**NAME……..... INDEX NO…….....……**

**CANDIDATE'S SIGNATURE……...**

**DATE……..…….....**

**232/2**
**PHYSICS (THEORY)**
**PAPER 2**
**JULY/AUGUST 2011**
**TIME: 2 HRS.**

# NANDI EAST, NANDI SOUTH AND TINDIRET DISTRICTS JOINT EXAMINATION 2011

***Kenya Certificate of Secondary Education***
***PHYSICS PAPER 2 (THEORY)***
***TIME: 2 HRS.***

**INSTRUCTIONS TO CANDIDATES:**

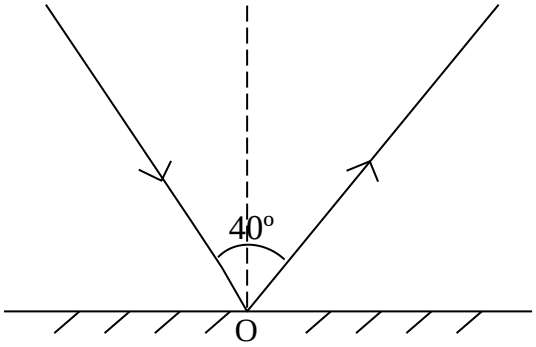
(a) Write your **Name** and **Index Number** in the spaces provided **above**.
(b) **Sign** and write the **date** of examination in the spaces provided **above**.
(c) This paper consists of **two** Sections; **A** and **B**.
Answer **ALL** the questions in sections **A** and **B** in the spaces provided.
(d) All workings must be clearly shown.
(e) Non-programmable silent electronic calculators and KNEC Mathematical tables and **may be** used.

**FOR EXAMINER'S USE ONLY:**

| Section | Question | Maximum Score | Candidate's Score |
|---|---|---|---|
| A | 1 - 13 | 25 | |
| B | 14 | 08 | |
| | 15 | 14 | |
| | 16 | 13 | |
| | 17 | 11 | |
| | 18 | 09 | |
| Total Score | | 80 | |

**SECTION A: (25 MARKS)**

1. A ray of light falls on a plane mirror such that the angle between the incident ray and the reflected ray is 40º as shown below.




The mirror is then turned such that the new angle between the incident and reflected rays is 60º about O. Calculate the angle of rotation. (The direction of the incident ray is maintained). (2mks)

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2. Explain how the conduction properties of a material can be investigated using a charged electroscope. (2mks)

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3. A magnet can lose its strength when hit. Explain this using the domain theory. (1mk)

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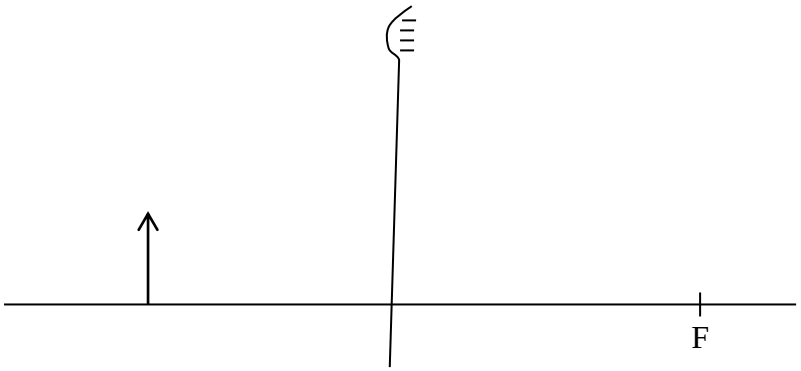
4. The figure below represents an object O placed in front of a convex mirror.




Locate its image. (2mks)

5. Victorine placed a small piece of paper on water in a ripple tank. She then produced 5 complete waves every second using a vibrator touching the water surface. The paper did not move with the waves.

(i) Explain the behaviour of the paper. (2mks)

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(ii) Calculate the period of the waves. (1mk)

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6. You are provided with the following:

- A diode.
- A cell.
- Connecting wires.
- Bulb.

Draw a labelled circuit with all the components provided that will make the bulb to light. (1mk)

7. Car accumulators can be used for long if well taken care of:

(i) Give **one** reason why they should not be placed on a cemented floor? (1mk)

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(ii) State any other way of increasing its life-span other than not placing on a cemented floor. (1mk)

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8. State **two** factors that affect photoelectric emission from a metal surface. (2mks)

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9. An electric iron box has an element whose resistance is 1500Ω. Calculate the power it dissipates when operating on the mains at 240V. (3mks)

10. Sound is easily diffracted compared to light. Explain. (1mk)

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11. State **one** factor that determine the hardness of X-rays produced in an X-ray tube. (1mk)

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12. A pinhole camera forms an image of height 8.0cm. The object is 2.5m tall and 2.4m away from the pinhole. Calculate the length of the camera. (3mks)

13. Determine the energy of an ultra violet radiation with a wavelength of $2 \times 10^{-8}$m. (Take C = $3 \times 10^{8}$ m/s And h = $6.63 \times 10^{-34}$JS). (3mks)

14. (a) The following is a nuclear reaction which results in the loss of beta particles.

$$^{210}_{81}X \xrightarrow{3\ \text{Beta decay}} {}^{A}_{84}Y \xrightarrow{\alpha\ \text{decay}} {}^{B}_{82}Z$$

(i) Determine the values of A and B.

A _____ B _____ (2mks)

(ii) State the source of energy released. (1mk)

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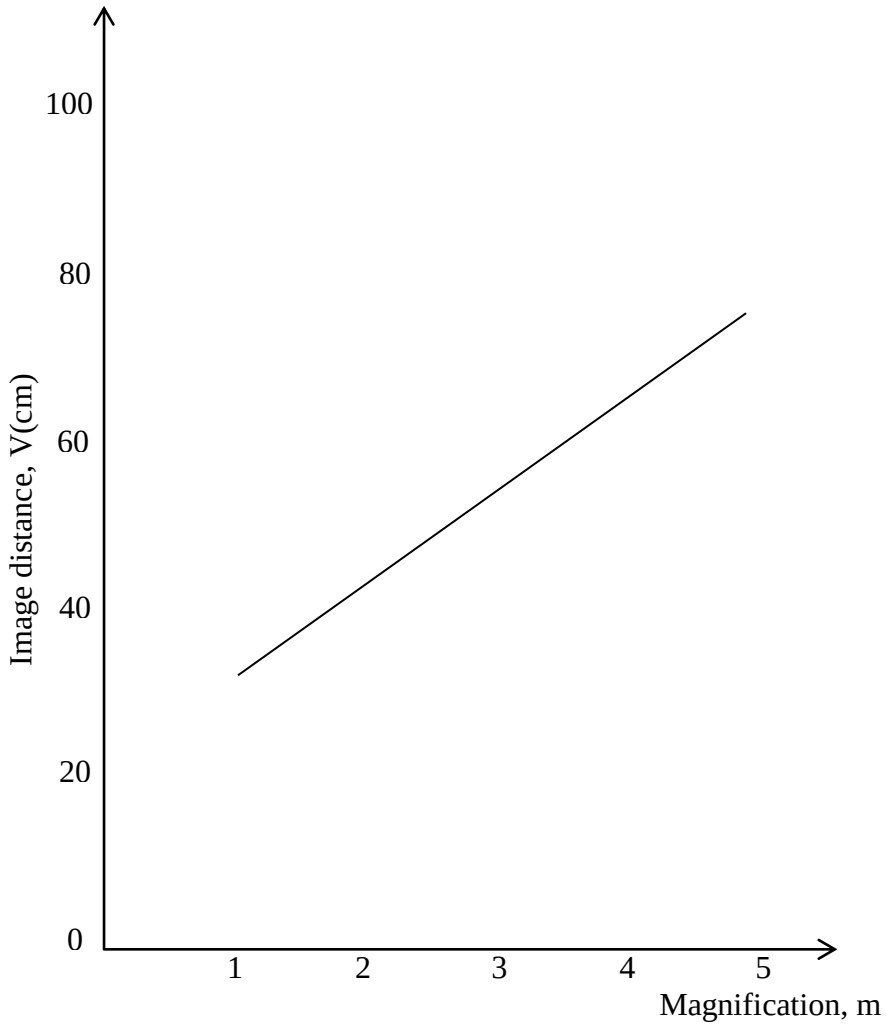
(b) A tube current of 200mA flows in an X-ray tube operating at 80KV. Determine

(i) the number of electrons hitting the target per second. (Take charge of an electron = $1.6 \times 10^{-19}$C). (3mks)

(ii) If only 0.4% of the electron energy is converted to X-rays, calculate the heat generated per second. (3mks)

15. (a) The graph in figure shows the relationship between image distance and magnification of a convex lens. Use the information on the graph to answer the questions that follow.




Determine:

(i) the equation relating the two quantities. Make the image distance, V the subject. (2mks)

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(ii) the object distance when m = 1. (2mks)

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(iii) the focal length of the lens. (3mks)

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(b) An object placed 10cm from a concave lens produces an image 18cm away from the object. Calculate

(i) the magnification of the image. (3mks)

(ii) the focal length of the lens. (3mks)

(c) State **one** similarity between a human eye and a lens camera. (1mk)

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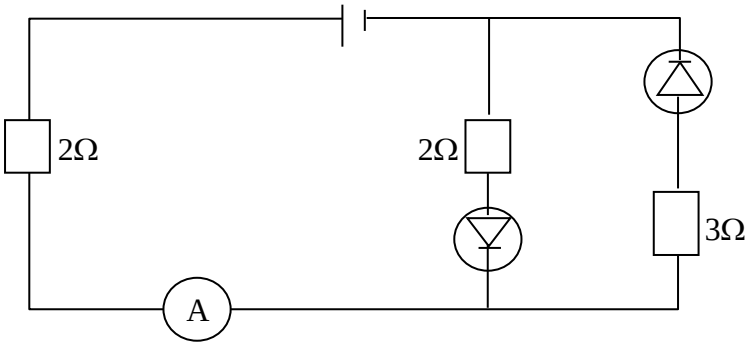
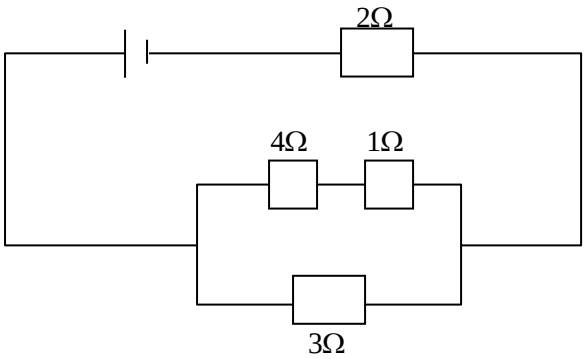
16. (a) The conductivity of a metal decreases with increase in temperature but that of an intrinsic semiconductor increases. Explain. (2mks)

(b) Study the circuit drawn in the figure below.




Calculate the ammeter reading given that the cell has an e.m.f of 2.0V and an internal resistance of 0.5Ω. (3mks)

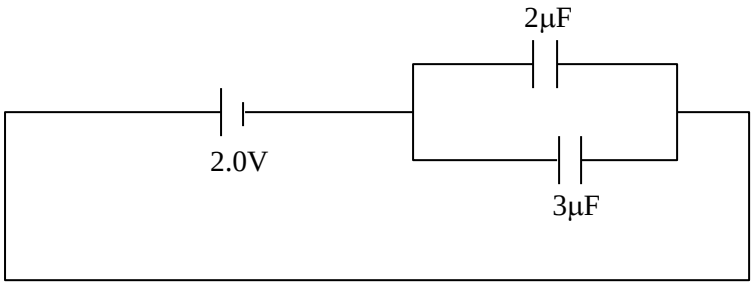
(c) A circuit set-up as shown in figure below makes a current of 1A to flow through the 4Ω resistor. Calculate




(i) the current through the 3Ω resistor. (3mks)

(ii) the e.m.f of the cell given that it has negligible internal resistance. (2mks)

(d) The figure below shows an arrangement of capacitors in a circuit.

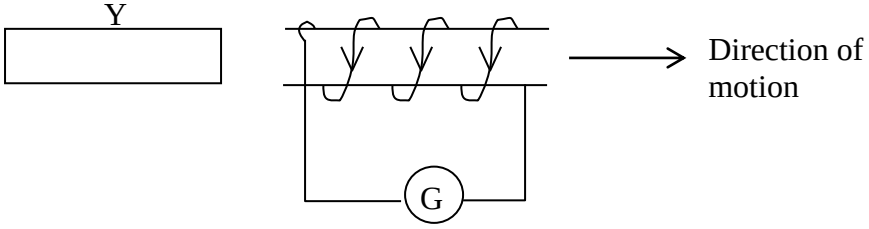



Calculate the total energy stored in the capacitors. (3mks)

17. (a) State Lenz's law of electromagnetic induction. (1mk)

(b) Give **one** structural feature in a transformer design which helps in achieving high efficiency. (1mk)

(c) A coil X is moved quickly away from the end of stationary magnet Y and current flows as shown.



Show the polarity of Y. (1mk)

(d) Eddy currents causes energy losses in transformers. Explain what is meant by eddy currents and how they are minimized. (2mks)

(e) A step-down transformer in which the primary and secondary windings are perfectly coupled is connected to 240V source. If the turns ratio is 1:5 and the secondary coil is connected to an ammeter via a 100Ω reactor.
Calculate:

(i) the output voltage. (2mks)

(ii) the output current. (2mks)

(iii) the power output. (2mks)

18. (a) Explain the effect on frequency of light as it moves from air to diamond prism. (1mk)

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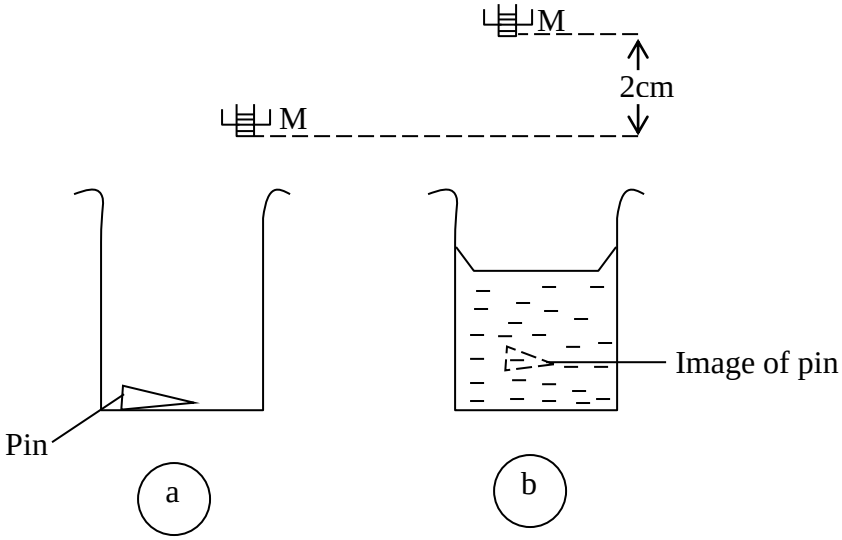
(b) A traveling microscope (M) is used to focus a pin placed at the bottom of an empty beaker as shown below.




When water of refractive index $^4/_3$ is poured into the beaker, the microscope has to be raised through 2.0cm to focus the image of the pin as in (b). Calculate the height of water poured into the beaker. (3mks)

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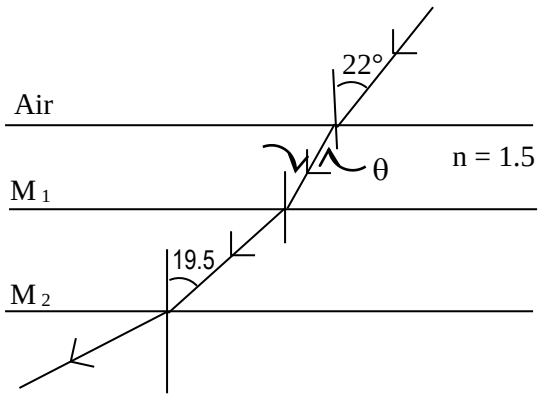
(c) A ray of infra-red light travels from air through multiple rays of transparent medium $M_1$, $M_2$ and $M_3$ whose boundaries are parallel as shown below.



Calculate:

(i) the angle θ. (2mks)

(ii) the refractive index of $M_2$ (2mks)

(iii) Speed of light in $M_1$ (speed of light in air = $3.0 \times 10^8$ m/s). (1mk)