ALTERNATIVE C

UNIVERSITIES OF MANCHESTER LIVERPOOL
LEEDS SHEFFIELD AND BIRMINGHAM

Joint Matriculation Board

General Certificate of Education

PHYSICS. PAPER III ALTERNATIVE C

ADVANCED

THURSDAY 27 JUNE 1957, 9.30-12.30

Answer **two** *questions.*

Choose three of the following questions. The Supervisor will inform you which two of these you are to answer. The third is not to be answered.

When sets of apparatus are given distinguishing letters or numbers, these letters or numbers must be given at the beginning of the answers.

All observations must be entered in ink in the answer-book. All rough work must be done in the answer-book. No extra paper may be used.

2 sheets of graph paper are supplied. Additional sheets will be supplied on request but **all** *sheets issued must be placed within the answer-book and handed in to the Supervisor.*

C1. Investigate the flow of water from a burette.

Clamp the burette vertically and fill it with water. Open the stopcock fully and determine the level (V ml.) of the water meniscus after one minute, starting from the instant when the meniscus crosses the 0 ml. graduation mark. *Without altering the setting of the stopcock* refill the burette and repeat for **four** more one minute intervals, starting with the meniscus crossing the 5 ml., 10 ml., 15 ml. and 20 ml. graduation marks respectively.

Measure the heights (H cm.) of the 0 ml., 5 ml., 10 ml., 15 ml., and 20 ml. marks above the end of the jet of the burette; also measure the heights (h cm.) of the observed levels (V ml.) above the end of the jet.

Use the tables of square roots to find values of $\sqrt{H}$ and $\sqrt{h}$. Plot a graph having values of $\sqrt{h}$ as ordinates and the corresponding values of $\sqrt{H}$ as abscissae. Find the gradient of the graph.

Once observations have started the stopcock must remain untouched until the whole experiment has been completed.

C2. Apply the method of electrical heating to determine the specific heat of the motor oil provided. Make some allowance for heat exchange between the calorimeter and its surroundings, preferably by using the graph referred to below.

Use a rise of temperature between 5 deg. C. and 6 deg. C. Take the temperature of the calorimeter and its contents at regular intervals throughout the experiment and plot a graph having temperature as ordinate and time as abscissa. Assume that 4·18 joules are equivalent to 1 calorie. The specific heat of the material of the calorimeter will be supplied.

C3. Provided the distance (d cm.) between the object and image screen is sufficient, two positions of the converging lens can be found for each of which an image is focused on the screen. For a given value of d determine the distance (a cm.) between these two positions. Repeat for **four** other well spaced values of d.

Plot a graph with a^2/d as ordinate and d as abscissa. Read from your graph the value of d when a^2/d is zero.

C4. The field at the centre of a coil of wire passing a current is to be balanced against the field due to a bar magnet.

Connect the tangent galvanometer coil with reversing key in series with the accumulator and variable resistance. Set the coil vertically in the magnetic meridian. Pass a current through the coil and adjust its value so that the magnetic needle at the centre of the coil is deflected about 55°. Note the value of the deflection (θ°). Place the magnet, supported on the wooden block, to the north or south of the coil and in the ' broadside on ' position. Bring up the magnet so as to reduce the deflection to zero. Note the distance of the centre of the magnet from the centre of the coil (d cm.). Remove the magnet. Repeat the observations for **four** smaller values of θ.

Plot a graph with log (10 tan θ) as ordinate and log d as abscissa. Find the slope of the graph.

Describe fully in your account how the apparatus was set up.