

*Fluid Mechanics.*—Centre of pressure on dams; metacentre; force of a jet of water; the water turbines; lift and force pumps. Hydraulic gradient, loss of head due to resistances.

A candidate in this subject will be required to present a certificate from the Principal of the institution attended that he has carried out a course of practical work of at least thirty hours' duration based on the above prescription and that his attendance and work have been satisfactory.

### *Chemistry*

Physical properties of gases; the laws of Boyle, Charles, and Avogadro; solubility and diffusion of gases.

Atomic theory; valency. Formulæ and equations. Chemical equivalents. Compounds; chemical reactions and their representation by equations. Periodic classification of the elements.

Oxygen and oxides; oxidation and reduction.

Acids, bases and salts. Solubility, crystallization and water of crystallization.

Hydrogen. Water. Reduction by hydrogen.

Carbon; oxides of carbon; carbonates and bi-carbonates.

Chlorine; hydrochloric acid; chlorides; potassium chlorate.

Nitrogen; nitric acid; nitrates; ammonia, liquefaction of ammonia; use of ammonia in refrigeration; ammonium salts. Sodium and potassium cyanide.

Sulphur; sulphuretted hydrogen; carbon di-sulphide; sulphides; oxides of sulphur; sulphuric acid and its preparation; sulphates.

Silica and silicates; the nature of glass and earthenware.

Metals and non-metals.

The occurrence, sources, and physical properties of sodium, calcium, magnesium, aluminium, zinc, iron, lead, copper. Their oxides and principal salts.

Physico-chemical properties of cast iron, steel, wrought-iron, and the simple non-ferrous alloys. Iron alloys.

Elementary thermo-chemistry.

Properties and uses of types of coal; coal-gas, producer gas, water-gas, carburetted-water gas.

Endothermic and exothermic reactions.

Electrolysis; meaning of pH. Electrolysis of aqueous solutions and fused electrolytes.

Metallic corrosion and its prevention. Protective coatings, paints, galvanizing and electro-deposited coatings.

Natural water; impurities and their effects on boilers.

Hardness in water, causes and removal.

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### *Drawing (a)*

Fundamental constructions in plane and solid geometry. Development of surfaces. Construction of conic sections, cycloid, involute, helix, and spiral, and their practical applications.

Locus of a point in simple mechanisms.

Elementary oblique, isometric and perspective projections.

Conventional representation of screw threads.

Drawing of and knowledge relating to standard parts such as nuts, bolts, rivets, and keys.