

(2.) "HEURISTIC" SCHEME.

INSTRUCTION IN EXPERIMENTAL SCIENCE.—SCHOOL BOARD FOR LONDON.

SYLLABUS FOR ELEMENTARY NATURAL PHILOSOPHY, AS DEFINED IN THE SECOND SCHEDULE
(§ 101 (f) COURSE H) OF THE NEW CODE.

Method of Instruction.—The science demonstrator for the Board gives one lesson fortnightly, of about forty minutes' duration, to the boys in the Fifth and higher standards in each school. These lessons are illustrated experimentally with apparatus belonging to the school. Between the visits of the science demonstrator at least one lesson is given to the same class by the teachers of each school (as a rule by the teacher who was present at the demonstrator's lesson, and who took full notes of it), and a written examination in the subject-matter of the lesson is also held. The answers are corrected by the teacher of the class, and submitted to the demonstrator at his next visit to the school. Courses for teachers of experimental work in this subject are held from time to time at the laboratory, Berner Street Board School, Commercial Road, E. Teachers requiring information regarding them should communicate with

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SYLLABUS OF LESSONS.

Stage I.

I. Measurement. Length. English and French systems. Practical lessons. Decimals. *Practical work*: (1.) Measure slates, books, &c., in inches and in centimetres. (2.) Find dimensions of room with tape. (3.) Measure lengths of sides of triangles to show sum of two sides always greater than third. (4.) Measure circumference of circles by twisting cotton several times round cylinders, such as glass bottles, drawing-models, and show relation between circumference and diameter is constant for all circles.

II. The lever and experimental discovery of its law. *Practical work*: Construct a series of calico bags loaded with gravel, shot, or sand, so that the weights of bag and contents are as the numbers 1, 2, 3, 4, 5, 6. Hang these by strings from boxwood lever, making six experiments to discover law. Show use of adjusting-weight which slides along lever.

III. The balance. Mode of using and adjustments. Metric system of weights. *Practical work*: (1.) Adjust balance by screw-nut. (2.) Weigh the eight cubes of different wood, and draw lines proportionate to these weights on squared paper.

IV. The weight of measured volumes of water, and measurement of volume indirectly by balance. *Experiments*: Find the weight of 10, 20, 30, 40, and 50 c.c., measured from burette to show 1 c.c. of water = 1 gram.

V. Measurement of area. Experimental proof of rule for multiplication of decimals. *Experiments*: Mark off rectangular areas on sectional paper; determine its area in square inches and hundredths of a square inch by counting up squares. Show that we get same figures by multiplying length of rectangle by breadth. Meaning of 0.01 and 0.001.

VI. Volume. Section of unit of volume. Calculation of volume of rectangular solids. *Experiments*: Make cubic centimetre from soap. Find how many c.c. in 2 cm. cube, and how many in a 4 cm. cube. To count the unit cubes in a rectangular solid we multiply length, breadth, and depth together. Use of burette and graduated cylinder.

VII. The specific gravity bottle. Relative weight. *Experiments*: Find weight of water in bottle when full, and hence record capacity of bottle in c.cs. Fill bottle with methylated spirit and weigh. Find relative weight of spirit with regard to water. Division of decimals.

VIII. Relative weights of liquids. *Experiment*: Weigh bottle full of petroleum oil, vinegar, tea, salt-water, &c. Represent weights of liquids by lines on squared paper. Find weight of 1 c.c. of each.

IX. Relative density of solids by displacement. *Experiments*: Break up four slate-pencils and place in bottle and weigh. Find weight of water necessary to fill bottle now pencils are in it. Find room taken up by pencils. Knowing volume and weight of pencils, find weight of 1 c.c. of slate-pencil. Repeat with sand, lead shot, glass beads, pieces of glass tube or rod, &c.

X. Relative density of mercury by displacement, and by direct measurement of volume from burette. *Experiments*: Find volume of about 150 grams of mercury (not more) by displacement. Find weight of 12 c.c. of mercury, measured from burette.

XI. Discovery of law of U tube. *Experiments*: Show water stands to same height in U tubes (a) when both limbs are same bore, (b) when limbs are of different bore. Pour mercury into U tube and show it is a form of balance, the mercury surfaces acting as scale-pans. Put water in one limb; measure columns of water and mercury that counterbalance one another. Show water column is as many times longer than mercury column, as mercury was found in Lesson X. to be heavier than water. Repeat it, if possible, with tubes of unequal bore. Into other leg of U tube pour spirit until mercury surfaces are level again, measure columns of water and spirit, and calculate relative density of spirit; compare with result obtained in Lesson VII.

XII. Air has weight. Pressure of atmosphere. *Experiments*: Fit florence-flask (round bottom) with tightly fitting indiarubber stopper with glass tube through it. Put about 5 c.c. of water in flask and boil vigorously; while boiling, close flask with indiarubber tube and glass rod; allow to cool, and weigh; open flask and allow air to enter; weigh again. Determine volume of air that has entered and calculate weight of 1 c.c.

XIII. The siphon barometer. Its uses and variations. *Experiments*: Construct barometer with dry tube and dry mercury. Mount on board with short limb adjustable. Affix scale and mark zero line on board. (Systematic observations of barometer should be made every day and plotted on squared paper.)