THE KENYA NATIONAL EXAMINATIONS COUNCIL

ELECTRICITY
School Based Assessment (Written test)
2026
Grade 10

Instructions to students

(i) This paper consists of **two** sections.

(ii) The paper has 12 pages.

(iii)Attempt ALL questions.

For Teacher's Use Only			
Tasks	**Question Numbers**	**Max. Score**	**Learner's score**
Fundamentals of Electricity	1-7, 21 & 22	21	
Electrical Machines	8-11	4	
Electrical Installation	12-17, 23, 24 & 25	22	
Electronics	18-20	3	
Total	**25 Questions**	**50**	

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SECTION A (20 marks)

1. While investigating a resistor in the laboratory, a learner varies the voltage across the resistor and records the results shown below.

Voltage (V)	Current (A)
2	0.20
4	0.40
6	0.60
8	0.80

Which conclusion is best supported by the results?

A. The resistance decreases slightly as the voltage increases.
B. The resistance remains constant as the voltage increases.
C. The resistance increases because a larger voltage produces a larger current.
D. The resistor allows the current to increase more rapidly than the voltage.

2. Figure 1 shows a simple electric circuit assembled by a learner during a practical lesson. When the switch is closed, the bulb does not light. The learner measures the voltage across the battery and finds that it is normal.

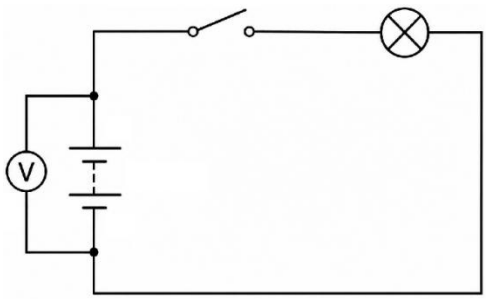


Figure 1

Which action would be most appropriate as the next step in identifying the fault?

A. Switch off the supply and test the circuit for continuity using a multimeter.
B. Measure the voltage across the bulb while the circuit is switched on.
C. Replace the bulb with a new one to determine whether it is faulty.
D. Tighten all wire connections and switch the circuit on again.

3. A school uses a rechargeable lead-acid battery to power emergency lights during frequent power outages. The technician wants to recharge the battery safely overnight without removing it from the system. Which charging method would be most appropriate, and why?

A. Boost charging, because a very large current should be supplied continuously to restore the battery as quickly as possible.
B. Constant-current charging, because the battery should receive the same high current throughout charging regardless of its state of charge.
C. Float charging, because the battery can be maintained at an appropriate voltage while receiving only the current needed to keep it fully charged.
D. Rapid charging, because the shortest charging time always provides the best protection against battery damage.

4. A learner is exploring career opportunities in the electricity sector. He wants a role that requires technical expertise, problem-solving, and adherence to safety standards. Which of the following career paths best demonstrates critical application of knowledge in the electricity field?
   A. Electrical engineer-designs and develops safe, efficient power distribution systems for communities.
   B. Household electrician-installs and maintains wiring, sockets, and lighting systems in homes.
   C. Power plant technician-monitors and maintains equipment to ensure safe electricity generation.
   D. Renewable energy specialist-applies knowledge to develop solar, wind, and hydroelectric systems for sustainable power.

5. Figure 2 shows a circuit of four identical batteries each rated 24 V, 5 Ah.

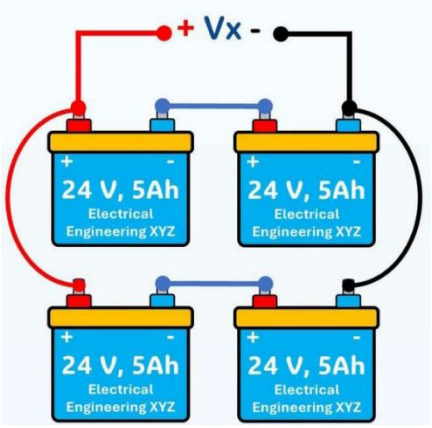


Figure 2

Determine the value of the voltage V_x.
   A. 12 V
   B. 24 V
   C. 48 V
   D. 96 V

6. Figure 3 shows a drawing representing a mechanical component.

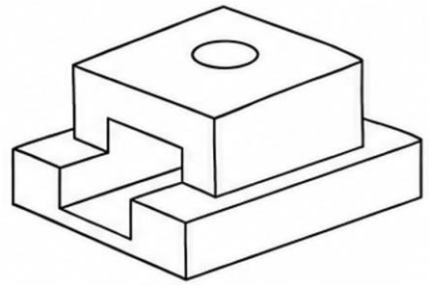


Figure 3

A technician wants to create a drawing that allows workshop personnel to clearly visualize the object in three dimensions while maintaining equal scale along the three principal axes. Which drawing method should the technician choose? Create
   A. an isometric drawing in which the length, width, and height are represented along equally inclined axes.

B. an oblique drawing in which the front face is drawn in true shape and the depth is projected backward.
C. a perspective drawing in which distant edges converge toward a vanishing point.
D. an orthographic drawing using separate front, top, and side views only.

7. A school technician has observed that the performance of rechargeable batteries used in an emergency lighting system has decreased because they are often left connected to the charger long after becoming fully charged. The technician is asked to create a battery maintenance guideline for the school. Which guideline would be the **best** to include?
   A. Connect additional batteries to the charger to improve charging efficiency.
   B. Disconnect the charger once the batteries are fully charged.
   C. Increase the charging voltage each time batteries are recharged.
   D. Recharge batteries only after they are completely discharged.

8. A learner is given a bar magnet, iron filings, a sheet of paper and a compass. The learner places the bar magnet beneath the paper and sprinkles iron filings on top. After gently tapping the paper, the iron filings form curved patterns around the magnet. Which activity would **best** help the learner verify that the patterns formed by the iron filings represent magnetic field lines?
   A. Add more iron filings until the entire paper is covered.
   B. Move the magnet rapidly beneath the paper and observe the movement of the filings.
   C. Place the compass around the magnet and observe the direction of its needle.
   B. Replace the magnet with a piece of iron and repeat the experiment.

9. A student constructs four solenoids using locally available materials and tests their magnetic strength by attracting iron pins. Which solenoid is most likely to produce the weakest magnetic field?

Solenoid	Number of Turns	Current	Core Material	Length of Coil
A.	100	High	Air	Short
B.	100	Low	Air	Short
C.	200	High	Soft Iron	Long
D.	200	Low	Soft Iron	Long

10. During a practical investigation, a learner connects an inductor of unknown inductance in series with a 6.0 Ω resistor and a 12 V d.c. supply. When the switch is closed, the current reaches 63% of its maximum value after 0.50 s. The learner uses the relationship for an RL circuit: $\tau = L / R$ where τ is the time constant. What is the inductance of the inductor?

    A. 0.083 H

    B. 0.50 H

    C. 3.0 H

    D. 36 H

11. A workshop technician is developing a magnet storage procedure for magnets used in lifting equipment and measuring instruments. The procedure must help retain the strength

of the magnets during long-term storage. Which storage method should the technician include in the procedure? Store magnets

A. in very hot rooms to improve their magnetic properties.
B. where they are frequently struck to increase their magnetic strength.
C. with appropriate soft iron keepers across the poles.
D. with like poles touching each other to strengthen the magnets.

12. Figure 4 shows a power cable used to connect a desktop computer to a power supply.

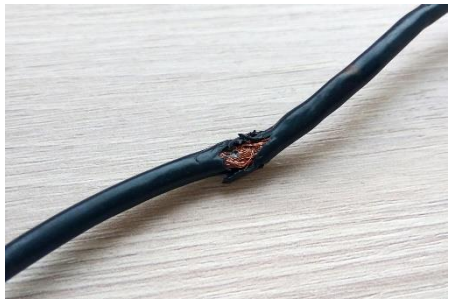


Figure 4

Amina, the class representative, notices the damaged cable before the computer is switched on. She is asked to recommend a procedure that will ensure the computer can be used safely. Which of the following procedures would be the safest recommendation?

A. Place the damaged section under the table so that learners do not touch it and continue using the computer.
B. Push the exposed wires back into the cable and switch on the computer to check whether it works.
C. Switch off the computer, disconnect the cable from the power supply and report to the teacher.
D. Wrap the damaged section tightly with adhesive tape and continue using the cable.

13. Figure 5 shows part of a house wiring system.

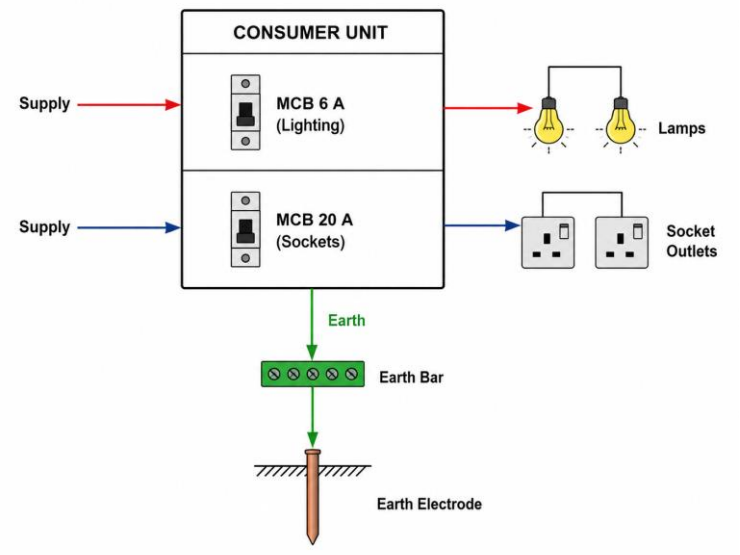


Figure 5

During a fault, the live conductor inside a lamp holder comes into contact with the metal casing of the fitting. The earthing system is correctly installed and functioning properly. What is the most likely outcome?

A. A large fault current will flow through the earth path, causing the circuit protective device to disconnect the supply.
B. The lamp will continue operating normally because the earth wire carries away the excess voltage.
C. The metal casing will remain live, but the earth connection will prevent electric shock.
D. The fault current will flow only through the earth electrode, so the circuit protective device will not operate.

14. A school is planning a new electrical installation. The designer must create a layout plan that ensures correct metering, protection, isolation, and distribution of electrical energy from the supply authority to the final circuits. Which design should the designer choose?

A. Supply → Main switch → Service cut-out fuse → Energy meter → Distribution board → Final circuits
B. Supply → Service cut-out fuse → Energy meter → Main switch → Distribution board → Final circuits
C. Supply → Energy meter → Service cut-out fuse → Distribution board → Main switch → Final circuits
D. Supply → Distribution board → Main switch → Energy meter → Service cut-out fuse → Final circuits

15. Figure 6 shows how electrical energy is transmitted from a power station to different consumers.

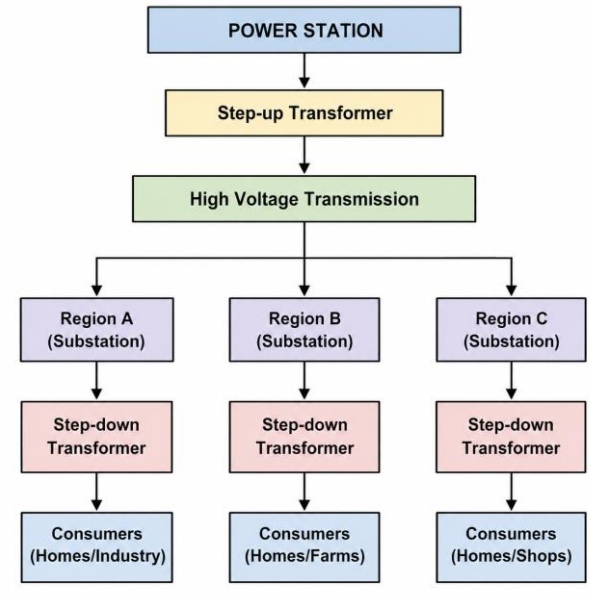


Figure 6

Which statement best explains why both the step-up and step-down transformers are necessary in the system?

	Step-up transformer	Step-down transformer
A.	Increases current to reduce energy losses during transmission	Reduces voltage to make electricity safer for consumers
B.	Increases voltage to reduce current in transmission lines	Reduces voltage to increase current for domestic use
C.	Increases voltage to minimise energy losses in transmission lines	Reduces current to supply appliances with sufficient power
D.	Increases voltage for efficient long-distance transmission	Reduces voltage to a suitable level for consumers

16. Figure 7 shows a staircase-light circuit wired by a learner.

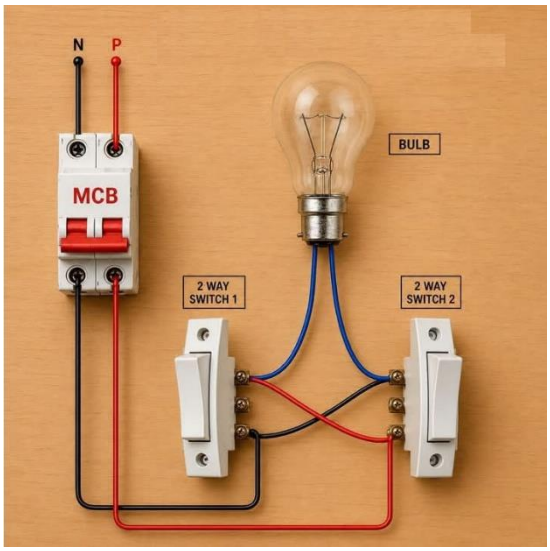


Figure 7

The learner claims that the circuit is safe because the bulb can be controlled from either switch. Which observation would provide the strongest evidence that the wiring is hazardous?

A. A switch combination connects phase to neutral, causing tripping of the MCB.
B. Both switches in the same position leave the circuit open, so the bulb stays off.
C. Operating either switch changes the bulb's state through an alternative current path.
D. Repeated switching makes the bulb dim because voltage is divided between the switches.

17. An electrical technician is designing a 3-phase 4-wire distribution system for a commercial building containing several three-phase motors and many single-phase lighting and socket-outlet circuits. During planning, the technician notices that most of the single-phase loads have been connected to only one phase. Which modification would best improve the safety and efficiency of the installation?

A. Connect additional single-phase loads to the same phase to simplify maintenance.
B. Connect all single-phase loads through the earth conductor to reduce wiring costs.
C. Redistribute the single-phase loads across all three phases, retain the neutral conductor, and maintain proper earthing.
D. Remove the neutral conductor and connect all single-phase loads between two phases.

18. A semiconductor manufacturer is developing two different types of silicon chips for use in smartphone circuits. Chip 1 requires electron conduction as the dominant charge carrier, while chip 2 requires hole conduction. An engineer is asked to create a doping plan that will produce the required semiconductor materials. Which plan should the engineer choose?

	Semiconductor Chip 1	**Semiconductor Chip 2**
A.	Dope silicon with boron.	Dope silicon with phosphorus.
B.	Dope silicon with indium.	Dope silicon with boron.
C.	Dope silicon with phosphorus.	Dope silicon with antimony.
D.	Dope silicon with antimony.	Dope silicon with indium.

19. Figure 8 circuit P and circuit Q used by a learner during a workshop practical. The learner observes that the lamp operates normally in circuit P but not in circuit Q.

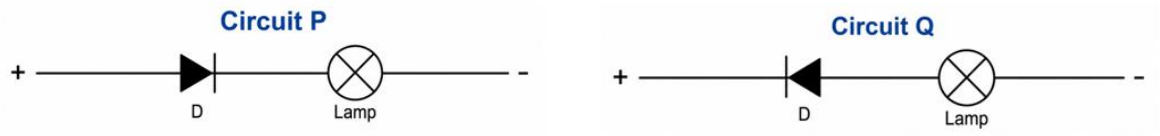


Figure 8

Which row has the explanation that best accounts for this observation?

	Diode in circuit P	**Diode in circuit Q**
A.	forward biased	forward biased
B.	reverse biased	reverse biased
C.	forward biased	reverse biased
D.	reverse biased	forward biased

20. Figure 9 shows a transistor circuit used to control a lamp.

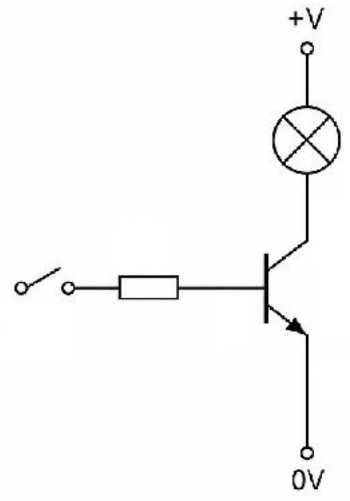


Figure 9

During testing, a learner closes the switch but observes that the lamp does not light. The learner measures the voltage between the base and emitter and finds it is approximately 0 V. Which change would most likely make the lamp light when the switch is closed?
A. Connect the switch to **+V** before resistor R so that base current flows through the transistor.
B. Connect the switch to **0 V** before resistor R so that the collector receives more current.
C. Connect the emitter directly to **+V** so that the transistor can supply current to the lamp.
D. Replace resistor R with a lamp so that the transistor receives a larger voltage at its base.

SECTION B (30 marks)

21. Figure 10 shows the front view and top view for designing of a metal housing of an electrical control unit.

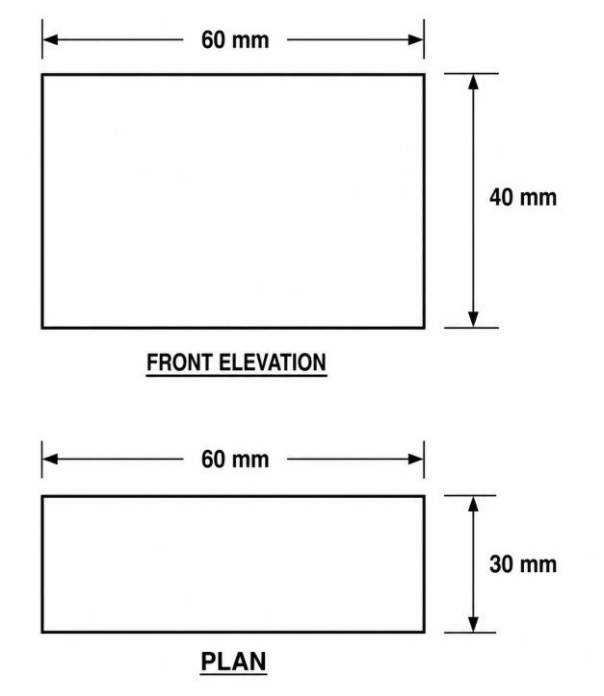


Figure 10

Before fabrication begins, the technician provides the front view and top view of the housing to trainees and asks them to prepare a pictorial drawing that will help the workshop team visualize the object accurately.

a) Draw a neat isometric sketch of the housing using the dimensions provided. (3 marks)

b) On the isometric sketch, label any **two** visible dimensions. (2 marks)

c) State **one** advantage of using an isometric drawing instead of only the orthographic views when communicating the design to the workshop team. (1 mark)

22. a) A technician is installing a DC lighting system in a remote health centre powered by a 12 V battery. Before connecting the lights, the technician tests a resistor used in the circuit and obtains the following readings:

Voltage (V)	Current (A)
3	0.30
6	0.60
9	0.90
12	1.20

i) Determine the power dissipated by the resistor when the voltage is 12 V. (2 marks)

_____

_____

_____

ii) Explain why understanding the relationship between voltage, current, and resistance is important when designing DC circuits for practical applications. (1 mark)

_____

_____

b) A technician is repairing an automatic security lighting system. The light is designed to remain ON for a short period after a person passes by. The technician discovers that a capacitor is used in the timing circuit. Two capacitors are available:

Capacitor	Capacitance
X	100 μF
Y	1000 μF

The technician must select the most suitable capacitor to keep the lamp ON for a longer time after the sensor is activated.

i) Identify the capacitor the technician should select? Give a reason. (1 mark)

_____

_____

ii) Explain how the selected capacitor helps keep the lamp ON after the sensor has been activated. (2 marks)

_____

_____

23. Figure 11 shows an arrangement of an intake equipment.

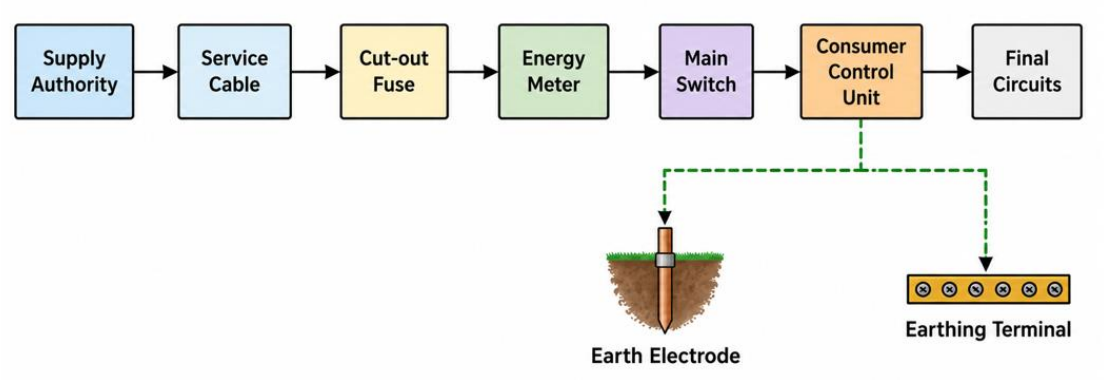


Figure 11

A technician is inspecting the electrical intake installation of a newly completed commercial building.

a) Explain why the energy meter must be installed before the main switch and consumer control unit. (2 marks)

_____

_____

b) The Consumer Control Unit supplies the final circuits. Indicate the recommended cable size for each of the following final circuits: (2 marks)

	Final circuit	**Recommended cable size**
(i)	Lighting	
(ii)	Socket outlets	

c) The building experiences a fault that causes excessive current to flow immediately after the service cable enters the premises. Identify the device that should operate first and give a reason. (2 marks)

_____

_____

24. Figure 12 shows electrical equipment.

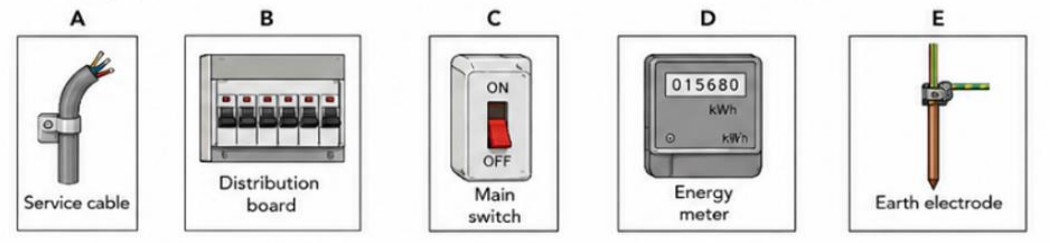


Figure 12

A learner is required to install the equipment at a consumer intake point.

a) Explain why the earth electrode is important at the consumer intake point. (2 marks)

_____

b) If the sequence of connection is incorrect, explain **one** danger that may occur in the installation. (2 marks)

c) Identify **two** tools that the learner would use to fix the service cable clamp on the wall. (2 marks)

25. Figure 13 shows a bell circuit.

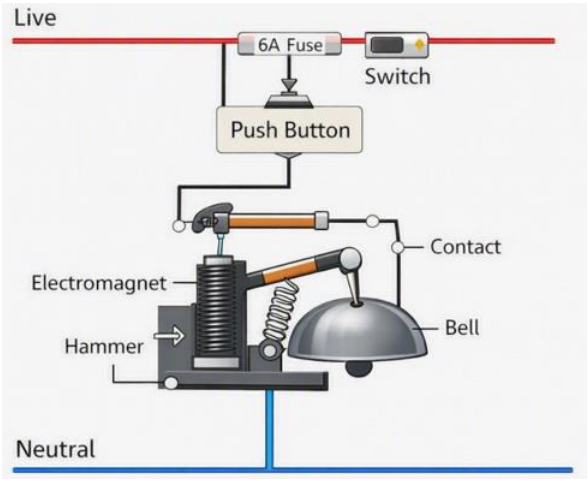


Figure 13

a) Identify **one** component that the technician should test first and justify your answer. (1 mark)

b) The technician discovers that the push button contacts are worn and do not close properly. Explain how this fault affects the operation of the bell circuit. (2 marks)

c) Suggest **one** modification that would allow the bell to be operated from two different entrances to the shop. (1 mark)

d) Explain why a fuse is included in the bell circuit even though the bell normally operates at a relatively low current. (2 marks)

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