

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:

- understand the concepts in auto electrical works;
- use tools and equipment to carry out maintenance and repair on motor vehicles;
- 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

TOPIC	
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TOPIC	NOTES
<p>1. BATTERY</p> <ul style="list-style-type: none"> ● Concept of battery ● Uses of battery ● Types, Constructional details and ratings ● Charging <p>1.5 Testing and Maintenance</p> <p>2. STARTING SYSTEM</p> <p>2.1 Purpose and components of starting system</p> <p>2.2 Circuit diagram</p>	<p>Definition, distinction between motor vehicle battery and other batteries</p> <p>Treatment should include vehicle battery assembly and as power source in soldering</p> <p>Lead-acid and Nickel-alkaline types</p> <p>Safety rules Electrolyte preparation Battery cleaning and connection Charging mode State of charge Treatment should include electrolyte testing</p> <p>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</p>

2.3 Types of starter motor

Treatment should include battery, flywheel, starter motor, switch and solenoid

2.4 Repair of starter motors

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

3. IGNITION SYSTEM

Treatment should include armature servicing, diagnosis and repairs/restoration

3.1 Purpose and components of ignition system

Ignition system assembly

Treatment should include circuit cables, ignition switch, battery, coil, distributor, capacitor, high tension leads and sparking plugs

3.2 Circuit diagram

Drawing and reading of circuit diagram

Treatment should include line diagram and conventional symbols

3.3 Construction and operation of ignition coil

Circuit diagram

Treatment should include the internal construction of the coil

3.4 Types of Ignition System

Conventional contact breaker and electronic ignition systems

Concept and timing faults such as retarded ignition and over-advanced ignition.

3.5 Timing

Hard starting

Jerking

Back firing etc.

Emphasize the use of multimeter, scanner, test lamps etc.

3.6 Faults and repairs

Charging system assembly as a sub-system in a

4. CHARGING SYSTEM

4.1 Purpose and components of charging system

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

4.2 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

4.3 Circuit diagram

Brush and Bearing replacement
Diode testing, repair and replacement
Treatment should include bearing seizure, charging failure etc.

4.4 Faults and repairs

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.

5. LIGHTING SYSTEM

5.1 Purpose and classification of lighting in a motor vehicle

Definition, uses and units
Treatment should include needs for auxiliary system

5.2 Head lamps

Treatment should include water temperature gauge, oil pressure gauge, fuel gauge, horn relay, wiper switch, screen washer pump, indicator and door switch

5.3 Circuit diagram

Troubleshooting

5.4 Maintenance and repairs

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.

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

LIST OF FACILITIES AND MAJOR EQUIPMENT/MATERIALS REQUIRED:

- Motor batteries
- Battery head moulder set
- A complete tool box
- Polythene hand gloves sets
- Ammeter, voltmeter, multimeter
- High rate discharge tester
- Spanners, hand drilling machine
- Vice
- Bench/Table
- Wire brush, bearing extractor, pulley extractor
- Feeler gauge, soldering iron and lead
- Emery cloth, wooden file, aprons
- Jumper cable, magnetic pick-up
- Goggles, plastic trays
- Hydrometer
- Tester (Screw driver type)
- Battery charger, testing lamp, cable stripper, insulation tape

