ALTERNATIVE R

UNIVERSITIES OF MANCHESTER LIVERPOOL
LEEDS SHEFFIELD AND BIRMINGHAM

JOINT MATRICULATION BOARD

GENERAL CERTIFICATE OF EDUCATION

PHYSICS—Paper III

ADVANCED

Tuesday 15 June 1965 9.30 - 12.30

Careless and untidy work will be penalized.

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.

Detailed descriptions of the experiments performed are not required, but labelled diagrams of the arrangement of the apparatus should be given and any precautions taken to reduce errors should be indicated.

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.*
Mathematical tables are supplied.

R1. You are provided with five steel spheres and some paraffin and are required to find the density of the steel and of the paraffin.

Weigh each sphere of mass m and measure its diameter d. Plot a graph having m as ordinate and d^3 as abscissa. Find the gradient of the graph. Hence deduce the density of the steel.

Now weigh the largest sphere completely immersed in paraffin. Hence deduce the density of the paraffin.

R2. Arrange an illuminated object, a convex lens and a screen so that an image is focussed on the screen. Keeping the object and screen fixed, move the lens until the image is again in focus on the screen. Measure the displacement d of the lens and the distance D between the object and screen. Repeat for four more values of D.

P1ot a graph having d^2 / D as ordinate and D as abscissa. Find the gradient of the graph. Also deduce the focal length of the lens from the graph.

R3. Apply the method of mixtures to determine the specific heat of liquid paraffin.

Use a 50 gm. brass mass as the hot body and about 100 gm. of the liquid paraffin in the calorimeter. Take the temperature of the calorimeter and its contents at intervals before, during and after the mixing and plot a graph with temperature as ordinate and time as abscissa. Use this graph to make some allowance for heat exchange between the calorimeter and its surroundings. Assume that the specific heat of brass is 0.090 cal. $gm.^{-1}$ $deg.^{-1}$ C. The specific heat of the material of the calorimeter will be supplied.

R4. Connect a length x of the uniform wire A in one arm of a metre bridge and a standard resistance in the other arm. Balance the bridge and measure the distance y of the balance point from the end of the bridge wire adjacent to A. Repeat for five more values of x.

Plot a graph having $1/y$ as ordinate and $1/x$ as abscissa. Find the gradient of the graph. Hence deduce the resistance per unit length of A.