

Heat and temperature; expansion by heat; thermometers; conduction and convection. Radiation; reflection and refraction; the spectrum; the rainbow; sunset effects. Chemical composition of matter; mixtures and compounds; air and water; oxygen, nitrogen, carbon, iron, mercury, carbon-dioxide, lime, silica, alkalies, common salt. Rain, dew, snow, hail, ice. Magnetism; mariner's compass; variation of the needle; magnetic poles of the earth. Earth's crust; minerals; rocks, stratified and unstratified. The chief forms of animal and vegetable life; fossils; succession of geological strata.

(b.) The earth's form; the horizon; the earth's dimensions and density; rotation of the earth on its axis. Latitude and longitude as angles and as arcs. Distance of earth from sun; dimensions and density of sun. Inclination of earth's axis; variation of length of day and night; the four seasons. The north and south line; the sundial; altitude of the sun; methods of determining latitude and longitude; great circles, small circles. The moon; lunar and solar eclipses; tides. The solar system; planets and "fixed stars"; law of gravity. Maps, how constructed; the conical, equidistant, and Mercator's projections; scale of map, contour lines; great-circle sailing; rhumb-line sailing. The atmosphere; isothermals; rainfall; dew point; winds, land and sea breezes, steady winds, cyclones, seasonal winds; Ballot's law; isobars. Climate, circumstances affecting climate. The earth's crust, its folding, faulting, movements slow and sudden. Work of rain, ice, rivers, and the sea. Distribution of plants and animals.

The candidate will be expected to show that, as far as possible, he has acquired his knowledge of the subject by actual experiment, observation, and measurement, but will not be expected to show any further knowledge of pure mathematics than what is demanded in subjects (10) and (11) above. He 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

- (17.) *Geology*.—Form and size of the earth, general chemical constitution of the crust; elements of crystallography and the classification of minerals, the principal rock-forming minerals and metallic ores, macroscopic characters and minute structure of rocks; classification of rocks according to their nature, composition, and mode of origin; volcanoes and volcanic action; earthquakes, secular movements of the crust; metamorphism; the geological effects of air, water, and living organisms; stratification, joints, inclination, and curvature of rocks; cleavage; faults; unconformity; mode of occurrence of igneous and metamorphic rocks; surface-features due to disturbance, volcanic action, and denudation.

An elementary knowledge of the chief orders of plants and the chief orders of animals that are represented in Australasian fossils. Geographical distribution of animals and plants in relation to geology, chronological classification of rocks, geological eras, and the characteristic fossils of the geological periods. The general geological structure of New Zealand, including the broader features of the chief systems of rocks, and the most characteristic genera (only) of fossils. Recognition of a well-known mineral or of a common rock from specimens or from descriptions.

A candidate in Geology 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.

- (18.) *Botany*.—General: (1.) The general structure and life-history of the following organisms, to illustrate certain general biological phenomena and laws—Haematococcus, Spirogyra, yeast, bacteria, Amoeba, aciliate infusorian, a fern, a flowering-plant, Hydra or any hydroid polyp. (2.) General structure and physiology of the cell; the general facts of nuclear division and cell-division. (3.) Principles of classification. (4.) Origin of species, heredity and variation, struggle for existence, use and disuse, degeneration, rudimentary and vestigial organs, modifications for protection and aggression, natural selection, production of varieties, connection between ontogeny and phylogeny. (5.) The bearing of the main facts of geographical and geological distribution on the theory of evolution.