

510/2  
PHYSICS  
Paper 2  
Nov, 2023  
1 Hours



**END OF YEAR EXAMINATIONS**  
**Uganda Advanced Certificate of Education**  
**S.5 PHYSICS**  
**Paper 2**  
**1 Hours**

**INSTRUCTIONS:**

- Attempt all the questions in this paper.
- Do **not** use a pencil **except** for drawings. Any work done in pencil will **not** be marked.
- Silent non-programmable calculators may be used.
- Where necessary, assume;
  - Acceleration due to gravity  $g$   $= 9.81ms^{-2}$ .
  - Electronic charge  $e$   $= 1.6 \times 10^{-19}C$ .
  - Electron mass  $= 9.11 \times 10^{-31}kg$ .
  - Density of air  $= 1.25kgm^{-3}$ .
  - Plank's constant  $h$   $= 6.6 \times 10^{-34}Js$ .
  - Avogadro's number  $N_A$   $= 6.02 \times 10^{23}mol^{-1}$ .
  - Density of water  $= 1000kgm^{-3}$ .
  - Specific heat capacity of water  $= 4200Jkg^{-1}K^{-1}$ .
  - Speed of light in air  $= 300ms^{-1}$ .
  - Speed of light in vacuum  $c$   $= 3.0 \times 10^8ms^{-1}$ .
  - Permeability of free space  $\mu_0$   $= 4.0\pi \times 10^{-7}Hm^{-1}$ .
  - Permittivity of free space  $\epsilon_0$   $= 8.85 \times 10^{-12}Fm^{-1}$ .
  - The electron volt  $eV$   $= 1.6 \times 10^{-19}J$ .
  - The constant  $\frac{1}{4\pi\epsilon_0}$   $= 9.0 \times 10^9F^{-1}m$ .

1. (a) (i) State the laws of reflection of light. (02 marks)  
 (ii) Light is reflected successively, once in each of the two mirrors inclined at an angle  $\beta$  to each other. Find in, terms of  $\beta$ , the deviation produced by the reflection. (04 marks)
  - (b) Describe how a sextant can be used to determine the angle of elevation of the sun. (05 marks)
  - (c) (i) Draw a ray diagram to show how a plane mirror forms an image of a real object placed in front of it. (02 marks)  
 (ii) Prove that the image formed is as far behind the mirror as the object is in front. (03 marks)  
 (iii) State two other properties of the image in c(i) above. (01 mark)
  - (d) A man 2m tall whose eye level is 1.84m above the ground looks at his image in a vertical mirror. Find the minimum vertical length of the mirror if the man is to be able to see the all of himself through the mirror. (03 marks)
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2. (a) (i) Define the term **electric current** and state its S.I units. (02 marks)  
 (ii) State four sources of electric current. (02 marks)  
 (iii) A current  $I$  flows through a conductor of length  $l$  and cross section area  $A$  containing  $n$  free electrons per unit volume. If the charge on each electron is  $e$ , derive the expression for the drift velocity  $v$  of the electrons. (04 marks)
  - (b) Explain the effect of cross section area on the resistance of a conductor. (03 marks)
  - (c) (i) State **Ohm's law** (01 marks)  
 (ii) Describe an experiment to verify Ohm's law. (05 marks)
  - (d) A wire of diameter 14mm and length 50cm has a resistivity of  $1.0 \times 10^{-7} \Omega m$  at a given temperature. Determine its resistance at this temperature. (03 marks)

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