# THE UNITED REPUBLIC OF TANZANIA
# NATIONAL EXAMINATIONS COUNCIL
# ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATON

**131/3A** **PHYSICS PAPER 3A**

## ALTERNATIVE A PRACTICAL

TIME: 3 Hours 10 Minutes 25 May 1999

### INSTRUCTIONS

1. Answer TWO (2) questions including question number ONE.
2. Use the first 10 minutes to read through the paper.
3. All calculations must be clearly presented in the answer booklet provided.
4. Mathematical tables, graph papers and electronic pocket calculators may be used.

This paper consists of 5 printed pages

1. (a) The aim of this experiment is to determine the surface tension of the liquid labelled A.

(b) Diagram:

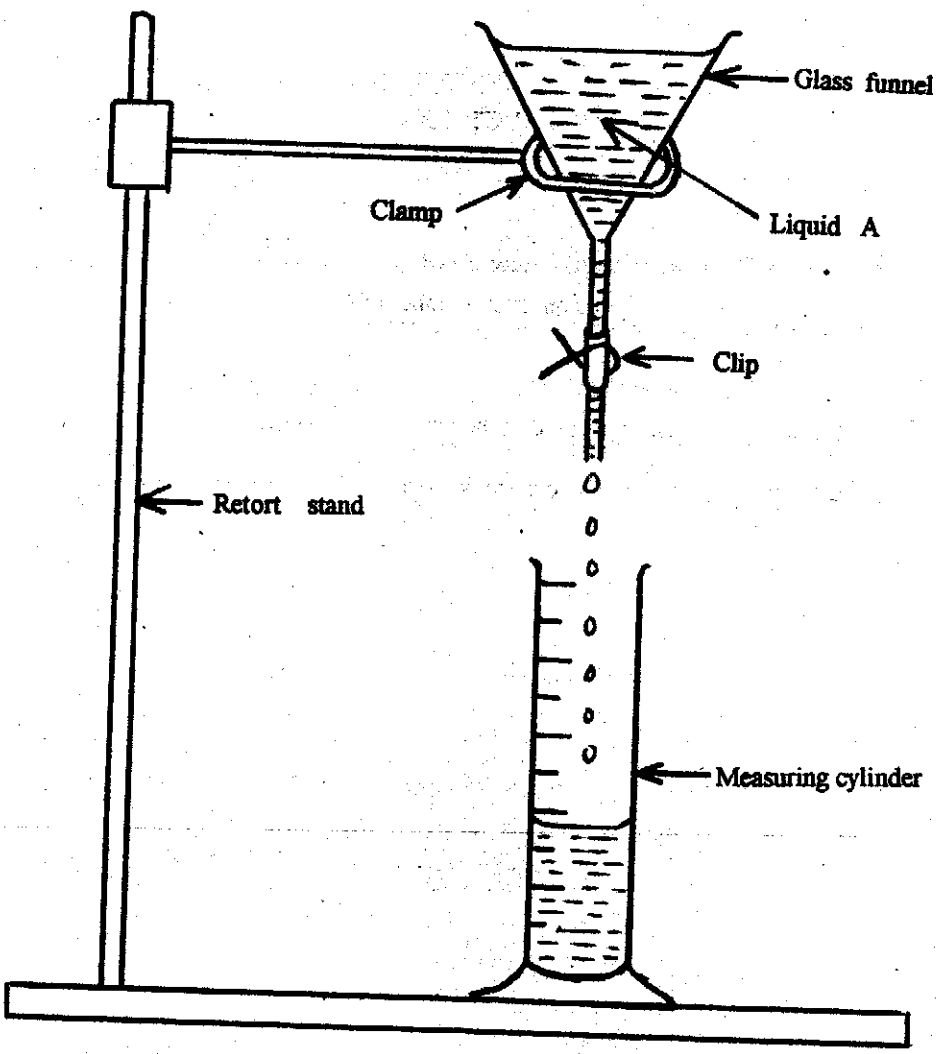



Figure 1.

(c) Procedure:

(i) Arrange the apparatus as shown in figure 1 with the funnel resting on the clamp of a retort stand.

(ii) Tighten the clip on the funnel to allow only drops of liquid A to pass through.

(iii) Read the initial volume $V_o$ of the liquid in the measuring cylinder. Then count about 100 drops and read again the new volume V of the liquid in the cylinder.

(iv) While adding more liquid (A) in the funnel continue counting the number n of drops which have fallen and noting the volume V.

(v) Record the values of $V-V_o$ and n in a table.

(d) Plot a graph of $V - V_o$ (vertical axis) against n (Horizontal axis); and determine its slope (s).

(e) Using the beam balance and the measuring cylinder, determine the density $\rho$ of liquid (A).

(f) Hence determine the surface tension $\gamma$ of liquid A from the equation

$$\gamma = \left(\frac{\pi}{6}\right)^{1/3} \frac{\rho g s^{2/3}}{1.9}, \quad \text{where } g = 9.81 \text{ ms}^{-2}$$

2. (a) The aim of this experiment is to determine whether liquid B obeys Newton's law or not.

(b) Procedure:

You are provided with a thermometer, a beaker, a stirrer, a stop watch or stop clock and liquid labelled B, which has been heated to about 90°C. Carry out the experiment whose aim is given in (a) above. Describe briefly the procedure and give the conclusion.

3. (a) The aim of this experiment is to determine the resistivity of the wire labelled W.

(b) <u>Circuit diagram.</u>

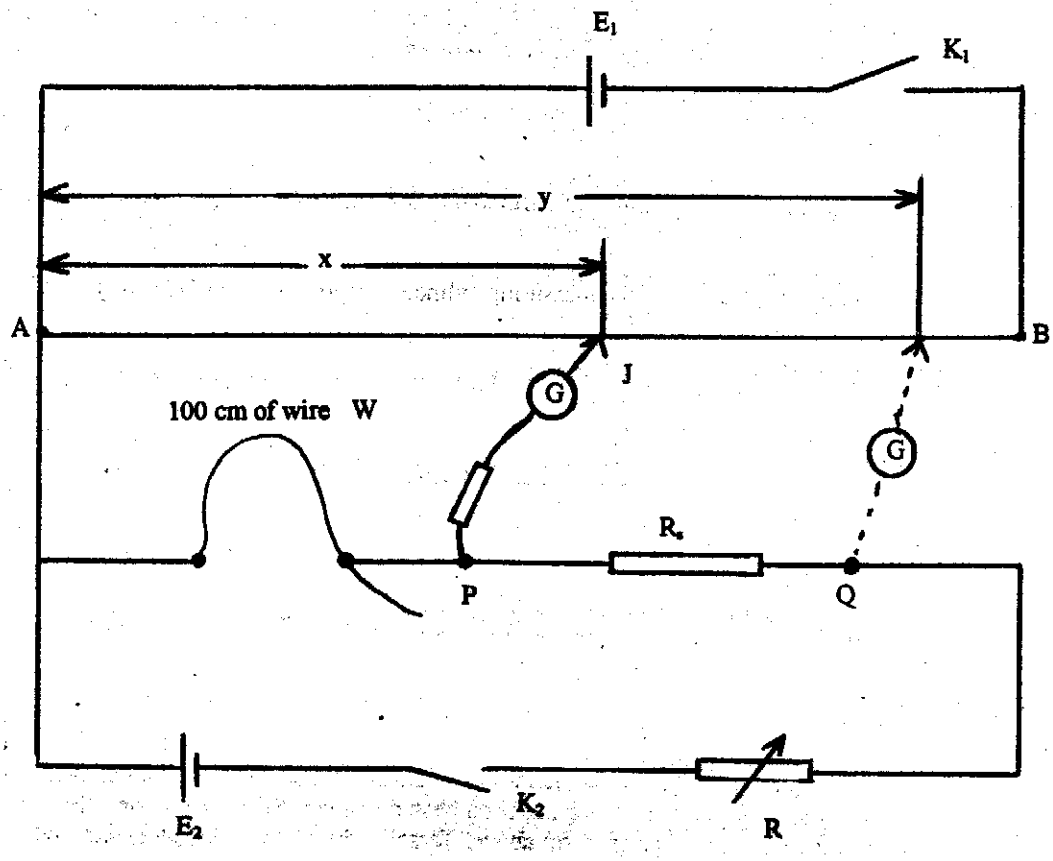



Figure 2

(c) Procedure:

Connect the accumulator $E_2$ in series with 100 cm of the wire labelled W, a standard resistor $R_s$ of 5 Ω, variable resistor (resistance box or rheostat) R, and key ($K_2$). Then connect the potentiometer circuit containing the accumulator $E_1$, key ($K_1$), potentiometer wire AB and the galvanometer G (with protective resistor) as shown in figure 2. J is a jockel.

Starting with a certain value of R, e.g. 1 Ω, determine the balance length x when the galvanometer is connected to P. Then disconnect the correcting wire from terminal P and move it to Q. (see dotted line). With the same value of R determine the new balance length (y).

Repeat the above procedure for six other values of R, with R in the range from 1 Ω to 7 Ω.

(d) Plot a graph of y (vertical axis) against x (horizontal axis).

(e) Determine $R_1$, the value of the resistance of wire W from the relation.

$$y = \frac{(R_1 + R_s)}{R_1} x$$

(f) Measure the diameter, d of wire W and hence determine the resistivity $\rho$ of wire W from the relation $\rho = 0.785 R_1 d^2$ (SI units)

(g) State any four sources of error in this experiment.