Name: MARKING SCHEME .....Class:..... Adm.No. .....

232/2
PHYSICS
THEORY
Paper 2
JUNE – JULY 2021
Time: 2 hours

Candidate's Signature: .....

MOKASA I JOINT EXAMINATION
JUNE - JULY 2021
Kenya Certificate of Secondary Education
PHYSICS
PAPER 2

Instructions to Candidates

- *Write your name, admission number, class and signature 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 spaces provided.*
- *Mathematical tables and electronic calculator may be used.*
- *You may use the following constants where necessary:-*
- *This paper consists of 11 printed pages.*
- *Candidates should answer the questions in English.*

$g = 10\ N/kg$, or m/s^2
$e = 1.6 \times 10^{-19} C$
$c = 3.0 \times 10^{8}\ m/s$

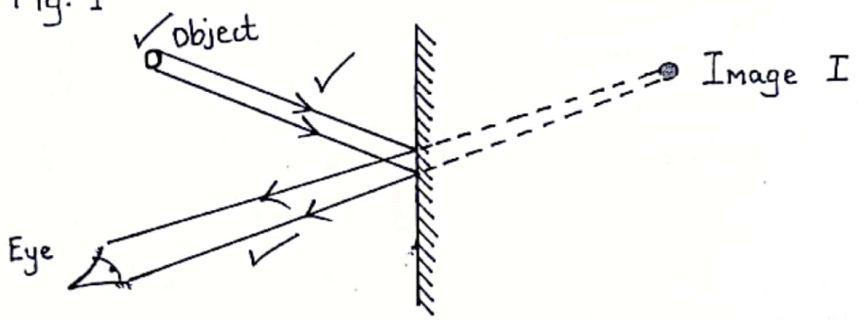
FOR EXAMINER'S USE ONLY

SECTION	QUESTIONS	MAXIMUM SCORE	CANDIDATE'S SCORE
A	1 – 07	25	
B	08	14	
	09	14	
	10	13	
	11	14	
	TOTAL SCORE	80	

SECTION A

1. a) Fig.1 below shows an image of an object reflected on a plane mirror. Using ray diagram, locate the position of the object. (3mks)

Fig. 1



b) A mirror is rotated through an angle of 15°, find the angle through which the reflected ray is rotated. (1mk)

$2 \times 15^\circ = 30^\circ$ ✓

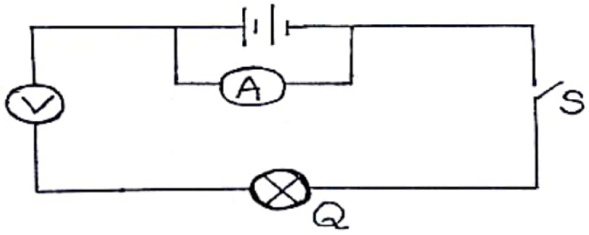
2. A strongly charged glass rod is brought close to a neutral electroscope. State and explain the observations made. (2mks)

Leaf rises / leaf diverges ✓

The rod repels negative charges/electrons at the leaf and metal plate ✓

3. **Fig.2** below shows a circuit made by a form 2 student.

Fig. 2



a) State and explain the observation made on component Q when switch S closed. (2mks)

The bulb will not light / component Q will not light ✓

The voltmeter is connected in series offering very high resistance to the flow of current. ✓

b) A current of 1A flows through a circuit for three minutes. Calculate the number of electrons that flows through a point in the circuit. (charge of an electron = 1.6×10^{-19}C) (3mks)

$Q = It = ne$

$ne = 1\times3\times60$

$(1.6\times10^{-19})n = 1\times3\times60$

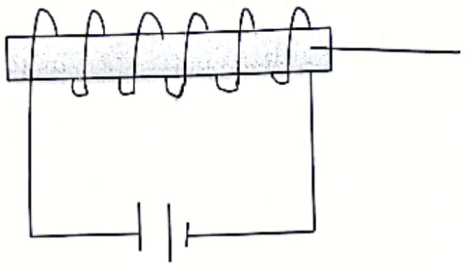
$1.6\times10^{-19}n = 180$

$n = \frac{180}{1.6\times10^{-19}}$

$n = 1.125\times10^{21}$ electrons ✓

4. **Fig. 3** below show a copper rod placed inside a solenoid.

Fig.3



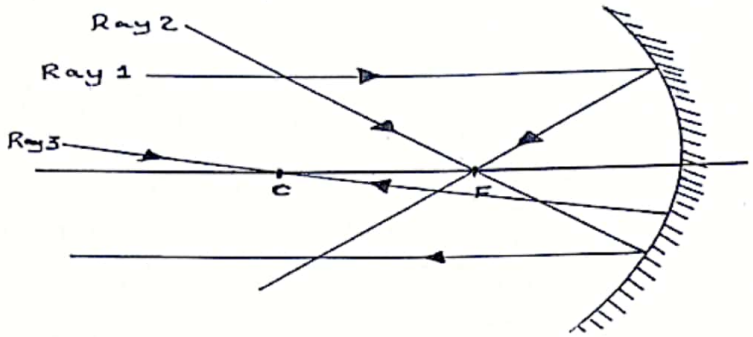
a) State and explain the observation made when the rod is removed after sometime and dipped into a container with iron fillings (2mks)

The copper rod did not attract the iron fillings ✓ Copper is a non-magnetic ✓ material hence was not magnetised by electrical method.

b) Using domain theory, distinguish between magnetic and non-magnetic materials (1mk)

Magnetic materials have dipoles aligned in a particular direction during magnetisation while in non-magnetic materials, dipoles cannot be aligned in the same direction during magnetisation. ✓

5. **Fig.4** below shows rays incident on a curved mirror.



State the rules for drawing the ray 1, ray 2 and ray 3.

Ray1 A Ray parallel to the principal axis and reflected through the principal Focus. ✓

Ray 2 A ray through the principal Focus and reflected parallel to the principal axis. ✓

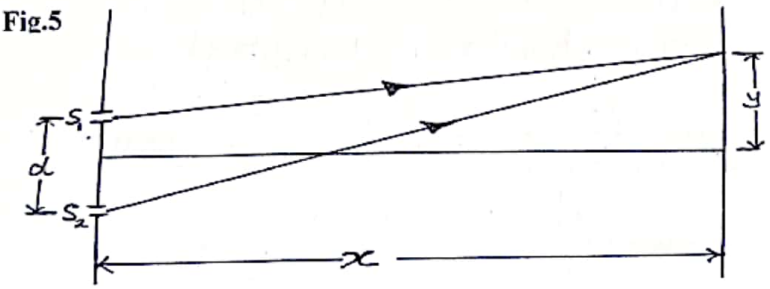
Ray3 A ray through the centre of curvature and reflected along the same path. ✓

6. a) Define interference as used the waves. (1mk)

Occur when two similar waves of same wavelength, same frequency are superimposed / meet / merge while travelling through same medium. ✓

b) The fig.5 below shows two ways of monochromatic light incident on two adjacent slit S_1, and S_2

Fig.5



State what is observed on the screen when:

i) The distance **x** is increased. (1mk)

Fringe Separation is decreased. ✓

ii) The slit separation **d** is reduced. (1mk)

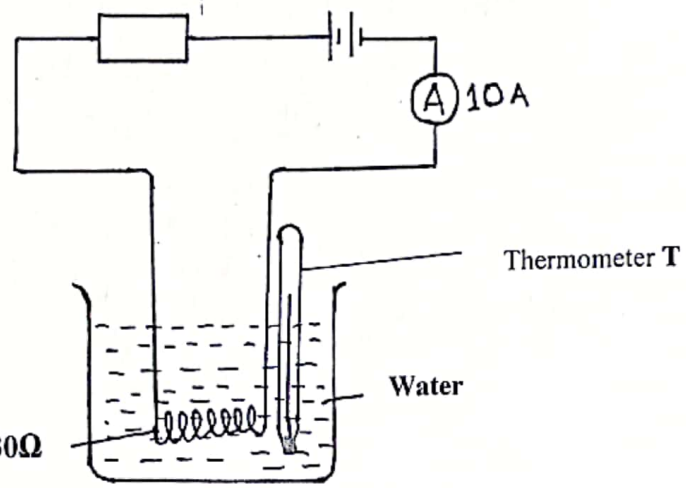
Fringe separation is increased ✓

iii) The white light is used. (1mk)

A pattern of different colours is produced. ✓

7. The **fig.6** below shows a circuit with a heating element **L** of resistance 30Ω immersed in a container of water.

Fig.6



a) If current in the circuit is 10A and the switch is on for 2minutes. Calculate the heat energy absorbed by the water in kilojoules. (*ignore heat gained by the container*) (3mks)

$E = I^2Rt$ ✓

$= (10)^2 \times 30 \times 2 \times 60$ ✓

$= 360\,000\ J$ ✓

b) State the adjustment made on the element **L** so that high temperature is recorded by the thermometer **T** in the same duration of time. (1mks)

Using a wire of smaller diameter ✓

SECTION B (55MKS)

8. a) A gun was fired at a point 150m from a vertical wall while listening to an echo. The echo coincides with the sound from the gun at each time the gun is fired. After 20 successive shots, time recorded was 18.5seconds. Determine:

i) Time taken for one echo to be heard (2mks)

$T = \frac{18.5}{20}$ ✓ | $T = 0.925\ sec$ ✓

ii) Speed of sound in air (3mks)

$S = \frac{2D}{t}$ ✓

$S = \frac{2 \times 150}{0.925}$ ✓ | $S = 324.3\ m/s$ ✓

iii) What difference would you expect if the gun was short on a colder day (1mks)

Speed of Sound would be lower due to lower temperature of air ✓

c) Sound is classified as a longitudinal mechanical wave, explain why sound is classified as

i) A longitudinal waves (1mk)

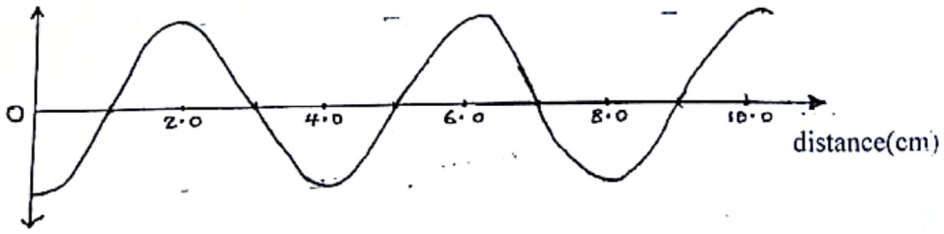
Transmitted in series of alternating compressions and rarefactions or direction of propagation is parallel to disturbance ✓

ii) A mechanical waves (1mk)

Require material medium for its transmission ✓

d) Fig.7 below shows a progressive waves of frequency 10Hz

Fig.7



Determine the speed of the wave (3mks)

$V = f\lambda$ ✓

$= 0.04 \times 10$ ✓

$V = 0.4\ m/s$ ✓

e) Calculate the wavelength of the KBC FM radio wave transmitted at a frequency of 95.6MHz. *($v = 3.0 \times 10^8 m/s$)* (3mks)

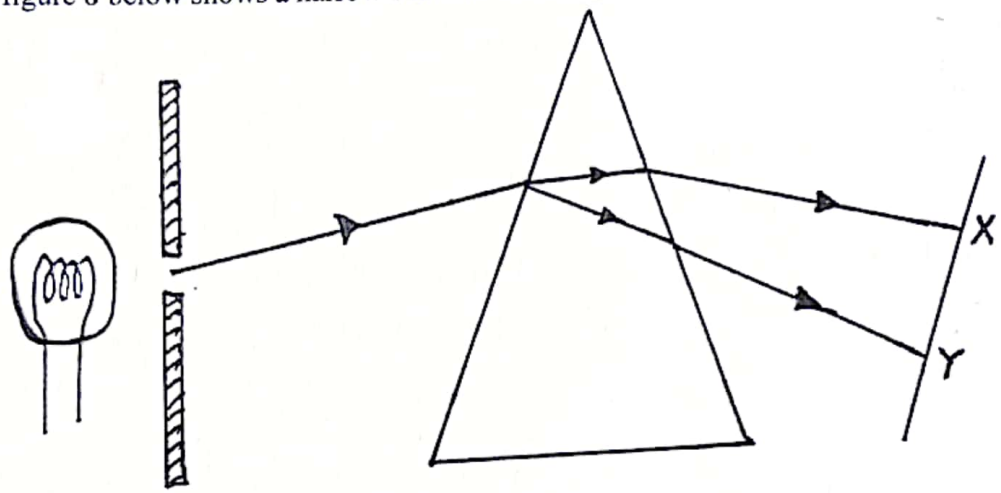
$\lambda = \frac{v}{f}$ ✓

$\lambda = \frac{3.0 \times 10^8}{95.6 \times 10^6}$ ✓

$\lambda = 3.138 m$ ✓

9. a) The figure 8 below shows a narrow beam of white light passed onto a glass Prism.

Fig.8



i) What is the name of the phenomenon represented in the diagram? (1mk)

Dispersion of White light ✓

ii. Name the colour at **X** and **Y**. (2mk)

X: Red ✓

Y: Violet ✓

iii. Give a reason for your answer in part (ii) above. (2mks)

Red has the lowest frequency/longest wavelength hence least deviation while Violet has high frequency/short wavelength hence more deviated. ✓ ✓

iv. What is the purpose of the slit? (1mk)

Act as a point source of light. ✓

b. Figure 9 below shows the path of ray of yellow light through a glass prism. The speed of yellow light in the prism is 1.8×10^8 m/s.

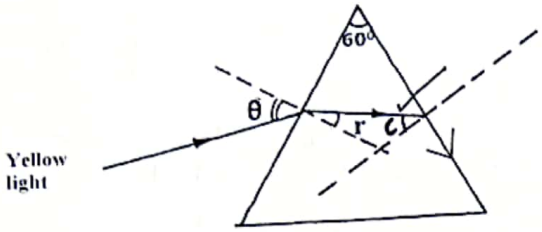


fig.9

i. Determine the refractive index of the prism material (Speed of light in vacuum, C $= 3.0 \times 10^8$ m/s) (3mks)

$n = \frac{\text{speed in air}}{\text{speed in material}} = \frac{3.0 \times 10^8}{1.8 \times 10^8}$ ✓ ✓

$n = 1.6667$ ✓

ii. Given that $r = 31.2^0$, determine the angle θ. (3mks)

$n = \frac{\sin i}{\sin r}$ ✓

$1.6667 = \frac{\sin \theta}{\sin 31.2^\circ}$

$\sin\theta = 1.6667 \sin 31.2^\circ$ ✓

$\theta = \sin^{-1} 0.8634$

$\theta = 59.7^\circ$ ✓

iii. Show on the same diagram, the critical angle c and hence determine its value. (3mks)

See c on the diagram ✓

$\sin c = \frac{1}{n}$ ✓

$= \frac{1}{1.6667}$ ✓

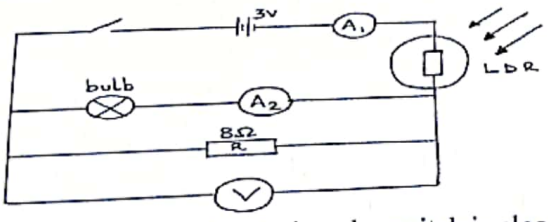
$\sin c = 0.5999$

$c = \sin^{-1} 0.5999$

$c = 36.86^\circ$ ✓

10. Fig.10 below shows a circuit in which a bulb. A resister R, a voltmeter V, a light dependent resistor(LDR) and ammeters A1 and A2 of negligible resistors are connected

Fig. 10



R has a resistance of 8Ω when the switch is closed with no source of light. Ammeter A2 reads 0.12A while the voltmeter reads 2.4V

a) Determine;

i) The current passing through R (2mk)

$I = \frac{V}{R}$ ✓

$= \frac{2.4}{8}$

$I = 0.3A$ ✓

ii) The resistance of the bulb (2mks)

$R = \frac{V}{I}$

$= \frac{2.4}{0.12}$ ✓

$= 20\Omega$ ✓

b) Light is now shone onto the Light Dependent resistor (LDR)

i) State how this will affect the reading of ammeter A1 (1mk)

The current/Ammeter reading increases ✓

ii) Explain your answer in b) (i) above (2mks)

More light on LDR lowers the resistance of the LDR hence more current flows/Ammeter reading increases ✓

c) If the LDR has a resistance of 10Ω at room temperature, determine:

i) The total resistance in the circuit at room temperature (2mks)

Resistance (Bulb + R) in parallel

$= \frac{8 \times 20}{8+20}$

$= 5.7143\Omega$ ✓

Total resistance $= 5.7143 + 10$

$= 15.7143\Omega$ ✓

ii) The voltage across the ~~ammeter A1~~ LDR (3mks)

Total current $= 3/15.7143$

$= 0.19009$

$V = IR$ ✓

$V = 0.19009 \times 10$

$= 1.9009V$ ✓

iii) Name one application of light dependent resistor(LDR) (1mk)

- light operated switching circuit
- Street lighting
- Burglar alarms

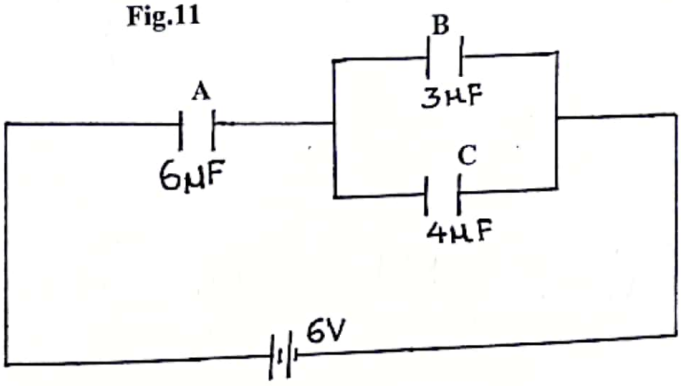
} Any one ✓

11. a) Explain how negatively charged electroscope gets discharged when the cap is touched with a finger. (1mks)

The body provide conducting path and electrons flow to the earth. ✓

b) Fig.11 below show a capacitor A,B,C connected as shown with a battery of e.m.f 6V

Fig.11



Determine: (3mks)

i) Effective capacitance of the circuit

Capacitor in parallel
$C_1 + C_2$
$3\mu F + 4\mu F$
$= 7\mu F$ ✓

Series $\Rightarrow \frac{1}{6} + \frac{1}{7}$ ✓
$C_T = \frac{6 \times 7}{6+7}$
$= 3.231\mu F$ ✓

~~Parallel =~~

(3mks)

ii) The potential difference across 6μF capacitor

$Q = CV$
$= 3.231 \times 10^{-6} \times 6$ ✓
$= 1.9386 \times 10^{-5} C$

$V = \frac{Q}{C}$
$= \frac{1.9386C}{6.0 \times 10^{-6}}$ ✓
$= 3.231V$ ✓

(2mks)

iii) Charge stored in 4μF capacitor

$Q = CV$
~~$= 4 \times 2$~~
voltage across 4μF
$= (6 - 3.2307)V$
$= 2.76923V$ ✓

$Q = 4 \times 10^{-6} \times 2.76923$ ✓
$= 11.07692\mu C$
or
$= 1.107692 \times 10^{-5} C$ ✓

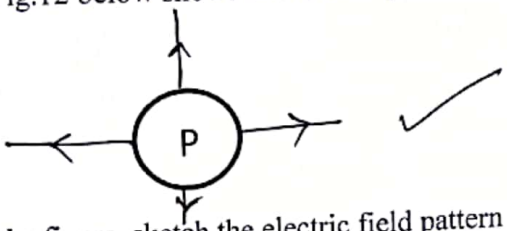
iv) Energy stored in a 4μF capacitor (2mks)

$E = \frac{1}{2}CV^2$

$= \frac{1}{2} \times (4 \times 10^{-6}) \times (2.76923)^2$ ✓

$= 1.5337 \times 10^{-5}$ J ✓

c) Fig.12 below shows an isolated positive point charge P



On the figure, sketch the electric field pattern around the charge (1mks)

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