Physics III **031** 18/11/2015 8.30am – 11.30am

Rwanda Education Board

ADVANCED LEVEL NATIONAL EXAMINATIONS, 2015

SUBJECT: PHYSICS

PAPER III: PRACTICAL

COMBINATIONS: PHYSICS –CHEMISTRY- MATHEMATICS (PCM)

PHYSICS –CHEMISTRY- BIOLOGY (PCB)

MATHEMATICS- PHYSICS-GEOGRAPHY (MPG)

MATHEMATICS-PHYSICS- COMPUTER SCIENCE (MPC)

PHYSICS-ECONOMICS – MATHEMATICS (PEM)

DURATION: 1HOUR 30 MINUTES

INSTRUCTIONS TO CANDIDATES:

1. Do not open this question paper until you are told to do so.
2. This paper consists of **one** compulsory question. **(40 marks)**
3. You may use non-programmable calculator and mathematical set where appropriate.
4. All answers should be written in the answer booklet provided.
5. **Avoid writing your identification** (school, index number, telephone number, names...) **on one white sheet of paper provided.**

   Insert and **attach** the sheet of paper used into the answer booklet and submit both to avoid being treated as a cheat.
6. **The diagram drawn on one white sheet of paper will be marked**.
7. Use only blue pen and pencil.

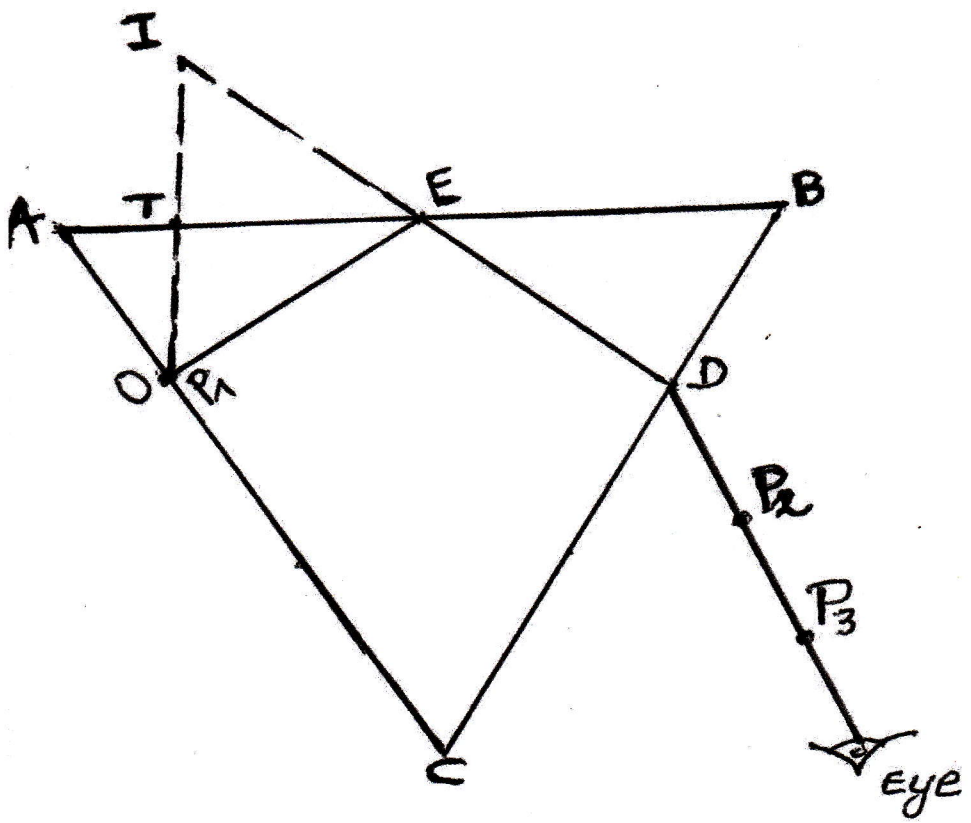
ANSWER ALL QUESTIONS (40 MARKS)

In this experiment you will determine the critical angle of the equilateral triangular glass prism provided.

Apparatus required: **1** equilateral triangular glass prism, **3** optical pins, **4** drawing pins, **1** plane soft board, **1** plane white sheet of paper A4, **1** pencil with rubber, and **1** ruler

(a) Fix a plane white sheet of paper on a soft board using 4 drawing pins provided.

(b) Place the equilateral triangular glass prism in the middle of the white sheet of paper pinned on the soft board, using a pencil, trace its outline ABC as shown below.



(c) Stick an optical pin P_1 at O, a distance d=1.0 cm from A.

(d) View the bright image of the optical pin P_1 from the side BC of the equilateral triangular glass prism. With your eye in this position, fix optical

pins P_2 and P_3 such that they are in line with the image of the optical pin P_1 at O.

(e) Remove the prism and optical pins.

(f) Draw a line passing through two points P_2 and P_3 to meet the line BC at D.

(g) Draw a perpendicular line to AB passing through point O to meet AB at T.

(h) Mark a point I on the perpendicular line drawn in (g) above such that OT=TI.

(i) Draw a straight line from I to D and label the point E where it intersects with side AB.

(j) Measure and record the distances OE and OI as x and y with 1 decimal place respectively.

(k) Put back the prism in its original position and repeat the procedures (c) to (j) for d=1.5, 2.0, 2.5, 3.0, 3.5 cm.

(l) Tabulate your results and include the values x^2 and y^2 with 2 decimal places each. **(17 marks)**

(m) Plot a graph of y^2 against x^2. **(14 marks)**

(n) Find the slope S of your graph. **(2 marks)**

(o) Compute the critical angle of refraction c of the glass prism from the expression $c=\cos^{-1}(\frac{1}{2}\sqrt{S})$. Is the obtained result reasonable? Comment. **(4 marks)**

(p) Submit the used white sheet of paper. **(3 marks)**