

**PHYSICS** **Paper 2**



**(THEORY)**

**MAY 2022**

2 hours

**Name …………………………………………………………. Index No. ……………………….**

**Adm. No. ……………… Candidate’s Signature…………………**

**2022 TRIAL 1 MAY INTERNAL EXAMINATION**

*Kenya Certificate of Secondary Education (KCSE)*

**Instructions to candidates**

* This paper consists of two sections A and B.
* Answer **all** the questions in the two sections in the spaces provided after each question
* All working must be clearly shown.
* Electronic calculators, mathematical tables may be used.
* All numerical answers should be expressed in the decimal notations.
* This paper consists of 14 printed pages and check to ensure all the pages are there.

|  |  |  |  |
| --- | --- | --- | --- |
| **SECTION** | **QUESTION** | **MAX MARKS** | **CANDIDATE’S SCORE** |
| **A** | **1 – 11** | **25** |  |
| **B** | **12** | **10** |  |
| **13** | **13** |  |
| **14** | **11** |  |
| **15** | **11** |  |
| **16** | **10** |  |
| **TOTAL** | | **80** |  |

**SECTION A (25 MARKS)**

**Answer all the questions in the space provided**

1. **Figure 1** below shows a ray of light reflected from a mirror.

300

Figure 1

Complete the ray diagram and find the new angle of reflection after it is rotated 100 anticlockwise with the incident ray fixed. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Three electric bulbs are connected in series with a battery of two dry cells and a switch. At first the bulbs light brightly.
2. State a reason why they gradually light dim. (2marks)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..

1. The switch is put off for sometimes. Explain why the bulbs again shine brightly. (1mark)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….

1. A positively charged rod is brought near the cap of a lightly charged electroscope. The leaf first collapses and as the rod comes nearer, the leaf diverges.
2. What is the charge on the electroscope? (1mark)

……………………………………………………………………………………………………………………………….

1. Explain the behavior of the leaf. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….…………………………………………………………………………………………………………………………………………………………………………………………….

1. Figure 2 below shows a bar magnet attracting steel pin as shown

N

S

X

Y

Steel pin

Figure 2

State and explain what would happen when a North pole of a bar magnet is brought near the tips of steel pin X and Y. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Determine the equivalent resistance between P and Q for the following resistors shown in Figure 3. (2marks)

30Ω

70Ω

19Ω

Figure 3

Q

P

……………………………………………………………………………………………………………………………

1. Figure 4 below shows a wave profile for a wave whose frequency is 5Hz.

t3

t5

t7

t9

t1

Time (s)

Displacement (cm)

1

-1

-2

Figure 4

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

Determine the value of t8. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. An electromagnetic radiation whose wavelength is greater than that of microwaves has a wavelength of 306.1224 m. Take speed of light in air, c = 3 x108 m/s.
2. Identify the radiation. (1mark)

……………………………………………………………………………………………………………………………….

1. Calculate its frequency. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Two heating coils A and B connected in parallel in a circuit produces power of 36W and 54W respectively. What is the ratio of their resistance?(2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. State **two** conditions necessary for total internal reflection to occur. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Define coherent source of a wave. (1mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Figure 5 below show a conductor carrying electric current place between two magnetic poles.

N

S

Figure 5

Complete the diagram by sketching the magnetic field and also show the direction of the force on the conductor. (3 marks)

**Section B (55 marks)**

**Answer ALL the questions in the spaces provided**

1. (a) State **one** factor that affects the force between two charged bodies. (1mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(b) To investigate charge distribution on metallic surfaces, electric charges were collected from different parts of the surfaces using a proof plane as shown in figure 6 below:

Proof Plane

Metallic conductor

Insulator

A

B

C

D

Fig. (i)

Fig. (ii)

Figure 6

The proof plane was then placed on the cap of a neutral electroscope.

1. State and explain the leave divergence of the electroscope as the proof plane is placed at various points round the spherical surface in figure (i) above. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. State with reason which part of the conductor in figure (ii) gave the greatest deflection of the electroscope. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(c) Figure 7 shows a 10µF capacitor being charged from a 12V battery by connecting the switch terminal on R. The switch is then connected to S to discharge the 4µF capacitor.

**4 μF**

**R**

**S**

**E = 12V**

**10 μF**

Figure 7

Determine the resultant potential difference between the two capacitors. (3marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. State two uses of capacitors. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. (a) State Faradays law of electromagnetic induction. (1mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(b) Figure 8 below shows a simplified circuit of a generator.

X

Y

N

S

Bulb

Figure 8

1. Identify parts X and Y. (2marks)

X: ..…………………………………….

Y: ………………………………………

1. State **two** ways of making the bulb light brighter. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(c) An a.c generator produces an e.m.f of 50.0V which is used to operate a circuit that requires a minimum of 250.0V. If the power of the generator is 200W, determine the:

(i) Current generated by the a.c source. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(ii) Current supplied to the circuit by the transformer assuming 100% efficiency. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(iii) Ratio of turns in the coils of the transformer, primary: secondary. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(d) Explain how power loses in a transformer are minimized. (2marks)

(i) Eddy currents

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(ii) Hysteresis losses

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. (a) A disc of a siren with 100 holes is rotated at constant speed making 0.5 revolutions per second. If air is blown towards the holes, calculate:
2. The frequency of the sound produced. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. The wavelength of the sound produced, if the velocity of sound is 340 m/s. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(b) A ship sends out an ultrasound whose echo is received after 5 seconds. If the wavelength of the ultrasound in water is 0.05 m and the frequency of the transmitter is 50 KHz, calculate the depth of the ocean. (3marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(c) A ray of light is incident at right angles to the face AB, of a right angled isosceles prism of refractive index 1.6 as shown in Figure 8 below.

A

B

B

Liquid

Liquid

Liquid

Figure 8

If the prism is surrounded by a liquid of refractive index 1.40, determine:

1. The angle of incidence on the face BC. (1mark)

…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(ii) The angle of refraction on the face BC. (3marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. (a) Distinguish between principal focus and focal length of a concave lens. (1mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Figure 9 below shows sketches of a window frame and its image formed on a screen by a convex lens.

600mm

480mm

160mm

200mm

Figure 9

1. State the nature of the image formed. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Calculate the linear magnification of the imaged formed. (2marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. The imaged of the frame was produced 500mm from the lens. Calculate the focal length of the lens. (3 marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. A student finds that at a distance of 25 cm, the words in a book looked blurred.
2. What eye defect does the student suffering from? (1mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. In which direction does he/she move the book to be able to see the words clearly from the distance? (1mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Which lens can be used to correct the eye defect? (1mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. (a) (i) Figure 10 shows a graph of 1/v against 1/u for a concave mirror. Use your graph to determine the focal length of the mirror. (2marks)

Figure 10

0.08

0.04

0

0.12

0

1/u cm-1

1/v cm-1

0.12

0.08

0.04

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(ii) Determine the image distance when the magnification is m = 2 for the concave mirror above. (3 marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(b) State **one** application of each of the following

(i) Convex mirror. (1mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(ii) Parabolic mirror. (1mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(c) A small object is placed 15 cm in front of a convex mirror of focal length 10 cm. Determine the position of the image. (3marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………