Physics III

031

21 Nov. 2012 8:30am – 11:30 am

REPUBLIC OF RWANDA

RWANDA EDUCATION BOARD (REB)

ADVANCED LEVEL NATIONAL EXAMINATIONS 2012

SUBJECT: PHYSICS

PAPER III: PRACTICAL

COMBINATIONS: **PHYSICS-CHEMISTRY-BIOLOGY (PCB)**

PHYSICS-ECONOMICS – MATHEMATICS (PEM)

PHYSICS- CHEMISTRY – MATHEMATICS (PCM)

MATHEMATICS – PHYSICS – COMPUTER SCIENCE (MPC)

MATHEMATICS – PHYSICS - GEOGRAPHY (MPG)

DURATION: 1hour 30 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists of **1** compulsory question. (**40marks)**

You are expected to use non- programmable calculators and student geometrical instruments (mathematical set) where appropriate.

All answers should be written in the answer booklet provided.

Answer all questions (40 marks)

You are going to determine the Young's modulus, Y of the metre rule provided.

Apparatus required:

2 metre rules

20 g of plasticine

1 piece of cotton thread 20 cm long

1 optical pin or a needle

1 retort stand with clamp and boss

2 wooden rectangular blocks

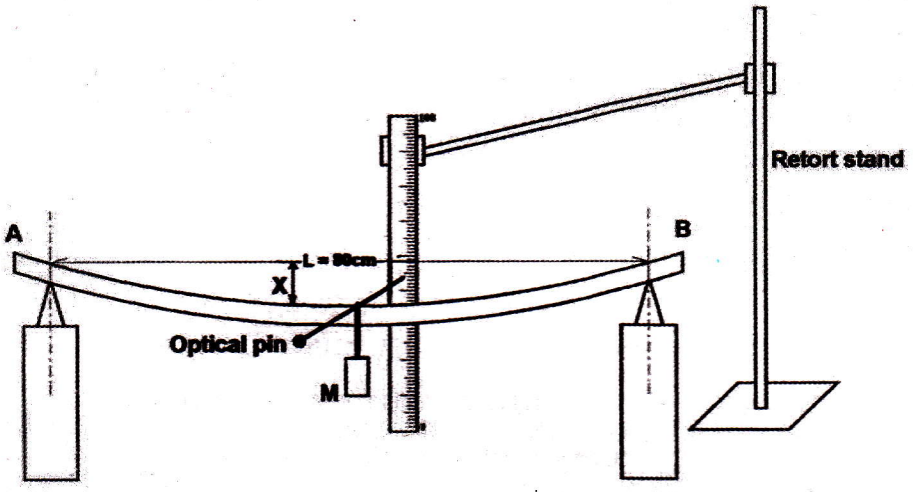
2 wooden knife edges

1 set of slotted masses with a hanger 500 g each set (1 hanger 50 g and 9 masses of 50 g each)

(a) Measure and record the breadth, p, in metres with 3 decimal places (3d.p) of the metre rule. **(2.5 marks)**

(b) Measure and record the thickness, q, in metres with 3 decimal places (3d.p) of the metre rule used in part (a). Its label is AB on the figure below. **(2.5 marks)**

(c) Set up the apparatus as shown in the figure below



(d) With mass M =0 g read and record the position, L_0 of the pointer (optical pin or a needle).The metre rule AB must be horizontal. **(1 mark)**

(e) Suspend a mass M=150 g at 50 cm from the end A or B of the metre rule. The pointer and the mass M are fixed on the metre rule respectively with the aid of plasticine (modelling clay) and a piece of thread.

(f) Read and record the position, L_x of the pointer. Remove the mass when you are recording.

(g) Repeat procedures (e) to (f) for values of M =200, 250, 300,350,400g.

(h) Record your results in a suitable table including values of M, L_x and values of the depression $X = L_0 - L_x$ **(12 marks)**

(i) Plot a graph of X (along the vertical axis) against M (along the horizontal axis). **(9 marks)**

(j) Determine the slope, S of the graph. **(2 marks)**

(k) Calculate Young's modulus, Y of the metre rule AB provided from the expression $Y = \frac{0.128}{S p q^3}$ **(2 marks)**

(l) Determine the unit of the constant 0.128 used in the above equation. **(2 marks)**

(m) A reasonable minimum absolute uncertainty might be one-half of the smallest division on the measuring instrument. Estimate the maximum absolute uncertainty and the relative uncertainty in the value for the depression $X = L_0 - L_x$. L_x is the position of the pointer for M=150g. **(7 marks)**