NAME ..... INDEX NO.....

SCHOOL ..... CANDIATES SIGNATURE _____

MARKING SCHEME

232/2

PHYSICS

PAPER 2

(THEORY)

TIME: 2 HOURS

Kenya Certificate of Secondary Education (K.C.S.E.)

SUKELLEMO JOINT EXAMINATION

TERM 2 2021

232/2
Physics
Paper 2

INSTRUCTIONS TO CANDIDATES

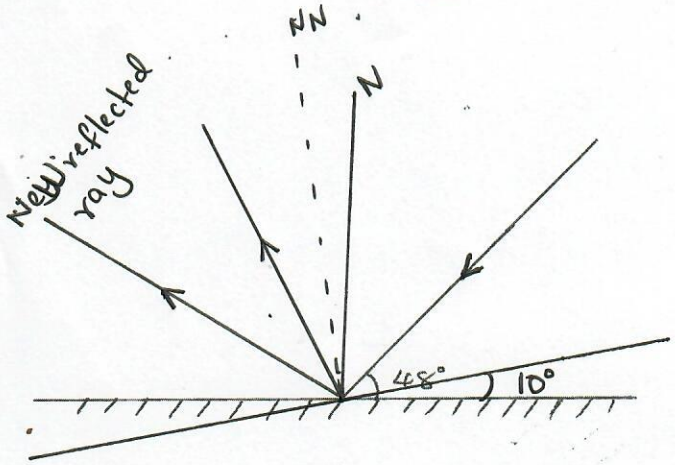
- Write your name and index number in the spaces provided
- This paper consist of two section **A** and **B**
- Answer all questions in section **A** and **B** in the spaces provided
- All working must be clearly shown in the spaces provided in this booklet.
- Non- Programmable silent electronic calculators and **KNEC** mathematical tables may be used

SECTION	QUESTION	MAXIMUM SCORE	CANDITATES SCORE
A	1-13	25	
B	14	12	
	15	11	
	16	11	
	17	09	
	18	12	
TOTAL SCORE		80	

This paper consists of 12 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions is missing

SECTION A (25 MARKS)

1. The figure 1 below shows a ray of light incident on a mirror. Determine the angle of reflection when the mirror is rotated 10^0 anticlockwise (2marks)



- Angles must be correctly indicated to score ✓ 1mk
- Angle of reflection = 52° ✓1

2. a) Explain why the E.M.F of a dry cell drops if a large current is drawn for a short time. (1mark)

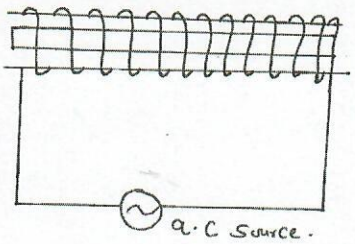
Large current drawn causes depolarisation since manganese (IV) oxide is slow depolariser.

b) Give one advantage of using dry cells over an accumulator (1mark)

Dry cells have lower internal resistance ✓1
Dry cells are more portable ✓1
The electrolyte used cannot spill ✓1
(Any 1)

3. A student set up the apparatus shown below in figure 2 to magnetize an iron bar

State one mistake in the set up and explain how it affects the experiment (2marks)



a.c source ✓1

It disorients the dipoles in the domains hence demagnetizes/do not allow the iron bar to get magnetised ✓1

4. Name one radiation of the electromagnetic spectrum which has the highest wavelength than the visible light (1mark)

X-rays, Gamma rays, Infra-red ✓1 (Any 1)

5. State two uses of optical fibre (2marks)

- Used in Communication.
- Used in medicine to view inner body organs

6. The activity of a radio activity source is initially 450 counts per second. After 72 hours, it reduces to 100 counts per second. If the background count is 50 counts per second, determine the half-life of the substance (3marks)

$N_0 = 450 - 50$
$= 400$
$N = N_0 \left(\frac{1}{2}\right)^{T/t}$

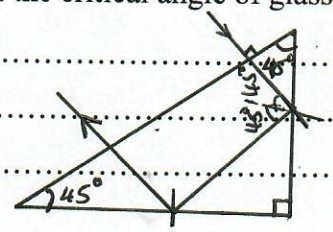
$100 = 400\left(\frac{1}{2}\right)^{72/t}$ ✓1
$\frac{1}{4} = \left(\frac{1}{2}\right)^{72/t}$

$\left(\frac{1}{2}\right)^2 = \left(\frac{1}{2}\right)^{72/t}$ ✓1
$2t = 72$
$t = 36$ hours ✓1

7. Give two ways of decreasing the capacitance of parallel plate capacitor (2marks)

- Reducing the area of overlap between the plates ✓1
- Increasing the distance of separation between the plates ✓1

8. Draw a ray diagram to show how a ray of light may be totally internally reflected two times in an isosceles right-angled prism (assume that the critical angle of glass is 42^0) (2marks)



Award 1mk for each internal reflection.

9. Define kilowatt- hour (1mark)

It is the electrical energy spent in 1 hour at the rate of 1000 joules per second (1000 W)

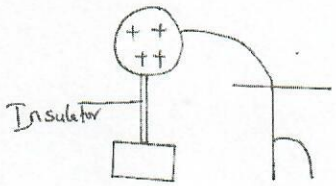
10. State two advantages of using circuit breakers in the consumer unit than using fuse wire (2marks)

- Circuit breakers do not require replacement
- They respond instantaneously.

11. A student observes her face in a concave mirror of focal length 100cm. If the mirror is 80cm away. State two characteristics of the image observed (2marks)

Image is virtual ✓1 (Any 2)
Erect ✓1
Magnified ✓1

12. A charged metal sphere is connected to an uncharged electroscope as shown in figure 3 below. State and explain the observations made (2marks)



The leaf diverges ✓1 negative charges from the electroscope flows to the sphere leaving positive charges on the electroscope thus there is divergence ✓1

13. Explain what happens to the depletion layer of a p-n junction diode when the diode is forward biased (2marks)

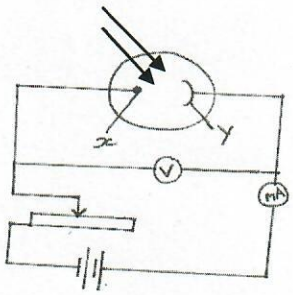
The thickness of the depletion layer reduces ✓1 since the electrons and holes are attracted to the opposite ends and the charges flow through the layer. ✓1

SECTION B (55 MARKS)

14. a) State one application of photoelectric effect (1mark)

Photoemissive Cells, Photovoltaic cells, Photoconductive Cells ✓1 (Any 1)

b) The figure 4 below shows an arrangement used to investigate photoelectric effect



i) Name the parts labelled X and Y (2marks)

X – Anode ✓1

Y – Cathode ✓1

ii) State two measurable quantities in this set up (2marks)

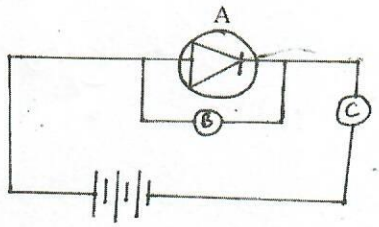
Potential difference ✓1

Current ✓1

iii) State and explain how the intensity of light affects the photo current (2marks)

Increase in intensity increases the number of electrons ✓1 ejected hence photocurrent increases. ✓1

c) The circuit shown in figure 5 below is used to investigate how current changes with voltage for component A



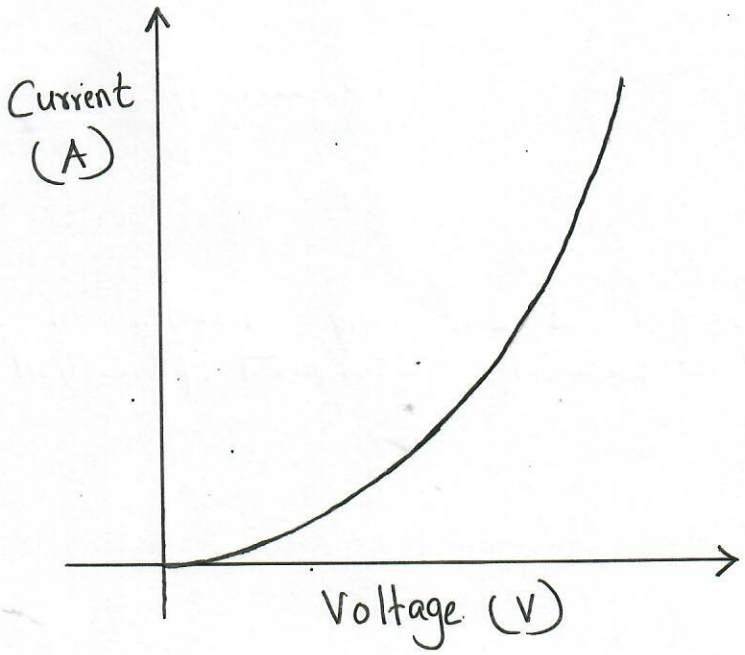
i) Name the components (3marks)

A P-n junction diode

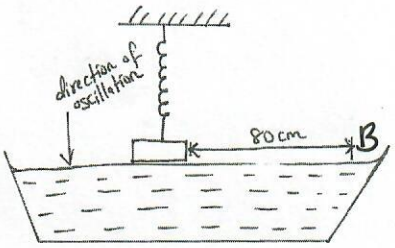
B voltmeter

C Ammeter /milliameter

ii) Sketch a graph of current (I) against voltage (V) to establish the characteristic of component A (2marks)



15. a) A student set up a mass attached to a spring such that when it oscillates it taps on the water surface in a wide shallow tank as in figure 6 below.



The student measures time for 20 oscillations and found that it takes 36 seconds.

Determine;

i) The periodic time of the mass (2marks)

$T = \frac{36}{20}$ ✓1 $= 1.8s$ ✓1

ii) The frequency of the waves produced on the water surface (2marks)

$f = \frac{1}{T} = \frac{1}{1.8}$ ✓1 $= 0.5556 Hz / 0.56 Hz$ ✓1

iii) The speed of the waves if the students counted four ripples between the mass and end B of the tank (3marks)

$3\lambda = 80cm$

$\lambda = \frac{80}{3}$ ✓1

$v = f\lambda$

$= 0.5556 \times \frac{80}{3}$ ✓1

$= 14.82 cm/s$ ✓1

b) An echo sounder of a ship received the reflected waves from a sea bed after 0.20 seconds

i) Determine the depth of the sea bed if the velocity of sound in the water is 1450 m/s (2marks)

$S = \frac{2d}{t} = 1450 = \frac{2d}{0.20}$ ✓1

$d = 145m$ ✓1

ii) When the ship above passes over a sunken reef, the echo sounder receives an echo after 0.16seconds. Determine the height of the sunken reef. (2marks)

$0.20 - 0.16 = 0.04s$

$1450 = \frac{2d}{0.04}$ ✓1

$d = 29m$ ✓1

Alternatively:

$d = \frac{st}{2}$

$= \frac{1450}{2} \times 0.16$

$= 116m$ ✓1

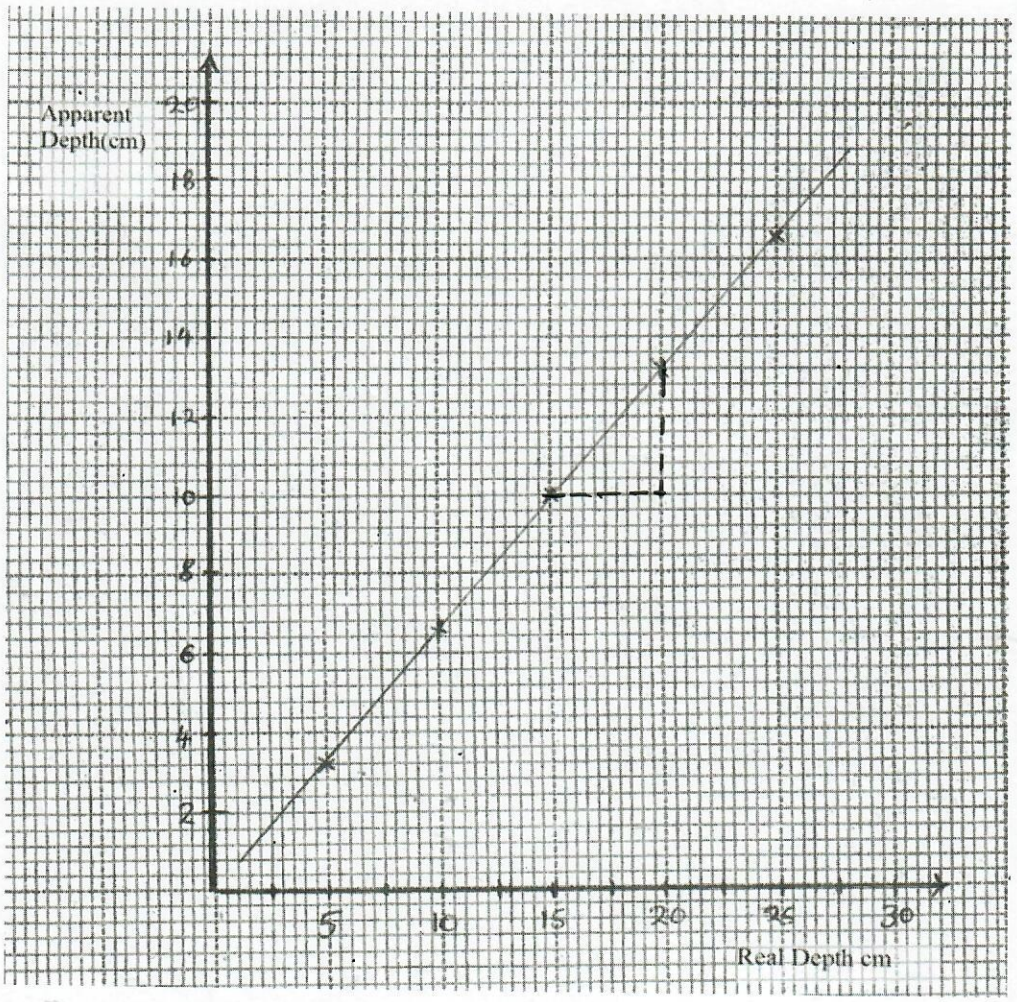
$145 - 116$

$= 29m$ ✓1

16. (a) Define the refractive index of a substance (1mark)

It is the ratio of the sine of the angle of incidence to the sine of the angle of refraction. ✓1

(b) In an experiment to determine the refractive index of a liquid the liquid was poured into a measuring cylinder. A pin was placed at the bottom of the cylinder and another pin was used to locate the apparent position of the first pin. The real depth and the apparent depth were measured for various volumes of the liquid. A graph shown below was obtained.



From the graph determine the refractive index of the liquid (3marks)

Slope of the graph/gradient $= \frac{1}{n}$ ✓1

gradient $= \frac{\text{Apparent}}{\text{Real depth}}$

$= \frac{13-10}{20-15} = \frac{3}{5} = 0.6$ ✓1

$\frac{1}{n} = 0.6$

$n = \frac{1}{0.6}$

$= 1.667$ ✓1

c) A vertical object is placed 20cm in front of a convex lens of a focal length 5cm. Determine

i) The image distance (3marks)

$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ ✓1 | $\frac{1}{5} = \frac{1}{20} + \frac{1}{v}$ ✓1 | $= \frac{4-1}{20} = \frac{3}{20}$

$\frac{1}{v} = \frac{1}{5} - \frac{1}{20}$ | $v = 6.67cm$ ✓1

ii) State two characteristics of the image (2marks)

It is real

diminished.

d) Give one similarity and one difference between human eye and a camera (2marks)

Similarity - The eye has a Crystalline Convex lens while the Camera has a convex lens.

Difference - Choroid layer of the eye is black while Camera box is Painted black inside. (Any 1)

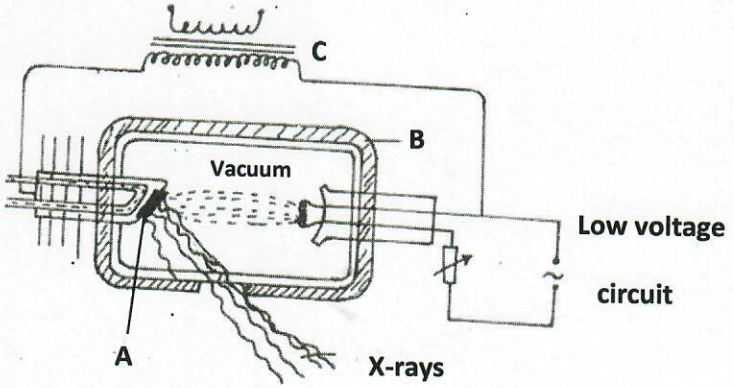
- ~~Focal~~ Focal length of the eye lens is variable while that of a Camera is fixed.

- Cameras have variable image distance while eye has a constant image distance

17a) Distinguish between hard and soft x-rays. (1 mark)

hard x-rays have very short wavelengths, high frequency and high Penetrating Power while soft x-rays have longer wavelengths, lower frequency and low Penetrating Power.

b) Figure 12 below shows an x-ray tube



i) Name the elements used in making the parts labeled **A** and **B**. (2marks)

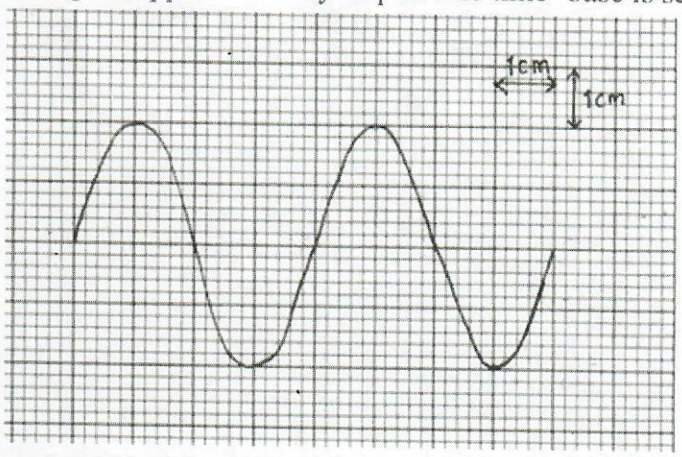
A Tungsten target ✓1

B Lead shield ✓1

ii) Explain the use of the part labeled **C**. (2marks)

It is a step-up transformer used to step up voltage ✓1 i.e the high accelerating voltage ✓1

(c) Figure 14 shows a waveform displayed on the cathode ray oscilloscope screen when an alternating voltage is applied to the y- input. The time- base is set at 1ms/cm and the y- gain at 10v/cm



Calculate

i) The amplitude of the ac input voltage. (2 marks)

1cm = 10v

2cm = (10X2) ✓1

= 20V ✓1

Alternatively

Input voltage = displacement X y-gain

= 2X10 ✓1

= 20V ✓1

ii) The frequency of the ac input voltage signal. (2 marks)

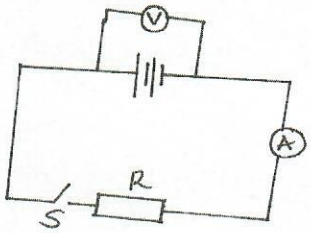
$f = \frac{1}{T} = \frac{1}{1\times10^{-3}\times4}$ ✓1

= 250 Hz ✓1

18. a) Explain the meaning of the term battery (1mark)

It is a Combination of the Cells/groups of Cells Connected in Series or Parallel in a Circuit ✓1

b) It was noted that for the circuit diagram below, when S was opened the voltmeter gave a reading of 12V but when it is closed, the voltmeter reading drops to 10V.



i) Give an explanation for the difference on the voltmeter reading when S is open and when it is closed (2marks)

Difference is due to the loss of voltage ✓1 that is Caused by the internal resistance of the cells. ✓1

ii) If the ammeter gave a reading of 0.8A when S is closed, determine the value of R (3marks)

$V = IR$ ✓1

$10 = 0.8 \times R$ ✓1

$R = \frac{10}{0.8} = 12.5\Omega$ ✓1

iii) What is the internal resistance of the accumulator (2marks)

$2 = 0.8 \times r$ ✓1

$r = 2.5\Omega$ ✓1

Alternative

$E = V + Ir$

$Ir = E - V$

$0.8r = 2$ ✓1

$r = 2.5\Omega$ ✓1

c) Calculate the cost of using the following appliances in one month of 30 days, if the company rates is Ksh. 10.50 per unit (4marks)

A 200W water heater for 2hours per day

A 75W bulb for 10 hours per day

A 1500W electric iron for 1hour per day

Water heater $= \frac{200 \times 2}{1000} = \frac{400}{1000} \times 30$

$= 12$ kwh

bulb $= \frac{75}{1000} \times 10 \times 30 = 22.5$ kwh

Electric iron $= \frac{1500}{1000} \times 1 \times 30$

$= 45$ kwh

Total units $= 12 + 22.5 + 45$ ✓1

$= 79.5$ kwh ✓1

Total cost

$= 79.5 \times 10.50$ ✓1

$=$ Ksh. 834.75 ✓1

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