THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

NOVEMBER 1995

031/2

PHYSICS PAPER 2

ALTERNATIVE TO PRACTICAL

(For Both School and Private Candidates)

TIME: 3 Hours

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1. This paper consists of sections A, B and C.
2. Answer ALL questions in ALL sections in the answer book provided.
3. Wherever calculations are involved, show ALL steps involved.
4. Remember to write your Index Number on every page of your answer book provided.

This paper consists of 6 printed pages.

SECTION A

Answer ALL questions in this section.

1. (a) Record the spring scale figure 1.1 below.

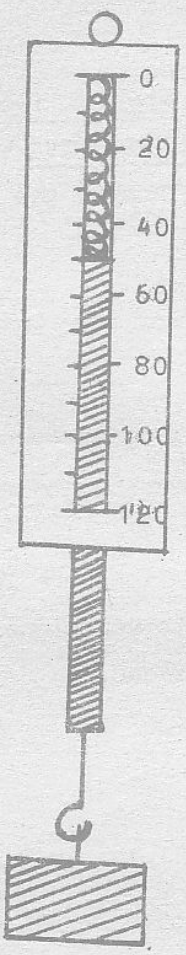


Fig.1.1

(b) Record the zero error, that is, ± correction for each of the watches in figures 1.2 and 1.3 below callibrated to measure in seconds.

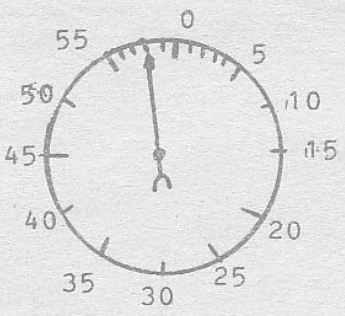


Fig. 1.2

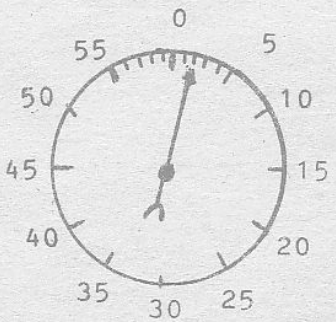


Fig.1.3

(c) If the watches of figures 1.2 and 1.3 above are used to measure 10.50 seconds, what time will each watch register?

2. The data below were recorded in a class experiment whose aim was to determine the specific heat capacity of a metal block by heat exchange.

Mass of metal block	=	300g
Mass of empty calorimeter	=	250g
Mass of calorimeter and water	=	750g
Initial temperature of water	=	$28^{o}C$
Final temperature of water	=	$36^{o}C$
Temperature of hot metal	=	$100^{o}C$
Specific capacity of copper	=	400J/kgK
Specific capacity of water	=	4200J/kg K

(a) Use the data given above to find the

(i) mass of water

(ii) heat gained by water

(iii) heat gained by calorimeter

(iv) heat lost by the metal block in terms of the specific heat capacity, C of the metal.

(b) Write the heat equation leading to the determination of the value of C.

(c) What is the specific heat capacity of the metal, that is, the value of C?

3. In a class experiment to investigate the Young's modulus of a wooden metre rule, the following data were recorded:

Load	0	50	100	150	200	250	300
Height above ground	89.0	87.4	85.1	82.7	80.3	78.1	76.1
Depression	2.0	2.4	4.6	7.1	9.3	11.5	13.7

Length = l = 80cm, breadth = b = 2.58, thickness = t = 0.54cm

(a) Fill in the blanks appearing in the above table.

(b) Plot a graph of depression against load

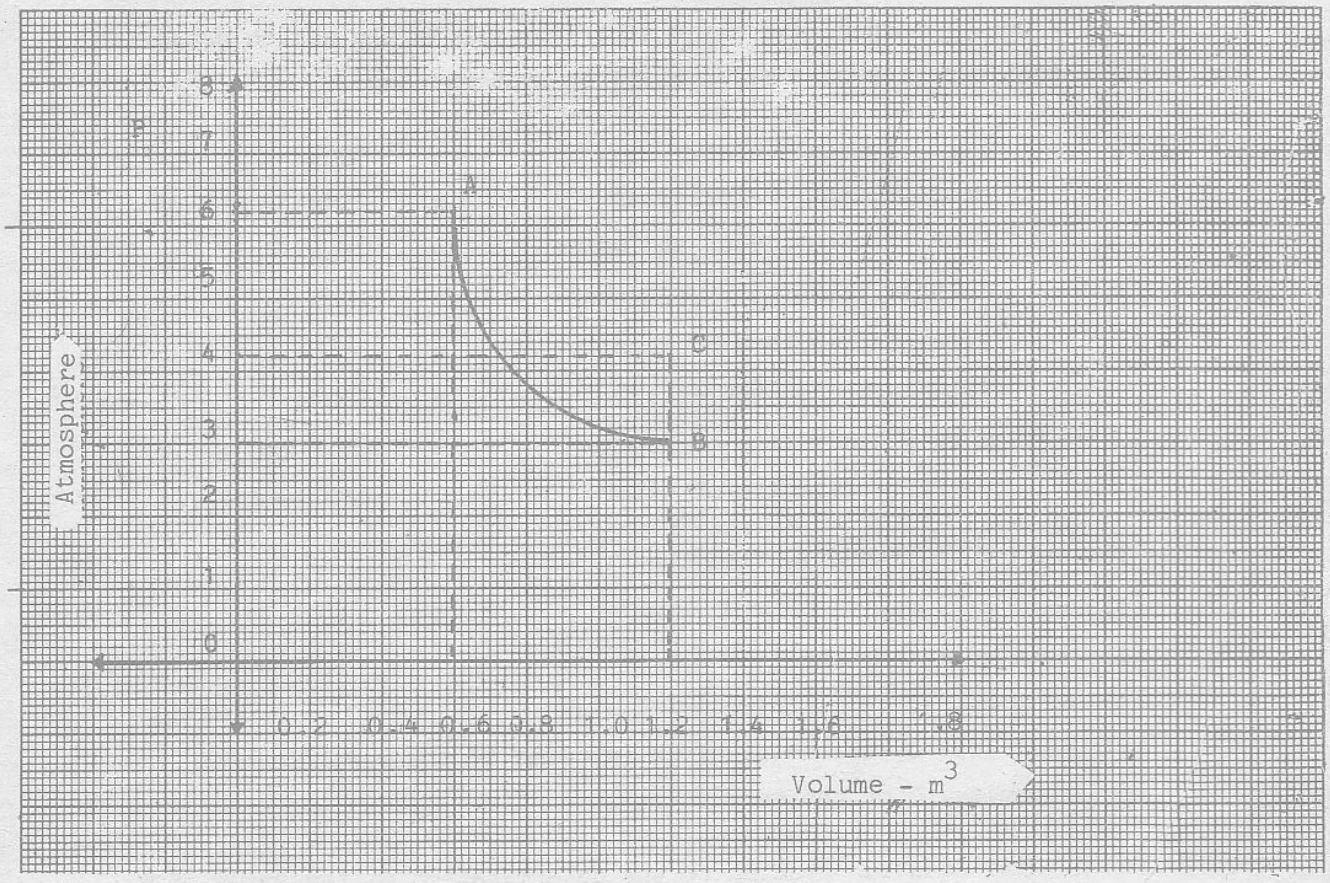
(c) From your graph in (b) above,

(i) Compute the slope, G.

(ii) Determine Young's modulus Y, of the wooden metre rule, given that $Y = \frac{4}{Gb}\left(\frac{l}{t}\right)^3$ where l, b and t are the length, breadth and thickness respectively of the wooden metre rule.

SECTION B

Answer ALL questions in this section.



The graph above shows changes of pressure and volume of a fixed mass of a gas. AB respresent a change taking place at a constant temperature of $37^{o}C$. BC represents a further change for the same mass of the gas.

(a) Use the values of pressure and volume given on the graph to calculate the volume of the gas at B.

(b) Explain the nature of change represented by BC.

(c) Calculate the temperature of the gas at C.

5. An experiment was carried out to determine the focal length f_L of transparent liquid lens and the refractive index n_L of the liquid by parallax method. The measurements for f(cm) and f'(cm) were recorded as shown in the table below. f is the focal length of the glass lens and f' is the focal length of the combined liquid and glass lens.

				AVERAGE
f(cm)	10.0	9.9	10.1	
f'(cm)	12.5	12.6	12.4	

Radius of curvature of the liquid lens = r = - 20cm.

(a) Find the average value for each of f and f'.

(b) Find the focal length f_L, given that $\frac{1}{f_L} = \frac{1}{f} - \frac{1}{f}$

(c) Calculate the refractive index, n_L of the liquid if

$\frac{1}{f_L} = (n_L - 1)\frac{1}{r}$, where r is the radius of curvature of the lens.

SECTION C

Answer ALL questions in this section.

6. The table below is a record for the voltage V for different values of resistance R obtained from an experiment whose aim was to determine the resistance of a battery. In this experiment, the voltmeter was connected in series with a resistance box R, a battery B of emf 1.5v and a tapping key K.

RΩ	400	1000	1600	2200	2800	3400	4000
V volts	1.1	0.8	0.6	0.5	0.4	0.35	0.3

(a) Draw the circuit diagram adopted in this experiment.

(b) (i) Copy the table above and include a row for the values of $\frac{1}{V}$, the reciprocal of voltage.

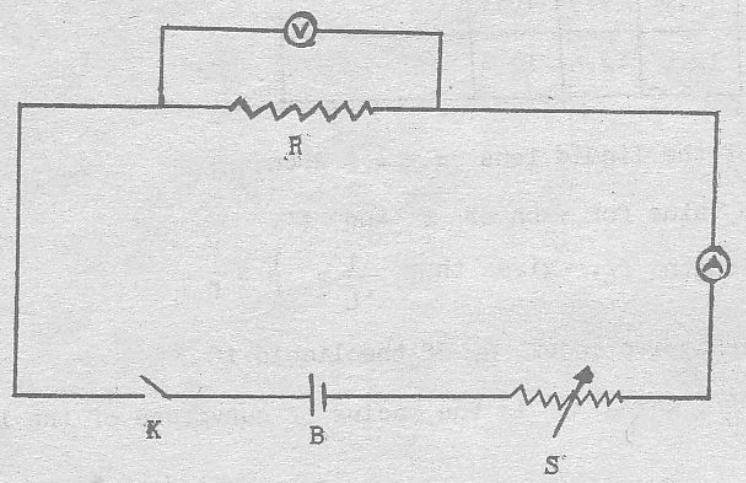
(ii) Then plot a graph of R against $\frac{1}{V}$.

(c) Determine the slope S and intercept K in the R axis.

(d) If E, R_V and r and the e.m.f. of the cell, resistance of the voltmeter and internal resistance of the battery respectively, then your graph in (b)(ii) above obeys the equation: $R = ER_V(\frac{1}{V}) - (r + Rv)$.

Use this relation and the values of S and K to determine the resistance of the voltmeter, R_V and internal resistance of the battery, r.

7. A circuit diagram drawn below was used by one class in Njiro secondary school in order to carry out a certain experiment.



The results from this experiment were recorded as follows:

I(A)	0.52	0.48	0.44	0.40	0.36	0.28	0.20
V(VOLTS)	2.6	2.4	2.2	2.0	1.8	1.4	1.0

(a) Write the name and use of each of the apparatus labelled K, B, S, and V in the circuit diagram above.

(b) Plot a graph of V against I.

(c) From your graph in (b) above, obtain slope m. of the graph.

(d) What is the physical meaning of m?

(e) Suggest a suitable title or aim for this experiment.