**Courtesy: WAEC**

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**AUTO ELECTRICAL WORK**

**1. PREAMBLE**

This examination syllabus has been evolved from the Senior Secondary School Trade Curriculum. The examination syllabus does not replace the curriculum.

The syllabus has been arranged to subsume six themes: battery, starting, ignition, charging, lighting and auxiliary systems.

**2. OBJECTIVE**

The objective of the syllabus is to test candidates’ knowledge, skills and attitude in the field of Auto Electrical Works. Specifically, candidates are to:

1. understand the concepts in auto electrical works;
2. use tools and equipment to carry out maintenance and repair on motor vehicles;
3. understand the safety practices and observe them in the work environment.

**3.** **EXAMINATION SCHEME**

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

**PAPER 1**: will consist of forty multiple-choice objective questions all of which are to be answered in 45 minutes for 40 marks.

 **PAPER 2**: will consist of six short-structured questions. Candidates will be required to answer any four in 1 hour for 60 marks.

**PAPER 3**: will be a practical test of 2 hours duration. It will consist of three

skill-based questions out of which candidates will answer two for

90 marks.

 A list of materials for the test shall be made available to schools

not less than two weeks before the paper is taken for materials

procurement and relevant preparations.

 Alternative to Practical Test:

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 Alternatively, in the event that materials for the actual practical test cannot be acquired, the Council may consider testing theoretically, candidates’ level of acquisition of the practical skills prescribed in the syllabus. For this alternative test, there will be two compulsory essay questions to be answered in 2 hours for 100 marks.

 Industrial Attachment

This should be done by the candidates during the long vacation between their SS II and SS III course. It will be supervised and assessed by their subject teachers. It will carry 10 marks.

**4. DETAILED SYLLABUS**

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| **TOPIC** | **NOTES** |
| **1. BATTERY*** 1. Concept of battery
	2. Uses of battery
	3. Types, Constructional details and ratings
	4. Charging

1.5 Testing and Maintenance**2. STARTING SYSTEM**2.1 Purpose and components of starting system2.2 Circuit diagram2.3 Types of starter motor2.4 Repair of starter motors**3. IGNITION SYSTEM**3.1 Purpose and components of ignition system3.2 Circuit diagram3.3 Construction and operation of ignition coil3.4 Types of Ignition System3.5 Timing3.6 Faults and repairs**4. CHARGING SYSTEM**4.1 Purpose and components of charging system4.2 Alternator4.3 Circuit diagram4.4 Faults and repairs**5. LIGHTING SYSTEM**5.1 Purpose and classification of lighting in a motor  vehicle5.2 Head lamps5.3 Circuit diagram5.4 Maintenance and repairs**6. AUXILIARY SYSTEM**6.1 Concept and components of auxiliary system6.2 Constructional details and operation of  auxiliary system component6.3 Maintenance and repairs of auxiliary Components | Definition, distinction between motor vehicle battery and other batteriesTreatment should include vehicle battery assembly and as power source in solderingLead-acid and Nickel-alkaline typesSafety rulesElectrolyte preparationBattery cleaning and connectionCharging modeState of chargeTreatment should include electrolyte testingSpecific gravity test of electrolyteCell voltage and polarity testsTools and equipmentTreatment should include electrolyte topping up, hydrometer reading and interpretation, over-charging symptoms and idle-battery safe-keeping hintTreatment should include battery, flywheel, startermotor, switch and solenoid Drawing and reading of circuit diagramTreatment should include the location of the components and their sequential arrangement in a vehicle.Axial and Inertia. Treatment should include pinion engagementsDismantling and assemblingBushing and brush replacementCommutator soldering/repairTrouble shooting and rectificationTreatment should include armature servicing,diagnosis and repairs/restorationIgnition system assemblyTreatment should include circuit cables, ignition switch, battery, coil, distributor, capacitor, hightension leads and sparking plugsDrawing and reading of circuit diagramTreatment should include line diagram andconventional symbolsCircuit diagramTreatment should include the internal construction of the coilConventional contact breaker and electronic ignition systemsConcept and timing faults such as retarded ignition and over-advanced ignition.Hard startingJerkingBack firing etc.Emphasize the use of multimeter, scanner, test lamps etc.Charging system assembly as a sub-system in a motor vehicleTreatment should include switch, battery, cables, alternators, voltage regulators.Constructional detailsConversion of a.c. to d.c.(rectification)Function of each part of an alternatorDrawing and reading of circuit diagramTreatment should include graphical and pictorial representation, need for diagrammatic representation and how to remove and fix the charging system unitsBrush and Bearing replacementDiode testing, repair and replacementTreatment should include bearing seizure, charging failure etc.Obligatory and non-obligatory lightsTypesFeaturesSetting of head lampsClassification, drawing and reading of circuit diagramTrouble shootingTreatment should include tools, equipment and procedures for repairing faults such as broken headlamp lens, bulb failure, non-alignedheadlamps, open and short circuits etc.Definition, uses and unitsTreatment should include needs for auxiliary systemTreatment should include water temperature gauge, oil pressure gauge, fuel gauge, horn relay, wiper switch, screen watcher pump, indicator and door switchTroubleshooting Treatment should include tools and equipment and Procedures for repairs of faults such as the failure of horn, screen wiper, oil pressure gauge, fuel gauge etc. |

**LIST OF FACILITIES AND MAJOR EQUIPMENT/MATERIALS REQUIRED:**

1. Motor batteries
2. Battery head moulder set
3. A complete tool box
4. Polythene hand gloves sets
5. Ammeter, voltmeter, multimeter
6. High rate discharge tester
7. Spanners, hand drilling machine
8. Vice
9. Bench/Table
10. Wire brush, bearing extractor, pulley extractor
11. Feeler gauge, soldering iron and lead
12. Emery cloth, wooden file, aprons
13. Jumper cable, magnetic pick-up
14. Googles, plastic trays
15. Hydrometer
16. Tester (Screw driver type)
17. Battery charger, testing lamp, cable stripper, insulation tape

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