Grade 10 Electrical Technology

Term 2 - 55 complete lesson plans

Ready to teach, in the KICD lesson-plan format | 40-minute lessons | PDF and editable Word

ABOUT THIS PACK

55 complete, ready-to-teach Grade 10 Electrical Technology lesson plans for Term 2, covering electro-magnetism, measuring instruments, generation, transmission and distribution of electricity and equipment at consumers intake point.

TOPICS IN THIS PACK

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2.2	Electro-magnetism	15
2.3	Measuring Instruments	14
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INSIDE EVERY LESSON PLAN

- The specific learning outcomes, key inquiry question, core competencies, values and PCIs, and the resources needed.
- A timed lesson flow: what the teacher does and what the learners do, from introduction to summary.
- The key content (a worked example, notes or a practical with its expected results), then four practice questions with the answers for the teacher.
- The common mistake to watch for, and ideas for learners who need support and for those ready for more.
- A four-level CBC assessment rubric (EE, ME, AE, BE), homework, and a blank reflection space to fill in after teaching.

A TASTE OF LESSON 1

The principle of electromagnetism

By the end of the lesson, the learner should be able to: a) explain that an electric current produces a magnetic field; b) describe Oersted's observation and its importance

> **Current and magnetism**
> In 1820 the Danish scientist Hans Christian Oersted noticed, during a lecture, that a compass needle near a wire twitched when a current flowed in the wire. He had found that an electric current produces a magnetic field around it, which ties electricity and magnetism together. This link is called electromagnetism. A magnet is not needed: a current alone makes a field. The field exists only while the current flows: switch off the current, and the field disappears.

You also receive this pack as an editable Word file, so you can change any lesson to suit your class before you print it. Lessons follow the order of the KICD curriculum design.

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The principle of electromagnetism

Strand 2.0 Electrical Machines > Sub-strand 2.2 Electro-magnetism | Lesson 1 of 15 | 40 minutes

SCHOOL	TEACHER	DATE
CLASS / STREAM	TIME	ROLL (B / G)

SPECIFIC LEARNING OUTCOME(S)

By the end of the lesson, the learner should be able to: a) explain that an electric current produces a magnetic field; b) describe Oersted's observation and its importance

KEY INQUIRY QUESTION(S)

- How are electromagnets made?
- Why is it preferable to use an electromagnet and not a permanent magnet?

CORE COMPETENCIES, VALUES AND PCIS IN THIS LESSON

COMPETENCY	**Digital literacy**	Learners use a phone, tablet or the class computer to explore or check the idea.
COMPETENCY	**Learning to learn**	Learners say what they found easy or hard and decide their next step.
COMPETENCY	**Creativity and imagination**	Learners make up their own examples, patterns or ways of showing the idea.
VALUE	**Responsibility**	Learners look after shared materials and finish every task.
VALUE	**Respect**	Learners listen while others explain and accept correction politely.
VALUE	**Unity**	Learners share materials fairly and work as one team.
PCI	**Safety and security**	Learners follow safety rules when using materials and moving about.
PCI	**Self-awareness**	Developed through the activities in this lesson.
PCI	**Environmental education**	Examples link to caring for the school and home environment.

LEARNING RESOURCES

Charts of the field around a wire and a coil, and of the grip rule and the screw rule | Bar magnets and a magnetic compass | Pictures of an electric bell, a relay, a loudspeaker and a lifting electromagnet | Calculators | Notebooks and pencils

ORGANISATION OF LEARNING

Whole class for demonstrations and rules; pairs for the field plotting and calculations; groups of three or four for building the solenoid, bell and relay circuits; every practical uses only dry cells, is supervised by the teacher, and the switch is kept open except for readings so that coils do not overheat and cells are not drained.

KEY WORDS

electromagnetism | solenoid | electromagnet | core | ampere-turns | relay | armature | coil | contacts | field

THE LESSON AT A GLANCE

Introduction	Teacher models	Guided practice	On their own	Wrap-up
6 min	9 min	10 min	9 min	6 min

Inside this plan: the step-by-step lesson flow with what the teacher and learners do, the key content, practice questions with answers, a common mistake to watch for, an assessment rubric on the four CBC levels, support and extension ideas, homework and a reflection page.

LESSON FLOW

Stage	Minutes	The teacher	The learners
Introduction	6	Greet the class and ask: "A magnetic compass placed near a wire that suddenly carries a current from a battery swings away from north. What does this tell you?" Take two or three answers, link them to earlier work, then state today's outcome.	Answer the starter question, recall what they already know and read the outcome aloud.
Step 1: Teacher models	9	Take learners through "Current and magnetism" (key ideas on the next page), explaining as you go. Use charts of the field around a wire and a coil, and of the grip rule and the screw rule, bar magnets and a magnetic compass, pictures of an electric bell, a relay, a loudspeaker and a lifting electromagnet. Ask learners to predict what comes next before you show it.	Watch, predict the next step, ask questions and note the key steps in their exercise books.
Step 2: Guided practice	10	Give questions 1 and 2. Move round the groups, ask "How do you know?" and correct errors kindly on the spot.	Work in pairs or small groups, explain each step to a partner and check one another's answers.
Step 3: Independent practice	9	Set questions 3 and 4 for individual work. Mark as you walk round and note who needs help in the next lesson.	Work on their own, then swap books with a partner to check.
Summary and conclusion	6	Ask two or three learners to state the key idea in their own words. Give this exit question and check the answers: "Name three devices that depend on electromagnetism."	Say the key idea in their own words and answer the exit question in the exercise book.

KEY IDEAS

Current and magnetism

In 1820 the Danish scientist Hans Christian Oersted noticed, during a lecture, that a compass needle near a wire twitched when a current flowed in the wire. He had found that an electric current produces a magnetic field around it, which ties electricity and magnetism together. This link is called electromagnetism. A magnet is not needed: a current alone makes a field. The field exists only while the current flows: switch off the current, and the field disappears.

Properties: the field forms circles around a straight wire; its strength increases with the current and is weaker with distance from the wire; it reverses when the current is reversed; and it can be made much stronger by winding the wire into a coil, and by putting iron inside the coil. Because an electromagnet can be switched on and off and its strength changed, it is far more useful than a permanent magnet in many machines.

Importance: electromagnetism is the basis of bells and relays, loudspeakers and microphones, electric motors and generators, transformers, lifting magnets, door locks, circuit breakers, meters, hard disk heads and MRI scanners. Almost every electrical machine in a home, workshop or factory depends on it. Later lessons show how to find the field of a wire and a coil, how to build an electromagnet and how to use it.

PRACTICE QUESTIONS - WITH ANSWERS FOR THE TEACHER

No.	Question	Answer
1	What did Oersted discover?	**That an electric current produces a magnetic field around the wire.**
2	What happens to the field around a wire when the current is switched off?	**The field disappears.**
3	Name three ways of making the field of a current stronger.	**Increase the current, wind the wire into a coil with many turns, and put an iron core inside the coil.**
4	Name three devices that depend on electromagnetism.	**For example: an electric bell, a relay, a loudspeaker, a motor, a generator, a transformer.**

WATCH OUT FOR

Learners think that a wire carrying a current needs a magnet nearby to have a field. The current itself produces the field.

ASSESSMENT RUBRIC - THE FOUR CBC LEVELS

Level	What the learner can do
Exceeds expectations (EE)	Can explain that an electric current produces a magnetic field confidently and accurately, explain the method used, and apply the idea to new or unfamiliar problems.
Meets expectations (ME)	Can explain that an electric current produces a magnetic field accurately in familiar situations; notices and corrects slips without help.
Approaches expectations (AE)	Can partly explain that an electric current produces a magnetic field, or does so with prompts from the teacher or a partner; makes some errors.
Below expectations (BE)	Cannot yet explain that an electric current produces a magnetic field without direct help; needs the idea taught again with concrete objects.

SUPPORT AND EXTENSION

Learners who need support	Give a picture of a compass near a wire with and without a current, for learners to draw the needle positions.
Learners ready for more	Explain why an electromagnet is more useful than a permanent magnet for lifting scrap iron. (Answer: The electromagnet can be switched on to pick up the load and off to release it, and its strength can be adjusted, while a permanent magnet always holds on)
Inclusion	Seat learners with low vision near the board and read aloud whatever you write; use large, clear, tactile materials; allow extra time; pair with a patient partner; use gestures or Kenyan Sign Language for the key words.

HOMEWORK AND FOLLOW-UP

Redo questions 3 and 4 neatly in the exercise book. Then tell someone at home what you learned about "the principle of electromagnetism" and bring one question of your own to ask next lesson.

TEACHER SELF-CHECK

- Did every learner get a turn to handle materials or explain their thinking?
- Did most learners meet the outcome? Write down the names of those who did not.
- Was the pace right — did any step take too long or too short a time?
- Which competency and value did I see learners showing?
- What will I change the next time I teach this lesson?

REFLECTION ON THE LESSON / SELF-REMARKS

Write this after teaching - what worked, what to change, which learners need follow-up.