

# Level 2 Diploma in Auto Electrical and Mobile Electrical Principles (4290- [62])

October 2013 | Version 1.1





## Qualification at a glance

<b>Subject area</b>	<b>Vehicle Maintenance and Repair</b>
<b>City &amp; Guilds number</b>	4290
<b>Age group approved</b>	16+
<b>Entry requirements</b>	There are no entry requirements
<b>Assessment and grading</b>	Online multiple choice tests (graded Pass, Merit, Distinction) and assignments (graded Pass)
<b>Fast track</b>	Not available; automatic approval applies in some cases
<b>Support materials</b>	Centre handbook Practical assessment workbook
<b>Registration and certification</b>	See online catalogue/Walled Garden for last dates.

<b>Title and level</b>	<b>City &amp; Guilds number</b>	<b>Accreditation number</b>
Level 2 Diploma in Auto Electrical and Mobile Electrical Principles	4290-62	501/0132/8

<b>Version and date</b>	<b>Change detail</b>	<b>Section</b>
1.1 Oct 2013	Unit supporting information updated with introductory text	<b>Units</b>



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# 1 Introduction

This document tells you what you need to do to deliver the qualification:

Area	Description
Who are the qualifications for?	Candidates wanting to develop some of the key skills and understanding in motor vehicle systems. Successful candidates will have the basic skills needed to apply for an automotive apprenticeship or similar engineering pathway. These qualifications could also be used as an 'interest' course for a wide range of learners.
What do the qualifications cover?	Allow candidates to learn, develop and practise the skills required for employment and/or career progression in the automotive industry.
Are the qualifications part of a framework or initiative?	These qualifications are part of the Automotive Maintenance and Repair Young and Intermediate Apprenticeship Frameworks (framework 1) which will replace current framework 4 from April 2011.
Who did we develop the qualification with?	This qualification was developed in collaboration with the Institute of the Motor Industry (IMI) the sector skills council for the automotive retail industry and other awarding organisations.
What opportunities for progression are there?	Allow candidates to progress into employment or to the following City & Guilds qualifications: <ul style="list-style-type: none"> <li>• 4290-13 Level 3 Diploma in Light Vehicle Maintenance &amp; Repair Principles</li> <li>• 4270 -12 City &amp; Guilds Level 2 Diploma in Light Vehicle Maintenance &amp; Repair Competence</li> <li>• 4270-13 City &amp; Guilds Level 3 Diploma in Light Vehicle Maintenance &amp; Repair Competence</li> </ul>

## Structure

Qualification title	City & Guilds qualification number	Units required
City & Guilds Level 2 Diploma in Auto Electrical and Mobile Electrical Principles	4290-62	<p>The total credit value required is 70 credits.</p> <p>65 credits from mandatory units: 001, 003 - 004, 051, 053 - 054, 103, 153, 401 – 402, 408, 451 – 452, 458</p> <p>plus a minimum of 5 credits from : 218 and 268 or 403 and 453 or 407 and 457</p>

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Y/601/7254	4290-001	Skills in health, safety and good housekeeping in the automotive environment	7
J/601/6262	4290-003	Skills in supporting job roles in the automotive work environment	5
Y/601/6279	4290-004	Skills in materials, fabrication, tools and measuring devices used in the automotive environment	7
D/601/6171	4290-051	Knowledge of health, safety and good housekeeping in the automotive environment	3
T/601/6175	4290-053	Knowledge of support for job roles in the automotive work environment	3
K/601/6237	4290-054	Knowledge of materials, fabrication, tools and measuring devices used in the automotive environment	4
T/601/3874	4290-103	Skills in removing and replacing light vehicle electrical units and components	5
T/601/3731	4290-153	Knowledge of removing and replacing light vehicle electrical units and components	6

<b>Unit accreditation number</b>	<b>City &amp; Guilds unit number</b>	<b>Unit title</b>	<b>Credit value</b>
K/601/3869	4290-218	Skills in removing and fitting of basic light vehicle mechanical, electrical and trim (MET) components and non permanently fixed vehicle body panels	3
F/601/3747	4290-268	Knowledge of removing and fitting basic light vehicle mechanical, electrical and trim (MET) components and non permanently fixed vehicle body panels	2
F/601/6034	4290-401	Skills in Locating and Correcting Simple Electrical Faults in the Automotive Workplace	5
J/601/6035	4290-402	Skills in Enhancing Vehicle Electrical Systems	5
R/601/6037	4290-403	Skills in the Overhauling of Electrical Units	5
H/601/6043	4290-407	Skills in Fitting Auxiliary Locks and Security Devices (Electrical & Mechanical)	3
T/601/6046	4290-408	Skills in Inspecting Vehicles Using Prescribed Methods	2
K/601/6013	4290-451	Knowledge of Locating and Correcting Simple Electrical Faults in the Automotive Workplace	6
F/601/6017	4290-452	Knowledge in Enhancing Vehicle Electrical Systems	6
L/601/6022	4290-453	Knowledge of the Overhauling of Electrical Units	6
K/601/6027	4290-457	Knowledge of Fitting Auxiliary Locks and Security Devices (Electrical & Mechanical)	3
M/601/6028	4290-458	Knowledge of Inspecting Vehicles Using Prescribed Methods	1

Full qualification certificates will be awarded to successful candidates on completion of the required combinations of units. Candidates completing one or more units, rather than the full qualification(s), will receive a Certificate of Unit Credit (CUC).



## 2 Centre requirements

### Approval

Centres already approved to offer the Level 2 Certificate/Diploma in Maintenance and Repair - Auto-Electrical (4101-49) will be automatically approved to register and certificate candidates on the 4290-62 (unless the centre is already subject to sanctions).

For all other cases, centres will need to gain both centre and qualification approval. Please refer to the *Centre guide* and *Providing City & Guilds Qualifications* for further information.

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualifications before designing a course programme.

### Physical resources and site agreements

Centres must have access to sufficient equipment in the college, training centre or workplace to ensure candidates have the opportunity to cover all of the practical activities.

### Centre staffing

Staff delivering these qualifications must be able to demonstrate that they meet the following occupational expertise requirements. They should:

- be occupationally competent or technically knowledgeable in the area(s) for which they are delivering training and/or have experience of providing training. This knowledge must be to the same level as the training being delivered
- have recent relevant experience in the specific area they will be assessing
- have credible experience of providing training.

Centre staff may undertake more than one role, eg tutor and assessor or internal verifier, but cannot internally verify their own assessments.

### Assessor and verifiers

While the Assessor/Verifier (A/V) units are valued as qualifications for centre staff, they are not currently a requirement for this qualification.

### Continuing professional development (CPD)

Centres must support their staff to ensure that they have current knowledge of the occupational area, that delivery, mentoring, training, assessment and verification is in line with best practice, and that it takes account of any national or legislative developments.



## **Candidate entry requirements**

City & Guilds does not set entry requirements for these qualifications. However, centres must ensure that candidates have the potential and opportunity to gain the qualifications successfully.

Please note that for funding purposes, candidates should not be entered for a qualification of the same type, content and level as that of a qualification they already hold.

## **Age restrictions**

City & Guilds cannot accept any registrations for candidates under 16 as this qualification is not approved for under 16s.

## **Guidance on risk management of pre 16 candidates**

Centres offering the City & Guilds Level 2 Certificate/Diploma in Light Vehicle Maintenance & Repair (4290) to candidates under the age of 16 must assume responsibility for the safe delivery of the qualification. This will include those units that require using and working with power tools and machinery and using and working under lifts and hoists.

In order to ensure that the risk related to the delivery and assessment of this qualification is managed appropriately, City & Guilds requires the Head of Centre to provide a satisfactory risk assessment. The risk assessment should outline those activities within the units which, specific to the centre, may pose a risk or hazard to the safety of the candidate and identify how these risks/hazards will be managed to reduce or alleviate risk.

The risk assessment should be forwarded to your local City & Guilds regional office to be held on file. A copy should be retained by the centre and made available to a City & Guilds external verifier or representative on request.



## 3 Delivering the qualification

### Initial assessment and induction

An initial assessment of each candidate should be made before the start of their programme to identify:

- if the candidate has any specific training needs,
- support and guidance they may need when working towards their qualification.
- any units they have already completed, or credit they have accumulated which is relevant to the qualification.
- the appropriate type and level of qualification.

We recommend that centres provide an induction programme so the candidate fully understands the requirements of the qualification, their responsibilities as a candidate, and the responsibilities of the centre. This information can be recorded on a learning contract.

### Support materials

The following resources are available for these qualifications:

<b>Description</b>	<b>How to access</b>
Centre handbook	<a href="http://www.cityandguilds.com/automotive">www.cityandguilds.com/automotive</a>
Practical assessment workbook	<a href="http://www.cityandguilds.com/automotive">www.cityandguilds.com/automotive</a>
Practical training workbook	<a href="http://www.cityandguilds.com/automotive">www.cityandguilds.com/automotive</a>
Exam Success book	Walled Garden (TL024290)
Online practice tests	Walled Garden
SmartScreen	<a href="http://www.smartscreen.co.uk">www.smartscreen.co.uk</a>



## 4 Assessment

### Assessment of the qualification

City & Guilds has written the following assessments to use with this qualification:

- Assignments (practical assessment workbooks) comprising of practical tasks and knowledge based questions to cover all learning outcomes. Graded Pass only.
- Online multiple choice tests graded as Pass, Merit, Distinction.
- Assignments can be downloaded from [www.cityandguilds.com/automotive](http://www.cityandguilds.com/automotive). These assessments are carried out in centres and must be completed to current industry standards and practice. It is important to note that although the units within these qualifications bear a close relationship to the VCQ units, they do not imply occupational competence.

Assessment requirements for all skills units are shown in full in our assessment documentation.

Full details of the assessment requirements relating to these qualifications can be obtained directly from the Institute of the Motor Industry (IMI) <http://www.motor.org.uk>

### Time constraints

The following must be applied to the assessment of this qualification:

- Candidates must complete their assessments within their registration period.

### Recognition of prior learning (RPL)

#### Proxy units / credit transfer

Learners transferring from City & Guilds 4101 NQF qualifications or from another awarding organisation may be exempt from taking the 4290/4270/4291/4271 online multiple choice tests, on production of a valid certificate of equivalent units achieved. Proxy units are available in these circumstances. Please note that a certificate of unit credit (CUC) is not available when claiming a proxy unit. For more information on credit transfer please refer to our 9420 Automotive Apprenticeship Framework centre guide available from [www.cityandguilds.com](http://www.cityandguilds.com)

### Test specifications

Summary test specifications for all 4290 online tests can be found in the '**Automotive online test specifications**' document, downloadable from the 4290 website.

## Level 2 Diploma in Auto Electrical and Mobile Electrical Principles

City & Guilds unit number	Level	Unit title	Credit value	Assessment method
4290-001	Level 2	Skills in health, safety and good housekeeping in the automotive environment	7	Assignment
4290-003	Level 3	Skills in supporting job roles in the automotive work environment	5	Assignment
4290-004	Level 2	Skills in materials, fabrication, tools and measuring devices used in the automotive environment	7	Assignment
4290-051	Level 2	Knowledge of health, safety and good housekeeping in the automotive environment	3	Assignment
4290-053	Level 3	Knowledge of support for job roles in the automotive work environment	3	Assignment
4290-054	Level 2	Knowledge of materials, fabrication, tools and measuring devices used in the automotive environment	4	Assignment
4290-103	Level 2	Skills in removing and replacing light vehicle electrical units and components	5	Assignment
4290-153	Level 2	Knowledge of removing and replacing light vehicle electrical units and components	6	Multiple choice test
4290-218	Level 2	Skills in removing and fitting of basic light vehicle mechanical, electrical and trim (MET) components and non permanently fixed vehicle body panels	3	Assignment
4290-268	Level 2	Knowledge of removing and fitting basic light vehicle mechanical, electrical and trim (MET) components and non permanently fixed vehicle body panels	2	Multiple choice test
4290-401	Level 2	Skills in Locating and Correcting Simple Electrical Faults in the Automotive Workplace	5	Assignment

4290-402	Level 2	Skills in Enhancing Vehicle Electrical Systems	5	Assignment
4290-403	Level 2	Skills in the Overhauling of Electrical Units	5	Assignment
4290-407	Level 2	Skills in Fitting Auxiliary Locks and Security Devices (Electrical & Mechanical)	3	Assignment
4290-408	Level 2	Skills in Inspecting Vehicles Using Prescribed Methods	2	Assignment
4290-451	Level 2	Knowledge of Locating and Correcting Simple Electrical Faults in the Automotive Workplace	6	Multiple choice test
4290-452	Level 2	Knowledge in Enhancing Vehicle Electrical Systems	6	Multiple choice test
4290-453	Level 2	Knowledge of the Overhauling of Electrical Units	6	Multiple choice test
4290-457	Level 2	Knowledge of Fitting Auxiliary Locks and Security Devices (Electrical & Mechanical)	3	Multiple choice test
4290-458	Level 2	Knowledge of Inspecting Vehicles Using Prescribed Methods	1	Multiple choice test



## 5 Units

### Structure of units

These units each have the following:

- City & Guilds reference number
- unit accreditation number
- title
- level
- credit value
- unit aim
- relationship to NOS
- learning outcomes which are comprised of a number of assessment criteria
- unit range

## Unit 001

# Skills in health, safety and good housekeeping in the automotive environment

<b>UAN:</b>	<b>Y/601/7254</b>
<b>Level:</b>	2
<b>Credit value:</b>	7
<b>GLH:</b>	60
<b>Relationship to NOS:</b>	This unit is linked to G1 Contribute to Housekeeping in Motor Vehicle Environment and G2 Reduce Risks to Health and Safety in the Motor Vehicle Environment.
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	<p>This unit will enable the learner to develop the skills required to:</p> <ul style="list-style-type: none"><li>• carry out day to day work area cleaning, clearing away, dealing with spillages and disposal of waste, used materials and debris.</li><li>• identify hazards and risks in the automotive environment and complying with relevant legislation and good practice.</li><li>• work safely at all times within the automotive environment, both as an individual and with others.</li></ul>

<b>Learning outcome</b>	<b>The learner will:</b>
1. be able to use correct personal and vehicle protection within the automotive work environment	
<b>Assessment criteria</b>	
The learner can:	
1.1	select and use personal protective equipment throughout activities. To include appropriate protection of: a. eyes b. ears c. head d. skin e. feet f. hands g. lungs
1.2	select and use vehicle protective equipment throughout all activities.

<b>Learning outcome</b>	<b>The learner will:</b>
2.	be able to carry out effective housekeeping practices in the automotive work environment
<b>Assessment criteria</b>	
The learner can:	
2.1	select and use cleaning equipment which is of the right type and suitable for the task
2.2	use utilities and appropriate consumables, avoiding waste
2.3	use materials and equipment to carry out cleaning and maintenance duties in allocated work areas, following automotive work environment policies, schedules and manufacturers' instructions
2.4	perform housekeeping activities safely and in a way which minimizes inconvenience to customers and staff.
2.5	keep the work area clean and free from debris and waste materials
2.6	keep tools and equipment fit for purpose by regular cleaning and keeping tidy
2.7	dispose of used cleaning agents, waste materials and debris to comply with legal and workplace requirements.

<b>Learning outcome</b>	<b>The learner will:</b>
3.	be able to recognise and deal with dangers in order to work safely within the automotive workplace
<b>Assessment criteria</b>	
The learner can:	
3.1	name and locate the responsible persons for health and safety in their relevant workplace
3.2	identify and report working practices and hazards which could be harmful to themselves or others
3.3	carry out safe working practices whilst working with equipment, materials and products in the automotive environment
3.4	rectify health and safety risks encountered at work, within the scope and capability of their job role.

<b>Learning outcome</b>	<b>The learner will:</b>
4.	be able to conduct themselves responsibly
<b>Assessment criteria</b>	
The learner can:	
4.1	show personal conduct in the workplace which does not endanger the health and safety of themselves or others
4.2	display suitable personal presentation at work which ensures the health and safety of themselves and others at work.



## Unit 003

## Skills in supporting job roles in the automotive work environment

<b>UAN:</b>	<b>J/601/6262</b>
<b>Level:</b>	3
<b>Credit value:</b>	5
<b>GLH:</b>	40
<b>Relationship to NOS:</b>	This unit is linked to G3 Maintain Working Relationships in the Motor Vehicle Environment.
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	This unit will help the learner develop the skills required to keep good working relationships with all colleagues and customers in the automotive work environment by using effective communication and support.

<b>Learning outcome</b>	<b>The learner will:</b>
1.	be able to work effectively within the organisational structure of the automotive work environment
<b>Assessment criteria</b>	
The learner can	
1.1	respond promptly and willingly to requests for assistance from customers and colleagues
1.2	refer customers and colleagues to the correct person should requests fall outside their responsibility and capability.

<b>Learning outcome</b>	<b>The learner will:</b>
2.	be able to obtain and use information in order to support their job role within the automotive work environment
<b>Assessment criteria</b>	
The learner can	
2.1	select and use legal and technical information, in an automotive work environment.

<b>Learning outcome</b>	<b>The learner will:</b>
	3. be able to communicate with and support colleagues and customers effectively within the automotive work environment
<b>Assessment criteria</b>	
The learner can	
3.1 use methods of communication with customers and colleagues which meet their needs	
3.2 give customers and colleagues accurate information	
3.3 make requests for assistance from or to customers and colleagues clearly and courteously.	

<b>Learning outcome</b>	<b>The learner will:</b>
	4. be able to develop and keep good working relationships in the automotive work environment
<b>Assessment criteria</b>	
The learner can	
4.1 contribute to team work by initiating ideas and co-operating with customers and colleagues	
4.2 treat customers and colleagues in a way which shows respect for their views and opinions	
4.3 make and keep achievable commitments to customers and colleagues	
4.4 inform colleagues promptly of anything likely to affect their own work.	

## Unit 004

# Skills in materials, fabrication, tools and measuring devices in the automotive environment

<b>UAN:</b>	<b>Y/601/6279</b>
<b>Level:</b>	2
<b>Credit value:</b>	7
<b>GLH:</b>	60
<b>Relationship to NOS:</b>	This unit is linked to G4 Use of hand tools and equipment in motor vehicle engineering.
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	<p>This unit helps the learner to develop the skills required for:</p> <ul style="list-style-type: none"><li>• the correct selection, care and use of key hand tools and measuring devices for modification, fabrication and repair in the automotive environment</li><li>• the correct preparation and use of common work environment equipment</li><li>• the correct selection and fabrication of materials used when modifying and repairing</li><li>• the correct application of automotive engineering fabrication and fitting principles.</li></ul>

<b>Learning outcome</b>	<b>The learner will:</b>
1. be able to select, maintain and use hand tools and measuring devices in the automotive environment	
<b>Assessment criteria</b>	
The learner can:	
1.1	select, maintain and use suitable hand tools safely when fabricating and fitting in the automotive workplace
1.2	select, maintain and use suitable measuring devices safely when fabricating and fitting in the automotive environment
1.3	select, maintain and use suitable PPE for fabrication, repair and fitting in the automotive environment
1.4	select, maintain and use suitable electrical measuring tools safely when repairing vehicles and components.

<b>Learning outcome</b>	<b>The learner will:</b>
	2. be able to prepare and use common workshop equipment
<b>Assessment criteria</b>	
The learner can:	
2.1 use suitably maintained workshop equipment safely	
2.2 use correct interpretation of 'safe working load' on lifting and supporting equipment	
2.3 report any faulty or damaged tools and equipment to the relevant persons clearly and promptly	
2.4 store work tools and equipment in a safe manner which permits ease of access and identification for use.	

<b>Learning outcome</b>	<b>The learner will:</b>
	3. be able to select materials when fabricating, modifying and repairing vehicles and fitting components
<b>Assessment criteria</b>	
The learner can:	
3.1 select and use appropriate materials whilst constructing, fitting, modifying or repairing vehicles and components.	

<b>Learning outcome</b>	<b>The learner will:</b>
	4. be able to apply automotive engineering, fabrication and fitting principles when modifying and repairing vehicles and components
<b>Assessment criteria</b>	
The learner can:	
4.1 use correct procedures when:	
a. filing	
b. tapping threads	
c. cutting plastics and metals	
d. drilling plastics and metals	
e. fitting	
4.2 use appropriate techniques when fabricating, repairing and modifying vehicles and components	
4.3 select and use:	
a. gaskets	
b. seals	
c. sealants	
d. fittings and fasteners	
4.4 apply modification and repair techniques to automotive electrical circuits	
4.5 select and use locking, fixing and fastening devices.	

## Unit 051

# Knowledge of health, safety and good housekeeping in the automotive environment

<b>UAN:</b>	<b>D/601/6171</b>
<b>Level:</b>	2
<b>Credit value:</b>	3
<b>GLH:</b>	30
<b>Relationship to NOS:</b>	This unit is linked to G1 Contribute to Housekeeping in Motor Vehicle Environment and G2 Reduce Risks to Health and Safety in the Motor Vehicle Environment.
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	<p>This unit enables the learner to develop an understanding of:</p> <ul style="list-style-type: none"><li>• routine maintenance and cleaning of the automotive environment and using resources economically</li><li>• health and safety legislation and duties of everyone in the motor vehicle environment. It will provide an appreciation of significant risks in the automotive environment and how to identify and deal with them. Once completed the learner will be able to identify hazards and evaluate and reduce risk.</li></ul>

<b>Learning outcome</b>	<b>The learner will:</b>
1. understand the correct personal and vehicle protective equipment to be used within the automotive environment	
<b>Assessment criteria</b>	
The learner can	
1.1	explain the importance of wearing the types of PPE required for a range automotive repair activities
1.2	identify vehicle protective equipment for a range of repair activities
1.3	describe vehicle and personal safety considerations when working at the roadside.

<b>Learning outcome</b>	<b>The learner will:</b>
2. understand effective housekeeping practices in the automotive environment	
<b>Assessment criteria</b>	
The learner can	
2.1	describe why the automotive environment should be properly cleaned and maintained
2.2	describe requirements and systems which may be put in place to ensure a clean automotive environment.
2.3	describe how to minimise waste when using utilities and consumables
2.4	state the procedures and precautions necessary when cleaning and maintaining an automotive environment
2.5	describe the selection and use of cleaning equipment when dealing with general cleaning, spillages and leaks in the automotive environment
2.6	describe procedures for correct disposal of waste materials from an automotive environment
2.7	describe procedures for starting and ending the working day which ensure effective housekeeping practices are followed.

<b>Learning outcome</b>	<b>The learner will:</b>
3. understand key health and safety requirements relevant to the automotive environment	
<b>Assessment criteria</b>	
The learner can	
3.1	list the main legislation relating to automotive environment health and safety
3.2	describe the general legal duties of employers and employees required by current health and safety legislation
3.3	describe key, current health and safety requirements relating to the automotive environment
3.4	describe why workplace policies and procedures relating to health and safety are important.

<b>Learning outcome</b>	<b>The learner will:</b>
4. understand about hazards and potential risks relevant to the automotive environment	
<b>Assessment criteria</b>	
The learner can	
4.1	identify key hazards and risks in an automotive environment
4.2	describe policies and procedures for reporting hazards, risks, health and safety matters in the automotive environment
4.3	state precautions and procedures which need to be taken when working with vehicles, associated materials, tools and equipment
4.4	identify fire extinguishers in common use and which types of fire they should be used on
4.5	identify key warning signs and their characteristics that are found in the vehicle repair environment
4.6	state the meaning of common product warning labels used in an automotive environment.

<b>Learning outcome</b>	<b>The learner will:</b>
5. understand personal responsibilities	
<b>Assessment criteria</b>	
The learner can	
5.1	explain the importance of personal conduct in maintaining the health and safety of the individual and others
5.2	explain the importance of personal presentation in maintaining health safety and welfare.

# **Unit 051                      Knowledge of health, safety and good housekeeping in the automotive environment**

## Supporting information

**Candidates will be assessed on the assessment criteria as specified within the unit. The following information has been provided by IMI SSC and is included to support centres in terms of teaching and delivery.**

### **Economic use of resources**

- a. Consumable materials eg grease, oils, split pins, locking and fastening devices.

### **Requirement to maintain work area effectively**

- a. Cleaning tools and equipment to maximise workplace efficiency.
- b. Requirement to carry out the housekeeping activities safely and in a way that minimises inconvenience to customers and staff.
- c. Risks involved when using solvents and detergents.
- d. Advantages of good housekeeping.

### **Spillages, leaks and waste materials**

- a. Relevance of safe systems of work to the storage and disposal of waste materials.
- b. Requirement to store and dispose of waste, used materials and debris correctly.
- c. Safe disposal of special / hazardous waste materials.
- d. Advantages of recycling waste materials.
- e. Dealing with spillages and leaks.

### **Basic legislative requirements**

- a. Provision and Use of Work Equipment Regulations 1992
- b. Power Presses Regulations 1992
- c. Pressure Systems and Transportable Gas Containers Regulations 1989
- d. Electricity at Work Regulations 1989
- e. Noise at Work Regulations 1989
- f. Manual Handling Operations Regulations 1992
- g. Health and Safety (Display Screen Equipment) Regulations 1992
- h. Abrasive Wheel Regulations
- i. Safe Working Loads
- j. Working at Height Regulations.



### **Routine maintenance of the workplace**

- a. Trainee's personal responsibilities and limits of their authority with regard to work equipment.
- b. Risk assessment of the workplace activities and work equipment.
- c. Workplace person responsible for training and maintenance of workplace equipment.
- d. When and why safety equipment must be used.
- e. Location of safety equipment.
- f. Particular hazards associated with their work area and equipment.
- g. Prohibited areas.
- h. Plant and machinery that trainees must not use or operate.
- i. Why and how faults on unsafe equipment should be reported.
- j. Storing tools, equipment and products safely and appropriately.
- k. Using the correct PPE.
- l. Following manufacturers' recommendations.
- m. Location of routine maintenance information e.g. electrical safety check log.

### **Legislation relevant to Health and Safety**

- a. HASAWA
- b. COSHH
- c. EPA
- d. Manual Handling Operations Regulations 1992
- e. PPE Regulations 1992.

### **General regulations to include an awareness of:**

- a. Health and Safety (Display Screen Equipment) Regulations 1992
- b. Health and Safety (First Aid) Regulations 1981
- c. Health and Safety (Safety Signs and Signals) Regulations 1996
- d. Health and Safety (Consultation with Employees) Regulations 1996
- e. Employers Liability (Compulsory Insurance) Act 1969 and Regulations 1998
- f. Confined Spaces Regulations 1997
- g. Noise at Work Regulations 1989
- h. Electricity at Work Regulations 1989
- i. Electricity (Safety) Regulations 1994
- j. Fire Precautions Act 1971
- k. Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1985
- l. Pressure Systems Safety Regulations 2000
- m. Waste Management 1991
- n. Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002
- o. Control of Asbestos at Work Regulations 2002.

### **Legislative duties**

- a. The purpose of a Health and Safety Policy.
- b. The relevance of the Health and Safety Executive.
- c. The relevance of an initial induction to Health and Safety requirements at your workplace.
- d. General employee responsibilities under the HASAWA and the consequences of non-compliance.
- e. General employer responsibilities under the HASAWA and the consequences of non-compliance.
- f. The limits of authority with regard to Health and Safety within a personal job role.
- g. Workplace procedure to be followed to report Health and Safety matters.

### **Precautions to be taken when working with vehicles, workshop materials, tools and equipment including electrical safety, pneumatics and hydraulics**

- a. Accessing and interpreting safety information.
- b. Seeking advice when needed.
- c. Seeking assistance when required.
- d. Reporting of unsafe equipment.
- e. Storing tools, equipment and products safely and appropriately.
- f. Using the correct PPE.
- g. Following manufacturers' recommendations.
- h. Following application procedures e.g. hazardous substances.
- i. The correct selection and use of extraction equipment.

### **PPE to include:**

- a. Typical maintenance procedures for PPE equipment to include:
  - i. typical maintenance log
  - ii. cleaning procedures
  - iii. filter maintenance
  - iv. variation in glove types
  - v. air quality checks.
- b. Choice and fitting procedures for masks and air breathing equipment.
- c. Typical workplace processes which would require the use of PPE to include:
  - i. welding
  - ii. sanding and grinding
  - iii. filling
  - iv. panel removal and replacement
  - v. drilling
  - vi. cutting
  - vii. chiselling
  - viii. removal of broken glass
  - ix. removal of rubber seals from fire damaged vehicles
  - x. removal of hypodermic needles
  - xi. servicing activities
  - xii. roadside recovery.
- d. Unserviceable PPE.

- e. PPE required for a range of automotive repair activities. To include appropriate protection of:
  - i. eyes
  - ii. ears
  - iii. head
  - iv. skin
  - v. feet
  - vi. hands
  - vii. lungs.

### **Fire and extinguishers**

- a. Classification of fire types.
- b. Using a fire extinguisher effectively.
- c. Types of extinguishers:
  - i. foam
  - ii. dry powder
  - iii. CO2
  - iv. water
  - v. fire blanket.

### **Action to be taken in the event of a fire to include:**

- a. The procedure as:
  - i. raise the alarm
  - ii. fight fire only if appropriate
  - iii. evacuate building
  - iv. call for assistance.

### **Product warning labels to include:**

- a. Reasons for placing warning labels on containers.
- b. Warning labels in common use
  - i. toxic
  - ii. corrosive
  - iii. poisonous
  - iv. harmful
  - v. irritant
  - vi. flammable
  - vii. explosive.

### **Warning signs and notices**

- a. Colours used for warning signs:
  - i. red
  - ii. blue
  - iii. green.
- b. Shapes and meaning of warning signs:
  - i. round
  - ii. triangular
  - iii. square.
- c. The meaning of prohibitive warning signs in common use.
- d. The meaning of mandatory warning signs in common use.
- e. The meaning of warning notices in common use.
- f. General design of safe place warning signs.

**Hazards and risks to include:**

- a. The difference between a risk and a hazard.
- b. Potential risks resulting from:
  - i. the use and maintenance of machinery or equipment
  - ii. the use of materials or substances
  - iii. accidental breakages and spillages
  - iv. unsafe behaviour
  - v. working practices that do not conform to laid down policies
  - vi. environmental factors
  - vii. personal presentation
  - viii. unauthorised personnel, customers, contractors etc entering the work premises
  - ix. working by the roadside
  - x. vehicle recovery.
- c. The employee's responsibilities in identifying and reporting risks within their working environment.
- d. The method of reporting risks that are outside own limits of authority.
- e. Potential causes of:
  - i. fire
  - ii. explosion
  - iii. noise
  - iv. harmful fumes
  - v. slips
  - vi. trips
  - vii. falling objects
  - viii. accidents whilst dealing with broken down vehicles.

**Personal responsibilities**

- a. The purpose of workplace polices and procedures on:
  - i. the use of safe working methods and equipment
  - ii. the safe use of hazardous substances
  - iii. smoking, eating , drinking and drugs
  - iv. emergency procedures
  - v. personal appearance.
- b. The importance of personal appearance in the control of health and safety.

### **Action to be taken in the event of colleagues suffering accidents**

- a. The typical sequence of events following the discovery of an accident such as:
  - i. make the area safe
  - ii. remove hazards if appropriate i.e. switch off power
  - iii. administer minor first aid
  - iv. take appropriate action to re-assure the injured party
  - v. raise the alarm
  - vi. get help
  - vii. report on the accident.
- b. Typical examples of first aid which can be administered by persons at the scene of an accident:
  - i. check for consciousness
  - ii. stem bleeding
  - iii. keep the injured person's airways free
  - iv. place in the recovery position if injured person is unconscious
  - v. issue plasters for minor cuts
  - vi. action to prevent shock i.e. keep the injured party warm
  - vii. administer water for minor burns or chemical injuries
  - viii. wash eyes with water to remove dust or ingress of chemicals (battery acid)
  - ix. need to seek professional help for serious injuries.
- c. Examples of bad practice which may result in further injury such as:
  - i. moving the injured party
  - ii. removing foreign objects from wounds or eyes
  - iii. inducing vomiting
  - iv. straightening deformed limbs.

## Unit 053

## Knowledge of support for job roles in the automotive work environment

<b>UAN:</b>	<b>T/601/6175</b>
<b>Level:</b>	3
<b>Credit value:</b>	3
<b>GLH:</b>	20
<b>Relationship to NOS:</b>	This unit is linked to G3 Maintain Working Relationships in the Motor Vehicle Environment.
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	This unit enables the learner to develop an understanding of how to keep good working relationships with all colleagues in the automotive work environment by using effective communication and support skills.

<b>Learning outcome</b>	<b>The learner will:</b>
1. understand key organisational structures, functions and roles within the automotive work environment	
<b>Assessment criteria</b>	
The learner can:	
1.1 identify the purpose of the different sections of a typical automotive work environment	
1.2 explain organisational structures and lines of communication within the automotive work environment	
1.3 explain levels of responsibility within specific job roles in an automotive workplace. To include:	
a. trainee	
b. skilled technician	
c. supervisor	
d. manager.	
<b>Learning outcome</b>	<b>The learner will:</b>
2. understand the importance of obtaining, interpreting and using information in order to support their job role within the automotive work environment	
<b>Assessment criteria</b>	
The learner can:	
2.1 explain the importance of different sources of information in an automotive work environment	

2.2	explain how to find, interpret and use relevant sources of information
2.3	describe the main legal requirements relating to the vehicle, including road safety requirements
2.4	explain the importance of working to recognised procedures and processes
2.5	explain when replacement units and components must meet the manufacturers' original equipment specification
2.6	explain how to use identification codes.

<b>Learning outcome</b>	<b>The learner will:</b>
3. understand the importance of different types of communication within the automotive work environment	
<b>Assessment criteria</b>	
The learner can:	
3.1	explain where different methods of communication would be used within the automotive environment
3.2	explain the factors which can determine their choice of communication
3.3	explain how the communication of information can change with the target audience to include informed and uninformed people.

<b>Learning outcome</b>	<b>The learner will:</b>
4. understand communication requirements when carrying out vehicle repairs in the automotive work environment	
<b>Assessment criteria</b>	
The learner can:	
4.1	explain how to report using written and verbal communication
4.2	explain the importance of documenting information relating to work carried out in the automotive environment
4.3	explain the importance of working to agreed timescales.

<b>Learning outcome</b>	<b>The learner will:</b>
5. understand how to develop good working relationships with colleagues and customers in the automotive workplace	
<b>Assessment criteria</b>	
The learner can:	
5.1	describe how to develop positive working relationships with colleagues and customers
5.2	explain the importance of developing positive working relationships
5.3	explain the importance of accepting other peoples' views and opinions
5.4	explain the importance of making and honouring realistic commitments to colleagues and customers.

## **Unit 053                    Knowledge of support for job roles in the automotive work environment**

### Supporting information

**Candidates will be assessed on the assessment criteria as specified within the unit. The following information has been provided by IMI SSC and is included to support centres in terms of teaching and delivery.**

#### **The structure of a typical vehicle repair business**

- a. How these areas relate to each other within the business:
  - i. body shop
  - ii. vehicle repair workshop
  - iii. paint shop
  - iv. valeting
  - v. vehicle parts store
  - vi. main office
  - vii. vehicle sales
  - viii. reception.

#### **Sources of information:**

- a. other staff
- b. manuals
- c. parts lists
- d. computer software and the internet
- e. manufacturer
- f. diagnostic equipment.

#### **Communication requirements when carrying out vehicle repairs**

- a. Locating and using correct documentation and information for:
  - i. recording vehicle maintenance and repairs
  - ii. vehicle specifications
  - iii. component specifications
  - iv. oil and fluid specifications
  - v. equipment and tools
  - vi. identification codes.
- b. Procedures for:
  - i. referral of problems
  - ii. reporting delays
  - iii. additional work identified during repair or maintenance
  - iv. keeping others informed of progress.
- c. Methods of communication:
  - i. verbal
  - ii. signs and notices
  - iii. memos
  - iv. telephone



- v. electronic mail
  - vi. vehicle job card
  - vii. notice boards
  - viii. SMS text messaging
  - ix. letters.
- d. Organisational and customer requirements:
- i. importance of time scales to customer and organization
  - ii. relationship between time and costs
  - iii. meaning of profit.
- e. Choice of communication
- i. distance
  - ii. location
  - iii. job responsibility.
- f, Importance of maintaining positive working relationships:
- i. morale
  - ii. productivity
  - iii. company image
  - iv. customer relationships
  - v. colleagues.

## Unit 054

# Knowledge of materials, fabrication, tools and measuring devices in the automotive environment

<b>UAN:</b>	<b>K/601/6237</b>
<b>Level:</b>	2
<b>Credit value:</b>	4
<b>GLH:</b>	40
<b>Relationship to NOS:</b>	This unit is linked to G4 Use of hand tools and equipment in Motor Vehicle Engineering.
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	<p>This unit enables the learner to develop an understanding of:</p> <ul style="list-style-type: none"><li>• the correct selection, care and use of key hand tools and measuring devices for modification, fabrication and repair in the automotive environment</li><li>• the correct preparation and use of common work environment equipment</li><li>• the correct selection and fabrication of materials used when modifying and repairing</li><li>• the correct application of automotive engineering fabrication and fitting principles.</li></ul>

<b>Learning outcome</b>	<b>The learner will:</b>
1. understand how to select, use and care for hand tools and measuring devices in the automotive environment	
<b>Assessment criteria</b>	
The learner can:	
1.1	identify and explain the use of common types of hand tools used for fabricating and fitting in the automotive environment
1.2	identify and explain the use of common measuring devices used for fabrication and fitting in the automotive environment
1.3	describe, within the scope of their responsibilities, how to select, prepare and maintain hand tools, measuring devices and PPE used for fabrication, repair and fitting in the automotive environment
1.4	state the limitations of common hand tools and measuring devices used for fabricating, repair and fitting in the automotive workplace

1.5	explain how common hand tools and measuring devices used for fabricating, repair and fitting in the automotive environment should be stored and maintained
1.6	identify common electrical measuring tools used in the repair of vehicles and components
1.7	explain the preparation and safe and correct use of common electrical tools when measuring voltage, current and resistance.

<b>Learning outcome</b>	<b>The learner will:</b>
2. understand how to prepare and use common workshop equipment	
<b>Assessment criteria</b>	
The learner can:	
2.1	describe the preparation and safe use of workshop equipment
2.2	explain the term: safe working load.

<b>Learning outcome</b>	<b>The learner will:</b>
3. understand how to select materials when fabricating, modifying and repairing vehicles and fitting components	
<b>Assessment criteria</b>	
The learner can:	
3.1	describe the properties, application and limitations of ferrous and non-ferrous metals, including their safe use
3.2	describe the properties, application and limitations of common non-metallic materials, including their safe use
3.3	define common terms relating to the properties of materials

<b>Learning outcome</b>	<b>The learner will:</b>
4. understand how to apply automotive engineering, fabrication and fitting principles when modifying and repairing vehicles and components	
<b>Assessment criteria</b>	
The learner can:	
4.1	describe how to tap threads, file, cut and drill plastics and metals when modifying or repairing vehicles
4.2	describe how to measure, mark out, shape and join materials when fabricating
4.3	describe the selection and fitting procedures of the following: <ul style="list-style-type: none"> <li>a. gaskets and seals</li> <li>b. sealants and adhesives</li> <li>c. fittings and fasteners</li> <li>d. electrical circuit components</li> </ul>
4.4	identify locking, fastening and fixing devices
4.5	state the importance of current operating specifications for limits, fits and tolerances in the automotive environment.

## **Unit 054 Knowledge of materials, fabrication, tools and measuring devices in the automotive environment**

### Supporting information

**Candidates will be assessed on the assessment criteria as specified within the unit. The following information has been provided by IMI SSC and is included to support centres in terms of teaching and delivery.**

**Common types of hand tools used for fabricating and fitting in the automotive workplace** to include:

- a. files
- b. hacksaws and snips
- c. hammers
- d. screwdrivers
- e. pliers
- f. spanners
- g. sockets
- h. punches
- i. types of drill and drill bits
- j. taps and dies
- k. stud removers
- l. marking out tools.

**Common measuring devices used for fabrication and fitting** in the automotive environment. To include:

- a. rule or tape
- b. callipers
- c. feeler gauge
- d. volume measures
- e. micrometer
- f. dial gauges
- g. torque wrenches
- h. depth gauges

**Common electrical measuring tools** used in the repair of vehicles and components. To include:

- a. ammeter
- b. voltmeter
- c. ohmmeter
- d. multi-meter.

**Common electrical terms when measuring:**

- a. voltage
- b. current
- c. resistance.

**Workshop equipment (including appropriate PPE) to include:**

- a. hydraulic jacks
- b. axle stands
- c. pillar drills
- d. air tools
- e. vehicle lifts
- f. cranes
- g. hoists
- h. electrical power tools.

**The properties, application and limitations (to include safe use) of ferrous and non-ferrous metals used when constructing, modifying and repairing vehicles and components.**

Materials to include:

- a. carbon steels
- b. alloy steels
- c. cast iron
- d. aluminium alloys
- e. brass
- f. copper
- g. lead.

**Properties, application and limitations (to include safe use) of non-metallic materials used when constructing, modifying and repairing vehicles and components.**

Materials to include:

- a. glass
- b. plastics (inc. GRP)
- c. Kevlar
- d. rubber.

**Terms relating to the properties of materials to include:**

- a. hardness
- b. toughness
- c. ductility
- d. elasticity
- e. tenacity
- f. malleability
- g. plasticity.

## Unit 103

## Skills in removing and replacing light vehicle electrical units and components

<b>UAN:</b>	<b>T/601/3874</b>
<b>Level:</b>	2
<b>Credit value:</b>	5
<b>GLH:</b>	45
<b>Relationship to NOS:</b>	This unit is linked to LV03 Remove and Replace Light Vehicle Electrical Units and Components.
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	This unit allows the learner to develop skills to remove and replace light vehicle engine system components. It also covers the evaluation of performance of the replaced units and systems.

<b>Learning outcome</b>	<b>The learner will:</b>
1.	be able to work safely when carrying out removal and replacement activities
<b>Assessment criteria</b>	
The learner can	
1.1	use suitable personal protective equipment and vehicle coverings when working on light vehicle electrical systems and components
1.2	work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.

<b>Learning outcome</b>	<b>The learner will:</b>
2.	be able to use relevant information to carry out the task
<b>Assessment criteria</b>	
The learner can	
2.1	select suitable sources of technical information to support light vehicle electrical unit and component removal and replacement activities including: a. vehicle technical data b. removal and replacement procedures c. legal requirements
2.2	use technical information to support light vehicle electrical unit and component removal and replacement activities.

<b>Learning outcome</b>	<b>The learner will:</b>
	3. be able to use appropriate tools and equipment
<b>Assessment criteria</b>	
The learner can	
3.1	select the appropriate tools and equipment necessary for removal and replacement of motor vehicle electrical system components
3.2	ensure that equipment has been calibrated to meet manufacturers' and legal requirements
3.3	use the tools and equipment in the way specified by manufacturers to remove and replace motor vehicle electrical systems.

<b>Learning outcome</b>	<b>The learner will:</b>
	4. be able to carry out removal and replacement of light vehicle electrical units and components
<b>Assessment criteria</b>	
The learner can	
4.1	remove and replace the motor vehicle's electrical systems and components, adhering to the specifications and tolerances for the vehicle and following: <ul style="list-style-type: none"> <li>a. the manufacturer's approved removal and replacement methods</li> <li>b. recognised researched repair methods</li> <li>c. health and safety requirements</li> </ul>
4.2	ensure that replacement motor vehicle electrical units and components conform to the vehicle operating specification and any legal requirements
4.3	use suitable testing methods to evaluate the performance of the reassembled system
4.4	ensure that the reassembled motor vehicle electrical systems perform to the vehicle operating specification and meets any legal requirements.

<b>Learning outcome</b>	<b>The learner will:</b>
	5. be able to record information and make suitable recommendations
<b>Assessment criteria</b>	
The learner can	
5.1	produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required
5.2	make suitable and justifiable recommendations for cost effective repairs
5.3	record and report any additional faults noticed during the course of their work promptly in the format required.

## Unit 153

# Knowledge of removing and replacing light vehicle electrical units and components

<b>UAN:</b>	<b>T/601/3731</b>
<b>Level:</b>	2
<b>Credit value:</b>	6
<b>GLH:</b>	45
<b>Relationship to NOS:</b>	This unit is linked to LV03 Remove and Replace Light Vehicle Electrical Units and Components.
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	This unit enables the learner to develop an understanding of the principles, construction and operation and testing methods of common electrical and electronic systems and components. It also covers the procedures involved in the removal and replacement of system components and the evaluation of their performance.

<b>Learning outcome</b>	<b>The learner will:</b>
1.	understand light vehicle electrical and electronic principles
<b>Assessment criteria</b>	
1.1	identify electrical symbols and units found in light vehicle circuits
1.2	describe how to interpret simple light vehicle wiring diagrams
1.3	describe the operation of key light vehicle circuit protection devices and why these are necessary
1.4	describe earthing principles and earthing methods
1.5	identify the use of different cables and connectors used in light vehicle circuits
1.6	describe the operation of electrical and electronic sensors and actuators and their application
1.7	describe the key electrical and electronic control principles that are related to light vehicle electrical circuits
1.8	state common terms used in light vehicle electrical circuits.



<b>Learning outcome</b>	<b>The learner will:</b>
2. understand how light vehicle batteries, starting and charging systems operate	
<b>Assessment criteria</b>	
The learner can	
2.1 identify light vehicle batteries, starting and charging system components	
2.2 describe the construction and operation of light vehicle batteries, starting and charging system components	
2.3 describe how to remove and replace batteries, starting and charging system units and components	
2.4 compare light vehicle batteries, starting and charging system components and assemblies against alternatives to identify differences in construction and operation	
2.5 state common terms used in conjunction with light vehicle batteries, starting and charging systems.	
<b>Learning outcome</b>	<b>The learner will:</b>
3. understand how light vehicle auxiliary electrical systems operate	
<b>Assessment criteria</b>	
The learner can	
3.1 identify light vehicle auxiliary system components	
3.2 describe the construction and operation of light vehicle auxiliary systems. Auxiliary systems to include:	
a. lighting	
b. wiper	
c. security and alarm	
d. comfort and convenience	
e. information and entertainment	
f. telephone and two-way communication	
g. electric window	
h. monitoring and instrumentation	
3.3 compare key light vehicle auxiliary system components and assemblies against alternatives to identify differences in construction and operation	
3.4 state common terms used in light vehicle auxiliary system design.	
<b>Learning outcome</b>	<b>The learner will:</b>
4. understand how to check, replace and test light vehicle electrical systems and components	
<b>Assessment criteria</b>	
The learner can	
4.1 describe how to remove and replace light vehicle electrical system units and components	
4.2 describe common types of testing methods used to check the operation of light vehicle electrical systems and components and their purpose	
4.3 explain how to test and evaluate the performance of replacement units against specifications	
4.4 identify common faults found in light vehicle electrical systems and components.	

# Unit 153 Knowledge of removing and replacing light vehicle electrical units and components

## Supporting information

**Candidates will be assessed on the assessment criteria as specified within the unit. The following information has been provided by IMI SSC and is included to support centres in terms of teaching and delivery.**

### 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 components.
- 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 of and replacing electrical and electronic components and systems.
- c. The importance 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.

## Unit 218

## Skills in removing and fitting of basic light vehicle mechanical, electrical and trim (MET) components and non permanently fixed vehicle body panels

<b>UAN:</b>	<b>K/601/3869</b>
<b>Level:</b>	2
<b>Credit value:</b>	3
<b>GLH:</b>	20
<b>Relationship to NOS:</b>	This unit is linked to BP18 Remove and Fit Basic Motor Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Motor Vehicle Body Panels.
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	This unit allows the learner to demonstrate they can carry out a range of removal and fitting of basic mechanical, electrical and trim (MET) components and non-permanently fixed light vehicle body panels. It also covers the evaluation of the operation of the components when fitted.

<b>Learning outcome</b>	<b>The learner will:</b>
1. be able to work safely when carrying out removal and fitting of basic MET components and non-permanently fixed light vehicle body panels	
<b>Assessment criteria</b>	
The learner can	
1.1	use suitable personal protective equipment and vehicle coverings throughout all light vehicle removal and fitting of basic MET components and non-permanently fixed light vehicle body panels
1.2	work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.

<b>Learning outcome</b>	<b>The learner will:</b>
	2. be able to use relevant information to carry out the task
<b>Assessment criteria</b>	
The learner can	
2.1 select suitable sources of technical information to support light vehicle removal and fitting activities including: <ul style="list-style-type: none"> <li>a. vehicle technical data</li> <li>b. removal and fitting procedures</li> <li>c. legal requirements</li> </ul>	
2.2 use technical information to support light vehicle removal and fitting activities.	

<b>Learning outcome</b>	<b>The learner will:</b>
	3. be able to use appropriate tools and equipment
<b>Assessment criteria</b>	
3.1 select the appropriate tools and equipment necessary for carrying out removal and fitting of basic MET components and non-permanently fixed light vehicle body panels	
3.2 ensure that equipment has been calibrated to meet manufacturers' and legal requirements	
3.3 use the correct tools and equipment in the way specified by manufacturers when carrying removal and fitting of basic MET components and non-permanently fixed light vehicle body panels.	

<b>Learning outcome</b>	<b>The learner will:</b>
	4. be able to carry out removal and fitting of basic MET components and non-permanently fixed light vehicle body panels
<b>Assessment criteria</b>	
The learner can	
4.1 remove and fit basic MET components and non-permanently fixed light vehicle body panels	
4.2 ensure that the removal and fitting of basic MET components and non-permanently fixed light vehicle body panels conforms to the vehicle operating specification and any legal requirements	
4.3 ensure no damage occurs to other components when carrying out removal and fitting of basic MET components and non-permanently fixed light vehicle body panels	
4.4 ensure all components and panels are stored safely and in the correct location.	

<b>Learning outcome</b>	<b>The learner will:</b>
	5. be able to record information and make suitable recommendations
<b>Assessment criteria</b>	
The learner can	
5.1 produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required	
5.2 make suitable and justifiable recommendations for cost effective repairs	
5.3 record and report any additional faults noticed during the course of their work promptly in the format required.	



## Unit 268

## Knowledge of removing and fitting basic light vehicle mechanical, electrical and trim (MET) components and non permanently fixed vehicle body panels

<b>UAN:</b>	<b>F/601/3747</b>
<b>Level:</b>	2
<b>Credit value:</b>	2
<b>GLH:</b>	20
<b>Relationship to NOS:</b>	This unit is linked to BP18 Remove and Fit Basic Motor Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Motor Vehicle Body Panels.
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	This unit enables the learner to develop an understanding of carrying out a range of removal and fitting of basic mechanical, electrical and trim (MET) components and non-permanently fixed light vehicle body panels. It also covers the evaluation of the operation of the components when fitted.

<b>Learning outcome</b>	<b>The learner will:</b>
1. understand how to carry out removal and fitting of basic light vehicle mechanical electrical and trim (MET) components	
<b>Assessment criteria</b>	
The learner can	
1.1 identify the procedures involved in carrying out the systematic removal and fitting of basic light vehicle MET components to the standard required including:	
a. bumpers	
b. headlamp units	
c. road wheels	
d. batteries	
e. bonnet and boot trim	
f. interior trim components	
g. exterior trim components	

1.2	identify the procedures involved in working with supplementary safety systems when fitting basic light vehicle MET components
1.3	identify the procedures involved in working with gas discharge headlamp systems when fitting basic light vehicle MET components
1.4	explain the methods and procedures for storing removed light vehicle MET components
1.5	identify the different types of fastenings and fixings used when removing and fitting light vehicle MET components
1.6	explain the reasons for the use of different types of fastenings and fixings used in light vehicle MET components
1.7	explain the procedures, methods and reasons for ensuring correct alignment of light vehicle MET components
1.8	identify the quality checks that can be used to ensure correct alignment and operation of light vehicle MET components
1.9	identify correct conformity of vehicle systems against light vehicle specification and legal requirements on completion
1.10	explain the procedure for reporting cosmetic damage to light vehicle MET components and units.

<b>Learning outcome</b>	<b>The learner will:</b>
2.	understand how to carry out removal and fitting of basic light vehicle non permanently fixed vehicle body panels
<b>Assessment criteria</b>	
The learner can	
2.1	identify the procedures involved in carrying out the systematic removal and fitting of basic light vehicle non-welded, non-structural body panels to the standard required including: <ul style="list-style-type: none"> <li>a. wings</li> <li>b. doors</li> <li>c. bonnets</li> <li>d. boot lids and tailgates</li> <li>e. bumper bars, covers and components</li> </ul>
2.2	identify the procedures involved in working with supplementary safety systems when fitting basic light vehicle non-welded, non-structural body panels
2.3	explain the methods and procedures for storing removed light vehicle non-welded, non-structural body panels
2.4	identify the different types of fastenings and fixings used when removing and fitting light vehicle non-welded, non-structural body panels
2.5	explain the reasons for the use of different types of fastenings and fixings used in light vehicle non-welded, non-structural body panels
2.6	explain the procedures, methods and reasons for ensuring correct alignment of light vehicle non-welded, non-structural body panels
2.7	identify the quality checks that can be used to ensure correct alignment and operation of light vehicle non-welded, non-structural body panels
2.8	identify correct conformity of vehicle systems against light vehicle specification and legal requirements on completion
2.9	explain the procedure for reporting cosmetic damage to light vehicle non-welded, non-structural body panels.

## **Unit 268 Knowledge of removing and fitting basic light vehicle mechanical, electrical and trim (MET) components and non permanently fixed vehicle body panels**

### Supporting information

**Candidates will be assessed on the assessment criteria as specified within the unit. The following information has been provided by IMI SSC and is included to support centres in terms of teaching and delivery.**

#### **Describe procedures to prevent damage to the vehicle, components and contents when removing, storing and refitting basic MET components**

- a. The methods that can be used to protect undamaged items to ensure they are removed and refitted without causing unnecessary damage:
  - i. bumpers
  - ii. headlamp units
  - iii. road wheels
  - iv. batteries
  - v. bonnet and boot trim
  - vi. interior trim components
  - vii. exterior trim components.
- b. The procedures for the correct storage of vehicle contents.
- c. The process for the reporting of extra damage and items that may have broken when removed or refitted.

#### **The processes involved when handling batteries**

- a. The procedure for the removal, storage and refitting of lead acid batteries.
- b. The procedure for the disposal of lead acid batteries.
- c. Battery checks:
  - i. electrolyte
  - ii. discharge
  - iii. specific gravity.
- d. The charging process and procedures:
  - i. trickle charge
  - ii. normal charge
  - iii. boost / start.
- e. The health and safety issues involved when charging (explosive gasses).

### **Types of clips and fixings**

- a. The following types of clips and identify reasons and limitations for their use:
  - i. speed
  - ii. 'c'
  - iii. 'd'
  - iv. 'j' type captive nut
  - v. 'r'
  - vi. 'u' type captive nut
  - vii. cable clip
  - viii. trim clips.
- b. The following types of fixings and identify reasons and limitations for their use:
  - i. pop rivet
  - ii. plastic rivet
  - iii. plastic capture nut
  - iv. nut and bolt
  - v. soulder bolt
  - vi. 'Nyloc' type nuts
  - vii. washers
  - viii. 'Spring' type washers
  - ix. self tapping screws and bolts
  - x. quick release plastic trim fastenings
  - xi. trim tapes
  - xii. adhesives and sealers.

### **The processes involved when carrying out quality checks**

- a. Items that may have been 'workshop' soiled and describe processes for rectifying:
  - i. door cards
  - ii. seats
  - iii. carpets
  - iv. boot and bonnet trims
- b. Methods for checking gaps.
- c. The process for checking and aligning headlamps:
  - i. address handling procedures for halogen bulbs
  - ii. address handling and health and safety issues relating to xenon bulbs and systems.
- d. Operational checks and rectification methods to include:
  - i. lights
  - ii. washers and wipers
  - iii. SRS systems (checking not rectification)
  - iv. charging system (checking not rectification)
  - v. horn
  - vi. fluid levels
  - vii. interior switches
  - viii. operation of door lock mechanisms.

## **Removing and Fitting Non-Structural Body Panels**

- a. Find, interpret and use sources of information applicable to the removal and fitting of basic non welded non-structural body panels.
- b. Select check and use all the tools and equipment required to remove and fit basic non welded non-structural body panels including:
  - i. hinge pin removers
  - ii. spanners
  - iii. screwdrivers.
- c. The different types of mechanical fixings for non welded non-structural body panels and when and why they should be used including:
  - i. bolts
  - ii. self tapping bolts
  - iii. speed nuts
  - iv. washers.
- d. The correct procedures and processes for removing and fitting of non welded non-structural body panels.
- e. The need for correct alignment of panels and methods to achieve this:
  - i. aperture gaps
  - ii. alignment of panel features
  - iii. best fit of components to panels
  - iv. vehicle geometry
  - v. operation of openings such as doors, tailgates, bonnets etc.
- f. The types of quality control checks that can be used to ensure correct alignment and contour of panels and operation of components to manufacturer's specification.
- g. The method of storing removed panels and the importance of storing them correctly.

## Unit 401

## Skills in locating and correcting simple electrical faults in the automotive workplace

<b>UAN:</b>	<b>F/601/6034</b>
<b>Level:</b>	2
<b>Credit value:</b>	5
<b>GLH:</b>	45
<b>Relationship to NOS:</b>	This unit is linked to NOS AE01 – Locate and Correct Motor Vehicle Electrical Faults
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	This unit will help the learner to demonstrate and conduct a range of routine electrical tests and identifying simple faults on a variety of basic electrical components and undertaking suitable correction activities.

<b>Learning outcome</b>	<b>The learner will:</b>
	1. be able to work safely when carrying out electrical testing techniques and rectification activities
<b>Assessment criteria</b>	
The learner can	
1.1	use suitable personal protective equipment and vehicle coverings throughout when carrying out vehicle electrical testing and rectification activities
1.2	work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.

<b>Learning outcome</b>	<b>The learner will:</b>
	2. be able to use relevant information to carry out the task
<b>Assessment criteria</b>	
The learner can	
2.1	select suitable sources of technical information to support the identification of electrical faults, by reviewing: <ul style="list-style-type: none"> <li>a technical data</li> <li>b diagnostic test procedures</li> </ul>
2.2	use technical information to support the identification of electrical faults.

<b>Learning outcome</b>	<b>The learner will:</b>
3.	be able to use appropriate tools and equipment
<b>Assessment criteria</b>	
The learner can	
3.1	select the appropriate tools and equipment necessary for carrying out electrical testing techniques and rectification activities
3.2	ensure that equipment has been calibrated to meet manufacturers' and legal requirements
3.3	use the correct tools and equipment in the way specified by manufacturers when carrying out electrical testing techniques and rectification activities.

<b>Learning outcome</b>	<b>The learner will:</b>
4.	be able to carry out electrical testing techniques and rectification activities
<b>Assessment criteria</b>	
The learner can	
4.1	carry out a functionality test of the electrical system and or component
4.2	use electrical testing methods that are suitable for assessing the performance of the electrical system and or components concerned
4.3	carry out all diagnostic and rectification activities following: <ul style="list-style-type: none"> <li>a. manufacturers' instructions</li> <li>b. recognised researched repair methods</li> <li>c. workplace procedures</li> <li>d. health and safety requirements</li> </ul>
4.4	ensure all electrical testing techniques clearly identifies the cause of the identified faults
4.5	seek assistance of the relevant person promptly where the results of the testing are unclear
4.6	ensure all repaired and replaced electrical components are secure and function as specified by the manufacturer or any legal requirements
4.7	dispose of any removed electrical components safely to comply with legal requirements and workplace procedures.

<b>Learning outcome</b>	<b>The learner will:</b>
5.	Be able to record information and make suitable recommendations
<b>Assessment criteria</b>	
The learner can	
5.1	produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required
5.2	make suitable and justifiable recommendations for cost effective repairs
5.3	record and report any additional faults noticed during the course of their work promptly in the format required.

## Unit 402

## Skills in enhancing vehicle electrical systems

<b>UAN:</b>	<b>J/601/6035</b>
<b>Level:</b>	2
<b>Credit value:</b>	5
<b>GLH:</b>	45
<b>Relationship to NOS:</b>	This unit is linked to NOS AE02 – Install Motor Vehicle Electrical System Enhancements
<b>Assessment requirements specified by a sector or regulatory body:</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim:</b>	This unit will help the learner to develop the skills required to demonstrate they can carry out a range of vehicle enhancement activities to improve the original vehicle features and specification and to meet customer requirements.

<b>Learning outcome</b>	<b>The learner will:</b>
1.	be able to work safely when carrying out vehicle electrical enhancement activities
<b>Assessment criteria</b>	
The learner can:	
1.1	use suitable personal protective equipment and vehicle coverings throughout when carrying out vehicle electrical enhancement activities
1.2	work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.

<b>Learning outcome</b>	<b>The learner will:</b>
2.	be able to use relevant information to carry out the task
<b>Assessment criteria</b>	
The learner can:	
2.1	select suitable sources of technical information to support the vehicle enhancement activities, by reviewing manufacturer: a. technical data b. fitting procedures c. legal requirements
2.2	use technical information to support the vehicle enhancement activities.



<b>Learning outcome</b>	<b>The learner will:</b>
	3. be able to use appropriate tools and equipment
<b>Assessment criteria</b>	
The learner can:	
3.1	select the appropriate tools and equipment necessary for carrying out vehicle enhancement activities:
3.2	ensure that equipment has been calibrated to meet manufacturers' and legal requirements
3.3	use the correct tools and equipment in the way specified by manufacturers when carrying out vehicle enhancement activities.

<b>Learning outcome</b>	<b>The learner will:</b>
	4. be able to carry out vehicle electrical enhancement activities
<b>Assessment criteria</b>	
The learner can:	
4.1	ensure prior to fitment that components are compatible with the vehicle specification and the customers requirements
4.2	carry out all vehicle enhancement activities following: <ul style="list-style-type: none"> <li>a. manufacturers' instructions</li> <li>b. legal requirements</li> <li>c. workplace procedures</li> <li>d. health and safety requirements</li> </ul>
4.3	ensure when necessary that adjustments to components and systems are carried out to ensure correct and effective operation
4.4	ensure all enhanced vehicle electrical components are secure and function as specified by the manufacturer or any legal requirements.

<b>Learning outcome</b>	<b>The learner will:</b>
	5. be able to record information and make suitable recommendations
<b>Assessment criteria</b>	
The learner can:	
5.1	produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required
5.2	make suitable and justifiable recommendations for cost effective repairs
5.3	record and report any additional faults noticed during the course of their work promptly in the format required.

## Unit 403

## Skills in the overhauling of electrical units

<b>UAN:</b>	<b>R/601/6037</b>
<b>Level:</b>	2
<b>Credit value:</b>	5
<b>GLH:</b>	45
<b>Relationship to NOS:</b>	This unit is linked to NOS AE03 – Repair and Overhaul Motor Vehicle Electrical Units
<b>Assessment requirements specified by a sector or regulatory body:</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim:</b>	This unit will help the learner to develop the skills required to demonstrate overhaul of starting and charging units.

<b>Learning outcome</b>	<b>The learner will:</b>
1.	be able to work safely when overhauling electrical components.
<b>Assessment criteria</b>	
The learner can:	
1.1	use suitable personal protective equipment and vehicle coverings throughout when overhauling vehicle electrical components
1.2	work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.

<b>Learning outcome</b>	<b>The learner will:</b>
2.	be able to use relevant information to carry out the task
<b>Assessment criteria</b>	
The learner can:	
2.1	select suitable sources of technical information to support the electrical overhaul activities, by reviewing manufacturers:
	a. technical data
	b. manufacturers overhauling procedures
	c. test procedures
2.2	use technical information to support the electrical overhaul activities.

<b>Learning outcome</b>	<b>The learner will:</b>
	3. be able to use appropriate tools and equipment
<b>Assessment criteria</b>	
The learner can:	
3.1	select the appropriate tools and equipment necessary for carrying out the electrical overhaul activities
3.2	check that equipment has been calibrated to meet manufacturers' and legal requirements
3.3	use the correct tools and equipment in the way specified by manufacturers when carrying out electrical overhaul activities.

<b>Learning outcome</b>	<b>The learner will:</b>
	4. be able to overhaul electrical components.
<b>Assessment criteria</b>	
The learner can:	
4.1	ensure initial assessment and testing methods of electrical units identifies accurately the condition and suitability for reconditioning, repair or replacement
4.2	use electrical testing methods which are suitable for assessing the performance of the type of electrical unit being tested
4.3	carry out all electrical overhauling activities following: <ul style="list-style-type: none"> <li>a. manufacturers' instructions</li> <li>b. recognised researched repair methods</li> <li>c. health and safety requirements</li> </ul>
4.4	ensure when necessary that adjustments to components are carried out to ensure correct and effective operation
4.5	ensure all repaired alternators and starters are secure and function as specified by the manufacturer or any legal requirements.

<b>Learning outcome</b>	<b>The learner will:</b>
	5. be able to record information and make suitable recommendations
<b>Assessment criteria</b>	
The learner can:	
5.1	produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required
5.2	make suitable and justifiable recommendations for cost effective repairs
5.3	record and report any additional faults noticed during the course of their work promptly in the format required.

## Unit 407

## Skills in fitting auxiliary locks and security devices (Electrical & Mechanical)

<b>UAN:</b>	<b>H/601/6043</b>
<b>Level:</b>	2
<b>Credit value:</b>	3
<b>GLH:</b>	25
<b>Relationship to NOS:</b>	This unit is linked to NOS AE07 – Motor Vehicle Auxiliary Locks and Security Devices
<b>Assessment requirements specified by a sector or regulatory body:</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim:</b>	This unit will enable the learner to develop skills in carrying out a range of vehicle enhancement activities fitting auxiliary locks and security devices. It also covers the evaluation of performance of the fitted auxiliary locks and security devices

<b>Learning outcome</b>	<b>The learner will:</b>
	1. be able to work safely when carrying out the fitting of auxiliary locks and security devices
<b>Assessment criteria</b>	
The learner can:	
1.1	use suitable personal protective equipment and vehicle coverings throughout when fitting auxiliary locks and security devices
1.2	work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.

<b>Learning outcome</b>	<b>The learner will:</b>
	2. Be able to use relevant information to carry out the task
<b>Assessment criteria</b>	
The learner can:	
2.1	select suitable sources of technical information to support the fitting of auxiliary locks and security devices including: a. vehicle technical data b. manufacturers fitting procedures
2.2	use technical information to support the fitting of auxiliary locks and security devices.

<b>Learning outcome</b>	<b>The learner will:</b>
	3. be able to use appropriate tools and equipment
<b>Assessment criteria</b>	
The learner can:	
3.1 select the appropriate tools and equipment necessary for the fitting of auxiliary locks and security devices	
3.2 check that equipment has been calibrated to meet manufacturers' and legal requirements	
3.3 use the equipment required, correctly and safely throughout all of the fitting activities.	

<b>Learning outcome</b>	<b>The learner will:</b>
	4. be able to carry out the overhauling of light vehicle steering and suspension units
<b>Assessment criteria</b>	
The learner can:	
4.1 ensure fitment of components are compatible with the vehicle specification and the customers requirements	
4.2 carry out all vehicle fitting activities following:	
a. manufacturers' instructions	
b. legal requirements	
c. workplace procedures	
d. health and safety requirements	
4.3 ensure when necessary that adjustments to components and systems are carried out to ensure correct and effective operation	
4.4 ensure all auxiliary locks and security devices conform to the vehicle operating specification and are secure and function as specified by the manufacturer or any legal requirements.	

<b>Learning outcome</b>	<b>The learner will:</b>
	5. be able to record information and make suitable recommendations
<b>Assessment criteria</b>	
The learner can:	
5.1 produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required	
5.2 make suitable and justifiable recommendations for cost effective repairs	
5.3 record and report any additional faults noticed during the course of their work promptly in the format required.	

## Unit 408

## Skills in inspecting vehicles using prescribed methods

<b>UAN:</b>	<b>T/601/6046</b>
<b>Level:</b>	2
<b>Credit value:</b>	2
<b>GLH:</b>	4
<b>Relationship to NOS:</b>	This unit is linked to NOS AE08 – Inspect Motor Vehicle using Prescribed Inspection Methods
<b>Assessment requirements specified by a sector or regulatory body:</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim:</b>	This unit will enable the learner to develop skills in carrying out a range of light vehicle inspections on vehicles using a variety of prescribed testing and inspection methods

<b>Learning outcome</b>	<b>The learner will:</b>
1. be able to work safely when carrying out light vehicle inspections using prescribed methods	
<b>Assessment criteria</b>	
The learner can:	
1.1 use suitable personal protective equipment and vehicle coverings throughout when carrying out vehicle inspection activities	
1.2 work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.	

<b>Learning outcome</b>	<b>The learner will:</b>
2. be able to use relevant information to carry out the task	
<b>Assessment criteria</b>	
The learner can:	
2.1 select suitable sources of technical information to support light vehicle inspection activities including:	
a. vehicle technical data	
b. inspection procedures	
c. legal requirements	
2.2 use technical information to support light vehicle inspection activities.	

<b>Learning outcome</b>	<b>The learner will:</b>
	3. be able to use appropriate tools and equipment
<b>Assessment criteria</b>	
The learner can:	
3.1	select the appropriate tools and equipment necessary for carrying out a range of inspections on light vehicle systems
3.2	use tools and equipment in the way specified by manufacturers when carrying out a range of inspections on light vehicle systems including:

<b>Learning outcome</b>	<b>The learner will:</b>
	4. be able to carry out light vehicle inspections using prescribed methods
<b>Assessment criteria</b>	
The learner can:	
4.1	carry out light vehicle inspections using prescribed methods, adhering to the specifications and tolerances for the vehicle and following: <ul style="list-style-type: none"> <li>a. the manufacturer's approved inspection methods</li> <li>b. recognised researched inspection methods</li> <li>c. health and safety requirements</li> <li>d. prescribed documentation</li> </ul>
4.2	ensure that inspected light vehicle conforms to the vehicle operating specification and any legal requirements
4.3	ensure any comparison of the vehicle against specification accurately identifies any: <ul style="list-style-type: none"> <li>a. differences from the vehicle specification</li> <li>b. vehicle appearance and condition faults</li> </ul>
4.4	use suitable testing methods to evaluate the performance of the inspected systems.

<b>Learning outcome</b>	<b>The learner will:</b>
	5. be able to record information and make suitable recommendations
<b>Assessment criteria</b>	
The learner can:	
5.1	produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required
5.2	make suitable and justifiable recommendations for cost effective repairs
5.3	record and report any additional faults noticed during the course of their work promptly in the format required.

## Unit 451

## Knowledge of locating and correcting simple electrical faults in the automotive workplace

<b>UAN:</b>	<b>K/601/6013</b>
<b>Level:</b>	2
<b>Credit value:</b>	6
<b>GLH:</b>	45
<b>Relationship to NOS:</b>	This unit is linked to NOS AE01 – Locate and Correct Motor Vehicle Electrical Faults
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	This unit enables the learner to develop an understanding in conducting a range of routine electrical tests, identifying simple faults on a variety of basic electrical components and undertaking suitable correction activities.

<b>Learning outcome</b>	<b>The learner will:</b>
1. understand the use of electrical testing equipment and measurements taken	
<b>Assessment criteria</b>	
The learner can	
1.1 identify commonly used electrical test equipment	
1.2 describe how to use and operate electrical test equipment	
1.3 describe the safety and operational checks that should be carried out on tools and equipment required to remove and replace electrical components	
1.4 describe how to measure voltage, resistance, current, and specific gravity in determining simple circuit faults	
1.5 describe when and where to use voltage, ohm, amp and specific gravity measurements in determining simple circuit faults	
1.6 describe the fundamental operation of motors, capacitors, resistors, semi-conductors, transistors, actuators and sensors (including active or self-generating and passive or modulating).	



Learning outcome	The learner will:
2. understand how to carry out electrical testing techniques	
<b>Assessment criteria</b>	
<p>The learner can</p> <ul style="list-style-type: none"> <li>2.1 describe common types of testing methods used to check the operation of vehicle electrical/electronic circuits and components</li> <li>2.2 describe how to determine component condition and suitability based upon calculations using ohms law</li> <li>2.3 describe how to conduct tests following electrical safety and workplace procedures</li> <li>2.4 explain how to evaluate and interpret test results found in diagnosing simple electrical circuit faults against vehicle manufacturer specifications and settings</li> <li>2.5 describe how and the importance of making recommendations for rectification based upon the analysis of the test information gained</li> <li>2.6 explain how to identify common faults and their causes found in fundamental electrical systems and components</li> <li>2.7 explain how to evaluate the performance of any replaced electrical components against vehicle specification and the importance of doing so</li> <li>2.8 describe the procedures for disposing of any removed electrical components.</li> </ul>	

# Unit 451 Knowledge of locating and correcting simple electrical faults in the automotive workplace

## Supporting information

**Candidates will be assessed on the assessment criteria as specified within the unit. The following information has been provided by IMI SSC and is included to support centres in terms of teaching and delivery.**

Basic electrical principles

- a. Explain the direction of current flow and electron flow.
- b. These principles must include:
  - i. volts
  - ii. amps
  - iii. ohms
  - iv. power
  - v. AC/DC
  - vi. magnetism
  - vii. electromagnetism
  - viii. electromotive force
  - ix. electromagnetic induction
  - x. electrical heating effect
- c. The terms used within these principles:
  - i. volt (electrical pressure)
  - ii. ampere (electrical current)
  - iii. ohm (electrical resistance)
  - iv. watt (power)
- d. Calculations for the basic principles:
  - i. amps
  - ii. Ohms
  - iii. volts
  - iv. watts
- e. Circuit principles to include:
  - i. series circuits
  - ii. parallel circuits
  - iii. current flow
  - iv. voltage of components
  - v. volt drop
  - vi. resistance
  - vii. the effect on circuit operation of open circuit component(s)
- f. Earth and insulated return systems.
- g. Cable sizes and colour codes.
- h. Different types of connectors, terminals and circuit protection devices.
- i. Meaning of and checks for:
  - i. short circuit
  - ii. open circuit
  - iii. bad earth
  - iv. high resistance

- v. security
- vi. functionality
- vii. performance to specific

### **Vehicle and electrical unit wiring diagrams**

- a. Describe and identify vehicle and unit electrical symbols
- b. Interpret information from vehicle wiring diagrams.
  - i. vehicle systems
  - ii. electrical units
  - iii. wire colour and size
  - iv. earth locations
  - v. wiring junction locations
  - vi. fuse size and location
  - vii. connection pin numbers

### **Safety procedures and precautions when working on electrical and electronic systems**

- a. Safety precautions when working on electrical and electronic systems to include:
  - i. avoidance of short circuits
  - ii. power surges
  - iii. prevention of electric shock
  - iv. protection of electrical and electronic components.
  - v. protection of circuits from overload or damage

### **Electrical test equipment, its function and correct use**

- a. Equipment to include:
  - i. voltmeters
  - ii. ammeters
  - iii. ohmmeters
  - iv. lock torque testers
  - v. regulator testers
  - vi. insulation testers
  - vii. oscilloscopes
  - viii. specialist test equipment

### **Different types of Batteries**

- a. Identify various types
  - i. lead acid – conventional
  - ii. maintenance free
  - iii. gel
  - iv. alkaline
  - v. sodium.

### **Battery structure and chemical composition**

- a. Lead-acid and alkaline batteries:
  - i. construction
  - ii. capacity
  - iii. rating
  - iv. reserve capacity
  - v. cranking rating
  - vi. polarity
  - vii. electrochemical action
  - viii. electrolyte type

## **Battery maintenance and charging**

- a. Maintenance including:
  - i. cleaning terminals and battery tops
  - ii. protecting terminals
  - iii. cell top-up for non-sealed units
  - iv. securing to the vehicle
  - v. removal and refitting procedures
- b. Charging to include:
  - i. trickle charging
  - ii. boost charging
  - iii. charging rates
  - iv. safe charging techniques
  - v. charging equipment

## **Lead-acid battery testing techniques and identify basic battery faults**

- a. Testing techniques for:
  - i. testing of electrolyte
  - ii. high rate discharge testing
  - iii. testing equipment.
- b. Faults including:
  - i. low charge
  - ii. battery not holding charge
  - iii. sulphating
  - iv. battery voltage drop during different component operation
  - v. damaged plates and insulators

## **Different types of generators**

- a. Dynamos and regulators.
- b. Alternators with internal and external regulators.

## **Charging principles and function of generators**

- a. Charging principles:
  - i. supply current demands
  - ii. battery charging
  - iii. constant voltage at different engine speeds

## **Components of generators**

- a. Dynamo and alternator components:
  - i. field coils
  - ii. armature
  - iii. brush assemblies
  - iv. alternator stator
  - v. rotor
  - vi. slip rings
  - vii. rectifier
  - viii. end frame packs
  - ix. bearings
  - x. regulator
  - xi. drive system

## **Basic testing procedures and identify charging system faults**

- a. Basic test procedures:
  - i. testing of generator outputs (under and off load)
  - ii. testing for rectification and regulation

- iii. removal and fitting procedure
  - iv. bench testing
  - v. vehicle testing
- b. Faults to include:
- i. slipping drive belt
  - ii. corroded or loose connections
  - iii. secure mounting
  - iv. not charging
  - v. noisy operation

### **Types, structure and operating principles of starter motors**

- a. Starter motor types:
- i. pre-engaged
  - ii. permanent magnet for heavy and diesel vehicles
  - iii. gear reduction.
- b. Components to include:
- i. solenoid
  - ii. armature
  - iii. commutator
  - iv. brush assemblies
  - v. drive systems
  - vi. ignition switches

### **Basic common faults and testing procedures for starter motors**

- a. Basic test to include:
- i. pre-engaged
  - ii. permanent magnet for heavy and diesel vehicles and light vehicle
  - iii. gear reduction starters
- i. wiring related to the circuits
  - ii. ignition switches
  - iii. removal and refitting procedures
- b. Faults to include:
- i. starter not engaging
  - ii. slow engine cranking speed
  - iii. insecure mounting

### **Types of ignition systems and ignition fundamentals**

- a. Ignition system types:
- i. conventional
  - ii. electronic
  - iii. programmed
  - iv. distributorless
- b. Ignition system functional requirements.

### **The function of ignition components**

- a. Components to include:
- i. ignition switch
  - ii. coil
  - iii. distributor
  - iv. spark plugs
  - v. leads
  - vi. ballast resistor
  - vii. contact breakers
  - viii. condenser
  - ix. electronic systems

### **Testing procedures and basic common faults relating to the ignition system**

- a. Testing procedures relating to the ignition system and components including:
  - i. wiring
  - ii. connections
  - iii. switching of the primary circuit
  - iv. removal and refitting procedures.
- b. Failing to start and running erratic

### **The operating principles of the fuel system**

#### **Different fuel types and the relevant combustion process.**

- a. Fuel and air mix
- b. Compression ratios
- c. Exhaust emissions.

### **The different types of fuel system and components**

- a. Petrol fuel systems and components:
  - i. carburettor
  - ii. choke
  - iii. fuel cut off
  - iv. stepper motors
  - v. sensors
  - vi. injectors
  - vii. fuel pumps
  - viii. relays
  - ix. cold start
  - x. anti run on solenoid
  - xi. lambda sensors
  - xii. idle control actuators
  - xiii. single and multipoint injection systems
- b. Compression ignition systems:
  - i. engine stop solenoid
  - ii. injectors
  - iii. fuel pumps
  - iv. relays
  - v. heater plugs
  - vi. injection pumps
  - vii. filters

### **Test procedures and basic common faults associated electronic elements of fuel systems and components**

- a. Basic testing procedures:
  - i. diesel engine failing to start
  - ii. failing to stop when switched off
  - iii. petrol engine not starting
  - iv. difficult to start when cold

### **The function of the engine management system and its components**

- a. Describe the engine management working processes:

- b. System component including:
  - i. pulse, hall, optimum inductive generators
  - ii. ECU
  - iii. control modules
- c. Sensors including:
  - i. crankshaft
  - ii. manifold
  - iii. temperature
  - iv. knock

### **Different types of components**

- a. Components to include:
  - i. constant energy systems
  - ii. pulse generators
  - iii. hall effect generators
  - iv. optimum inductive pulse generators
  - v. modules
  - vi. ECU
  - vii. sensors

### **Basic common faults and testing methods associated with engine management systems**

- a. Basic faults and tests to include:
  - i. engine fails to start
  - ii. erratic running
  - iii. poor fuel consumption
  - iv. poor connections
- b. Removal and replacement procedures.

### **The different lighting system components**

- a. Components to include:
  - i. side and tail lights
  - ii. brake lights
  - iii. reverse lights
  - iv. rear and front fog lights
  - v. headlights
  - vi. driving lights
  - vii. spot lights
  - viii. indicators
  - ix. headlamp trim motors
  - x. index lights

### **The function of component parts**

- a. Components to include:
  - i. lamp holders
  - ii. bulbs
  - iii. relays
  - iv. switches
  - v. warning systems
  - vi. trim motors

### **Basic common faults and testing methods associated with external lighting system**

- a. Faults relating to:
  - i. switches

- ii. relays
- iii. lamp holders
- iv. wiring
- v. connections
- vi. fuses and fuse ratings
- vii. headlamp alignment

**The operating principles of external lighting systems**

- a. Principles including:
  - i. side and tail lights
  - ii. brake lights
  - iii. reverse lights
  - iv. rear and front fog lights
  - v. headlights
  - vi. spot lights
  - vii. indicators



## Unit 452

## Knowledge in enhancing vehicle electrical systems

<b>UAN:</b>	<b>F/601/6017</b>
<b>Level:</b>	2
<b>Credit value:</b>	6
<b>GLH:</b>	45
<b>Relationship to NOS:</b>	This unit is linked to NOS AE02 – Install Motor Vehicle Electrical System Enhancements
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	This unit enables the learner to develop an understanding of the operation and fitting of electrical enhancement components and systems to improve the original vehicle features and specification to meet customer requirements.

<b>Learning outcome</b>	<b>The learner will:</b>
1. understand how electrical enhancement systems and components operate	
<b>Assessment criteria</b>	
The learner can	
1.1	identify commonly fitted electrical enhancement systems and components
1.2	describe the function and operation of the electrical enhancement systems and components
1.3	describe how the enhancement may be limited by the existing vehicle systems and fitments
1.4	compare the advantages and disadvantages of carrying out the vehicle electrical customisation.

<b>Learning outcome</b>	<b>The learner will:</b>
2. understand how to fit electrical enhancement systems and components	
<b>Assessment criteria</b>	
The learner can	
2.1	describe the procedures involved in fitting vehicle enhancement systems and components
2.2	describe how to follow manufacturers requirements relating to the components that are fitted

2.3 compare the differences in fitting a tow bar between a light vehicle and a draw bar on a heavy vehicle

<b>Learning outcome</b>	<b>The learner will:</b>
3. understand how to carry out checks to any electrical enhancement systems and components fitted	
<b>Assessment criteria</b>	
The learner can	
3.1	describe the checks that are made to make sure the components are compatible with the vehicle specification and the customer requirements
3.2	explain how to test and evaluate the performance of any electrical enhancements fitted against vehicle specification and the importance of doing so
3.3	explain how to make adjustments to components and to any surrounding systems to ensure effective operation.

# **Unit 452            Knowledge in enhancing vehicle electrical systems**

## Supporting information

**Candidates will be assessed on the assessment criteria as specified within the unit. The following information has been provided by IMI SSC and is included to support centres in terms of teaching and delivery.**

### **The different types of I.C.E. systems and components**

- a. Systems and components to include:
  - i. radio/CD players
  - ii. multi-play CD players
  - iii. DVD
  - iv. MP3 players
  - v. speakers
  - vi. aerial systems
  - vii. amplifiers
  - viii. visual display screens
  - ix. satellite navigation
  - x. mobile communication units

### **The function of component parts in the I.C.E. systems**

- a. Components include:
  - i. radio
  - ii. CD
  - iii. video
  - iv. DVD players
  - v. aerial systems
  - vi. speakers
  - vii. amplifiers
  - viii. visual display screens
  - ix. mobile communication systems

### **The operating principles of I.C.E systems**

- a. Operation of entertainment systems speaker systems and aerial systems.

### **The relevant legislation relevant to I.C.E systems**

- a. Find and apply all relevant legislation for the fitment and use of I.C.E systems.

### **Basic common faults and testing methods associated I.C.E. systems**

- a. Test and procedures for the following:
  - i. radio/CD players
  - ii. speakers
  - iii. aerial systems
  - iv. amplifiers
  - v. wiring

- vi. connections
- vii. relays
- viii. fuses
- ix. removal and refitting procedures

### **Types of security/warning systems and components**

- a. Components to include:
  - i. control units
  - ii. alarm modules
  - iii. audible warning units
  - iv. immobiliser units
  - v. sensing units
  - vi. horn
  - vii. audible warning speakers

### **The function of component parts in security and warning systems**

- a. Components to include:
  - i. control units
  - ii. alarm modules
  - iii. audible warning units
  - iv. interior sensing systems
  - v. immobiliser units
  - vi. relays
  - vii. diodes
  - viii. horns

### **The operating principles of security and warning systems**

- a. Operation of alarm systems and audible warning units.

### **The relevant legislation relevant to security and warning systems**

- a. Find and apply all relevant legislation for the fitment and use of security and warning systems.

### **Basic common faults and testing methods associated security and warning systems**

- a. Components to include:
  - i. control units
  - ii. audible warning units
  - iii. immobiliser units
  - iv. horns
  - v. relays
  - vi. diodes
  - vii. wiring
  - viii. connections and protection devices
  - ix. removal and refitting procedures

### **The different types of safety fitment systems and components**

- a. Components to include:
  - i. reversing aids and systems
  - ii. working lamps
  - iii. driving lamps
  - iv. additional fog lights
  - v. fuel cut off switches
  - vi. engine cut off switches

### **The function of component parts in safety fitment systems**

- a. Components to include:
  - i. reversing aids and systems
  - ii. working lamps
  - iii. driving lamps
  - iv. additional fog lights
  - v. fuel cut off switches
  - vi. engine cut off switches

### **The operating principles of safety fitment systems**

- a. The following safety fitments:
  - i. reversing aids and systems
  - ii. working lamps
  - iii. driving lamps
  - iv. additional fog lights
  - v. fuel cut off switches
  - vi. engine cut off switches

### **The relevant legislation relevant to safety fitment systems**

- a. Find and apply all relevant legislation for the fitment and use of safety fitment systems.

### **Basic common faults and testing methods associated with safety fitment systems**

- a. To include the following systems and components:
  - i. control units
  - ii. components
  - iii. horns
  - iv. relays
  - v. diodes
  - vi. wiring
  - vii. connections
  - viii. protection devices
  - ix. removal and refitting procedures

### **The different types of towing systems and components**

- a. Components to include:
  - i. reversing aids and systems
  - ii. towbar mounting systems
  - iii. single and double plug wiring systems
  - iv. audible warning systems
  - v. split charging systems
  - vi. trailer lighting board

### **The function of component parts in towing systems**

- a. Components must include:
  - i. reversing aids
  - ii. towbar
  - iii. wiring connectors
  - iv. audible warning systems
  - v. visible warning systems
  - vi. split charge control units
  - vii. relays
  - viii. lighting boards

### **The operating principles of towing systems**

- a. Principles to include:
  - i. reversing aids
  - ii. 7 pin plug systems
  - iii. vehicle lighting systems
  - iv. audible warning systems
  - v. visible warning systems
  - vi. split charge systems

### **The relevant legislation relevant to Towbar systems**

- a. Find and apply all relevant legislation for the fitment and use of towbar systems.

### **Basic common faults and testing methods associated with towing systems**

- a. Basic faults and tests to include:
  - i. lighting systems
  - ii. split charge systems
  - iii. warning systems
  - iv. reversing aid systems
  - v. earth faults
  - vi. voltage test methods
  - vii. resistance testing
  - viii. functional tests

## Unit 453

## Knowledge of the overhauling of electrical units

<b>UAN:</b>	<b>L/601/6022</b>
<b>Level:</b>	2
<b>Credit value:</b>	6
<b>GLH:</b>	45
<b>Relationship to NOS:</b>	This unit is linked to NOS AE03 – Repair and Overhaul Motor Vehicle Electrical Units
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim:</b>	This unit enables the learner to develop an understanding of the repair and overhauling of electrical units.

<b>Learning outcome</b>	<b>The learner will:</b>
1.	understand how to use appropriate electrical testing equipment
<b>Assessment criteria</b>	
The learner can:	
1.1	identify specialist electrical test equipment used for overhauling electrical units
1.2	describe how to use and operate specialist electrical test equipment used for overhauling electrical units
1.3	describe how to prepare, assess and test the accuracy and operation of all the electrical repair and testing equipment.

<b>Learning outcome</b>	<b>The learner will:</b>
2.	understand how to find, select and use sources of overhaul information
<b>Assessment criteria</b>	
The learner can:	
2.1	identify suitable sources of technical information to support electrical repair procedures including: a. technical data b. manufacturers instructions c. legal requirements d. industry recognised repair methods
2.2	explain how to interpret and use technical information to support the electrical repair procedures.

<b>Learning outcome</b>	<b>The learner will:</b>
3. understand how to carry out testing to electrical systems and components	
<b>Assessment criteria</b>	
The learner can:	
3.1	describe how to test and evaluate the performance of vehicles electrical systems against vehicle specification
3.2	explain how to interpret test results and carry out electrical efficiency calculations
3.3	identify common symptoms, causes and faults found in vehicle charging and starting systems
3.4	explain methods used to identify vehicle charging and starting systems faults
3.5	describe how the condition of the components are assessed within charging and starting systems to find faults
3.6	describe how to test the following alternator components: <ul style="list-style-type: none"> <li>a. diode pack</li> <li>b. rotor field</li> <li>c. stator windings</li> </ul>
3.7	describe the purpose and when to use torque, resistance, insulation and visual tests
3.8	explain the suppression requirements applicable to electrical components and the types of faults which can occur in charging, starting and motor systems.

<b>Learning outcome</b>	<b>The learner will:</b>
4. understand how to overhaul starting, charging, motor and actuator systems	
<b>Assessment criteria</b>	
The learner can:	
4.1	describe how to overhaul charging, starting, motor and actuator systems
4.2	describe how to carry out a solder repair
4.3	explain the procedures to make suitable adjustments to the starter drive setting
4.4	describe how to evaluate the operation of components and systems following overhaul.



# Unit 453 Knowledge of the overhauling of electrical units

## Supporting information

**Candidates will be assessed on the assessment criteria as specified within the unit. The following information has been provided by IMI SSC and is included to support centres in terms of teaching and delivery.**

### **The various types of generators fitted to motor vehicles**

- a. Generators must include:
  - i. alternator with an internal regulator
  - ii. alternator with an external regulator
  - iii. alternator with a separate regulator
  - iv. DC generators

### **The operating principles of each generator**

- a. Generators must include:
  - i. alternators with an internal regulator
  - ii. alternators with an external regulator
  - iii. alternators with a separate regulator
  - iv. DC generators

### **The components and how they function within each type of generator**

- a. Generators must include:
  - i. alternators with an internal regulator
  - ii. alternators with an external regulator
  - iii. alternators with a separate regulator
  - iv. DC generators
- b. Components must include:
  - i. rotors
  - ii. stators
  - iii. rectifiers
  - iv. regulator
  - v. slip rings
  - vi. bearings
  - vii. housings
  - viii. fans and pulleys
  - ix. armatures
  - x. field windings
  - xi. brushes and brush boxes
  - xii. surge protection diode

### **Test each component within each type of generator**

- a. Generators must include:
  - i. alternators with an internal regulator
  - ii. alternators with an external regulator
  - iii. alternators with a separate regulator
  - iv. DC generators
- b. Components must include:
  - i. rotors
  - ii. stators

- iii. rectifiers
  - iv. regulator
  - v. slip rings
  - vi. bearings
  - vii. housings
  - viii. fans and pulleys
  - ix. armatures
  - x. field windings
  - xi. brushes and brush boxes
  - xii. surge protection diode
- c. Tools must include:
- i. voltmeters
  - ii. ammeters
  - iii. ohmmeters
  - iv. insulation testers
  - v. regulator testers

### **Symptoms and faults associated with basic generators**

- a. Generators must include:
- i. alternators with an internal regulator
  - ii. alternators with an external regulator
  - iii. alternators with a separate regulator
  - iv. DC generators

### **Test procedures for the repaired generators and evaluate the results**

- a. Generators must include:
- i. alternators with an internal regulator
  - ii. alternators with an external regulator
  - iii. alternators with a separate regulator
  - iv. DC generators
- b. Tools must include:
- i. voltmeters
  - ii. ammeters
  - iii. specialist test equipment

### **The various types of starter motor fitted to motor vehicles**

- a. Starter motors must include:
- i. inertia starter motors
  - ii. pre-engaged starter motors
  - iii. axial starter motors
  - iv. co-axial starter motors

### **The operating principles of each type of starter motor**

- a. Starter motors must include:
- i. pre-engaged starter motors
  - ii. axial starter motors
  - iii. co-axial starter motors
  - iv. gear reduction starters

### **The components and how they function within each type of starter motor**

- a. Starter motors must include:
- i. pre-engaged starter motors
  - ii. axial starter motors
  - iii. co-axial starter motors
  - iv. gear reduction starters
- b. Components must include:

- i. armatures
- ii. field windings
- iii. brushes and brush boxes
- iv. bearings and bushes
- v. solenoids
- vi. drive gears and clutches
- vii. housings
- viii. fans and pulleys
- ix. reduction gears

**Test each component within each type of starter motor**

- a. Starter motors must include:
  - i.
  - ii. pre-engaged starter motors
  - iii. axial starter motors
  - iv. co-axial starter motors
  - v. gear reduction starters
- b. Components must include:
  - i. armatures
  - ii. field windings
  - iii. brushes and brush boxes
  - iv. bearings and bushes
  - v. solenoids
  - vi. drive gears and clutches
  - vii. housings
  - viii. fans and pulleys
  - ix. reduction gears
- c. Tools must include:
  - i. voltmeters
  - ii. ammeters
  - iii. ohmmeters
  - iv. insulation testers

**Symptoms and faults associated with starter motors**

- a. Starter motors must include:
  - i. pre-engaged starter motors
  - ii. axial starter motors
  - iii. co-axial starter motors
  - iv. gear reduction

**Tests and adjustment procedures for the repaired starter motors and evaluate the results**

- a. Starter motors must include:
  - i. pre-engaged starter motors
  - ii. axial starter motors
  - iii. co-axial starter motors
  - iv. gear reduction
- b. Tools must include:
  - i. voltmeters
  - ii. ammeters
  - iii. specialist test equipment
  - iv. lock torque testers

## Unit 457

## Knowledge of fitting auxiliary locks and security devices (electrical & mechanical)

<b>UAN:</b>	<b>K/601/6027</b>
<b>Level:</b>	2
<b>Credit value:</b>	3
<b>GLH:</b>	25
<b>Relationship to NOS:</b>	This unit is linked to NOS AE07 – Motor Vehicle Auxiliary Locks and Security Devices
<b>Assessment requirements specified by a sector or regulatory body:</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim:</b>	This unit enables the learner to develop an understanding of the operation and fitting of auxiliary locks and security devices to improve the original features and specification of

<b>Learning outcome</b>	<b>The learner will:</b>
	1. understand how auxiliary locks and security devices operate
<b>Assessment criteria</b>	
The learner can:	
1.1 identify auxiliary locks and security devices including:	
a. electronic and electro mechanical lock mechanisms	
b. additional auxiliary mechanical door locks using cylinder type locks	
c. additional auxiliary mechanical door and aperture locks using external locking systems	
d. mechanical window protection devices (internal and external)	
e. replacement security windows and window security films	
f. pneumatic locking systems	
1.2 describe the function and operation of the auxiliary locks and security devices	
1.3 describe how the fitment may be limited by the existing vehicle systems and fitments	
1.4 compare the advantages and disadvantages of carrying out the fitting of auxiliary locks and security devices	
1.5 describe the interaction between electrical and electronic and mechanical components within auxiliary locks and security devices.	

<b>Learning outcome</b>	<b>The learner will:</b>
	2. understand how to fit auxiliary locks and security devices
<b>Assessment criteria</b>	
The learner can:	
2.1	describe the procedures involved in fitting auxiliary locks and security devices
2.2	describe how to integrate vehicle electrical systems with auxiliary locks and security devices
2.3	describe how to apply vehicle body anticorrosion to meet vehicle requirements.

<b>Learning outcome</b>	<b>The learner will:</b>
	3. understand how to carry out checks to auxiliary locks and security devices fitted
<b>Assessment criteria</b>	
The learner can:	
3.1	describe the checks that are made to make sure the components are compatible with the vehicle specification and the customer requirements
3.2	explain how to test and evaluate the performance of any auxiliary locks and security devices fitted against vehicle specification and the importance of doing so
3.3	describe how to prepare, calibrate and use any equipment required to fit auxiliary security devices
3.4	explain how to make adjustments to components and to any surrounding systems to ensure effective operation.

## **Unit 457            Knowledge of fitting auxiliary locks and security devices (electrical & mechanical)**

### Supporting information

**Candidates will be assessed on the assessment criteria as specified within the unit. The following information has been provided by IMI SSC and is included to support centres in terms of teaching and delivery.**

#### **The identification of different types of auxiliary locks and security devices components**

- a. Systems and components to include:
  - i. electronic/electro mechanical lock mechanisms
  - ii. additional auxiliary mechanical door locks using cylinder type locks
  - iii. additional auxiliary mechanical door/aperture locks using external locking systems
  - iv. mechanical window protection devices (internal and external)
  - v. replacement security windows/ window security films
  - vi. pneumatic locking systems

#### **The function of components in the auxiliary locks and security devices components**

- a. Components include:
  - i. electronic/electro mechanical lock mechanisms
  - ii. additional auxiliary mechanical door locks using cylinder type locks
  - iii. additional auxiliary mechanical door/aperture locks using external locking systems
  - iv. mechanical window protection devices (internal and external)
  - v. replacement security windows/ window security films
  - vi. pneumatic locking systems

#### **The operating principles of auxiliary locks and security systems**

- a. Systems include:
  - i. electronic/electro mechanical lock mechanisms
  - ii. additional auxiliary mechanical door locks using cylinder type locks
  - iii. additional auxiliary mechanical door/aperture locks using external locking systems
  - iv. mechanical window protection devices (internal and external)
  - v. replacement security windows/ window security films
  - vi. pneumatic locking systems

#### **The relevant legislation relevant to the auxiliary locks and security systems**

- a. Find and apply all relevant legislation for the fitment and use of auxiliary locks and security systems.

**Faults and testing methods associated with auxiliary locks and security systems**

- a. Test and procedures for the following:
  - i. lock mechanisms
  - ii. cylinder locks
  - iii. external locks
  - iv. window protection devices
  - v. pneumatic locks

## Unit 458

## Knowledge of inspecting vehicles using prescribed methods

<b>UAN:</b>	<b>M/601/6028</b>
<b>Level:</b>	2
<b>Credit value:</b>	1
<b>GLH:</b>	4
<b>Relationship to NOS:</b>	This unit is linked to NOS AE08 – Inspect Motor Vehicle using Prescribed Inspection Methods
<b>Assessment requirements specified by a sector or regulatory body</b>	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
<b>Aim</b>	This unit enables the learner to develop an understanding of carrying out a range of inspections on light vehicles using a variety of prescribed testing and inspection methods

<b>Learning outcome</b>	<b>The learner will:</b>
1. understand how to carry out inspections on light vehicle using prescribed methods	
<b>Assessment criteria</b>	
The learner can	
1.1	explain the difference between the various prescribed light vehicle inspection methods to include: a. pre-work b. installed system functional check c. post-work d. vehicle handover inspection
1.2	identify the different systems to be inspected when using the prescribed inspection methods
1.3	identify the procedures involved in carrying out the systematic inspection of the prescribed inspection methods on light vehicles
1.4	identify correct conformity of vehicle systems and condition on light vehicles inspections
1.5	compare test and inspection results against light vehicle specification and legal requirements
1.6	explain how to record and complete the inspection results in the format required
1.7	identify the recommendations that can be made based on results of



the light vehicle inspections

- 1.8 explain the implications of failing to carry out light vehicle inspections activities correctly
- 1.9 explain the implications of signing workplace documentation and vehicle records
- 1.10 explain the procedure for reporting cosmetic damage to light vehicle components and units outside normal inspection items.

# Unit 458 Knowledge of inspecting vehicles using prescribed methods

## Supporting information

**Candidates will be assessed on the assessment criteria as specified within the unit. The following information has been provided by IMI SSC and is included to support centres in terms of teaching and delivery.**

### **Pre and post work vehicle inspections and record findings**

- a. PPE and vehicle protection relating to:
  - i. vehicle body panels
  - ii. paint surfaces
  - iii. seats
  - iv. carpets and floor mats prior to conduction vehicle inspections
- b. Pre and post work vehicle inspection procedures:
  - i. aural
  - ii. visual and functional assessments on engine
  - iii. engine systems
  - iv. chassis systems
  - v. wheels and tyres
  - vi. transmission system
  - vii. electrical and electronic systems
  - viii. exterior vehicle body
  - ix. vehicle interior
- c. The methods for carrying out inspections for: damage, corrosion, fluid leaks, wear, security, mounting security and condition to include;
  - i. engines and engine systems
  - ii. chassis systems
  - iii. brakes
  - iv. steering
  - v. suspension
  - vi. wheels
  - vii. tyres
  - viii. body panels
  - ix. electrical and electronic systems and components
  - x. vehicle seating and vehicle interior
  - xi. vehicle instrumentation
  - xii. driver controls
- d. Check conformity to manufacturer's specifications and legal requirements.
- e. Completion of documentation to include:
  - i. inspection records
  - ii. job cards
  - iii. vehicle records
- f. Make recommendations based on results of vehicle inspections.
- g. The checks necessary to ensure customer satisfaction for:
  - i. vehicle body panels
  - ii. paint surfaces
  - iii. seats

- iv. carpets and floor mats following pre or post vehicle inspections
- h. Prepare and use appropriate inspection equipment and tools.
  - i. Inspection procedures following inspection checklists.



## Appendix 1 Relationships to other qualifications

### Links to other qualifications

Mapping is provided as guidance and suggests areas of commonality between the qualifications. It does not imply that candidates completing units in one qualification have automatically covered all of the content of another.

Centres are responsible for checking the different requirements of all qualifications they are delivering and ensuring that candidates meet requirements of all units/qualifications.

These qualifications have connections to the 4270 Level 2/3 VCQs in Light Vehicle Maintenance and Repair.

### Literacy, language, numeracy and ICT skills development

These qualifications can develop skills that can be used in the following qualifications:

Functional Skills (England) – see

**[www.cityandguilds.com/functionalskills](http://www.cityandguilds.com/functionalskills)**

Essential Skills (Northern Ireland) – see

**[www.cityandguilds.com/essentialskillsni](http://www.cityandguilds.com/essentialskillsni)**

Essential Skills Wales (from September 2010).

## Appendix 2 Sources of general information



The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on [www.cityandguilds.com](http://www.cityandguilds.com).

***Providing City & Guilds qualifications – a guide to centre and qualification approval*** contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve ‘approved centre’ status, or to offer a particular qualification. Specifically, the document includes sections on:

- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

***Ensuring quality*** contains updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document contains information on:

- Management systems
- Maintaining records
- Assessment
- Internal verification and quality assurance
- External verification.

***Access to Assessment & Qualifications*** provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **centre homepage** section of the City & Guilds website also contains useful information such on such things as:

- **Walled Garden**  
Find out how to register and certificate candidates on line
- **Qualifications and Credit Framework (QCF)**  
Contains general guidance about the QCF and how qualifications will change, as well as information on the IT systems needed and FAQs
- **Events**  
Contains dates and information on the latest Centre events
- **Online assessment**  
Contains information on how to register for GOLLA assessments.

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## Useful contacts

<b>UK learners</b> General qualification information	T: +44 (0)844 543 0033 E: <b>learnersupport@cityandguilds.com</b>
<b>International learners</b> General qualification information	T: +44 (0)844 543 0033 F: +44 (0)20 7294 2413 E: <b>intcg@cityandguilds.com</b>
<b>Centres</b> Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: <b>centresupport@cityandguilds.com</b>
<b>Single subject qualifications</b> Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 F: +44 (0)20 7294 2404 (BB forms) E: <b>singlesubjects@cityandguilds.com</b>
<b>International awards</b> Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: <b>intops@cityandguilds.com</b>
<b>Walled Garden</b> Re-issue of password or username, Technical problems, Entries, Results, GOLLA, Navigation, User/menu option, Problems	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: <b>walledgarden@cityandguilds.com</b>
<b>Employer</b> Employer solutions, Mapping, Accreditation, Development Skills, Consultancy	T: +44 (0)121 503 8993 E: <b>business_unit@cityandguilds.com</b>
<b>Publications</b> Logbooks, Centre documents, Forms, Free literature	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413

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