GRADE 6

NATURAL SCIENCES AND TECHNOLOGY

TERM - 3

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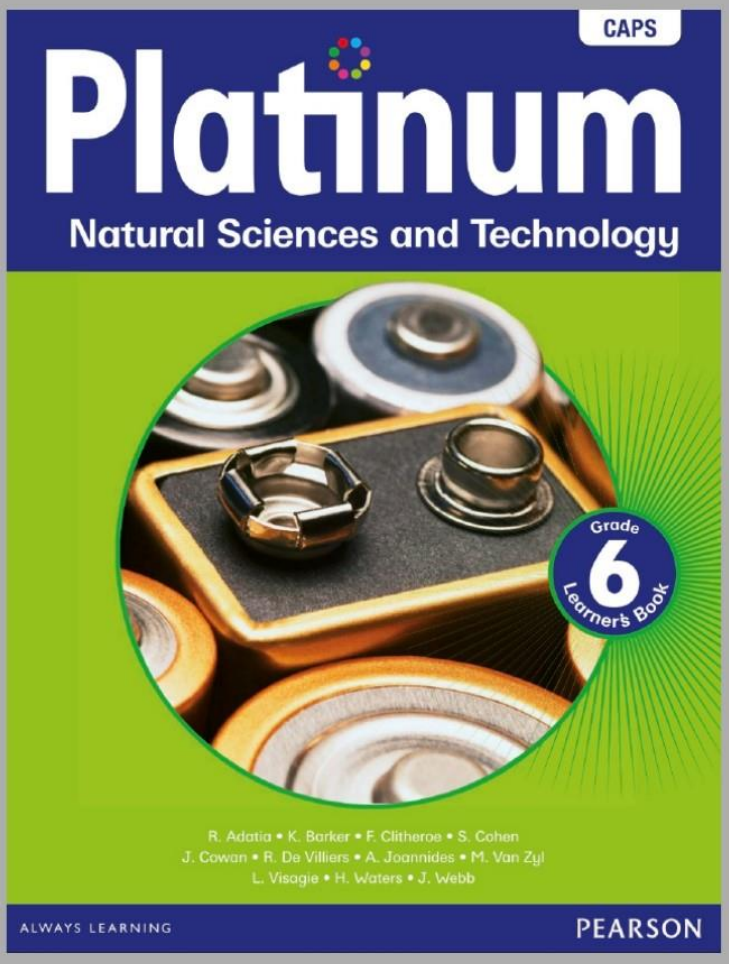
Grade 6

NATURAL SCIENCE AND TECHNOLOGY

SUMMARIES

Term - 3

SUMMARIES FROM:



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Term 3 – Energy and change and systems and control

All Summaries according to

PLATINUM TEXT BOOKS.

TOPIC 10

Unit 1 – Electric circuits

Important words to REMEMBER!

buzzer	an electric device that converts electrical energy to sound energy
components	parts of an electric circuit
cell	a source of electrical energy that stores and then supplies energy to a circuit
battery	two or more cells connected to provide electrical energy
conductor	a material that allows electrical current to flow through it
electric circuit	system for transferring electrical energy from one place to another
electric current	the movement of electric charges through a conductor
electric motors	convert electrical energy into movement energy
insulation	covering on circuit wires that keep electrical current in the wire
insulator	a material through which an electrical current is not able to travel
switch	a component for controlling whether current flows in an electric circuit
output device	component that changes electrical energy to another form of energy

GETTING ELECTRICAL ENERGY FROM ONE PLACE TO ANOTHER

- An **ELECTRIC CIRCUIT**
  -> is a **system for transferring energy** from **one place to another.**
- **A CIRCUIT**
  -> provides a pathway for electricity to flow from an energy source such as a cell to where it is needed and back to the source.

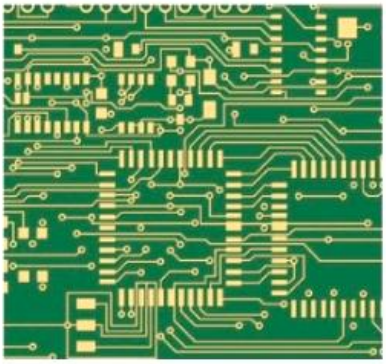
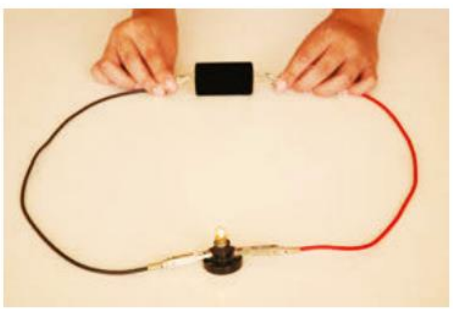


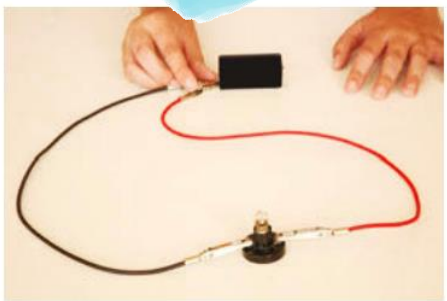
Figure 1 This is a circuit board inside a computer. The pathways for electricity to flow are made of gold

- The pathway needs to form a **CLOSED LOOP** and can be made of **electrical wires.**
- The **CLOSED LOOP** is called an **ELECTRICAL CIRCUIT**.

Figure 2 These pylons support the long transmission wires that carry electricity to all parts of our country—they are part of a nation-wide circuit called the national grid

- An electric circuit can also be **METAL PATHWAYS** printed on a board. These boards are known as **CIRCUIT BOARDS**. Circuit boards are found in many **modern appliances**.
- Circuits can also be very **large**, like the circuit that brings **ELECTRICITY TO OUR HOMES**.





COMPONENTS OF A SIMPLE ELECTRIC CIRCUIT

- Made out of different parts -> called COMPONENTS

1. A SOURCE OF ENERGY:

- Each circuit needs a source of **ELECTRICAL ENERGY.**
- **CELLS** and **BATTERIES** are **one source of electrical energy** in an electrical circuit
- A battery has a **POSITIVE SIDE** and a **NEGATIVE SIDE.**

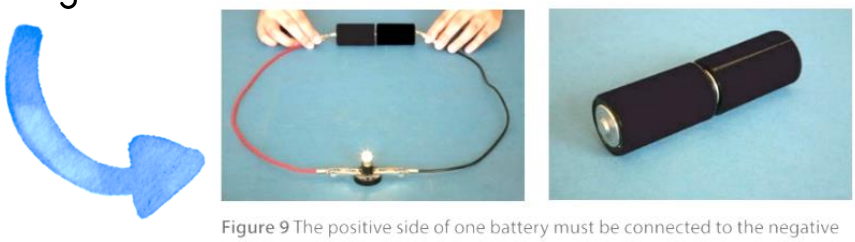


Figure 9 The positive side of one battery must be connected to the negative side of the next battery

2. CONDUCTING MATERIAL:

- **WIRES**

  -> are **conducting materials that carry the electrical current from the energy source to the other parts of the electric circuit.**

- **AN ELECTRICAL CURRENT**

  -> is **the movement of electric charges through a conductor.**

- The wires that carry **electrical charges** or **the electrical current** are made of a material like COPPER. **Copper** is a material that has the **property of conducting electricity.**
- The wires are usually covered by a **layer of plastic.** The layer of plastic is called = INSULATION.
- Electrical wires are **INSULATED** to keep the **electrical current from flowing where it is not wanted.**
- In **large circuits** with powerful electrical currents, it is **dangerous** to **touch wires that are not insulated.**

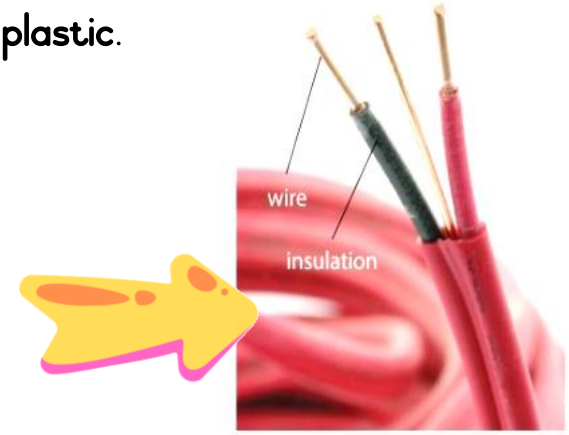


Figure 10 Electrical wires come with different-coloured insulation

3. DEVICES:

- DEVICES
  -> ARE MAN-MADE OBJECTS, made to do a spesific job.
  = eg. bulbs, buzzers and motors.
- It is used in electrical circuits to convert or change ELECTRICAL ENERGY to **other forms of energy**, such as **LIGHT, SOUND OR MOVEMENT.**

Compact fluorescent bulb

EXAMPLES OF DEVICES:

BUZZERS

- Electric device that makes a buzzing sound.
- Converts the electrical energy to sound energy.
- Can be used as warning signals and doorbells.

Figure 12 Buzzers are used in a variety of ways such as warning signals and doorbells

BULBS

- We use bulbs to convert or change electrical energy into light energy.
- Electrical energy flowing through a bulb causes the bulb to give off light. This light is called the output energy.
- Light is useful to us as it helps us to see things when it is dark.
  A bulb is an **output device.**
- We get different kinds of bulbs:
  - Compact fluorescent bulbs
  - Torch bulbs
  - Incandescent bulbs

MOTORS

- Electric motors convert electrical energy into movement energy.
- The electrical current passes through a motor. It causes the shaft to spin.
  This spinning movement can be used in many ways.
- Electric motors are found in household appliances such as fans, washing machines and in tools such as drills and grinders.

Figure 14 Electric motors come in many sizes, from those small enough to fit in a wrist watch to those large enough to drive enormous ships

A CIRCUIT IS AN UNBROKEN PATHWAY

- For an **electrical current to flow** = needs a complete, UNBROKEN PATHWAY.
- There can **be no gaps between the parts** of an **electric circuit**.
- If there are any **gaps in the circuit =** the **electrical current cannot flow**. we say that THE CIRCUIT IS BROKEN.

SWITCHES:

- We use an ELECTRIC SWITCH
  -> **to <u>start or stop</u> the flow of an electric current in a circuit.**
- By using a switch:
  -> You CONTROL THE MOVEMENT OF ELECTRICITY in a circuit.
- By using a switch:
  -> You can turn an appliance ON OR OFF without having to **plug it in** or to **unplug** it.
- All electrical appliances HAVE SWITCHES.

TYPES OF SWITCHES:

1. Light switch

2. Electronic equipment switch

3. Oven knob switch

4. In-line switch

Unit 2 – Circuit diagrams

Important words to REMEMBER!

circuit diagram	diagram of an electric circuit, drawn using standard symbols for electrical components

SYMBOLS USED IN CIRCUIT DIAGRAMS

- Each **electrical component** has ITS **OWN SYMBOL**.
- People all over the world, use this **same symbol** for **each component**.
- This is so that **everyone can understand** each other's **circuit diagrams** and **build the circuits from these diagrams**.

TOPIC II

Unit 1 – Electrical conductors and insulators

Important words to REMEMBER!

electrical conductor	a material that electricity can go through
transfer	the process by which energy goes from one part of a system to another
insulator	a material through which an electrical current is not able to travel

SOME MATERIALS CONDUCT ELECTRICITY

- **Materials** electricity can go through, are called ELECTRICAL CONDUCTORS.
- Most **metals** conduct electricity AND SO DOES WATER. (even salty water)
- Some materials conduct electricity more easily than others.
  These are good conductors -> **silver** and **copper**.
- In **electrical systems**, we **use metals to take electricity** from one part of the system, to another.
- The appliance changes the electricity into = LIGHT, HEAT, SOUND OR MOVEMENT
- Electrical systems also made of materials that do not conduct electricity.
  -> called ELECTRICAL INSULATORS

(INSULATING MATERIALS are used to **stop electricity** going to other parts of the system, where it is not wanted)

Figure 1 Cables, usually made of copper, are used to transfer electricity over long distances from a power station to where it is needed

Figure 2 An electricity box in a building with mains electricity. The wires in the circuits are usually made of copper, with plastic around them. They take electricity to wall sockets and light switches

Figure 3 Electrical appliances can be used in different places. Electrical cords connect appliances to the electric circuit.

Figure 4 Wiring inside a three-pin plug

Figure 5 Inside an electrical cord

Figure 6 Good conductors, such as silver, gold, copper and iron are used to make small circuits in complicated appliances, such as computers

INTERPRET INFORMATION

- INTERPRETING INFORMATION = is the ability to explain the meaning of something. It involves **explaining the results of an activity or an investigation.**

HOW TO INTERPRET THE RESULTS OF AN EXPLANATIONS

1. **Observe the changes** you see happening during an investigation:
   - **Observe** what has **stayed the same**.
2. Record your observations clearly and accurately:
   - If you must complete a **record table**, DRAW A DIAGRAM, or WRITE SENTENCES to describe what you see.
3. Think about your information:
   -What can it tell you about the reasons why things changed or stayed the same?
4. You may sort some of your observations into groups, to see if there are any patterns or links between them:
   - If you made a prediction at the beginning of the investigation, were the results the same or different to what you expected?
5. **Write down the main things** that you found out from the investigation:
   - Describe anything you cannot explain.

ELECTRICAL CONDUCTORS AND SAFETY

- KNOWING WHICH MATERIALS CONDUCT ELECTRICITY, **can help you to use electricity safely and to save your life**.
- **Our bodies** are made **mostly of water** -> this means that WE CAN CONDUCT ELECTRICITY!
- If someone near you touches a live electrical wire and cannot let go, **do not touch the person.** The electricity will go from their body into yours, giving you an electric shock.
- Use an **object that does not conduct electricity**, such as a **wooden broom handle**, to move the person away from the electrical wire.
- NEVER PUT OUT an **electrical fire with water.**
  -> USE SAND, OR A CHEMICAL FIRE EXTINGUISHER

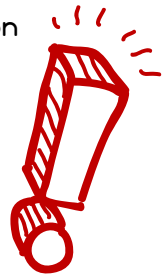
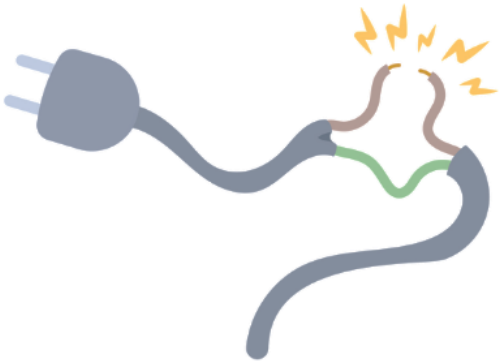


Figure 9 Use a fire extinguisher or sand to put out an electrical fire

TIPS FOR USING ELECTRICAL APPLIANCES SAFELY

1. Before filling an electric kettle or an iron with water, make sure it is **unplugged and that the socket switch is off.**
2. **Do not use electrical appliances** if you can **see the bare metal wires**, for example;
   -> if the electrical cord is damaged.
3. **Do not use electrical appliances in a bathroom**, for example;
   -> It is dangerous to use an electric heater near a bath.

Figure 10 A heater like this must not be used near water



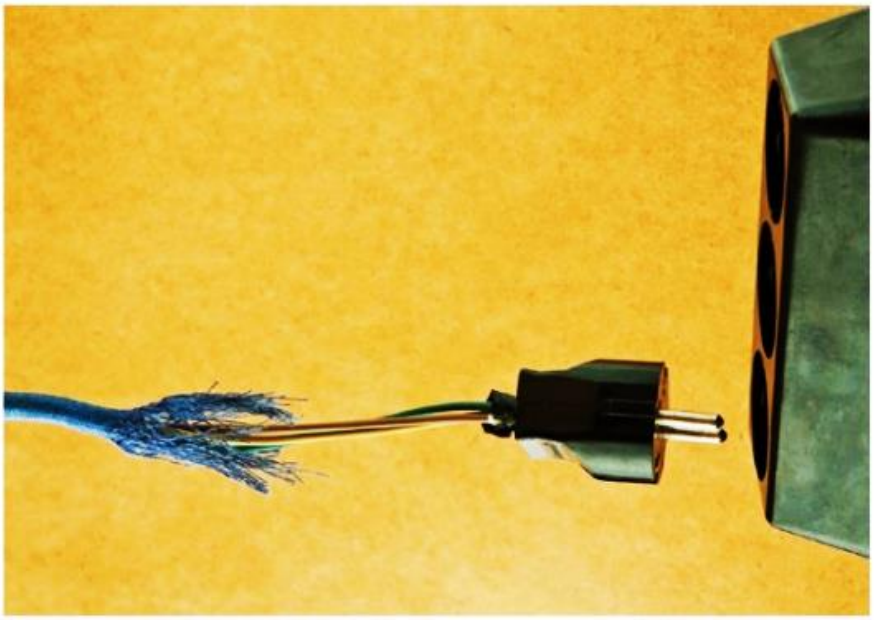


Figure 11 The connection of this wire to the plug is not safe. It must be repaired

Unit 2 – Insulators

- **Materials** that **do not allow electricity to go through:**
  -> ELECTRICAL INSULATORS
- Example:
  · RUBBER · PLASTIC · CERAMICS · GLASS

USE OF PLASTIC AND RUBBER FOR ELECTRICAL INSULATION

- ELECTRICAL SYSTEM-> **insulating materials**, such as **plastic** are used to keep the electricity in the circuit where it is useful.
- The INSULATORS -> **stop the electricity from going to other parts of the system,** where it might cause a **fire** or **other damage** or **injure a person.**
- ELECTRICAL INSULATORS -> **protect** us from the dangers of **electricity.**

Figure 12 Do not use appliances that have damaged electrical cords or wires

Figure 14 Only an electrician should repair damaged wiring in a household circuit

Figure 13 Electrical wires that are used for different purposes are covered with different types and colours of insulation

Figure 15 An electrician uses wire cutters insulated with plastic or rubber

- All **wires, switches** and **appliances** must BE INSULATED. They must never have **bare wires** or **circuit boards** showing.
- If the **insulation** on an electrical cord is **damaged**, the cord **must be replaced**.
- A **qualified electrician** must **replace or repair** any **damaged wiring** in a **household circuit**.

Figure 16 Electricians use insulated screwdrivers to work on electric circuits. The insulation is made of plastic or rubber. This prevents them getting an electric shock from electricity passing through the metal screwdriver

USE OF GLASS AND CERAMIC FOR ELECTRICAL INSULATION

- TRANSMISSION LINES are attached to PYLONS by INSULATORS -> made of **ceramic material** or **toughened glass**.
- The **insulation** stops the electricity going from the **cables into the metal pylons**.

Figure 17 Sometimes electricians wear insulating gloves made of rubber or leather

Figure 18 Power line with ceramic insulators

Figure 19 Never climb pylons or poles that carry electrical cables. Even if you think the wires are insulated, the insulation may be damaged

TOPIC 12

Unit 1 – Using electric circuits

Important words to REMEMBER!

system	something that is made up of two or more parts, that work together to do a specific job
input	a component that goes into a circuit and provides the energy to the circuit
output	a component that causes the result in a circuit, due to the input component's energy
process	the way in which the input is changed to the output; the link between the input and output devices

- A SYSTEM -> something that is **made of two or more parts** that work together like A bicycle.
- All the **parts work together** to move someone from one place to another.
- A cyclist can ride a bicycle from one place to another, because **all the parts are doing their job.**
- If you remove some parts of the system, it can't work.
- When a cyclist rides a bicycle = **energy is transferred.**
- The cyclist pushes the pedals -> INPUT OF ENERGY
- The **energy is transferred** by the different **mechanisms of the bicycle**.
- It is **changed to movement energy** = OUTPUT OF ENERGY
  - An ELECTRIC CIRCUIT is **also a system =** made up of electrical components.
- **Each component** does something different, but they all work together.
- If certain components were removed from the system, **-> the system would not work.**
- Like the bicycle, an ELECTRICAL SYSTEM needs at least one component to put **energy into the system** -> BATTERY -> INPUT DEVICE

Figure 1 The cyclist puts energy into the system by pushing the pedals. The pedals transfer the energy through a chain to the back wheel. The energy is changed to movement energy and the bicycle moves

- The CELL stores **CHEMICAL ELECTRICAL ENERGY** and **releases** it into this circuit as **ELECTRICAL ENERGY** when the circuit is complete.
- Energy is **TRANSFERRED FROM THE BATTERY** to the other components in the system.
- In an electric circuit, the energy is transferred from the battery, through **WIRES**, to the place where it is needed.
- Energy can **change form a number of times** along its path.

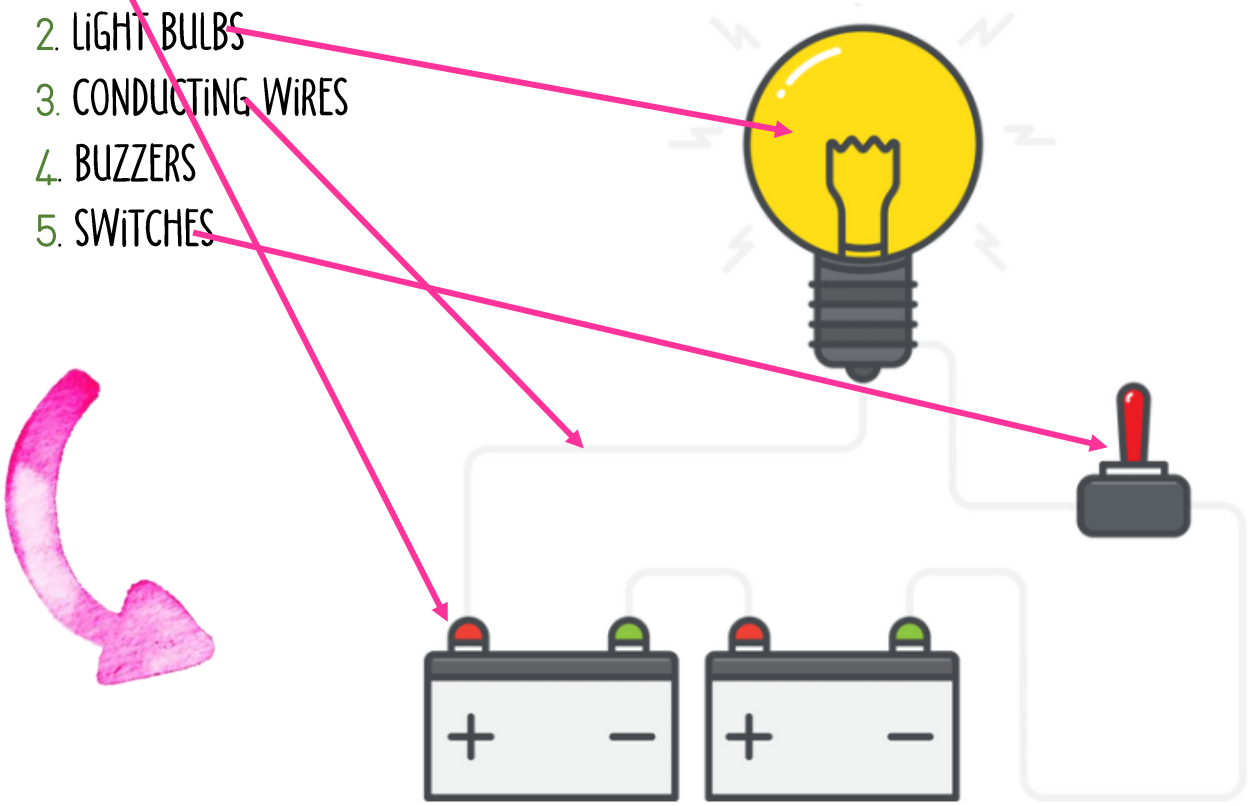
USING ELECTRIC CIRCUITS

- **ELECTRIC CIRCUITS** are often used to **solve problems that require energy**, such as street lighting, alarms, electric gates, traffic lights, fans and heaters.
- **ELECTRIC CIRCUITS = can ALSO BE USED IN MODELS AND TOYS**

BASIC COMPONENTS OF ELECTRIC CIRCUITS

Examples of **BASIC COMPONENTS OF ELECTRIC CIRCUITS**:

1. CELLS
2. LIGHT BULBS
3. CONDUCTING WIRES
4. BUZZERS
5. SWITCHES



ELECTRIC CIRCUITS THAT PRODUCE MOVEMENT

EXAMPLE ->TOY CARS

- The wheels of the toy car are connected to a basic electric circuit.
- The circuit is connected to two cells which provide power to an electric motor.
- When the switch is turned on, the motor can make the wheels of the toy car move.
- More examples:
  -> electric gates
  -> turning blades of handheld misting fans

Figure 4 Handheld fans work with an electric motor

Figure 2 Inside view of a toy car driven by an electric motor

Figure 3 Side view of a toy car driven by an electric motor

ELECTRIC CIRCUITS THAT PRODUCE LIGHT

EXAMPLE -> TORCH

- Inside a torch is an electric circuit that can produce light
- This circuit is connected to cells and a light bulb
- More examples: **Bulbs in your home, Street lights, Traffic lights and Light Emitting Diodes (LEDs)**
  (LEDs last longer and shines brighter)

Figure 6 Electric circuit provides energy to street lights

Figure 7 Electric circuit provides energy to an LED torch

ELECTRIC CIRCUITS THAT PRODUCE SOUND

EXAMPLE -> DOORBELL

- A **BASIC ELECTRIC CIRCUIT** is built into a doorbell, to produce energy, to make a sound.
- Sound is made by a small component, called a buzzer.
- A buzzer **converts** ELECTRICAL ENERGY TO SOUND ENERGY.
- Another example -> **digital clock**

Figure 9 Electric circuit provides energy to a door bell

Figure 10 A front view of a digital clock

ELECTRIC CIRCUITS THAT PRODUCE HEAT

EXAMPLE -> HEATER

- Inside the heater is an **element,** made from very **thin, specially made wires.**
- As electricity flows through these wires, they start to get hot.
- More examples
  = Hairdryers, Irons, Curling Irons,Toasters

Figure 12 Electric circuit produces heat

CIRCUIT DIAGRAMS

- We use **ELECTRIC CIRCUIT DIAGRAMS** to represent = **ELECTRIC CIRCUITS**
- It is much easier than drawing the whole circuit.
- Different components in an electric circuit are called = CIRCUIT COMPONENTS

HOW TO DRAW A CIRCUIT DIAGRAM

1. Use a sharp pencil and ruler.
2. Draw the conducting wires with a ruler. (Even though wires are not straight in real life)
3. Add the components one after the other and draw lines for the wires in between.
4. Do not draw the connections between the wires and the components.
5. A battery consists of more than one cell. Draw the cells one after the other.
6. We normally draw the circuit in the shape of a rectangle.

SYSTEM DIAGRAMS

- The process that takes place in an energy system, can change one form of energy to another.
- In a watermill the falling water has **POTENTIAL ENERGY** that changes to **MOVEMENT ENERGY** -> that makes the wheel turn.
- An ELECTRIC CIRCUIT is an example of an ENERY SYSTEM.
- An ELECTRIC ENERGY SYSTEM consists of 3 PORTS:

1. INPUT:

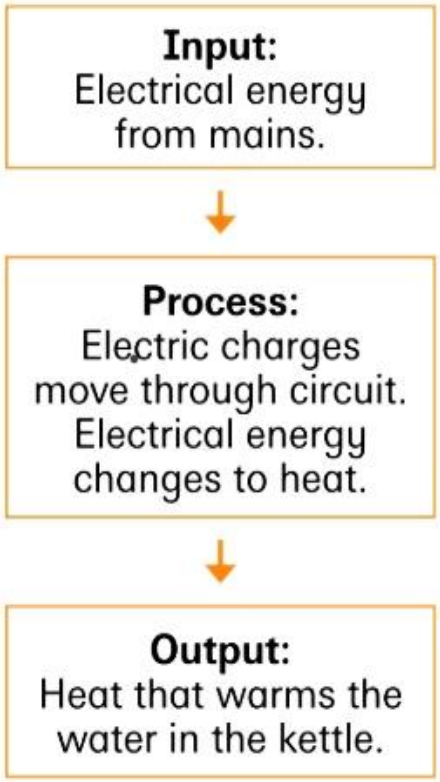
- What goes into the circuit?
- It can be the ELECTRICAL ENERGY from a **battery** or **mains electricity**.

2. OUTPUT:

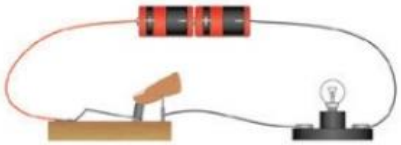
- What is released from the circuit?
- It can be **light from a bulb** or **heat from the element of a heater**.

3. PROCESS:

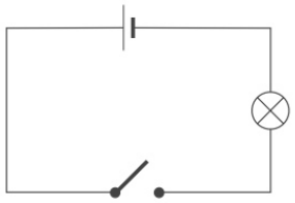
- The manner in which the **input is changed into the output**.
  = For example, the electric current in a circuit heats up the element of a heater.
- Electric energy is changed into heat.



- We use **A SYSTEM DIAGRAM** to show what happens in an electrical system.



A. A real circuit



B. A circuit diagram

TOPIC 13

Unit 1 – Fossil fuels and electricity

Important words to REMEMBER!

fossil fuels	the remains of dead plants and animals that store energy from the sun from millions of years ago
non-renewable resources	resources such as coal that cannot be replaced when they are used up
power station	a place where electricity is generated
turbine	the rotating blades of a machine
generator	a machine that produces electricity
transformer	a machine that changes the amount of energy carried by electricity
boiler	a machine that boils water

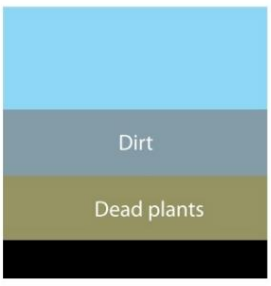
FOSSIL FUELS WERE FORMED MILLIONS OF YEARS AGO FROM DEAD PLANTS AND ANIMALS

- **COAL, OIL AND NATURAL GAS, are examples of**
  = FOSSIL FUELS
- **ENERGY** IS STORED IN FOSSIL FUELS and comes from:
  = THE SUN
- Millions of years ago, the Sun gave it's energy to plants and animals.
- When they died, **pressure from above** and **heat from the earth,** over millions of years, turned these dead plants and animals into **black coal, oil** or **natural gas**.

Figure 1 A lump of coal

Figure 2 In this photo, you can see a coal seam in the layers of rock

1.



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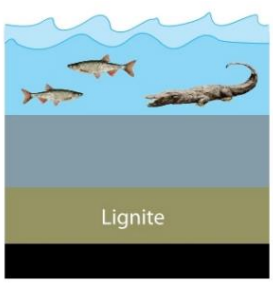

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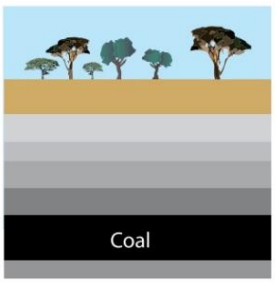

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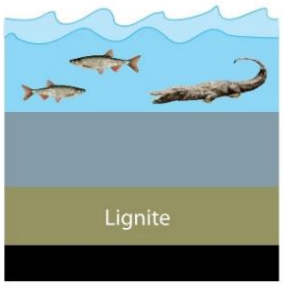
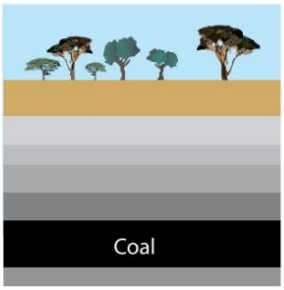
3. 

4. 

1. Millions of years ago in low-lying wetland areas huge ferns and forests grew. They absorbed the energy from the Sun.
2. Over time these plants died and formed into layers of rotting material. Over time pressure from above, packed these layers together to form peat.
3. When sand and water collected on these layers they were pressed together even more tightly and this made a soft brown layer called lignite.
4. As more sand and mud piled on top, more pressure occurred. The heat inside the Earth helped to slowly turn the lignite in the Earth's crust into black coal.

FOSSIL FUELS ARE NON-RENEWABLE RESOURCES

- Some of the natural resources that we use = **WILL NOT LAST FOREVER**.

- BECAUSE they have taken millions of years to form and need very specific conditions to form, like: **PRESSURE AND HEAT**.

  These are called -> **NON-RENEWABLE RECOURCES**

- Once they are used up = **they cannot be replaced**.

  Examples: COAL, OIL AND NATURAL GASSES

IN SA, COAL IS MOSTLY USED AS A FUEL IN POWER STATIONS

- **Power stations change the energy** that is stored in coal
  -> INTO ELECTRICAL ENERGY.
- The energy in the coal is USED TO BOIL WATER.
- **The steam produced from the boiling water, turns the turbine of a generator, to produce electricity.**

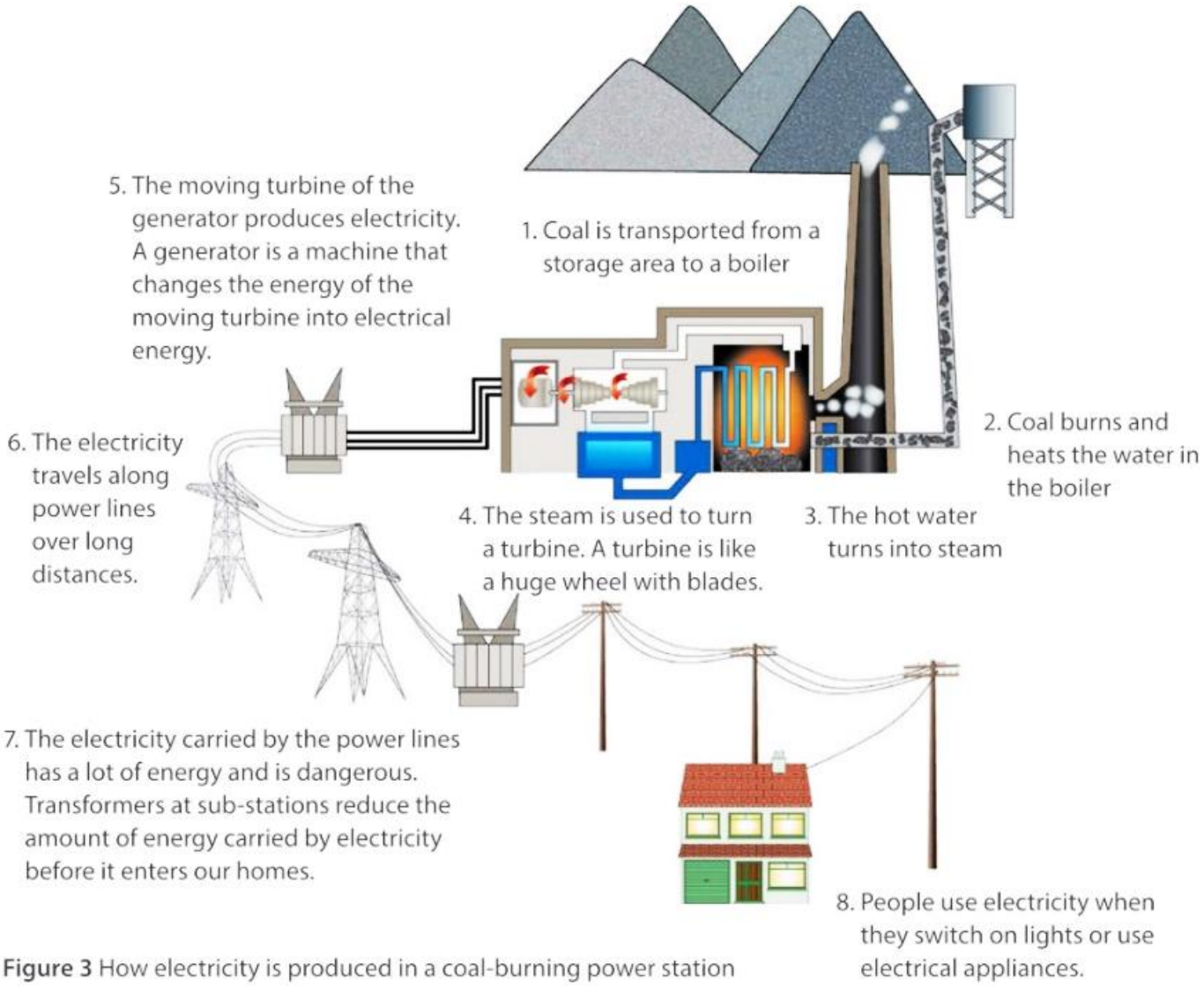


Figure 3 How electricity is produced in a coal-burning power station

VERY IMPORTANT TO KNOW FOR THE TESTS!

Unit 2 – The cost of producing electricity

Important words to REMEMBER!

wattage	the amount of electrical power an appliance requires to work

THE COST OF PRODUCING ELECTRICITY

- **INFRASTRUCTURE MEANS:**
  -> The structures and other things that are needed to make sure something works properly.
- **GENERATING and DISTRIBUTING** electricity is **very costly.**
  -> **because of the infrastructure that is required**
- It **costs hundreds of billions of Rand to build coal-burning fire stations.**
- It also costs billions to keep all the structures and equipment working properly.
- For these reasons **ELECTRICITY IS VERY COSTLY.**
- Everyone who uses electricity = has to pay for it.
- When we pay for electricity, we are paying
  -> for the **amount of energy our electrical appliances use.**

Figure 5 A coal mine

Figure 6 Transporting coal to power stations is expensive

Figure 7 A coal-burning fire station

Figure 8 Tall pylons are the frame structures that support power lines

Figure 9 Power lines are the thick cables or wires that carry electricity from power stations to substations

Figure 10 Transformers at sub-stations reduce the amount of electricity. Electrical substations distribute electricity from power stations to homes, offices and schools

SOME ELECTRICAL APPLIANCES REQUIRE MORE ELECTRICITY THAN OTHERS

- The amount of energy an electrical appliance uses, depends on its
  -> ELECTRICAL POWER
- Each electrical appliance has a **WATTAGE RATING (W)**
  (Helps to give us an idea of how much electricity the appliance will use).
  POWER IS MEASURED IN UNITS CALLED WATTS
- **Wattage ratings** are different for **different appliances** and **different models.**
  = Most **kettles** require more than - 2000W
  = An **average radio** - 14W
- Electricity usage also depends on **HOW LONG** AN APPLIANCE IS USED FOR.

RECOURCES ARE USED TO GENERATE ONE UNIT OF ELECTRICITY

- HEATING APPLIANCES - requires **more electricity** than others.
  Example:
  = **An iron rated at 1000W**
  And used for one hour - the iron will use ONE UNIT OF ELECTRICITY
  -> To generate one unit of electricity, Eskom uses:
  * a little more than half a kg of coal.
  * and 1 and a half litres of water
- The **waste products** for every one unit of electricity generated, include:
  * 155g ash
  * 1 kg carbon dioxide
- It pollutes the air and can **cause illnesses** such as **bronchitis and asthma.**

Figure 12 If Mrs Dobson irons for 5 hours a week (which is 20 hours a month), her ironing would:
Use 10.8 kg of coal.
Use 27.4 litres of water.
Produce 3.1 kg of ash.
Produce 20 kg of carbon dioxide.

SAVING ENERGY

1. ENERGY SAVING LIGHT BULBS

- Some appliances are **NOT ENERGY-EFFICIENT**. (They waste a lot of energy)
- Energy-saving light bulbs use up to **75% less power** than ordinary light bulbs and **last up to 9 times longer**.
- Compact fluorescent light bulbs, light up when an electric current activates gases in the bulb.

Figure 14 About 5% of the electrical energy used in this filament light bulb is changed to light energy. The rest is wasted as heat energy

Figure 15 Compact fluorescent light bulbs light up when an electric current activates gases in the bulb

2. SOLAR GEYSERS

- **Hot water geysers** use most of a household's electricity.
- Solar water heaters use the **energy from the sun to heat the water**.

Figure 13 A house with a solar water heater

Unit 3 – Illegal connections

Important words to REMEMBER!

illegal connections	a connection of electricity wires that is not made by a qualified electrician or does not meet the standard of the electricity laws

- ELECTRICITY IS DANGEROUS -> government has written laws about how electrical equipment must be installed.
- This includes, getting a **qualified electrician to do installations.**
- Sometimes people run their own cables from the homes of others, making their own connections.
- ILLEGAL CONNECTIONS -> **is against the law**
- A second type of illegal connection is where people connect wires to electricity poles to steal electricity, because they do not want to pay for it.
- The biggest problem with illegal connections -> IT IS UNSAFE.

Illegal connections like this one cost many lives.

Unit 4 – Renewable ways to generate electricity

Important words to REMEMBER!

hydro-electric	generating electricity using waterpower
renewable energy resources	energy sources they cannot be used up
photovoltaic cells	devices that convert energy from the Sun into electricity
solar panels	a panel made-up of a number of photovoltaic cells

- NON RENEWABLE RESOURCES -> COAL
- Because non-renewable resources will run out, scientists and other people are looking at renewable energy resources to generate electricity.
- RENEWABLE RESOURCES -> WILL NOT RUN OUT

  Examples : SUN, WIND AND MOVING WATER

1. WIND POWER
2. WATER POWER
3. SUN POWER

1. WIND POWER

Figure 17 A wind farm has many wind turbines that are close together. A wind farm generates electricity that we can use at home or school

Figure 16 When the wind turns this windmill, water is pumped up from underground and stored in the dam

- **WIND** can be used to turn **turbines**.
- A wind turbine works like a **wind pump**.
- It has a **wheel with blades** that turn in the wind.
- There is a **box** behind the wheel with a **generator** inside.
- When the **blades turn**, the **generator makes electricity**.
- **WIRES** take the electricity to where it is needed.
- Wind turbines use the **energy from moving air** to generate electricity.
- Wind farms are usually in places where the wind blows most of the time.
- The first wind farm in South Africa was built near **DARLING IN THE WESTERN CAPE IN 2008.**

2. WATER POWER

Figure 18 A water-wheel. Moving water pushes the wheel around. In a watermill, water wheels are used to help grind grain to make flour

- **Moving water has energy.**
- **Moving water** can be used to turn turbines to generate electricity.
- The energy in falling water is changed to **electrical energy** at hydro-electric **power stations**.
- The water comes from **big dams**, **across rivers** and flows down **large tubes** to turn the turbines of electrical generators.
  -> Example: GARIEP HYDRO-ELECTRIC POWER STATION

Figure 19 In this hydro-electric power station at Gariep in South Africa, water is dammed behind a wall and released through a turbine connected to a generator

3. SUN POWER

Figure 21 A panel of photovoltaic cells converts sunlight into electricity during the day

Figure 22 In this picture, you can see a solar panel. It uses energy from the Sun to make electricity. The energy can be stored in the battery and is used for lighting at night

- **PHOTOVOLTAIC SOLAR PANELS** have photovoltaic cells.
- **Photovoltaic cells** convert SUNLIGHT into ELECTRICITY.
- The electricity is stored in a **BATTERY**.

TEST YOURSELF 01

1. How many definitions do you know?

buzzer	
components	
cell	
battery	
conductor	
electric circuit	
electric current	
electric motors	
insulation	
insulator	
switch	
output device	
circuit diagram	
wattage	
hydro-electric	
renewable energy resources	
photovoltaic cells	
solar panels	

TEST YOURSELF 02

1. How many definitions do you know?

electrical conductor	
transfer	
insulator	
system	
input	
output	
process	
fossil fuels	
non-renewable resources	
power station	
turbine	
generator	
transformer	
boiler	
illegal connections	

TEST YOURSELF 01 - MEMORANDUM

1. How many definitions do you know?

buzzer	an electric device that converts electrical energy to sound energy
components	parts of an electric circuit
cell	a source of electrical energy that stores and then supplies energy to a circuit
battery	two or more cells connected to provide electrical energy
conductor	a material that allows electrical current to flow through it
electric circuit	system for transferring electrical energy from one place to another
electric current	the movement of electric charges through a conductor
electric motors	convert electrical energy into movement energy
insulation	covering on circuit wires that keep electrical current in the wire
insulator	a material through which an electrical current is not able to travel
switch	a component for controlling whether current flows in an electric circuit
output device	component that changes electrical energy to another form of energy
circuit diagram	diagram of an electric circuit, drawn using standard symbols for electrical components
wattage	the amount of electrical power an appliance requires to work
hydro-electric	generating electricity using waterpower
renewable energy resources	energy sources they cannot be used up
photovoltaic cells	devices that convert energy from the Sun into electricity
solar panels	a panel made-up of a number of photovoltaic cells

TEST YOURSELF 02 - MEMORANDUM

1. How many definitions do you know?

electrical conductor	a material that electricity can go through
transfer	the process by which energy goes from one part of a system to another
insulator	a material through which an electrical current is not able to travel
system	something that is made up of two or more parts, that work together to do a specific job
input	a component that goes into a circuit and provides the energy to the circuit
output	a component that causes the result in a circuit, due to the input component's energy
process	the way in which the input is changed to the output; the link between the input and output devices
fossil fuels	the remains of dead plants and animals that store energy from the sun from millions of years ago
non-renewable resources	resources such as coal that cannot be replaced when they are used up
power station	a place where electricity is generated
turbine	the rotating blades of a machine
generator	a machine that produces electricity
transformer	a machine that changes the amount of energy carried by electricity
boiler	a machine that boils water
illegal connections	a connection of electricity wires that is not made by a qualified electrician or does not meet the standard of the electricity laws

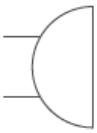
TEST YOURSELF 03

1. Complete the following sentences using the words in the word box below:

ELECTRICAL	SOURCE	CONDUCTING	BULBS	SOUND

Wires are the _____ material that carries the electrical current from the energy _____ to the other parts of the electric circuit. We use _____ to convert or change _____ energy to light energy in a circuit. A buzzer converts the electrical energy to _____ energy in a circuit.

2. Match the component names to the symbols that represent them in the table below.

Component	Symbol (picture letter)
a. Switch	1. 
b. Cell	2. 
c. Battery	3. 
d. Bulb	4. 
e. Buzzer	5. 

TEST YOURSELF 03 - MEMORANDUM

1. Wires are the conducting materials that carry the electrical current from the energy source to the other parts of the electric circuit. We use bulbs to convert or change electric energy to light energy in a circuit. A buzzer converts the electrical energy to sound energy in a circuit.

2.

A-5

B-1

C-4

D-2

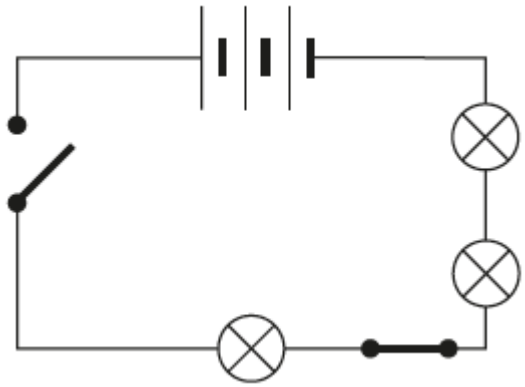
E-3

TEST YOURSELF 04

1. What do you call a material that electricity can go through?

2. What do you call a material that electricity cannot go through?

3. Name all the components in this circuit diagram.



4. If an electrical appliance catches fire:

a. Write down 2 things that you can use to put out the fire:

b. Write down 1 thing that you must not use, and give a reason for your answer:

TEST YOURSELF 04 – MEMORANDUM

1.

An electrical conductor

2.

An electrical insulator

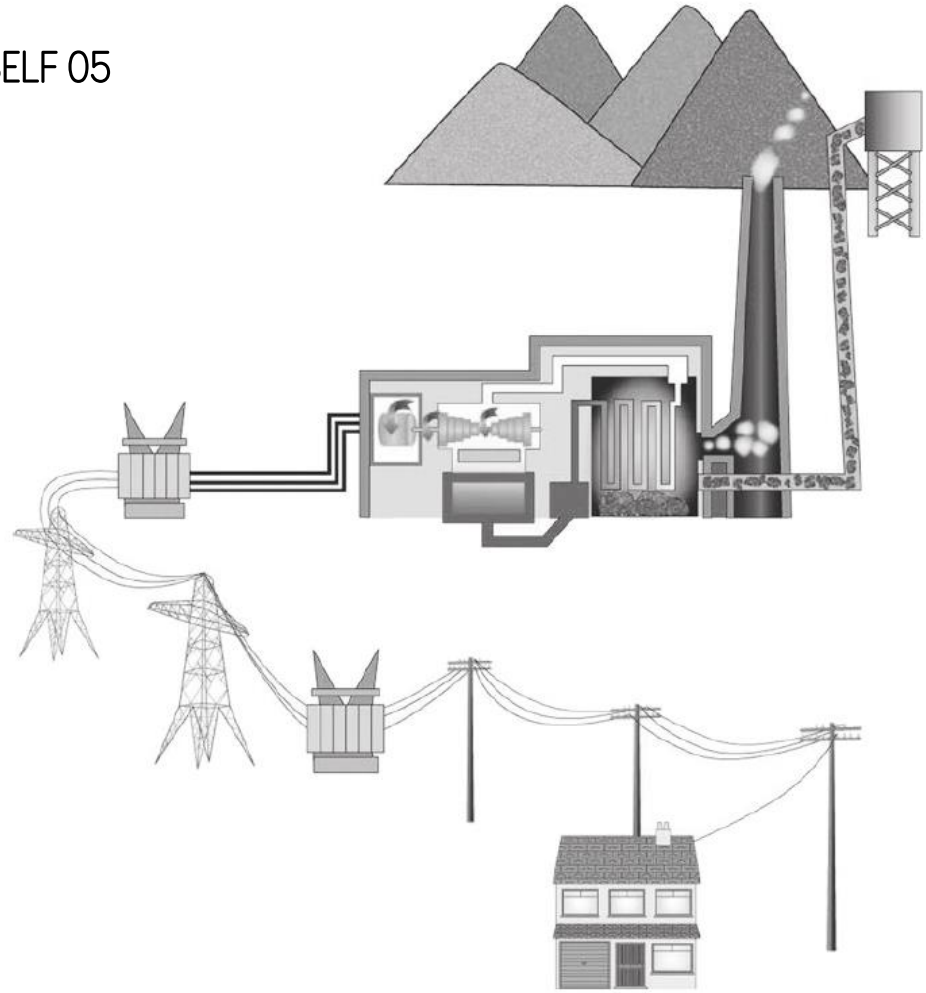
3.

Three batteries, one open switch, one bulb, one closed switch, connected to two bulbs, connected back to the batteries. (

4.

a. A chemical fire extinguisher. Sand.
b. You must not use water, because water conducts electricity.

TEST YOURSELF 05



a. What happens to the water in the boiler?

b. What part does the turbine play in energy generation? What type of energy does it produce?

c. What is a generator?

d. How does the electricity travel from the power station to our homes?

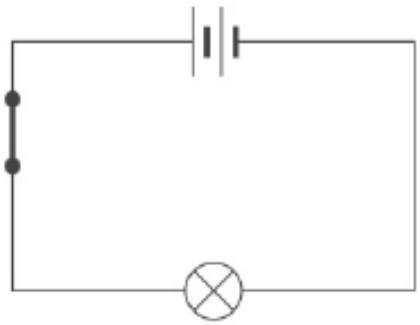
e. What role does the transformer play in the national grid?

TEST YOURSELF 05 - MEMORANDUM

a. The coal is burnt to boil the water in the boiler. The water evaporates as steam when it is hot enough.
b. The steam from the boiler turns the turbine, creating movement energy.
c. A generator is a machine that changes the energy of the moving turbine into electrical energy.
d. Through conducting wires in cables.
e. The transformer reduces the energy that flows through it into our homes, to make it safe for us to use and suitable for using electrical appliances.

TEST YOURSELF 06

1. Which of these parts does a circuit need to work properly?
   a. Battery
   b. Bulb
   c. Paper clip. (1)
2. Which circuit will not work?
   a. A circuit where there is no switch
   b. A circuit where there is a small gap between the batteries
   c. A circuit where there is only one battery. (1)
3. What do batteries do in a circuit?
   a. Nothing
   b. Use up electrical energy
   c. Provide electrical energy. (1)
4. Which object does not have a switch?
   a. A torch
   b. A television set (TV)
   c. A battery. (1)
5. What is a battery?
   a. Two or more wires that are connected
   b. Two or more cells that are connected
   c. Two or more bulbs that are connected. (1)
6. When a switch is in the 'on' position, it means that
   a. Electricity can flow through the switch
   b. Electricity cannot flow through the switch
   c. The circuit is broken. (1)
7. Name all the components in this circuit diagram. (4)



Total: 10

TEST YOURSELF 06 - MEMORANDUM

1. a. A battery, (1)
2. b. A circuit where there is a small gap between the batteries (1)
3. c. Provide electrical energy (1)
4. c. A battery (1)
5. b. Two or more cells that are connected (1)
6. a. Electricity can flow through the switch (1)
7. Two batteries in series, connected to one closed switch, connected to one bulb, connected back to the batteries (4)

Total: [10]

TEST YOURSELF 07 (Write your answers on your own answer sheet)

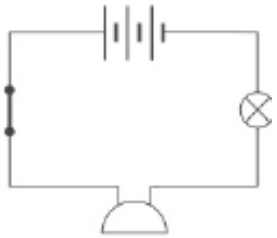
Technology language activity

1. Match the correct meaning in Column B with the correct word in Column A.

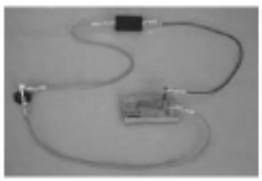
Column A	Column B
a. Design	1. Look at the advantages and disadvantages of what you have done.
b. Evaluate	2. Something that limits a product.
c. Specification	3. Use drawings and words to plan how to make a product.
d. Constraint	4. A specific piece of information about a product.

Revision activity

1. In your game, the electric circuit converted the energy from the input device to sound. What other two forms of energy were also possible? (2)
2. What do you call the device that controls the process in an electric circuit? (2)
3. Look at the circuit diagram.



   a. Name the input device in this circuit. (2)
   b. Name the types of energy that is released by this circuit. (2)
   c. Look at the switch. Is it open or closed? (1)
   d. What does your answer to Question 1c tell you about the bulb and the buzzer? (2)
4. A television is an example of an electric system.
   a. Identify the input, process and output of a TV set. (3)
   b. Draw a systems diagram of the TV set system. (3)
5. Examine the photo shown alongside. How and why would the circuit be affected if the following components were left out?



   a. wires b. switch (4)
6. Provide one example of an object that has an electric circuit that produces: (4)
   a. movement b. light c. sound d. heat

Total: 25

TEST YOURSELF 07 - MEMORANDUM

Technology Language Activity

1. a. 3
   b. 1
   c. 4
   d. 2

Revision Activity

1. Light and movement (2)
2. Switch (2)
3. a Battery consisting of 3 cells (2)
   b. Light and sound (2)
   c. Closed switch. (1)
   d. Both circuit components are working – the light bulb is shining and the buzzer is making a sound. (2)
4. a. Input: switch turns TV set on by allowing electricity to the TV set.
   Process: electric components make the screen work.
   Output: images appear on TV screen. (3)
   b. Learners draw a proper systems diagram with blocks and connecting arrows (3)
5. Light Bulb: removing the light bulb will have no influence on the circuit.

Conducting wire: nothing is connecting the different components, the circuit won't work.
Battery: removing the battery leaves the circuit with no energy source, the circuit won't work.
Switch: removing the switch will have no influence on the circuit, but the circuit will stay "switched on" the whole time. (4)

6. a. Electric toy car, electric gates, fan (1)
   b. Torch, street lights, car lights, security lights (1)
   c. Doorbell, digital clock, burglar alarm (1)
   d. Heaters, hairdryers, irons, curling irons, toasters (1)

Total: [25]

TEST YOURSELF 08 (Write your answers on your own answer sheet)

Science language activity

1. Match words in Column A with the correct sentence in Column B.

Column A	Column B
a. Wattage	1. The remains of dead plants and animals that store energy from the Sun from millions of years ago.
b. Turbine	2. A machine that produces electricity.
c. Renewable energy source	3. The rotating blades of a generator.
d. Fossil fuels	4. Energy source that cannot be used up.
e. Generator	5. The amount of electrical power an appliance requires to work.

Revision activity

Choose the correct answer:

1. Which fuel is most commonly used in South African power stations?
   a. Natural gas
   b. Coal
   c. Oil. (2)
2. Which of the following is an example of electricity generated using a non-renewable resource.
   a. Electricity from a coal burning power station
   b. Electricity generated from solar power
   c. Hydro-electric power. (2)
3. Explain how the energy in coal comes from the Sun originally. (2)
4. Write a sentence saying what illegal connections are and why they are usually dangerous. (2)
5. List two ways we can save electricity. (2)

Total: 10

TEST YOURSELF 08 - MEMORANDUM

Science language activity

Answers

a) 5
b) 3
c) 4
d) 1
e) 2

Revision activity

1. c
2. a
3. Plants get their energy from the sun. When the plants die, the rotted plant material stays under the surface of the earth for millions of years under immense pressure, and coal forms.
4. Illegal connections are when people do not want to pay for electricity and they construct their own wiring systems to plug into the national grid system. These illegal connections are very dangerous because they often contain live wires that can cause fires.
5. Learners' answers will vary. Two options are:
   Switch of lights when we are not in rooms. Switch off geyser when we don't need warm water. (2)

Total: [10]

TEST YOURSELF 09 (Write your answers on your own answer sheet)

1. Choose the correct word from the list below to complete each sentence.

transformers	wattage	fossil fuels	non-renewable	coal-burning

a. Coal, oil and natural gas are examples of _____.
b. Fossil fuels are _____ resources of energy.
c. In South Africa most of our mains electricity is produced by _____ power stations.
d. _____ at sub-stations reduce the amount of energy carried by electricity before it enters our homes.
e. _____ is the amount of electrical power an appliance requires to work.

(5)

2. Look at the photographs of circuits below.

a. For each of the circuits A, B and C, give a reason why the bulb does not shine.
b. For each of the circuits A, B and C, say what you must do to make the bulb shine. (9)

3. Draw a circuit diagram for an electric circuit that has these components: two cells, one open switch, two bulbs. (6)

4. Look at the following pictures.


steel cutlery

aluminium foil


gold rings


plastic cutlery


electric light bulb

a. Identify all the objects that:
   i. will conduct electric current
   ii. will not conduct electric current
   iii. have a resistor in them. (6)

5. Most door bells work with a circuit that has a switch and a bell. Deaf people sometimes use door lights instead of door bells.
   a. How do you think a door light works? (3)
   b. Draw a circuit diagram for a circuit that works with a battery and can be used for a door light. (4)
   c. Give at least two specifications for a bulb that can be used in a door light. (2)
   d. Give any other suggestion that a deaf person can use instead of a door bell. (2)

6. What is an illegal connection? (2)

7. Write down three examples of renewable sources of energy that can be used to generate electricity. (3)

8. Why is electricity expensive? List two ways in which we can save electricity. (5)

9. Explain where the energy in coal comes from originally. (3)

Total: 50

TEST YOURSELF 09 - MEMORANDUM

Answers

1. a. Coal, oil and natural gas are examples of fossil fuels.
   b. Fossil fuels are non-renewable resources of energy.
   c. In South Africa most of our mains electricity is produced by coal-burning power stations.
   d. Transformers at sub-stations reduce the amount of energy carried by electricity before it enters our homes.
   e. Wattage is the amount of electrical power an appliance requires to work (5)
2. a. A: The circuit is not a closed loop.
      B: The wires are not connected correctly to the battery.
      C: The switch is not on.
   b. A: Connect the loose end of the wire to the other side of the battery.
      B: Connect a wire to each side of the battery.
      C: Close the switch. (6)
3. Give marks for each of the following:
   symbol for battery, two batteries
   symbol for bulb, two bulbs
   symbol for open switch
   circuit connected correctly (6)
4. a) Steel cutlery, gold rings, foil, light bulb
   b) Plastic cutlery
   c) Light bulb (6)
5. a) When someone presses a switch, the light goes on. (1)
   b) Correct symbols for: batteries, bulb, switch, connecting wires. (4)
   c) Accept any logical answers, for example, the bulb must shine very brightly and you must be able to attach it above the door. (2)
   d) Accept any logical answer, for example, the person can have a dog that barks when the door bell rings. (1)
6. When people run their own cables from the homes of others making their own connections, or when people connect wires to electricity poles to steal electricity. (2)
7. Wind power, solar power, water power. (3)
8. Electricity is costly because it requires infrastructure to generate and distribute it. We can save e nergy through using solar water heaters and energy saving light bulb. A lot of electricity can be saved simply by turning off lights and appliances when they are not needed. (4)

Total: [40]

Divide total by 2 to obtain a mark out of 20