**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:

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 system  2.2 Circuit diagram  2.3 Types of starter motor  2.4 Repair of starter motors  **3. IGNITION SYSTEM**  3.1 Purpose and components of ignition system  3.2 Circuit diagram  3.3 Construction and operation of ignition coil  3.4 Types of Ignition System  3.5 Timing  3.6 Faults and repairs  **4. CHARGING SYSTEM**  4.1 Purpose and components of charging system  4.2 Alternator  4.3 Circuit diagram  4.4 Faults and repairs  **5. LIGHTING SYSTEM**  5.1 Purpose and classification of lighting in a motor  vehicle  5.2 Head lamps  5.3 Circuit diagram  5.4 Maintenance and repairs  **6. AUXILIARY SYSTEM**  6.1 Concept and components of auxiliary system  6.2 Constructional details and operation of  auxiliary system component  6.3 Maintenance and repairs of auxiliary  Components | Definition, distinction between motor vehicle battery and other batteries  Treatment should include vehicle battery assembly and as power source in soldering  Lead-acid and Nickel-alkaline types  Safety rules  Electrolyte preparation  Battery cleaning and connection  Charging mode  State of charge  Treatment should include electrolyte testing  Specific gravity test of electrolyte  Cell voltage and polarity tests  Tools and equipment  Treatment should include electrolyte topping up, hydrometer reading and interpretation, over-charging symptoms and idle-battery safe-keeping hint  Treatment should include battery, flywheel, starter  motor, switch and solenoid  Drawing and reading of circuit diagram  Treatment should include the location of the  components and their sequential arrangement in a  vehicle.  Axial and Inertia.  Treatment should include pinion engagements  Dismantling and assembling  Bushing and brush replacement  Commutator soldering/repair  Trouble shooting and rectification  Treatment should include armature servicing,  diagnosis and repairs/restoration  Ignition system assembly  Treatment should include circuit cables, ignition  switch, battery, coil, distributor, capacitor, high  tension leads and sparking plugs  Drawing and reading of circuit diagram  Treatment should include line diagram and  conventional symbols  Circuit diagram  Treatment should include the internal construction  of the coil  Conventional contact breaker and electronic  ignition systems  Concept and timing faults such as retarded ignition and over-advanced ignition.  Hard starting  Jerking  Back firing etc.  Emphasize the use of multimeter, scanner, test  lamps etc.  Charging system assembly as a sub-system in a  motor vehicle  Treatment should include switch, battery, cables,  alternators, voltage regulators.  Constructional details  Conversion of a.c. to d.c.(rectification)  Function of each part of an alternator  Drawing and reading of circuit diagram  Treatment should include graphical and pictorial  representation, need for diagrammatic  representation and how to remove and fix the  charging system units  Brush and Bearing replacement  Diode testing, repair and replacement  Treatment should include bearing seizure, charging  failure etc.  Obligatory and non-obligatory lights  Types  Features  Setting of head lamps  Classification, drawing and reading of circuit  diagram  Trouble shooting  Treatment should include tools, equipment and  procedures for repairing faults such as broken  headlamp lens, bulb failure, non-aligned  headlamps, open and short circuits etc.  Definition, uses and units  Treatment should include needs for auxiliary  system  Treatment should include water temperature gauge,  oil pressure gauge, fuel gauge, horn relay, wiper  switch, screen watcher pump, indicator and door  switch  Troubleshooting  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