MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education

FORM 4 PRE-MOCK EXAMINATIONS 2024

232/2 PHYSICS PAPER 2

MARCH/APRIL 2024 – 2 Hours

MARKING GUIDE

Instructions to candidates

- This paper consists 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 **12** pages are printed as indicated and that no questions are missing.

For Examiner's Use Only

SECTION	Question	Maximum Score	Candidate's Score
A	1 – 14	25	
B	15	10	
	16	11	
	17	14	
	18	11	
	19	09	
	Total Score	**80**	

H.O.D.

SECTION A (25 MARKS)

Answer ALL the question in this section in the spaces provided

1. State the condition under which the p.d across the terminals of a cell is equal to its e.m.f.

(1 mark)

When there is no current flowing out of the cell. ✓1

2. Explain why radio wave signals are easier to receive than TV waves signals in a place surrounded by hills. (2 marks)

Radio waves are easily diffracted ✓1 around hills than TV waves since they have longer wavelength. ✓1

3. Kiss FM is broadcasting at a frequency of 70MHz. What is the wavelength of the waves, if the speed of the waves is 3.0×10^8 m/s? (2 marks)

$V = f\lambda$

$\lambda = \frac{3X10^8}{70X10^6}$ ✓1

$= 4.286m$ ✓1

4. How can it be shown that the strength of a magnet is concentrated at the poles? (1 mark)

Dipping the magnet in iron filings, more of them will cling at the poles. ✓1

5. **Figure 1** shows a fuse.

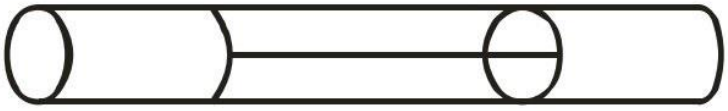


Figure 1

Rev. Peter Okoth

a) Explain how the fuse works in an electric circuit. (2 marks)

When the electric current exceeds the required value/rating of fuse, the wire in the fuse heats up and melts ✓1 hence breaking the circuit. ✓1

b) What modification can be made on the above fuse so that it can be used in a circuit supplying a higher current? (1 mark)

-Using a wire of larger radius/crossection area. ✓1 OR

-Reducing length of the wire.

6. State the Snell's law of refraction. (1 mark)

The ratio of sin i to sin r is always a constant for a given pair of media. ✓1

7. Give **two** reasons why soft iron is used as a core of the coil in an electric bell. (2 marks)

(i) Easily demagnetized and magnetized ✓1

(ii) It makes stronger magnets ✓1

8. A real object of height 1cm placed 50mm from a concave mirror forms a virtual image 100mm from the mirror. Determine the focal length of the mirror. (3 marks)

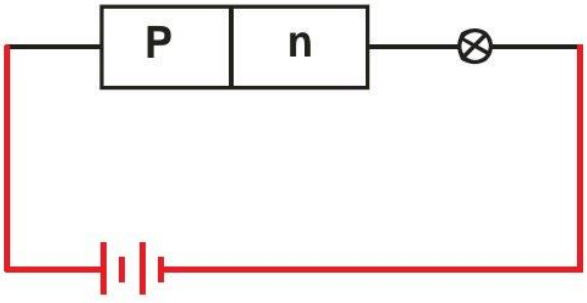
$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ ✓1

$\frac{1}{f} = \frac{1}{-100} + \frac{1}{50}$ ✓1

$\frac{1}{f} = 0.01$

$f = 100mm / 1cm$ ✓1

9. **Figure 2** shows a p-n junction diode in series with a small bulb. Complete the diagram to show how a battery should be connected so that the diode is forward biased. (1 mark)



✓1 at least two dry cells

Figure 2

Mr. Duncan Ouya

10. Alpha and beta particles from a radioactive source deviate by different amounts when moving in a magnetic field. Give **two** reasons why alpha particles deviate less. (2 marks)

-They are heavier than beta particles ✓1

-They are short ranged. ✓1

11. Arrange the following in order of increasing frequency. Visible light, infrared radiation, X-rays, U.V radiation, Radio waves. (1 mark)

Radio waves, Infrared radiation, Visible light, U.V. radiation, X-rays ✓1

12. **Figure 3** shows a human eye with a certain defect.

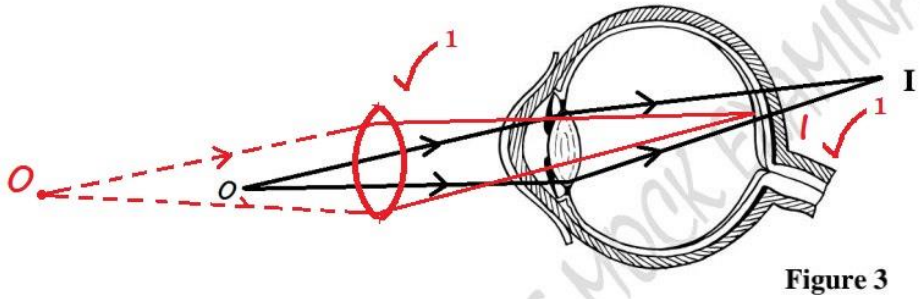


Figure 3

a) Name the defect. (1 mark)

Long sightedness/Hypermetropia ✓1

b) On **Figure 3**, sketch the appropriate lens to correct the defect and sketch the rays to show the effect of the lens. (2 marks)

13. Give the difference in the deflection system of a cathode ray oscilloscope and a television set. (1 mark)

In a C.R.O., deflection is caused by an electric field while in a T.V., it is caused by a magnetic field. ✓1

14. **Figure 4** below shows a single phase demonstration transformer intended to converted 24V, 50Hz as AC supply to 240V, 50Hz.

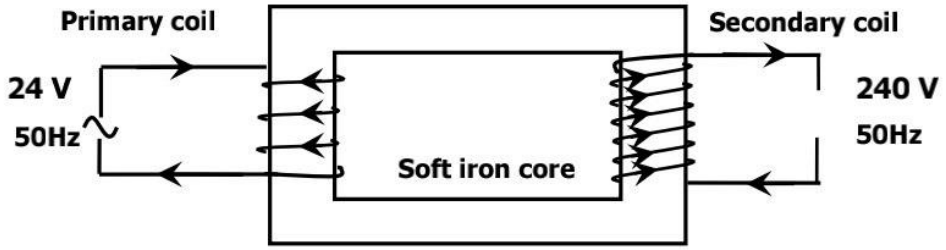


Figure 4

Peter Andang'o

If the primary core has 50 turns of coil, how many turns of coils should the secondary have?

(2 marks)

$\frac{N_s}{N_p} = \frac{V_s}{V_p}$ | $\frac{N_s}{50} = \frac{240}{24}$ ✓1

$N_s = 500$ turns ✓1

SECTION B (55 MARKS)

Answer ALL the questions in this section in the spaces provided

15. a) **Figure 5** shows ultraviolet light striking a clean zinc plate placed on a positively charged leaf electroscope.

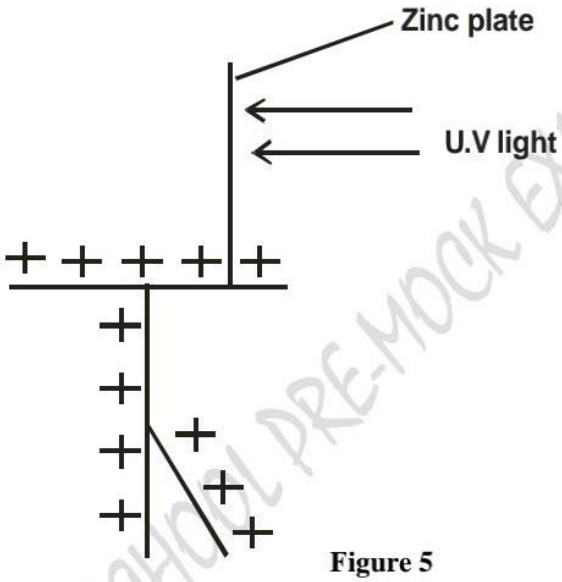


Figure 5

Explain the following observations;

i) The leaf does not fall. (1 mark)

The electrons dislodged from the zinc plate are attracted by the positive charge on the electroscope, hence the leaf does not fall. ✓1

ii) When the same experiment is carried out with a negatively charged electroscope, the leaf falls. (1 mark)

The electrons dislodged from the zinc plate are repelled hence decreasing charge density on the electroscope; the leaf falls. ✓1

Mr. Victor Odundo

b) State **two** factors that affect photoelectric emission. (2 marks)

(i) The frequency/wavelength of the radiation ✓1

(ii) The nature of the metal ✓1

c) In an experiment on photoelectric emission, a metal surface was illuminated by light of different 20 frequencies but of constant intensity. The maximum kinetic energy (K.E. $_{max}$) of the photoelectrons emitted for each frequency f, was measured. The graph below shows how the K.E. $_{max}$ varied with frequency.

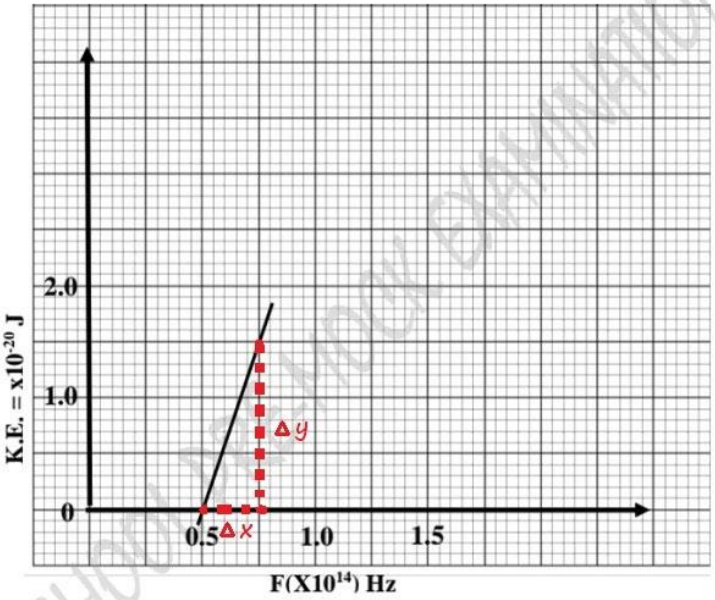


Figure 6

Use the graph and Einstein's equation of photoelectric effect to determine the value of;

i) Planck's constant. (3 marks)

h = gradient ✓1

$h = \frac{(1.5 - 0)X10^{-20}}{(0.75-0.5)X10^{14}}$ ✓1

$= 6.0X10^{-34}$ Js ✓1

ii) Work function of the metal surface. (3 marks)

$W_o = hf_o$

$f_o = 0.5X10^{14}$ Hz ✓1

$W_o = (6.0X10^{-34}) \times (0.5X10^{14})$ ✓1

$= 3.0X10^{-20}$ J ✓1

Mr. Maurice Asoro

16. a) **Figure 7** below shows a goldleaf electroscope

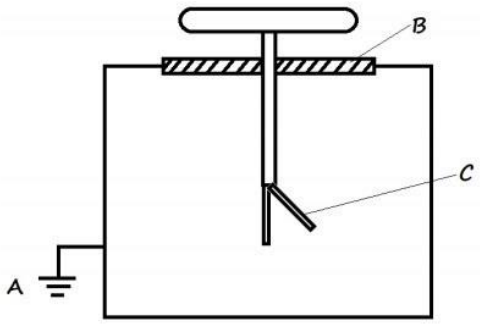


Figure 7

i) Identify the part labeled A (1 mark)

Earth | Earth connection | Earthing | Grounding ✓1

ii) State the function of the parts labelled

I. B – (1 mark)

Stops charge from escaping/leaking through the casing ✓1

II. C – (1mark)

Shows deflection/shows convergence/collapsing OR show presence of charge by divergence or collapsing. ✓1

b) A highly negatively charged rod is brought close to a lightly positively charged gold leaf electroscope

i) State what is observed on the gold leaf (1 mark)

Leaf divergence decreases then increases ✓1 (OR)

falls then rises

ii) Explain the observation made in **b i)** (2 marks)

On approaching the cap the negatively charged rod repels the ✓1 electron from the cap towards the leaf, which then neutralizes the +ve charges hence divergence decreases. The rod is highly -ve hence repels more electrons, causing the leaf to rise again. ✓1

c) **Figure 8** shows a thin wire connected to a highly positively charged rod and placed close to a candle flame.

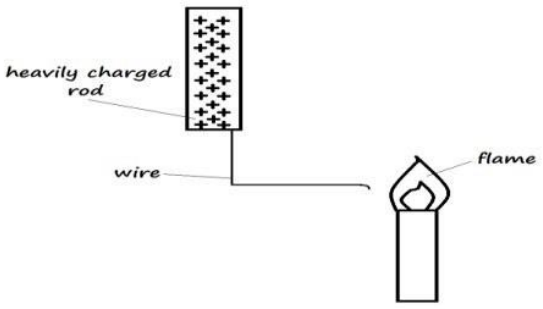


Figure 8

Mr. Kennedy Otieno

i) State what is observed on the flame when the wire is brought closer (1 mark)

(i) The flame is deflected/blown/pushed away from the wire
or
(ii) Flame splits into two
or
(iii) Flame bends and splits into two

ii) Explain the reason for the observation in **c i)** (1 mark)

a reason matches the observation

(i) Charges on the wire ionize air around the flame and the +ve ions are repelled away from the wire, creating an electric wind
(ii) The -ve ions in the flame are attracted to the wire while the +ve ions in the flame are repelled.
(iii) The wire ionises the air around the flame and the -ve charges are attracted while +ve charges are repelled

d) The **figure 9** shows an arrangement of **three** capacitors in a circuit.

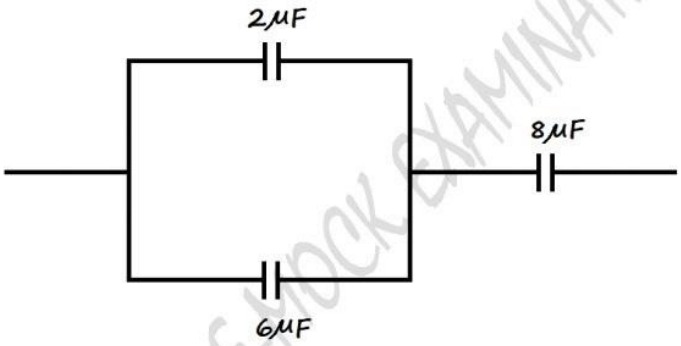


Figure 9

Determine the effective capacitance of the arrangement (3 marks)

$C_{parallel} = 2 + 6 = 8$ ✓1

$C_{total} = \frac{8 \times 8}{8 + 8}$ ✓1 $= 4\mu F$ ✓1

17. a) When power stations generate electricity, it is always stepped up to very high voltages so as to be transmitted over long distances.

i) Explain why it is necessary to do so. (1 mark)

High voltage transmission minimises power losses in the transmission cables. ✓1

ii) State any **two** dangers of this high voltage transmission. (2 marks)

-The risk of electric shock in case poles collapse or cables hang too low ✓1
-The risk of fire on nearby structures and vegetation when the cables get too close. ✓1
-The harmful effects of strong electric fields

ANY TWO

Mr. Duncan Ouya

b) **Figure 10** shows a section of a house wiring system.

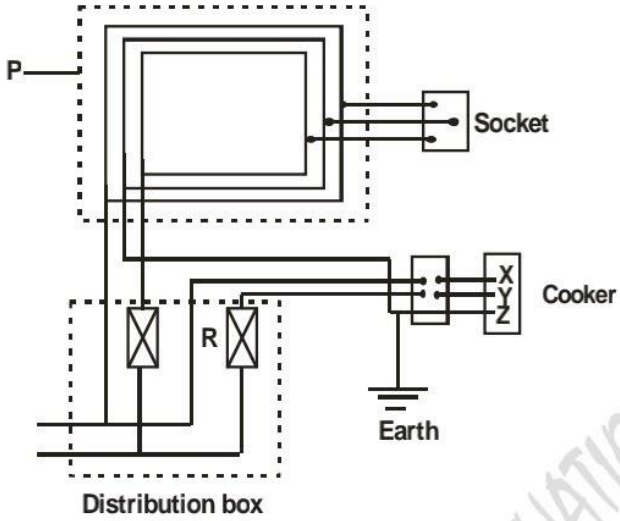


Figure 10

i) Name the circuit labeled **P**. (1 mark)

Ring mains circuit ✓1

ii) Name the terminals labeled **X** and **Y**. (2 marks)

X Neutral ✓1

Y Live ✓1

iii) State the purpose of **R** in the circuit. (1 mark)

Disconnecting the circuit/breaking the circuit/ opening the circuit ✓1

iv) Give a reason why **R** is connected to **Y** but not to **X**. (1 mark)

Y is always at the mains potential (live), R is connected there for safety. ✓1

v) Why is the earthing necessary in such a circuit? (1 mark)

To prevent the risk of electric shock hence making electrical appliances safe to handle. ✓1

c) Determine the cost of using an electric iron box rated 1500W, for a total of 30 hours, given that, the cost of electricity is Ksh. 8 per unit. (2 marks)

Cost = $\left(\frac{1500}{1000} \times 30\right) \times$ sh 8 ✓1

= 45 kWh X 8

= Sh 360 ✓1

Mr. Austine Oduor

d) **Figure 11** shows a Geiger-muller tube:

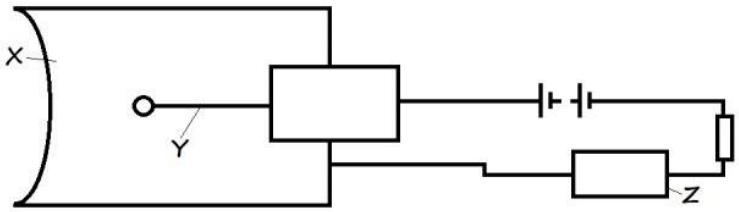


Figure 11

Name the parts labelled **X**, **Y**, **Z** (3 marks)

X Mica window ✓1

Y Anode ✓1

Z Pulse counter ✓1

18. a) State **two** differences between hard and soft X-rays (2 marks)

-Hard x-rays have a relatively higher penetrating power than soft x-rays

-Hard x-rays have higher frequency than soft x-rays ✓1

-Hard x-rays have shorter wavelength than soft x-rays ✓1

-Hard x-rays are produced by electrons moving at a relatively higher velocity than the electrons for soft x-rays. [any two]

b) **Figure 12** shows the features of an X-ray tube.

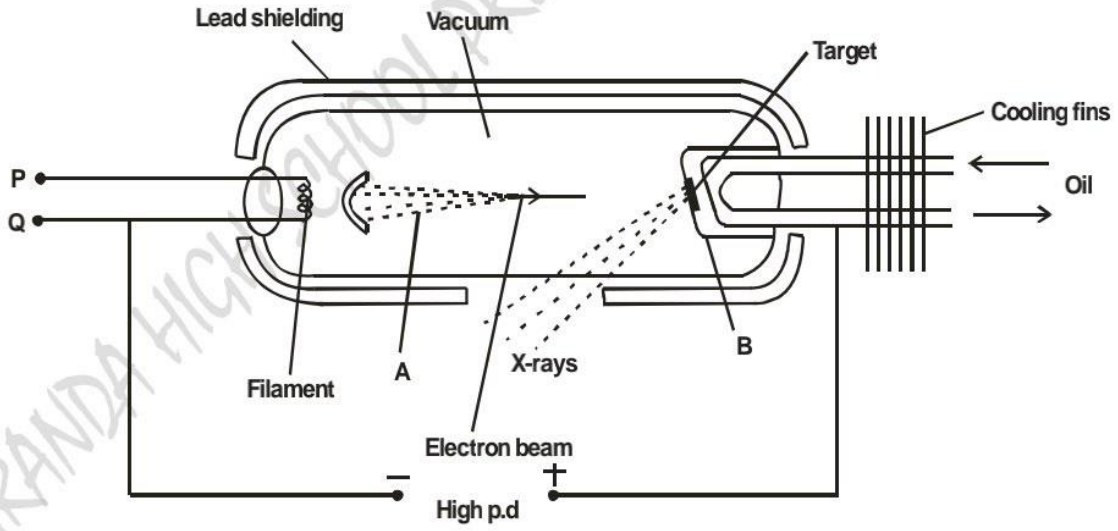


Figure 12

i) Name the parts labeled **A** and **B**. (2 marks)

A Cathode ray ✓1

B Anode ✓1

Mr. Austine Oduor & Mr. Peter Andang'o

ii) Explain how a change in the potential across **PQ** changes the intensity of the X-rays produced in the tube. (2 marks)

The increase in potential increases the heating current ✓1
which in turn leads to emission of a greater number of electrons
hence more x-rays are produced and vice versa. ✓1

iii) During the operation of the tube, the target becomes very hot. Explain how this heat is caused. (1 mark)

Most of the kinetic energy of the electrons is converted to heat
energy on hitting the target. ✓1

iv) What property of lead makes it suitable for use as a shielding material? (1 mark)

High density ✓1 / Greater thickness

c) In a certain X-ray tube, the electrons are accelerated by a potential difference (P.d.) of 12000V. Assuming all the energy goes to produce X-rays, determine the frequency of the X-rays produced. (3 marks)

(Planck's constant h = 6.62 x 10^{-34}Js, and charge of an electron **e** = 1.6 x 10^{-19}C)

$E = eV = hf$ ✓1

$f = \frac{1.6X10^{-19} \times 12000}{6.62X10^{-34}}$ ✓1 $f = 2.9X10^{18}Hz$ ✓1

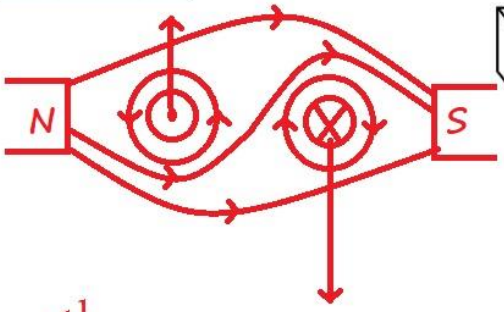
19. a) State Fleming's left hand rule (1 mark)

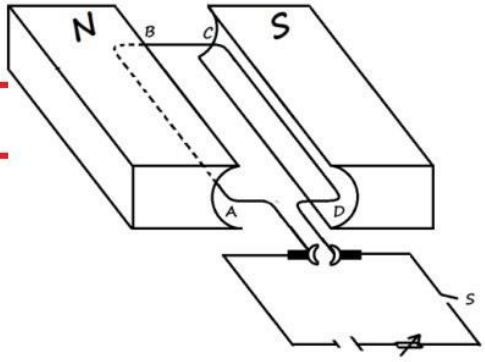
If the left hand is held with the thumb, first and second fingers mutually at right angles such that the first finger points in the direction of magnetic field, second finger in the direction of the current, then the thumb points in the direction of motion/force ✓1

b) **Figure 13** shows an electric motor with a coil **ABCD** in the magnetic field

Mr. Philemon Tambo

Alternative





✓1 diagram

✓1 ✓1 explanation

Figure 13

i) Indicate with an arrow on the coil **ABCD**, the direction of the current **I** when switch S is closed

ii) State the direction in which the coil rotates when the switch is closed (1 mark) ✓1

Clockwise direction/ Side AB move up, CD down /shown from diag.

iii) Explain what makes the coil to rotate (3 marks)

When current flows in the coil ✓1 the magnetic field due to the ✓1 current interracts with the magnetic field due to the bar magnets. by Flemmings left hand rule, side AB experiences an upward force and CD a downward force, causing the coil to rotate. ✓1

iv) State **three** ways in which the power of this motor can be increased (3 marks)

-Using a stronger magnet/Pushing magnet closer

-Increasing the number of turns in the coil

-Winding the coil around a soft-iron core

-Increasing the current/strength of current/using more cells

v) State the purpose of the rheostat in the setup (1 mark)

Vary/regulate/control the current in the coil. ✓1

-Multiply the number of coils and commutator segments

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