

WEST AFRICAN SENIOR SCHOOL CERTIFICATE EXAMINATION
WOODWORK

PREAMBLE

The course in woodwork at the Senior Secondary School Level is to enable students gain knowledge in the art and craft of woodworking, and provide them with basic and necessary skills for technological growth. The knowledge to be acquired at this level is fundamental and will act as an avenue for continued growth during and after school.

It is intended to give candidates the opportunity to display detailed knowledge of, and skills in

- (a) technical drawing and designing;
- (b) practical work;
- (c) methods and principles of construction.

AIMS/OBJECTIVES

Candidates are expected to demonstrate

- (a) creative ability, mental and practical skills in the use of hand and machine tools for construction of basic items in wood and related materials;
- (b) a good basic knowledge of design and reading of working drawings;
- (c) the ability to plan and follow a sequence of work operations which are necessary to lead to successful completion of projects;
- (d) functional skills capable of providing a means of livelihood in woodworking;
- (e) awareness of problems relating to wood and the wood industry.

STRUCTURE AND SCHEME OF EXAMINATION

There shall be three (3) papers, all of which must be taken.

PAPER 1 : shall be a practical test of 3 hours
Candidates will be required to make a test piece for which the appropriate drawings will be supplied. Fifteen minutes will be allowed immediately prior to the examination for candidates to study the question paper. This paper will carry 100 marks.

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PAPER 2 : shall be a Drawing and Design test of 2 hours
It will be a simple planning problem in which candidates will be required to work from any of the following: Pictorial sketch, description/specification. Measurements will be in S.I. Units only.
The paper will carry 100 marks.

PAPER 3 : shall be a theory paper of **two** (2) sections (A and B) for 2 hours.

Section A: shall comprise 40 multiple choice questions to be answered in 1 hour for 40 marks.

Section B: shall comprise **four** (4) structured questions out of which any **three** (3) must be answered in 1 hour for 60 marks.

CONTINUOUS ASSESSMENT

A continuous assessment is required for each school, but the finished projects must be left undestroyed for at least six months after the release of results. It is recommended that at least three specific projects be prepared during the course by each candidate.

DETAILED SYLLABUS

Practical

1. The practical activities would require the use of
 - (a) common hand tools;
 - (b) portable power tools and basic woodworking machines;
 - (c) different joints and shapes;
 - (d) nails, screws and other means of fastenings.

2. Candidates will be required to work from dimensioned sketches, written descriptions or scaled drawings. They are expected to be able to construct the following joints:
 - (a) widening joints – e.g. simple butt, dowelled, tongue and grooved, rebated.

 - (b) Angle joints
 - (i) for box-like construction, e.g. common and lapped dovetail, pin joints;
 - (ii) for shelf-like construction, e.g. housing joints, pinned joints.

 - (c) Framing joints – e.g. mortice and tenon, bridle and lapped joints.
Candidates will also be expected to be able to perform the following operations:
 - (i) shaping – e.g. chamfering, rounding and tapering;
 - (ii) assembling and finishing – e.g. testing for squareness, parallelism, use of diagonals, trial assembly, cramping method, preparation of surfaces and application of finishes.

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THEORY

1. **General Safety precautions:**

- (a) Personal safety - clothing/habits.
- (b) Workshop safety - hand tools, machine tools, fire, lighting, ventilation, environment and electrical.
- (d) Safety equipment and administration of First Aid.

2. **Tools**

2.1 Hand tools – identification and features, sharpening, maintenance, storage, safety and uses of the following:

- (a) measuring tools e.g. rule, calipers;
- (b) cutting and shaping tools e.g. saws, planes, chisels, spokeshaves;
- (c) abrasion and scraping e.g. files, scrapers, abrasive papers;
- (d) boring e.g. braces, bits, drills, gimlet, bradawls;
- (e) percussion and impelling e.g. hammers, screwdrivers, mallet;
- (f) holding and supporting e.g. cramps, cutting-board, vices, pincers.

2.2 Portable power tools – safety, care and uses of the following:

- (a) Planes: power hand planer, router planer;
- (b) Saws: jig saw, portable power saw;
- (c) Sanders: orbital sander, belt sander, drum sander, disc sander;
- (d) Hand drill;
- (e) Spray gun.

2.3 Special Purpose hand tools – types, uses and safety precautions of:

- (a) Planes e.g. plough plane, compass plane, router plane, shoulder plane, block plane, rebate plane, bullnose plane, spokeshave.
- (b) Saws e.g. coping saw, fret saw, bow saw, compass saw, pad saw, junior hacksaw;
- (c) Boring bits e.g. expansion bit, forstner bit, countersink bit, auger bit.
- (d) Shapers e.g. scrapers, rasps, surform.

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3. **Woodworking Machines**

- 3.1 Uses of guards, jigs, fences, push sticks, push blocks, gauges.
- 3.2 Safety precautions and operational techniques as applied to the following machines:
- (a) Maintenance e.g. grinding wheel;
 - (b) Sawing e.g. circular saw bench, cross-cut saw, bandsaw;
 - (c) Planing e.g. surfacer or jointer, thicknesser;
 - (d) Morticing e.g. chain and chisels, horizontal borer;
 - (e) Shaping e.g. lathe, spindle moulder, drum sander, jig saw, router;
 - (f) Boring e.g. drill press.

4. **Materials**

4.1 Timber

- (a) Classification – hard and soft woods
- (b) Growth
 - (i) height, girth;
 - (ii) food (absorbed from soil);
 - (iii) parts (cross and longitudinal sections).
- (c) Surface quality of timber
 - (i) grain;
 - (ii) texture;
 - (iii) figure;
 - (iv) colour.
- (d) Mechanical properties: - hardness, strength (tensile, compressive and shear), elasticity and toughness.
- (e) Conversion – (methods):
 - (i) plain/through and through/live sawing;
 - (ii) tangential/back/flat/rake sawing;
 - (iii) quarter/radial/rift sawing.
- (f) Marketable sizes:
log, board, plank, strip, batten, square, scantling, flooring board and flooring blocks.

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- (g) Seasoning:
 - (i) natural or open air seasoning;
 - (ii) artificial or kiln seasoning;
 - (iii) water seasoning;
 - (iv) chemical seasoning.

- (h) Determination of moisture content:
 - (i) oven dry method;
 - (ii) moisture meter method.

- (i) Wood Preservation:
 - (i) reasons for preserving timber;
 - (ii) types of preservatives – tar oil, water borne, organic solvent;
 - (iii) qualities of an ideal preservative;
 - (iv) method of application:
 - pressure treatment (full cell and empty cell);
 - non-pressure treatment (spraying, impregnation, brushing, dipping, hot and cold treatment, steeping).

- (j) Defects in Timber:
 - (i) natural defects e.g. knots, burr, grains;
 - (ii) defects caused by organisms, e.g. rots, bores;
 - (iii) wood processing, defects e.g. diagonal grain, upset, compression shakes.
 - (iv) seasoning defects e.g. splits, warp, shakes, honeycombing, case hardening.

- (k) West African Timbers:
Characteristics, uses and working qualities of iroko (Odum), abura, mahogany, obeche (wawa), walnut, afara, ebony, danta, emery, shedua, mansonina, cedar, afromosia (kokrodua), avodire, kusia.

- (l) Veneer:
 - (i) Method of production: rotary, slicing, half-slicing;
 - (ii) Types: face, core and back veneers.

- (m) Manufactured board: types and uses.
 - plywood, block board, lamin board, chip or particle board, batten board, hard board, fibre board.

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4.2 Surface Decoration: Methods

- Inlaying, veneering, marquetry, laminated plastics, edging (hardwood, plastics, metals), mouldings, incised and relief carving.

4.3 Non-wood Materials: Types and uses

(a) Nails

- (i) French or wire nails, oval wire nails, lost-head nails.

(b) Screws

- (i) countersunk head, raised head, round head, Philips' head.

(c) Plastics

- (i) fibre glass, thermo-setting, thermoplastic.

(d) Glass

- (i) opaque, transparent and decorative glasses.

(e) Leather

- (i) natural and artificial leather.

(f) Abrasives

- (i) selection and uses of glasspaper and garnet paper.

(g) Fittings

- (i) locks, hinges, bolts including catches, castors, stays.

4.3.1 Adhesives

(a) Types

- (i) Protein e.g. animal, casein;
- (ii) Synthetics e.g. urea, phenol, melamine formaldehyde;
- (iii) Contact e.g. rubber based (EVOSTICK)

(b) Characteristics, preparation and application, uses.

5. **Finishing and Finishes**

- (a) Finishing – various surface preparation (e.g. planing, scraping, sanding), filling, staining, bleaching, spraying and polishing.

- (b) Finishing materials: Preparation and application of the following:

(i) fillers;

(ii) stains;

(iii) finishes (paints, varnishes, lacquers, polishes, laminated plastics).

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- (c) Properties – oxidation and evaporation;
- (d) Application – manual and mechanical;
- (e) Safety precautions.

6. **Shaping and Wood Bending**

Types and application:

- (i) solid and laminated;
- (ii) saw kerf, curve cutting, bending laminated wood with the aid of formers.

7. **Woodwork Joints**

Classification, construction and uses:

- (a) angle joints - mortice and tenon, dowel, dovetails, housing, halving.
- (b) widening joints - dowel, tongue and groove, loose tongue, rebated butt.
- (c) framing joints - mortice and tenon, bridle, mitre, dowelled.

8. **Upholstery**

- (a) Tools e.g. tack hammer, strainer, curved and straight needle, tack remover, stapler, sawing machine.
- (b) Materials e.g. twine or cord, thread, spring, jute, hessian or baft, foam, webbing, fabric, natural and artificial leathers, feathers, tack nails, stud, cotton.
- (c) Upholstery parts e.g. frame, platform, stuffing/padding, covering.

9. **Design and Drawing**

- (a) Factors affecting design: fitness for purpose, proportion, suitability, finishing aesthetics, cost;
- (b) Freehand sketching of designs;
- (c) Preparation of working drawings;
- (d) Preparation of cutting list, estimating and costing of materials;
- (e) Design projects e.g. stools, chairs, tables, shelves, cabinets, cupboards, trays, racks.
- (f) Geometrical construction – lines, angles, triangles, polygons, ellipses, circles, principles of tangency.

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10. **Mensuration**

Estimation, calculations involving linear, area, volume, percentage.

11. **Wood Turning**

- (a) The Lathe – parts and accessories;
- (b) Wood turning tools – gauges, chisels;
- (c) Turning operations – face plate turning, between centres turning, boring;
- (d) Projects – e.g. vase, cup, egg holder, bowl, table stand, candle holder, decorative moulding, police baton.

12. **Mass Production**

Procedure only:

- (i) Design;
- (ii) Template;
- (iii) Prototype;
- (iv) Quality control;
- (v) Jigs and fixtures;
- (vi) Produced parts – division of labour;
- (vii) Trial run;
- (viii) Assembly line;
- (ix) Go, no-go gauges.

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RECOMMENDED TEXTBOOKS

AUTHOR	TITLE	PUBLISHER
J. A. Walton	Woodwork in theory and practice(metric edition)	Australasian Publishing Company (London)
D. M. Shaw	Woodwork Design and Practice	Hodder and Stoughton, London
H. E. King	General Certificate Woodwork (3 rd edition)	Harrap, London
D. N. Willacy	Woodwork Book 1 and 2	Nelson, Lagos
Nurudeen et all	Fundamentals of woodworking	Evans, Lagos
G. W. Brazier and N. A. Harris	Woodwork	Bungay, Richard Clay
J. Fierre and G. Hutchings	Advanced Woodworking and Furniture Making	
CESAC	Woodwork for Senior Secondary School	
J.N.K. Sackey G. Manu and R.Y. Baafi	Woodwork for Senior Secondary School	Macmillan
Rom Pettit	Woodwork Made Simple	W.H. Allen and Co. Ltd. London
John Strefford Guy McMurdo	Woodwork Technology	Schofield and Sims Ltd.
E. J. Wynter	Woodwork	Longman

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LIST OF TOOLS AND EQUIPMENT FOR WOODWORK WORKSHOP

GEOMETRICAL TOOLS

Pencil, Tape rule, (Metric), try-square, marking gauge, Pencil gauge, cutting gauge, pair of compasses, sliding bevel, spirit level, winding strips.

CUTTING TOOLS

Pairing

- (i) chisel (various types and sizes), gauges.
- (ii) planes: jack plane, smoothing plane, block plane, spokeshaves, plough plane, shoulder plane, rebate plane, bullnose plane.
- (iii) saws: rip saw, crosscut saw, panel saw, coping saw, tenon saw, dovetail saw, back saw, nest of saws, bow saw.

Boring Tools : Brace bits (various types and sizes), gimlet, bradawl, drills.

Percussion and Impelling Tools: Hammers (various weights), mallets, punches, screwdrivers, pincers.

Holding and Supporting Tools: Bench vice, sashcramps, G-cramps, F-cramps, bench holdfast.

Scraping Tools: Files, rasps, hand scrapers, surforms.

Grinding Tools : Sets of turning chisels, calipers.

Finishing : Brushes, spray gun, wire brush.

Portable Power Tools : Compressor, drills, sanders, jig saw, router.

Machines : Cross-cut saw, circular saw, surfacer, thicknesser, bandsaw, lathe, grinding wheel, drill press, mortisers, spindle moulder.