

A candidate in magnetism and electricity 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.

- (15.) *Chemistry*.—Candidates will be expected to show that they have an experimental as well as a theoretical knowledge of the matters set forth in the subjoined syllabus. The three states of matter; indestructibility of matter. Physical changes compared with chemical changes. Difference between mechanical mixtures and chemical compounds. Phenomena of chemical action; conditions that promote or check or otherwise modify chemical action. The metric system. Elements and compounds. Modes of chemical action; direct union, displacement, mutual exchange, decomposition. Effects of pressure and temperature on gases; Boyle's and Charles's laws. Estimation of the weight of an element in a given weight of one of its compounds, of the weight of one element required to displace another from a given compound, and of the weight of known volumes of gases. Combining weights; laws of combination of elements in definite proportions by weight; laws of gaseous combination of elements and compounds; atoms and molecules, their relative weights; the atomic theory; Avogadro's law; meaning and use of symbols, formulæ, and equations; valency; graphic formulæ; calculations of quantities by volume and by weight. Production and properties of oxygen, hydrogen, and nitrogen. Air, its properties, the exact determination of its composition; the constituents of the atmosphere; estimation of the amount of aqueous vapour and of carbon-dioxide. Water, its properties; solution and crystallization; hard and soft water; determination of the composition of water by volume and by weight; production and properties of ozone and of peroxide of hydrogen. The production and properties of chlorine, hydrochloric acid, ammonia, oxides of nitrogen, nitric acid. Definition and general properties of oxides, acids, alkalies, and bases; the basicity of acids and the classification of salts. The physical and chemical properties of the various forms of carbon, sulphur, and phosphorus; the production of the two latter on the large scale; the production and properties of the oxides of the three elements just named; the production and properties of sulphuretted hydrogen, of bisulphide of carbon, of sulphurous and sulphuric acids (manufacture not required), of phosphoretted hydrogen, and of meta-, pyro-, and ortho-phosphoric acid. Experimental determination of the composition of hydrochloric acid, ammonia, carbon-dioxide, sulphuretted hydrogen. The halogens, their physical and chemical properties compared; the production of iodine on the large scale; the combinations of the halogens with hydrogen. The sources and the physical and chemical properties of arsenic, antimony, and bismuth. The more important compounds of these elements, with special reference to their relation to phosphorus. The detection of arsenic. The sources and the physical and chemical properties of boron and silicon; the more important compounds of these elements. General properties of metals and non-metals. The chief methods of isolating and the physical and chemical properties of sodium, potassium, ammonium, silver, calcium, zinc, magnesium, copper, mercury, tin, lead, manganese, and iron; the properties of their more important compounds. The production and properties of the following carbon compounds, with special reference to processes of substitution, oxidation, and reduction, the meaning of constitutional formulæ, and the evidence on which they are constructed, and the characters of homologous series: the homologous paraffins treated as a series, ethylene, acetylene, methyl and ethyl alcohols, formic acid, acetic acid, and their relations to one another.

A candidate in Chemistry 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.

- (16.) *Physiography*.—(a.) Forms of matter; units of length, area, volume; quantity of matter; specific gravity; law of Archimedes. Measurement of time; its relation to the earth's rotation. Velocity; force, resultant of forces. Centre of gravity. Measurement of angles; angular velocity; "centrifugal force." Energy; forms of energy.