NAME: Teacher's Guide - MS .....CLASS:.....ADM NO:.....

SIGNATURE:.....INDEX NO:.....

DATE:.....

232/2
PHYSICS
PAPER 2
June 2022
TIME: 2 HOURS

KASSU JET – JUNE 2022

Kenya Certificate of Secondary Education

Physics Paper 2

Instructions to candidates

- Write your name, admission number, class, signature and date in the spaces provided at the top of the page.
- This paper consists of two sections A and B.
- Answer all the questions in the two sections in the spaces provided after each question
- All working must be clearly shown.
- Electronic calculators, mathematical tables may be used.
- All numerical answers should be expressed in the decimal notations.
- This paper consists of 12 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION	QUESTION	MAX MARKS	CANDIDATE'S SCORE
A	1 – 10	25	
B	11	10	
	12	11	
	13	12	
	14	10	
	15	12	
TOTAL		80	

SECTION A: (25 MARKS)

Attempt all the questions in the spaces provided.

1. State the laws of reflection of light. (2 marks)

✓ The incident ray, reflected ray and the normal, at the ✓
point of incidence all lie on the same plane surface. ✓1
✓ The angle of incidence equal to angle of reflection ✓1

2. State the two advantages of optical fibre over the ordinary cable. (2 marks)

✓ They have a higher carrying capacity. ✓1

✓ They are lighter. ✓1

3. Derive the expression for the total electrical energy converted into heat in a wire of resistance, **R** when a current, **I** is maintained through it for a time,**t**. (3 marks)

Work done = qV ✓1 but $q = It$ and $V = IR$

$= It \times IR$ ✓1

$= I^2Rt$. ✓1

3.

4. A driver looked into his side mirror and saw a diminished image of a car behind him.

(a) State the type of mirror the side mirror is made of. (1 mark)

Convex mirror.

(b) State two reasons why (a) above is preferred as side mirror. (2 marks)

✓ They produce upright images regardless of object distance. ✓1

✓ They have a wider field of view. ✓1

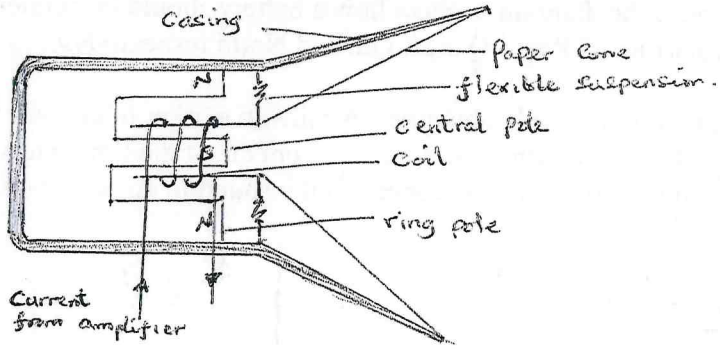
(c) Define focal length of concave mirror. (1 mark)

✓ Distance from the pole of mirror to the principal focus. ✓1

5. State the basic law of electrostatics. (1 mark)

✓ Unlike charges attract while like charges repel. ✓1

6. The diagram below shows the different parts of a loud speaker.



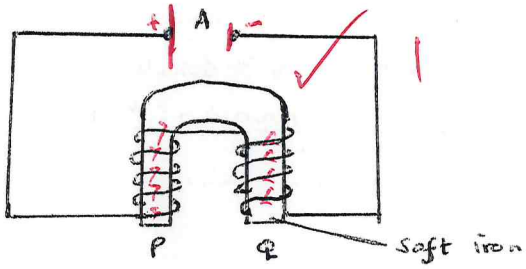
State the role of the current from the amplifier. (2 marks)

✓ Causing the coil to move ↕ ✓1 and fro due to varying current; making ✓ diaphragm vibrate ↕ and for producing sound. 1

7. (a) You are provided with two iron bars, x and y, one is magnetized and the other is not. Explain how you would identify the magnetized bar without using a magnet. (2 marks)

✓ Suspend the two bars x and y using a string. ✓1
✓ Allow them to freely swing, the one that is magnetized will after a short time rest in N-S direction of earth's magnetic axis while the unmagnetized will continue swinging. ✓1

(b) The figure below shows a set-up used to make a magnet.



(i) Explain why soft iron is used. (1 mark)

✓ Easily magnetized and demagnetized. ✓1

(ii) Complete the diagram to show how a battery should be connected at A so that the polarities of **P** and **Q** are south and North respectively. (1 mark)

8. A boy strikes a railway line with a hammer. A railway worker 60m away ~~leaves~~ hears two sounds, one from the railway line and the other from air. If the time interval between the sounds is ~~1.6~~ 0.216 seconds, and the average speed of the sound in air is 320 m/s. Determine the speed of sound in the rail. (3 marks)

$v = \frac{2x}{t}$ (Echo)

$320 = \frac{60}{t}$

$t = \frac{60}{320} = 0.1875$ secs ✓1 | 0.19s

$t_{solid} = 0.19 - 0.16 = 0.035$ ✓1

$Speed = \frac{60}{0.03} = 2000$ m/s. ✓1

3

9. (a) Define electric current. (1 mark)

✓ Rate of flow of charge. ✓1

or flow of charge per unit time.

(b) A current of 3A passes through bulb B for 3 minutes 45 seconds. Determine the quantity of change through B. (2 marks)

$Q = It$ ✓1

$= 3 \times (3 \times 60 + 45)$

$= 675$ C ✓1

10. State one way in which radio waves can be detected. (1 mark)

✓ use of earphones. ✓1

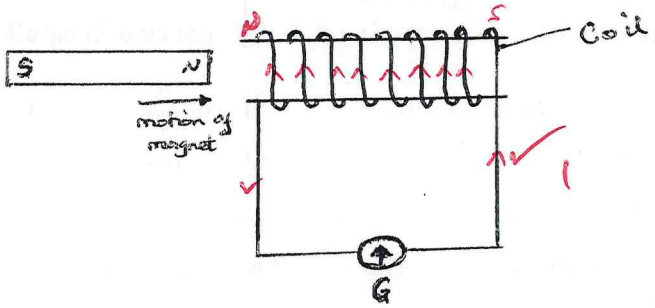
SECTION B (55 MARKS)

Attempt all the question in the spaces provided.

11. (a) State Faraday's law of electromagnetic ~~inductors.~~ Induction. (1 mark)

✓The magnitude (size) of an induced is directly proportional to the rate of change of magnetic flux linkage.

(b) A bar magnet is moved into a coil of insulated copper wire connected to a centre-zero galvanometer as shown below.



(i) Show on the diagram, the direction of induced current in the coil. (1 mark)

(ii) State and explain what is observed on the galvanometer when the north pole of the magnet is moved into and then withdrawn from the coil. (3 marks)

✓The galvanometer deflects in the direction of induced current. ✓1

✓When withdrawn, the direction of induced current reverses such as to oppose (attract) N-pole leaving the coil. ✓1 Deflection of Galvanometer reverses. ✓1 3

(c) A transformer has 1000 turns in the primary and 40 turns in the secondary winding. The alternating e.m.f. connected to the primary is 240V and the current is 0.4A. Determine:

(i) The second voltage (e.m.f.) (2 marks)

$\frac{V_s}{V_p} = \frac{N_s}{N_p}$ ✓

$\frac{V_s}{240} = \frac{40}{1000}$

$V_s = \frac{240 \times 40}{1000}$

$= 9.6V$ ✓ 2

(ii) The power in the secondary, if the transformer is 90% efficient. (3 marks)

$\eta = \frac{P_{out}}{P_{in}} \times 100\%$ ✓

$\eta = \frac{I_s V_s}{I_p V_p} \times 100\%$ ✓1

$90 = \frac{P_{out}}{240 \times 0.4} \times 100$

$P_{out} = \frac{90 \times 12}{100}$

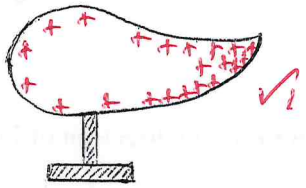
$= 108\ W$ ✓1

12. (a) State any two ways of decreasing the capacitance of a parallel-plate capacitor. (2 marks)

✓ Decrease in the area of overlap between plates. ✓1

✓ Increase in the distance of separation between plates. ✓1 2

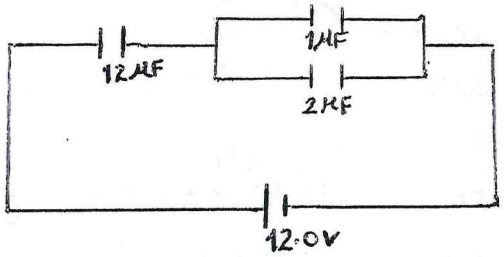
(b) A metallic body shaped as shown below is positively charged and insulated from the ground.



✓1

Show on the figure the charge distribution on the conductor. (1 mark)

(c) The figure below shows three capacitors A, B and C connected to a battery of e.m.f. 12.0V and zero internal resistance.



Determine:

(i) The effective capacitance of the circuit. (3 marks)

✓ Parallel $1 + 2 = 3\mu F$. ✓1

series $\frac{12 \times 3}{12+3} = \frac{36}{15} = 2.4\mu F$. ✓ ✓1 3

(ii) The p.d. across the 12 μF capacitor. (3 marks)

$Q = CV = 2.4\mu F \times 12 = 28.8\mu F$. ✓1

$V = \frac{Q}{C} = \frac{28.8\mu F}{12\mu F}$ ✓ $= 2.4V$ ✓1

(iii) Charge stored in the 1 μF capacitor. (2 marks)

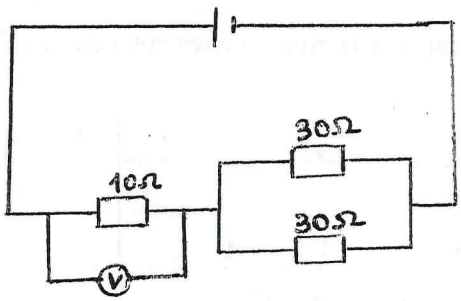
$V_{1\mu F \parallel 2.4\mu F} = 12 - 2.4 = 9.6V$ ✓1

$Q = CV = 1 \times 9.6 = 9.6\mu C$ ✓1

13. (a) State Ohm's law. (1 mark)

"Current flowing through a current-carrying conductor is directly proportional to the potential difference across its ends, provided temperature and other physical conditions are kept constant" ✓1

(b) The cell in figure has an e.m.f. of **2.6V** and negligible internal resistance.



Determine the:

(i) Total resistance in the circuit (2 marks)

Parallel: $\frac{30 \times 30}{30+30} = 15\Omega$ ✓ 2

Series: $10 + 15 = 25\Omega$ ✓

(ii) Current in the circuit (2 marks)

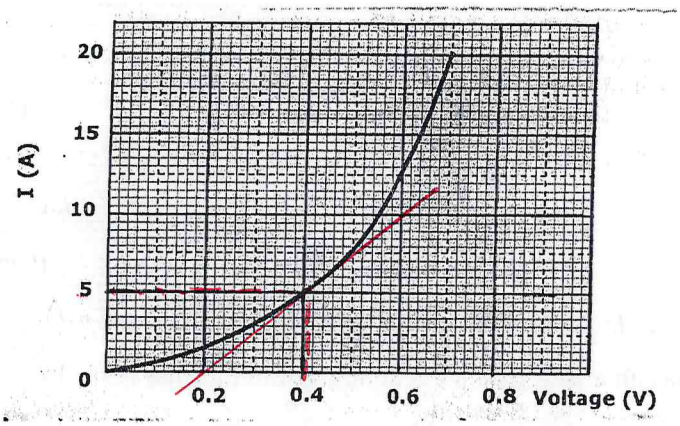
$I = \frac{V_1}{R_1} = \frac{2.6}{25} = 0.104\ A$ ✓1 ✓1 2

(iii) Reading on the voltmeter (2 marks)

$V = IR$ ✓1

$= 0.104 \times 10 = 1.04V$ ✓1 2

(c) The graph below shows how the voltage, V, varies with the current, I for a filament lamp.



(i) From the graph, determine the resistance of the lamp when a current of 5A flows. (3 marks)

At I_{5A}; $V = 0.4V$

$V = IR$ ✓

$0.4 = 5R$

$R = \frac{0.4}{5} V = 0.08\Omega$ ✓ 3

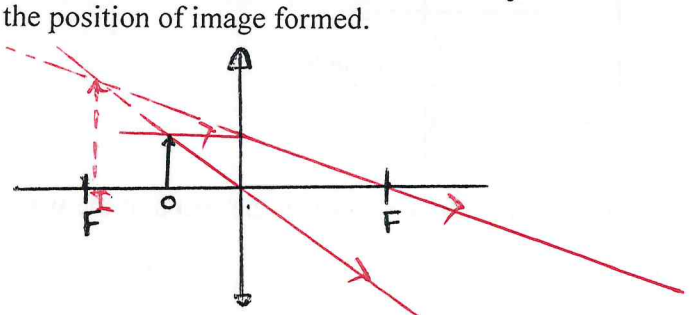
(ii) State with a reason whether the device is ohmic or non-ohmic. (2 marks)

Non-ohmic; resistance varies with time ✓ 2

14. (a) (i) Define the term lens. (1 mark)

✓ Is a transparent material with at least one curved surface that operates on the principle of refraction. ✓ 1

(ii) I. The figure below shows a convex lens with an object before it. Draw rays to identify the position of image formed. (3 marks)



II. State one device in which such a set-up is used. (1 mark)

✓ Search light ✓ spot light.

(b) A lens forms an image is that four times the size of the object on a screen. The distance between the object and the screen is 150 cm when the image is sharply focused.

(i) State with reason the type of lens that was used. (2 marks)

Convex lens (diverging) ✓ 1. A magnified image is focused on screen. ✓ 1

(ii) Determine the focal length of the lens. (3 marks)

$m = v/u$

$4 = v/u$ ✓ 1

$v = 4u = 120$cm

$u + v = 150$

$u + 4u = 150$; $u = 150/5 = 30$cm

$\frac{1}{f} = \frac{1}{v} + \frac{1}{4}$

$\frac{1}{f} = \frac{1}{120} + \frac{1}{30}$ ✓ 1

$\frac{1}{f} = \frac{1+4}{120}$ ✓ 1

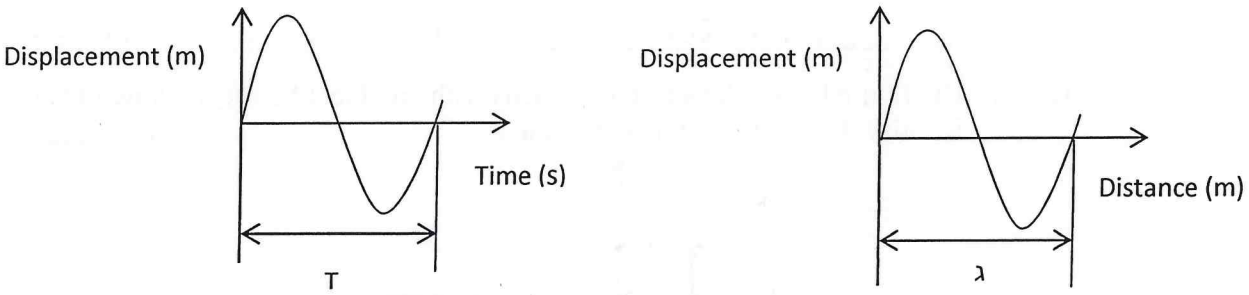
$f = \frac{120}{5}$ ✓ 1

$= 24$ cm. 3

15. (a) Distinguish between longitudinal and transverse wave (2 marks)

✓ Longitudinal waves are those whose particle vibration is parallel to the wave travel while transverse are those whose wave particle vibration is perpendicular to the wave travel. ✓ 1

(b) The figure below shows the displacement- time and displacement-distance graphs of a certain wave.

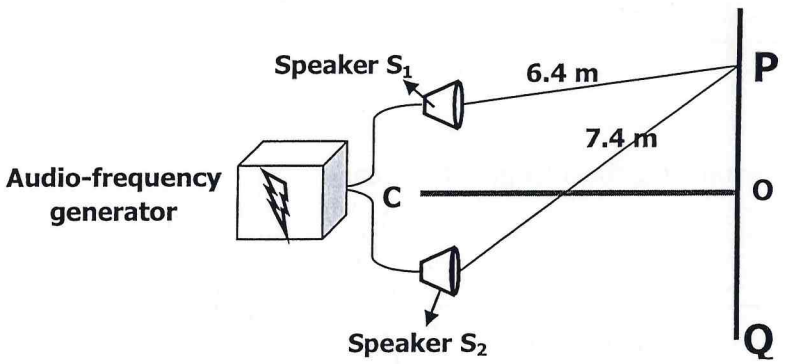


From the information above show that the speed of the wave = frequency X wavelength ($c=f\lambda$). (2 marks)

Speed = Distance travelled / time taken = $\frac{\lambda}{T}$ ✓ but $T = \frac{1}{f}$

$V = \frac{\lambda}{T} = f\lambda$. ✓ 2

(c) Figure shows two speakers connected to an audio – frequency generator.



(i) Give reason why the loudspeakers are connected to the same audio – frequency generator. (1 mark)

✓ To produce coherent sound waves / waves of same wavelength / frequency. ✓1

(ii) State and explain the observation made by an observer moving along the path **PQ.**

(2 marks)

- The observer will hear instances of loud and soft sound. ✓1
- Loud sound is due to constructive interference, soft sound is due to destructive interference. ✓1

(iii) State the observations made if the frequency of the signal generator was increased.

(1 mark)

Distance between loud and soft sound decreases, ✓1
more soft and loud sounds heard

(iv) Explain the observation made when the distance **CO** was increased. (1 mark)

- Distance between the sounds (bands) increases ✓1

(v) If the distances S_1P and S_2P are 6.4m and 7.4m respectively. Determine the frequency of the signal generator from the set up above given that **P** is the first constructive interference after the central order and the velocity of sound is **320m/s.** (3 marks)

S_2P and $S_1P = 1\lambda$.
$= 7.4 - 6.4$
$= 1m$ ✓1

$c = f\lambda$ ✓
$f = \frac{c}{\lambda} = \frac{320}{1}$ ✓
$= 320Hz$. 3

END

This is the last printed page.