The value of our electricity

Senior Phase (Grade 8)

Educator Guide

Natural Science

Eskom | Powering your world

www.eskom.co.za

How to save energy

Electricity is produced from fuel such as coal, water, diesel and uranium which are limited resources. An alternative to building new power stations to supply the increase in demand for electricity is to use what we have more efficiently (i.e. without wasting), one of the ways is to change the way we use electricity. Eskom's Integrated Demand Management (IDM) Energy Education programme motivates people to change the way they use electricity. Eskom has taken the approach of integrating energy education within the school curriculum.

The energy education programme is being introduced in the Senior Phase so that learners can see energy-saving as integral to their lives and put into practice as they grow. The activities are simple and can be adapted by the educator. The activities are within the context of the Curriculum and Assessment Policy Statement (CAPS) of the Department of Basic Education (DBE).

Note: The Eskom guides are in English. The educator will need to translate them into the Home Language.

Educators need to consult the Department of Education's CAPS policy guides for details of the skills, content and assessment within the relevant Phase and Grade.

Teaching Natural Sciences (Department of Education, 2011, p13)

Careful selection of content, and use of a variety of approaches to teaching and learning Science, should promote understanding of:

- Science as a discipline that sustains enjoyment and curiosity about the world and natural phenomena
- The history of Science and the relationship between Natural Sciences and other subjects
- The different cultural contexts in which indigenous knowledge systems have developed
- The contribution of Science to social justice and societal development
- The need for using scientific knowledge responsibly in the interest of ourselves, of society and the environment
- The practical and ethical consequences of decisions based on Science.

Natural Sciences at the Senior Phase level lays the basis of further study in more specific Science disciplines, such as Life Sciences, Physical Sciences, Earth Sciences or Agricultural Sciences. It prepares learners for active participation in a democratic society that values human rights and promotes responsibility towards the environment. Natural Sciences can also prepare learners for economic activity and self-expression.

For the educator to take note:

- The energy-wise message is integral to all the activities.
- You may use the activities as they are.
- You can adapt or change the activities.
- You can use other resources where you see appropriate.
- Adapt the activities to suit the grade you teach.
- Adapt the activities according to the level of the learners (consider language or any other barriers).
- Share and discuss the activities with other educators in the same phase and grade.
- You can design your own activities that best suit the level of learners and grade you are teaching.
- Practice the energy-saving behaviour so you become an example of what is expected.
- Share your knowledge and practice on energy-wise education with everyone at school, at home and in the community.
- Saving energy means we don't have to produce so much, using our limited natural resources and limiting the amount of pollution we create, thus taking better care of our envirnment.

Thank you for taking care of our earth

Energy-saving

Grade 8

The activity/activities which follow have reference to the content from the Department of Education's (2011) CAPS policy document - Natural Science Senior Phase (Grades 7, 8, 9) (p48).

Strand: Energy and change

Topic: Energy transfer in electrical systems

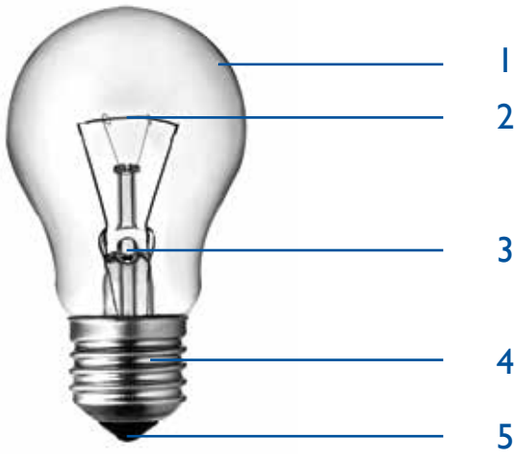
Content: Components of a circuit – Resistors

- Resistors are made of materials that resist/oppose the flow of electrical current in a circuit.
- Resistors in a circuit have an influence on the amount of electric current flowing in that circuit.
- Some resistors (including bulb filaments, heating wires, elements in kettles/heaters/geysers/stoves) can heat up to provide useful output energy (e.g. a light bulb).
- A light bulb such as a torch bulb contains a resistance wire called a filament. The filament heats up and becomes white hot when connected in a circuit. The resistance wire is connected to two contact points - the one end to the screw part (casing) and the other end to the solder knob at the bottom. The two contacts are separated by an insulator.

Activity 1: Components of a circuit – Resistors

- This activity focuses on the resistor as a component of a circuit. The incandescent light bulb is used as an example of having a filament as a resistor. This activity also intends to bring out energy-saving messages.
- Show the learners a sample of an incandescent light bulb or you can also start the activity by getting the learners to connect a simple circuit using a torch bulb or set up a demo circuit for them. Ask the learners to describe what they observe when the switch is on [heating and lighting effect]. Ask the learners to explain how the light is produced.
- It is better to use small torch bulbs for demonstration as looking directly at higher wattage bulbs can damage the eyes.
- Bring an electrical kettle to the classroom. Ask the learners to identify the different parts of the kettle by pointing to the appliance. The heating element as a resistor needs to be the focus. Raise safety precautions - the element is heated when switched on and should not be touched/the electric kettle should always be filled with water above the level of the element. Switching the kettle on without water or with water below the level of the element is dangerous and can damage the appliance.
- Also show the learners samples of energy-saving lights like the compact fluorescent light (CFL) or LED lights.
- Introductory notes extracted from the CAPS policy document should be given prior to the activity. Discuss these notes with the learners.
- Ask the learners to complete the activity sheet.
- Review the activity sheet with the learners.
- You can adapt or change the activity sheet to suit your lesson.

Read the introductory notes given on resistors. Find a sample of an incandescent light (old light bulb). Study the sample of the incandescent light bulb and the picture of the incandescent light bulb below.



* Be careful when handling the light bulb as the casing is made of thin glass which can break easily. Do not dismantle the bulb and dispose by wrapping in paper and then in plastic before putting it into the bin. You can also drop the bulb at your nearest recycling centre.

1. Provide the following labels on the picture – filament (2), casing (1), solder knob (5), separating insulator (3), screw part (4).

2. What material is used to make the filament? [Metal – tungsten].

3. What is the purpose of the filament in the light bulb? [The filament is a resistor. By resisting the electrical current the filament heats up and eventually converts to light energy].

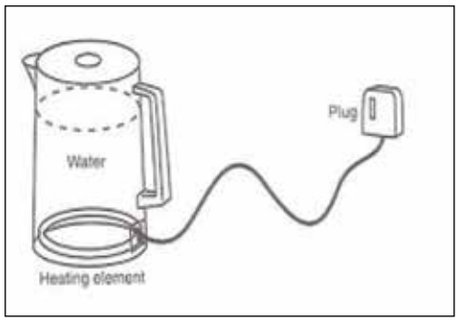
4. List the output energies provided by the filament. [Heat energy and light energy].

5. In the case of the incandescent light bulb, the filament heats up to about 2000°C before heat energy can be converted to light energy.

   5.1 Why do you think that the incandescent light bulb is not an energy-saving product? [The primary purpose of the light bulb is to get light and not heat. A lot of energy is "wasted" as the filament has to heat up before light is produced – in this way more electricity is used].

5.2 Which lights should we use to save electricity? The compact fluorescent light (CFL). The CFL uses mercury gas (vapour) rather than a filament.

6. Look at the different parts of the electrical kettle.



6.1 Which part of the electric kettle is a resistor? [The heating element].

6.2 State the output energy provided by this part (resistor). [Heat energy].

6.3 How can one use the electric kettle in a way that saves energy? [Boil only the amount of water needed. Precaution: Always keep the level of water above the element].

Notes:

Notes:

Notes:

For more information on the schools programme, please visit www.eskom.co.za/idm.