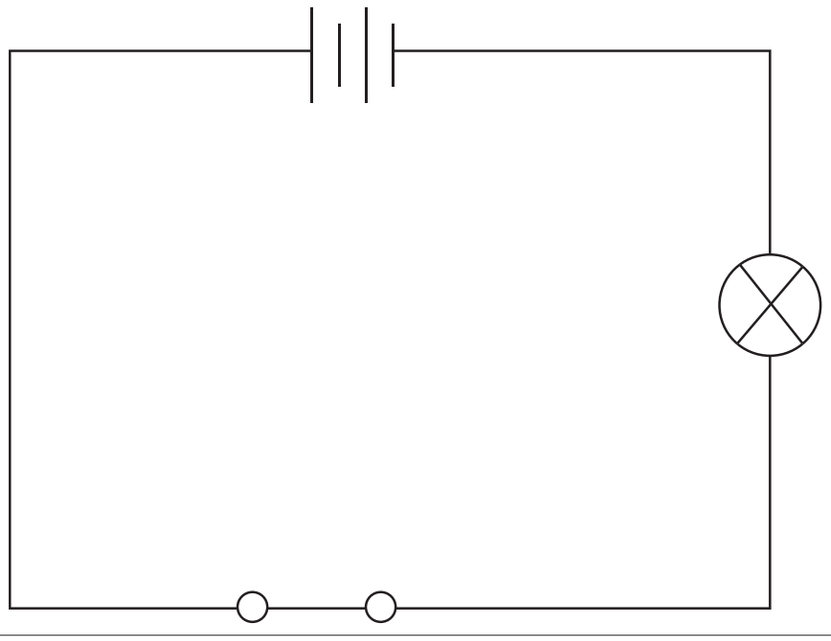
1. Write the following on the chalkboard (always try to do this before the lesson starts):

ACTIVITY 1: DRAWING A CIRCUIT DIAGRAM FOR A LIGHT BULB

1. Symbols are easier and quicker to draw than doing a realistic drawing.
2. Use the symbols to draw a circuit diagram with a light bulb as the output device.
3. Your circuit diagram must have a switch and two cells.

2. Explain this to the learners as follows:
   a. This is a revision of Lessons 2B and 2C.
   b. Learners must refer to the notes on symbols and circuit diagrams.
   c. Remind learners that a circuit diagram is drawn as a rectangle.
   d. The cells/ batteries are placed at the top.
   e. The other components follow in the order that they occur in the circuit.
3. Model answer:

A CIRCUIT DIAGRAM FOR A LIGHT BULB



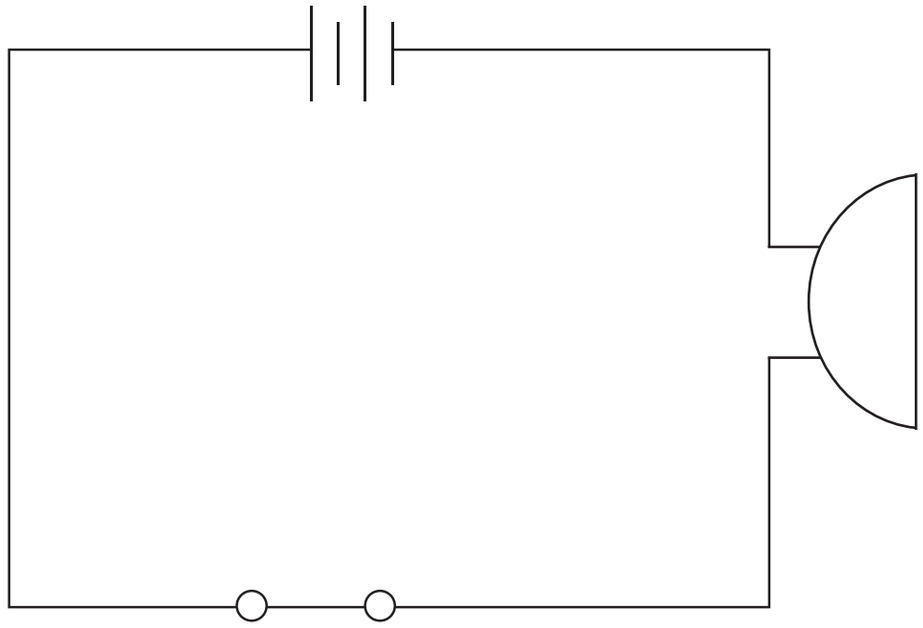
4. Write the following onto the chalkboard.

ACTIVITY 2: ANOTHER CIRCUIT DRAWING

1. Draw a circuit diagram with two cells, a switch and a buzzer.

5. Model answer:

A CIRCUIT DIAGRAM WITH A BUZZER



Checkpoint 2

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

a. Which electronic component is used to change electrical energy to sound energy?
b. Which electronic component is used to change electrical energy to movement energy?

Answers to the checkpoint questions are as follows:

a. A buzzer is used to produce sound.
b. A motor is used to produce movement.

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
Study & Master	Systems to solve problems	-
Viva	Systems to solve problems	124
Platinum	Systems to solve problems	138
Solutions for All	Systems to solve problems	214
Day-by-Day	Systems to solve problems	131
Oxford	Systems to solve problems	-
Spot On	Systems to solve problems	61
Top Class	Systems to solve problems	106
Sasol Inzalo Bk B	Systems to solve problems	49-50

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://goo.gl/u2yPKP (2min 07sec) [How to make a simple circuit with on/off switch for a light bulb]
2. http://www.instructables.com/id/Buzzer-2/ [Buzzer]

5 B

Term 3, Week 5, Lesson B
Lesson Title: Using electric circuits
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Design a circuit
CAPS Page Number	58

Lesson Objectives

By the end of the lesson, learners will be able to:

- design a circuit to solve a specific problem
- identify the correct output device to solve a problem.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing		8. Predicting		14. Designing	✓
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations	✓	16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	
6. Identifying problems & issues	✓	12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
N/A	

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 electrical component would you choose to produce sound?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

I would choose a buzzer to make sound.

D ACCESSING INFORMATION

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

PROBLEM SCENARIO

Draw a grandfather sitting outside a simple house on a bench in the evening reading. Behind him, on the wall, draw a plastic box with a small light bulb (torch bulb) shining in the middle. Make the light bright. Label the light, the protective box, the grandfather, the house, his book.

DESIGN BRIEF, SPECIFICATIONS AND CONSTRAINTS

1. Write a design brief for this problem by completing the sentence below:

   Design and make a ____ (what it is you are designing and making) for ____ (who this is for) that will _____ (state the problem here).

2. Write a list of specifications and constraints. Specifications tell you what your product will look like and should do. Constraints are things that your design must comply with. Write specifications in point form by answering these questions:
   a. What must your product be able to do?
   b. Who will the product be designed for?
   c. Where will your product be used?
   d. What must your product have according to the given problem?

2. Explain this to the learners as follows:
   a. Design briefs, specifications and constraints are what all designers use.
   b. Read through the problem scenario with the learners.

c. Each learner must write down a design brief and the specifications and constraints in their workbooks.

3. Give learners time to do this activity in their workbooks.
4. Model answer

DESIGN BRIEF

Design and make a product that has a light bulb circuit so that my grandfather can read outside in the evenings.

SPECIFICATIONS AND CONSTRAINTS

a. *The lighting device must provide sufficient light for reading at night. It must be placed on the wall and it must be protected from the weather.*
b. *My grandfather will be using this product.*
c. *It will be placed on the outside wall of the house.*
d. *This product must have an electric circuit with a switch.*

Checkpoint 1

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

a. What are specifications?
b. Where will your product be placed?

Answers to the checkpoint questions are as follows:

a. Specifications tell you what your product will look like and what it should do.
b. The product will be placed on the outside wall of a house.

E CONCEPTUAL DEVELOPMENT

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

DESIGN

1. Draw a design for a lighting device to be placed on the outside wall of your house.
2. You might have to do more than one drawing to explain your idea.
3. Show where the circuit will be placed so that a person will be able to see to read.
4. Think carefully about how you are going to protect the circuit from the weather.
5. You might want to put your circuit in a plastic box and make a hole for the light to shine through.
6. Label all the different parts of your design.
7. Give your drawing a heading.

CHOOSE A DESIGN

1. Your teacher will put you into groups.
2. Choose one design for a lighting device that you will make as a group in the next lesson.

2. Explain this to the learners as follows:
    a. Learners do not have to draw a circuit diagram as they did this in the previous lesson.
    b. They must think carefully about how to protect the circuit from weather and where they are going to place their circuit.
    c. The circuit will not work if it gets wet, as water is a conductor of electricity.
    d. It is important to label drawings so that anyone looking at drawings will understand them.
    e. Put learners into groups of four to six.
    f. They must choose one design to make.

Checkpoint 2

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

a. Why is it important to label your drawings?
b. Why must the circuit be protected from the weather?

Answers to the checkpoint questions are as follows:

a. It is important to label drawings so that other people can understand them.
b. The circuit will not work if it gets wet as water, is a conductor of electricity.

3. 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
Study & Master	Systems to solve problems	112
Viva	Systems to solve problems	126-129
Platinum	Systems to solve problems	142
Solutions for All	Systems to solve problems	217-220
Day-by-Day	Systems to solve problems	132
Oxford	Systems to solve problems	100-101
Spot On	Systems to solve problems	62
Top Class	Systems to solve problems	109
Sasol Inzalo Bk B	Systems to solve problems	50-51

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.tomnewbyschool.co.za/wp-content/uploads/2016/07/Grd-6-NS-Tech-T3-2016-approved.pdf
2. http://www.sciencecompanion.com/wp-content/uploads/ElectricalCircuitsDesignProjectDigital-SamplerWEB.pdf
3. http://exemplars.ysimste.ca/task/6ec.pdf

5 C

Term 3, Week 5, Lesson C
Lesson Title: Using electric circuits
Time for lesson: 1½ hours

A POLICY AND OUTCOMES

Sub-Topic	Make a circuit
CAPS Page Number	58

Lesson Objectives

By the end of the lesson, learners will be able to:

- make a switch for a circuit
- make a circuit to solve a problem
- use safe work practices.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing		8. Predicting	✓	14. Designing	
3. Comparing		9. Hypothesizing	✓	15. Making / constructing	✓
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations	✓	17. Communicating	
6. Identifying problems & issues		12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Per group: cardboard, 3m electrical wire, two 1,5V cells, a cell holder for two cells, a light bulb, a light bulb holder, a paper clip, two metal drawing pins	
Cardboard, plastic for covering the cardboard, glue, recycled boxes, sellotape, screw driver, pair of scissors	

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 is it important to label your drawings?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

> *It is important to label drawings so that other people can understand what you have drawn.*

D ACCESSING INFORMATION

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

> MAKE AN OUTDOOR LIGHT
>
> 1. Make a list of all the tools and materials you will need according to your chosen design.
> 2. Gather all the tools and materials.

2. Explain this to the learners as follows:
   a. Learners must think carefully about all the tools and materials they will need for their light.
   b. Materials are the items that you use to make the circuit and the protective covering for the outdoor light, like cardboard, light bulb, and wire.
   c. Tools are the items that help you make it, like a pair of scissors, rulers, and screwdrivers.
   d. One learner from each group must fetch the tools and materials.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What are tools?
b. What are materials?

Answers to the checkpoint questions are as follows:

a. Tools are the items you use to help you make something, like a pair of scissors.
b. Materials are what you use to make your product, like carboard.

E CONCEPTUAL DEVELOPMENT

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

MAKE THE OUTDOOR LIGHT

1. Make your outdoor light.
2. A member of your group should make the circuit and the others should make a protective cover for the outdoor light.
3. Work safely: do not run, do not shout, hold tools pointing downwards, focus when using tools.
4. Test your light to see if it will switch on and off.
5. Fix it if necessary by checking that: the connections are good, the cells are working, the light bulb is working, and the switch is working properly.
6. Tidy up your work space.

2. Explain this to the learners as follows:
   a. The circuit must be made carefully and the connections must be strong.
   b. The light must be strong enough to read by.
   c. Learners must observe safe work practices otherwise injuries can happen.

Checkpoint 2

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

a. Give two things you should check if your circuit does not work?
b. Why is it important to observe safe work practices?

Answers to the checkpoint questions are as follows:

a. Any two of: the connections must be good, the cells must be working, the light bulb must be working, the switch must be working properly
b. It is important to work safely to avoid injury.

3. 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
Study & Master	Systems to solve problems	114
Viva	Systems to solve problems	133;137
Platinum	Systems to solve problems	143-144
Solutions for All	Systems to solve problems	221-228
Day-by-Day	Systems to solve problems	132
Oxford	Systems to solve problems	101
Spot On	Systems to solve problems	62
Top Class	Systems to solve problems	110
Sasol Inzalo Bk B	Systems to solve problems	51

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.tomnewbyschool.co.za/wp-content/uploads/2016/07/Grd-6-NS-Tech-T3-2016-approved.pdf
2. http://www.sciencecompanion.com/wp-content/uploads/ElectricalCircuitsDesignProjectDigital-SamplerWEB.pdf
3. http://exemplars.ysimste.ca/task/6ec.pdf

6 A

Term 3, Week 6, Lesson A
Lesson Title: Using electric circuits
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Evaluate your design
CAPS Page Number	58

Lesson Objectives

By the end of the lesson, learners will be able to:

- evaluate a circuit according to given criteria
- make suggestions for improvements from the evaluation.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions	✓	13. Interpreting Information	✓
2. Observing		8. Predicting		14. Designing	
3. Comparing		9. Hypothesizing	✓	15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	✓
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues	✓	12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
N/A	

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 tools?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

Tools, like a screwdriver or a pair of scissors, are the things you use to make a product.

D ACCESSING INFORMATION

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

EVALUATE

1. To **evaluate** means to look at the product and the way in which you worked. In this process you will also think about what worked well and what you could improve on.
2. We evaluate products and work practices so that we can work better next time.

2. Explain this to the learners as follows:
   a. Evaluation is an important part of the design and manufacturing process.
   b. It is not the last step.
   c. If you find anything that you can improve, you should go back and change what needs to be improved.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. Why is evaluation important?
b. Is evaluation the last step in the process?

Answers to the checkpoint questions are as follows:

a. We evaluate our designs and work practices so that we can improve on the design and the way in which we work.
b. No, it is not the last step as you can go back and change things that need improving.

E CONCEPTUAL DEVELOPMENT

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

AN EVALUATION CHECKLIST

1. Use the checklist below to evaluate your outdoor light.
2. Place a tick in the box that answers the questions about your outdoor light.
3. Do this together with the other members of your group._

Checklist	**Yes**	**No**
Does the light bulb go on when the switch is on?		
Is the circuit well-made and tidy?		
Does the circuit have a protective cover in case it rains?		
Is the protective cover made neatly and is it tidy?		
Does the light shine brightly when it is switched on or does the protective cover get in the way?		
Were all members of the group involved in making the outdoor light?		

4. What is good about your outdoor light?
5. What could be improved on if you had more time?

2. Explain this to the learners as follows:
   a. Learners must copy the evaluation checklist into their workbooks.
   b. The group must do the evaluation together.
3. Model answer (answers will vary):

Checklist	**Yes**	**No**
Does the light bulb go on when the switch is on?	✓	
Is the circuit well-made and tidy?		✓
Does the circuit have a protective cover in case it rains?	✓	
Is the protective cover made neatly and is it tidy?	✓	
Does the light shine brightly when it is switched on or does the protective cover get in the way?	✓	
Were all members of the group involved in making the outdoor light?	✓	

4. *The outdoor light works well and the protective cover was well-made.*
5. *The circuit was untidy and the connection could be done more neatly.*

Checkpoint 2

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

a. Is the following statement true or false: A checklist is one way to evaluate a product?
b. What should you do if the product can be improved on?

Answers to the checkpoint questions are as follows:

a. True
b. You should make changes to the product.

4. 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
Study & Master	Systems to solve problems	114
Viva	Systems to solve problems	137
Platinum	Systems to solve problems	144
Solutions for All	Systems to solve problems	229
Day-by-Day	Systems to solve problems	133
Oxford	Systems to solve problems	101
Spot On	Systems to solve problems	63
Top Class	Systems to solve problems	110
Sasol Inzalo Bk B	Systems to solve problems	51

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.tomnewbyschool.co.za/wp-content/uploads/2016/07/Grd-6-NS-Tech-T3-2016-approved.pdf
2. http://www.sciencecompanion.com/wp-content/uploads/ElectricalCircuitsDesignProjectDigital-SamplerWEB.pdf
3. http://exemplars.ysimste.ca/task/6ec.pdf

6 B

Term 3, Week 6, Lesson B
Lesson Title: Using electric circuits
Time for lesson: 1 hour

A POLICY AND OUTCOMES

i

Sub-Topic	Present your design
CAPS Page Number	58

Lesson Objectives

By the end of the lesson, learners will be able to:

- present a product to the class
- identify and explain the main ideas of the project.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS

1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing		8. Predicting		14. Designing	
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations	✓	16. Evaluating and improving products	✓
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues	✓	12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
N/A	

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 is it good to evaluate a product?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

It is good to evaluate a product so that future designs may be improved.

D ACCESSING INFORMATION

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

PRESENT YOUR PRODUCT

1. Before your group presents their product, they need to plan what they are going to say and demonstrate.
2. Your group will need to demonstrate their product.
3. They will need to explain how it works.
4. The group will then have to explain the evaluation and how the product could be improved.

2. Explain this to the learners as follows:
   a. Always prepare and plan before you do a presentation.
   b. Work out what you are going to say and who is going to say it.
   c. Practise your presentation.
3. Read through this information with the learners

Checkpoint 1

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

a. What is the energy change for the circuit used in your design?
b. What output device changes the energy from the input energy to the useful output energy?

Answers to the checkpoint questions are as follows:

a. Electrical energy is changed to light energy.
b. A light bulb changes electrical energy to light energy.

E CONCEPTUAL DEVELOPMENT

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

PLANNING

1. In your group, plan what you are going to say and who will say it.
2. Plan how you are going to demonstrate your product.
3. Plan how you are going to present the evaluation.

PRESENTATION

1. Each group will have three minutes to present to the rest of the class.
2. There will be one minute for comments or questions from the rest of the class.

2. Explain the following to the learners:
   a. Plan the entire demonstration carefully.
   b. This will then enable the audience (your classmates and teacher) to understand your presentation.
   c. Give each group no longer than three minutes to present their product.
   d. Encourage the rest of the class to ask questions after each presentation.
   e. This makes the group more focused and requires the group to think more critically about their product

Checkpoint 2

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

a. Why is it important to plan your presentation?
b. Why is it important to get comments and questions from the rest of the class?

Answers to the checkpoint questions are as follows:

a. It is important to plan a presentation so that it makes sense to the audience.
b. It is important to get comments and questions from the rest of the class as it makes the group think more carefully about their design.

3. 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
Study & Master	Systems to solve problems	115
Viva	Systems to solve problems	137-138
Platinum	Systems to solve problems	144-145
Solutions for All	Systems to solve problems	229-230
Day-by-Day	Systems to solve problems	133
Oxford	Systems to solve problems	-
Spot On	Systems to solve problems	63
Top Class	Systems to solve problems	111
Sasol Inzalo Bk B	Systems to solve problems	51

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.educatorstechnology.com/2014/02/4-great-rubrics-to-develop-students.html

TOPIC OVERVIEW:
Mains electricity
Term 3, Weeks 6C – 9C

A. TOPIC OVERVIEW

TERM 3, WEEKS 6C – 9C

- This topic runs for weeks.
- It is presented over 10 lessons.
- This topic counts for 20% in the end-of-year exam.
- 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	C

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	C

B. SEQUENTIAL TABLE

GRADE 5	GRADE 5	GRADE 7
LOOKING BACK	**CURRENT**	**LOOKING FORWARD**
• Energy around us: energy stored in fuels such as coal, wood, food, gas • Mains electricity: a circuit from power station to home and back; power stations need a source of energy; this can be a fuel such as coal	• Fossil fuels and electricity: types of fossil fuels; formed over millions of years; South Africa mostly uses coal; how a power station works; non-renewable resources • Cost of electricity: requires infrastructure; some appliances use more electrical energy than others; saving energy • Illegal connections: are dangerous • Renewable ways to generate electricity	• Sources of energy: renewable and non-renewable resources; • The national electricity supply system: energy transfers in the national grid; saving energy in the home • Energy transfer in electrical systems

C. SCIENTIFIC AND TECHNOLOGICAL VOCABULARY

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

	TERM	EXPLANATION
1.	substance	Physical matter of which things are made
2.	compressed	Squashed, flattened by pressure
3.	colourless	Has no colour
4.	odourless	Has no smell
5.	pipelines	A long pipe for moving oil or gas over long distances
6.	tankers	A ship, road vehicle or aeroplane for carrying liquids in big quantities
7.	generate	Make, create, produce
8.	turbine	A machine for making power in which a wheel with blades is made to turn by flowing water, steam, gas, air or other fluid
9.	blades	The flat, wide side of an implement such as a propeller
10.	generator	A machine for changing movement energy to electrical energy
11.	infrastructure	All the structures and other things needed to make sure something works
12.	distribute	To give out; to supply to everyone
13.	maintained	To keep in working order; to keep in existence
14.	install	Place or fix in place ready to use
15.	tampered	Interfered with to cause damage or make illegal changes
16.	accidental	Not on purpose, happened by chance
17.	anonymously	Name unknown; you do not have to give your name.
18.	capture	Take into possession; to catch

D. UNDERSTANDING THE USES / VALUE OF SCIENCE

Fossil fuels are very important as they can be burned for energy. The use of coal to provide heat energy has been around for centuries. Coal is used to generate electricity. It is also used in furnaces to extract gold from ore.

E. PERSONAL REFLECTION

Reflect on your teaching at the end of each topic:

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

6 C

Term 3, Week 6, Lesson C
Lesson Title: Fossil fuels and electricity
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	How fossil fuels were formed
CAPS Page Number	59

Lesson Objectives

By the end of the lesson, learners will be able to:

- describe how fossil fuels were formed millions of years ago
- describe what fossil fuels were made from
- describe where these fossil fuels are found.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing	✓	8. Predicting		14. Designing	
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
N/A	

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 is the symbol for a buzzer:  or  ?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

The symbol for a buzzer is 

D ACCESSING INFORMATION

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

HOW FOSSIL FUELS ARE FORMED

1. Fuels are substances which release heat energy when they are burned.
2. Fossil fuels come from living things that died millions of years ago.
3. These living things were animals, forests and wetlands.
4. These living things received their energy from the Sun.
5. This living matter died and was squashed (**compressed**) by layers of mud and sand.
6. These layers became heavy.
7. After millions of years of being squashed, this living matter changed into **substances** like coal, oil and natural gas.
8. Some fossil fuels, like coal, can be found near the Earth's surface.
9. Most fossil fuels are found deep under the Earth.

2. Explain this to the learners as follows:
   a. Remind learners that they learnt about fossils in Grade 5 Term 4.
   b. They learned that fossils are the remains of ancient plants and animals preserved in rock.
   c. This section of work is about fossil fuels.
   d. The three types of fossil fuels are oil, natural gas and coal.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What are fossil fuels made from?
b. Where are fossil fuels found?

Answers to the checkpoint questions are as follows:

a. Fossil fuels are made from living things that died millions of years ago.
b. Fossil fuels are found deep under the Earth.

E CONCEPTUAL DEVELOPMENT

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

ACTIVITY: FOSSIL FUELS

Rewrite these sentences placing them in the correct order.

1. These huge ferns plants got their energy from the Sun.
2. Millions of years ago, in wetlands and forest areas, huge ferns and plants grew.
3. The heat inside the Earth helped to slowly turn these layers of dead plants into black coal.
4. When these plants died, they formed layers of rotting material.
5. As more mud and water piled on top, these layers were compressed further.
6. These layers were compressed (squashed) by mud and water.

2. Explain this to the learners as follows:
   a. The sentences are not in the correct order.
   b. Read through the sentences carefully and then rewrite them in the correct order in your workbooks.
   c. Get learners to check their answers with a partner.
   d. They must correct any mistakes.
   e. Go over the model answer with the learners.
3. Give learners enough time to complete this activity in their workbooks.
4. Model answer:

FOSSIL FUELS

1. *Millions of years ago, in wetlands and forest areas, huge ferns and plants grew.*
2. *These huge ferns and plants got their energy from the Sun.*
3. *When these plants died, they formed layers of rotting material.*
4. *These layers were compressed (squashed) by mud and water.*
5. *As more mud and water piled on top, these layers were compressed further.*
6. *The heat inside the Earth helped to slowly turn these layers of dead plants into black coal.*

Checkpoint 2

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

a. Name three types of fossil fuels?
b. What were the living things that died millions of years ago covered with?

Answers to the checkpoint questions are as follows:

a. Coal, oil and natural gas are fossil fuels.
b. The living things that died millions of years ago were covered with layers of mud and sand.

5. 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
Study & Master	Mains electricity	116-117
Viva	Mains electricity	139-140
Platinum	Mains electricity	148-149
Solutions for All	Mains electricity	232
Day-by-Day	Mains electricity	138
Oxford	Mains electricity	102-103
Spot On	Mains electricity	66
Top Class	Mains electricity	112-113
Sasol Inzalo Bk B	Mains electricity	56-58; 62-63

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://goo.gl/TTJg4U [Mains electricity and fossil fuels]
2. https://goo.gl/y0XzpN (2min 42sec) [Fossil Fuels 101]
3. https://goo.gl/cN9yl5 (2min 51sec) [Fossil fuels]

7 A

Term 3, Week 7, Lesson A
Lesson Title: Fossil fuels and electricity
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Oil and natural gas and their uses
CAPS Page Number	59

Lesson Objectives

By the end of the lesson, learners will be able to:

- describe how oil and natural gas were formed
- discuss why oil and natural gas are useful forms of energy

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing	✓	8. Predicting		14. Designing	
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 24: An oil rig	
Resource 25: A gas canister	
Resource 26: Petrol is made from oil	
Resource 32: An oil rig in the desert	

C CLASSROOM MANAGEMENT

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

When were fossil fuels formed?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

Fossil fuels were formed millions of years ago.

D ACCESSING INFORMATION

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

OIL AND NATURAL GAS

1. Oil is a thick, black liquid used to make petrol.
2. Petrol is burned in cars, trucks and buses.
3. Gas is **colourless** and **odourless** (it has no smell).
4. A chemical is added to natural gas to make it smell.
5. This is for safety reasons.
6. Gas is used in homes for cooking and heating.

WHERE THEY ARE FOUND

1. Oil and natural gas can be found buried deep under the ocean floor.
2. Huge structures called oil rigs are used to drill for oil and gas.
3. Oil and natural gas can also be found deep underground.
4. A hole is sunk with a big drill to reach the oil and gas.
5. These fossil fuels are then brought to the surface.

2. Explain this to the learners as follows:
    a. Oil and gas are normally found deep under the ocean floor.
    b. Show learners Resource 24: 'An oil rig'.
    c. The oil rigs are huge structures used to drill for oil and gas deep under the ocean floor.
    d. Oil and gas can be found deep underground as well.
    e. Show learners Resource 32: 'An oil rig in the desert'.
    f. Oil rigs are big structures.
    g. Show learners Resource 25: 'A gas canister'.
    h. Gas is stored in canisters of different sizes.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What do we call the huge structures that are used for drilling for oil?
b. Give two words to describe natural gas?

Answers to the checkpoint questions are as follows:

a. The structures for drilling oil are called oil rigs.
b. Natural gas is colourless and odourless.

E CONCEPTUAL DEVELOPMENT

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

USES OF OIL AND NATURAL GAS

1. Oil is the most used energy fuel in the world.
2. Oil is used to make petrol.
3. Most cars, trucks, tractors use petrol as a fuel.
4. These vehicles are used to get goods to shops and to transport people.
5. Oil is also used for heating.
6. Plastic is made from oil.
7. Plastic is used to make many products from shopping bags to toys.
8. Natural gas is used in many homes for heating and cooking.
9. Gas is used in factories for energy.
10. Glass and steel factories use gas for energy.
11. Natural gas is the cleanest of the fossil fuels.
12. Oil and natural gas are transported in **pipelines**, trucks and **tankers**.

2. Explain this to the learners as follows:
   a. Oil and gas are useful fuels.
   b. In our modern lives, we use oil and gas for many things.
   c. Show learners Resource 26: Petrol is made from oil.
   d. Petrol is one of the many things made from oil.
   e. Read through the information on the chalkboard.

ACTIVITY: USES OF OIL AND GAS

Using the information on the chalkboard, copy and complete the following sentences. Use the words from the list below:

petrol, shopping bags, energy, plastic, heating, people, goods, toys, cooking.

1. Oil is used to make _____ and ____.
2. Petrol is used in vehicles to transport ____ and ____.
3. Plastic is used to make ___ ___ and ____.
4. Gas is used for ____ and ____.
5. Gas is used in factories for ____.

3. Give learners time to complete this activity in their workbooks.
4. Model answer:

USES OF OIL AND GAS

1. *Oil is used to make petrol and plastic.*
2. *Petrol is used in vehicles to transport people and goods.*
3. *Plastic is used to make shopping bags and toys.*
4. *Gas is used for heating and cooking.*
5. *Gas is used in factories for energy.*

Checkpoint 2

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

a. What fossil fuel is used to make plastic?
b. What is gas used for in homes?

Answers to the checkpoint questions are as follows:

a. Plastic is made from oil.
b. Gas is used for heating and cooking.

5. 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
Study & Master	Mains electricity	117-118
Viva	Mains electricity	139-140
Platinum	Mains electricity	148-149
Solutions for All	Mains electricity	232
Day-by-Day	Mains electricity	138
Oxford	Mains electricity	102-103
Spot On	Mains electricity	66
Top Class	Mains electricity	112-113
Sasol Inzalo Bk B	Mains electricity	56-58

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://goo.gl/LutXaz [All about natural gas]
2. https://goo.gl/fgMeCJ [How to save energy]

7 B

Term 3, Week 7, Lesson B
Lesson Title: Fossil fuels and electricity
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Formation of fossil fuels
CAPS Page Number	59

Lesson Objectives

By the end of the lesson, learners will be able to:

- describe how coal was formed from fossilized plants.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS

1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing	✓	8. Predicting		14. Designing	
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 27: How coal was formed over millions of years	

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 is oil?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

Oil is a thick, black liquid. It is a fossil fuel and is used to make petrol and plastic.

D ACCESSING INFORMATION

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

COAL

1. Coal was formed from the remains of trees, ferns and plants that lived 300 to 400 million years ago.
2. These plants got their energy from the Sun.
3. Over time, the layers of dead plants were covered with layers of mud and water.
4. These layers squashed down on the dead plants.
5. The weight of these layers and the heat turned the plants into the coal that we use today.
6. This energy was trapped by the layers of mud and water.
7. Over millions of years, these dead plants became coal.

2. Explain this to the learners as follows:
   a. Coal is an important fossil fuel for South Africa.
   b. You will learn more about this in the next lesson.
   c. Coal comes from plants that died millions of years ago.
   d. These dead plants were then squashed under layers of mud and water.
   e. After millions of years, they became coal.
   f. Show learners Resource 27: ‘How coal was formed over millions of years’.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. Explain how coal is formed?
b. How did dead plants become coal?

Answers to the checkpoint questions are as follows:

a. Coal is made from plants that died millions of years ago.
b. Dead plants had layers of mud and water over them which compressed them. After millions of years of being squashed and also being heated, they became coal.

E CONCEPTUAL DEVELOPMENT

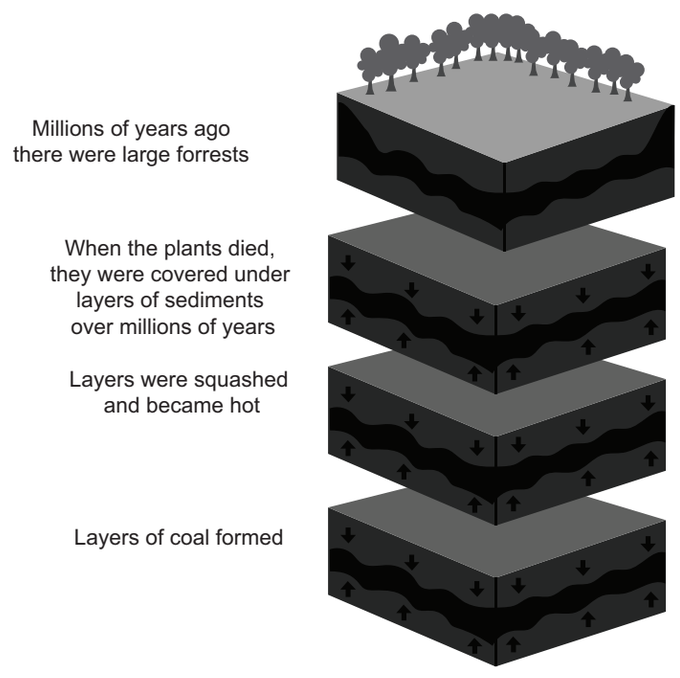
1. Write the following on the chalkboard (always try to do this before the lesson starts):

ACTIVITY: DRAWING OF HOW COAL WAS FORMED

1. Do a drawing to explain how coal was formed over hundreds of years.
2. Your drawing must have a heading.
3. Your drawing must have labels to explain how coal was formed.
4. Use the drawing that your teacher has shown you as a guide.

2. Explain this to the learners as follows:
   a. Learners can copy the drawing from Resources 27-31: 'How coal was formed over millions of years'.
   b. All drawings should have a heading (title) and labels to explain the drawing.
3. Model answer:

HOW COAL WAS FORMED



ACTIVITY: WRITE ABOUT HOW COAL WAS FORMED

1. Write five to six sentences in your own words on how coal was formed.
2. Use your drawing from the previous activity to help you.
3. Read the labels carefully.
4. Use the notes that you wrote to help you.

4. Model answer (answers may vary):

HOW COAL WAS FORMED

Coal was formed by plants that lived millions of years ago. These plants got their energy from the Sun. The dead plants were covered by mud and water. These layers of mud and water became heavy and compressed the dead plants. The energy from these dead plants was trapped. After millions of years, these dead plants formed into coal.

Checkpoint 2

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

a. What formed layers over the dead plants that made coal after millions of years?
b. Where did these plants get their energy?

Answers to the checkpoint questions are as follows:

a. Mud and water formed layers over the dead plants.
b. These plants got their energy from the Sun.

5. 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
Study & Master	Mains electricity	-
Viva	Mains electricity	140
Platinum	Mains electricity	150
Solutions for All	Mains electricity	233
Day-by-Day	Mains electricity	139
Oxford	Mains electricity	103
Spot On	Mains electricity	67
Top Class	Mains electricity	113
Sasol Inzalo Bk B	Mains electricity	58

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://goo.gl/zvj8Rz (1min 51sec) [How is coal formed?]
2. https://goo.gl/y0XzpN (2min 42sec) [Fossil fuels 101]
3. https://goo.gl/kZ3ByR [Kids Korner: How coal is formed]

7 C

Term 3, Week 7, Lesson C
Lesson Title: Fossil fuels and electricity
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Coal power station
CAPS Page Number	59

Lesson Objectives

By the end of the lesson, learners will be able to:

- describe how coal is used to make electricity
- describe the energy transfer process from the Sun to electricity in our homes.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing	✓	8. Predicting		14. Designing	✓
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information	✓		

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 33: A coal-fired power station	

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 is coal made from?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

Coal is made from dead plants that were covered with layers of mud and water. This took millions of years.

D ACCESSING INFORMATION

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

POWER STATIONS USE COAL TO MAKE ELECTRICITY

1. Many power stations use coal to generate (make) electricity.
2. Coal is used as an input energy.
3. The coal is used to heat water.
4. The water turns to steam.
5. The steam turns the blades of the turbine.
6. The turbine is linked to a **generator**.
7. A big magnet turns inside a generator.
8. This produces electricity.
9. This electricity is transported along transmission lines to our homes.
10. Electricity is the output energy of the power station.

2. Explain this to the learners as follows:
   a. Remind learners that in Grade 5 they learned how mains electricity reaches our homes.
   b. In Grade 6, learners must look in more detail at how electricity is made in a power station.
   c. Show learners Resource 33: ‘A coal-fired power station’.
   d. Coal is burned in a furnace to boil water.
   e. The steam turns the blades of the turbine.

f. The turbine turns a magnet in a generator.
g. This makes electricity.

3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What part of the power station is turned by steam?
b. What part of the power station makes electricity by turning a magnet?

Answers to the checkpoint questions are as follows:

a. The turbine is turned by steam.
b. The generator makes electricity.

E CONCEPTUAL DEVELOPMENT

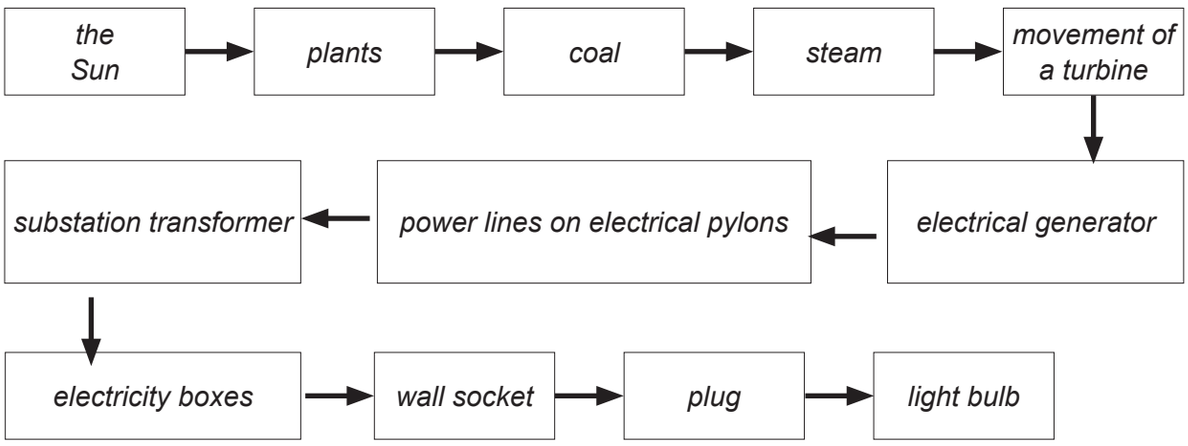
1. Write the following on the chalkboard (always try to do this before the lesson starts):

ACTIVITY: THE FLOW OF ENERGY FROM THE SUN TO AN APPLIANCE

1. Draw a flow diagram to show the flow of energy from the Sun to a light.
2. Use the words and phrases below to put in each block of the flow diagram. Put the words and phrases into the correct order.
   a. light bulb
   b. wall socket
   c. substation transformer
   d. movement of a turbine
   e. steam
   f. plants
   g. Sun
   h. electricity boxes
   i. coal
   j. generator
   k. power lines on pylons
   l. plug

2. Explain the following to the learners:
   a. A flow diagram shows the step-by-step process of something.
   b. Start with the Sun and end with the light bulb.
   c. Put arrows between the between the blocks.
3. *Model answer:*

FLOW OF ENERGY FROM THE SUN TO A LIGHT BULB



Checkpoint 2

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

a. What will always be at the start of a flow diagram, showing the flow of energy?
b. What does the steam do in a power station?

Answers to the checkpoint questions are as follows:

a. The Sun will always be at the start of a flow diagram, showing the flow of diagram.
b. The steam turns the blades of the turbine.

4. 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
Study & Master	Mains electricity	119-120
Viva	Mains electricity	141235
Platinum	Mains electricity	150-151
Solutions for All	Mains electricity	235-236
Day-by-Day	Mains electricity	139-140
Oxford	Mains electricity	104
Spot On	Mains electricity	68-69
Top Class	Mains electricity	114-115
Sasol Inzalo Bk B	Mains electricity	62-64

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://goo.gl/DqTs7n (2min 12sec) [How a coal power station works]
2. https://goo.gl/rLqWYH (1min 53sec) [Coal plants for 5th graders]

8 A

Term 3, Week 8, Lesson A
Lesson Title: Fossil fuels and electricity
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Fossil fuels are Non-renewable resources
CAPS Page Number	59

Lesson Objectives

By the end of the lesson, learners will be able to:

- define a non-renewable resource
- describe the problem with non-renewable resources
- discuss how South Africa has large amounts of coal.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing	✓	8. Predicting		14. Designing	
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues	✓	12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 34: Wind farm in South Africa	
Resource 35: Solar power in a shack settlement	
Resource 36: Hydro-power at Gariep Dam	

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 is coal used for in a power station?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

Coal is burned to heat water. This process then makes steam to turn a turbine.

D ACCESSING INFORMATION

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

NON-RENEWABLE RESOURCES

1. Fossil fuels are non-renewable resources.
2. A non-renewable resource is a resource that is being used up quicker than it can be made.
3. Oil, coal and natural gas were made from living things that died millions of years ago.
4. They cannot be replaced.
5. Once the resource is used up, it cannot be replaced.
6. Most of the energy sources that humans use are non-renewable resources.

2. Explain this to the learners as follows:
   a. We are using non-renewable resources so quickly that we will run out of them in the near future.
   b. This is because fossil fuels take millions of years to be formed.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What is a non-renewable resource?
b. Name three non-renewable resources?

Answers to the checkpoint questions are as follows:

a. It is a resource that is being used up quicker than it can be made.
b. Oil, coal and natural gas are non-renewable resources.

E CONCEPTUAL DEVELOPMENT

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

NON-RENEWABLE RESOURCES

1. The world has started to run out of oil.
2. South Africa has a good supply of coal.
3. Coal is found mostly in Mpumalanga.
4. Burning coal and other fossil fuels causes a lot of air pollution.
5. Many countries have started to develop and use renewable energy resources.
6. Solar, wind and hydro-electric power are renewable energy sources.

2. Explain this to the learners as follows:
   a. South Africa has a good supply of coal.
   b. The problem with burning coal is the amount of air pollution it causes.
   c. In the Cape, wind turbines are being used.
   d. Many shack settlements and low-cost housing have solar geysers.
   e. Hydro-electric power has been used for some time in South Africa.
   f. Show learners Resource 34: ‘A wind farm in South Africa’.
   g. More and more wind turbines are being built in the Cape.
   h. Show learners Resource 35: ‘Solar power in a shack settlement’.
   i. Solar power is used for geysers in many homes in South Africa.
   j. Show learners Resource 36: ‘Hydro-power at Gariep Dam’.
   k. South Africa has many hydro-electric power stations.
3. Give learners time to copy this information into their workbooks.
4. ACTIVITY: Coal as a fuel for generating electricity

ACTIVITY: COAL AS A FUEL FOR GENERATING ELECTRICITY

1. Write down one advantage of using coal for generating electricity in South Africa.
2. Write down one disadvantage of using coal in South Africa.

5. Explain this to the learners as follows:
   a. Learners must read through the information in their workbooks.
   b. They must identify one advantage and one disadvantage of using coal to generate electricity in South Africa.
6. *Model Answer:*

COAL AS A FUEL FOR GENERATING ELECTRICITY

1. *There is a good supply of coal in South Africa.*
2. *Burning coal causes air pollution, which is not good for the environment.*

Checkpoint 2

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

a. What is meant by non-renewable resource?
b. Give two examples of renewable resources?

Answers to the checkpoint questions are as follows:

a. A non-renewable resource is a resource that is gone forever once it is used up.
b. Any two of the following: wind, solar, hydro-electric

7. 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
Study & Master	Mains electricity	121
Viva	Mains electricity	141
Platinum	Mains electricity	140
Solutions for All	Mains electricity	234
Day-by-Day	Mains electricity	140
Oxford	Mains electricity	104
Spot On	Mains electricity	66
Top Class	Mains electricity	115
Sasol Inzalo Bk B	Mains electricity	64

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://goo.gl/cmymPn (1min 4sec) [Renewable and Non-renewable resources]
2. https://goo.gl/vFWDNz (4min 44sec) [Electricity, its sources, renewable and non-renewable]
3. https://goo.gl/VbFgrz (2min 21sec) [Non-renewable resources]

8 B

Term 3, Week 8, Lesson B
Lesson Title: Cost of electricity
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Electricity is costly
CAPS Page Number	59

Lesson Objectives

By the end of the lesson, learners will be able to:

- describe why electricity is costly.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS

1. Accessing & recalling Information	✓	7. Raising Questions	✓	13. Interpreting Information	✓
2. Observing		8. Predicting		14. Designing	✓
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information	✓		

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 37: From the power station to a home	

C CLASSROOM MANAGEMENT

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

Is solar energy a non-renewable resource?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

No, it is a renewable resource; it will never be used up.

D ACCESSING INFORMATION

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

THE COST OF PRODUCING ELECTRICITY

1. Electricity is expensive.
2. A big **infrastructure** is needed to produce electricity.
3. Infrastructure means all the structures and other systems that are needed to make sure something works.
4. To make and **distribute** electricity costs a lot of money.
5. Coal needs to be mined.
6. The coal is then transported to the power station.
7. The power station must be built and **maintained**.
8. It costs hundreds of billions of Rands to build a power station.
9. Electrical energy travels across the country; it is carried by transmission lines.
10. These lines are held up by pylons.
11. Transformers at sub-stations reduce the electrical energy so that houses and businesses can use it.

2. Explain this to the learners as follows:
    a. Electricity is expensive.
    b. To make and distribute electricity requires a big infrastructure.
    c. The infrastructure needs to be maintained.
    d. Show learners Resource 37: 'From the power station to the home'.
    e. Inform learners about all the structures that need to be built and maintained to take electrical energy from the power station to the home.
    f. Infrastructure is also needed to mine the coal and transport it to the power station.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What is infrastructure?
b. What does 'to distribute' mean?

Answers to the checkpoint questions are as follows:

a. Infrastructure means all the structures and systems that are needed to make sure something works.
b. 'To distribute' means to give out, to supply.

E CONCEPTUAL DEVELOPMENT

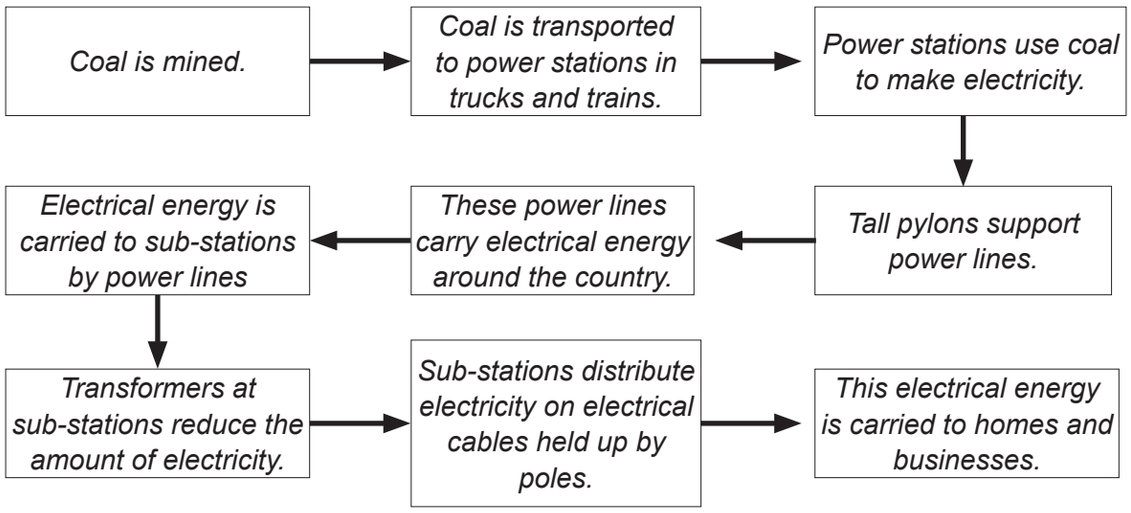
1. Write the following on the chalkboard (always try to do this before the lesson starts):

ACTIVITY: THE INFRASTRUCTURE NEEDED FOR ELCTRICITY

1. Draw a flow diagram to show the infrastructure needed to get electricity into homes and businesses.
2. Also use the words and phrases below to put in each block of the flow diagram. Put the words and phrases into the correct order.
    a. Electrical energy is carried to sub-stations by power lines.
    b. Tall pylons support power lines.
    c. Coal is transported to power stations in trucks and trains.
    d. This electrical energy is carried to homes and businesses.
    e. Sub-stations distribute electricity on electrical cables held up by poles.
    f. Power stations use coal to make electricity.
    g. Tall pylons support power lines.
    h. These power lines carry electrical energy around the country.
    i. Coal is mined.
    j. Transformers at sub-stations reduce the amount of electricity.

2. Explain this to the learners as follows:
   a. A flow diagram shows the step-by-step process of something.
   b. This flow diagram shows the infrastructure needed to make electricity.
   c. Put arrows between the blocks to show how this process proceeds.
3. *Model answer*

INFRASTRUCTURE NEEDED FOR ELECTRICITY



Checkpoint 2

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

a. How much does it cost to build a power station? e.g Is it cheap or expensive to build a power station?
b. Is the following statement True or False: The infrastructure for electricity is expensive as the structures need to be built and maintained?

Answers to the checkpoint questions are as follows:

a. It costs hundreds of billions of Rands to build a power station.
b. True

4. 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
Study & Master	Mains electricity	122
Viva	Mains electricity	143
Platinum	Mains electricity	154
Solutions for All	Mains electricity	237
Day-by-Day	Mains electricity	141
Oxford	Mains electricity	105-106
Spot On	Mains electricity	70-71
Top Class	Mains electricity	116
Sasol Inzalo Bk B	Mains electricity	64-65

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://goo.gl/JqkUz3 [Mains electricity - Cost of electricity]
2. https://goo.gl/QizDnz [The cost of energy consumption]
3. https://goo.gl/fgMeCJ [Activity 2 - Cost of and saving electricity]

8 C

Term 3, Week 8, Lesson C
Lesson Title: Cost of electricity
Time for lesson: 1½ hours

A POLICY AND OUTCOMES

Sub-Topic	Examine labels of electrical appliances
CAPS Page Number	59

Lesson Objectives

By the end of the lesson, learners will be able to:

- understand the labels on electrical appliances
- identify how much electrical energy they use
- record the findings in a table
- discuss ways to save electrical energy
- identify which appliances use more electricity than others.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing		8. Predicting		14. Designing	
3. Comparing	✓	9. Hypothesizing		15. Making/ constructing	
4. Measuring	✓	10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information	✓		

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
N/A	

C CLASSROOM MANAGEMENT

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

Where is electrical energy stored?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

Electrical energy is stored in cells and batteries.

D ACCESSING INFORMATION

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

ENERGY REQUIRED BY ELECTRICAL APPLIANCES

1. Some electrical appliances use more electricity to run than others.
2. Appliances that use heat use the most energy.
3. Geysers and heaters use heat.
4. The labels on appliances tell you how much energy the appliance will use.
5. You will need to look for the ‘W’ or ‘kW’ amount.
6. This stands for watt (W) or kilowatt (kW).
7. The higher the number, the more energy the appliance will use in a specific time.
8. The longer you use an appliance the more electrical energy you will use.

2. Explain this to the learners as follows:
   a. Power is measured in units called watts.
   b. The symbol for watts is W and for kilowatts it is kW.
   c. Electricity usage also depends on how long you use the appliance for.
   d. The amount of electrical energy you use depends on the wattage and the amount of time the appliance is used.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What is electrical power measured in?
b. Which kinds of appliances use the most electrical energy?

Answers to the checkpoint questions are as follows:

a. Electrical power is measured in watts (W) or kilowatts (kW).
b. Appliances that use heat use the most electrical energy.

E CONCEPTUAL DEVELOPMENT

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

COMPARING APPLIANCES AND THEIR USE OF ELECTRICAL ENERGY

1. Study the appliances listed below and record the output energy and wattage rating for each appliance in the table:

   heater - 2 000 W

   toaster – 100 W

   light fitting – 1 400 W

   TV – 2 000 W

   electric stove – 2 500 W

   fridge – 15 W

   washing machine – 4 500 W.

2. Copy and complete the table below.

Appliance	Output energy	Wattage rating

3. Answer the questions that follow:
   a. Which appliance has the highest wattage rating?
   b. Which appliance has the lowest wattage rating?
   c. Why do you think the appliance with the highest wattage rating uses so much electrical energy?

2. Explain this to the learners as follows:
   a. Copy and complete the table.
   b. Answer the questions that follow.
   c. Ask learners to look at the labels on appliances at home and to record the wattage rating of these appliances.
   d. Learners must compare their answers with a partner.
   e. Discuss the answers with the class.
3. *Model answer:*

COMPARING APPLIANCES AND THEIR USE OF ELECTRICAL ENERGY

Appliance	***Output energy***	***Wattage rating***
heater	*heat*	*2 000 W*
toaster	*heat*	*100 W*
light fitting	*light*	*1 400 W*
T.V.	*light and sound*	*2 000 W*
electric stove	*heat*	*2 500 W*
fridge	*cold*	*15 W*
washing machine	*movement and heat*	*4 500 W*

3.

a. The washing machine has the highest rating.

b. The fridge has the lowest rating.

c. The washing machine uses heat to heat up the water. This requires much energy. It also uses movement energy.

Checkpoint 2

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

a. Which appliance use the larger amount of electrical power: a washing machine or a toaster?
b. Which appliance uses the least amount of electrical power: a fridge or a stove?

Answers to the checkpoint questions are as follows:

a. A washing machine uses the larger amount of power.
b. A fridge uses the least amount of power.

4. 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
Study & Master	Mains electricity	123-126
Viva	Mains electricity	145-146
Platinum	Mains electricity	155-158
Solutions for All	Mains electricity	238-240
Day-by-Day	Mains electricity	141-142
Oxford	Mains electricity	106-107
Spot On	Mains electricity	72
Top Class	Mains electricity	-
Sasol Inzalo Bk B	Mains electricity	65-67

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://goo.gl/V1w2FR [My Green Home - How to read appliance energy levels]
2. https://goo.gl/VuuiAF (6mins) [What the Ngewana family do]

9 A

Term 3, Week 9, Lesson A
Lesson Title: Cost of electricity
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Illegal connections
CAPS Page Number	59

Lesson Objectives

By the end of the lesson, learners will be able to:

- understand why illegal connections are dangerous
- discuss why people make illegal connections.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	✓

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing		8. Predicting		14. Designing	✓
3. Comparing		9. Hypothesizing		15. Making/ constructing	✓
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information	✓		

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 38: Illegal electrical connections	

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 measurement should you look for on an appliance label to tell you how much electrical energy is being used: watts (W) or volts (V)?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

You should look for the watts (W).

D ACCESSING INFORMATION

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

ILLEGAL CONNECTIONS

1. Electricity is very dangerous, and it can kill people.
2. The government enacted laws about **installing** electrical equipment.
3. A qualified electrician must do the installation.
4. Some people run their own cables from the homes of others.
5. This is illegal.
6. Another illegal connection is when cables are connected to electricity poles.
7. This is stealing electricity.
8. These illegal connections are unsafe.
9. Some children have died from touching loose cables.
10. Some people have died when trying to connect electrical cables.
11. You can report illegal connections **anonymously** to 32211.

2. Explain this to the learners as follows:
    a. Illegal connections are extremely dangerous.
    b. Show learners Resource 38: 'Illegal electrical connections'.
    c. These illegal connections occur when someone, who is not an official electrician, has connected wires.
    d. Two ways of connecting electricity illegally are written on the chalkboard.
    e. One is connecting cables from another house.
    f. The other is connecting to electricity poles.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. Who should install electrical equipment?
b. Can you give two reasons why one should not connect electricity illegally?

Answers to the checkpoint questions are as follows:

a. A qualified electrician should install electrical equipment.
b. It is unsafe. Stealing takes place when electricity is connected illegally.

E CONCEPTUAL DEVELOPMENT

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

WHAT TO REMEMBER WITH ELECTRICAL CONNECTIONS

1. Power lines should not be touched.
2. Report to the municipality if you come across lines that have been **tampered** with.
3. Do not cut power lines.
4. Do not climb over fences to get to sub-stations.
5. Make sure all electrical wiring is insulated with plastic covering.
6. An earth leakage unit protects us from **accidental** contact.
7. It trips the electricity by switching it off at the main switch.
8. Often illegal connections bypass the earth leakage.

2. Explain this to the learners as follows:
    a. Read through the information on the chalkboard and make the learners understand all the words.
    b. Learners need to know what illegal connections look like.
    c. Remind learners of safe practices when working with electricity.
    d. They learned about this in Grade 5.
    e. Do not touch anyone who is touching an electric wire and being shocked.
    f. Switch off the electricity at the mains switch.
    g. Use a wooden broom to try and get the person away from the wire.
3. Write the following on the chalkboard (always try and do this before the lesson starts):

ACTIVITY: DISCUSS THE DANGERS OF ILLEGAL CONNECTIONS.

1. With a partner, discuss the dangers of illegal connections.
2. Design a A5 size pamphlet (half an A4 page) in which you educate people about the dangers of illegal connections.

4. Model answer (answers will vary):

PROTECT YOURSELVES

Be careful of electrical wire that is not insulated.

Do not connect electricity illegally.

ELECTRICITY CAN KILL!

Phone 32211 anonymously to report illegal connections.

Checkpoint 2

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

a. Is the following statement true or false: Electrical wiring should be insulated with plastic?
b. What does an earth leakage do?

Answers to the checkpoint questions are as follows:

a. True
b. Earth leakage protects us from accidental contact with electricity. It switches off the main electrical switch.

5. 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
Study & Master	Mains electricity	126-128
Viva	Mains electricity	146-147
Platinum	Mains electricity	159-160
Solutions for All	Mains electricity	240-243
Day-by-Day	Mains electricity	143
Oxford	Mains electricity	108-110
Spot On	Mains electricity	73
Top Class	Mains electricity	118-119
Sasol Inzalo Bk B	Mains electricity	69-75

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://goo.gl/FGpR6s (5min 42sec) [Illegal and unsafe wiring in homes]
2. https://goo.gl/H4yJRN [Illegal connections - ESKOM]

9 B

Term 3, Week 9, Lesson B
Lesson Title: Renewable energy
Time for lesson: 1 hour

A POLICY AND OUTCOMES

Sub-Topic	Renewable ways to generate electricity
CAPS Page Number	59

Lesson Objectives

By the end of the lesson, learners will be able to:

- describe what a renewable resource is
- give examples of renewable and non-renewable resources
- list the advantages and disadvantages of one of the renewable resources.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing	✓	8. Predicting		14. Designing	
3. Comparing		9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information	✓		

TOPIC: Mains electricity

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Articles about renewable energy	

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 material should insulate should electrical wiring?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

Electrical wiring should be covered with plastic for insulation.

D ACCESSING INFORMATION

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

RENEWABLE WAYS TO GENERATE ELECTRICITY

1. We get energy from many different sources.
2. These can be divided into renewable and non-renewable resources.
3. Fossil fuels are non-renewable resources.
4. Oil, coal and oil are non-renewable resources.
5. The Sun, wind and water are examples of renewable resources.
6. These types of resources will not run out and they are free to use.
7. Renewable energy resources do not pollute the air or water.
8. However, the machines used to **capture** this energy are expensive.
9. The weather is also not always reliable.
10. Water is scarce in times of drought.

2. Explain this to the learners as follows:
   a. We need to use fossil fuels sparingly. Once they are used up, they will be finished.
   b. Increasingly people are using non-renewable resources of energy.
   c. These include solar, wind and hydro-electricity.
   d. Renewable energy has advantages and disadvantages
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What are renewable energy sources?
b. Can you name three types of renewable energy?

Answers to the checkpoint questions are as follows:

a. Renewable energy sources are those that will not run out.
b. Solar, wind and hydro-electricity are types of renewable electricity.

E CONCEPTUAL DEVELOPMENT

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

ACTIVITY: ADVANTAGES AND DISADVANTAGES OF RENEWABLE ENERGY

1. Solar power uses the energy from the Sun.
2. Solar panels are fitted onto the roofs of houses.

Answer the following questions about solar energy.

1. Can you write down three advantages of solar power?
2. Can you write down two disadvantages of solar power?

2. Explain this to the learners as follows:
   a. Renewable energy has advantages and disadvantages.
   b. Tell learners to read through their notes from the previous section.
   c. Ask them if they understand these notes.
   d. Ask learners to do the activity.
3. *Model answer*

ADVANTAGES AND DISADVANTAGES OF RENEWABLE ENERGY

1.

a. The Sun will always be there – its energy will not run out.
b. Sunshine is free.
c. Solar energy does not pollute the air or water.

2.

a. The panels used to capture this energy are expensive.
b. The weather is not always reliable – the Sun does not always shine.

Checkpoint 2

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

a. Can you give one advantage of all renewable resources?
b. What is a disadvantage of wind and solar electricity?

Answers to the checkpoint questions are as follows:

a. Any of the following: once installed, their use is free; they do not run out; they do not pollute the air or water.
b. The weather is not always reliable and these two resources rely on the weather.

5. 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
Study & Master	Mains electricity	129-132
Viva	Mains electricity	148-149
Platinum	Mains electricity	161
Solutions for All	Mains electricity	243-244
Day-by-Day	Mains electricity	144
Oxford	Mains electricity	111
Spot On	Mains electricity	74
Top Class	Mains electricity	119-120
Sasol Inzalo Bk B	Mains electricity	75-76

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://goo.gl/RnLFX2 (4min 37sec) [Renewable energy]
2. https://goo.gl/YdMxgN (4min 37sec) [Renewable vs Non-Renewable Energy Sources]
3. https://goo.gl/FtmZ7P (3min 07sec) [Renewable energy - Bill Nye]

9 C

Term 3, Week 9, Lesson C
Lesson Title: Renewable energy
Time for lesson: 1½ hours

A POLICY AND OUTCOMES

Sub-Topic	Comapring renewable energies.
CAPS Page Number	59

Lesson Objectives

By the end of the lesson, learners will be able to:

- list three renewable resources
- describe how these resources capture energy
- describe the energy change that happens.

Specific Aims	1. DOING SCIENCE & TECHNOLOGY	✓
	2. KNOWING THE SUBJECT CONTENT & MAKING CONNECTIONS	✓
	3. UNDERSTANDING THE USES OF SCIENCES & INDIGENOUS KNOWLEDGE	

SCIENCE PROCESS SKILLS					
1. Accessing & recalling Information	✓	7. Raising Questions		13. Interpreting Information	✓
2. Observing		8. Predicting		14. Designing	
3. Comparing	✓	9. Hypothesizing		15. Making/ constructing	
4. Measuring		10. Planning Investigations		16. Evaluating and improving products	
5. Sorting & Classifying		11. Doing Investigations		17. Communicating	✓
6. Identifying problems & issues		12. Recording Information			

B POSSIBLE RESOURCES

For this lesson, you will need:

IDEAL RESOURCES	IMPROVISED RESOURCES
Resource 34: A wind farm in South Africa	
Resource 35: Solar power in a shack settlement	
Resource 36: Hydro-power at Gariep Dam	

C CLASSROOM MANAGEMENT

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

Can you name three types of renewable energy resources?

3. Learners should enter the classroom, then discuss the question with the teacher and answer it in their workbooks.
4. Discuss their answers with the learners.
5. Write the model answer onto the chalkboard.

Solar, wind and hydro-electric power are renewable energy resources.

D ACCESSING INFORMATION

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

TYPES OF RENEWABLE RESOURCES

1. Solar energy uses solar panels to capture energy from the Sun.
2. These panels convert (change) solar energy to heat or electrical energy.
3. The panels must be carefully placed to catch as much sun as possible.
4. Wind energy uses wind turbines with huge blades to capture energy.
5. Wind turbines convert wind energy to electrical energy.
6. Many wind turbines together are called a wind farm.
7. The first wind farm in South Africa was built in Darling in the Western Cape.
8. Hydro-electric power uses water to generate electrical energy.
9. The force of flowing water turns the turbines.
10. The turbines and generators change hydro power to electrical energy.
11. The water is then returned to the rivers.
12. Dams store water.
13. Dams are expensive to build.

2. Explain this to the learners as follows:
   a. South Africa is starting to use more renewable resources, as electricity is becoming expensive.
   b. Read through points 1 to 3 on the chalkboard.
   c. Show learners Resource 35: 'Solar power in a shack settlement'.
   d. Solar power, once installed, is free to use.
   e. Read through points 4 to 7 on the chalkboard.
   f. Show learners Resource 34: 'A wind farm in South Africa'.
   g. Wind turbines are being used increasingly in South Africa, especially in the Cape, where it is windy.
   h. Read through points 8 to 13.
   i. Show learners Resource 36: 'Hydro-power at Gariep Dam'.
   j. There are many hydro-electric power stations in South Africa and Lesotho.
3. Give learners time to copy this information into their workbooks.

Checkpoint 1

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

a. What do we call the type of power that is produced from falling water?
b. What do we call the machine that captures the wind to turn it into electrical energy?

Answers to the checkpoint questions are as follows:

a. Hydro-electric power is produced from falling water.
b. A wind turbine captures wind energy and changes it into electrical energy.

E CONCEPTUAL DEVELOPMENT

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

ACTIVITY: RENEWABLE WAYS TO GENERATE ELECTRICITY

1. Copy and complete the table below.
2. Use your notes and the pictures your teacher has shown you.

	Hydro-electric power station	**Wind farm**
Examples in South Africa:		
Change in energy:		
Advantages:		
Disadvantages:		

3. Write four to five sentences in which you discuss solar energy. Use the words and phrases below to help you:

   the Sun, no pollution, expensive to install, free, panels, capture, heat energy, electrical and heat energy.

2. Explain this to the learners as follows:
   a. Copy and complete the table.
   b. Learners must use their notes to help them do this.
3. Model answer:

ACTIVITY: RENEWABLE WAYS TO GENERATE ELECTRICITY

	Hydro-electric power station	***Wind farm***
Examples in South Africa:	*Gariep Dam*	*Darling*
Change in energy:	*Water to electrical*	*Wind to electrical*
Advantages:	• *Water is renewable* • *There is no pollution*	• *Wind is renewable* • *It does not harm the environment.*
Disadvantages:	• *Dams are expensive to build*	• *Wind turbines are expensive to build and install.* • *They do not work when there is no wind.*

3. Solar energy gets its energy from the Sun. It is expensive to install but once installed it is free. Solar panels change heat energy into electrical and heat energy. An advantage of solar power is that is does not cause pollution.

Checkpoint 2

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

a. What is an advantage of hydro-electric power?
b. Where does solar energy get its energy from?

Answers to the checkpoint questions are as follows:

a. Either of the following: water is renewable, so it will not run out; there is no pollution.
b. Solar energy gets its energy from the Sun.

4. 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
Study & Master	Mains electricity	129-132
Viva	Mains electricity	148-149
Platinum	Mains electricity	161-13
Solutions for All	Mains electricity	244-248
Day-by-Day	Mains electricity	144-145
Oxford	Mains electricity	111-112
Spot On	Mains electricity	74-75
Top Class	Mains electricity	120
Sasol Inzalo Bk B	Mains electricity	76-78

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://goo.gl/nerxra (6min 01sec) [Alternative energy resources]
2. https://goo.gl/ABu5ch (3min 37sec) [Alternative energy sources]

NATURAL SCIENCES & TECHNOLOGY

ASSESSMENT GRADE 6 TERM 3

GRADE 6 ASSESSMENT

- This section presents the CAPS assessment requirements for this grade for this term.
- See your prescribed textbooks for examples of the required assessments.

CAPS Assessment

Assessment is a continuous planned process that involves identifying, gathering, interpreting and diagnosing information about the performance of learners.

Assessment involves generating and collecting evidence of learner achievement and progress, and using this information to understand and provide assistance to the learner during the process of teaching and learning.

Assessment should be both *formal* and *informal*:

a. ***Informal Assessment*** involves regular checking of learners' class work and practical tasks; asking questions; discussions; informal classroom interactions; and giving constructive feedback. Informal assessment marks do not need to be recorded, but the teacher can make notes for future reference.

b. ***Formal Assessment*** provides teachers with a systematic way of evaluating how well learners are progressing. Formal Assessment consists of selected assessment tasks. These tasks are stipulated by CAPS and the marks need to be recorded. These tasks are done throughout the year, and include practical tasks, tests and examinations.

   i. ***Tests and Examinations***

      Examinations must include questions on both Natural Sciences and Technology. The weighting of the marks should reflect the time allocated to each section in the curriculum content. Tests and exams should consist of a range of questions that cover different cognitive levels: recall; understanding; application; evaluation; analysis; and synthesis. CAPS aligned tests and examinations, with accompanying memoranda, are provided with these lesson plans.

   ii. ***Practical Tasks***

      Practical tasks give learners the opportunity to demonstrate knowledge, skills and understanding. Practical tasks form part of the activities included in these lesson plans. Each term, one practical task has been selected for assessment. A rubric is provided to conduct the assessment.

A minimum mark allocation is prescribed in CAPS for tests, practical tasks and examinations for each grade. For this grade, these are summarised in the table below:

GRADE 6 ASSESSMENT

Grade 6						
Programme of Formal Assessment						
Formal Assessments	**TERM 1**	**TERM 2**	**TERM 3**	**TERM 4**	**TOTAL MARKS FOR THE YEAR**	**TOTAL**
School-based assessments	1 test [20 marks] 1 selected practical task [15 marks]	1 exam or test on work from terms 1 & 2 [50 marks] 1 selected practical task [15 marks]	1 test [20 marks] 1 selected practical task [15 marks]	1 selected practical task [15 marks]	150 marks	Together make up 75% of the total marks of the year
Exams [60 minutes]				Exam on work from terms 3 & 4 [50 marks]	50 marks	Makes up 25% of the total marks of the year
Number of formal assessments	2	2	2	2	Total 8 assessments [200 marks]	Total: 100%

Refer to CAPS on the processes for converting marks to percentages and to the 7-point scale.

In this section of the booklet, you will find your science assessments for this term.

There are two assessments included:

A Practical Activity

The activity completed is drawn from one of the lessons in the lesson plans. The rubric or memorandum attached in this pack will assist you with assessing the task completed by the learners.

A Test

The test included will need to be copied onto the chalkboard for learners to complete. There is also a test memorandum included to assist you with marking the learners completed test scripts.

All of the assessments are aligned to CAPS requirements and the marks allocated for each assessment are as stipulated in CAPS.

Grade 6
Term 3
Practical Task

Time: 40 Minutes (15 minutes preparation, 25 minutes task time)
Marks: 15

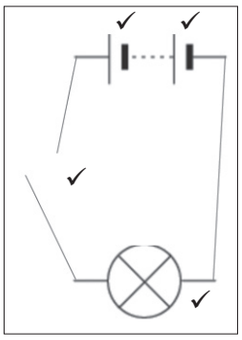
NOTES TO THE TEACHER

1. This practical activity will be completed as part of Section E of lesson 4A.
2. This practical will take place during the lesson after the teaching component in Section D, "Accessing Information".
3. The first 15 minutes will be used to teach section D and prepare learners for the practical task.
4. The next 25 minutes will be used to complete the practical activity as outlined in Section E.
5. The instructions and content of the practical task should be written on the chalkboard for the learners.
6. The memo for assessing the practical task is provided.
7. This will be a demonstration lesson unless there is enough equipment available for group work.
8. The following equipment will need to be collected before the lesson:
    - a circuit with a lightbulb (see Section D of Lesson 3B on instructions on how to make a circuit)
    - a coke can
    - an eraser
    - a plastic pen
    - a metal cup or kettle
    - a glass cup or bowl
    - a stick
    - a coin
    - tinfoil
9. Ensure that all the materials have been collected before the practical lesson. This may take a few days. Allow enough time for this.
10. If the lesson will be done in groups, each group will need a set of this equipment.
11. The learners should complete the drawings with a sharp pencil and the written answers should be completed in pen.

Grade 6
Natural Sciences & Technology
Term 3
Practical Task

Memorandum

(See section e of lesson 4a for instructions and questions)

CAPS Topic	Task	Expected answer/outcome	Marks
	1		
Energy and electricity	1.1		4
Energy and electricity	1.2	The circuit is not closed, and electricity cannot flow from the battery to the lightbulb. ✓	1
Energy and electricity	1.3	Join the wires to close the circuit so that the electricity can flow. ✓	1
	2		
Energy and electricity	2	(Note: The only requirement is that the learner made both a prediction in column one ✓ and checked the answer during the test in column two. This is completed on the table). ✓	2
	3		
Energy and electricity	3.1	Most seem to be made of metals. ✓	1
Energy and electricity	3.2	Answers will vary. ✓	1
Energy and electricity	3.3	Answers will vary. ✓	1
Energy and electricity	3.4	• To make full use of their useful properties. • To avoid dangerous use of materials. (Any 1) ✓	1
Energy and electricity	3.5	• To insulate the electricity. ✓	1
Energy and electricity	3.6	• Shock and/or electrocution ✓ • Fire hazard ✓	2
			TOTAL 15

Grade 6
Natural Sciences & Technology
Term 3
Test

Time: 40 minutes
Marks: 20

NOTE TO THE TEACHER:

If possible, photocopy this test for each learner. If this is not possible, write the test on the chalkboard.

INSTRUCTIONS TO THE LEARNERS

1. Answer all questions in blue or black ink.
2. Read each question carefully before answering it.
3. Pay attention to the mark allocations.
4. Plan your time carefully.
5. Write your answers in the spaces provided.
6. Write neatly.

PRACTICE QUESTION

Read the question and circle the letter that shows the correct answer.

1.1 Which of the following is an example of a conductor of electricity?

a. glass
b. copper wire
c. plastic
d. rubber

You have answered correctly if you have circled (B)

QUESTION 1: MULTIPLE CHOICE [3]

1.1. Which one of these is NOT an example of a fossil fuel?

a. oil
b. coal
c. natural gas
d. electricity

1.2. Which of these statements is FALSE?

a. A fan uses a motor to change electrical energy into movement energy.

b. A doorbell uses a buzzer to change electrical energy into sound energy.

c. A torch uses a battery to change electrical energy into light energy.

d. A stove uses a heating element to change electrical energy into heat energy.

1.3. In circuitry, which of the following is the symbol for a lightbulb?

a. 

b. 

c. 

d. 

QUESTION 2 [4]

Write one word that means the same as the sentence:

2.1. Material that does not allow electricity to pass through it.

_____

2.2. The metal wires inside a light bulb.

_____

2.3. A machine for making power in which a wheel with blades is made to turn by flowing water, steam, gas, air or other fluid.

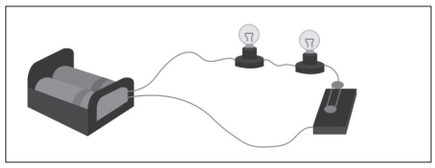
_____

2.4. A resource that that once has been used up cannot be replaced.

_____

QUESTION 3 [6]

Look at the following illustration of a two bulb circuit:



- Draw a circuit diagram of this illustration.
- Use a sharp pencil and a ruler.
- Use the correct symbols for the components.
- Give the circuit a title or heading.

QUESTION 4 [7]

4.1. Name two examples of renewable energy.

_____

_____

4.2. Explain why using coal to generate electricity is not a good long-term solution for South Africa or the rest of the planet. Give three reasons for your answer.

_____

_____

_____

4.3. Which form of renewable energy do you think is most suitable for South Africa? Give a reason for your answer.

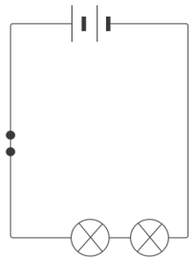
_____

_____

Total: 20

Grade 6
Natural Sciences & Technology
Term 3
Test

Memorandum

CAPS Topic	Questions	Expected answer(s)	Marks
	1		
Mains electricity	1.1	D ✓	1
Systems to solve problems	1.2	C ✓	1
Electric circuits	1.3	A ✓	1
	2.		
Electrical conductors and insulators	2.1	insulator ✓	1
Electrical conductors and insulators	2.2	filament ✓	1
Mains electricity	2.3	turbine ✓	1
Mains electricity	2.4	non-renewable ✓	1
	3.		
Electrical circuits		 e.g. A two bulb circuit or A closed circuit Allocate marks as follows: • Symbols are correct ✓ ✓ ✓ • Symbols are in correct order ✓ • Lines are straight and correct ✓ • A suitable label has been given ✓	3 1 1 1
	4.		
Mains electricity	4.1	(Any two) ✓ ✓ • Hydroelectricity • Wind turbines • Solar panels • Landfill gas	2

CAPS Topic	Questions	Expected answer(s)	Marks
Mains electricity	4.2	Any three ✓ ✓ ✓ • It is a non-renewable energy source. • It is a major cause of air pollution. • The infrastructure to mine, transport and convert coal to electricity is expensive. • Coal shortages are responsible for load shedding.	3
Mains electricity	4.3	Answers will vary, e.g. hydro power, solar power, etc. ✓ ✓	2
			TOTAL 20