

## **WOODWORK**

### **1. PREAMBLE**

The course in Woodwork at the Senior High School level is to enable candidates gain knowledge in the art and craft of woodworking and provide them with basic and necessary skills for technological growth. At this level, the knowledge to be acquired will act as an avenue for further growth during and after school.

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

- (1) technical drawing and designing;
- (2) practical work;
- (3) methods and principles of construction;
- (4) quality control, estimation and costing.

### **2. AIMS**

Candidates are expected to demonstrate

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

### **3. ASSESSMENT OBJECTIVES**

- (1) Candidates should be able to demonstrate knowledge and understanding of:
  - (a) terminologies used in woodwork;
  - (b) materials used in woodwork;
  - (c) care and maintenance of hand tools and machines;
  - (d) safety precautions at the workshop; (e) principles of designing and drawing;

- (f) methods and principles of construction.
- (2) Candidates should be able to demonstrate the ability to
- (a) follow a given design brief to produce working drawings;
  - (b) interpret working drawings;
  - (c) use tools, equipment and materials to carry out practical operations in sequential order;
  - (d) prepare surfaces and apply appropriate finishes.
- (3) Candidates should be able to:
- (a) compare features of different items and make comments or judgment, contrast, justify, support or criticize a job;
  - (b) write appraisal report on artefacts.

#### 4. **STRUCTURE AND SCHEME OF EXAMINATION**

There will be three papers, papers 1, 2 and 3 all of which must be taken. Papers 1 and 2 will composite paper to be taken at a sitting.

**PAPER 1:** will consist of forty multiple-choice objective questions all of which must be answered within 40 minutes for 40 marks.

**PAPER 2:** will consist of theory and design paper of two sections, Sections A and B to be taken within 2hours 20 minutes.

Section A will be short structured questions in three parts. Parts I, II and III as follows:

- Part I will be for candidates in Ghana only.
- Part II will be for candidates in Nigeria, Sierra Leone and The Gambia.
- Part III will be for all candidates. It will comprise of two questions out of which all candidates will be required to answer one.

Section B: shall comprise design and drawing questions, all of which must be answered within 1 hour 40 minutes for 40 marks.

**PAPER 3:** will be a practical test lasting 3 hours. Candidates will be required to make a test piece for which the appropriate drawings will be supplied. It will carry 100 marks.

## 5. DETAILED SYLLABUS

### A. PRACTICAL

1. The practical activities would require the use of common hand tools;
  1. common hand tools;
  2. portable power tools and basic woodworking machines;
  3. different joints and shapes;
  4. nails, screws and other fasteners and fittings;
  5. solid wood, manufactured boards and non-wood materials.
2. Candidates will be required to work from dimensioned sketches, written descriptions or working drawings. They are expected to be able to construct the following joints:
  - (a) Widening joints – e.g. plain/simple butt, dowelled, tongued and grooved, rebated butt.
  - (b) Angle joints
    - (i) box-like construction, e.g. common and lapped dovetail, pin joints.
    - (ii) Shelf-like construction, e.g. housing joints, pinned joints, dowelled, plain mitre.
  - (c) Framing joints – e.g. mortise and tenon, bridle and lapped joints, mitre, dowelled.

Candidates will also be expected to be able to perform the following operations:

- (i) cutting – e.g. ripping, cross-cutting;
- (ii) planing – e.g. surfacing, thicknessing;
- (iii) shaping – e.g. chamfering, rounding and tapering;

- (iv) assembling and finishing – e.g. testing for squareness, parallelism, use of diagonals, trial assembly, cramping methods, preparation of surfaces and application of finishes.

**B. THEORY**

S/NO.	TOPIC	CONTENT	NOTES
1.	General Workshop Safety	(a) Personal safety precautions. (b) General Workshop safety regulations. (c) Safety devices and appliances. (d) Hand tool safety.  (e) Machine safety: (i) General machine shop safety; (ii) Safety precautions in the use of portable power tools and machines; (iii) Safety in machines operations; (iv) Prevention of mechanical faults. (f) First aid.	Types and uses  Safety precautions in carrying, storing, and handling hand tools.  Materials and administration.

2.	Hand tools	(a) Types  (b) Classification: geometrical, holding and supporting, impelling and percussion, cutting, boring, abrading and scraping tools.	To include identification, description and sketching.
3.	Special Purpose Hand tools.	Types and uses: <ul style="list-style-type: none"> <li>• Planes: spokeshaves rebate Plane, Plough plane, block plane, shoulder plane etc.</li> <li>• Saws: bow saw, pad/keyhole saw, coping saw, fret saw.</li> <li>• Boring bit: expansion bit, forstner bit, countersink bit, auger</li> </ul>	To include identification, description and sketching.

		bit, etc.  • Shapers: scrapers, rasps, surforms, etc.	
<b>S/NO.</b>	<b>TOPIC</b>	<b>CONTENT</b>	<b>NOTES</b>
4.	Portable Power tools.	(a) Types: Power drill, jig saw, spray gun, screw driver, sanders, router, power circular saw, etc.  (b) Uses.	To include identification, description, care and safe use.

5.	Woodworking machines.	<p>(a) Types: Circular saw, crosscut saw, thicknesser, surface planer, mortiser, lathe, grinding wheel, drilling machine, etc.</p> <p>(b) Uses.</p> <p>(c) Safety Precautions.</p>	<p>To include identification, description, care and safe use.</p> <p>To include the use of guards, fences, push sticks, push blocks, gauges etc.</p>
6.	Maintenance	<p>(a) Types: corrective, routine, predictive and preventive.</p> <p>(b) Reasons for maintenance</p> <p>(c) Maintenance of hand tools.</p> <p>(d) Maintenance of machines.</p>	<p>To include maintenance activities, materials and tools.</p> <p>To include oiling, sharpening, repairing, storing etc.</p> <p>To include cleaning, oiling, servicing, replacing parts etc.</p>
7.	West African Timbers in common use.	<p>(a) Timber growth and structure.</p> <p>(b) Common West African Timbers e.g. Iroko (Odum), abura, mahogany, obeche (Wawa), African walnut, afara, ebony, danta, emery, shedua, mansonia, cedar, afromosia (kokrodua), avodire, kusia.</p>	<p>Structure to include classification, e.g. soft/hardwoods. Parts and their functions</p>

		<p>(c) Characteristics.</p> <p>(d) Uses</p>	<p>Surface, working and mechanical qualities, similarities and differences. Specific uses.</p>
<b>S/NO.</b>	<b>TOPIC</b>	<b>CONTENT</b>	<b>NOTES</b>

8.	Timber Conversion	<p>(a) Explanation.</p> <p>(b) Conversion methods:                      (i) plain/through and through/live sawing;                      (ii) Tangential/back/flat/rake sawing                      (iii) Quarter/radial/rift sawing;</p> <p>(c) Common market sizes: log, plank, scantling, board, batten, strip/lath, squares.</p>	<p>Characteristics, advantages and disadvantages of each method.</p> <p>Including, identification description and uses.</p>
9.	Timber seasoning	<p>(a) Explanation.</p> <p>(b) Reasons for seasoning</p> <p>(c) Methods of seasoning: Natural/open air , artificial/kiln, water and chemical seasoning.</p> <p>(d) Determination of moisture content: (i) moisture meter method;                      (ii) oven dry method.</p>	<p>Advantages and disadvantages of each method.</p> <p>Advantages and disadvantages of each method.                      Calculation of percentage moisture content.</p>

10.	Timber defects	<p>(a) Explanation of timber defect.</p> <p>(b) Types of defects</p> <p>(i) natural growth defects;</p> <p>(ii) felling defects;</p> <p>(iii) conversion defects;</p> <p>(iv) seasoning defects; (v) defects caused by Organisms.</p>	Causes, prevention, remedies, description and sketching.
<b>S/NO.</b>	<b>TOPIC</b>	<b>CONTENT</b>	<b>NOTES</b>
11.	Timber preservation	<p>(a) Reasons for preserving timber.</p> <p>(b) Common timber preservatives</p> <p>(c) Properties of a good timber preservative (d) Methods of applying timber preservatives: brushing, dipping, spraying etc.</p>	<p>To include specific uses.</p> <p>Advantages and disadvantages of each method.</p>
12.	Manufactured boards	<p>(i) types;</p> <p>(ii) structure; (iii) characteristics (iv) uses.</p>	<p>To include description and uses.</p> <p>Advantages and disadvantages of each type.</p>
13.	Timber Preparation	<p>(a) Selection of tools and machines</p> <p>(b) Operational sequence:</p> <p>(i) hand preparation;</p> <p>(ii) machine preparation.</p>	To include practical preparation of stock.



14.	Woodwork joints	<p>Classification:</p> <p>(i) widening joints: simple butt, dowel, tongued and grooved, loose tongue, rebated butt etc.</p> <p>(ii) angle joints: mortise and tenon, dowelled butt, dovetails, housing,</p>	To include identification, description, sketching, construction, specific use etc.
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		<p>halving etc.</p> <p>(iii) framing joints: mortise and tenon, bridle, plain mitre, dowelled butt, halving etc.</p>	
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15.	Wood finishes and finishing.	<p>Wood finishes:</p> <p>(i) types: fillers, stains, paints, varnishes, lacquers, polishes etc. (ii) application of finishes:</p> <ul style="list-style-type: none"> <li>- surface preparation;</li> <li>- tools;</li> <li>- methods: brushing, spraying, dipping, etc.</li> </ul>	<p>To include:</p> <p>(i) properties, characteristics and uses of each.</p> <p>To include:</p> <p>(i) stages and tools for each method.</p> <p>(ii) Safety precautions.</p>
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S/NO.	TOPIC	CONTENT	NOTES
16.	Wood abrasives	<p>(a) Meaning</p> <p>(b) Grades: coarse, medium and fine.</p> <p>(c) Selection and uses.</p>	<p>Identification, selection and uses.</p> <p>To include specific application of each grade.</p>
17.	Wood adhesives	<p>Types:</p> <p>(a) protein: animal, casein</p> <p>(b) synthetic resins: urea, phenol and melamine formaldehydes, epoxy resins, polyvinyl acetate (PVA).</p> <p>(c) contact/rubber based</p>	To include characteristics, uses, preparation and application and safety precaution during application.

18.	Wood fittings and fasteners	(a) Fittings: e.g. hinges, locks, handles, bolts, catches, etc.  (b) Fasteners: Nails, screws, bolts and nuts, corrugated fasteners etc.	To include identification, description, sketching, uses, application, fixing etc.  To include identification, description, sketching, uses, application, fixing etc.
19.	Non-wood materials	Types: Glass, plastics, rubber, ceramics, metal, leather, etc.	To include identification, description, characteristics, uses and other types of each.
20.	Veneers and Veneering	(a) Veneers: Types	To include identification,

		Production. (b) Veneering: (i) Methods: hammer, press. (ii) Tools: veneer hammer, pressing iron, cramps, caul, etc.	description and uses.  To include the processes for each method.  To include identification, description, sketching and uses.
21.	Wood shaping and bending.	(a) Shaping: Rounding, moulding, bevelling, chamfering, tapering, carving, etc.  (b) Bending: Solid, laminated	To include identification, description, sketching, processes, techniques, tools and machines, properties of wood suitable for each.
<b>S/NO.</b>	<b>TOPIC</b>	<b>CONTENT</b>	<b>NOTES</b>
22.	Design and Drawing	(a) Concept of design; (b) Design fundamentals and processes; (c) Free hand sketching; (e) Working drawings; (f) Cutting list and bill of materials; (g) Basic draftsmanship skills.	Working drawings in the First and Third Angle orthographic projections. Indication of cutting correct sectional representation of the materials are assential.

23.	Project Design and Construction.	<p>(a) Identification and analysis of given design problems.</p> <p>(b) Designing to solve the problems.</p> <p>(c) Estimating the cost of the design.</p> <p>(d) Constructing to meet the design specification.</p>	<p>Design problems should arise from customer needs, market survey, situation analysis, etc.</p> <p>To include evaluating the product to meet design purpose and specification.</p>
24.	Upholstery	<p>(a) Upholstery work.</p> <p>(b) Hand tools and machines: needles, pair of scissors, hammer, webbing stretcher, sewing machine, buttoning machine.</p> <p>(c) Materials e.g. for framing, stuffing/padding, covering, decorating.</p> <p>(d) Processes and techniques: framing, padding, covering, finishing, decoration, etc.</p>	<p>To include description, types and parts.</p> <p>Identification, description, sketching, care and uses.</p> <p>To be applied in constructing upholstery project.</p>
<b>S/NO.</b>	<b>TOPIC</b>	<b>CONTENT</b>	<b>NOTES</b>

25.	Wood turning	<p>(a) The wood lathe: Parts and accessories.</p> <p>(b) Turning tools: chisels, gouges, calipers, etc.</p> <p>(c) Turning operations: face plate turning, turning between centres and boring.</p> <p>(d) Suitable wood for turning: abura, ebony, mahogany, etc.</p> <p>(e) Projects: vase, bowl, candle holder, etc.</p>	<p>Identification, description, sketching, care, uses and safe use.</p> <p>To include identification and specific use.</p> <p>To include description and actual turning.</p>
26.	Wood carving and sculpture	<p>(a) Carving: incise and relief.</p> <p>(b) Sculpture: Production of simple ornaments.</p>	<p>To include description, identification, application and processes.</p>
		<p>(c) Tools e.g. chisels, gouges, knives, files, etc.</p>	<p>To include identification, sketching and uses.</p>
27.	Surface Decoration	<p>Types: inlaying, veneering, marquetry, lamination, laminated plastics, mouldings, etc.</p>	<p>Identification, description, processes, techniques and application.</p>

28.	Mass Production	<p>(a) Concept and principles.</p> <p>(b) Processes: Market survey, design, production, quality assurance, sales/marketing, management, procurement, cost estimation, tooling up for production.</p>	<p>To include mass production terms, e.g. templates, fixtures, trial run, departments, section, prototype, quality control, etc.</p> <p>Basic knowledge of the concepts required.</p>
<b>S/NO.</b>	<b>TOPIC</b>	<b>CONTENT</b>	<b>NOTES</b>
<b>FOR CANDIDATES IN NIGERIA ONLY</b>			
29.	Entrepreneurship in Woodworking.	<p>(a) Types of business organisation e.g. sole proprietorship, partnership, cooperatives etc.</p> <p>(b) Business opportunities in Woodworking: e.g. merchandizing, spray painting, upholstery work, wood turning.</p> <p>(c) Business plans: format and content.</p> <p>(d) Sources of fund e.g. gifts, personal savings, loans, inheritance, cooperatives etc.</p>	<p>To include characteristic advantages and disadvantages.</p> <p>To include sample plans.</p> <p>To include benefits and the risks.</p>

## RECOMMENDED TOOLS AND MACHINES

### A. HAND TOOLS

1. Try square
2. Marking gauge
3. Mortise gauge
4. Mitre square
5. Sliding bevel
6. Pair of compasses
7. Pair of dividers
8. Pair of callipers
9. G-Cramps
10. Sash Cramps
11. F-Cramps
12. Work Bench
13. Rip saw
14. Crosscut saw
15. Panel saw
16. Dovetail saw
17. Tenon saw
18. Coping saw
19. Fret saw
20. Nest of saws
21. Jack plane
22. Smooth plane
23. Block plane
24. Try plane
25. Beveled edge chisels
26. Firmer chisels
27. Mortise chisels
28. Pairing chisels
29. Claw Hammer
30. Ball pen hammer
31. Tack hammer
32. Braces (ordinary and ratchet)
33. Brace bits
34. Hand drill(s)
35. Drill bit(s)
36. Screw driver sets
37. Mallets
38. Rasps
39. Files
40. Surforms
41. Plough planes
42. Rebate planes
43. Bullnose Rebate plane
44. Pair of scissors
45. Upholstery hammer
46. Webbing stretcher
47. Needles (straight, curved)
48. Staplers

### B. WOODWORKING MACHINES

1. Cross-cut saw
2. Circular saw bench
3. Dimension saw
4. Band saw

### C. PORTABLE POWER TOOLS

1. Plane

2. Router
3. Jig saw
4. Circular saw
5. Power drill
6. Sanders (orbital, belt, disc)

### **SUGGESTED READING LIST**

1. Woodwork in Theory and Practice – John A. Walton, Australian Publishing Company.
2. Woodwork Design and Practice – David M. Shaw – Hodder and Stoughton
3. Woodwork by G. N Green
4. Basic Principles of Woodwork Design and Drawing – Emmanuel A. Nnenji  
Aranke woods
5. Practical Upholstery – C. Howes F.A. M.U  
Evans Brothers Limited, London.
6. General Certificate Woodwork by H. E. King
7. Fundamentals of Woodworking by Nurudeen et all
8. Woodwork by G. W. Brazier and H. A. Harris
9. Advance Woodworking and Furniture Making by J. Fierre and G. Hutchings
10. Woodwork for Senior Secondary School by CESAC
11. Woodwork for Senior Secondary School by J. N. K. Sackey, G. Manu and R. Y. Baafi
12. Woodwork Made Simple by Tom Pettit
13. Woodwork Technology by John Strefford Guy McMurdo
14. Woodwork by E. J. Wunter
15. Woodwork Technology by J. K. N. Sackey
16. Woodworker's Pocket Book by Charles H. Hayford

17. Collins complete woodworker's Manual by Jackson Albert and Day David