# Nyaraya Cluster Examination

**Kenya Certificate of Secondary Education**

**Form Four Mock Evaluation Programme**

NAME …………………………...………………...ADM NO………...STREAM……….

INDEX NO. ……….……….…SCHOOL………………........SIGNATURE………………

232/2

PHYSICS

PAPER 2

JULY 2023

TIME: 2 HOURS.

**PHYSICS**

**PAPER 2**

INSTRUCTIONS TO CANDIDATES

* Write your name, admission number, index number, name of school and signature in the spaces provided above.
* This paper consists of two sections A and B
* Answer all questions in section A and B in the spaces provided
* All working must be shown in the spaces provided.
* Mathematical tables and non-programmable electronic calculators may be used

**FOR OFFICIAL USE**

|  |  |  |  |
| --- | --- | --- | --- |
| SECTION | QUESTION | MAX. SCORE | CANDIDATE’S SCORE |
| A | 1-14 | 25 |  |
| B | 15 | 14 |  |
| 16 | 12 |  |
| 17 | 13 |  |
| 19 | 09 |  |
| 18 | 07 |  |
| TOTAL SCORE | 80 |  |

***This paper consists of 14 printed pages. Candidates should check the question paper to ascertain that all pages are printed as indicated and that no pages are missing.***

**SECTION A (25 MARKS)**

**Answer all the questions in the spaces provided**

1. **Figure 1** shows a ray of light incident on a plane mirror. The mirror is rotated **anticlockwise** through an angle of **100**.



Figure

 Determine the angle between the incident ray and the new reflected ray. (2marks)

2. **Figures 2 (a)** and **2 (b)** show two circuits with identical cells and bulbs.



(a)

(b)

Figure

State, with a reason, in which circuit the bulbs will be brighter. (2 marks)

3. **Figure 3** shows a wooden rod placed between two bar magnets.



Figure

Sketch the resulting magnetic pattern in the arrangement in **figure 3**. (1 mark)

4.**Figure 4** shows a circuit used by a student to investigate the effect of current on a coil.



Figure

(i) The coil feels warmer after closing the switch. Explain. (1 mark)

 (ii) The ammeter and voltmeter reading in **figure 4** is 1.5A and 4.1V respectively. Calculate the energy developed in 1 minute. (2 marks)

5.Give the difference between Infra-red and Ultraviolet radiation in terms of their production

 (1 mark)

6. On the grid provided below, show the display on the CRO screen of an **AC** signal peak voltage 400V and a frequency 50Hz when the time base is on. (Y-gain at 200V/div, time base at 5ms/div) (2 marks)



7. Figure 5 shows a virtual image I formed by a convex mirror.



Figure

Draw a ray diagram to locate the object. (3 marks)

8. The figure 6 shows a cathode ray beam entering a magnetic field, perpendicular to the plane of the paper. Complete the diagram to show the path of the beam in the field. (1 mark)

**Cathode rays**

Figure 6

9. Uranium 235 was bombarded with a neutron and fission took place in the following manner.

$$\genfrac{}{}{0pt}{}{235}{92}U + \genfrac{}{}{0pt}{}{1}{0}n→\genfrac{}{}{0pt}{}{90}{38}Rn + \genfrac{}{}{0pt}{}{a}{b}X + 10 \genfrac{}{}{0pt}{}{1}{0}n$$

Determine the values of **a** and **b**  (2 marks)

10. **Figure 7** shows bulbs connected in a household.


 (i) Identify any mistake in the circuit. (1 mark)

Figure 7

 (ii) Draw the correct connection of the circuit. (1 mark)

11. The resistance of a metal conductor increases with increase in temperature. Explain

 (2 marks)

12. State what is meant by the term doping as used in diode. (1 mark)

13.Two students stand 300m from a wall. One bangs two pieces of wood together and at the same time, the other starts a stop watch. They hear an echo after 1.8 seconds. Determine the speed of sound in air.

 (2 marks)

14. Define wavelength as used in longitudinal wave. (1 mark)

**SECTION B (55 MARKS)**

***Answer all the questions in this section in the spaces provided.***

15 a) **Figure 8** shows the parts and circuit of a modern X-ray tube.



Figure 8

1. State and explain how the following changes affect the nature of X-rays produced:
2. increasing the potential across MN. (2 marks)
3. increasing the filament current. (2 marks)
4. The material of Q should withstand a lot of heat. State the source of heat in the tube. (1 mark)
5. State the property of lead which makes it suitable as a shield. (1 mark)
6. Give a reason for the shape of part R. (1 mark)

b) A 5μF and a 3μF capacitor are connected in series with a 6V battery.

1. Sketch and label the circuit diagram showing the arrangement. (2 marks)
2. Determine;
3. The potential difference across the 5μF. (4 marks)
4. The charge stored in the circuit. (1 mark)
5. State one use of a charged gold leaf electroscope. (1 mark)

16.(a) State what is meant by the term mutual induction. (1 mark)

 (b) **Figure 9** shows two coils wound on a laminated soft iron core. It is connected to a 300V mains supply.



Figure 9

1. Identify the type of the transformer in **figure 9**. (1 mark)
2. The transformer in **figure 9** loses 20% of the input energy into heat per second. Determine the maximum current measured on the ammeter, if the input current is 2A.

 (3 marks)

 (iii) Explain how energy losses in the transformer in **figure 9** are minimized by having:

 (I) a soft iron core. (1 mark)

 (II) a laminated core. (1 mark)

1. Figure 10 shows two identical copper coils X and Y placed close to each other. Coil X is connected to a DC power supply while coil Y is connected to a galvanometer.



Figure 10

1. Explain what is observed on the galvanometer when the switch is closed. (4mks)
2. State what is observed on the galvanometer when the switch is opened. (1mk)

17. (a) Apart from light moving from an optically denser medium to less dense medium, state the other condition for total internal reflection. (1 mark)

(b) **Figure 11** below shows the path of light through a transparent material placed in air.

Figure 11

Determine the refractive index of the transparent material. (3marks)

c) (i) Figure 12 shows an object O placed in front of an objective lens Lo whose focal length fo is less than fe the focal length of the eye piece lens Le. Complete using ray construction how the arrangement would produce the final image. (3 marks)



Figure 12

1. An object is placed 25cm from the objective lens of focal length 15cm.On the other side of the objective lens another converging lens of focal length 30cm is placed as the eye piece lens. The distance between the two lenses is 52.5cm. Determine;
2. The position of the first image. (3 marks)
3. The position of the final image from the eye piece lens. (3 marks)

18. State **two** factors which determine the speed of photoelectrons emitted from a metal surface. (2 marks)

 c) **Figure 13** shows a graph of the square of the maximum velocity (Vmax)2 of the emitted photoelectrons against the frequency (f) of the radiation causing photoelectric effect on a clean zinc plate.



Figure 13

(i) Determine the slope of the graph. (2 marks)

 The equation of the line is V2 = $\frac{2h}{m} $*f* – $\frac{2h}{m} $*f*o where m = 9.11 x 10-31 kg

(ii) From the graph determine the:

(I) minimum frequency of the radiation that will cause emission of electrons from the zinc surface. (1 mark)

 (II) Planck’s constant. (2 marks)

 (III) minimum amount of energy required to just emit electrons from the zinc surface. (2 marks)

19. Figure 14 shows a set up for observing interference of waves from two sources S1 and S2. The points C and D represent positions of the constructive and destructive interference respectively as observed on the screen.



Figure 14

1. If the observation was made in a ripple tank, describe:

 (i) How the two sets of coherent waves were produced. (2 marks)

 (ii) How the constructive and destructive interferences are identified. (1 mark)

1. Explain how the constructive interference C and destructive interference D patterns are produced. (2 marks)
2. Draw:
3. The line joining all points where waves S1 and S2 have travelled equal distance. Label it A.

 (1 mark)

 (ii) The line joining all points where waves from S2 have travelled one wavelength further than the waves from S1. Label it B. (1 mark)

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