

Assessment Requirements

Unit LV03K – Knowledge of Light Vehicle Electrical Units and Components

Content:

Electrical/Electronic Principles

- a. Electrical units:
 - i. volt (electrical pressure)
 - ii. ampere (electrical current)
 - iii. ohm (electrical resistance)
 - iv. watt (power)
- b. The requirements for an electrical circuit:
 - i. battery
 - ii. cables
 - iii. switch
 - iv. current consuming device
 - v. continuity
- c. The direction of current flow and electron flow.
- d. Series and parallel circuits to include:
 - i. current flow
 - ii. voltage of components
 - iii. volt drop
 - iv. resistance
 - v. the effect on circuit operation of open circuit component(s)
- e. Earth and insulated return systems.
- f. Cable sizes and colour codes.
- g. Different types of connectors, terminals and circuit protection devices.
- h. Common electrical and electronic symbols.
- i. The meaning of:
 - i. short circuit
 - ii. open circuit
 - iii. bad earth
 - iv. high resistance
 - v. electrical capacity
- j. The principles of vehicle electronic systems and component.
- k. Interpret vehicle wiring diagrams to include:
 - i. vehicle lighting
 - ii. auxiliary circuits
 - iii. indicators
 - iv. starting and charging systems
- l. Function and construction of electrical components including:
 - i. circuit relays
 - ii. bulb types
 - iii. fan and heater
 - iv. circuit protection
- m. The safety precautions when working on electrical and electronic systems to include:
 - i. disconnection and connection of battery
 - ii. avoidance of short circuits
 - iii. power surges
 - iv. prevention of electric shock
 - v. protection of electrical and electronic components

- vi. protection of circuits from overload or damage
- n. The set-up and use of:
 - i. digital and analogue multi-meters
 - ii. voltmeter
 - iii. ammeter
 - iv. ohmmeter
 - v. oscilloscope
 - vi. manufacturer's dedicated test equipment
- o. Electrical and electronic checks for electrical and electronic systems to include:
 - i. connections
 - ii. security
 - iii. functionality
 - iv. performance to specifications
 - v. continuity, open circuit
 - vi. short circuit
 - vii. high resistance
 - viii. volt drop
 - ix. current consumption
 - x. output patterns (oscilloscope)
- p. Symptoms and faults associated with electrical and electronic systems to include:
 - i. high resistance
 - ii. loose and corroded connections
 - iii. short circuit
 - iv. excessive current consumption
 - v. open circuit
 - vi. malfunction
 - vii. poor performance
 - viii. battery faults to include flat battery
 - ix. failure to hold charge
 - x. low state of charge
 - xi. overheating
 - xii. poor starting

Battery and Charging

- a. The construction and operation of vehicle batteries including:
 - i. low maintenance and maintenance free
 - ii. lead acid and nickel cadmium types
 - iii. cells
 - iv. separators
 - v. plates
 - vi. electrolyte
- b. The operation of the vehicle charging system:
 - i. alternator
 - ii. rotor
 - iii. stator
 - iv. slip ring
 - v. brush assembly
 - vi. three phase output
 - vii. diode rectification pack
 - viii. voltage regulation
 - ix. phased winding connections
 - x. cooling fan
 - xi. alternator drive system

Starting

- a. The layout, construction and operation of engine starting systems: inertia and pre-engaged principles.
- b. The function and operation of the following components:
 - i. inertia and pre-engaged starter motor
 - ii. starter ring gear
 - iii. pinion
 - iv. starter solenoid
 - v. ignition/starter switch
 - vi. starter relay (if appropriate)
 - vii. one-way clutch (pre-engaged starter motor)

Lighting

- a. Function and construction of electrical components including:
 - i. front and tail lamps
 - ii. main and dip beam headlamps
 - iii. fog and spot lamps
 - iv. lighting and dip switch
 - v. directional indicators
- b. The circuit diagram and operation of components for:
 - i. side and tail lamps
 - ii. headlamps
 - iii. interior lamps
 - iv. fog and spot lamps
 - v. direction indicators
- c. The statutory requirements for vehicle lighting when using a vehicle on the road.
- d. Headlamp adjustment and beam setting.

Auxiliary Systems

- a. Function and construction of electrical components including:
 - i. central door locking
 - ii. anti theft devices
 - iii. manual locking and dead lock systems
 - iv. window winding
 - v. demisting systems
 - vi. door mirror operation mechanisms
 - vii. interior lights and switching
 - viii. sun roof operation
- b. The circuit diagram and operation of components for:
 - i. central door locking
 - ii. anti theft devices
 - iii. manual locking and dead lock systems
 - iv. window winding
 - v. demisting systems
 - vi. door mirror operation mechanisms
 - vii. sun roof operation
- c. Comfort and convenience systems to include:
 - i. heated seats
 - ii. electrically adjusted seats
 - iii. heated screens
 - iv. electric mirrors
 - v. heating
 - vi. climate control
 - vii. air conditioning

General

- a. The preparation, testing and use of:
 - i. tools and equipment
 - ii. electrical meters and equipment used for dismantling
 - iii. removal and replacement of electrical and electronic systems and components
- b. Appropriate safety precautions:
 - i. PPE
 - ii. vehicle protection when dismantling
 - iii. removal and replacing electrical and electronic components and systems
- c. The important of logical and systematic processes.
- d. Preparation of replacement units for re-fitting or replacement electrical and electronic components and systems.
- e. The reasons why replacement components and units must meet the original specifications (OES) – warranty requirements, to maintain performance, safety requirements.
- f. Refitting procedures.
- g. The inspection and testing of units and systems to ensure compliance with manufacturer's, legal and performance requirements.
- h. Inspection and re-instatement of the vehicle following repair to ensure:
 - i. customer satisfaction
 - ii. cleanliness of vehicle interior and exterior
 - iii. security of components and fittings
 - iv. re-instatement of components and fittings