



SUPPLEMENT

TO THE

NEW ZEALAND GAZETTE

OF

THURSDAY, MARCH 21, 1907.

Published by Authority.

 WELLINGTON, WEDNESDAY, MARCH 27, 1907.

"The Civil Service Reform Act, 1886," and "The Civil Service Examination Act, 1900."—Civil Service Senior Examination.

PLUNKET, Governor.

ORDER IN COUNCIL.

At the Government Buildings, at Wellington, this twenty-sixth day of March, 1907.

Present:

THE HONOURABLE W. HALL-JONES PRESIDING IN COUNCIL.

IN exercise and pursuance of the powers and authorities vested in him by "The Civil Service Reform Act, 1886," and "The Civil Service Examination Act, 1900," the Governor, with the advice and consent of the Executive Council of the colony, doth make the regulations for the Civil Service Senior Examination set forth in the Schedule hereto; and, with the like advice and consent, doth prescribe that this Order shall come into force on the date of the publication thereof in the *New Zealand Gazette*, and that on the same date the regulations for the Civil Service Senior Examination made by Orders in Council of the twenty-fourth day of July, one thousand nine hundred and one, of the fifth day of June, one thousand nine hundred and three, of the thirty-first day of August, one thousand nine hundred and three, and of the thirtieth day of May, one thousand nine hundred and four, shall be repealed.

SCHEDULE.

1. An examination (hereinafter called the "Senior Examination") to serve all the purposes of the Senior Civil Service Examination and to meet all the requirements of sections 2 and 3 of "The Civil Service Examination Act, 1900," shall be held in the month of January in each year commencing between the fifth and the tenth days of the

month in each city or borough in which the Board of any education district has its office, and in any other places that may from year to year be appointed by the Minister of Education.

2. (a.) Every candidate must give notice in a form prescribed by the Minister of Education, and such notice must be sent so as to reach the office of the Education Department not later than the 30th day of September next before the examination, and must be accompanied by a receipt for the payment of £1 sterling to the Public Account at some branch of the Bank of New Zealand.

(b.) A candidate's notice may, however, be received between the 30th day of September and the 15th day of October if it is accompanied by a bank receipt for a late fee of £1 in addition to the receipt for the entrance fee.

3. The examination may be passed as a whole, or in sections. In the latter case the first section must consist of not less than two subjects. For every admission, whether to the whole examination or to a section of the examination, the entrance fee of £1 shall be paid.

4. As soon as possible after the Senior Examination has been held the Minister of Education shall publish a list of the successful candidates, and in the list those that, taking the whole examination at once, have passed with distinction shall be specially indicated.

5. In ~~subjects corresponding to those prescribed for~~ the Senior Examination, the examinations of any British chartered university, of any chartered institute of accountants or surveyors, the examinations of the Science and Art Department of the English Board of Education, recognised public examinations of barristers and solicitors, and examinations of any authorised medical board will be accepted, *quantum valent*, in lieu thereof.

6. Every candidate will be required to pass in the ~~two~~ ^{subject} subjects named below as constituting Group I, and also in not less than four, or, in the case of cadet engineers, not less than five, subjects to be selected, with the limitations indicated in clause 7 of these regulations, from among the subjects named as constituting Group II. Not more than five subjects from Group II may be offered by any candidate at any one examination.

GROUP I.

- | | |
|--|---------------------------------------|
| (1.) <i>Précis</i> writing and Correspondence. | (2.) English Language and Literature. |
|--|---------------------------------------|

GROUP II.

- | | |
|---|---|
| (3.) Greek. | (27.) English Constitutional History. |
| (4.) Latin. | (28.) Economics. |
| (5.) French. | (29.) Economic History. |
| (6.) German. | (30.) Commercial Geography. |
| (7.) Italian. | (31.) Jurisprudence. |
| (8.) Spanish. | (32.) Contracts. |
| (9.) Maori. | (33.) Real and Personal Property. |
| (10.) Arithmetic and Algebra. | (34.) Criminal Law and Torts. |
| (11.) Geometry and Trigonometry. | (35.) Industrial Law. |
| (12.) Mechanics and Hydrostatics. | (36.) Life and Accident Insurance Law. |
| (13.) Heat and Light. | (37.) Principles of Life Insurance. |
| (14.) Magnetism and Electricity. | (38.) Life and Accident Insurance Book-keeping. |
| (15.) Chemistry. | (39.) Elementary Actuarial Mathematics. |
| (16.) Physiography. | (40.) Statistical Method. |
| (17.) Geology. | (41.) Applied Mechanics. |
| (18.) Zoology. | (42.) Machine Construction and Drawing. |
| (19.) Botany. | (43.) Building-construction. |
| (20.) Physiology and the Structure of the Body. | (44.) Mining. |
| (21.) Hygiene. | (45.) Dairy-work. |
| (22.) General Agriculture. | (46.) Accounting. |
| (23.) Agricultural Chemistry. | (47.) Shorthand. |
| (24.) Agricultural Zoology. | |
| (25.) Agricultural Botany. | |
| (26.) General History. | |

7. The following Schedule indicates the extent to which the choice of subjects from Group II is limited in the case of candidates in the service of certain Departments. At least one of the subjects recom-

Page 1025 Gazette 1900 Vol 2

mended by any Department must be taken by candidates in the service of that Department:—

Department.	Subjects recommended.
Agriculture	22 to 25 inclusive, 45.
Customs	5 or 6, 12, 30.
Education	One of the subjects 3 to 9; 10, 11; one of the subjects 13 to 21.
Insurance	36 to 39 inclusive (two essential).
Labour	28, 29, 35.
Land and Income Tax	10, 33, 39, 46.
Mines	10, 11, 40, 44.
Old-age Pensions ..	10, 39.
Police	34, 46, 47.
Printing and Stationery	9, 39, 46, 47.
Public Trust	9 or 10, 32 or 33, 46 or 47 (32 or 33 compulsory).
Stamps and Deeds ..	32, 33, 39.
Treasury	10, 30, 46.
Post Office	5, 10, 14.
Public Works—	
For clerical cadets ..	4, 10, 30, 46.
For engineering cadets	10, 11, 12, 14, 41 (all essential).

SCOPE OF THE EXAMINATION.

8. The scope of the examination in the several subjects is here indicated more or less fully:—

GROUP I.

- (1.) *Précis-writing*, &c.—In addition to the making of *précis*, this subject shall include the reading, copying, and recasting of manuscript, writing letters from hastily written, incomplete, or merely suggestive drafts or minutes, and the making of abstracts.
- (2.) In *English Language and Literature* a candidate will be required to give evidence of a fair knowledge of the principles of English composition, and display ability to write good English. He must also possess a knowledge of certain special books, or else of certain special books together with a period of literature. The special books and the period of literature will be chosen from time to time and duly announced.

GROUP II.

- (3) to (9). In *Languages other than English* candidates will be required to show reasonable proficiency in translating from and into the language chosen; to show a knowledge of certain special books; and to answer questions in grammar arising out of the special books. In each language one or more special books will be prescribed from time to time and duly announced. At least one of the passages set for translation from the language shall be taken from a special book so prescribed, and part of the work set for translation into the language shall be based upon the vocabulary and diction of one of such prescribed special books.*

Questions may also be set to test an elementary knowledge of a period in the national or literary history, as may from time to time be specified in the announcement relating to special books.

* The provisions relating to special books shall not, until further notice, apply to Maori.

- (10.) *Arithmetic and Algebra.*—(a.) Arithmetic : Contracted and approximate methods of multiplying and dividing numbers, so as to omit all unnecessary figures ; use of rough checks, especially with regard to the position of the decimal point ; use of such expressions as 1.732×10^4 for 17320, and 1.732×10^{-3} for .001732. Meaning of a common logarithm ; use of logarithmic tables of four or five figures. Calculation of numerical values from formulæ. Working of problems in practice, interest, &c., by decimals ; use of squared paper, and application of graphical methods to arithmetical problems.

A knowledge of the arithmetic and mensuration included in the programme of the Civil Service Junior Examination will be assumed. Tables of logarithms will be supplied.

(b.) Algebra : Definitions and explanations of algebraical signs and terms ; addition, subtraction, multiplication, and division of algebraical quantities, including easy fractions and easy surds (the candidate will not be expected to show skill in the manipulation of complicated formulæ, but he may be required to ascertain accurately the numerical value of any quantity or expression given to him) ; square root ; the elementary rules of ratio and proportion ; easy equations of a degree not higher than the second, and questions producing such equations ; easy arithmetical and geometrical series ; graphs of simple algebraic functions within the limits of the foregoing work, and graphical methods of solving equations. Very easy permutations and combinations ; binomial theorem (the candidate may be expected to explain the case in which the exponent is a positive integer, but a rigid proof will not be required) ; the use of approximate formulæ, such as $(1+x)^n = 1+nx$, $(1-x)^{-1} = 1+\frac{1}{2}x$, when x is small compared with 1.

- (11.) *Geometry and Trigonometry.*—Every candidate must be provided with a ruler graduated in inches and tenths and in centimeters and millimeters, a small set-square, a protractor or scale of chords, compasses with pencil-point, and a fine pencil. Tables of logarithms will be supplied.

(a.) Geometry : Sections A and B (practical and theoretical geometry) as in the Civil Service Junior Examination, together with the following :—

SECTION C (PRACTICAL).

To draw a normal to a plane from an external point.
Projections of a point on three planes at right angles.

Determination of a point by means of its co-ordinates (x, y, z), referred to three rectangular axes and by means of its polar co-ordinates.

Projection of a straight line on a plane making a given angle with it.

Projection of a plane figure on a plane making a given angle with it.

Development of the right prism, and of the right pyramid.

Determination of the surface, the base being a regular polygon, of the right prism and right pyramid.

Volume of the prism and pyramid.

The generation of the right circular cylinder, right circular cone, and sphere by revolution.

Development of the right circular cylinder, and right circular cone ; the surface of each.

Volume of the cylinder, cone, and sphere.

SECTION D (THEORETICAL).

If a straight line is drawn parallel to one side of a triangle, the other sides are divided proportionally ; and the converse.

If two triangles are equiangular, their corresponding sides are proportional; and the converse.

If two triangles have one angle of the one equal to one angle of the other, and the sides about their equal angles proportional, the triangles are similar.

The internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the sides containing the angle, and likewise the external bisector externally.

The ratio of the areas of similar triangles is equal to the ratio of the squares on corresponding sides.

The ratio of the areas of similar polygons is equal to the ratio of the squares on corresponding sides.

In equal circles (or in the same circle) the ratio of any two angles at the centre or of any two sectors is equal to the ratio of the arcs on which they stand.

(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° , 45° , 60° , 75° , 90° , &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.

- (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.*—Candidates will be expected to show an experimental as well as a theoretical knowledge of the fundamental laws of heat and light, 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*.

Heat: Sources and nature of heat; methods of measuring energy; different kinds of energy; transformation of energy of visible motion into heat; mechanical equivalent of heat; distinction between temperature and heat; effects of heat. Thermometry; construction

of mercurial thermometers and methods of ascertaining the fixed points. Expansion of solids; determination of the coefficient of linear expansion of a solid; effects and applications of unequal expansion. Real and apparent expansion of liquids; determination of the coefficient of apparent expansion of mercury; expansion of water. Expansion of gases; determination of the coefficient of expansion of gases; the air thermometer; absolute zero of temperature deduced from air thermometer. Transmission of heat; conduction in solids and liquids; the safety-lamp; convection in liquids and gases; hot-water heating systems; ocean currents; ventilation. Laws of fusion and solidification; determination of melting-points and of the latent heat of water; effects of change of volume. Evaporation and boiling; the laws of boiling, and the causes affecting the evaporation and boiling-points of liquids; determination of boiling-points, and of the latent heat of steam. Condensation of aqueous vapour; the dew-point and its measurement; hygrometry; clouds, rain, snow, and hail. The unit of heat; capacity for heat; specific heat; methods of finding the specific heat of solids and liquids; consequences of the high specific heat of water. Reflection, refraction, transmission, and absorption of radiant energy. Newton's law of cooling.

Light: Propagation and velocity of light; pencils and rays, pinhole images; illuminating-power; intensity of light; shadows and penumbrae; eclipses; photometry. Reflection of light; irregular reflection; formation of images in a plane mirror, in parallel and in inclined-plane mirrors; the sextant; reflection of light from curved surfaces; determination of the principal foci of concave and convex spherical mirrors; real and virtual images; conjugate foci. Refraction; refractive index; total reflection; transmission of light through a plate, a prism, and a lens; convex and concave lenses; determination of the principal focus of a lens; real and virtual images; conjugate foci; geometrical methods of finding the position of a small object in front of a plane mirror or on the axis of a mirror or lens; relative sizes of an object and of its images formed by mirrors and lenses; interference, double refraction, simple plane polarisation. The telescope, the microscope, the camera; the eye as an optical instrument. Composition of light; prismatic dispersion; the spectroscope; colour.

- (14.) *Magnetism and Electricity*.—Candidates will be expected to show an experimental as well as a theoretical knowledge of the fundamental laws of magnetism and electricity, 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*.

Magnetism: Natural and artificial magnets, their parts and properties; tests of permanent magnetization; mutual action of the poles of two bar magnets of equal strength; astatic system; methods of magnetization; notion of a molecular magnet; breaking a magnetized needle; magnetization of a tube of filings; intermediate poles; effects of concussion, heat, and corrosion on a magnet; magnetic saturation; coercive force; retentivity; laws of magnetic force; unit magnet pole; the magnetic field and lines of force; magnetic influence; keepers, and their use; action of a strong magnet on a weak magnetic needle near it; intensity of field and of magnetization; magnetic moment; permeability and susceptibility; hysteresis; graphic representation of the distribution of free magnetism along a bar magnet, and of the lines of force due to a bar magnet, to a horse-shoe magnet without and with its keeper, to various groups of bar magnets, and to pieces of soft iron in the field of

a strong magnet; law of oscillations; use of the method of oscillations in comparing the force of the earth's magnetism at a place with that of a magnet at the same place, in comparing the strength of two magnets, and in examining the surface distribution along a bar magnet. Terrestrial magnetism; declination and mariner's compass; inclination and the dip-needle; determination of the magnetic meridian, and of the dip at a place; the magnetic elements of a place; comparison of horizontal forces at different places; the explanation of the behaviour of a compass-needle and of a dip-needle at various places on the earth's surface; magnetization of a steel bar under the influence of the earth's magnetism.

Statical Electricity: Two kinds of electrification, their simultaneous and equal development, and their mutual reactions; conductors and non-conductors; electrification by contact; influence of a charged body on earth-connected and on insulated bodies; "free" and "bound" electricity. Gold-leaf electroscope; the electrification of it by contact and by influence; the interpretation of its indications; the use of it in examining the seat and distribution of charges on solid and on hollow conductors of various shapes. The electrophorus and frictional electrical machines; the action of sharp points. Laws of electric action; electrostatic units; capacity; potential; the relation between the quantity of electricity and the capacity and potential of a charged sphere; surface density; energy of discharge; the use of the electroscope in examining the effects of alteration of the area of a charged body on the density of its charge, the disturbance of the distribution of the charge on a body produced by the presence of another charged body, and the electrical condition of a hollow conductor enclosing a charged insulated body; electric screens; subdivision and redistribution of charges on spheres of equal and of different radii after contact. The Leyden jar; conditions on which its capacity depends; its charge and discharge; the seat of the charge. Description and construction and principles involved in the use of electrostatic induction machines, condensers, and the quadrant electrometer.

Current Electricity: The parts of a simple voltaic cell and chemical action within it; polarisation, its cause and effects; the chief kinds of voltaic cell; conditions which a good cell should fulfil; Ohm's law, and simple applications of it; absolute and practical units; the total and the available electro-motive force in a circuit; combinations of cells to form batteries; magnetic effect of the current. Magnetic properties of a coiled conductor; Maxwell's rule; De la Rive's floating battery. The mutual action of currents upon one another and the interaction of currents and magnets. The magnetic circuit; reluctance; electro-magnets; graphic representation of lines of force due to a solenoid and to an electro-magnet. Conductance and resistance of wires; resistance of conductors in series and in parallel; shunts. Methods for the measurement of the strength of currents, electro-motive forces, resistances, and power. Principles on which these methods depend; construction and use of instruments required for their practical application. Development and distribution of heat in a circuit; Joule's law; electric lamps; thermo-electricity. Chemical effect of the current; electrolysis of water, of hydrochloric acid, of sulphate of copper, and nitrate of silver; voltameters and the use of them; electric energy and power; available and wasted power. Induction of currents. General principles of the construction and description of simple forms of continuous-current dynamos and motors.

- (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 amounts of aqueous vapour and of carbonic 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.

- (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. 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 sun-dial; 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.

N.B.—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.

(17.) *Geology*.—The general structure of the earth; mode of formation, character, and classification of the chief rocks, especially those represented in New Zealand; a knowledge of the principles upon which classification as to age is determined; a knowledge of geological phenomena and of the methods of geological research; an elementary knowledge of the chief minerals that occur in New Zealand; an elementary knowledge of the chief orders of plants and the chief orders of animals that are represented in New Zealand fossils; recognition of a well-known mineral or of a common rock from specimens or from descriptions.

(18.) *Zoology*.—(a.) Elementary general biology: The general structure and life-history of the following organisms to illustrate the biological phenomena and laws mentioned below—Hæmatococcus, spirogyra, yeast, bacteria, amœba, a ciliate infusorian, a fern (the general life-history only), a flowering plant, hydra or any hydroid polyp, frog. The general structure and physiology of the cell; the general facts of nuclear division and cell division. General structure of the simple tissues in plants and animals, arrangements of tissues into organs, and systems of organs. General phenomena of nutrition, circulation, respiration, and excretion in plants and animals. Elementary physiology of muscle and nerve. General phenomena of reproduction, sexual and asexual, in plants and animals. Principles of classification.

(b.) Zoology: The distinctive characters of the leading divisions of the animal kingdom; an elementary general knowledge of the New Zealand fauna; the

structure, life-history, and mode of life of the following types: Sea anemone, starfish, tapeworm, earthworm, crayfish, cockroach or other insect, snail, frog, fish, and rabbit. The distribution of the vertebrata; the characters and subdivisions of the zoogeographical regions; the interpretation of the facts of distribution; the recognition and classification of a well-known animal from a specimen or from a description. The simpler processes of dissecting and of preparing unstained objects for microscopical examination.

- (19.) *Botany*.—Elementary general biology as in subject (18) *Zoology*. Elementary morphology, anatomy, and physiology of plants; elementary knowledge of the structure and life-history of the bean, the pine, the liverwort (*Marchantia* or *Lunularia*), of a mould (*Mucor*); a knowledge of the chief divisions of plants and the characters of the Pteridophyta (or vascular cryptogams), and of the following orders of flowering plants—*Graminaceæ*, *Liliaceæ*, *Orchidaceæ*, *Ranunculaceæ*, *Cruciferae*, *Geraniaceæ*, *Umbelliferae*, *Myrtaceæ*, *Rosaceæ*, *Leguminosæ*, *Scrophulariaceæ*, *Compositæ*, *Coniferae*; an elementary general knowledge of the New Zealand flora; recognition and classification of a well-known plant from a specimen or from a description. The process of dissecting plants, and of preparing sections for microscopical examination (not involving the use of other than the very commonest reagents). Ability to describe a flowering plant or a fern.
- (20.) *Physiology and the Structure of the Body*.—The chief differences between animals and plants, especially as regards nutrition. The animal cell and its more important modifications. Structure of bone and of cartilage; the principal bones of the human skeleton, their arrangement and functions; structure of the principal joints. Muscles, their structure, mode of attachment, and functions, with a knowledge of the principal muscles that give form to the human body. The structure and functions of the vocal organs. The alimentary tract and the functions of alimentation. The lymphatic system. The heart, and the circulatory system in general, including the physical composition and functions of the blood. Respiration and the respiratory organs. Glands, especially those concerned in alimentation; secretion in general; excretion and excretory organs. Structure and function of the kidneys. The skin and its functions. A general knowledge of the central nervous system, with a knowledge of a few of the principal nerves and of the principal forms of nerve endings; afferent and efferent nerves; reflex action and nerve functions in general. The sympathetic nervous system. The organs of sense, especially the ear and the eye. Practical histological work will not be demanded, except in so far as the preparation, without the use of the microtome, of unstained tissue for microscopical examination is concerned. The paper will be so framed as to discover, by practical tests or otherwise, whether the candidate has actually dissected some readily available mammal, as the rabbit, dog, or sheep.
- (21.) *Hygiene*.—Composition, characters, and classification of drinking-waters. Sources of water-supply. The collection, storage, and distribution of water; constant and intermittent systems of water-service compared. Sources of contamination and protective precautions; effects of impure and insufficient supplies. Methods of filtering and purifying water; construction and action of water-filters. Composition, properties, and impurities of air; chemical and microscopical examination of air. Effects of temperature; humidity, dew, mist, rain, and snow. Quantity of fresh air required under varying conditions; air-space around and in buildings; overcrowding. Prin-

ciples and methods of ventilation; natural and artificial ventilation compared. Effects of respiration and combustion upon composition of air. Classification and relative value and digestibility of foodstuffs. General principles of diet; quantity of each class of food required; energy obtainable from food. Care and preservation of food; putrefaction and fermentation; parasites introduced in food. Method and appliances for cooking food; general composition and dietetic value of meat, fish, bread, vegetables, milk, butter, cheese, eggs, tea, coffee, cocoa, condiments, sugar, and fermented beverages; brewing. Precautions as to aspect, elevation, and drainage of building-sites; properties of materials used in construction of various parts of a building; cause and prevention of damp; floor and wall coverings; methods and appliances for heating and lighting buildings. Materials and principles of clothing for children and adults. Disposal of surface and rain water, of excreta and house-refuse; construction and laying of drains, drain-testing; effects of sewer-gas; disinfectants, antiseptics, and deodorisers. General composition and properties of soil, soil-temperature, conditions of soil affecting health, classification of soils in order of healthiness. Cleanliness, and attention to action of skin and bowels; use of soap; exercise; care of eyesight; rest, sleep. Influence of temperament, habits, idiosyncrasy, and heredity. Treatment of cuts, burns and scalds, bleeding, fits, drowning, suffocation, poisoning, bites and stings, prevention of endemic and epidemic diseases.

- (22.) *General Agriculture*.—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. What agriculture is; objects of the farmer; aid given by allied sciences. The soil: how soil is made, the contents of the soil; organic and inorganic constituents; plant-food in soil; nutrifying bacteria; classification of soils; relation of the soil to the plant; transportation of soil; examination of soils; indications determining the nature of a soil and its agricultural value; the texture of soil; causes of barrenness and of exhaustion of soil; the importance of good soil and how to obtain it. Value of drainage and irrigation; method of carrying out these operations. Importance of moisture in soil; how water is held in the soil; how the capacity for moisture in the soil may be increased; the conservation of moisture, indications that land needs draining. Tillage; its effects on soil; methods and implements for tillage. The enrichment of the soil and the object of it; farm resources, their value and management. Classification, composition, properties, and management of manures; indications determining the selection of manures; soils and crops for which manures are best suited. The plant in its relation to soil, climate, animal life and man; how the plant lives; the factors of growth; the food of plants, how and whence plants procure food; root-distribution. How plants are propagated; importance of a good seed-bed and of good seed; seed-testing; preparation and care of the seed-bed. How plants adapt themselves to, and are influenced by, their surroundings. The chief characters, management, and care of the principal crops; selection of suitable soils and situations; rotation of crops; objects of grafting and pruning; enemies of plants, preventives and remedies; intertillage of crops; eradication of weeds. Making new kinds of plants.

- (23.) *Agricultural Chemistry*.—The atmosphere, rain, dew, and their composition.

Soils: The origin, formation, and mechanical analysis of soils; the physical properties of soils; the chemical and physical properties of the constituents of soils;

the effects on soils of weathering, of vegetable and animal life, and of tillage; the oxidation of organic matter in soils; the active or available and the dormant or reserve soil-constituents; the conditions necessary for the formation of the active from the dormant constituents, or promoting this formation.

Manures: Definition of manures; the principles governing their use; the properties and composition of the chief general, artificial, and manufactured manures; fermentation.

Plants: The organic and inorganic constituents; the proportions of water and solid matter. The ash of plants; the essential, non-essential, and useful ash-constituents; differences in composition between the ash of grain and that of straw or leaf. General composition of farm crops; chemical elements in the plant obtained from the air and from the soil; chemical actions in different parts of the plant; effects of light and heat; chemical changes during germination.

Animals: Chief organic and inorganic constituents of animal bodies; ash-constituents of blood, muscle, and bone; composition of fats; the general composition and values of ordinary farm foods and their uses in the animal body. The constituents of milk, cream, butter, and cheese.

- (24.) *Agricultural Zoology.*—The chief characteristics, geographical distribution, and general conditions of existence in respect of those orders of the animal kingdom to which the animals (including those injurious to agriculture) that are of economic importance to agriculturists, belong. A knowledge of the external features, general structure, and mode of life of such animals. The means of destroying animals injurious to agriculture, or of holding them in check.
- (25.) *Agricultural Botany.*—The elementary morphology, anatomy, and physiology of plants; the functions of the members of the plant; pollination and fertilisation; formation of seed; adaptations for protection and dispersal of seed; germination and growth; storage of food; general conditions of plant-life; contention with physical environment; competition with fellows; variation. Description of gymnosperms used for timber in New Zealand, and of cryptogams that are parasitic upon higher plants and upon animals of economic value, with methods of prevention and cure. Classification of phanerogams, with special reference to those orders to which the more important trees, grasses, plants, weeds, &c., with which the agriculturist is concerned, belong. The recognition, description, reference to their orders, and uses of such trees, &c. The prevention and destruction of weeds, with a special knowledge of impurities and adulterants, and the determination of the germinating power of seeds.
- (26.) *General History.*—Candidates will be required to show a knowledge of the course and of the principal events of European history from the year 1680 to 1880, with some acquaintance with earlier circumstances that affected the character and course of after-history; also some knowledge of the history of British colonisation, and of the United States of America.
- (27.) *English Constitutional History.*—Constitutional history of England. The paper will be similar to the paper set for the B.A. examination of the New Zealand University, but it will be somewhat easier.
- (28.) *Economics.*—The general economics of the production, consumption, distribution, and exchange of wealth; problems of industrial organization; proposed remedies for low wages; co-operation; trade-unions; strikes; effects of industrial improvements; trade monopolies and combinations; overproduction; immigration;

land-tenures; land-nationalisation; land rating and taxation; international trade; free trade and protection; preferential trade; economic functions of government; State regulation of labour and labour disputes. Especial regard will be had to those features of the subjects enumerated that have a direct bearing on current problems of New Zealand life and industry.

- (29.) *Economic History*.—The outlines of the industrial and commercial development of Great Britain, the questions being mainly chosen so as to deal with the period subsequent to 1760, and to include—The effects of the introduction of machinery upon industry and trade; changes in industrial organization; the development of transport and the distribution of products; the economic effect of the Napoleonic wars; movements of foreign trade; the effects of protective tariffs upon production and distribution; trade-unionism, with especial regard to its effects in raising or lowering the standard of wages and industrial efficiency in Great Britain and New Zealand during the last half-century; the influence of the co-operative movement; the rise and growth of large companies and trusts; the growth of banking; the adoption of the gold standard; and the history of general prices.
- (30.) *Commercial Geography*.—The producing and distributing of commercial commodities, especially food and food-stuffs, raw and manufactured products, and minerals; the various facilities for trade and hindrances to trade. The paper will have special reference to Great Britain, to New Zealand, to Australia and the Pacific islands, and to America, dealing with the chief geographical and local conditions under which commodities are produced and distributed, with the chief trade routes and means of transit, with currencies, with social and political conditions affecting or likely to affect trade with New Zealand, with ports or harbours, coaling-stations, the chief post and telegraph routes, the distribution of population, of minerals, of forests, and of vegetable products; the necessary conditions of development in manufactures, agriculture, and commerce; the distribution of industries, the distribution of forests and of the main timber trees, the distribution of density of population, railway-routes and trade-lines, routes by sea to countries with which most trade is done. The candidate should also know what special inducement is offered by the Government of New Zealand to any given trade, and what exports and imports are carried on under special Government supervision or regulation.
- (31.) *Jurisprudence*.—The nature of civil law and its relations to other kinds of law; the nature of the State and its functions; the administration of justice and its various forms; the sources of law; the leading divisions of law; the leading ideas involved in a legal system; general principles of legal development; a comparison of the leading principles of English and Roman law (details of these systems are not required).
- (32), (33), and (34). The requirements in the English law subjects—*Contracts, Real and Personal Property, Criminal Law and Torts*—shall be the same as the requirements of the examination conducted by the New Zealand University for candidates for admission as solicitors. Candidates taking these subjects may be required to present themselves at that examination.
- (35.) *Industrial Law*.—The law of master and servant, with special reference to the statutory law of New Zealand, dealing with contracts for employment, age, sex, and educational standard of employees; hours and conditions of labour; payment, recovery, and protection of wages; compensation for injury, and settlement of disputes.

- (36.) *Life and Accident Insurance Law* in general, and *Life and Accident Insurance Companies Law* in New Zealand.
- (37.) *Principles of Life Insurance*.—(a.) Application of the theory of probabilities to life contingencies. The theory of annuities and assurances (including the use of commutation tables and computation of ordinary premiums). The source and characteristics of the principal mortality tables. The valuation of ordinary forms of policies.
 (b.) The general nature of insurance contracts.
 (c.) The selection of lives for insurance. (The candidates must satisfy the examiner in two at least of the three divisions (a), (b), and (c).)
- (38.) *Life and Accident Insurance Book-keeping*, with special reference to the books of the Government Insurance Department.
- (39.) *Elementary Actuarial Mathematics*.—The use of logarithms and of easy series as applied to interest, mortality tables, insurance, and annuities. Probabilities with reference to easy problems connected with life expectation, insurance, and annuities. Graphical methods applied to easy economic problems. Approximate methods of solving easy actuarial problems; limits of error in the approximations.
- (40.) *Statistical Method*.—Data and forms of returns; tabulation and other forms of reduction of data; averages, the various forms (*e.g.*, median, geometric, mean) and their respective advantages; average and type; distribution about the average, and measurement of dispersion; ascertainment of probability of given deviations; accuracy, and estimation of limits of error; proportional error in results caused by errors in original data; the use of graphical methods in statistics. The use of index numbers for the determination of changes in prices or wages. The commoner forms of statistical fallacy.
- (41), (42), and (43). *Applied Mechanics, Machine Construction and Drawing, and Building-construction*.—The Department reserves the right to hold the examination in these subjects at any time or place, or to require candidates to take the examination of the Science and Art Department, South Kensington, London, in the Second Stage, or other examinations.
- (44.) *Mining*.—On application to the Education Department a syllabus will be supplied.
- (45.) *Dairy-work*.—Before undergoing the written examination in this subject, the candidate will be required to furnish a certificate showing that he has satisfactorily completed an approved course of practical instruction in dairy-work. The examination will include the general properties of solids, liquids, and gases; solution; precipitation; emulsification; coagulation; weighing and measuring; the balance; graduated measures; specific gravity; measurement of the specific gravity of liquids; fluid-pressure; pumps and siphons; the hydrometer and lactometer; the effect of heat on liquids; evaporation and condensation; measurement of temperature; thermometers; relation between pressure and boiling-point; the unit of heat; specific heat; latent heat; refrigeration; temperature of mixtures; fermentation.
 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 and of separated milk, of buttermilk, and of cream. The uses and value of separated milk and of buttermilk. Methods of determining the fat in milk and in its products. Acidity and the estimation of acidity. Sampling. The care of milk. Influence of temperature on milk. Sterilising milk. Objections to the use of chemical preservatives. Conveyance of milk. Experimental proof that souring of

milk is due to bacterial activity. Sources of bacterial contamination. Injurious bacteria of milk. Milk in relation to disease.

Methods of raising and separating cream. The ripening of cream. Use of starters. The process of churning. Composition of butter. Washing, working, and salting butter. Bacterial faults in butter.

Rennet, how prepared; its action on milk; the determination of its strength. Composition of whey. Process of cheddar-cheese making. Ripening of cheese; the changes which occur and the agents at work.

The examination may also include practical work based on the foregoing syllabus.

- (46.) *Accounting*.—Approximate and contracted methods of calculation. Areas and volumes of rectangular figures, and other simple figures required in commerce. Metrical weights and measures. The object and value of book-keeping. Double entry, its meaning and advantages. The form, nature, and classification of accounts. The balancing and closing of accounts. The explanation of simple commercial terms, such as debit, credit, balance, profit (gross and net), interest, discount, commission, insurance, assets, liabilities, capital, bankruptcy, composition, bad debts, trial balance, company (limited and unlimited), invoice, receipt, voucher, cheque, bill of exchange. A knowledge of the transactions involved and the special terms used in connection with cheques, promissory notes, and bills of exchange. The form, use, and method of keeping the cash-book, the purchase-book or invoice-book, the sales-book or day-book, the journal, and the ledger. Journalising an easy trial balance, preparing profit-and-loss account and balance-sheet. General principles of the "columnar" system and the "index" or "card" system. The prevention, detection, and rectification of errors. The explanation of commercial terms, such as rebate, account current, account sales, depreciation, lease, assignment, bill of sale, bill of lading, freight, dock warrant, free on board, demurrage, average, brokerage, *ad valorem*, *del credere*. A knowledge of the transactions involved and the documents employed in connection with the purchase and sale of goods, with the import and export trades, with partnership accounts, consignments, adventures, and account sales. A general knowledge of the nature of capital, of debentures, stocks, and shares, and of company book-keeping.
- (47.) *Shorthand*.—Writing one hundred and thirty words a minute, and transcribing accurately into longhand. Candidates should be able to explain the principles of the system they use.

J. F. ANDREWS,
Acting Clerk of the Executive Council.

