

3.6 ELECTRICITY (448)

Electricity examination at Kenya Certificate of Secondary Education comprises of two papers namely; paper 1 (448/1) and paper 2 (448/2). Paper 1 is a theory paper while paper 2 tests practical skills. These papers constitute 60 % and 40 % of the final mark respectively. In 2022 examination, both papers followed the usual setting format as those of the previous years.

3.6.1 General candidates performance

The table below shows candidates' overall performance in Electricity in the KCSE examination since the year 2017.

Table 15: Candidates overall performance from the year 2017 to 2022

Year	Paper	Candidature	Maximum Score	Mean Score	Standard Deviation
2017	1	227	60	32.02	9.89
	2		40	31.52	3.99
	Overall		100	63.53	12.31
2018	1	244	60	37.14	10.91
	2		40	27.32	4.64
	Overall		100	64.46	13.93
2019	1	274	60	36.42	9.98
	2		40	30.77	3.47
	Overall		100	67.19	11.85
2020	1	276	60	43.04	8.78
	2		40	28.34	4.66
	Overall		100	72.04	10.54
2021	1	438	60	40.71	10.01
	2		40	32.42	3.23
	Overall		100	73.04	12.13
2022	1	508	60	36.49	10.16
	2		40	32.42	3.32
	Overall		100	66.69	12.80

From the table it can be noted that:

- (i) The candidature increased from 438 in the year 2021 to 508 in the year 2022.
- (ii) The overall mean score dropped from 73.04 % in the year 2021 to 66.69 in the year 2022.
- (iii) The standard deviation increased from 12.13 in 2021 to 12.80 in 2022.

3.6.2 Electricity Paper 1 (448/1)

The questions which were reported to have been poorly performed are teased out and analyzed. This is meant to point out candidates' weaknesses and propose suggestions on some remedial measures that can be taken in order to help the learners to improve in their performance in future. The questions for discussion include 3, 4, 10 (b) and 14 (c).

Question 3

For a purely resistive AC circuit, draw the:

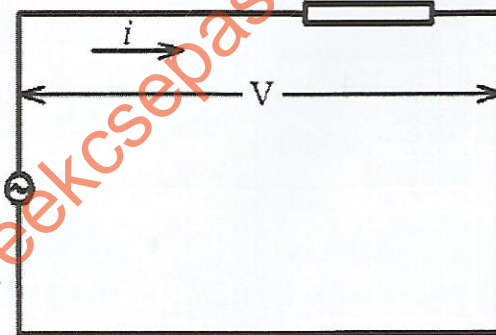
- (a) circuit diagram (2 marks)
 (b) phasor diagram (2 marks)
 (c) current/voltage waveform (2 marks)

Weaknesses

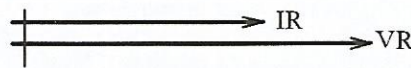
Most candidates were not able to correctly draw the diagrams.

Expected response

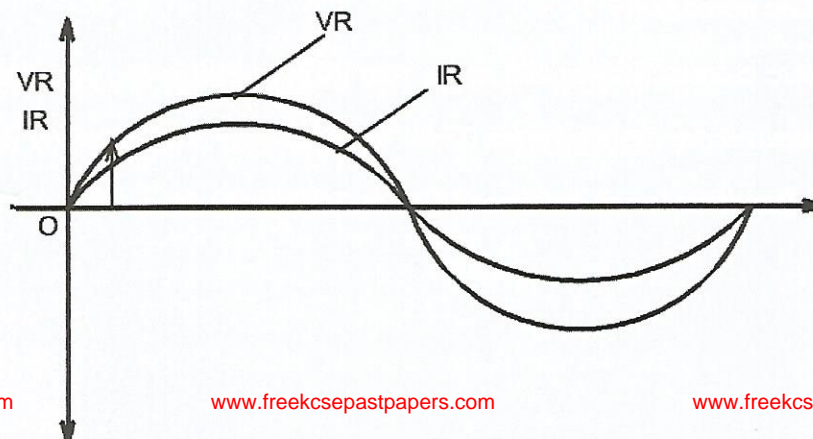
- (a) circuit diagram (2 marks)



- (b) phasor diagram (2 marks)



- (c) current/voltage waveform (2 marks)



Advice to Teachers

Teachers to take the learners through A.C circuits especially drawing of diagrams.

Question 4

Figure 1 shows an electromagnet.

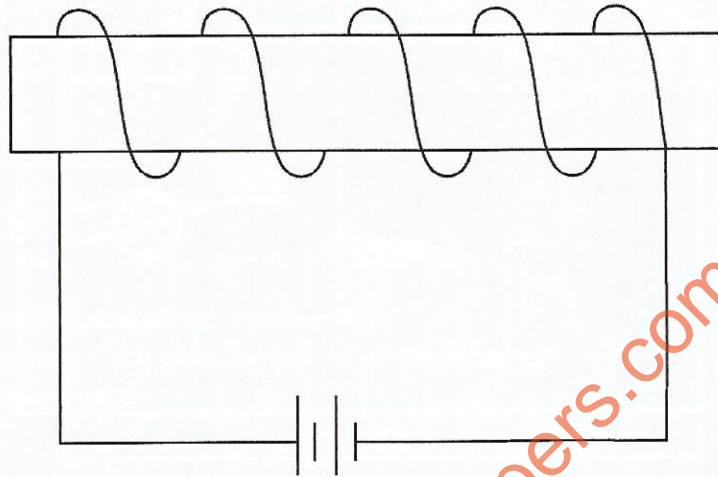


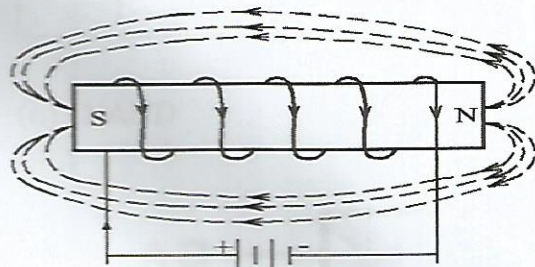
Figure 1

- (a) Show the direction of current. (1 mark)
 (b) Complete the direction of the field pattern. (2 marks)
 (c) Indicate the polarity of the electromagnet. (1 mark)

Weaknesses

Most learners were unable to identify the direction of the current in the solenoid hence they could not draw and indicate the field pattern and the polarity respectively.

Expected response



Advice to Teachers

Teachers to expose the learners to experiments involving making of electromagnets using soft iron like iron nail. Learners should be guided to test and determine the polarity of the electromagnet made. They should then use iron filings to observe the field lines whose direction can be determined using the plotting compass.

Question 10 (b)

Figure 3 shows a metal template.

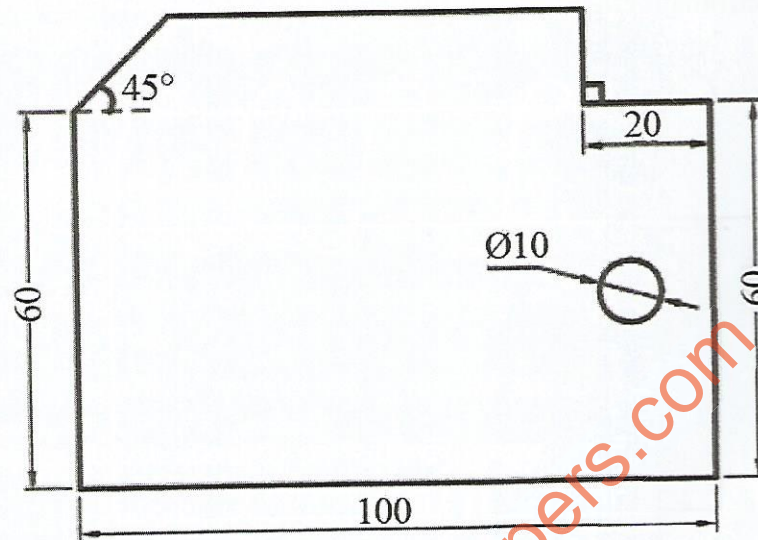


Figure 3

List **four** tools and equipment used when fabricating the piece.

(2 marks)

Weaknesses

Most candidates were not able to identify the tools and equipment for fabricating the metal template.

Expected response

(b) Tools and equipment

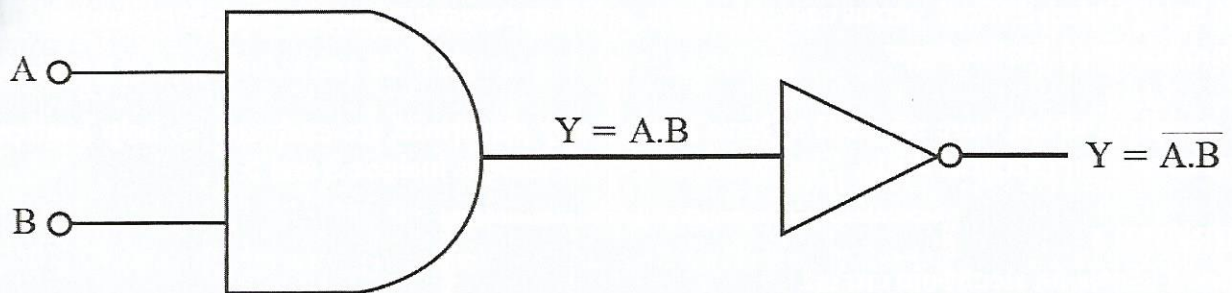
- Drilling machine
- Scriber
- Drill bit 10 mm
- Engineer's square
- Hacksaw
- Set of file
- Engineer's steel rule
- Punch

Advice to Teachers

Teachers should take the learners to the workshop for fabrication. Teachers to help them in identifying the tools used as they do fabrication.

Question 14 (c)

Figure 7 shows the combination of AND gate and NOT gate.

**Figure 7**

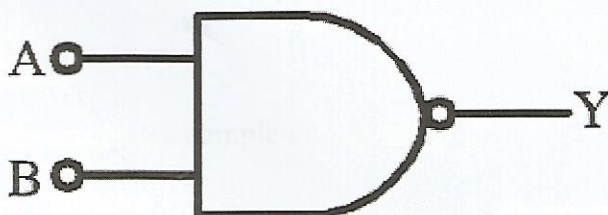
- (i) Draw the truth table of the combination. (4 marks)
- (ii) State the name of the gate formed after combination. (1 mark)
- (iii) Draw the logic gate. (1 mark)

Weaknesses

Most candidates were not able to draw the right truth table thus identifying the logic gate was a challenge to them.

Expected response**(i) Truth table**

Inputs		Output	
A	B	AND Y'	NAND Y
0	0	0	1
1	0	0	1
0	1	0	1
1	1	1	0

(ii) NAND**(iii)****Advice to Teachers**

Teachers are advised to expose learners to combinations of logic gates and their truth tables.

3.6.3 Electricity Paper 2 (448/2)

All the Electricity paper 2 questions were set from the syllabus. The paper was balanced in terms of skills being tested, difficult versus easy questions, syllabus coverage, length of questions and adequacy of time allocated for the paper.

The exercises which were reported to have been poorly performed are analyzed to help learners to improve on their practical skills. The exercises for discussions include 2 and 5.

EXERCISE 1

Figure 1 shows an electronic circuit.

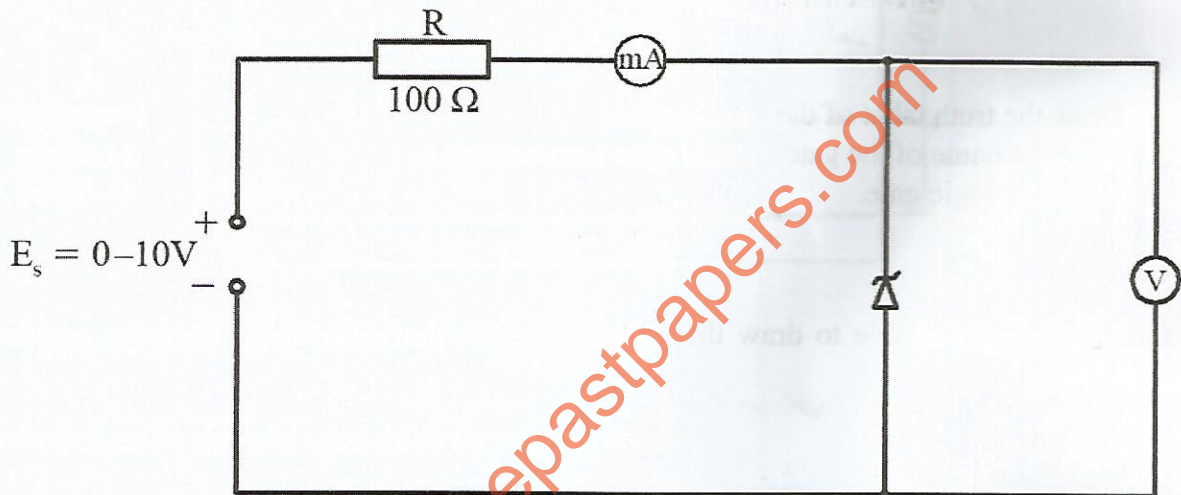


Figure 1

- (a) Using the breadboard and items provided, connect the circuit as shown. Let the examiner check your work. (5 marks)
- (b) Adjust the power supply to obtain the values shown in **Table 1**, and for each voltage value, measure and record the corresponding value of voltage (V) and current (mA). (10 marks)
- (c) Using the values in **Table 1**, plot a graph of current (mA) against voltage (V). (4 marks)
- (d) From the graph, obtain the zener potential voltage.
 V_z volts. (1 mark)

Weakness

Some candidates could not connect the circuit correctly.

Advice to teachers

Teachers to guide the learners in experiments involving electronic circuits. The learners should be encouraged to record their observations, draw graphs and make inferences from the graph.

EXERCISE 4

Figure 4 shows a block diagram of a prefabricated circuit provided.

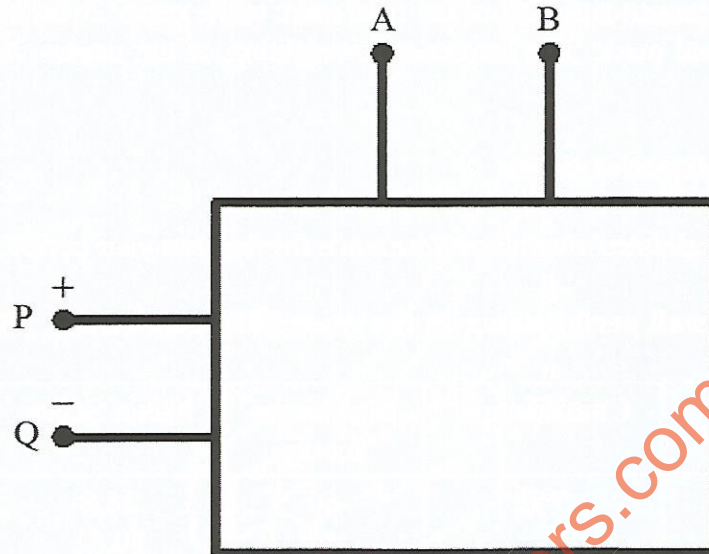


Figure 4

- (a) With the switch open, perform each of the following tasks:
- (i) Connect the power supply set at 9 V DC across points labelled P and Q (1 mark)
 - (ii) Connect the ammeter across terminals marked A and B (1 mark)
- (b) Close the switch, vary the potentiometer from minimum to maximum.
- (i) State your observation (4 marks)
 - (ii) Measure the values of current at:
 - I. minimum mA (1 mark)
 - II. maximum mA (1 mark)
- (c) Explain the reason for your observation in 4(b). (4 marks)
- (d) Draw a schematic diagram of the circuit. (8 marks)

Weaknesses

Not all the candidates completed the task.

Advice to teachers

Teachers to guide the learners in performing experiments involving prefabricated circuits.