THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION,

NOVEMBER 1991

031/2

PHYSICS PAPER 2

ALTERNATIVE TO PRACTICAL

(For Both School and Private Candidates)

TIME: 2 Hours.

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1. This paper consists of sections A, B and C.
2. Answer ALL questions in each of the sections A, B and C in the answer book provided.
3. Wherever calculations are made, you are expected to show ALL the steps involved.
4. Each question carries a total of ten (10) marks.
5. Remember to write your Index Number in the answer book provided.
6. Write the number of each question you attempt.
7. Graph papers may be provided.

$$\pi = \frac{22}{7}$$

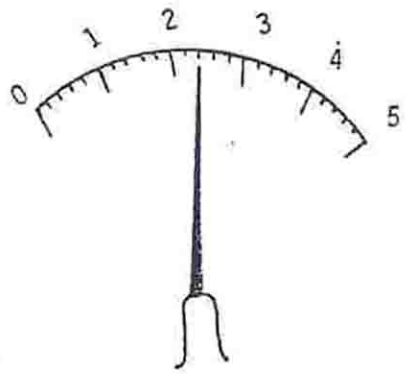
This paper consists of 7 printed pages.

SECTION A

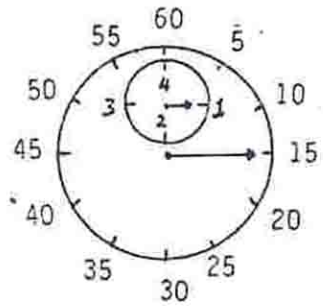
Answer ALL questions in this section.

1. (a) Explain briefly how you would determine the thickness of one sheet of paper from a book containing 100 pages excluding the covers.

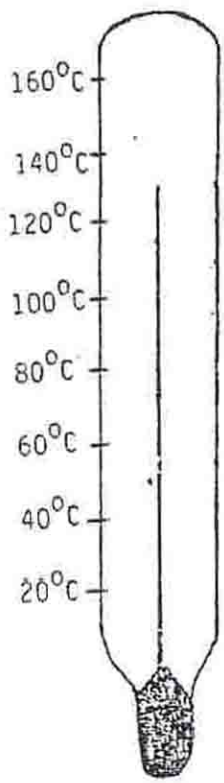
   (b) For each of the following diagrammatically represented apparatus, record the correct reading with its units.



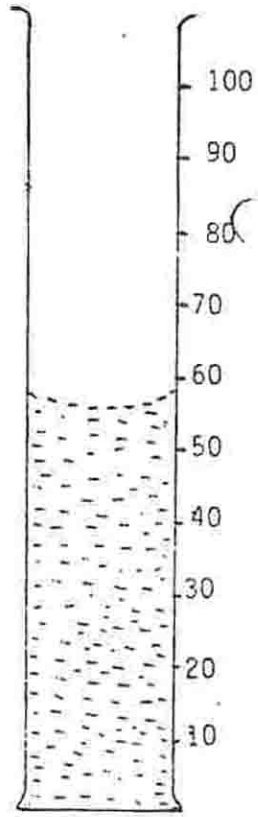
(i) Ammeter



(ii) Stop-watch

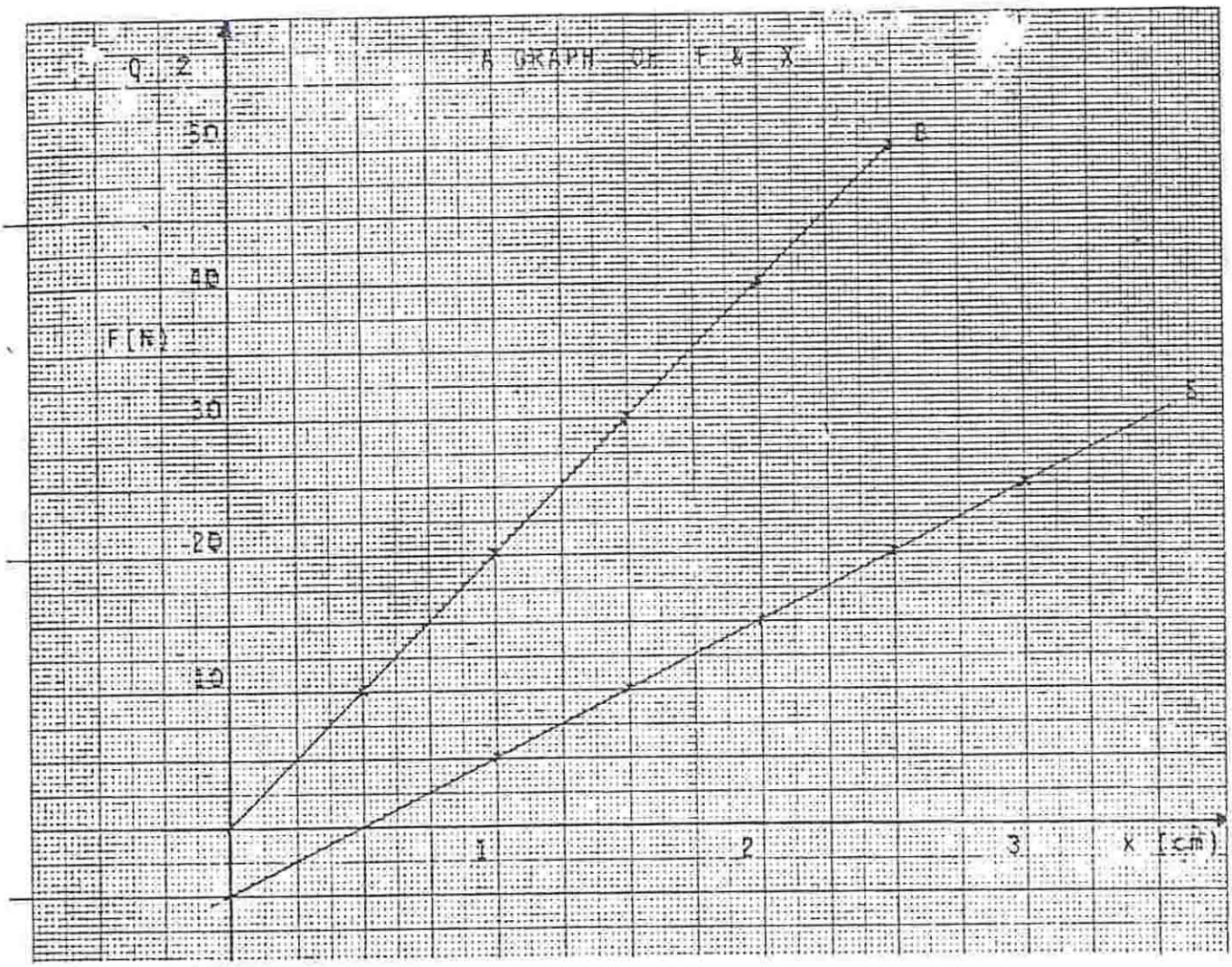


(iii) Thermometer



(iv) Measuring cylinder

2. An experiment was conducted to compare the elasticity of two metal wires B and S. The results were summarized in the form of graphs as illustrated below.



(a) Which graph is represented by the formula $F = Kx + C$, where K and C are constants. Give reasons.

(b) (i) Using the two graphs, determine the values of K_B and K_S, ie K for each wire.

(ii) What does K represent in each case?

(iii) Calculate the ratio $\frac{K_B}{K_S}$

(iv) What is the physical representation of this ratio?

(c) Determine the value of C.

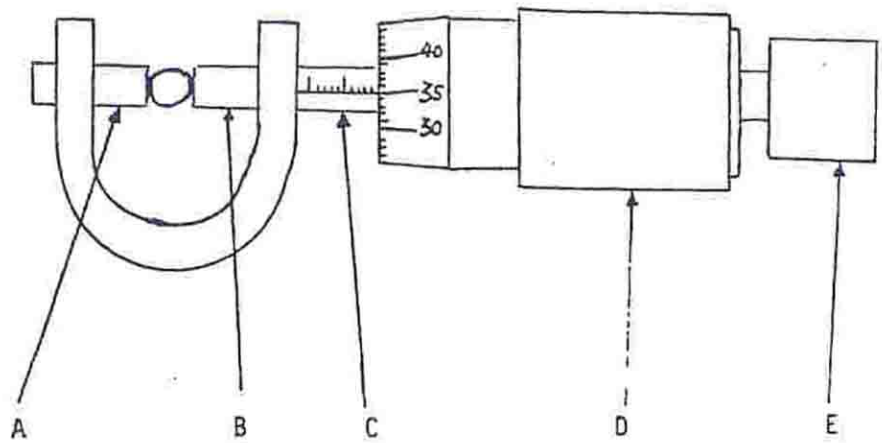
3. Several measurements were taken from the laboratory using the apparatus shown in diagram (M) below.

(a) Name the parts shown by letters A, B, C, D and E in diagram (M) below.

(b) Write the reading for each of the diagrams in (N) and (O) below.

(c) Write down the uses of the inside jaws and outside jaws of a vernier calliper.

Diagram M



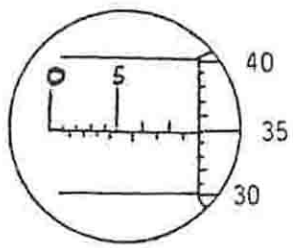


Diagram N

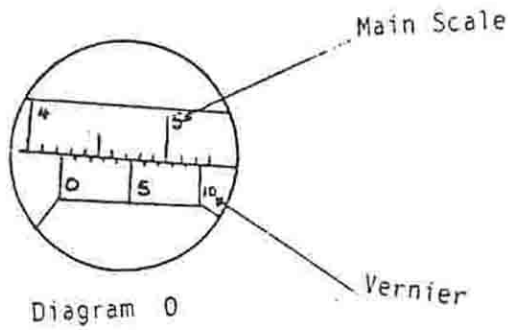


Diagram O

4. Given below is a data of an experiment carried out by Joseph.

Length, L, of Pendulum(m)	Time for 50 oscillations (S)	Periodic Time, T(S)	T^2 (S^2)
100	99		
80	90		
60	78		
40	65		
20	45		

(a) From the table above, obtain the corresponding values for the periodic time, T, and T^2.

(b) Using the table completed in (a) above, plot a graph of T^2 against L.

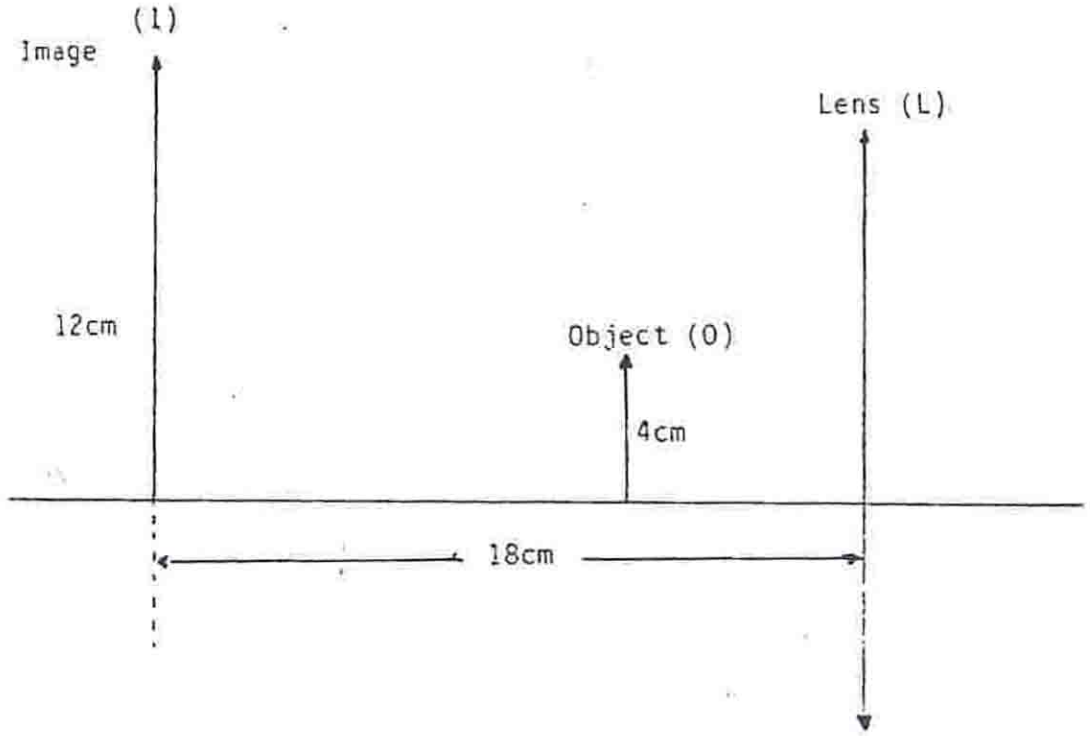
(c) If T and L are related by the equation $T^2 = \frac{4\pi^2 L}{g}$, obtain the value of g with the help of your graph.

(d) Write down the aim of the experiment done by Joseph.

SECTION B

Answer ALL questions in this section.

5. The diagram below shows an object O, 6cm from the converging lens when it is used as a magnifying glass.



(a) (i) Use a graph paper to complete the actual paths of rays using the measurements given in the figure above.

(ii) Measure the focal length

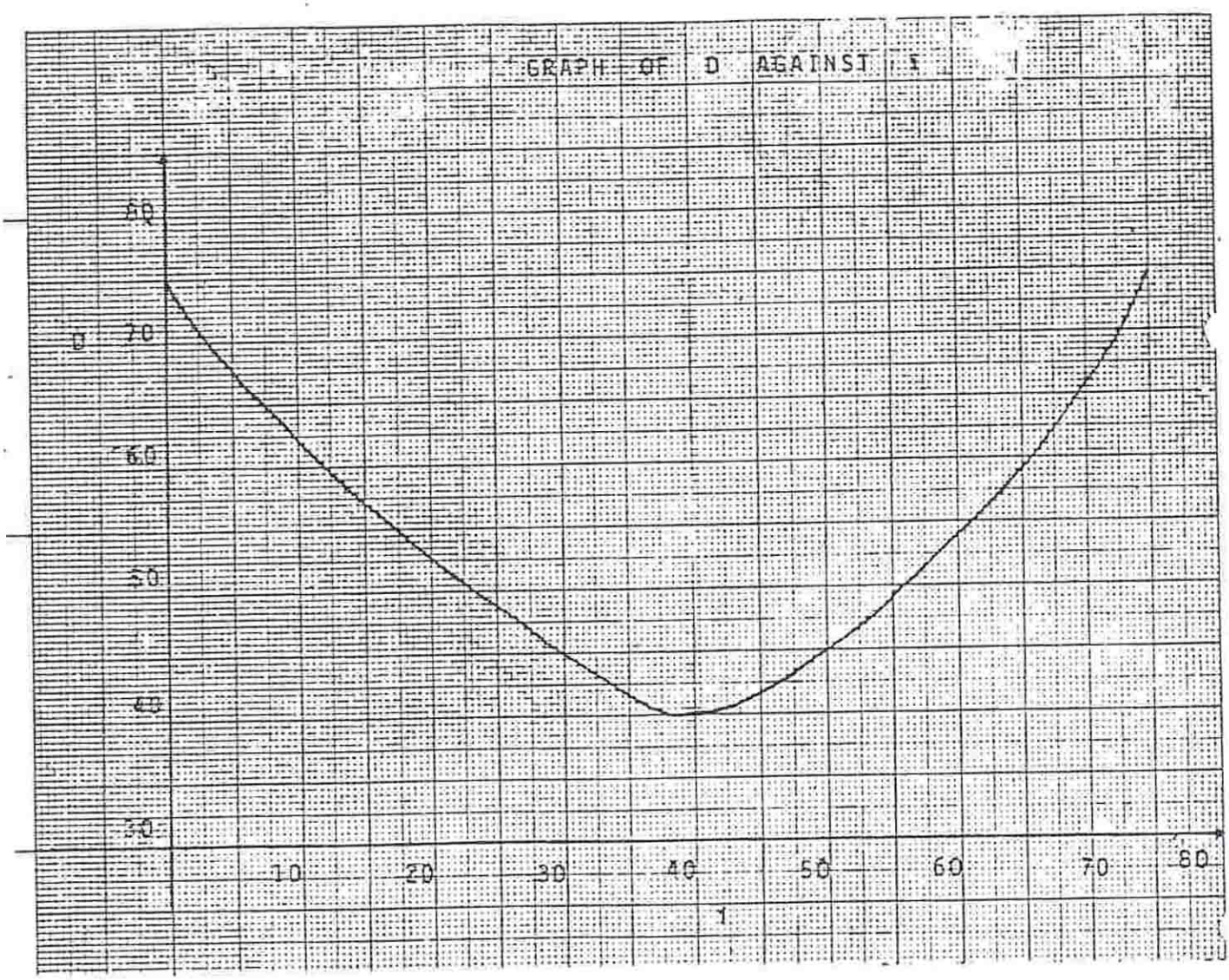
(iii) Is the image real or virtual?

(b) (i) Determine the magnification m

(ii) Compare V, the image distance given in the figure and the value obtained from calculations using $m = \frac{v}{f} + 1$.

6. An object, 2cm high was placed 60cm away from a concave lens of focal length of 12cm. Find graphically the image distance and the magnification.

7. The graph below shows plotted data for the angle of deviation, D, against the angle of incidence, i, obtained from an experiment carried out to determine the refractive index of glass using a ray of light from air to glass.



(a) Using the graph;

(i) Record the value of Dm (The minimum angle of deviation).

(ii) Fill in the table below the values of D (angles of deviation) and the corresponding values of i (angles of incidence)

Angle of deviation, D^{o},	75^{o}			50			54		
Angle of incidence, i^{o},			30			50			70

(b) Given that $n = \dfrac{\text{Sine}\left(\frac{A + Dm}{2}\right)}{\text{Sine}\left(\frac{A}{2}\right)}$, where $A = 64^{o}$.

Find the refractive index, n, of the glass

(c) State two sources of errors and two precautions to be taken when conducting an experiment to determine the refractive index of glass.

SECTION C

Answer ALL questions in this section.

8. An experiment to determine the e.m.f, E, and internal resistance, r, of a cell was carried out. Part of the results were as follows:-

Resistance, R (Ω)	4	6	8	10	12
Current, I (A)	0.250	0.200	0.150	0.125	0.100
$\frac{1}{\text{current}}$, $\frac{1}{I}$ (A^{-1})					

(a) (i) Copy and complete the table above.

(ii) Plot a graph of $\frac{1}{I}$ against R

(iii) Determine the slope, S and the intercept C on the $\frac{1}{I}$ axis.

(b) Determine the values of E and r given that

$$E = \frac{1}{\text{Slope}} \quad \text{and} \quad \frac{r}{E} = C.$$

9. An accumulator of e.m.f. 2v and negligible internal resistance is connected in series with two resistors of resistances 2Ω and 3Ω and an instrument N. Another instrument P is connected in parallel across the 3Ω resistance.

(a) Draw the circuit diagram

(b) Label the polarities of N and P

(c) Name the instruments N and P

(d) Calculate the readings of N and P.

10. In an experiment to determine the resistance R of a resistor, the following values for V, the potential difference across the resistor, and I, the current through the resistance, were obtained.

V(V)	1.94	3.60	5.95	9.10	11.8
I(A)	0.10	0.19	0.31	0.48	0.65

(a) (i) Use the data in the above table to plot the graph of V against I.

(ii) Determine the gradient, G, of the line. Mark the graph so as to show the values from which G has been calculated.

(b) Obtain a value for R given that G = R.