

(b.) Trigonometry: Degrees and radians; use of protractor or scale of chords; trigonometrical functions and their fundamental relations; determinations of their value by graphical methods and setting-out of angles when the value of the sine, cosine, or tangent is given. Approximate solution of right-angled triangles and oblique triangles by drawing to scale; tracing of trigonometrical functions through the four quadrants; arithmetical values of the trigonometrical functions of  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ ,  $75^\circ$ ,  $90^\circ$ , &c. Formulæ for finding the sine, cosine, and tangent of the sum or difference of two angles (excluding angles greater than two right angles), and easy derived formulæ; the sine rule in triangles, or  $\sin A/\sin B = a/b$ , and other simple properties of triangles; the area of a triangle. Use of natural and logarithmic tables of sines, cosines, and tangents of four or five figures. Solution of triangles; heights and distances. Description and use of the vernier, theodolite, prismatic compass, and sextant.

Skill in the transformation of trigonometrical expressions or in the manipulation of formulæ will not be required except in so far as it is implied in the above syllabus.

- (11A.) *Practical Mathematics* and (11B.) *Practical Geometry and Graphics*.—The Commissioner reserves to himself the right to hold the examination in these subjects at any time or place, or to require candidates to take the Lower Examination (older Second-stage Examination) of the Board of Education, Whitehall, London, in the subject, or some other approved examination. On application to the Education Department a syllabus will be supplied.

- (12.) *Mechanics and Hydrostatics*.—The composition and resolution of forces acting on a point and on a rigid body on one plane; the mechanical powers; friction between two plane surfaces treated simply; the centre of gravity; the fundamental laws of motion; the laws of uniform and uniformly accelerated motion and of falling bodies; projectiles (exclusive of problems depending on the geometry of the parabola); impact; circular motion; simple pendulums; the pressure of liquids and gases; the equilibrium of floating bodies; specific gravities; the principal instruments and machines the action of which depends on the properties of fluids, with simple problems and examples.

Candidates will be expected to show an experimental as well as a theoretical knowledge of fundamental laws, but will not be expected to show any further knowledge of pure mathematics than what is demanded in subject (10) *Arithmetic and Algebra*, and subject (11) *Geometry and Trigonometry*.

- (13.) *Heat and Light*.—(a.) General physics: C.G.S. units, velocity, acceleration, force, weight, equilibrium, couples, energy, power, and simple pendulum. Properties of matter—Compressibility, viscosity, and diffusion of gases and liquids; absorption of gases; rigidity of solids, Hook's Law; constitution of matter, atoms, molecules.

(b.) Heat: Change of volume, measurement of temperature, specific heat, calorimetry, change of state, latent heat, hygrometry, transformation of energy, mechanical equivalent of heat; convection, conduction, radiation, and absorption.

(c.) Light: Nature, velocity; photometry; reflection and refraction at plane and spherical surfaces; thin lenses; dispersion and spectra; the principal optical instruments and vision; interference; plane polarization, and double refraction.

A candidate in Heat and Light will be required to forward to the Education Department, before the examination, a certificate on the form supplied by the Department that he has gone through a sufficient course of practical work in the subject occupying at least eighty hours.

- (14.) *Electricity and Magnetism*.—(a.) General physics: C.G.S. units, velocity, acceleration, force, weight, equilibrium, couples, energy, power, and simple pendulum. Properties of matter—Compressibility, viscosity, and diffusion of gases and liquids; absorption of gases; rigidity of solids, Hook's Law; constitution of matter, atoms, molecules.

(b.) Magnetism and electricity: Production of charge, inverse square law, induction and distribution, electro-static field, lines of force, potential capacity, condensers, dielectric capacity, electrometers, electrostatic machines.

Magnetic pole, inverse square law, magnetic moment, magnetic field, and lines of force, induction, permeability, terrestrial magnetism.

Magnetic force due to currents, galvanometers, Ohm's law, E.M.F., thermal effect of a current; voltaic cells and electrolysis; interaction of magnets and currents; mutual action of currents, induction coil; thermo-electricity; technical applications illustrating principles; units.