MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education
PRE-MOCK EXAMINATIONS 2023

232/2 **PHYSICS** **Paper 2**

April 2023 – 2 Hours

MARKING GUIDE

Instructions to candidates

- This paper consist of TWO sections; A and B. Answer ALL the questions in section A and B in the spaces provided.
- ALL working MUST be clearly shown. Mathematical tables, electronic calculators and slide rules may be used.
- Candidates should check the question paper to ensure that all the **11** pages are printed as indicated and that no questions are missing.
- Take:

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SECTION	Question	Maximum Score	Candidate's Score
A	1-10	25	
B	11	11	
	12	13	
	13	10	
	14	10	
	15	11	
TOTAL		**80**	

SECTION A (25 MARKS)

*Attempt **ALL** questions in this section in the spaces provided*

1. State two factors which determine the velocity of sound in air. (2 marks)

- density of air ✓1 - humidity of air ✓1

- temperature of air

2. Explain why electric power is not transmitted at low voltage (1 mark)

At low voltage, current is high hence higher power loss due to I^2R ✓1

3. (a) State one similarity between X-rays and gamma rays (1 mark)

Both travel at a speed of $3.0X10^8 m/s$, electromagnetic in nature ✓1

(b) State one difference between X-rays and gamma rays (1 mark)

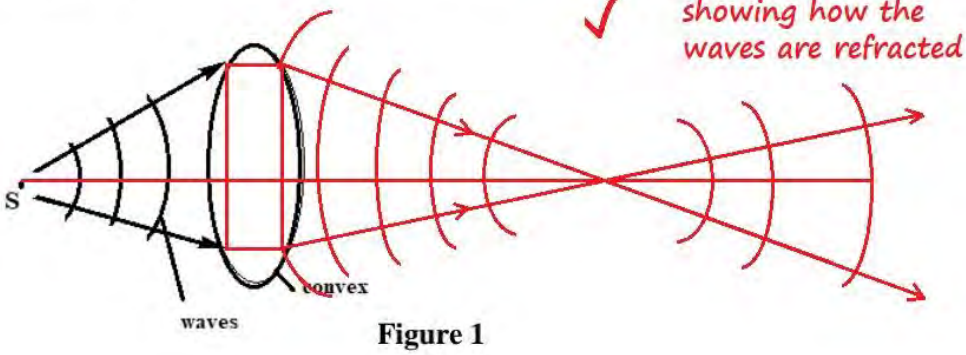
X-rays originate in the electron fields surrounding the nucleus, while gamma rays originate from the nucleus. ✓1

(c) Describe one safety measure to be taken when handling these radiations. (1 mark)

- Always wear gloves when handling them. ✓1

- Avoid direct exposure to the radiations

4. **Figure 1** shows a wave moving through a convex section of a medium.



✓1 correct path showing how the waves are refracted

Figure 1

(a) Complete the diagram to show the path of the rays (1 mark)

(b) State the property of waves illustrated above (1 mark)

Refraction ✓1

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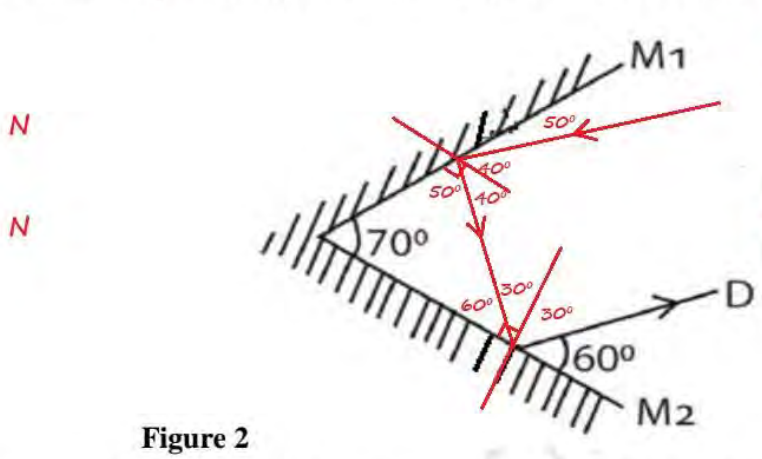
5. When an object is placed 12 cm from a concave mirror, an image of height 4 cm is formed 24 cm from the mirror. Find the height of the object (2 marks)

$\frac{v}{u} = \frac{h_i}{h_o}$

$\frac{24cm}{12cm} = \frac{4cm}{h_o}$ ✓1

$h_o = 2cm$ ✓1

6. **Figure 2** shows two plane mirrors M_1 and M_2 are inclined to each other at an angle of 70°.



✓1 all angles correctly indicated

✓1 direction of rays correctly indicated

Figure 2

If ray D is reflected ray from mirror M_2, complete the path of the rays and hence determine the angle of incidence of on M_1 (3 marks)

Angle of incidence on M_1 = 40° ✓1

7. The p.d across a resistance wire is 12V. Find the quantity of electric charge flowing through the wire to generate 1.68 kJ of heat energy in one second. (3 marks)

$H = VIt$ ✓1

$1680 = 12 \times I \times 1$

$I = 140A$ ✓1

$Q = It$

$= 140 \times I$

$= 140C$ ✓1

8. .

(a) What is a hard magnetic material? (1 mark)

It is a magnetic material that is hard to magnetize but which when magnetized, retains its magnetism for long. ✓1

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(b) **Figure 3** shows a soft iron bar and a steel bar are suspended inside a coil above a container of iron filling.

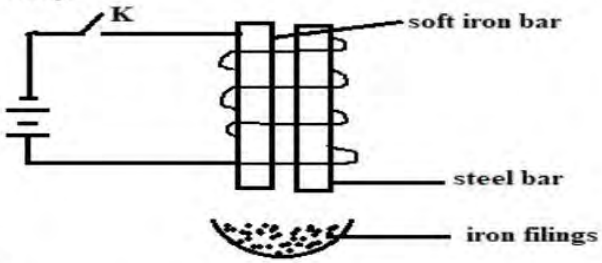

Figure 3

Explain what is observed when switch K is closed (2 marks)

Soft iron bar attracts iron filings first, and more than the steel bar. ✓1

Soft iron bar is easily magnetized, while steel bar is difficult. ✓1

9. **Figure 4** shows a sound wave produced from a tuning fork vibrating at 800 Hz

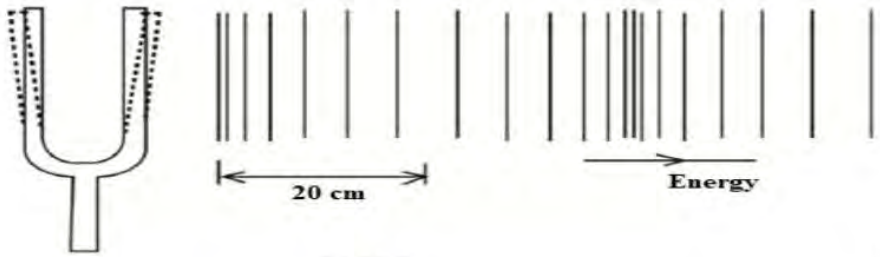

Figure 4

Calculate the velocity of the wave in the medium. (3 marks)

½ λ = 20cm

λ = 40cm

V = fλ ✓1

= 800 × 40/100 ✓1

= 320m/s ✓1

10. .

(a) When a charged glass rod is brought near a gold leaf electroscope, the leaf diverges but fall again when the rod is removed. Explain the observations (2 marks)

Leaf diverges because the glass rod repels like charges, and attracts unlike charges. ✓1 It falls again when the rod is removed, since the electroscope acquires a temporary charge. ✓1

(b) State any one precaution that should be observed when working with an electrostatic device. (1 mark)

Avoid direct hand/body contact; instead, wear gloves and proper clothing. ✓1

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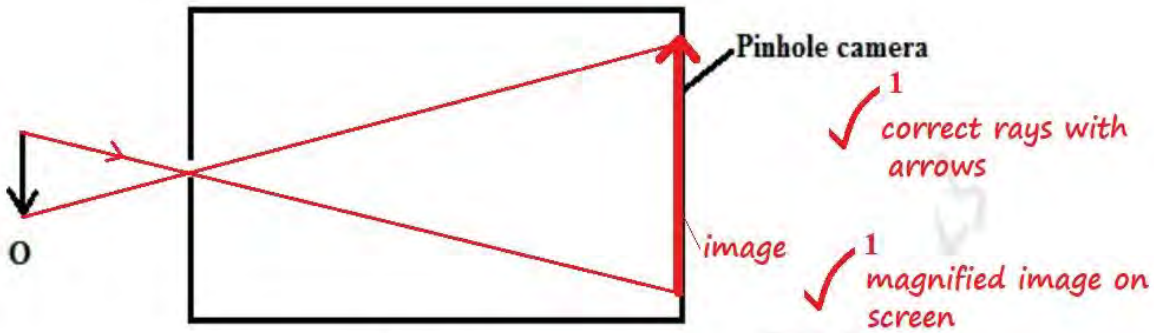
Duncan Ouya

SECTION B: (55 MARKS)

*Attempt **ALL** questions in the spaces provided*

11. **Figure 5** shows an object O placed in front of a pinhole camera. Use it to answer the questions that follow;



1 ✓ correct rays with arrows

1 ✓ magnified image on screen

Figure 5

(a) Use ray diagrams to locate the position of image (2 marks)

(b) State the characteristics of the image formed (3 marks)

- Magnified ✓1
- Inverted/Upside down ✓1
- Focused on screen/real ✓1

(c) Increasing the size of the pinhole makes the image to be brighter but blurred. Explain why the image is;

(i) Brighter (1 mark)

Larger hole allows more light into the pinhole ✓1

(ii) Blurred (1 mark)

Larger hole causes more images which overlap, hence blurred. ✓1

(d) An object 1.6 m long is placed 8m from a pinhole camera which is 20 cm long.

(i) Calculate the height of the image (2 marks)

$\frac{h_i}{h_o} = \frac{v}{u}$

$\frac{h_i}{1.6m} = \frac{0.20m}{8m}$ ✓1

$h_i = 0.04m/4cm$ ✓1

(ii) What will be the height of the image formed if the camera is 10 cm long (2 marks)

$\frac{h_i}{h_o} = \frac{v}{u}$

$\frac{h_i}{1.6m} = \frac{0.10m}{8m}$ ✓1

$h_i = \frac{1.6m \times 0.10m}{8m}$

$= 0.02m/2cm$ ✓1

12. .

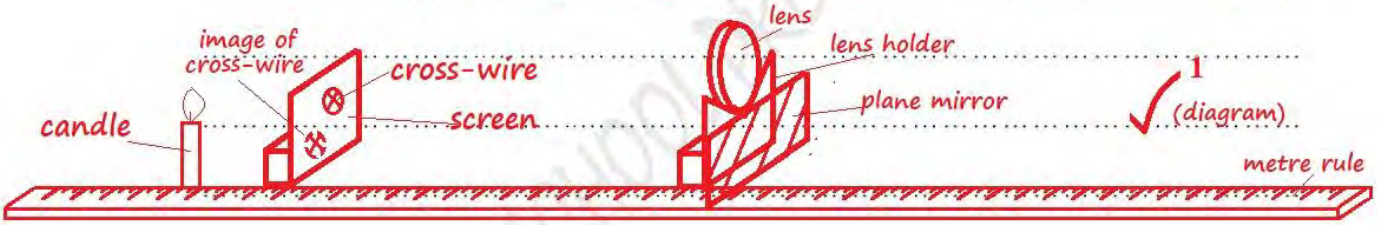
(a) Define the term *principal focus of diverging mirror* (1 mark)

A point from which all rays close to and parallel to the prinipal axis appears appear to diverge from after reflection by the mirror. ✓1

(b) With an aid of a well labeled diagram, describe an experiment to determine the focal length of a convex lens using an illuminated object and plane mirror. (5 marks)

1. Apparatus: Metre rule, lens-holder, candle, screen with cross wires ✓1 (apparatus)

2. Procedure: Set the lens in its holer with a plane mirror behind it so that light passing through it can be reflected back as shown below. ✓1 (procedure)



✓1 (diagram)

- Adjust the position of the lens until a sharp image of the cross-wire is formed alongside (close to) the cross-wire. ✓1 (procedure)

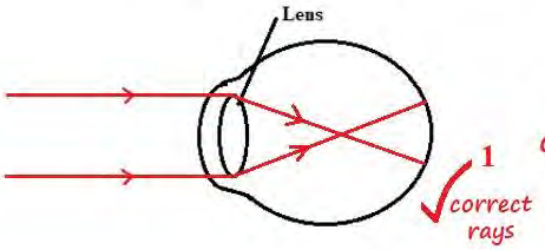
3. Conclusion: The distance between the object and the centre of the lens, gives the focal length of the lens. ✓1 (conclusion)

(c) State two differences between the operation of a lens camera and the eyes (2 marks)

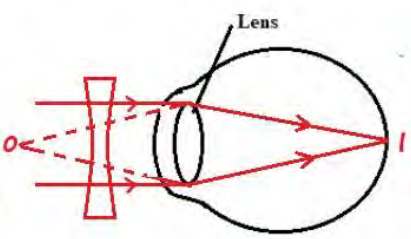
- Focal length of the eye lens changes while that of the lens camera is constant ✓1
- The distance between the lens and film in a lens camera can be varied by zooming, while the distance between the eye lens and retina is constant. ✓1
- A camera can take only one photo at a time when the shutter is open, while the eye forms constantly changing pictures.

(d) .

(i) By completing the diagram in **figure 6(a)** explain shortsightedness of the eye (3 marks)



1 correct rays



1 diverging lens in front of eye lens

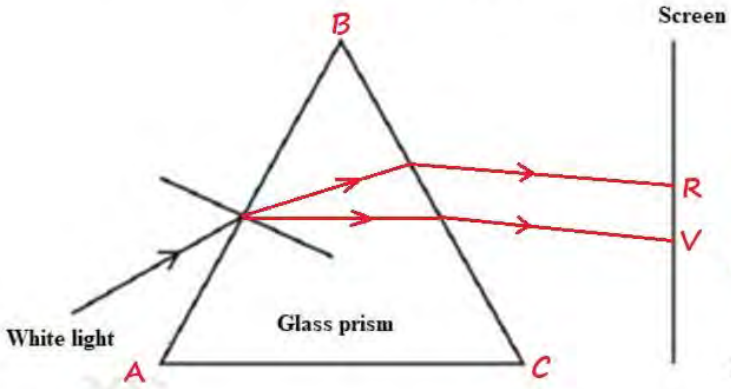
1 correct ray diagrams

Figure 6(a) **Figure 6(b)**

Rays for distant objects are focused in front of the retina due to short ✓1 focal length of the eye lens and long eye ball. ✓1

(ii) Complete the **Figure 6(b)** to illustrate how the above defect is corrected (2 marks)

13. **Figure 7** shows a ray of white light incident on a glass prism.



1 refraction at face AB of different colours

1 refraction at face BC with arrows shown

Figure 7

(a) Complete the diagram to show effect of the glass prism on the ray. (2 marks)

(b) State two effects caused by the glass prism on the white light (2 marks)

Dispersion - Separation of white light into its component colours. ✓1

Refraction - Change in speed of light ✓1

(c) Find the critical angle for glass in air if the refractive index of the glass is 1.5. (3 marks)

$\sin C = \frac{1}{n}$ ✓1

$\sin C = \frac{1}{1.5}$ ✓1

$\sin C = 0.6667$

$C = \sin^{-1} 0.6667$

$C = 41.81°$ ✓1

(d) State what happens when the above critical angle is exceeded (1 mark)

Total internal reflection occurs ✓1

(e) **Figure 8** shows how a mirage is formed. Complete the diagram to show how the mirage is formed and seen by the eye (2 marks)

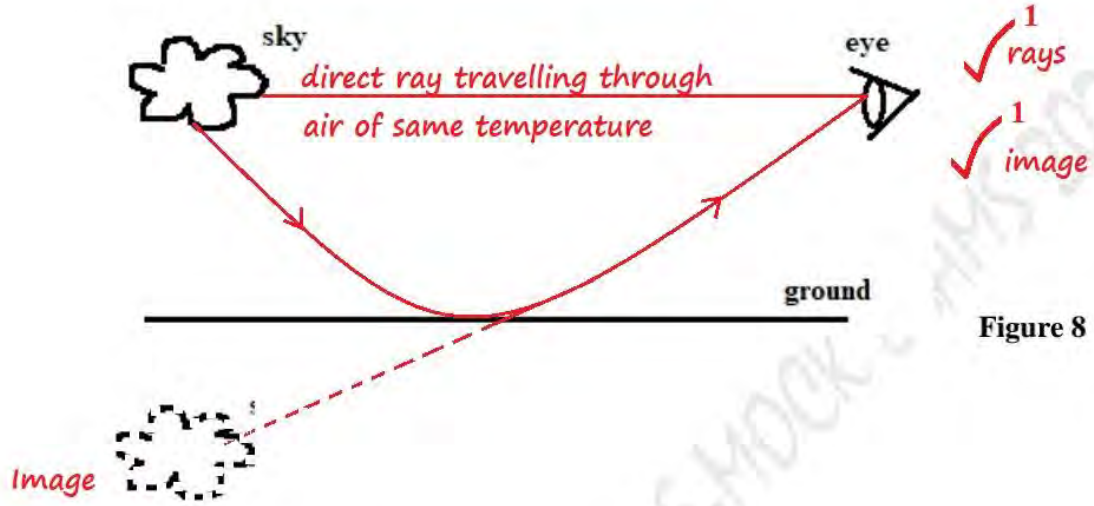


Figure 8

14. .

(a) State the reason why soft iron is laminated (1 mark)

To reduce eddy currents [small currents that result from the changing magnetic field created by the alternating current in the primary coil]. ✓1

(b) State one property of soft iron that makes it suitable for use as a transformer core (1 mark)

Easily magnetized and demagnetized ✓1

(c) **Figure 9** shows a step-down transformer..

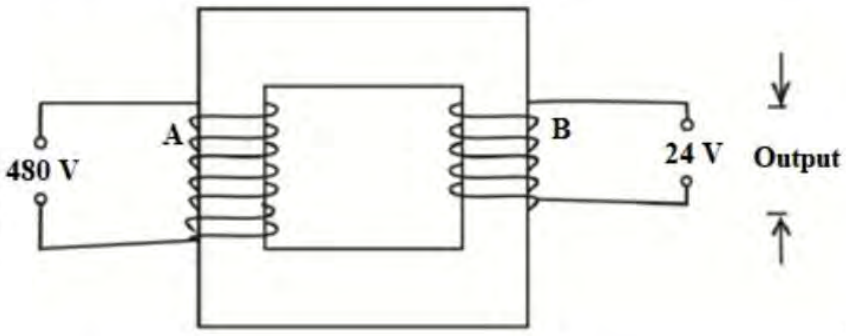


Figure 9

(i) Name the coils marked A and B (2 marks)

A - Primary coil ✓1

B - Secondary coil ✓1

(ii) If the transformer is used to step down mains supply from 480 V to 24V and coil A has 800 turns, determine the number of turns in coil B. (3 marks)

$\frac{N_s}{N_p} = \frac{V_s}{V_p}$ ✓1

$\frac{N_s}{800} = \frac{24}{480}$ ✓1

$N_s = \frac{800 \times 24}{480}$

N_s = 40 turns. ✓1

(d) **Figure 10** shows pendulum A and pendulum B freely suspended between the poles of identical magnets. Pendulum A is made of thick copper plate while B is made of copper plate with slots

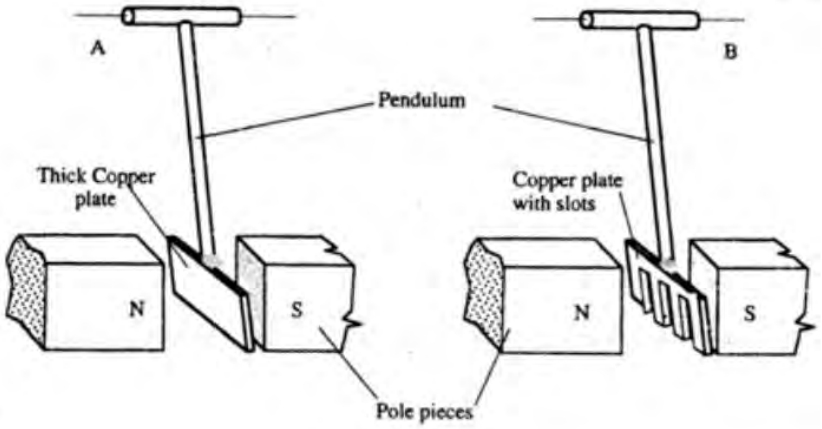


Figure 10

(i) When the two are set to swing, it is observed that A slows down faster than B Explain this observation. (2 marks)

Copper plate with slots experiences slower motion hence lower damping ✓1

which will result in in smooth stopping compared to the thick copper ✓1

plate with higher motion.

(ii) State one application of the concept illustrated in pendulum A (1 mark)

(eddy current damping)

Hot wire, moving coil and induction type instruments ✓1

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15. .

(a) **Figure 11** shows three capacitors of capacitance 3μF, 2μF, 6μF and 12V supply connected in. a circuit.

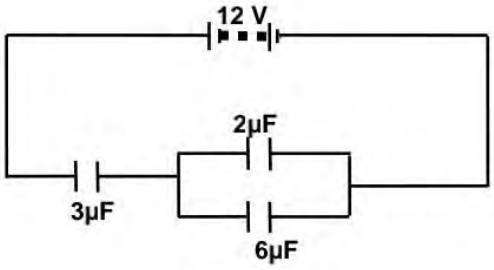

Figure 11

Calculate:

(i) The total capacitance of the circuit. (2 marks)

$C_T = \frac{3 \times 8}{3 + 8}$ ✓1

$2\frac{2}{11}\mu F$ / 2.1818μF ✓1

(ii) The charge stored in the circuit. (2 marks)

$Q = C V$ ✓1

$= 2.1818 \times 12$

$= 26.1816\mu C$ ✓1

(iii) The potential difference across the 6μF capacitor. (2 marks)

$V_{3\mu F} = \frac{26.1818\mu C}{3\mu F}$

$= 8.7272V$ ✓1

$V_{6\mu F} = 12 - 8.7272$ ✓1

$= 3.2728V$ ✓1

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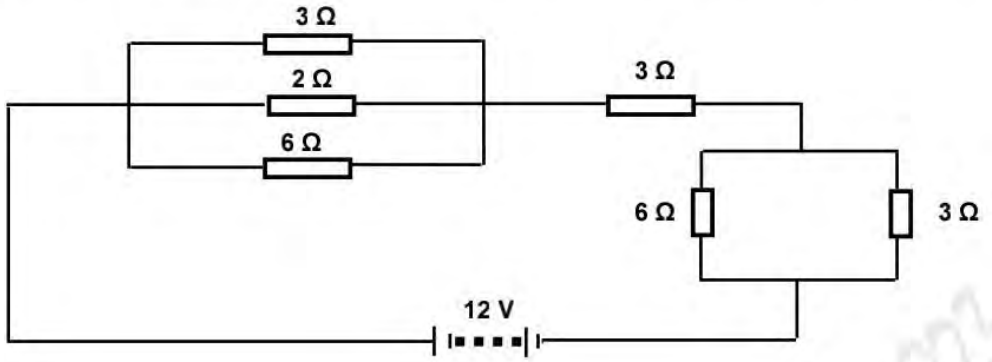
(b) **Figure 12** shows an arrangement of resistors. Use it to answer questions that follow.



(i) Calculate the total resistance in the circuit. (3 marks)

$R_{P1} = \left(\frac{1}{6} + \frac{1}{2} + \frac{1}{3}\right)^{-1} = 1\Omega$ ✓1

$R_{P2} = \frac{6 \times 3}{6+3} = 2\Omega$ ✓1

$R_T = 1\Omega + 3\Omega + 2\Omega$

$= 6\Omega$ ✓1

(ii) Calculate effective current in the circuit. (2 marks)

$I = \frac{V}{R}$ ✓1

$= \frac{12}{6}$ ✓1

$= 2A$

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