

and the principles underlying the breeding of new types of plants according to Mendel, De Vries, &c. Methods of seed testing and selection. Development of pure strains by selection. Plant propagation.

(b) Farm Crops: Preparation of soil, sowing, subsequent cultivation, manuring, harvesting, and subsequent treatment of principal farm crops grown in New Zealand, with knowledge of the machinery used in the work. Insect, fungous, bacterial, and weed pests of farm crops and the means used to control them. Economic value of the various farm crops.

(c) Pastures: Economic importance of grasses and clovers found in New Zealand pastures. Choice of seed for particular classes of soil and for various agricultural purposes. Permanent pastures, their management and treatment. Hay and ensilage making.

(d) Orchard Work: Orchard practice, budding, pruning, grafting, spraying, and cultivation.

(e) The Soil: Detailed knowledge of formation of soil. Common rocks of New Zealand which give various types of soil. Sedentary and transported soils and where found. Common indications of good and poor soils. Soil bacteria and their work—*i.e.*, nitrifying, denitrifying, nitrogen-fixing, symbiotic, humus-formation. Limiting factors in soil-fertility—(i) air; (ii) temperature; (iii) water; (iv) harmful conditions; (v) lack of available food constituents. Colloidal matter in soil. Tillage operations—implements used; principles underlying tillage operations. Soil-temperatures. Air in the soil.

(f) Water: Soil-water; sources; kinds of soil-water; movements of soil-water; water-conservation. Principles underlying dry farming. Irrigation. Removal of excess of water from soil. Drainage on large and small scales.

(g) Manures and Fertilizers: Simple (qualitative) chemical analysis of soil and wood ash. Exhaustion of plant-food in soil. Methods of preventing or remedying exhaustion by (i) methods of cultivation and cropping, (ii) soil-improvers, (iii) use of artificial manures. Principles underlying the use of fertilizers. A general knowledge of the various groups of fertilizers—(i) phosphatic, (ii) nitrogenous, (iii) potassic, (iv) lime in all its forms. Laboratory work to cover (i) solubility in distilled water and effect on litmus, (ii) solubility in soil-waters. Physical, chemical, and bacterial effects of liming and green manuring.

(h) Dairy Science: The constituents of milk; causes of variations and of defects in the composition of milk; the physical and chemical properties of milk; the coagulation of milk; the composition of skimmed milk, separated milk, buttermilk, cream, and whey; the uses and value of separated milk, buttermilk, and whey; acidity, and the estimation of acidity; influence of temperature on milk; pasteurizing and sterilizing milk; objections to the use of chemical preservatives; experimental proof that souring of milk is due to bacterial activity; sources of bacterial contamination; injurious bacteria of milk; milk as a medium for conveying disease. Sampling. The examination will include also a knowledge of the construction, manipulation, and principles of manipulation, and principles of working of the apparatus used for testing milk and its products. Methods of raising and separating cream; the ripening of cream; the process of churning; the composition of butter; washing, working, and salting butter. Rennet—how prepared, its action on milk, and the determination of its strength; use of starters; process of Cheddar-cheese making; ripening of cheese, with the changes that occur and the agents at work.

A candidate in Agriculture and Dairy Science will be required to forward to the Department a certificate on the prescribed form that he has carried out satisfactorily a course of practical work in the subject occupying at least sixty hours.

(12) *Physical Science* (three-hour paper).—(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; surface tension, capillarity; rigidity of solids, Hook's law; constitution of matter, atoms, molecules.

(b) Heat: Nature of heat; effects of heat; measurement of temperature; expansion of solids, liquids, and gases, including familiar application; calorimetry; specific heat, latent heat, change of state; refrigeration; liquefaction of air; hygrometry; transformation of energy; mechanical equivalent of heat; conduction, convection; elements of 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.