

GOVERNMENT OF NORTHERN IRELAND

MINISTRY OF EDUCATION

JUNIOR TECHNICAL CERTIFICATE

discontinued after 1966.

AND

TECHNICAL CERTIFICATE EXAMINATIONS

RULES AND PROGRAMME



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- BIBLIOTHEK -

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PART I : RULES

General

1. The Ministry will hold Examinations leading to the award of Junior Technical Certificates and Technical Certificates to pupils who have followed approved courses in accordance with these Rules.

Definitions

2. (1) In these Rules the following expressions have the meanings hereby given to them;

"The Ministry" means the Ministry of Education for Northern Ireland;

"approved" means approved by the Ministry;

"school year" means an annual period beginning on the first day of August and ending on the thirty-first day of July following.

(2) Other expressions to which meanings have been given in the Education Act (Northern Ireland), 1947, have, for the purpose of these Rules, the meanings given to them in that Act.

Admission to the Examinations

3. (1) Junior Technical Certificate Examination:

A pupil who

(a) has been in attendance from the beginning of the school year in which the examination is held, and

(b) will have followed an approved course for at least two school years by the end of the school year in which the examination is held

at a technical intermediate school or secondary (intermediate) school may be entered as a candidate.

Provided that, upon written application by the Principal or other competent authority of the technical or secondary (intermediate) school at which the pupil is enrolled, the Ministry may admit as a candidate a pupil who does not satisfy these requirements.

(2) Technical Certificate Examination:

A pupil who

(a) has been in attendance from the beginning of the school year in which the examination is held, and

(b) will have followed an approved course for at least three school years by the end of the school year in which the examination is held

at a technical intermediate school or secondary (intermediate) school may be entered as a candidate.

Provided that, upon written application by the Principal or other competent authority of the technical or secondary (intermediate) school at which the pupil is enrolled, the Ministry may admit as a candidate a pupil who does not satisfy these requirements.

4. A pupil who satisfies the conditions in Rule 3 may be entered as a candidate for the full range of subjects or for a lesser number in either Examination.

Subjects of the Junior Technical Certificate Examination

5. (1) The subjects of the Junior Technical Certificate Examination will be as follows:-

English	Mathematics I (Arithmetic and Algebra)
French	Mathematics II (Geometry and Trigonometry)
German	Science I (General Physics, Light and Chemistry)
Irish	Science II (Mechanics, Heat, Magnetism and Electricity)
Woodwork	Drawing
Metalwork	Mechanical Drawing
Geography	

(2) Two papers will be set in English. In each of the other subjects one paper will be set.

(3) The first question in French, German and Irish will consist of a test in Dictation.

(4) The examinations in Woodwork and Metalwork will consist of practical tests only.

(5) The practical test in Metalwork will be conducted upon work submitted by candidates and made from drawings prepared by the examiner. Such work must be carried out in the school workshop and candidates should spend not more than 16 hours during any eight weeks of a ten-week period prescribed by the Ministry; the work should then be sent either to the Ministry or to the Examiner as may be directed. At the same time a Declaration, on the prescribed form, signed by the teacher responsible for the instruction must be furnished to the Ministry.

Subjects of the Technical Certificate Examination

6. (1) The subjects of the Technical Certificate Examination will be as follows:-

English	Mathematics
French	Chemistry
German	Mechanics, General Physics and Heat
Irish	Magnetism, Electricity and Light
Geography	Mechanical Drawing
Art	Workshop Practice (Wood and Metal)

(2) Two papers will be set in English and in Mathematics. The examination in Workshop Practice will consist of practical tests in Woodwork and in Metalwork, and of a written examination in either Woodwork or Metalwork, at the candidate's choice. In each of the other subjects one paper only will be set.

(3) The first question in French, German and Irish will consist of a test in Dictation.

(4) The practical test in Metalwork will be conducted upon work submitted by candidates and made from drawings prepared by the examiner. Such work must be carried out in the school workshop and candidates should spend not more than 16 hours during any eight weeks of a ten-week period prescribed by the Ministry; the work should then be sent either to the Ministry or to the Examiner as may be directed. At the same time a Declaration, on the prescribed form, signed by the teacher responsible for the instruction must be furnished to the Ministry.

Examination Marks

7. The maximum number of marks obtainable in each subject will be 400.

8. A candidate -

- (1) who obtains at least 160 marks in any subject will pass in that subject;
- (2) who obtains at least 220 marks in any subject will pass with credit in that subject;

- (3) who obtains at least 280 marks in any subject will pass with distinction in that subject.

Certificates

9. (1) The Ministry will award to each candidate who has satisfied the conditions prescribed by these Rules a Junior Technical Certificate or a Technical Certificate, as the case may be, on which will be specified each subject in which the candidate has passed and whether he has passed with credit or distinction.

(2) Save in most exceptional circumstances, a Certificate destroyed or otherwise lost will not be replaced.

10. (1) In order to qualify for the award of the Junior Technical Certificate a candidate must either -

- (a) obtain passes in each of six compulsory subjects, or
- (b) (i) obtain passes in five of the six compulsory subjects;
(ii) obtain not less than 100 marks (120 marks in the case of English) in the sixth compulsory subject; and
(iii) obtain an aggregate of at least 960 marks in English and the five compulsory subjects in which he has passed.

(2) For the purpose of this Rule the six compulsory subjects shall be chosen as follows:-

- (a) English
(b) Two of the following:-

Mathematics I	Mathematics II
Science I	Science II

- (c) Any fourth, fifth and sixth subject from the subjects listed in Rule 5(1).

11. (1) In order to qualify for the award of the Technical Certificate a candidate must either

- (a) obtain passes in each of five compulsory subjects, or
- (b) (i) obtain passes in four of the five compulsory subjects;
(ii) obtain not less than 100 marks (120 marks in the case of English) in the fifth compulsory subject; and
(iii) obtain an aggregate in the five compulsory subjects of at least 800 marks.

(2) For the purpose of this Rule the five compulsory subjects shall be chosen as follows:-

- (a) English;
(b) Mathematics;
(c) One of the following:-

Chemistry,
Mechanics, General Physics and Heat,
Magnetism, Electricity and Light;

- (d) Any fourth and fifth subject from the subjects listed in Rule 6 (1).

12. A candidate who does not qualify for the award of a Junior Technical Certificate or a Technical Certificate will be issued with a certificate specifying the subject(s) in which he has passed and whether he passed with credit or distinction.

Entries

13. (1) Entries must be made, on the prescribed forms obtainable from the Ministry, by the Principal or other competent authority of the school.

(2) Entry forms must reach the Ministry not later than 31st January in the year in which the examination is to be held and must be accompanied by the prescribed fee in respect of each candidate.

14. Where special arrangements are made for any candidate the Ministry reserves the right to charge an additional fee.

Late Applications

15. (1) The Ministry reserves the right to accept or to refuse any late application and, in the event of the acceptance of a late application to charge, in addition to the ordinary fee, a late fee in respect of each entry.

(2) Any application received after 1st March in the year in which the examination is to be held will be accepted only in special circumstances.

Refund of Fees

16. (1) The Ministry may refund the prescribed fee in respect of a candidate who withdraws before taking any part of either Examination.

(2) Any application for a refund must be made by the Principal or other competent authority of the school at which the candidate is enrolled.

(3) Any application for a refund which reaches the Ministry after 31st March will be accepted only if it is accompanied by a medical certificate testifying to the incapacity of the candidate to take the Examination for which he was entered.

(4) In no circumstances will an application for a refund be accepted which reaches the Ministry after 30th June.

(5) In the event of the refusal of any application for admission to either Examination the fee tendered will be returned.

Conduct

17. A candidate who is adjudged by the Ministry to have failed to observe any instruction given to him either by the Ministry or by an examination superintendent, or in any way to have acted unfairly or improperly during an Examination, may be excluded from subsequent Examinations and may be deprived of the marks awarded to him in all the subjects taken, or in such subjects as the Ministry may decide.

Publication of Results

18. (1) The Ministry will publish such particulars of the results of the Examinations and such other relevant information as it may think fit.

(2) Any candidate will, upon payment of an additional fee², be supplied with a certified statement of his performance, together with his marks.

J.M. BENN.

Secretary.

Ministry of Education
Dundonald House
Upper Newtownards Road
BELFAST, 4

July, 1965.

¹The prescribed fee for each of the Examinations is £2.10.0d. For a candidate who has entered for one or more subjects the fee will be 15/0d. for each subject with a maximum charge of £2.10.0d.

²The fee for a certified statement of marks is 2s. 6d.

PART II : PROGRAMME

SYLLABUSES

E N G L I S H

Junior Technical Certificate Examination

Composition including letter-writing.

Comprehension.

Usage: Spelling and punctuation; vocabulary; correct use of parts of speech with special reference to common errors.

Poetry:)

Drama:)

Prose:)

The prescribed texts will be notified annually

Technical Certificate Examination

Composition.

Letter or short factual description.

Comprehension.

Precis.

Usage: synthesis; general analysis; correct usage.

Poetry:)

Drama:)

Prose:)

The prescribed texts will be notified annually.

SCIENCE

Junior Technical Certificate Examination

General Physics

The simple pendulum and an outline of its application to time measurement.

Density and specific gravity: determination for solids and liquids using direct reading balances.

Pressure: distinction between pressure and thrust; characteristics of fluid pressure; hydraulic pressure. Pressure gauges; mercury and water manometers. Siphon. Hydraulic press and jack. Lift and force pumps. Atmospheric pressure; mercury and aneroid barometers.

Archimedes' principle: upthrust in fluids; application to density determination. Flotation; hydrometers.

Mechanics

An elementary treatment of force, weight and mass. Types of forces. Measurement of forces by extension of a spring: the spring balance.

Friction: a simple treatment of sliding friction. Lubrication.

A study of levers leading to moments, the turning effect of forces. Simple lever illustration of the principle of moments. Examples of levers. Like and unlike parallel forces. Couples. Principle of moments applied to parallel forces and couples.

Centre of gravity as centre of symmetry: experimental determination for laminae; movement of C.G. with additional load; simple treatment of stability, with applications.

A simple experimental treatment of the equilibrium of a body acted on by three forces in a plane: triangle of forces and its applications, e.g., to jib crane. Resultant; parallelogram of forces. Resolution of a force.

Work as force x distance (ft. lb.)

The lever as a machine: mechanical advantage and velocity ratio. Work done by the machine equal to work done on the machine (in absence of friction). Machines with friction: experiments with pulleys. Efficiency: applications to various machines - bicycle, wheel and axle, inclined plane. Gears as a means of changing velocity ratio.

Power: rate of doing work; horse power.

Energy: a qualitative treatment of kinetic and potential energy; conservation of energy illustrated by consideration of practical energy transformations.

Heat

Heat as a form of energy. Sources and transmission of heat: conduction, convection and radiation.

Thermal expansion of solids, liquids and gases: applications. Coefficients of linear, superficial and cubical expansion. Determination of coefficient of linear expansion.

Distinction between heat and temperature. Thermometers: comparison between centigrade and Fahrenheit scales. Heat units. Specific heat and heat capacity. Determination of specific heats of solids and liquids.

Melting, evaporation, boiling: melting and boiling points; cooling by evaporation; refrigeration. Influence of pressure on boiling point and of pressure and dissolved substances on freezing point. Anomalous expansion of water.

Light

Straight-line propagation: shadows; eclipses.

A simple introduction to reflection and refraction, including -

- (1) reflection at a plane surface: formation of image in a plane mirror; periscope;
- (2) reflection at concave and convex mirrors; centre of curvature and principle focus;
- (3) refraction at air/glass and air/liquid surfaces; real and apparent depth. Converging and diverging properties of lenses.

Dispersion of white light by a prism: spectrum; additive and subtractive colour effects.

Magnetism and Electricity

Properties of magnets; magnetisation; natural magnets; magnetic poles; lines of force shown using iron filings.

The compass: earth's magnetism.

Electric current as electron flow. Conductors and insulators.

Simple electrical circuits; resistance; practical units of current, potential difference and resistance; Ohm's law.

Magnetic effect of a current in a straight wire and in a coil.

Heating effect of a current; fuses; electric fires, etc.

Chemical effect of a current: electrolytic conductors; electroplating.

Simple treatment of electromagnetic induction: electromagnets; electric bell.

Simple cell; dry cell; secondary cells.

Chemistry

Chemistry as a study of man's use of his material environment.

Composition of the air: oxygen; air in relation to burning, rusting and respiration. Carbon dioxide. Increase in weight on oxidation: oxidation of iron, copper, magnesium.

A simple treatment of pure substances and mixtures. Elements and compounds.

Water: natural sources; filtration; distillation; water as a solvent; crystallisation.

Action of metals on water: hydrogen; synthesis of water by burning hydrogen; analysis of water by electrolysis.

The earth's crust and man's use of minerals: chalk; quicklime; slaked lime; lime water. Carbonates. Building materials: mortar.

Sulphur: sulphuric acid; sulphates.

Acids, bases and salts; salts from sea water; sodium hydroxide and sodium carbonate.

Coal and coal distillation products. Fuels. Gas and candle flames; explosion of gas/air mixtures.

Winning metals from their ores: reduction by coal gas and carbon.

Metals: a simple treatment of their proportion as reflected in their uses. Corrosion. Alloys.

Technical Certificate Examination

A fuller treatment of the work in the Junior Technical Certificate syllabus together with the following:

Mechanics, composition and resolution of co-planar forces. General conditions of equilibrium for co-planar forces. Numerical and graphical exercises.

Linear motion: velocity and acceleration; Newton's laws; equations of motion; motion under gravity. Poundal. Dyne.

Impulse. Momentum; conservation of linear momentum.

Kinetic and potential energy; conservation of energy. Work. Power. Erg. Joule.

Strength and elasticity of materials: stress-strain curves: Hooke's law: Young's modulus for a wire.

Heat

Expansion of gases. Boyle's and Charles' laws; absolute scale of temperature. Determination of coefficients of cubical expansion for liquids and gases.

Change of state: latent heat: determination of latent heats of fusion, and of vaporisation of water.

Vapour pressure and boiling point: determination of boiling points of liquids.

Relation between heat and work: mechanical equivalent of heat.

Simple treatment of thermal conductivity with application to heat insulation.

Light

Inverse square law; simple photometry; intensity of illumination.

Reflection at plane surfaces; applications. Diffused reflection; application to room lighting. Reflection from curved surfaces, cylindrical, spherical, parabolic. Radius of curvature and principal focus of concave and convex spherical mirrors; simple mirror formula; size and position of images by formula and construction.

Refraction at a plane surface; refractive index of solids and liquids. Internal reflection. Reflection through a triangular prism. Reflecting prisms and applications. Concave and convex lenses; principal focus; simple lens formula; size and position of images by formula and construction.

The eye; defects of vision; spectacles. Optical instruments: camera, projection lantern, simple (refracting) astronomical telescope.

Magnetism and Electricity

Earth's magnetic field; magnetic variation and angle of dip.

Permanent magnets and their fields. Force between poles. Magnetic screening. Introductory treatment of permeability.

Electric current; potential difference; resistance. Measurement of resistance by metre bridge and Post Office box; specific resistance; resistances in series and parallel. Galvanometers, ammeters, voltmeters. Use of potentiometer.

Heating effect of a current; temperature coefficient of resistance; resistance thermometer. Electrical energy and power; watt, kilowatt-hour. Joule's equivalent.

Electrolysis: Faraday's laws; electro-chemical equivalents. Cells: polarisation; internal resistance. Cells in series and parallel.

Electromagnetic induction; elementary treatment of induction coil, transformer, a.c. and d.c. generators and d.c. motor. Simple experiments with alternating current. Transmission of electrical energy.

Relations between electrical, mechanical and thermal units of work, power and energy. Simple calculations of the cost of using electrical appliances.

Chemistry

Quantitative nature of chemical reactions; equivalents; laws of chemical combination; simple outline of atomic and molecular theories; valency; formulae and equations; calculations on reacting quantities.

Composition of water; hard and soft waters; treatment of water for industrial and domestic use.

Nitrogen and the atmosphere; ammonia and ammonium compounds; nitric acid and nitrates.

Chlorine; hydrochloric acid; chlorides.

Sulphur; hydrogen sulphide; oxides; sulphuric acid; sulphates.

Carbon; allotropes; oxides; carbonates; fuels; calorific values.

Simple ionic theory applied to acids, bases and salts. Electro-chemical series of the common metals. Electrolytic production of sodium, aluminium and sodium hydroxide. Smelting of iron. Nature and simple properties of steel. Alloys. Corrosion of metals.

Important properties and uses of the following metals and the compounds mentioned:-

Sodium: hydroxide, carbonate, chloride.

Calcium: oxide, hydroxide, carbonate, sulphate.

Aluminium.

Iron: ferrous sulphate.

Lead: oxides.

Zinc.

Oxidation and reduction.

Neutralisation of acids and alkalis; simple experiments involving the use of normal and decinormal solutions.

M A T H E M A T I C S

Junior Technical Certificate Examination

(The order of statement in what follows is not meant to indicate an order of treatment).

Fractions, decimals, approximations and significant figures; metric system.

Averages; Unitary method, ratio and proportion; percentages.

Simple interest, compound interest and depreciation for short periods, common forms of small investment (e.g., Savings Banks and Savings Certificates).

Square root.

Mensuration of rectangle, triangle, trapezium, circle and of figures compounded of these; volume and surface area of rectangular prism, cylinder, cone and sphere.

Expression of numbers as powers of 10; the use of logarithms to calculate products, quotients, powers and roots.

Generalisation of simple arithmetical processes, algebraic notation, the rule of signs, basic algebraic processes.

Simple equations.

Construction, evaluation and transformation of formulae.

Simultaneous equations of the first degree in two unknowns.

Rules for positive integral indices, meaning of a^n when n is fractional or negative; easy exercises in indices.

Multiplication of two binomial quantities; related division.

Factors of first and second degree expressions.

Solution of quadratic equations by factors, by completion of the square, and by formula.

Arithmetic and geometric series.

Graphical representation of statistical quantities, the continuous graph, graphs of $y = ax+b$, $y = ax^2+bx+c$, $y = a/x$; determination of constants in graphs of the form $y = ax+b$, $y = ax^2+b$, $y = a/x$.

Graphical solution of algebraic equations.

Determination, by the mid-ordinate rule, of areas, volumes and mean values.

Numerical, practical and deductive exercises on the following. Proofs of the theorems and constructions marked with an asterisk should be known.

Measurement of lines and angles, use of ruler, compass, set square and protractor.

Right angle, straight angle, complete revolution.

*Equality of vertically opposite angles.

Parallel lines, properties of angles made with parallel lines by a transversal.

*Angle properties of triangle and convex polygon.

Construction of triangles from given data; congruence of triangles.

*Basic properties of isosceles and equilateral triangle.

*Construction of bisectors of lines and angles, of perpendiculars, of angle equal to a given angle and of line parallel to a given line.

*Basic properties of the parallelogram derived from the normal definition. Equality in area of triangles and parallelograms on same or equal bases and between same parallels.

*Theorem of Pythagoras.

*Bisection of chord by perpendicular from centre, converse.

*Equality of chords equidistant from centre, converse.

*Construction of the circle through 3 non collinear points.

*Property of angle at centre and angle on circumference standing on same arc.

*Equality of angles in the same segment, converse.

*Angle in a semi-circle is a right angle.

Tangent to a circle is perpendicular to the radius through the point of contact, converse.

*Construction of tangents from an external point.

*Equality of tangents from an external point.

Construction of common tangents.

*Equality of angle between tangent and chord and angle in alternate segment.

Construction of a segment of a circle containing a given angle.

Collinearity of centres and point of contact of touching circles. Locus of a moving point (i) equidistant from 2 fixed points, (ii) equidistant from 2 fixed lines, (iii) at a constant distance from a fixed point.

Sine, cosine and tangent of acute angles and of angles of any magnitude; use of trigonometric tables.

Solution of right angled triangles, solution of plane triangles using the sine and cosine rules (the ambiguous case need not be treated).

Technical Certificate Examination

(The order of statement in what follows is not meant to indicate an order of treatment).

Notion of gradient and introduction to Calculus.

Rate of change, velocity and acceleration.

Differentiation of positive, negative and fractional powers of x , of sum, product and quotient; application to maxima and minima.

Integration treated as the reverse of differentiation.

Integration between limits as a summation with application to areas.

Simpson's rule.

Simple curve sketching related to the Calculus stated above.

More difficult exercises in algebraic multiplication and division; functional notation, factorisation by the Remainder Theorem, factors for the sum and difference of two cubes, easy exercises on simplification, addition, subtraction, multiplication and division of algebraic fractions.

Expression of $\sqrt{-n}$ as $j\sqrt{n}$, application to solution of simple numerical quadratic equations.

Vector notation $r(\theta)$ and \overline{CA} ; addition and subtraction of vectors.

More difficult examples of solution of plane triangles by the sine and cosine rules, including treatment of the ambiguous case.

Simple calculations of lengths in three dimensional figures, angle between a line and a plane, angle between two planes: elementary applications to the rectangular prism, pyramid, cylinder, cone and sphere.

Basic trigonometric identities, solution of simple trigonometric equations.

Radian measure; area of sector and segment of a circle.

Further exercises in graphs with more difficult exercises in determination of constants including the constants in graphs of the type $y = ax^n$.

Graphs of simple trigonometric functions.

Numerical, practical and deductive exercises on the following.

Proofs of the theorems marked with an asterisk should be known.

*Equal intercept theorem.

*Line parallel to one side of a triangle divides the other two sides in proportion.

*Similarity of triangles.

*Rectangle properties of chords, secants and tangents of a circle.

*Ratio of areas of similar triangles.

Ratio of areas of similar polygons.

Ratio of volumes of similar three dimensional figures.

D R A W I N G

Junior Technical Certificate Examination

Representational Drawing

The elementary perspective of the square, circle, cube and cylinder. Simple objects arranged singly or in groups below eye-level. Studies of light and shade in monochrome. Studies of flowers to be used in pattern making. Figure drawing: quick sketches from the living model in every day costume.

More advanced perspective of the cube, cone and cylinder. Groups of familiar objects. Studies of light and shade in colour. Studies of natural forms for use in pattern making. Outdoor sketching. Figure drawing: portraits and full-length studies from the model; action poses.

Memory and Imaginative Drawing

Every day scenes requiring some memory drawing. Illustration of stories, poems and episodes from history. Figure scenes based on sketches from the model.

An amplification of the above, including pictorial composition based on the imaginative treatment of observed objects.

Design and Colour

Repeating border and all-over patterns on simple geometrical networks; units based on abstract, geometrical and floral forms. Counter-change pattern. The use of potato-cuts and stencils for pattern making. Simple silhouette posters. Lettering: a "sans serif" alphabet for use in poster work. Colour mixing: hues, tints and shades; complementary colour schemes applied to pattern.

Space-filling. More advanced all-over patterns; drop repeats; pictorial units. The use of linoleum blocks and stencils for pattern making. Poster and show card design. Lettering: "sans serif" forms for poster-work; script for writing short passages of prose and poetry. Colour: analogous and complementary colour schemes; the analysis of colour harmonies in flowers, butterflies, etc.

Designs and patterns should be applied to one, or more, of the following crafts:-

Fabric Printing; Embroidery; Applique; Bookbinding; Weaving; Painted decoration for pottery or wooden objects.

Technical Certificate Examination

Memory, Imaginative and Representational Drawing

These sections should be closely co-ordinated and the work should cover as wide a field as possible.

Design and Colour

The making of designs and working drawings for one of the following crafts:-

Metalwork; Woodwork; Plastics; Pottery; Fabric Printing; Embroidery; Weaving.

Lettering: Roman forms, and good modern forms for poster work, script for writing prose and poetry.

Colour: colour schemes for craft projects, interior decoration, stage scenery and costumes, etc.

Appreciation

Short illustrated talks on good design in every day things. Visits to exhibitions of Art and Craftwork. The frequent exhibition of well designed objects, or photographs of them, in the Art room.

At all stages a wide variety of materials should be provided, including paint, pencil, chalk, charcoal, cut-paper, pen and ink.

M E C H A N I C A L D R A W I N G

Junior Technical Certificate Examination

Use and care of drawing instruments.

Construction, measurement and bisection of lines and angles; division; perpendiculars and parallels.

Construction of plane rectilineal figures; regular and irregular polygons (triangle, square, pentagon, hexagon, octagon); enlargement and reduction of these using ratio of sides.

Scales: construction of plain, diagonal and proportional scales of a simple character.

The circle: elementary constructions involving a knowledge of radii, chords, secants, arcs, segments, sectors and tangents.

The ellipse: construction by trammel and by projection from auxiliary circles.

Solids: sections and simple orthographic projections in plan and elevation of regular solids (cube, cylinder and the simpler types of prisms and pyramids); complete developments of surfaces of these solids and of the cone.

Plane figures: further cases of the construction of regular and irregular polygons.

The circle: lengths of arcs, constructions involving tangency with lines and other circles; construction of common tangents, compound curves composed of tangential arcs; spirals.

Loci: construction of the ellipse and parabola; elementary properties arising from definitions of these curves. Simple mechanisms and link motions.

Points and lines in space: true length, inclination of line to orthogonal co-ordinate planes.

Solids: orthographic projection, auxiliary views, sections, true shapes; developments of complete, or incomplete, surfaces.

Interpenetration of surfaces: curves of interpenetration for simple regular solids (excluding the cone and sphere) with axes meeting at right angles.

Isometric and pictorial (oblique) projection, conventional representation; hand sketching of simple machine parts.

Technical Certificate Examination

More advanced work on the foregoing; further cases of interpenetration of surfaces and consequent developments; curves (cycloid, involute, helix, spiral); loci (curves traced by points on simple moving mechanisms).

Points and lines in space: determination, from orthographic projections, of the true shape of plane rectilineal figures with three or four sides.

Introduction to trade drawing: recommendations of British Standards Institution; dimensioned drawings of simple workshop details and machine parts, materials used in construction; hand sketching; preparation of tracings.

WOODWORK

Junior Technical Certificate Examination

Exercises involving the accurate use of the common tools.

Simple models in soft wood exemplifying the use of the following joints:- butt, glued, nailed and screwed; housing; halving; mortice and tenon.

More difficult examples of the foregoing joints; common dovetailing.

Curved work involving the use of the bow saw, spokeshave and gauge.

Models requiring the interpretation of working drawings and increased accuracy in craftsmanship and testing ability to work in hard woods.

Technical Certificate Examination

(Practical)

More difficult models in soft and hard woods exemplifying the constructions used in frames, boxes, tables and cabinets, and involving the use of four or more pieces of wood.

(Theory)

The growth of a tree, difference between hard and soft woods, cross section of a tree.

Conversion of logs into planks and boards.

Basic methods of seasoning timber by natural and artificial processes.

The following defects and diseases in timber: shakes, dry rot, wet rot.

Varieties and uses of plywood, blockboard and laminated board.

Preparation of animal glue for use in the workshop. Sizes and uses of oval and round nails, panel pins, brass and steel screws, glasspaper, ordering, making of sample orders.

Ability to recognise and state the use of the following bench tools; jack plane, smoothing plane, rebate plane, plough plane, router, spokeshave, rip saw, cross-cut saw, panel saw, tenon saw, bow saw, coping saw, mortice chisel, firmer and bevelled edge chisels, gouges, try square, marking knife, brace and bits, sliding bevel, marking gauge, mortice gauge, pincers, bradawl, screwdriver, hand-drill, "G" cramps, sash cramps, hammers, mallet.

Basic methods of joining used in the construction of frames, boxes, stools and small tables - t.e. gluing, nailing, screwing, housing, halving, mortice and tenon, through dovetailing, lap dovetailing, dowelled jointing.

Surface preparation by the use of scraper and glasspaper. Finishing with wax polish or paint.

M E T A L W O R K

Junior Technical Certificate Examination

Filing straight and curved edges; testing work. Marking out work.

Drilling; types of machine; safe method of holding work.

Thread forming, using taps and dies.

Bending, simple fitting and general vice work.

Joining of metals by nuts, bolts and screws; simple locking devices; rivets (and rivet sets), countersinking.

Soldering fluxes, soft solders and soldering bits; preparation of work; running seams, filling holes, sweated joints.

Brazing fluxes, hard solders; blowpipe applied to construction of non-ferrous articles of straightforward type.

Forging: Types of tools; the forge and its operation, correct heating of work; drawing down, bending, twisting.

Heat Treatment: Annealing, tempering, hardening - meaning of terms and elementary applications.

Turning: Brief description of centre lathe and tools used; preparation of materials for lathe; plain parallel turning between centres; use of 3-jaw chuck.

Measuring and testing instruments: Use of scribing block, surface gauge, surface plate, calipers, micrometer, screw gauge and vernier gauge.

Technical Certificate Examination

All of the work in the Junior Technical Certificate Syllabus together with the following:-

(Practical)

Filing, clipping, scraping: more difficult exercises leading to the fitting of mating parts; marking out work for machining; measuring and testing of work.

Brazing: More difficult exercises than in previous course; planishing and polishing of non-ferrous work.

Metal Spinning and beating: Tools and formers required; simple exercises in copper, brass or gilding metal; effect of operation on material. Bending strip material to shape; hollowing; raising.

Forging: More advanced exercises based on previous operations; flattening and upsetting; simple weld.

Lathe Work: Cutting action of tools, tool angles; feeds and speeds. Parallel and non-parallel (or taper) turning between centres; drilling and boring; screw cutting; use of 4-jaw chuck.

Moulding: the elements of simple moulding using metals and alloys of low melting point.

Shaping and Milling: Use of shaping and milling machines (where these are installed) for elementary exercises (including roughing and finishing to caliper sizes all sides of a plain rectangular block; squaring shoulders).

As the course progresses a greater degree of skill, accuracy and finish should be expected in the exercises attempted by the pupil. The exercises should be of a more advanced character and, although fewer in number, should be of a more composite type.

(Theory)

The properties and general characteristics of iron, steel, aluminium, copper, brass, bronze, gilding metal, lead, zinc and their general uses in the workshop.

Soft and hard solders, fluxes.
Lubricants, cutting fluids.

Care and use of rule, square, calipers, compasses, dividers, bevel, files, chisels, hammers, mallets, saws, gauges (depth, surface, wire and sheet), micrometer, punches, spanners, snips, stakes, seam and rivet sets, folding bars, drills, soldering equipment, stocks and dies, vices (hand, bench and machine), tool cramps, pliers.

Essential features of lathe, shaper, drilling machine and use of associated tools; smith's hearth, anvil, and tools.

Application of the following processes to the production of work: setting out, sawing, chiselling, filing, drilling, riveting, tapping, screwing, folding, seaming, wiring, piercing, raising, hollowing, planishing, soldering, brazing, forging, heat treatment, lathe work.

Simple decorative treatments and appropriate finishes.

Safety precautions.

G E O G R A P H Y

Junior Technical Certificate Examination

An outline treatment of World Geography.

Physical Geography - an elementary knowledge of the simple facts of physical geography -

The shape and size of the earth; latitude and longitude. Movements of the earth; the seasons; day and night.

The distribution of land and sea.

Land forms and the agencies modifying them.

Maps (including contour and O.S. maps) their meaning and their uses.

Factors which determine climate; wind belts; ocean currents.

Climatic types; vegetation belts in relation to climate.

Human geography - a general description of each great vegetation zone as a unit:-

Its relief and climate.

Its products, natural and cultivated in relation to the controlling physical features.

The geography of the British Isles in detail.

Technical Certificate Examination

Revision of the Junior Technical Certificate syllabus.

The Geography of the British Commonwealth and Empire, of South Africa, and of either Europe or the United States of America. The study should include:-

position;

structure and surface features;

climate and natural vegetation;

agriculture with special reference to the raw materials of commerce;

industries, trade and communications;

great cities and towns, their industries and occupations.

MODERN LANGUAGES

(French, German, Irish)

Junior Technical Certificate and Technical Certificate Examinations

There are no prescribed syllabuses in Modern Languages. The notes given below should assist teachers to draw up their own syllabuses.

NOTES

The following conditions need to be present if a student is to derive any real benefit from the study of a modern language:-

- (a) he must have an adequate knowledge of English, including an understanding of its elementary structure, accidence, syntax and grammatical terminology;
- (b) he must have some aptitude for language study and the necessary interest and will to learn; and
- (c) sufficient time must be devoted to the subject. (5 weekly lessons of 40 minutes are the normal requirement).

If any one of these conditions is lacking the student should be strongly dissuaded from taking up the study of a modern language.

1. Aims of the Course

The aims of the course should be to enable the pupil:

- (1) to understand simple conversations in the foreign language;
- (2) to express himself in speech in the foreign language, with an acceptable pronunciation, on everyday topics;
- (3) to read with understanding straightforward continuous prose in the foreign language;
- (4) to express himself in writing in the foreign language on easy topics;
- (5) to acquire some knowledge of the civilisation of the country whose language he is studying; and
- (6) to acquire a surer appreciation of the value of words and a more effective knowledge of his own language.

2. Its Attainment

The most that can reasonably be attempted in a short course is the laying of a firm foundation of knowledge of vocabulary, idiom and grammar, and the basis of a fair degree of oral proficiency. In view of the academic nature of the examination for which most of the pupils will be striving it is desirable that the acquisition of knowledge of grammar and syntax should keep pace with that of vocabulary and idiom. The teaching of grammar in isolation should, however, be avoided. Instead it should be related to the spoken phrase or to the continuous text being studied.

The work in the classroom should as a rule consist partly of oral, partly of written practice, a judicious balance being maintained between these two aspects of the language. In most cases it will be found advisable to use a 'Compromise' method, grammatical and other difficulties being explained in English and after this the foreign language used to the fullest possible extent as the medium of expression.

Regular use should be made of the oral method of 'question and answer' so that the pupils may acquire proficiency in the active use of the language. Careful instruction in the foreign sounds will be needed. The repetition in unison and singly of 'pronunciation and intonation exercises', suitably related to the text of the lesson, will help towards the acquisition of oral fluency and correctness.

As a general rule it will be found advisable to base written exercises on matter previously dealt with orally. They might frequently take the form of simple free composition within the framework of the pupils' active vocabulary and grammatical knowledge. The critical comparison of the two modes of expression, the foreign and the English, will help to strengthen the pupils' knowledge of both languages.

It is suggested that the teaching should not be based too closely on any manual or text and that the pupils should be enabled to read a wide selection of easy story-readers.

In conclusion it is urged that the cultural side of the language study should not be overlooked and that every possible opportunity should be taken to familiarise the pupils with different aspects of the life and civilisation of the country whose language they are learning.