QUALIFICATION HANDBOOK

Level 2 and 3 Diploma in Light Vehicle Maintenance and Repair Competence (4270-12/13)

September 2013 Version 2.2

City & Guilds

Qualification at a glance

Subject area	**Light Vehicle Maintenance and Repair**
City & Guilds number	4270
Age group approved	16-18, 19+
Assessment and grading	Portfolio of Evidence and Online Multiple Choice
Fast track	Not available. Automatic approval applies in some cases.
Support materials	Centre handbook SmartScreen Exam Success Book Online Practice tests Practical Assessment workbook Practical training workbook
Registration and certification	See online/Walled Garden for last dates.

Title and level	**City & Guilds number**	**Accreditation number**
Level 2 Diploma in Light Vehicle Maintenance and Repair Competence	4270-12	500/9975/9
Level 3 Diploma in Light Vehicle Maintenance and Repair Competence	4270-13	501/0017/8

Version and Date	**Change Detail**	**Section**
Version 2 (Sep 2012)	General clarification of Unit Range, grammatical errors corrected. Addition of range to units 161, 162, 456. Addition of statements in Section 4.	Various
2.1 Mar 2013	Corrected credit values for Units 121, 131, 171, 181	Structure
2.2 Sept 2013	Unit supporting information updated with introductory text	Units

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Unit 161	**Knowledge of overhauling light vehicle engine units**	**151**
Unit 162	**Knowledge of light vehicle transmission and driveline units and components**	**154**
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Unit 172	**Knowledge of light vehicle fuel, ignition, air and exhaust system units and components**	**167**
Unit 181	**Knowledge of overhauling light vehicle steering and suspension units**	**174**
Unit 218	**Competency in removing and fitting basic light vehicle mechanical, electrical and trim (MET) components and non-permanently fixed vehicle body panels**	**177**
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1 Introduction

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

Area	Description
Who are the qualifications for?	These Levels 2 and 3 Diplomas in Light Vehicle Maintenance and Repair Competence are for anyone developing a career in the motor industry. These practical qualifications demonstrate your skills on the job, in your own workplace, showing that you meet national standards for automotive workers. Their structure and assessment strategy have been produced by the Institute of the Motor Industry, who are the Sector Skills Council for the Automotive Industry.
What do the qualifications cover?	Candidates cover areas such as routine vehicle maintenance, removal and replacement of vehicle units and components and diagnosis and rectification of vehicle faults. They are assessed in the workplace by using the following methods: • workplace observation • witness testimony • verbal questioning of essential knowledge • City & Guilds' GOLA multiple choice test
Are the qualifications part of a framework or initiative?	These qualifications are part of the Automotive Maintenance and Repair Intermediate Apprenticeship and Advanced Apprenticeship Frameworks (framework 1) which replaced the current framework 4 from April 2011.
What opportunities for progression are there?	After taking these qualifications candidates will have a qualification that show employers and customers they have the skills of a competent technician - for example to work on light vehicles and will be able to progress into employment. In addition, candidates who enjoy leading teams of people at work could also move onto a qualification as a Team Leader or Supervisor such as qualifications at Levels 2, 3 and 4 through the Institute of Leadership and Management (ILM).

Structure

To achieve the **Level 2 Diploma in Light Vehicle Maintenance and Repair Competence**, learners must achieve 93 credits from the mandatory units and a minimum of 5 credits from a single group of optional units available.

Unit reference number	City & Guilds unit number	Unit title	Credit value
Mandatory			
A/601/6338	001	Competency in Health, Safety and Good Housekeeping in the Automotive Environment	7
K/601/6366	003	Competency in Supporting Job Roles in the Automotive Work Environment	5
Y/601/6279	004	Skills in Materials, Fabrication, Tools and Measuring Devices in the Automotive Environment	7
D/601/6171	051	Knowledge of Health, Safety and Good Housekeeping in the Automotive Environment	3
T/601/6175	053	Knowledge of Support for Job Roles in the Automotive Work Environment	3
K/601/6237	054	Knowledge of Materials, Fabrication, Tools and Measuring Devices used in the Automotive Environment	4
L/601/3766	101	Competency in Routine Light Vehicle Maintenance	7
D/601/3769	102	Competency in Removing and Replacing Light Vehicle Engine Units and Components	10
Y/601/3771	103	Competency in Removing and Replacing Light Vehicle Electrical Units and Components	10
K/601/3774	104	Competency in Removing and Replacing Light Vehicle Chassis Units and Components	10
F/601/3716	151	Knowledge of Routine Light Vehicle Maintenance	3
R/601/3719	152	Knowledge of Light Vehicle Engine Mechanical, Lubrication and Cooling System Units and Components	3
T/601/3731	153	Knowledge of Removing and Replacing Light Vehicle Electrical Units and Components	6
A/601/3732	154	Knowledge of Removing and Replacing Light Vehicle Chassis Units and Components	6
Y/601/3740	162	Knowledge of Light Vehicle Transmission and Driveline Units and Components	6
H/601/3725	172	Knowledge of Light Vehicle Fuel, Ignition, Air and Exhaust System Units and Components	3

Unit reference number	City & Guilds unit number	Unit title	Credit value
Optional Group 1			
M/601/3792	105	Competency in Inspecting Light Vehicles Using Prescribed Methods	10
H/601/3742	155	Knowledge in Inspecting Light Vehicles Using Prescribed Methods	10
Group 2			
D/601/3786	111	Competency in Overhauling Light Vehicle Engine Mechanical Units	2
R/601/3736	161	Knowledge of Overhauling Light Vehicle Engine Units	3
Group 3			
H/601/3787	121	Competency in Overhauling Light Vehicle Transmission Units	2
Y/601/3737	171	Knowledge of Overhauling Light Vehicle Transmission Units	3
Group 4			
K/601/3788	131	Competency in Overhauling Light Vehicle Steering and Suspension Units	2
D/601/3738	181	Knowledge of Overhauling Light Vehicle Steering and Suspension Units	3
Group 5			
K/601/6383	008	Competency in Identifying and Agreeing Motor Vehicle Customer Service Needs	5
R/601/6247	058	Knowledge of how to Identify and Agree Motor Vehicle Customer Service Needs	5
Group 6			
M/601/3789	112	Competency in Removing and Replacing Light Vehicle Driveline Units and Components	10
Group 7			
J/601/3751	218	Competency in Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non-permanently Fixed Vehicle Body Panels	5
F/601/3747	268	Knowledge of Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non-permanently Fixed Vehicle Body Panels	2

To achieve the **Level 3 Diploma in Light Vehicle Maintenance and Repair Competence**, learners must achieve 83 credits from the mandatory units and a minimum of 5 credits from a single group of optional units.

Unit reference number	City & Guilds unit number	Unit title	Credit value
Mandatory			
A/601/6338	001	Competency in Health, Safety and Good Housekeeping in the Automotive Environment	7
K/601/6366	003	Competency in Supporting Job Roles in the Automotive Work Environment	5
Y/601/6279	004	Skills in Materials, Fabrication, Tools and Measuring Devices in the Automotive Environment	7
D/601/6171	051	Knowledge of Health, Safety and Good Housekeeping in the Automotive Environment	3
T/601/6175	053	Knowledge of Support for Job Roles in the Automotive Work Environment	3
K/601/6237	054	Knowledge of Materials, Fabrication, Tools and Measuring Devices used in the Automotive Environment	4
J/601/3779	107	Competency in Diagnosing and Rectifying Light Vehicle Engine Faults	10
Y/601/3785	108	Competency in Diagnosing and Rectifying Light Vehicle Chassis System Faults	10
F/601/3733	157	Knowledge of Diagnosis and Rectification of Light Vehicle Engine Faults	6
L/601/3735	158	Knowledge in Diagnosis and Rectification of Light Vehicle Chassis Faults	6
D/601/3741	163	Knowledge of Diagnosis and Rectification of Light Vehicle Transmission and Driveline Faults	6
L/601/3749	406	Competency in Diagnosing and Rectifying Vehicle Auxiliary Electrical Faults	10
A/601/3746	456	Knowledge of Diagnosis and Rectification of Vehicle Auxiliary Electrical Faults	6
Optional Group 1			
M/601/3792	105	Competency in Inspecting Light Vehicles Using Prescribed Methods	10
H/601/3742	155	Knowledge in Inspecting Light Vehicles Using Prescribed Methods	4

Unit reference number	City & Guilds unit number	Unit title	Credit value
Group 2			
D/601/3786	111	Competency in Overhauling Light Vehicle Engine Mechanical Units	2
R/601/3736	161	Knowledge of Overhauling Light Vehicle Engine Units	3
Group 3			
H/601/3787	121	Competency in Overhauling Light Vehicle Transmission Units	2
Y/601/3737	171	Knowledge of Overhauling Light Vehicle Transmission Units	3
Group 4			
K/601/3788	131	Competency in Overhauling Light Vehicle Steering and Suspension Units	2
D/601/3738	181	Knowledge of Overhauling Light Vehicle Steering and Suspension Units	3
Group 5			
K/601/6383	008	Competency in Identifying and Agreeing Motor Vehicle Customer Service Needs	5
R/601/6247	058	Knowledge of how to Identify and Agree Motor Vehicle Customer Service Needs	5
Group 6			
K/601/3791	113	Competency in Diagnosing and Rectifying Light Vehicle Transmission and Driveline Faults	10
Group 7			
J/601/3751	218	Competency in Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non-permanently Fixed Vehicle Body Panels	5
F/601/3747	268	Knowledge of Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non-permanently Fixed Vehicle Body Panels	2
Group 8			
Y/601/6380	006	Competency in Making Learning Possible through Demonstrations and Instruction	5
T/601/6242	056	Knowledge of how to Make Learning Possible through Demonstrations and Instruction	5

2 Centre requirements

Approval

If your Centre is approved to offer qualification Level 2 NVQ in Automotive Maintenance and Repair - Light Vehicle (4101-01) you will be granted automatic approval for Level 2 Diploma in Light Vehicle Maintenance and Repair Competence (4270-12) and will be able to make registrations straight away.

In regards to the level 3, the Level 3 NVQ in Automotive Maintenance and Repair - Light Vehicle (4101-06) will provided you with automatic approval for Level 3 Diploma in Light Vehicle Maintenance and Repair Competence (4270-13).

For any 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.

Resource requirements

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 areas 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.

Assessors and internal verifiers

All assessors must:

- have sufficient and relevant technical/occupational competence in the Unit, at or above the level of the Unit being assessed
- have in depth knowledge of the Qualification or credit based unit evidence requirements.
- hold or be working towards a relevant assessors' award as specified by the Sector Skills Council. This will include, but not be limited to the Assessor qualifications, Level 3 Award in Understanding the Principles and Practices of Assessment, Level 3 Award in Assessing Competence in the Work Environment, Level 3 Award in Assessing Vocationally Related Achievement, Level 3 Certificate in Assessing Vocational Achievement. (and by implication legacy Assessor units A1, A2 and D32/33 unit) but may be an appropriate equivalent as defined by the SSC).
- assessors working towards a relevant assessor qualification must achieve their qualification within 12 months.
- demonstrate knowledge and understanding of the competencies that a learner is required to demonstrate for the qualification that they are undertaking
- provide evidence of completing 5 days working/job shadowing in industry within their professional area in a 24 month period.
- provide evidence of 30 hours of technical/qualification related CPD within a 12 month period. (This is in additional to working/job shadowing).

All internal verifiers must:

- have in-depth knowledge of the occupational standards and credit based unit evidence requirements.
- be occupationally aware of the relevant industry sector being internally verified
- hold or be working towards a relevant verifier award as specified by the Sector Skills Council. This will include, but not be limited to the Quality Assurance qualifications Level 4 Award in Understanding the Internal Quality Assurance of Assessment Processes and Practice, Level 4 Award in the Internal Quality Assurance of Assessment Processes and Practice, Level 4 Certificate in Leading the Internal Quality Assurance of Assessment Processes and Practice, (and by implication legacy Internal Verifier unit V1 D34 unit) but may be an appropriate equivalent as defined by the Sector Skills Council.
- verifiers working towards a relevant qualification must achieve their qualification within 12 months.
- provide evidence of CPD totalling not less than 30 hours from within their professional area within a 12 month period.

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.

Age restrictions

There is no age restriction for these qualifications unless this is a legal requirement of the process or the environment.

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 qualifications.
- any units they have already completed, or credit they have accumulated which is relevant to the qualifications.
- the appropriate type and level of qualification.

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

Support materials

City & Guilds will provide the following learning and support resources which will be posted on our website:
www.cityandguilds.com/automotive

- Online practice tests
- Practical Assessment workbook
- Practical training workbook.
- Useful material is available on SmartScreen **www.smartscreen.co.uk**
- Exam Success book TL024290

Recording documents

Candidates and centres may decide to use a paper-based or electronic method of recording evidence.

To support the delivery of vocational qualifications we offer our own ePortfolio, Learning Assistant, an easy to use and secure online tool to support and evidence candidates' progress towards achieving qualifications. Further details are available at:
www.cityandguilds.com/eportfolios.

City & Guilds has developed training and assessment documentation specifically for these qualifications which are available from City & Guilds website.

Although new centres are expected to use these forms, centres may devise or customise alternative forms, which must be approved for use by the external verifier, before they are used by candidates and assessors at the centre.

Health and safety

The requirement to follow safe working practices is an integral part of all City & Guilds qualifications and assessments, and it is the responsibility of centres to ensure that all relevant health and safety requirements are in place before candidates start practical assessments.

Should a candidate fail to follow health and safety practice and procedures during an assessment, the assessment must be stopped. The candidate should be informed that they have not reached the standard required to successfully pass the assessment and told the reason why. Candidates may retake the assessment at a later date, at the discretion of the centre. In case of any doubt, guidance should be sought from the external verifier.

Data protection and confidentiality

Centres offering this qualification may need to provide City & Guilds with personal data for staff and candidates. Guidance on data protection and the obligations of City & Guilds and centres are explained in *Providing City & Guilds qualifications*.

Initial assessment and induction

Centres will need to make an initial assessment of each candidate prior to the start of their programme to ensure they are entered for an appropriate type and level of qualification.

The initial assessment should identify any specific training needs the candidate may have, and the support and guidance they may require when working towards their qualification.

City & Guilds recommends that centres provide an induction programme to ensure the candidate fully understands the requirements of the qualification they will work towards, their responsibilities as a candidate, and the responsibilities of the centre. It may be helpful to record the information on a learning contract.

Further guidance about initial assessment and induction, as well as a learning contract that centres may use, are available in the Centre toolkit.

Equal opportunities

It is a requirement of centre approval that centres have an equal opportunities policy (see *Providing City & Guilds qualifications)*.

The regulatory authorities require City & Guilds to monitor centres to ensure that equal opportunity policies are being followed.

The City & Guilds equal opportunities policy is set out on the City & Guilds website, in *Providing City & Guilds qualifications*, in the *Directory of qualifications*, and is also available from the City & Guilds Customer Relations department.

Access to qualifications on the Qualifications Credit Framework is open to all, irrespective of gender, race, creed, age or special needs. The centre co-ordinator should ensure that no candidate is subject to unfair discrimination on any ground in relation to access to assessment and the fairness of the assessment.

Access to assessment

City & Guilds' guidance and regulations on access to assessment are designed to facilitate access to assessments and qualifications for candidates who are eligible for adjustments to assessment arrangements. Access arrangements are designed to allow attainment to be demonstrated. For further information, please see *Access to assessment and qualifications*, available on the City & Guilds website.

Appeals

Centres must have their own, auditable, appeals procedure that must be explained to candidates during their induction. Appeals must be fully documented by the quality assurance co-ordinator and made available to the external verifier or City & Guilds.

Further information on appeals is given in *Providing City & Guilds qualifications*. There is also information on appeals for centres and learners on the City & Guilds website or available from the Customer Relations department.

4 Assessment

Assessment of the qualification

Candidates must complete

- Online multiple choice tests graded as Pass, Merit, Distinction for the knowledge units.
- A portfolio of evidence for each competence unit

Time constraints

There are no time constraints applied to the assessment of this qualification. If centres have queries regarding the length of time required to complete a particular task, they should contact their external verifier in the first instance who will advise accordingly and feed this information back to City & Guilds where appropriate.

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

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

Level 2 Diploma in Light Vehicle Maintenance and Repair Competence (QCF)

Unit number	Unit title	Assessment method
001	Competency in Health, Safety and Good Housekeeping in the Automotive Environment	Portfolio
003	Competency in Supporting Job Roles in the Automotive Work Environment	Portfolio
004	Skills in Materials, Fabrication, Tools and Measuring Devices in the Automotive Environment	Portfolio
008	Competency in Identifying and Agreeing Motor Vehicle Customer Service Needs	Portfolio

Unit number	Unit title	Assessment method
051	Knowledge of Health, Safety and Good Housekeeping in the Automotive Environment	Portfolio
053	Knowledge of Support for Job Roles in the Automotive Work Environment	Portfolio
054	Knowledge of Materials, Fabrication, Tools and Measuring Devices used in the Automotive Environment	Portfolio
058	Knowledge of how to Identify and Agree Motor Vehicle Customer Service Needs	Portfolio
101	Competency in Routine Light Vehicle Maintenance	Portfolio
102	Competency in Removing and Replacing Light Vehicle Engine Units and Components	Portfolio
103	Competency in Removing and Replacing Light Vehicle Electrical Units and Components	Portfolio
104	Competency in Removing and Replacing Light Vehicle Chassis Units and Components	Portfolio
105	Competency in Inspecting Light Vehicles Using Prescribed Methods	Portfolio
111	Competency in Overhauling Light Vehicle Engine Mechanical Units	Portfolio
112	Competency in Removing and Replacing Light Vehicle Driveline Units and Components	Portfolio
121	Competency in Overhauling Light Vehicle Transmission Units	Portfolio
131	Competency in Overhauling Light Vehicle Steering and Suspension Units	Portfolio
151	Knowledge of Routine Light Vehicle Maintenance	Multiple Choice
152	Knowledge of Light Vehicle Engine Mechanical, Lubrication and Cooling System Units and Components	Multiple Choice
153	Knowledge of Removing and Replacing Light Vehicle Electrical Units and Components	Multiple Choice
154	Knowledge of Removing and Replacing Light Vehicle Chassis Units and Components	Multiple Choice
155	Knowledge of Inspecting Light Vehicles Using Prescribed Methods	Multiple Choice
161	Knowledge of Overhauling Light Vehicle Engine Units	Multiple Choice
162	Knowledge of Light Vehicle Transmission and Driveline Units and Components	Multiple Choice
171	Knowledge of Overhauling Light Vehicle Transmission Units	Multiple Choice
172	Knowledge of Light Vehicle Fuel, Ignition, Air and Exhaust System Units and Components	Multiple Choice

Unit number	Unit title	Assessment method
181	Knowledge of Overhauling Light Vehicle Steering and Suspension Units	Multiple Choice
218	Competency in Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non-permanently Fixed Vehicle Body Panels	Portfolio
268	Knowledge of Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non-permanently Fixed Vehicle Body Panels	Multiple Choice

Level 3 Diploma in Light Vehicle Maintenance and Repair Competence (QCF)

Unit number	Unit title	Assessment method
001	Competency in Health, Safety and Good Housekeeping in the Automotive Environment	Portfolio
003	Competency in Supporting Job Roles in the Automotive Work Environment	Portfolio
004	Skills in Materials, Fabrication, Tools and Measuring Devices in the Automotive Environment	Portfolio
006	Competency in Making Learning Possible through Demonstrations and Instruction	Portfolio
008	Competency in Identifying and Agreeing Motor Vehicle Customer Service Needs	Portfolio
051	Knowledge of Health, Safety and Good Housekeeping in the Automotive Environment	Portfolio
053	Knowledge of Support for Job Roles in the Automotive Work Environment	Portfolio
054	Knowledge of Materials, Fabrication, Tools and Measuring Devices used in the Automotive Environment	Portfolio
056	Knowledge of how to Make Learning Possible through Demonstrations and Instruction	Portfolio
058	Knowledge of how to Identify and Agree Motor Vehicle Customer Service Needs	Portfolio
105	Competency in Inspecting Light Vehicles Using Prescribed Methods	Portfolio
107	Competency in Diagnosing and Rectifying Light Vehicle Engine Faults	Portfolio
108	Competency in Diagnosing and Rectifying Light Vehicle Chassis System Faults	Portfolio
111	Competency in Overhauling Light Vehicle Engine Mechanical Units	Portfolio
113	Competency in Diagnosing and Rectifying Light Vehicle Transmission and Driveline Faults	Portfolio
121	Competency in Overhauling Light Vehicle Transmission Units	Portfolio
131	Competency in Overhauling Light Vehicle Steering and Suspension Units	Portfolio
155	Knowledge in Inspecting Light Vehicles Using Prescribed Methods	Multiple Choice
157	Knowledge of Diagnosis and Rectification of Light Vehicle Engine Faults	Multiple Choice
158	Knowledge in Diagnosis and Rectification of Light Vehicle Chassis Faults	Multiple Choice
161	Knowledge of Overhauling Light Vehicle Engine Units	Multiple Choice

Unit number	Unit title	Assessment method
163	Knowledge of Diagnosis and Rectification of Light Vehicle Transmission and Driveline Faults	Multiple Choice
171	Knowledge of Overhauling Light Vehicle Transmission Units	Multiple Choice
181	Knowledge of Overhauling Light Vehicle Steering and Suspension Units	Multiple Choice
218	Competency in Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non-permanently Fixed Vehicle Body Panels	Portfolio
268	Knowledge of Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non-permanently Fixed Vehicle Body Panels	Multiple Choice
406	Competency in the Diagnosing and Rectifying of Automotive Vehicle Auxiliary Electrical Faults	Portfolio
456	Knowledge of Diagnosis and Rectification of Vehicle Auxiliary Electrical Faults	Multiple Choice

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

5 Units

Availability of units

Below is a list of the learning outcomes for all the units.

Structure of units

These units each have the following:

- City & Guilds reference number
- unit accreditation number (UAN)
- title
- level
- credit value
- unit aim
- relationship to NOS, other qualifications and frameworks
- endorsement by a sector or other appropriate body
- information on assessment
- learning outcomes which are comprised of a number of assessment criteria
- notes for guidance.

Summary of units

City & Guilds unit number	Unit title	Unit reference number (UAN)
001	Competency in Health, Safety and Good Housekeeping in the Automotive Environment	A/601/6338
003	Competency in Supporting Job Roles in the Automotive Work Environment	K/601/6366
004	Skills in Materials, Fabrication, Tools and Measuring Devices in the Automotive Environment	Y/601/6279
006	Competency in Making Learning Possible through Demonstrations and Instruction	Y/601/6380
008	Competency in Identifying and Agreeing Motor Vehicle Customer Service Needs	K/601/6383
051	Knowledge of Health, Safety and Good Housekeeping in the Automotive Environment	D/601/6171

City & Guilds unit number	Unit title	Unit reference number (UAN)
053	Knowledge of Support for Job Roles in the Automotive Work Environment	T/601/6175
054	Knowledge of Materials, Fabrication, Tools and Measuring Devices used in the Automotive Environment	K/601/6237
056	Knowledge of how to Make Learning Possible through Demonstrations and Instruction	T/601/6242
058	Knowledge of how to Identify and Agree Motor Vehicle Customer Service Needs	R/601/6247
101	Competency in Routine Light Vehicle Maintenance	L/601/3766
102	Competency in Removing and Replacing Light Vehicle Engine Units and Components	D/601/3769
103	Competency in Removing and Replacing Light Vehicle Electrical Units and Components	Y/601/3771
104	Competency in Removing and Replacing Light Vehicle Chassis Units and Components	K/601/3774
105	Competency in Inspecting Light Vehicles Using Prescribed Methods	M/601/3792
107	Competency in Diagnosing and Rectifying Light Vehicle Engine Faults	J/601/3779
108	Competency in Diagnosing and Rectifying Light Vehicle Chassis System Faults	Y/601/3785
111	Competency in Overhauling Light Vehicle Engine Mechanical Units	D/601/3786
112	Competency in Removing and Replacing Light Vehicle Driveline Units and Components	M/601/3789
113	Competency in Diagnosing and Rectifying Light Vehicle Transmission and Driveline Faults	K/601/3791
121	Competency in Overhauling Light Vehicle Transmission Units	H/601/3787
131	Competency in Overhauling Light Vehicle Steering and Suspension Units	K/601/3788
151	Knowledge of Routine Light Vehicle Maintenance	F/601/3716
152	Knowledge of Light Vehicle Engine Mechanical, Lubrication and Cooling System Units and Components	R/601/3719
153	Knowledge of Removing and Replacing Light Vehicle Electrical Units and Components	T/601/3731

City & Guilds unit number	Unit title	Unit reference number (UAN)
154	Knowledge of Removing and Replacing Light Vehicle Chassis Units and Components	A/601/3732
155	Knowledge in Inspecting Light Vehicles Using Prescribed Methods	H/601/3742
157	Knowledge of Diagnosis and Rectification of Light Vehicle Engine Faults	F/601/3733
158	Knowledge in Diagnosis and Rectification of Light Vehicle Chassis Faults	L/601/3735
161	Knowledge of Overhauling Light Vehicle Engine Units	R/601/3736
162	Knowledge of Light Vehicle Transmission and Driveline Units and Components	Y/601/3740
163	Knowledge of Diagnosis and Rectification of Light Vehicle Transmission and Driveline Faults	D/601/3741
171	Knowledge of Overhauling Light Vehicle Transmission Units	Y/601/3737
172	Knowledge of Light Vehicle Fuel, Ignition, Air and Exhaust System Units and Components	H/601/3725
181	Knowledge of Overhauling Light Vehicle Steering and Suspension Units	D/601/3738
218	Competency in Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non-permanently Fixed Vehicle Body Panels	J/601/3751
268	Knowledge of Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non-permanently Fixed Vehicle Body Panels	F/601/3747
406	Competency in Diagnosing and Rectifying Vehicle Auxiliary Electrical Faults	L/601/3749
456	Knowledge of Diagnosis and Rectification of Vehicle Auxiliary Electrical Faults	A/601/3746

Unit 001 Competency in health, safety and good housekeeping in the automotive environment

UAN:	**A/601/6338**
Level:	Level 2
Credit value:	7
GLH:	60
Relationship to NOS:	This unit is linked to G1 Contribute to Housekeeping in Motor Vehicle Environments.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit helps the learner to develop the skills required to carry out the routine maintenance and cleaning of the automotive environment and to use resources economically. Also to adhere to 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.

Learning outcome	**The learner will:**
1. be able to use correct personal and vehicle protection within the automotive work environment	
Assessment criteria	
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	

Learning outcome	The learner will:
2. be able to carry out effective housekeeping practices in the automotive work environment	
Assessment criteria	
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.	

Learning outcome	The learner will:
3. be able to recognise and deal with dangers in order to work safely within the automotive workplace	
Assessment criteria	
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.	

Learning outcome	The learner will:
4. be able to conduct themselves responsibly	
Assessment criteria	
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 001 Competency in health, safety and good housekeeping in the automotive environment

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 003 Competency in supporting job roles in the automotive work environment

UAN:	**K/601/6366**
Level:	Level 3
Credit value:	5
GLH:	40
Relationship to NOS:	This unit is linked to G3 Maintain Working Relationships in the Motor Vehicle Environment.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit will help the learner develop competency in order to keep good working relationships with all colleagues and customers in the automotive work environment by using effective communication and support.

Learning outcome	**The learner will:**
1. be able to work effectively within the organisational structure of the automotive work environment	
Assessment criteria	
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.	

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

Learning outcome	The learner will:
3. be able to communicate with and support colleagues and customers effectively within the automotive work environment	
Assessment criteria	
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 3.4 report any anticipated delays in completion to the relevant persons promptly.	

Learning outcome	The learner will:
4. be able to develop and keep good working relationships in the automotive work environment	
Assessment criteria	
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 003 Competency in supporting job roles in the automotive work environment

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 004 Skills in materials, fabrication, tools and measuring devices in the automotive environment

UAN:	**Y/601/6279**
Level:	Level 2
Credit value:	7
GLH:	60
Relationship to NOS:	This unit is linked to G4 Use of Hand Tools and Equipment in Motor Vehicle Engineering.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit helps the learner to develop the skills required for: • the correct selection, care and use of key hand tools and measuring devices for modification, fabrication and repair in the automotive environment • the correct preparation and use of common work environment equipment • the correct selection and fabrication of materials used when modifying and repairing • the correct application of automotive engineering fabrication and fitting principles.

Learning outcome	**The learner will:**
1. be able to select, maintain and use and hand tools and measuring devices in the automotive environment	
Assessment criteria	
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.	

Learning outcome	The learner will:
2. be able to prepare and use common workshop equipment	
Assessment criteria	
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.	

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

Learning outcome	The learner will:
4. be able to apply automotive engineering, fabrication and fitting principles when modifying and repairing vehicles and components	
Assessment criteria	
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 004 Skills in materials, fabrication, tools and measuring devices in the automotive environment

Supporting information

Assessment requirements

The assessment requirements are shown in full in the assessment documentation.

Unit 006 Competency in making learning possible through demonstrations and instruction

UAN:	**Y/601/6380**
Level:	Level 3
Credit value:	5
GLH:	40
Relationship to NOS:	This unit is linked to G6 Enable Learning through Demonstration and Instruction.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit will help the learner to develop competency in order to carry out demonstrations and instruction. It includes demonstrating equipment, showing skills, giving instruction, deciding when to use demonstration or instruction, potential of technology based learning, checking on learners' progress and giving feedback.

Learning outcome	**The learner will:**
1. be able to demonstrate skills and methods to learners	
Assessment criteria	
The learner can: 1.1 perform demonstrations based on an analysis of the skills needed and the order in which they must be learned 1.2 perform demonstrations that are accurate and realistic 1.3 perform structured demonstrations so that the learner can get the most out of it 1.4 perform demonstrations whilst encouraging learners to ask questions and get explanation at appropriate stages in the demonstration 1.5 provide positive feedback to learners whilst they are being given the opportunity to practise the skills that have been demonstrated 1.6 perform additional demonstrations of skills being taught to reinforce learning 1.7 perform demonstrations in a safe environment which also allows learners to see clearly 1.8 respond to the needs of the learners during demonstrations 1.9 reduce distractions and disruptions as much as possible.	

Learning outcome	The learner will:
2. be able to instruct learners	
Assessment criteria	
The learner can: 2.1 implement instruction which is matched to the needs of learners 2.2 use identified learning outcomes which can be achieved through instruction 2.3 perform instruction, ensuring that the manner, level and speed of the instruction encourages learners to take part 2.4 perform instruction whilst regularly checking that the learners understand and adapt instruction as appropriate 2.5 give learners positive feedback on the learning experience and the outcomes achieved 2.6 carry out a review with the learners to identify anything that prevented learning and adapt instruction as appropriate.	

Unit 006 Competence in making learning possible through demonstrations and instruction

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 008 Competency in identifying and agreeing motor vehicle customer service needs

UAN:	**K/601/6383**
Level:	Level 3
Credit value:	5
GLH:	40
Relationship to NOS:	This unit is linked to G8 Identify and Agree the Motor Vehicle Customer Needs.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit helps the learner to develop the skills required to: gain information from customers on their perceived needs; give advice and information and agree a course of action; contract for the agreed work and complete all necessary records and instructions.

Learning outcome	**The learner will:**
1. be able to obtain relevant information from the customer	
Assessment criteria	
The learner can: 1.1 obtain and interpret sufficient, relevant information, from the customer to make an assessment of their needs 1.2 clarify customer and vehicle needs by referring to vehicle data and operating procedures.	

Learning outcome	**The learner will:**
2. be able to provide relevant information to the customer	
Assessment criteria	
The learner can: 2.1 provide customers with accurate, current and relevant advice and information, in a form that the customer will understand. 2.2 demonstrate techniques which encourage customers to ask questions and seek clarification during conversation.	

Learning outcome	The learner will:
3. be able to agree work undertaken with the customer	
Assessment criteria	
The learner can: 3.1 summarise and record work agreed with the customer, before accepting the vehicle 3.2 implement confirmation of the agreement by ensuring customer understanding.	

Learning outcome	The learner will:
4. be able to ensure recording systems are implemented correctly	
Assessment criteria	
The learner can: 4.1 use recording systems which are accurate and complete, in the required format and signed by the customer where necessary 4.2 perform the next stage in the process by passing on completed records to the correct person promptly 4.3 demonstrate correct procedures for customer approval where the contracted agreement is likely to be exceeded.	

Unit 008 Competency in identifying and agreeing motor vehicle customer service needs

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

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

UAN:	**D/601/6171**
Level:	Level 2
Credit value:	3
GLH:	30
Relationship to NOS:	This unit is linked to G1 Contribute to Housekeeping in Motor Vehicle Environments and G2 Reduce Risks to Health and Safety in the Motor Vehicle Environment.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of: • routine maintenance and cleaning of the automotive environment and using resources economically. • 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.

Learning outcome	**The learner will:**
1. understand the correct personal and vehicle protective equipment to be used within the automotive environment	
Assessment criteria	
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.	

Learning outcome	The learner will:
2. understand effective housekeeping practices in the automotive environment	
Assessment criteria	
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.	

Learning outcome	The learner will:
3. understand key health and safety requirements relevant to the automotive environment	
Assessment criteria	
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 3.4 automotive environment 3.5 describe why workplace policies and procedures relating to health and safety are important.	

Learning outcome	The learner will:
4. understand about hazards and potential risks relevant to the automotive environment	
Assessment criteria	
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.	

Learning outcome	The learner will:
5. understand personal responsibilities	
Assessment criteria	
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

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

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 e.g. 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. Provision and Use of Work Equipment Regulations 1998 as applied to power presses
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 Wheels Regulations 1970
i. The Lifting Operations and Lifting Equipment Regulations 1998
j. Work at Height Regulations 2005.

Routine maintenance of the workplace

a. Trainees' 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. Health And Safety At Work Act 1974
b. Control of Substances Hazardous to Health Regulations 2002
c. Environmental Protection Agency
d. Manual Handling Operations Regulations 1992
e. Personal Protective Equipment 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 Heath 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
    xiii. unserviceable PPE.
d. PPE required for a range 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 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

UAN:	**T/601/6175**
Level:	Level 3
Credit value:	3
GLH:	20
Relationship to NOS:	This unit is linked to G3 Maintaining Working Relationships in the Motor Vehicle Environment.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	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.

Learning outcome	**The learner will:**
1. understand key organisational structures, functions and roles within the automotive work environment	
Assessment criteria	
The learner can: 1.1 identify the purpose of the main 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 automotive workplace. to include: a. trainee b. skilled technician c. supervisor d. manager.	

Learning outcome	The learner will:
2. understand the importance of obtaining, interpreting and using information in order to support their job role within the automotive work environment	
Assessment criteria	
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 the purpose of how to use identification codes.	

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

Learning outcome	The learner will:
4. understand communication requirements when carrying out vehicle repairs in the automotive work environment	
Assessment criteria	
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.	

Learning outcome	The learner will:
5. understand how to develop good working relationships with colleagues and customers in the automotive workplace	
Assessment criteria	
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

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

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.

Methods of communication:

a. Verbal.
b. Signs and notices.
c. Memos.
d. Telephone.
e. Electronic mail.
f. Vehicle job card.
g. Notice boards.
h. SMS text messaging.
i. Letters.

Organisational and customer requirements:

a. Importance of time scales to customer and organization.
b. Relationship between time and costs.
c. Meaning of profit.

Choice of communication

a. Distance.
b. Location.
c. Job responsibility.

Importance of maintaining positive working relationships:

a. Morale.
b. Productivity.
c. Company image.
d. Customer relationships.
e. Colleagues.

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

UAN:	**K/601/6237**
Level:	Level 2
Credit value:	4
GLH:	40
Relationship to NOS:	This unit is linked to G4 Use of Hand Tools and Equipment in Motor Vehicle Engineering.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of: • the correct selection, care and use of key hand tools and measuring devices for modification, fabrication and repair in the automotive environment • the correct preparation and use of common automotive environment equipment • the correct selection and fabrication of materials used when modifying and repairing • the correct application of automotive engineering fabrication and fitting principles.

Learning outcome	**The learner will:**
1. understand how to select, use and care for hand tools and measuring devices in the automotive environment	
Assessment criteria	
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.

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

Learning outcome	**The learner will:**
3. understand how to select materials when fabricating, modifying and repairing vehicles and fitting components	
Assessment criteria	
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 non-metallic materials including their safe use.
3.3	define common terms relating to the properties of materials.

Learning outcome	**The learner will:**
4. understand how to apply automotive engineering, fabrication and fitting principles when modifying and repairing vehicles and components	
Assessment criteria	
The learner can:	
4.1	describe how to tap threads, file, cut and drill plastics and metals when modifying and 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: a. gaskets and seals b. sealants and adhesives c. fittings and fasteners d. electrical circuit components
4.4	identify locking, fastening and fixing devices
4.5	state the importance of correct operating specifications for limits, fits and tolerances in the automotive environment.

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

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

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 workplace, 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.

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 056 Knowledge of how to make learning possible through demonstrations and instruction

UAN:	**T/601/6242**
Level:	Level 3
Credit value:	5
GLH:	45
Relationship to NOS:	This unit is linked to G6 Enable Learning Through Demonstration and Instruction.
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of how to carry out demonstrations and instruction which will help the learner to learn. It includes demonstrating equipment, showing skills, giving instruction, deciding when to use demonstration or instruction, potential of technology based learning, checking on learners' progress and giving feedback.

Learning outcome	**The learner will:**
1. understand the nature and role of demonstrations and instruction	
Assessment criteria	
The learner can: 1.1 classify the separate areas of demonstrations which encourage learning 1.2 identify which types of learning are best achieved and supported through demonstrations 1.3 explain how to identify and use different learning opportunities 1.4 explain how to structure demonstrations and instruction sessions 1.5 explain how to choose from a range of demonstration techniques.	

Learning outcome	The learner will:
2. understand the principles and concepts of demonstration and instruction	
Assessment criteria	
The learner can: 2.1 describe how to put learners at ease and encourage them to take part 2.2 justify the choice between demonstration and instruction as a learning method 2.3 explain how to identify individual learning needs 2.4 clarify which factors are likely to prevent learning and how to overcome them 2.5 explain how to check learners' understanding and progress 2.6 explain how to choose and prepare appropriate materials 2.7 explain the separate areas of instructional techniques which encourage learning 2.8 describe which types of learning are best achieved and supported through instruction.	

Learning outcome	The learner will:
3. understand the external factors influencing human resource development	
Assessment criteria	
The learner can: 3.1 explain how to make sure everybody acts in line with health, safety and environmental protection, legislation and best practice. 3.2 analyse developments in technology based learning and new ways of delivery.	

Unit 056 Knowledge of how to make learning possible through demonstrations and instruction

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

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.

Separate areas of demonstration which encourage learning, to include:

a. Demonstration is particularly applicable to learning manual skills.
b. Learning to do something usually involves:
    i. purpose – the aim or objective
    ii. procedure – the most effective way of completing the task
    iii. practice – all skills require practice to improve.
c. Practical tasks are more quickly learnt through demonstration.
d. Emphasis to body movements is required when demonstrating.
e. The demonstrator should encourage learners to ask questions.
f. Emphasis should be placed upon key points whilst demonstrating.
g. Any demonstration should ensure that all safety aspects are covered.

Types of learning which are best achieved and supported through demonstrations, to include:

a. Types of learning:
    i. psychomotor – measurement of manual skill performance
    ii. cognitive – learning involving thought processes
    iii. iiiaffective – demonstration of feelings, emotions or attitudes
b. Demonstration – involves learning to do something (Psychomotor Domain).
c. Combination of instruction and practical demonstrations are very effective means of learning practical skills.

How to structure demonstration and instruction sessions, to include:

a. Before the demonstration and/or instruction ensure that the following good practice is recognised:
    i. identify key points
    ii. relate theoretical underpinning knowledge to key points
    iii. rehearse to ensure that all equipment is working

iv. ensure all students can see even small equipment and processes
v. time the demonstration
vi. consider how to make students participate
vii. consider how to emphasise safe working practices.

b. During the demonstration and/or instruction good practice is to:
i. give a clear introduction
ii. identify any tools/equipment
iii. determine the current audience level of knowledge
iv. complete the demonstration correctly (do not show how not to do it)
v. stress key points and show links between them
vi. monitor safety aspects
vii. check learner understanding.

c. After the demonstration (if possible):
i. enable the audience to practice the techniques
ii. provide feedback on their performance.

How to identify individual learning needs

a. Diagnose the learning needs of your audience to include:
i. what competencies they already have
ii. what experience they have of the subject area
iii. what competencies they need to achieve
iv. what demonstration techniques are best suited to their needs
v. how to assess their needs have been met.

What factors are likely to prevent learning to include:

a. Language barriers.
b. Physical barriers.
c. Specialist knowledge.
d. Pace of learning.
e. Method of delivery.
f. Environmental factors.
g. Teaching styles.
h. Dyslexia.

How to check learners understanding and progress

a. Questionnaires.
b. Verbal questioning.
c. Observation.
d. Assessment.
e. Role play.
f. Projects/assignments.
g. Multi-choice questions.
h. Simulation.
i. Tests.

How to organise information and prepare materials

a. Identify the course aim.
b. Identify the subject aim.
c. Identify the lesson aim.

d. Complete a lesson plan – plan the teaching.
e. Identify a series of 'cues' to be used during the lesson.
f. Logically organise the information.
g. Use suitable resources and equipment to maximise learning opportunities.
h. Assess the learner's progress and understanding.

Instructional techniques

a. Lectures.
b. Handouts.
c. Team teaching.
d. Peer teaching.
e. Discussion – individual, group and peer.
f. Question and answer.
g. Multimedia.
h. Seminars.
i. Case studies.
j. Project/assignments.

Environmental factors that effect learning

a. Environmental factors that should be considered before demonstration/instruction to include:
    i. loud noises
    ii. bright colours
    iii. bright lights
    iv. strong smells
    v. atmosphere
    vi. temperature
    vii. classroom seating
    viii. classroom layout.

Health and safety factors that affect learning

a. Health and safety factors that should be considered before demonstration/instruction to include:
    i. assessment of risk and hazards
    ii. condition of electrical/electronic equipment
    iii. position of cables and wires
    iv. safety of equipment used in demonstration/instruction
    v. condition of classroom equipment/furniture/structure
    vi. suitable protective clothing/equipment.

Analysis of demonstration/instruction to include:

a. Feedback from students.
b. Feedback from colleagues.
c. Organisational quality assessment.
d. Feedback from external organisations.
e. Awarding body requirements.

Developments in learning to include:

a. Multimedia based materials.
b. Web based materials.
c. Interactive materials.

How to choose and prepare appropriate materials, to include:

a. Putting information in order.
b. Deciding whether the language used is appropriate.
c. Type of material i.e. paper and technology based.

Unit 058 Knowledge of how to identify and agree motor vehicle customer service needs

UAN:	**R/601/6247**
Level:	Level 3
Credit value:	5
GLH:	45
Relationship to NOS:	This unit is linked to G8 Identify and Agree the Motor Vehicle Customer Needs.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of how to gain: information from customers on their perceived needs; give advice and information and agree a course of action; contract for the agreed work and complete all necessary records and instructions.

Learning outcome	**The learner will:**
1. understand legislative and organisational requirements and procedures	
Assessment criteria	
The learner can: 1.1 describe the fundamental legal requirements of current consumer legislation and the consequences of their own actions in respect of this legislation. 1.2 describe the content and limitations of company and product warranties for the vehicles dealt with by their company. 1.3 explain the limits of their own authority for accepting vehicles. 1.4 explain the importance of keeping customers informed of progress. 1.5 describe their workplace requirements for the completion of records. 1.6 explain how to complete and process all the necessary documentation.	

Learning outcome	The learner will:
2. understand how to communicate and care for customers	
Assessment criteria	
The learner can: 2.1 explain how to communicate effectively with customers. 2.2 describe how to adapt your language when explaining technical matters to non-technical customers. 2.3 explain how to use effective questioning techniques. 2.4 describe how to care for customers and achieve customer satisfaction.	

Learning outcome	The learner will:
3. understand company products and services	
Assessment criteria	
The learner can: 3.1 describe the range of options available to resolve vehicle problems. 3.2 describe the range and type of services offered by their company. 3.3 explain the effect of resource availability upon the receipt of customer vehicles and the completion work. 3.4 explain how to access costing and work completion time information.	

Unit 058 Knowledge of how to identify and agree motor vehicle customer service needs

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

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.

Organisational requirements

a. Explain the organisation's terms and conditions applicable to the acceptance of customer vehicles.
b. Explain the content and limitations of vehicle and component warranties for the vehicles dealt with by your organisation.
c. Detail what, if any, limits there are to the authority for accepting vehicles.
d. Detail why it is important to keep customers advised of progress and how this is achieved within the organisation.
e. Detail the organisation's procedures for the completion and processing of documentation and records, including payment methods and obtaining customer signatures as applicable.

Principles of customer communication and care

a. First impressions.
b. Listening skills – 80:20 ratio.
c. Eye contact and smiling.
d. Showing interest and concern.
e. Questioning techniques and customer qualification.
f. Giving clear non-technical explanations.
g. Confirming understanding (statement/question technique, reflective summary).
h. Written communication – purpose, content, presentation and style.
i. Providing a high quality service – fulfilling (ideally exceeding) customer expectations within agreed time frames.
j. Obtaining customer feedback and corrective actions when dissatisfaction expressed.
k. Dealing with complaints.

Company products and services

a. Service standards:
    i. national

ii. manufacturer
iii. organisational.

b. The range and type of services offered by the organisation:
   i. diagnostic
   ii. servicing
   iii. repair
   iv. warranty
   v. MOT testing
   vi. fitment of accessories/enhancements
   vii. internal.
c. The courses of action available to resolve customer problems:
   i. the extent and nature of the work to be undertaken
   ii. the terms and conditions of acceptance
   iii. the cost
   iv. the timescale
   v. required payment methods.
d. The effect of resource availability upon the receipt of customer vehicles and the completion of work:
   i. levels and availability of equipment
   ii. levels and availability of technicians
   iii. workshop loading systems.
e. How to access costing and work completion time information:
   i. manuals
   ii. computer based.

Vehicle information systems, servicing and repair requirements

a. Accessing technical data including diagnostics.
b. Servicing to manufacturer requirements/standards.
c. Repair/operating procedures.
d. MOT standards/requirements.
e. Quality controls – interim and final.
f. Requirements for cleanliness of vehicle on return to customer.
g. Handover procedures.

Consumer legislation to include:

a. Consumer protection.
b. Sale of goods.
c. Data protection.
d. Product liability.
e. Health and safety.
f. Discrimination.

Unit 101 Competency in routine light vehicle maintenance

UAN:	**L/601/3766**
Level:	Level 2
Credit value:	7
GLH:	60
Relationship to NOS:	This unit is linked to LV01 Carry Out Routine Motor Vehicle Maintenance.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit allows the learner to develop skills they can carry out light vehicle routine maintenance, adjustments and replacement activities as part of the periodic servicing of vehicles.

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

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

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment	
Assessment criteria	
The learner can: 3.1 select the appropriate tools and equipment necessary for carrying out routine maintenance 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 routine maintenance.	

Learning outcome	The learner will:
4. be able to carry out light vehicle routine maintenance	
Assessment criteria	
The learner can: 4.1 carry out light vehicle maintenance using prescribed methods, adhering to the correct specifications and tolerances for the vehicle and following: a. the manufacturer's approved inspection methods b. recognised researched inspection methods c. health and safety requirements d. workplace procedures 4.2 carry out adjustments, replacement of vehicle components and replenishment of consumable materials following the manufacturer's current specification 4.3 ensure the examination methods identify accurately any vehicle system and or component problems falling outside the maintenance schedule are specified. 4.4 ensure any comparison of the vehicle against specification accurately identifies any: a. differences from the vehicle specification b. vehicle appearance and condition faults c. variation from legal requirements 4.5 use suitable testing methods to evaluate the performance of all replaced and adjusted components and systems accurately 4.6 complete all system diagnostic activities within the agreed timescale.	
Learning outcome	**The learner will:**
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required. 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 101 Competency in routine light vehicle maintenance

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 102 Competency in removing and replacing light vehicle engine units and components

UAN:	**D/601/3769**
Level:	Level 2
Credit value:	10
GLH:	90
Relationship to NOS:	This unit is linked to LV02 Remove and Replace Motor Engine Units and Components.
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	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.

Learning outcome	**The learner will:**
1. be able to work safely when carrying out removal and replacement activities	
Assessment criteria	
The learner can: 1.1 use suitable personal protective equipment and vehicle coverings throughout all light vehicle engine unit and component removal and replacement activities 1.2 work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.	

Learning outcome	**The learner will:**
2. be able to use relevant information to carry out the task	
Assessment criteria	
The learner can: 2.1 select suitable sources of technical information to support light vehicle engine 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 engine unit and component removal and replacement activities.	

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment	
Assessment criteria	
The learner can: 3.1 select the appropriate tools and equipment necessary for removal and replacement of light vehicle engine systems 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 to remove and replace light vehicle engine systems.	

Learning outcome	The learner will:
4. be able to carry out removal and replacement of light vehicle engine mechanical, lubrication and cooling units and components.	
Assessment criteria	
The learner can: 4.1 remove and replace the light vehicle's engine systems and components, adhering to the correct specifications and tolerances for the vehicle and following: a. the manufacturer's approved removal and replacement methods b. recognised researched repair methods c. health and safety requirements. d. workplace procedures 4.2 ensure that replacement light vehicle engine 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 light vehicle engine systems performs to the vehicle operating specification and meets any legal requirements 4.5 complete all system diagnostic activities within the agreed timescale.	

Learning outcome	The learner will:
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required. 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 102 Competency in removing and replacing light vehicle engine units and components

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 103 Competency in removing and replacing light vehicle electrical units and components

UAN:	**Y/601/3771**
Level:	Level 2
Credit value:	10
GLH:	90
Relationship to NOS:	This unit is linked to LV03 Remove and Replace Motor Electrical Units and Components.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	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.

Learning outcome	**The learner will:**
1. be able to work safely when carrying out removal and replacement activities	
Assessment criteria	
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.	

Learning outcome	**The learner will:**
2. be able to use relevant information to carry out the task	
Assessment criteria	
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.	

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment	
Assessment criteria	
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 auxiliary.	

Learning outcome	The learner will:
4. be able to carry out removal and replacement of light vehicle electrical units and components.	
Assessment criteria	
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: a. the manufacturer's approved removal and replacement methods b. recognised researched repair methods c. health and safety requirements. 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 meet any legal requirements 4.5 complete all the system diagnostic activities within the agreed timescale.	

Learning outcome	The learner will:
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required. 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 103 Competency in removing and replacing light vehicle electrical units and components

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 104 Competency in removing and replacing light vehicle chassis units and components

UAN:	**K/601/3774**
Level:	Level 2
Credit value:	10
GLH:	90
Relationship to NOS:	This unit is linked to LV04 Remove and Replace Motor Vehicle Chassis Units and Components.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit allows the learner to develop skills to remove and replace light vehicle steering, suspension and braking units (including wheels and tyres). It also covers the evaluation of performance of the replaced units and systems.

Learning outcome	**The learner will:**
1. be able to work safely when carrying out removal and replacement activities	
Assessment criteria	
The learner can: 1.1 use suitable personal protective equipment and vehicle coverings throughout all light vehicle chassis unit and component removal and replacement activities 1.2 work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.	

Learning outcome	The learner will:
2. be able to use relevant information to carry out the task	
Assessment criteria	
The learner can: 2.1 select suitable sources of technical information to support light vehicle chassis 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 chassis unit and component removal and replacement activities.	

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment	
Assessment criteria	
The learner can: 3.1 select the appropriate tools and equipment necessary for removal and replacement of light vehicle chassis systems including: a. steering b. suspension c. braking d. wheels and tyres 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 to remove and replace light vehicle chassis systems.	

Learning outcome	The learner will:
4. be able to carry out removal and replacement of light vehicle chassis units and components	
Assessment criteria	
The learner can: 4.1 remove and replace the light vehicle's chassis systems and components, adhering to the correct specifications and tolerances for the vehicle and following: a. the manufacturer's approved removal and replacement methods b. recognised researched repair methods c. health and safety requirements. 4.2 ensure that replacement light vehicle chassis 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 light vehicle chassis system performs to the vehicle operating specification and meets any legal requirements 4.5 complete all system diagnostic activities within the agreed timescale.	

Learning outcome	The learner will:
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required. 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 104 Competency in removing and replacing light vehicle chassis units and components

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 105 Competency in inspecting light vehicles using prescribed methods

UAN:	**M/601/3792**
Level:	Level 2
Credit value:	10
GLH:	80
Relationship to NOS:	This unit is linked to LV05 Inspect Motor Vehicles using Prescribed Methods.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit allows the learner to develop skills to carry out a range of light vehicle inspections on vehicles using a variety of prescribed testing and inspection methods.

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

Learning outcome	**The learner will:**
2. be able to use relevant information to carry out the task	
Assessment criteria	
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.	

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment	
Assessment criteria	
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 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 a range of inspections on light vehicle systems.	

Learning outcome	The learner will:
4. be able to carry out light vehicle inspections using prescribed methods	
Assessment criteria	
The learner can: 4.1 carry out light vehicle inspections using prescribed methods, adhering to the correct specifications and tolerances for the vehicle and following: a. the manufacturer's approved inspection methods b. recognised researched inspection methods c. health and safety requirements 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: a. differences from the vehicle specification b. vehicle appearance and condition faults 4.4 use suitable testing methods to evaluate the performance of the inspected systems 4.5 complete all system diagnostic activities within the agreed timescale.	

Learning outcome	The learner will:
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 105 Competency in inspecting light vehicles using prescribed methods

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 107 Competency in diagnosing and rectifying light vehicle engine faults

UAN:	**J/601/3779**
Level:	Level 3
Credit value:	10
GLH:	90
Relationship to NOS:	This unit is linked to LV07 Diagnose and Rectify Motor Vehicle Engine and Component Faults.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to demonstrate competency in diagnosing and rectifying light vehicle engine mechanical, electrical, hydraulic and fluid systems faults. It also covers the evaluation of performance of the replaced or repaired units and systems.

Learning outcome	**The learner will:**
1. be able to work safely when carrying out light vehicle engine diagnostic and rectification activities	
Assessment criteria	
The learner can: 1.1 use suitable personal protective equipment and vehicle coverings when using light vehicle diagnostic methods and carrying out rectification activities 1.2 work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.	

Learning outcome	**The learner will:**
2. be able to use relevant information to carry out the task	
Assessment criteria	
The learner can: 2.1 select suitable sources of technical information to support light vehicle diagnostic and rectification activities including: a. vehicle technical data b. diagnostic test procedures 2.2 use sufficient diagnostic information in a systematic way to enable an accurate diagnosis of light vehicle engine system faults.	

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment	
Assessment criteria	
The learner can: 3.1 select the appropriate tools and equipment necessary for diagnostic and rectification activities 3.2 ensure that equipment has been calibrated to meet manufacturers' and legal requirements 3.3 use the equipment required, correctly and safely throughout all light vehicle engine diagnostic and rectification activities.	

Learning outcome	The learner will:
4. be able to carry out light vehicle engine diagnosis, rectification and test activities	
Assessment criteria	
The learner can: 4.1 use diagnostic methods that are relevant to the symptoms presented 4.2 evaluate your assessment of dismantled sub-assemblies and identify their condition and suitability for repair or replacement accurately 4.3 carry out all diagnostic and rectification activities following: a. manufacturers' instructions b. recognised researched repair methods c. workplace procedures d. health and safety requirements 4.4 ensure all repaired or replacement components and units conform to the vehicle operating specification and any legal requirements 4.5 adjust components and units correctly to ensure that they operate to meet system requirements 4.6 use testing methods that are suitable for assessing the performance of the system rectified 4.7 ensure the rectified light vehicle engine system performs to the vehicle operating specification and any legal requirements 4.8 complete all system diagnostic activities within the agreed timescale.	

Learning outcome	The learner will:
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required. 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 107 Competency in diagnosing and rectifying light vehicle engine faults

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 108 Competency in diagnosing and rectifying light vehicle chassis system faults

UAN:	**Y/601/3785**
Level:	Level 3
Credit value:	10
GLH:	90
Relationship to NOS:	This unit is linked to LV08 Diagnose and Rectify Motor Vehicle Chassis System Faults.
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to demonstrate competency in diagnosing and rectifying light vehicle braking steering and suspension systems faults. It also covers the evaluation of performance of the replaced or repaired units and systems.

Learning outcome	**The learner will:**
1. be able to work safely when carrying out light vehicle chassis diagnostic and rectification activities	
Assessment criteria	
The learner can: 1.1 use suitable personal protective equipment and vehicle coverings when using light vehicle diagnostic methods and carrying out rectification activities 1.2 work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.	

Learning outcome	**The learner will:**
2. be able to use relevant information to carry out the task	
Assessment criteria	
The learner can: 2.1 select suitable sources of technical information to support light vehicle diagnostic and rectification activities including: a. vehicle technical data b. diagnostic test procedures 2.2 use sufficient diagnostic information in a systematic way to enable an accurate diagnosis of light vehicle chassis system faults.	

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment	
Assessment criteria	
The learner can: 3.1 select the appropriate tools and equipment necessary for diagnostic and rectification activities 3.2 ensure that equipment has been calibrated to meet manufacturers' and legal requirements 3.3 use the equipment required, correctly and safely throughout all light vehicle chassis diagnostic and rectification activities.	

Learning outcome	The learner will:
4. be able to carry out light vehicle chassis diagnosis, rectification and test activities	
Assessment criteria	
The learner can: 4.1 use diagnostic methods that are relevant to the symptoms presented 4.2 evaluate your assessment of dismantled sub-assemblies and identify their condition and suitability for repair or replacement accurately 4.3 carry out all diagnostic and rectification activities following: a. manufacturers' instructions b. recognised researched repair methods c. workplace procedures d. health and safety requirements 4.4 ensure all repaired or replacement components and units conform to the vehicle operating specification and any legal requirements 4.5 adjust components and units correctly to ensure that they operate to meet system requirements 4.6 use testing methods that are suitable for assessing the performance of the system rectified 4.7 ensure the rectified light vehicle chassis system performs to the vehicle operating specification and any legal requirements 4.8 complete all system diagnostic activities within the agreed timescale.	

Learning outcome	The learner will:
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 108 Competency in diagnosing and rectifying light vehicle chassis system faults

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 111 Competency in overhauling light vehicle engine mechanical units

UAN:	**D/601/3786**
Level:	Level 3
Credit value:	2
GLH:	20
Relationship to NOS:	This unit is linked to LV11 Overhaul Motor Mechanical Units.
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to demonstrate competency in overhauling engines, It also covers the evaluation of performance of the overhauled units and systems.

Learning outcome	**The learner will:**
1. be able to work safely when overhauling light vehicle engine mechanical units	
Assessment criteria	
The learner can: 1.1 use suitable personal protective equipment and vehicle coverings when overhauling light vehicle engine units 1.2 work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.	

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

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment	
Assessment criteria	
The learner can: 3.1 select the appropriate tools and equipment necessary for overhauling light vehicle engine units 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 overhaul light vehicle engine units.	

Learning outcome	The learner will:
4. be able to carry out the overhauling of light vehicle engine mechanical units	
Assessment criteria	
The learner can: 4.1 carry out all overhauling of light vehicle engine mechanical units, adhering to the specifications and tolerances for the vehicle and following: a. the manufacturer's approved overhauling methods b. recognised researched repair methods c. health and safety requirements. d. workplace procedures 4.2 ensure the assessment of the dismantled unit identifies accurately its condition and suitability for overhaul 4.3 inform the relevant person(s) promptly where an overhaul is uneconomic or unsatisfactory to perform 4.4 use testing methods that comply with the manufacturer's requirements. 4.5 adjust the unit's components correctly where necessary to ensure that they operate to meet the vehicle operating requirements. 4.6 ensure the overhauled units and assemblies conform to the vehicle operating specification and any legal requirements. 4.7 complete all system diagnostic activities within the agreed timescale.	

Learning outcome	The learner will:
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required. 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 111 Competency in overhauling light vehicle engine mechanical units

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 112 Competency in removing and replacing light vehicle driveline units and components

UAN:	**M/601/3789**
Level:	Level 2
Credit value:	10
GLH:	90
Relationship to NOS:	This unit is linked to LV12 Remove and Replace Motor Vehicle Driveline Units and Components.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit allows the learner to develop skills in removing and replacing light vehicle transmission and driveline units. It also covers the evaluation of performance of the replaced units and systems.

Learning outcome	**The learner will:**
1. be able to work safely when carrying out removal and replacement activities	
Assessment criteria	
The learner can: 1.1 use suitable personal protective equipment and vehicle coverings throughout all light vehicle transmission and driveline unit and component removal and replacement activities 1.2 work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.	

Learning outcome	**The learner will:**
2. be able to use relevant information to carry out the task	
Assessment criteria	
The learner can: 2.1 select suitable sources of technical information to support light vehicle transmission and driveline 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 transmission and driveline unit and component removal and replacement activities.

Learning outcome	**The learner will:**
3. be able to use appropriate tools and equipment	
Assessment criteria	
The learner can: 3.1 select the appropriate tools and equipment necessary for removal and replacement of light vehicle transmission and driveline systems 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 to remove and replace light vehicle transmission and driveline systems.	

Learning outcome	**The learner will:**
4. be able to carry out removal and replacement of light vehicle transmission and driveline units and components	
Assessment criteria	
The learner can: 4.1 remove and replace the light vehicle's transmission and driveline systems and components, adhering to the correct specifications and tolerances for the vehicle and following: a. the manufacturer's approved removal and replacement methods b. recognised researched repair methods c. health and safety requirements. 4.2 ensure that replacement light vehicle transmission and driveline 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 light vehicle transmission and driveline system performs to the vehicle operating specification and meets any legal requirements 4.5 complete all system diagnostic activities with the agreed timescale.	

Learning outcome	**The learner will:**
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required. 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 112 Competency in removing and replacing Light vehicle driveline units and components

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 113 Competency in diagnosing and rectifying light vehicle transmission and driveline faults

UAN:	**K/601/3791**
Level:	Level 3
Credit value:	10
GLH:	90
Relationship to NOS:	This unit is linked to LV13 Diagnose and Rectify Motor Vehicle Transmission and Driveline Faults.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to demonstrate competency in diagnosing and rectifying light vehicle gearboxes, hubs and bearings, driveline shafts, clutches, differentials and final drive unit faults. It also covers the evaluation of performance of the replaced or repaired units and systems.

Learning outcome	**The learner will:**
1. be able to work safely when carrying out light vehicle transmission and driveline diagnostic and rectification activities	
Assessment criteria	
The learner can: 1.1 use suitable personal protective equipment and vehicle coverings when using light vehicle diagnostic methods and carrying out rectification activities 1.2 work in a way which minimises the risk of damage or injury to the vehicle, people or environment.	

Learning outcome	The learner will:
2. be able to use relevant information to carry out the task	
Assessment criteria	
The learner can: 2.1 select suitable sources of technical information to support light vehicle diagnostic and rectification activities including: a. vehicle technical data b. diagnostic test procedures 2.2 use sufficient diagnostic information in a systematic way to enable an accurate diagnosis of light vehicle transmission and driveline system faults.	

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment	
Assessment criteria	
The learner can: 3.1 select the appropriate tools and equipment necessary for diagnostic and rectification activities 3.2 ensure that equipment has been calibrated to meet manufacturers' and legal requirements 3.3 use the equipment required, correctly and safely throughout all light vehicle transmission and driveline diagnostic and rectification activities.	

Learning outcome	The learner will:
4. be able to carry out light vehicle transmission and driveline diagnosis, rectification and test activities	
Assessment criteria	
The learner can: 4.1 use diagnostic methods that are relevant to the symptoms presented 4.2 evaluate dismantled sub-assemblies for their condition and suitability for repair or replacement 4.3 carry out all diagnostic and rectification activities following: a. manufacturers' instructions b. recognised researched repair methods c. workplace procedures d. health and safety requirements 4.4 ensure all repaired or replacement components and units conform to the vehicle operating specification and any legal requirements 4.5 adjust components and units correctly to ensure that they operate to meet system requirements 4.6 use testing methods that are suitable for assessing the performance of the system rectified 4.7 ensure the light vehicle transmission and driveline system rectified performs to the vehicle operating specification and any legal requirements 4.8 complete all system diagnostic activities within the agreed timescale.	

Learning outcome	The learner will:
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required. 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 113 Competency in diagnosing and rectifying light vehicle transmission and driveline faults

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 121 Competency in overhauling light vehicle transmission units

UAN:	**H/601/3787**
Level:	Level 3
Credit value:	2
GLH:	20
Relationship to NOS:	This unit is linked to LV11 Overhaul Motor Mechanical Units.
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to demonstrate competency in overhauling gearboxes and final drive assemblies. It also covers the evaluation of performance of the overhauled units and systems.

Learning outcome	**The learner will:**
1. be able to work safely when overhauling light vehicle transmission units	
Assessment criteria	
The learner can: 1.1 use suitable personal protective equipment and vehicle coverings when overhauling light vehicle transmission units 1.2 work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.	

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

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment	
Assessment criteria	
The learner can: 3.1 select the appropriate tools and equipment necessary for overhaul of light vehicle transmission systems 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 overhaul light vehicle transmission unit.	

Learning outcome	The learner will:
4. be able to carry out the overhauling of light vehicle transmission units	
Assessment criteria	
The learner can: 4.1 carry out all overhauling of light vehicle transmission units, adhering to the specifications and tolerances for the vehicle and following: a. the manufacturer's approved overhauling methods b. recognised researched repair methods c. health and safety requirements. d. workplace procedures 4.2 ensure the assessment of the dismantled unit identifies accurately its condition and suitability for overhaul 4.3 inform the relevant person(s) promptly where an overhaul is uneconomic or unsatisfactory to perform 4.4 use testing methods that comply with the manufacturer's requirements. 4.5 adjust the unit's components correctly where necessary to ensure that they operate to meet the vehicle operating requirements. 4.6 ensure the overhauled units and assemblies conform to the vehicle operating specification and any legal requirements. 4.7 complete all system diagnostic activities within the agreed timescale.	

Learning outcome	The learner will:
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required. 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 121 Competency in overhauling light vehicle transmission units

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 131 Competency in overhauling light vehicle steering and suspension units

UAN:	**K/601/3788**
Level:	Level 3
Credit value:	2
GLH:	20
Relationship to NOS:	This unit is linked to LV11 Overhaul Motor Mechanical Units.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to demonstrate competency in overhauling steering and suspension units. It also covers the evaluation of performance of the overhauled units and systems.

Learning outcome	**The learner will:**
1. be able to work safely when overhauling light vehicle steering and suspension units	
Assessment criteria	
The learner can: 1.1 use suitable personal protective equipment and vehicle coverings when overhauling light vehicle steering and suspension units 1.2 work in a way which minimises the risk of damage or injury to the vehicle, people and the environment.	

Learning outcome	**The learner will:**
2. be able to use relevant information to carry out the task	
Assessment criteria	
The learner can: 2.1 select suitable sources of technical information to support the overhauling of light vehicle steering and suspension units including: a. vehicle technical data b. overhauling procedures c. legal requirements 2.2 use technical information to support the overhauling of light vehicle steering and suspension units.	

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment	
Assessment criteria	
The learner can: 3.1 select the appropriate tools and equipment necessary for overhauling light vehicle steering and suspension units 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 for overhauling light vehicle steering and suspension units.	

Learning outcome	The learner will:
4. be able to carry out the overhauling of light vehicle steering and suspension units	
Assessment criteria	
The learner can: 4.1 carry out all overhauling of light vehicle steering and suspension units, adhering to the specifications and tolerances for the vehicle and following: a. the manufacturer's approved overhauling methods b. recognised researched repair methods c. health and safety requirements. d. workplace procedures 4.2 ensure the assessment of the dismantled unit identifies accurately its condition and suitability for overhaul 4.3 inform the relevant person(s) promptly where an overhaul is uneconomic or unsatisfactory to perform 4.4 use testing methods that comply with the manufacturer's requirements. 4.5 adjust the unit's components correctly where necessary to ensure that they operate to meet the vehicle operating requirements. 4.6 ensure the overhauled units and assemblies conform to the vehicle operating specification and any legal requirements. 4.7 complete all system diagnostic activities within the agreed timescale.	

Learning outcome	The learner will:
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required. 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 131 Competency in overhauling light vehicle steering and suspension units

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 151 Knowledge of routine light vehicle maintenance

UAN:	**F/601/3716**
Level:	Level 2
Credit value:	3
GLH:	20
Relationship to NOS:	This unit is linked to LV01 Carry Out Routine Motor Vehicle Maintenance.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of conducting routine maintenance, adjustment and replacement activities as part of the periodic servicing of light vehicles.

Learning outcome	**The learner will:**
1. understand how to carry out routine light vehicle maintenance	
Assessment criteria	
The learner can: 1.1 explain how to conduct a scheduled light vehicle routine examination and assessment against the vehicle manufacturer's specification 1.2 identify the assessment methods used to check for conformity 1.3 identify the different systems to be inspected while carrying out light vehicle routine maintenance: a. engine b. chassis c. wheels and tyres d. transmission and driveline e. electrical and electronic f. exterior vehicle body g. vehicle interior 1.4 describe the procedures used for checking the condition and serviceability of light vehicle units and components 1.5 describe the procedures for checking and replenishing fluid levels 1.6 describe the procedures for checking and replacing lubricants 1.7 identify adjustments that need to be carried out on a light vehicle routine maintenance	

1.8	explain the procedure for reporting cosmetic damage to vehicle components and units outside normal service items
1.9	identify the operating specifications for the systems being checked while carrying out light vehicle routine maintenance.

Learning outcome	**The learner will:**
2. understand the importance of carrying out light vehicle maintenance	
Assessment criteria	
The learner can:	
2.1	describe the requirements of correct maintenance in order to maintain the vehicle in a roadworthy and legal condition
2.2	describe the importance of correct maintenance for warranty purposes.

Unit 151 Knowledge of routine light vehicle maintenance

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.

Vehicle maintenance, inspection and adjustment and record finding

a. Vehicle inspection techniques used in routine maintenance including:
   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.

b. The procedures used for inspecting the condition and serviceability of the following:
   i. filters
   ii. drive belts
   iii. wiper blades
   iv. brake linings
   v. pads
   vi. tyres
   vii. lights.

c. Preparation and appropriate use of equipment to include:
   i. test instruments
   ii. emission equipment
   iii. wheel alignment
   iv. beam setting equipment
   v. tyre tread depth gauges.

d. Procedures for checking and replenishing fluid levels:
   i. oil
   ii. water
   iii. hydraulic fluids.

e. Procedures for checking and replacement of lubricants:
   i. replace oil filters
   ii. check levels
   iii. types of oil
   iv. cleanliness
   v. disposal of old oil and filters.

f. Procedures for carrying out adjustments on vehicle systems or components:
   i. clearances
   ii. settings
   iii. alignment

iv. operational performance (engine idle, exhaust gas).

g. Procedures for checking electrical systems:
   i. operation
   ii. security
   iii. performance.
h. Importance and process of detailed inspection procedures:
   i. following inspection checklists
   ii. checking conformity to manufacturer's specifications
   iii. UK and European legal requirements.
i. Importance and process of completing all relevant documentation relating to routine maintenance:
   i. inspection records
   ii. job cards
   iii. vehicle repair records
   iv. in-vehicle service history.

The need to use vehicle protection prior to repair

a. Requirements and methods used for protecting:
   i. vehicle body panels
   ii. paint surfaces
   iii. seats
   iv. carpets and floor mats.

The need to check the vehicle following routine maintenance

a. The need to inspect the vehicle following routine maintenance:
   i. professional presentation of vehicle
   ii. customer perceptions.
b. The checks of vehicle following routine maintenance:
   i. removal of oil and grease marks
   ii. body panels
   iii. paint surfaces
   iv. seats
   v. carpets and floor mats
   vi. re-instatement of components.

Unit 152 Knowledge of light vehicle engine mechanical, lubrication and cooling system units and components

UAN:	**R/601/3719**
Level:	Level 2
Credit value:	3
GLH:	20
Relationship to NOS:	This unit is linked to LV02 Remove and Replace Motor Engine Units and Components.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of the construction and operation of common engine mechanical, lubrication and cooling systems. It also covers the procedures involved in the removal and replacement of system components and the evaluation of their performance.

Learning outcome	**The learner will:**
1. understand how the main light vehicle engine mechanical systems operate	
Assessment criteria	
The learner can: 1.1 identify light vehicle engine mechanical system components 1.2 describe the construction and operation of light vehicle engine mechanical systems: a. four stroke b. spark ignition c. compression ignition d. rotary 1.3 compare key light vehicle engine mechanical system components and assemblies against alternatives to identify differences in construction and operation	

1.4 identify the key engineering principles that are related to light vehicle engine mechanical systems:
   a. compression ratios
   b. cylinder capacity
   c. power
   d. torque

1.5 state common terms used in light vehicle engine mechanical system design:
   a. tdc
   b. bdc
   c. stroke
   d. bore.

Learning outcome	**The learner will:**
2. understand how light vehicle engine lubrication systems operate	
Assessment criteria	

The learner can:

2.1 identify light vehicle engine lubrication system components

2.2 describe the construction and operation of light vehicle engine lubrication components and systems:
   a. full flow
   b. by pass
   c. wet sump
   d. dry sump

2.3 compare key light vehicle engine lubrication system components and assemblies to identify differences in construction and operation

2.4 identify the key engineering principles that are related to light vehicle engine lubrication systems:
   a. classification of lubricants
   b. properties of lubricants
   c. methods of reducing friction

2.5 state common terms used in light vehicle engine lubrication system design.

Learning outcome	The learner will:
3. understand how light vehicle engine cooling, heating and ventilation systems operate	
Assessment criteria	
The learner can: 3.1 identify light vehicle engine cooling, heating and ventilation system components 3.2 describe the construction and operation of light vehicle engine cooling, heating and ventilation systems 3.3 compare key light vehicle engine cooling, heating and ventilation system components and assemblies against alternatives to identify differences in construction and operation 3.4 identify the key engineering principles that are related to light vehicle engine cooling, heating and ventilation systems: a. heat transfer b. linear and cubical expansion c. specific heat capacity d. boiling point of liquids 3.5 state common terms used in key light vehicle engine cooling, heating and ventilation system design.	

Learning outcome	The learner will:
4. understand how to check, replace and test light vehicle engine mechanical, lubrication and cooling systems system units and components	
Assessment criteria	
The learner can: 4.1 describe how to remove and replace engine mechanical, lubrication and cooling system units and components 4.2 describe common types of testing methods used to check the operation of engine mechanical, lubrication and cooling systems and their purpose 4.3 describe how to test and evaluate the performance of replacement units against vehicle specification 4.4 identify common faults found in light vehicle engine mechanical, lubrication and cooling systems and their causes.	

Unit 152 Knowledge of light vehicle engine mechanical, lubrication and cooling system 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.

Engines

a. Engine types and configurations:
   i. inline
   ii. flat
   iii. vee
   iv. four-stroke cycle and two-stroke cycle for spark ignition and compression ignition engines
   v. naturally aspirated and turbo-charged engines
   vi. hybrid fuel engines.
b. Relative advantages and disadvantages of different engine types and configurations.
c. Engine components and layouts:
   i. single (OHC) and multi camshaft (DOHC)
   ii. single and multi cylinder (2, 4, 6, 8 cylinder types).
d. Cylinder head layout and design, combustion chamber and piston design.
e. Calculate compression ratios from given data.
f. The procedures used when inspecting engines.
g. The procedures to assess:
   i. serviceability
   ii. wear
   iii. condition
   iv. clearances
   v. settings
   vi. linkages
   vii. joints
   viii. fluid systems
   ix. adjustments
   x. operation and functionality
   xi. security.
h. Symptoms and faults associated with mechanical engine operation:
   i. poor performance
   ii. abnormal or excessive mechanical noise
   iii. erratic running

iv. low power
v. exhaust emissions
vi. abnormal exhaust smoke
vii. unable to start
viii. exhaust gas leaks to cooling system
ix. exhaust gas leaks.

Lubrication

a. The advantages and disadvantages of wet and dry systems.
b. Engine lubrication system:
   i. splash and pressurised systems
   ii. pumps
   iii. pressure relief valve
   iv. filters
   v. oil ways
   vi. oil coolers.
c. Terms associated with lubrication and engine oil:
   i. full-flow
   ii. hydrodynamic
   iii. boundary
   iv. viscosity
   v. multi-grade
   vi. natural and synthetic oil
   vii. viscosity index
   viii. multi-grade.
d. The requirements and features of engine oil:
   i. operating temperatures
   ii. pressures
   iii. lubricant grades
   iv. viscosity
   v. multi-grade oil
   vi. additives
   vii. detergents
   viii. dispersants
   ix. anti-oxidants inhibitors
   x. anti-foaming agents
   xi. anti-wear
   xii. synthetic oils
   xiii. organic oils
   xiv. mineral oils.
e. Symptoms and faults associated with lubrication systems:
   i. excessive oil consumption
   ii. oil leaks
   iii. oil in water
   iv. low or excessive pressure
   v. oil contamination.
f. The procedures used when inspecting lubrication system.

Cooling, Heating and Ventilation

a. The components, operating principles, and functions of engine cooling systems.
b. Procedures used to remove, replace and adjust cooling system components:
    i. cooling fans and control devices
    ii. header tanks, radiators and pressure caps
    iii. heater matrices and temperature control systems
    iv. expansion tanks hoses, clips and pipes
    v. thermostats impellers and coolant
    vi. ventilation systems.
c. The preparation and method of use of appropriate specialist equipment used to evaluate system performance following component replacement:
    i. system pressure testers
    ii. pressure cap testers
    iii. hydrometer, or anti-freeze testing equipment
    iv. chemical tests for the detection of combustion gas.
d. The layout and construction of internal heater systems.
e. The controls and connections within internal heater system.
f. Symptoms and faults associated with cooling systems:
    i. water leaks
    ii. water in oil
    iii. internal heating system: efficiency, operation, leaks, controls, air filtration, air leaks and contamination
    iv. excessively low or high coolant temperature.
g. The procedures used when inspecting:
    i. internal heating system
    ii. cooling system.

General

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

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

UAN:	**T/601/3731**
Level:	Level 2
Credit value:	6
GLH:	45
Relationship to NOS:	This unit is linked to LV03 Remove and Replace Motor Electrical Units and Components.
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	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.

Learning outcome	**The learner will:**
1. understand light vehicle electrical and electronic principles	
Assessment criteria	
The learner can: 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	

Learning outcome	The learner will:
2. understand how light vehicle batteries, starting and charging systems operate	
Assessment criteria	
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	

Learning outcome	The learner will:
3. understand how light vehicle auxiliary electrical systems operate	
Assessment criteria	
The learner can: 3.1 identify light vehicle auxiliary system components 3.2 describe the construction and operation of light vehicle 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.	

Learning outcome	The learner will:
4. understand how to check, replace and test light vehicle electrical systems and components	
Assessment criteria	
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 154 Knowledge of removing and replacing light vehicle chassis units and components

UAN:	**A/601/3732**
Level:	Level 2
Credit value:	6
GLH:	45
Relationship to NOS:	This unit is linked to LV04 Remove and Replace Motor Vehicle Chassis Units and Components.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of the construction and operation of common steering, suspension and braking systems (including wheels and tyres). It also covers the procedures involved in the removal and replacement of system components and the evaluation of their performance.

Learning outcome	**The learner will:**
1. understand how light vehicle steering and suspension systems operate	
Assessment criteria	
The learner can: 1.1 identify light vehicle steering and suspension system components 1.2 describe the construction and operation of light vehicle steering and suspension systems 1.3 compare key light vehicle steering and suspension system components and assemblies against alternatives to identify differences in construction and operation 1.4 identify the key engineering principles that are related to light vehicle steering and suspension systems a. steering angles b. hydraulic forces c. stress and strain 1.5 state common terms used in light vehicle steering and suspension system design.	

Learning outcome	The learner will:
2. understand how light vehicle braking systems operate	
Assessment criteria	
The learner can: 2.1 identify light vehicle braking system components 2.2 describe the construction and operation of light vehicle braking systems 2.3 compare key light vehicle braking system components and assemblies against alternatives to identify differences in construction and operation 2.4 identify the key engineering principles that are related to light vehicle braking systems a. laws of friction b. hydraulics c. pneumatics d. properties of fluids e. properties of air f. braking efficiency 2.5 state common terms used in light vehicle braking system design.	

Learning outcome	The learner will:
3. understand how light vehicle wheel and tyres systems operate	
Assessment criteria	
The learner can: 3.1 identify light vehicle wheel and tyre components 3.2 describe the construction and operation of light vehicle wheels and tyres 3.3 compare key light vehicle wheel and tyre components and assemblies against alternatives to identify differences in construction and operation 3.4 identify the key engineering principles that are related to light vehicle wheel and tyre systems a. friction b. un-sprung weight c. dynamic and static balance 3.5 state common terms used in light vehicle wheel and tyre design.	

Learning outcome	The learner will:
4. understand how to check, replace and test light vehicle chassis units and components	
Assessment criteria	
The learner can: 4.1 describe how to remove and replace chassis units and components 4.2 describe common types of testing methods used to check the operation of chassis units and components and their purpose 4.3 explain how to evaluate the performance of replacement units against vehicle specification 4.4 identify common faults found in light vehicle chassis units and components.	

Unit 154 Knowledge of removing and replacing light vehicle chassis 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.

Steering

a. The action and purpose of steering geometry:
   i. castor angle
   ii. camber angle
   iii. kingpin or swivel pin inclination
   iv. negative offset
   v. wheel alignment (tracking) (toe in and toe out)
   vi. toe out on turns
   vii. steered wheel geometry.
b. The following terms associated with steering:
   i. Ackerman principle
   ii. slip angles
   iii. self-aligning torque oversteer and understeer
   iv. neutral steer.
c. The components and layout of hydraulic power steering systems:
   i. piston and power cylinders
   ii. drive belts and pumps
   iii. hydraulic valve (rotary, spool and flapper type)
   iv. hydraulic fluid.
d. The advantages of power assisted steering.
e. The operation of hydraulic power steering.
f. The principles of electronic power steering systems.
g. The procedures used for inspecting the serviceability and condition of:
   i. manual steering
   ii. power steering.
h. Steering system defects to include:
   i. uneven tyre wear
   ii. wear on outer edge of tyre
   iii. wear on inner edge of tyre
   iv. uneven wear
   v. flats on tread
   vi. steering vibrations
   v. wear in linkage
   vi. damage linkage

vii. incorrect wheel alignment
viii. incorrect steering geometry.

Suspension

a. The layout and components of suspension systems:
   i. non-independent suspensions
   ii. independent front suspension (IFS)
   iii. independent rear suspension (IRS)
   iv. hydraulic
   v. hydro-pneumatic
   vi. rigid axle types.
b. The operation of suspension systems and components:
   i. leaf and coil springs
   ii. torsion bar
   iii. rubber springs
   iv. Macpherson strut system
   v. hydraulic
   vi. hydro-pneumatic
   vii. hydraulic dampers
   viii. trailing arms
   ix. wish bones
   x. ball joints
   xi. track control arms
   xii. bump stops
   xiii. anti-roll bars
   xiv. stabiliser bars
   xv. swinging arms
   xvi. parallel link
   xvii. swinging half-axles
   xviii. transverse link
   xix. semi-swinging arms.
c. The advantages of different systems including:
   i. non-independent
   ii. independent suspension (IFS)
   iii. independent suspension (IRS)
   iv. hydraulic
   v. hydro-pneumatic
   vi. rigid axle.
d. The principles of electronic suspensions systems.
e. The forces acting on suspension systems during braking, driving and cornering.
f. The methods of locating the road wheels against braking, driving and cornering forces.
g. The methods of controlling cornering forces by fitting anti-roll torsion members.
h. Suspension terms:
   i. rebound
   ii. bump
   iii. float

iv. dive
v. pitch
vi. roll
vii. compliance.

i. The procedures used for inspecting the serviceability and condition of the suspension system

j. Suspension system defects:
i. wheel hop
ii. ride height (unequal and low)
iii. wear
iv. noises under operation
v. fluid leakage
vi. excessive travel
vii. excessive tyre wear
viii. bounce
ix. poor vehicle handling
x. worn dampers
xi. worn joints
xii. damaged linkages.

Brakes

a. The construction and operation of drum brakes:
i. leading and trailing shoe construction
ii. self-servo action
iii. automatic adjusters
iv. backing plates
v. parking brake system.

b. The construction and operation of disc brakes:
i. disc pads
ii. calliper
iii. brake disc
iv. ventilated disc
v. disc pad retraction
vi. parking brake system
vii. electrical and electronic components
viii. wear indicators and warning lamps.

c. The construction and operation of the hydraulic braking system:
i. single and dual line layout
ii. master cylinders
iii. wheel cylinders
iv. disc brake calliper and pistons
v. brake pipe
vi. brake servo
vii. warning lights
viii. parking brakes
ix. equalising valves.

d. The principles and components of electronic ABS systems, electrical and electronic components.

e. The requirements and hazards of brake fluid:
i. boiling point

ii. hygroscopic action
iii. manufacturer's change periods
iv. fluid classification and rating
v. potential to damage paint surfaces.

f. Terms associated with mechanical and hydraulic braking systems:
i. braking efficiency
ii. brake fade
iii. brake balance
iv. ABS.

g. The procedures used for inspecting the serviceability and condition of the braking system.

h. Braking system defects:
i. worn shoes or pads
ii. worn or scored brake surfaces
iii. abnormal brake noises
iv. brake judder
v. fluid contamination of brake surfaces
vi. fluid leaks
vii. pulling to one side
viii. poor braking efficiency
ix. lack of servo assistance
x. brake drag
xi. brake grab
xii. brake fade.

Wheel and tyres

a. The construction of different types of tyre:
i. radial
ii. cross ply
iii. bias belted
iv. tread patterns
v. tyre mixing regulations
vi. tyre applications.

b. Tyre markings:
i. tyre and wheel size markings
ii. speed rating
iii. direction of rotation
iv. profile
v. load rating
vi. ply rating
vii. tread-wear indicators.

c. Wheel construction:
i. light alloy
ii. pressed steel and wire wheels
iii. flat-edge and double hump rims.

d. Types of wheel bearing arrangements:
i. non-driving.

e. Types of bearing used for wheel bearing arrangements:
i. roller
ii. taper roller

iii. needle
iv. ball and plain.

f. The procedures used for inspecting the serviceability and condition of:
   i. tyres and wheels
   ii. bearings.
g. The defects associated with tyres and wheels:
   i. abnormal tyre wear
   ii. cuts
   iii. side wall damage
   iv. wheel vibrations
   v. tyre noise (squeal during cornering)
   vi. tyre over heating (low pressure)
   vii. tread separation.

General

The procedures for dismantling, removal and replacement of chassis system components

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

Unit 155 Knowledge of inspecting light vehicles using prescribed methods

UAN:	**H/601/3742**
Level:	Level 2
Credit value:	4
GLH:	40
Relationship to NOS:	This unit is linked to LV05 Inspect Motor Vehicles using Prescribed Inspection Methods and LV06 Inspect Light Vehicles.
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	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.

Learning outcome	**The learner will:**
1. understand how to carry out inspections on light vehicle using prescribed methods	
Assessment criteria	
The learner can: 1.1 explain the difference between the various prescribed light vehicle inspection methods to include:- a. pre-work b. post-work c. pre-delivery d. maintenance inspection (brake, seasonal and tyre) 1.2 identify the different systems to be inspected when using the prescribed inspection methods 1.3 identify the procedures involved in carry 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 155 Knowledge of inspecting light 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 conducting 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.

Unit 157 Knowledge of diagnosis and rectification of light vehicle engine faults

UAN:	**F/601/3733**
Level:	Level 3
Credit value:	6
GLH:	45
Relationship to NOS:	This unit is linked to LV07 Diagnose and Rectify Motor Vehicle Engine and Component Faults.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of diagnosis and rectification of engine mechanical, electrical, hydraulic and fluid systems. It also covers light vehicle engine systems and the evaluation of their performance.

Learning outcome	**The learner will:**
1. understand how the light vehicle engine systems operate	
Assessment criteria	
The learner can: 1.1 explain the construction and operation of light vehicle engine systems to include: a. SI fuel systems b. CI fuel systems c. ignition systems d. engine management e. valve mechanisms f. pressure charged induction systems g. exhaust emission reduction systems h. heating, ventilation and cooling 1.2 explain the interaction between electrical, electronic and mechanical components within light vehicle engine systems 1.3 explain how electrical systems interlink and interact, including multiplexing and fibre optics 1.4 compare light vehicle engine system components and assemblies against alternatives to identify differences in construction and operation	

1.5 identify the engineering principles that are related to light vehicle engine systems
   a. volumetric efficiency
   b. flame travel, pre ignition and detonation
   c. fuel properties
   d. composition of carbon fuels
   e. combustion process
   f. legal requirements for exhaust emissions.

Learning outcome	The learner will:
2. understand how to diagnose and rectify faults in light vehicle engine systems	
Assessment criteria	
The learner can: 2.1 describe how to analyse symptoms and causes of faults found in light vehicle engine systems to include: a. engine mechanical components b. ignition systems c. fuel systems d. engine management system e. pressure charged induction systems f. heating, ventilation and cooling 2.2 explain systematic diagnostic techniques used in identifying engine system faults 2.3 explain how to examine, measure and make suitable adjustments to the components including: a. settings b. input and output values c. voltages d. current consumption e. resistance f. output patterns with oscilloscope g. pressures h. condition i. wear and performance 2.4 explain how to carry out the diagnosis and rectification activities in order to correct the faults in the light vehicle engine systems 2.5 explain how to select, prepare and use diagnostic and rectification equipment for light vehicle engine systems 2.6 explain how to evaluate and interpret test results found in diagnosing light vehicle engine system faults against vehicle manufacturer specifications and settings 2.7 explain how to evaluate the operation of components and systems following diagnosis and repair to confirm system performance.	

Unit 157 Knowledge of diagnosis and rectification of light vehicle engine faults

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.

Single and multi-point petrol injection systems

a. The operation and construction of single and multi-point injection systems including:
   i. types of air flow sensor
   ii. fuel supply system
   iii. fuel pump
   iv. filter
   v. fuel regulator
   vi. injectors
   vii. sequential injection
   viii. continuous injection
   ix. semi-continuous injection
   x. electronic control unit (ECU)
   xi. injector pulse width
   xii. sensors.
b. The operation of each system under various operating conditions including:
   i. cold starting
   ii. warm up
   iii. hot starting
   iv. acceleration
   v. deceleration
   vi. cruising
   vii. full load.
c. Engine speed limiting and knock sensing.

Engine management

a. The function and purpose of engine management systems.
b. The difference between analogue, digital, programmable and non-programmable systems.
c. Open loop and closed loop control, types of input and output devices.
d. The function and operation of digital components and systems.
e. The operation of engine management systems under various conditions.

Valve mechanisms

a. The reasons for variable valve timing and multi-valve arrangements and the effect on performance.
b. Layout of multi-valve arrangements, components, operation and drive arrangements.
c. Construction features and operation of variable valve timing engines and electronic control.

Pressure charged induction systems

a. The meaning of volumetric efficiency; explain the effect of volumetric efficiency on engine performance, torque and power.
b. The methods used to improve volumetric efficiency:
    i. variable valve timing
    ii. turbo-charging
    iii. supercharging
    iv. intercoolers.
c. The operation of turbo-chargers and the purpose of:
    i. turbo-charging
    ii. supercharging
    iii. intercoolers
    iv. waste gates
    v. exhaust gas recirculation.
d. Advantages and disadvantages of pressure charging induction systems.

Terms associated with combustion

a. Flame travel, pre-ignition and detonation.
b. Fuel properties:
    i. octane rating
    ii. flash point
    iii. fire point
    iv. volatility
    v. composition of petrol and diesel fuels
    vi. hydro-carbon content.
c. Composition of carbon fuels (petrol and diesel):
    i. % hydrogen and carbon
    ii. composition of air
    iii. % oxygen
    iv. % nitrogen.
d. Combustion process for spark ignition and compression ignition engines:
    i. air fuel ratio
    ii. lambda ratio
    iii. stoichiometric ratio.
e. The by-products of combustion for different engine conditions and fuel mixtures:
    i. CO
    ii. CO_2
    iii. O
    iv. N
    v. H_2O

vi. NOx.

f. Describe the legal requirements for exhaust emissions:
   i. MOT requirements
   ii. EURO 3
   iii. 4 and 5 regulations.

Assessment, repair and restoration of mechanical engine components

a. How engine mechanical components are assessed and measured for wear and serviceability:
   i. cylinder bores
   ii. cylinder heads
   iii. crankshaft journals
   iv. valve faces
   v. valve guides
   vi. valve seats
   vii. camshafts.
b. The methods used for the repair and restoration of engine components.

Cooling, heating and ventilation

a. The components, operating principles, and functions of engine cooling systems.
b. Procedures used to remove, replace and adjust cooling system components:
   i. cooling fans and control devices
   ii. header tanks, radiators and pressure caps
   iii. heater matrices and temperature control systems
   iv. expansion tanks, hoses, clips and pipes
   v. thermostats, impellers and coolant
   vi. ventilation systems.
c. The preparation and method of use of appropriate specialist equipment used to evaluate system performance following component replacement:
   i. system pressure testers
   ii. pressure cap testers
   iii. hydrometer, or anti-freeze testing equipment
   iv. chemical tests for the detection of combustion gas.
d. The layout and construction of internal heater systems.
e. The controls and connections within internal heater system.
f. Symptoms and faults associated with cooling systems:
   i. water leaks
   ii. water in oil
   iii. internal heating system: efficiency, operation, leaks, controls, air filtration, air leaks and contamination
   iv. excessively low or high coolant temperature.
g. The procedures used when inspecting:
   i. internal heating system
   ii. cooling system.

Air conditioning systems

a. The operation of air conditioning components including:
    i. compressors
    ii. condensers
    iii. receivers
    iv. dryers
    v. connections
    vi. valves
    vii. hoses
    viii. thermostats
    ix. refrigerants.
b. The layout and operation of air conditioning systems.

Climate control systems

a. Identify components used in climate control systems including:
    i. sensors
    ii. speed controls
    iii. control systems
    iv. servomotors
    v. electronic components.
b. The layout of climate control systems.
c. The operation of climate control systems.

Symptoms and faults in engine mechanical systems and components

a. Symptoms and faults related to:
    i. worn cylinders
    ii. cylinder liners
    iii. pistons
    iv. piston rings
    v. crankshaft
    vi. camshaft
    vii. bearings
    viii. cylinder head and gasket
    ix. valves
    x. valve seats and valve guides
    xi. cambelts
    xii. lubrication system and components
    xiii. oil pump
    xiv. relief valve
    xv. filter
    xvi. turbo-charger
    xvii. supercharger.

Diagnosis of faults in engine mechanical systems and components

a. Interpret information for:
    i. diagnostic tests
    ii. manufacturer's vehicle and equipment specifications
    iii. use of equipment
    iv. testing procedures

v. test plans
vi. legal requirements.

b. The preparation of tools and equipment for use in diagnostic testing and assessment.
c. Systematic assessment, testing and inspection of engine components and systems including:
    i. mechanical system and component condition
    ii. engine balance
    iii. power balance
    iv. performance and operation
    v. wear
    vi. run out
    vii. alignment.
d. Use of appropriate tools and equipment including:
    i. compression gauges
    ii. leakage testers
    iii. cylinder balance tester
    iv. pressure gauges
    v. micrometers
    vi. vernier gauges.
e. Evaluate and interpret test results from diagnostic testing.
f. Compare test result and values with vehicle manufacturer's specifications and settings.
g. The procedures for dismantling components and systems and the use of appropriate equipment and procedures.
h. Assess, examine and measure components including:
    i. settings
    ii. values
    iii. condition
    iv. wear and performance of components and systems
i. Probable faults:
    i. malfunctions
    ii. incorrect settings
    iii. wear.
j. Rectification or replacement procedures.
k. Evaluate operation of components and systems following diagnosis and repair to confirm system performance.

Faults and symptoms in ignition systems

a. Ignition system failure or malfunctions including:
    i. no spark
    ii. misfiring
    iii. backfiring
    iv. cold or hot starting problems
    v. poor performance
    vi. pre-ignition
    vii. detonation
    viii. exhaust emission levels
    ix. fuel consumption
    x. low power
    xi. unstable idle speed.

Faults and symptoms in electronic petrol and diesel injection Systems

a. Petrol and diesel injection system failures or malfunctions including:
    i. cold or hot starting problems
    ii. poor performance
    iii. exhaust emissions
    iv. high fuel consumption
    v. erratic running
    vi. low power
    vii. unstable idle speed.

Faults and symptoms in engine management systems

a. Engine management system failure or malfunctions including:
    i. misfiring
    ii. backfiring
    iii. cold or hot starting problems
    iv. poor performance
    v. pre-ignition
    vi. detonation
    vii. exhaust emission levels
    viii. fuel consumption
    ix. low power
    x. unstable idle speed.

Diagnosis of faults in electronic ignition, petrol and diesel injection and engine management systems

a. Locate and interpret information for:
    i. diagnostic tests
    ii. manufacturer's vehicle and equipment specifications
    iii. use of equipment
    iv. testing procedures
    v. test plans
    vi. fault codes
    vii. legal requirements.
b. The preparation of tools and equipment for use in diagnostic testing and assessment.
c. Conduct systematic assessment and testing of engine systems including:
    i. component condition and performance
    ii. component settings
    iii. component values
    iv. electrical and electronic values
    v. system performance and operation
    vi. use of appropriate tools and equipment including gauges
    vii. multi-meter
    viii. breakout box
    ix. oscilloscope
    x. diagnostic tester
    xi. manufacturer's dedicated equipment

xii. exhaust gas analyser
xiii. fuel flow meter
xiv. pressure gauges.

d. Evaluate and interpret test results from diagnostic testing.
e. Compare test result values and fault codes with vehicle manufacturer's specifications and settings.
f. The procedures for dismantling components and systems using appropriate equipment.
g. Assess, examine and measure components including:
   i. settings
   ii. input and output values
   iii. voltages
   iv. current consumption
   v. resistance
   vi. output patterns with oscilloscope
   vii. condition
   viii. wear and performance of components and systems.
h. Identify probable faults and indications of:
   i. faults
   ii. malfunctions
   iii. incorrect settings
   iv. wear
   v. values
   vi. inputs and outputs
   vii. fault codes.
i. Rectification or replacement procedures.
j. Evaluation and the operation of components and systems following diagnosis and repair to confirm system performance.

Faults and symptoms in vehicle comfort systems

a. System failure, malfunction or ineffectiveness of internal heating system, air conditioning system or climatic control system including:
   i. leaks
   ii. abnormal noise
   iii. ineffective operation
   iv. failure to operate
   v. control faults
   vi. inadequate operation.

Diagnosis of faults in vehicle comfort systems

a. Locate and interpret information for:
   i. diagnostic tests
   ii. manufacturer's vehicle and equipment specifications
   iii. use of equipment
   iv. testing procedures
   v. test plans
   vi. fault codes
   vii. legal requirements.
b. The preparation of tools and equipment for use in diagnostic testing and assessment.

c. Conduct systematic assessment and testing of comfort systems including:
    i. component condition and performance
    ii. component settings
    iii. component values
    iv. electrical and electronic values
    v. system performance and operation
    vi. drive belts
    vii. controls
    viii. compressors
    ix. condensers
    x. receivers
    xi. dryers
    xii. connections
    xiii. valve
    xiv. hoses
    xv. thermostats and refrigerants
    xvi. sensors
    xvii. speed controls
    xviii. control systems
    xix. servomotors.
d. Use of appropriate tools and equipment including:
    i. pressure gauges
    ii. multi-meter
    iii. breakout box
    iv. oscilloscope
    v. diagnostic tester
    vi. manufacturer's dedicated equipment
    vii. flow meter.
e. Evaluate and interpret test results from diagnostic testing.
f. Compare test result values and fault codes with vehicle manufacturer's specifications and settings.
g. How to dismantle components and systems using appropriate equipment and procedures.
h. How to assess, examine and measure components including: settings, input and output values, voltages, current consumption, resistance, output patterns with oscilloscope, pressures, condition, wear and performance of components and systems.
i. Identification of probable faults and indications of faults, malfunctions, incorrect settings, wear, values, inputs and outputs, fault codes, pressures and leaks.
j. Rectification or replacement procedures.
k. Evaluation and operation of components and systems following diagnosis and repair to confirm system performance.

Unit 158 Knowledge in diagnosis and rectification of light vehicle chassis faults

UAN:	**L/601/3735**
Level:	Level 3
Credit value:	6
GLH:	45
Relationship to NOS:	This unit is linked to LV08 Diagnose and Rectify Motor Vehicle Chassis System Faults.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of diagnosis and rectification of braking steering and suspension systems. It also covers light vehicle chassis systems and the evaluation of their performance.

Learning outcome	**The learner will:**
1. understand how the light vehicle chassis systems operate	
Assessment criteria	
The learner can: 1.1 explain the construction and operation of light vehicle chassis systems to include: a. electronic braking b. front and rear wheel geometry c. four wheel steer d. hydraulic power steering e. electronic power steering f. self leveling suspension g. ride control system 1.2 explain the interaction between electrical, electronic and mechanical components within light vehicle chassis systems 1.3 explain how light vehicle chassis electrical systems interlink and interact, including multiplexing 1.4 compare light vehicle chassis system components and assemblies against alternatives to identify differences in construction and	

operation

1.5 identify the engineering principles that are related to light vehicle chassis systems
   a. inertia force, mass and acceleration
   b. laws of friction
   c. statics (springs and torsion bars)
   d. hydraulic machines.

Learning outcome	**The learner will:**
2. understand how to diagnose and rectify faults in light vehicle chassis systems	
Assessment criteria	
The learner can:	
2.1 explain symptoms and causes of faults found in light vehicle chassis systems	
2.2 explain systematic diagnostic techniques used in identifying chassis system faults	
2.3 explain how to examine, measure and make suitable adjustments to the components	
2.4 explain how to carry out the diagnosis and rectification activities in order to correct the faults in the light vehicle chassis systems	
2.5 explain how to select, prepare and use diagnostic and rectification equipment for light vehicle chassis systems	
2.6 explain how to evaluate and interpret test results found in diagnosing light vehicle chassis system faults against vehicle manufacturer specifications and settings	
2.7 explain how to evaluate the operation of components and systems following diagnosis and repair to confirm system performance.	

Unit 158 Knowledge in diagnosis and rectification of light vehicle chassis faults

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 and electronic principles of light vehicle chassis systems

a. The operation of electrical and electronic systems and components related to light vehicle chassis systems including:
    i. ECU
    ii. sensors and actuators
    iii. electrical inputs
    iv. voltages
    v. oscilloscope patterns
    vi. digital and fibre optic principles.
b. The interaction between the electrical/electronic system and mechanical components of chassis systems.
c. Electronic and electrical safety procedures.

Operation of electronic ABS and EBD braking systems

a. Layout of:
    i. ABS and EBD braking systems
    ii. anti-lock braking
    iii. anti-skid control systems
    iv. warning systems.
b. Operation of:
    i. hydraulic and electronic control units
    ii. wheel speed sensors
    iii. load sensors
    iv. hoses
    v. cables and connectors.
c. Advantage of ABS and EBD braking systems over conventional braking systems.
d. The relationship and interaction of ABS braking with other vehicle systems – traction control.

Steering geometry for light vehicle applications

a. Non-steered wheel geometry settings.
b. Front/rear wheel geometry:
    i. castor
    ii. camber
    iii. kingpin or swivel pin inclination
    iv. negative offset
    v. wheel alignment (tracking)
    vi. toe in and toe out
    vii. toe out on turns and steered wheel geometry

viii. Ackerman principle
ix. slip angles
x. self-aligning torque
xi. oversteer and understeer
xii. neutral steer.

c. The operation and layout of rear and four wheel steering.
d. The construction and operation of power assisted steering systems:
   i. hydraulic system
   ii. power cylinders
   iii. drive belts and pumps
   iv. hydraulic valve (rotary, spool and flapper type).
e. The operation of:
   i. electronic power steering systems (EPS)
   ii. electrical and electronic components.

Components and operation of self-levelling suspension

a. The components, construction and operation of a self levelling suspension system.
b. The operation of self-levelling suspension system under various conditions:
   i. self-energising
   ii. pump operated self-levelling suspension.

Operation of fitting ride-controlled systems

a. The reasons for fitting ride controlled systems.
b. The operation of driver controlled and ride controlled systems.

Symptoms and faults in braking systems

a. Symptoms and faults associated with conventional braking systems, ABS, and EBD systems:
   i. mechanical
   ii. hydraulic
   iii. electrical and electronic systems
   iv. fluid leaks
   v. warning light operation
   vi. poor brake efficiency
   vii. wheel locking under braking.

Diagnosis and faults in braking systems

a. Locate and interpret information for:
   i. diagnostic tests
   ii. vehicle and equipment specifications
   iii. use of equipment
   iv. testing procedures
   v. test plans
   vi. fault codes
   vii. legal requirements.
b. Prepare equipment for use in diagnostic testing.
c. Conduct systematic testing and inspection of:
   i. braking system
   ii. ABS
   iii. EBD
   iv. mechanical
   v. hydraulic
   vi. electrical and electronic systems.
d. Using appropriate tools and equipment including:

i. multi-meters
ii. oscilloscope
iii. pressure gauges.

e. Evaluate and interpret test results from diagnostic testing.
f. Compare test result and values with vehicle manufacturer's specifications and settings.
g. How to dismantle, components and systems using appropriate equipment and procedures.
h. Assess, examine and evaluate the operation, settings, values, condition and performance of components and systems.
i. Probable faults, malfunctions, incorrect settings.
j. Rectification or replacement procedures.
k. Operation of systems following diagnosis and repair to confirm operation and performance.

Symptoms and faults associated with steering systems

a. Symptoms and faults associated with steering systems:
   i. mechanical
   ii. hydraulic
   iii. electrical and electronic
   iv. steering boxes (rack and pinion, worm and re-circulating ball)
   v. steering arms and linkages
   vi. steering joints and bushes
   vii. idler gears
   viii. bearings
   ix. steering columns (collapsible and absorbing)
   x. power steering system.

Diagnosis and faults in steering systems

a. Locate and interpret information for:
   i. diagnostic tests
   ii. vehicle and equipment specifications
   iii. use of equipment
   iv. testing procedures
   v. test plans
   vi. fault codes
   vii. legal requirements.
b. How to prepare equipment for use in diagnostic testing.
c. Conduct systematic testing and inspection of:
   i. steering systems
   ii. mechanical
   iii. hydraulic
   iv. electrical and electronic systems
   v. power steering system.
d. Using appropriate tools and equipment including:
   i. multi-meters
   ii. oscilloscope
   iii. pressure gauges
   iv. wheel alignment equipment
   v. steering geometry equipment.
e. Evaluate and interpret test results from diagnostic testing.
f. Compare test result and values with vehicle manufacturer's specifications and settings.
g. How to dismantle, components and systems using appropriate equipment and procedures.
h. Assess, examine and evaluate the:
   i. operation

ii. settings
iii. values
iv. condition and performance of components and systems.

i. Probable faults, malfunctions, and incorrect settings.
j. Rectification or replacement procedures.
k. Operation of systems following diagnosis and repair to confirm operation and performance.

Symptoms and faults associated with suspension systems

a. Symptoms and faults associated with suspension systems:
    i. mechanical
    ii. hydraulic
    iii. electrical and electronic
    iv. conventional
    v. self-levelling and ride controlled suspension systems
    vi. ride height (unequal and low)
    vii. wear
    viii. noises under operation
    ix. fluid leakage
    x. excessive travel
    xi. excessive tyre wear.

Diagnosis and faults in suspension systems

a. Locate and interpret information for:
    i. diagnostic tests
    ii. vehicle and equipment specifications
    iii. use of equipment
    iv. testing procedures
    v. test plans
    vi. fault codes
    vii. legal requirements.
b. How to prepare equipment for use in diagnostic testing.
c. How to conduct systematic testing and inspection of:
    i. suspension systems
    ii. mechanical
    iii. hydraulic
    iv. electrical and electronic systems
    v. conventional
    vi. self-levelling and ride controlled suspension systems.
d. Using appropriate tools and equipment including:
    i. multi-meters
    ii. oscilloscope
    iii. pressure gauges
    iv. alignment equipment
    v. geometry equipment.
e. Evaluate and interpret test results from diagnostic testing.
f. Compare test result and values with vehicle manufacturer's specifications and settings.
g. How to dismantle, components and systems using appropriate equipment and procedures.
h. Assess, examine and evaluate the operation, settings, values, condition and performance of components and systems.
i. Probable faults, malfunctions and incorrect settings.
j. Rectification or replacement procedures.
k. Operation of systems following diagnosis and repair to confirm operation and performance.

Measurements on components:

a. settings
b. input and output values
c. voltages
d. current consumption
e. resistance
f. output patterns with oscilloscope
g. pressures
h. condition
i. wear and performance.

Unit 161 Knowledge of overhauling light vehicle engine units

UAN:	**R/601/3736**
Level:	Level 3
Credit value:	3
GLH:	20
Relationship to NOS:	This unit is linked to LV11 Overhaul Motor Mechanical Units.
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of the construction and operation and overhaul of engines units.

Learning outcome	**The learner will:**
1. understand how to overhaul light vehicle engine units	
Assessment criteria	
The learner can: 1.1 identify light vehicle engine unit components 1.2 describe the construction and operation of light vehicle engine units 1.3 explain how to prepare, use and assess all of the overhauling equipment 1.4 explain how light vehicle engine units are dismantled, overhauled and reassembled 1.5 explain common symptoms, causes and faults found in light vehicle engine units 1.6 explain methods used to identify engine unit faults 1.7 explain how to examine, measure and make suitable adjustments to light vehicle engine components 1.8 explain how to evaluate and interpret test results found in diagnosing light vehicle engine unit faults and compare with manufacturers specifications and settings 1.9 explain how to evaluate the operation of components and systems following overhauling units to confirm system performance.	

Unit 161 Knowledge of overhauling light vehicle engine 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.

How the units and assemblies being overhauled operate

a. Identify unit components.
b. Understand unit construction.
c. Describe unit operation.

How units are dismantled and reassembled

a. The dismantling procedure.
b. Tools and equipment used for stripping and rebuilding units and assemblies.
c. Methods of safe storage for removed components during overhaul activities.
d. The process for assessing the condition of sub-assemblies including:
    i. fit
    ii. tolerances
    iii. permitted limits.
e. The rebuild procedure for units and assemblies.
f. Adjustment procedures during re-assembly.

Unit and assembly testing and evaluation procedures

a. Appropriate testing and evaluation procedures prior to dismantling units.
b. Appropriate testing and evaluation procedures of components after dismantling units.
c. How to use overhauling and test equipment for the task.
d. The cost-benefit relationship between reconditioning, repair and replacement of components within units.
e. How to test and evaluate the performance of the overhauled units against the operating specification.
f. How to interpret test results.
g. Adjustment procedures during final evaluation.

Faults associated with units and assemblies being overhauled

a. Causes of faults and failures within units and assemblies.
b. The faults associated with units and assemblies.
c. How to make adjustments to meet final specification after testing and evaluation of assembled units and assemblies.

The procedures for dismantling, removal and replacement of units and components

a. The preparation, testing and use of:
    i. tools and equipment
    ii. removal and replacement of electrical and electronic systems and components.
b. Appropriate safety precautions:
    i. PPE
    ii. vehicle protection when dismantling
    iii. removal and replacing electrical and electronic components and systems.
c. The importance of logical and systematic processes.
d. The reasons why replacement components and units must meet the original specifications (OES) – warranty requirements, to maintain performance, safety requirements.
e. Refitting procedures
f. The inspection and testing of units and systems to ensure compliance with manufacturer's, legal and performance requirements.
g. 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
    v. cancelling of any fault codes and warning lights.

Unit 162 Knowledge of light vehicle transmission and driveline units and components

UAN:	**Y/601/3740**
Level:	Level 2
Credit value:	6
GLH:	45
Relationship to NOS:	This unit is linked to LV12 Remove and Replace Motor Vehicle Driveline Units and Components.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of the construction and operation of common transmission and driveline systems. It also covers the procedures involved in the removal and replacement of system components and the evaluation of their performance.

Learning outcome	**The learner will:**
1. understand how light vehicle clutch systems operate	
Assessment criteria	
The learner can: 1.1 identify light vehicle clutch system components 1.2 describe the construction and operation of light vehicle clutch systems 1.3 compare key light vehicle clutch system components and assemblies against alternatives to identify differences in construction and operation 1.4 identify the key engineering principles that are related to light vehicle clutch systems to include: a. principles of friction b. principle of levers c. torque transmission 1.5 state common terms used in light vehicle clutch system design.	

Learning outcome	The learner will:
2. understand how light vehicle manual gearbox systems operate	
Assessment criteria	
The learner can: 2.1 identify light vehicle manual gearbox system components 2.2 describe the construction and operation of light vehicle manual gearbox systems. 2.3 compare key light vehicle manual gearbox system components and assemblies against alternatives to identify differences in construction and operation 2.4 identify the key engineering principles that are related to light vehicle manual gearbox systems a. gear ratios b. torque multiplication 2.5 state common terms used in light vehicle manual gearbox system design.	

Learning outcome	The learner will:
3. understand how light vehicle driveline systems operate	
Assessment criteria	
The learner can: 3.1 identify light vehicle driveline components 3.2 describe the construction and operation of light vehicle driveline systems 3.3 compare key light vehicle driveline components and assemblies against alternatives to identify differences in construction and operation 3.4 identify the key engineering principles that are related to light vehicle driveline systems a. final drive and overall gear ratios b. simple stresses 3.5 state common terms used in light vehicle driveline design.	

Learning outcome	The learner will:
4. understand how to check, replace and test transmission and driveline units and components	
Assessment criteria	
The learner can: 4.1 describe how to remove and replace transmission and driveline system units and components 4.2 describe common types of testing methods used to check the operation of transmission and driveline systems and their purpose 4.3 explain how evaluate the performance of replacement units against vehicle specification 4.4 identify common faults found in light vehicle transmission and driveline systems and their causes.	

Unit 162 Knowledge of light vehicle transmission and driveline 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.

The operation of clutch operating systems

a. Clutch operating mechanisms:
   i. pedal and lever
   ii. hydraulic operated
   iii. mechanical
   iv. cable operated
   v. hydraulic components
   vi. master cylinder
   vii. slave cylinder
   viii. hydraulic pipes
   ix. electrical and electronic components (fluid level indicators).

The operation of friction clutches

a. The reasons for fitting a clutch.
b. The construction and operation of:
   i. hydraulically and cable operated clutches
   ii. coil spring clutches
   iii. diaphragm spring clutches
   iv. single plate clutches
   v. multi plate clutches.

The operation of manual gearboxes

a. The reasons for fitting gearboxes, to provide neutral, reverse, torque multiplication.
b. Different gearbox types: transverse and inline layouts.
c. The layout and construction of gears and shafts for 4, 5 and 6 speed gearbox designs, sliding mesh, constant mesh and synchromesh gearboxes reverse gear.
d. The construction and operation of:
   i. gear selection linkages
   ii. selector forks and rods
   iii. detents and interlock mechanisms.
e. The construction and operation of synchromesh devices.
f. The arrangements for gearbox bearings:
   i. bushes
   ii. oil seals
   iii. gaskets and gearbox lubrication
   iv. speedometer drive.
g. The electrical and electronic components including reverse lamp switch.

h. Calculate gear ratios and driving torque for typical gearbox specifications.

The operation of driveline components

a. The layout and construction of propshafts and drive shafts used in front wheel, rear wheel and four-wheel drive systems.
b. The reasons for using flexible couplings and sliding joints in transmissions systems.
c. The reason for using constant velocity joints in drive shafts incorporating steering mechanisms.
d. The construction and operation of:
    i. universal joints
    ii. sliding couplings
    iii. constant velocity joints.
e. The simple stresses applied to shafts: torsional, bending and shear.
f. The construction and operation of:
    i. final drive units
    ii. crown wheel and pinion
    iii. bevel
    iv. hypoid and helical gears
    v. differential gears
    vi. sun and planet gears
    vii. lubricants
    viii. lubrication bearings and seals
    ix. limited slip differential.
g. The reasons for fitting a differential.
h. Calculate final drive gear ratios.
i. Calculate the overall gear ratio from given data (gearbox ratio x final drive ratio).

The testing and inspection techniques used for light vehicle transmission systems

a. The techniques and procedures used for inspecting and testing clutches and clutch mechanisms including:
    i. clearances
    ii. pedal and lever settings
    iii. cables and linkages
    iv. hydraulic system
    v. leaks
    vi. adjustments
    vii. travel.
b. The techniques and procedures used for inspecting and testing gearboxes including:
    i. leaks
    ii. gear selection
    iii. synchromesh operation
    iv. abnormal noise.
c. The techniques and procedures used for inspecting and testing drive line systems (prop and drive shafts, couplings) including:
    i. security
    ii. serviceability of rubber boots
    iii. leaks
    iv. alignment
    v. balance weights (where applicable).
d. The techniques used when inspecting and testing final drive systems including:

i. fluid levels
ii. leaks
iii. noise.

The faults and symptoms associated with vehicle transmissions systems

a. The faults and symptoms associated with transmission systems:
   i. clutch faults
   ii. gearbox faults
   iii. drive line faults (propshaft, drive shaft, universal and constant velocity joints)
   iv. universal joint alignment
   v. final drive faults.
b. Faults and symptoms to include mechanical, electrical and hydraulic systems.

The procedures for dismantling, removal and replacement of transmission units and components

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

Types of wheel bearing arrangements

a. Driven wheels.
b. Fully floating.
c. Three quarter floating.
d. Semi floating axles.

Unit 163 Knowledge of diagnosis and rectification of light vehicle transmission and driveline faults

UAN:	**D/601/3741**
Level:	Level 3
Credit value:	6
GLH:	45
Relationship to NOS:	This unit is linked to LV13 Diagnose and Rectify Motor Vehicle Transmission and Driveline System Faults.
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of diagnosis and rectification of light vehicle gearboxes, hubs and bearings, driveline shafts, clutches, differentials and final drive units. It also covers the evaluation of performance of the systems.

Learning outcome	**The learner will:**
1. understand how the light vehicle transmission and driveline systems operate	
Assessment criteria	
The learner can: 1.1 explain the construction and operation of light vehicle transmission and driveline systems 1.2 explain the interaction between electrical, electronic and mechanical components within light vehicle transmission and driveline systems 1.3 explain how electrical systems interlink and interact, including multiplexing 1.4 compare light vehicle transmission and driveline system components and assemblies against alternatives to identify differences in construction and operation 1.5 identify the engineering principles that are related to light vehicle transmission and driveline systems: a. friction b. torque transmission c. materials d. fluids and energy e. potential and kinetic energy.	

Learning outcome	The learner will:
2. understand how to diagnose and rectify faults in light vehicle transmission and driveline systems	
Assessment criteria	
The learner can: 2.1 explain the symptoms and causes of faults found in light vehicle transmission and driveline systems 2.2 explain systematic diagnostic techniques used in identifying transmission and driveline system faults 2.3 explain how to examine, measure and make suitable adjustments components 2.4 explain how to carry out the rectification activities in order to correct the faults in light vehicle transmission and driveline systems 2.5 explain how to select, prepare and use diagnostic and rectification equipment for light vehicle transmission and driveline systems 2.6 explain how to evaluate and interpret test results found in diagnosing light vehicle transmission and driveline system faults against vehicle manufacturer specifications and settings 2.7 explain how to evaluate the operation of components and systems following diagnosis and repair to confirm system performance.	

Unit 163 Knowledge of diagnosis and rectification of light vehicle transmission and driveline faults

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 and electronic principles related to light vehicle transmission systems

a. The operation of electrical and electronic systems and components related to light vehicle transmission systems including:
   i. ECU
   ii. sensors and actuators
   iii. electrical inputs and outputs
   iv. voltages
   v. oscilloscope patterns
   vi. digital and fibre optic principles.
b. The interaction between the electrical/electronic system, hydraulic system and mechanical components of the transmission systems.
c. Electronic and electrical safety procedures.

The operation of light vehicle clutches and fluid couplings

a. The construction and operation of friction clutches (coil spring, diaphragm) including single and twin clutch designs.
b. The construction and operation of fluid couplings including:
   i. fluid flywheel
   ii. torque converter (torque multiplication, efficiency)
   iii. benefits of fluid couplings
   iv. benefits of toque converter over fluid flywheel.

The operation of light vehicle transmissions and driveline systems

a. The construction and operation of manual gearboxes:
   i. 4, 5 and 6 speed gearboxes
   ii. gear arrangements
   iii. shaft and bearing arrangements
   iv. synchromesh devices
   v. interlock mechanisms
   vi. linkages
   vii. overdrive
   viii. lubrication.
b. The construction and operation of automatic gearboxes including:
   i. hydraulic and electronic control systems
   ii. operations of epicyclic gears (sun, planet, annulus and carrier)
   iii. method for achieving different gear ratios using epicyclic gearing hydraulic control systems
   iv. components and operation

v. electronic control system
vi. components and operation.

c. The construction and operation of continuously variable transmissions (CVT) and the benefits of this type of gearbox design.
d. The construction and operation of the sequential manual gearbox (SMG).
e. The construction and operation of final drive systems including:
    i. conventional crown wheel and pinion
    ii. differential gears
    iii. limited slip differential.
f. The construction and operation of light vehicle 4 wheel drive systems including third differential and differential locks.
g. The operation of light vehicle traction control systems and launch control.
h. The construction and operation of light vehicle hub arrangements.
i. The construction and operation of:
    i. drive shafts
    ii. propshafts including flexible joints and couplings
    iii. universal joints
    iv. constant velocity joints
    v. sliding joints.

Symptoms and faults in light vehicle transmissions and drive-line systems

a. Clutch and coupling faults:
    i. abnormal noises
    ii. vibrations
    iii. fluid leaks
    iv. slip
    v. judder
    vi. grab
    vii. failure to release.
b. Gearbox faults:
    i. abnormal noises
    ii. vibrations
    iii. loss of drive
    iv. difficulty engaging or disengaging gears
    v. automatic gear box types
    vi. abnormal noises
    vii. vibrations
    viii. loss of drive
    ix. failure to engage gear
    x. failure to disengage gear
    xi. leaks
    xii. failure to operate
    xiii. incorrect shift patterns
    xiv. electrical and electronic faults.
c. Final drive faults:
    i. abnormal noises
    ii. vibrations
    iii. loss of drive
    iv. oil leaks
    v. failure to operate
    vi. electrical and electronic faults.
d. Drive-lines and couplings:
    i. abnormal noises
    ii. vibrations

iii. loss of drive.

Faults in light vehicle transmission systems

a. Interpret information for diagnostic tests, vehicle and equipment specifications, use of equipment, testing procedures, test plans, fault codes and legal requirements.
b. How to prepare equipment for use in diagnostic testing.
c. How to conduct systematic testing and inspection of transmission system, mechanical, hydraulic, electrical and electronic systems using appropriate tools and equipment including, mullet-meters, oscilloscope and pressure gauges.
d. How to carry out workshop based and road testing of vehicle and transmission system.
e. Evaluate and interpret test results from diagnostic and/or road testing.
f. Compare test result and values with vehicle manufacturer's specifications and settings.
g. How to dismantle components and systems using appropriate equipment and procedures.
h. Assess, examine and evaluate the operation, settings, values, condition and performance of components and systems.
i. Probable faults, malfunctions and incorrect settings.
j. Rectification or replacement procedures.
k. Operation of systems following diagnosis and repair to confirm operation and performance.
l. Measurements on components to include:
    i. settings
    ii. input and output values
    iii. voltages
    iv. current consumption
    v. resistance
    vi. output patterns with oscilloscope
    vii. pressures
    viii. condition
    ix. wear and performance.

Unit 171 Knowledge of overhauling light vehicle transmission units

UAN:	**Y/601/3737**
Level:	Level 3
Credit value:	3
GLH:	20
Relationship to NOS:	This unit is linked to LV11 Overhaul Light Vehicle Mechanical Units.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of the construction and operation and overhaul of gearboxes and final drive assemblies.

Learning outcome	**The learner will:**
1. understand how to overhaul light vehicle gearbox and final drive units	
Assessment criteria	
The learner can: 1.1 identify light vehicle gearbox and final drive unit components 1.2 describe the construction and operation of light vehicle gearbox and final drive units 1.3 explain how to prepare, use and assess all of the overhauling equipment 1.4 explain how light vehicle gearbox and final drive units are dismantled, overhauled and reassembled 1.5 explain common symptoms, causes and faults found in light vehicle gearbox and final drive units 1.6 explain methods used to identify gearbox and final drive unit faults 1.7 explain how to examine, measure and make suitable adjustments to light vehicle gearbox and final drive components 1.8 explain how to evaluate and interpret test results found in diagnosing light vehicle gearbox and final drive unit faults and compare with manufacturers' specifications and settings 1.9 explain how to evaluate the operation of components and systems following overhauling units to confirm system performance.	

Unit 171 Knowledge of overhauling light vehicle transmission 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.

How the units and assemblies being overhauled operate

a. Identify unit components.
b. Understand unit construction.
c. Describe unit operation.

How units are dismantled and reassembled

a. The dismantling procedure.
b. Tools and equipment used for stripping and rebuilding units and assemblies.
c. Methods of safe storage for removed components during overhaul activities.
d. The process for assessing the condition of sub-assemblies including:
   i. fit
   ii. tolerances
   iii. permitted limits.
e. The rebuild procedure for units and assemblies.
f. Adjustment procedures during re-assembly.

Unit and assembly testing and evaluation procedures

a. Appropriate testing and evaluation procedures prior to dismantling units.
b. Appropriate testing and evaluation procedures of components after dismantling units.
c. How to use overhauling and test equipment for the task.
d. The cost-benefit relationship between reconditioning, repair and replacement of components within units.
e. How to test and evaluate the performance of the overhauled units against the operating specification.
f. How to interpret test results.
g. Adjustment procedures during final evaluation.

Faults associated with units and assemblies being overhauled

a. Causes of faults and failures within units and assemblies.
b. The faults associated with units and assemblies.
c. How to make adjustments to meet final specification after testing and evaluation of assembled units and assemblies.

The procedures for dismantling, removal and replacement of units and components

a. The preparation, testing and use of:
   i. tools and equipment
   ii. removal and replacement of electrical and electronic systems and components.
b. Appropriate safety precautions:
   i. PPE
   ii. vehicle protection when dismantling
   iii. removal and replacing electrical and electronic components and systems.
c. The 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
   v. cancelling of any fault codes and warning lights.

Unit 172 Knowledge of light vehicle fuel, ignition, air and exhaust system units and components

UAN:	**H/601/3725**
Level:	Level 2
Credit value:	3
GLH:	20
Relationship to NOS:	This unit is linked to LV12 Remove and Replace Motor Vehicle Driveline Units and Components.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of the construction and operation of common fuel, ignition, air and exhaust systems. It also covers the procedures involved in the removal and replacement of system components and the evaluation of their performance.

Learning outcome	**The learner will:**
1. understand how light vehicle engine fuel systems operate	
Assessment criteria	
The learner can: 1.1 identify light vehicle engine fuel system components 1.2 describe the construction and operation of light vehicle engine fuel systems: a. multi point injection b. single point injection 1.3 compare key light vehicle engine fuel system components and assemblies against alternatives to identify differences in construction and operation 1.4 identify the key engineering principles that are related to light vehicle engine fuel systems: a. properties of fuels b. combustion processes c. exhaust gas constituents 1.5 state common terms used in light vehicle engine fuel system design.	

Learning outcome	The learner will:
2. understand how light vehicle engine ignition systems operate	
Assessment criteria	
The learner can: 2.1 identify light vehicle engine ignition system components 2.2 describe the construction and operation of light vehicle engine ignition systems: a. distributor ignition systems b. Distributor-less ignition systems 2.3 compare key light vehicle engine ignition system components and assemblies against alternatives to identify differences in construction and operation 2.4 identify the key engineering principles that are related to light vehicle engine ignition systems: a. flame travel b. ignition timing 2.5 state common terms used in key light vehicle engine ignition system design.	

Learning outcome	The learner will:
3. understand how light vehicle engine air supply and exhaust systems operate	
Assessment criteria	
The learner can: 3.1 identify light vehicle engine air supply and exhaust system components 3.2 describe the construction and operation of light vehicle engine air supply and exhaust systems: a. supercharging b. turbocharging c. exhaust gas recirculation (EGR) d. secondary air injection e. catalytic converters 3.3 compare key light vehicle engine air supply and exhaust system components and assemblies against alternatives to identify differences in construction and operation 3.4 identify the key engineering principles that are related to light vehicle engine air supply and exhaust systems: a. sound absorption b. reduction of harmful emissions 3.5 state common terms used in key light vehicle engine air supply and exhaust system design.	

Learning outcome	The learner will:
4. understand how to check, replace and test light vehicle engine fuel system units and components	
Assessment criteria	
The learner can: 4.1 describe how to remove and replace engine fuel, air supply and exhaust system units and components 4.2 describe common types of testing methods used to check the operation of engine fuel, air supply and exhaust system systems and their purpose 4.3 explain how to evaluate the performance of replacement units against vehicle specification 4.4 explain common faults found in light vehicle fuel, air supply and exhaust systems and their causes.	

Unit 172 Knowledge of light vehicle fuel, ignition, air and exhaust system 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.

Fuel - Petrol

a. The function and layout of petrol injection systems:
   i. single and multi-point systems
   ii. injection components
   iii. injection pump
   iv. pump relay
   v. injector valve
   vi. air flow sensor
   vii. throttle potentiometer
   viii. idle speed control valve
   ix. coolant sensor
   x. MAP and air temperature sensors
   xi. mechanical control devices
   xii. electronic control units.
b. The operation of single and multi-point petrol injection systems and components:
   i. injection pump
   ii. pump relay
   iii. injector valve
   iv. air flow sensor
   v. throttle potentiometer
   vi. idle speed control valve
   vii. coolant sensor
   viii. MAP and air temperature sensors
   ix. electronic control units
   x. fuel pressure regulators
   xi. fuel pump relays
   xii. lambda exhaust sensors
   xiii. flywheel and camshaft sensors
   xiv. air flow sensors (air flow meter and air mass meter)
   xv. EGR valve.
c. The procedures used when inspecting petrol systems.

Fuel – Diesel

a. The layout and construction of inline and rotary diesel systems.
b. The principles and requirements of compression ignition engines:

i. combustion chambers (direct and indirect injection).

c. The function and operation of diesel fuel injection components:
   i. fuel filters
   ii. sedimenters
   iii. injectors
   iv. injector types (direct and indirect injection)
   v. single
   vi. multi-hole and pintle nozzle types
   vii. governors
   viii. fuel pipes
   ix. glow plugs
   x. cold start devices
   xi. fuel cut-off solenoid.
d. The purpose and operation of:
   i. turbochargers
   ii. construction
   iii. use of inter-coolers.
e. Explain the procedures for injection pump timing and bleeding the system.
f. The procedures used when inspecting diesel system.

Fuel

a. The meaning of terms related to:
   i. hydro-carbon fuels
   ii. volatility
   iii. calorific value
   iv. flash point
   v. octane value
   vi. cetane value.
b. The composition of hydro-carbon fuels:
   i. % hydrogen and carbon in petrol and diesel fuels.
c. The composition of air (% nitrogen, oxygen), % of oxygen.
d. The chemically correct air/fuel ratio for petrol engines as 14.7:1 (lambda 1, stoichiometric ratio).
e. Weak and rich air/fuel ratios for petrol engines.
f. Exhaust composition and by-products for chemically correct, rich and weak air/fuel ratios of petrol engines:
   i. water vapour (H_2O)
   ii. nitrogen (N)
   iii. carbon monoxide (CO)
   iv. carbon dioxide (CO_2)
   v. carbon (C)
   vi. hydrocarbon (HC)
   vii. oxides of nitrogen (NOx, NO_2, NO) and particulates.
g. The relative advantages and disadvantages of diesel and petrol engines.
h. Symptoms and faults associated with fuel systems
   i. diesel fuel system: air in fuel system, water in fuel, filter blockage, leaks, difficult starting, erratic running, excessive smoke (black, blue, white), engine knock, turbocharger faults
   ii. petrol injection system: leaks, erratic running, excessive smoke, poor starting, poor performance, poor fuel economy, failure to

start, exhaust emissions, running-on, excessive fuel consumption and surging.

Ignition

a. The layout of electronic ignition systems, advantages over conventional systems (points).
b. Electronic ignition circuits and components:
    i. LT Circuit
    ii. battery
    iii. ignition switch
    iv. electronic trigger devices
    v. capacitor
    vi. HT Circuit
    vii. spark plugs (reach, heat range, electrode features and electrode polarity)
    viii. rotor arm
    ix. distributor (if applicable)
    x. distributor cap
    xi. ignition leads
    xii. ignition coil
    xiii. ignition timing advance system.
c. The operation electronic system components:
    i. amplifiers
    ii. triggering systems
    iii. inductive pick-ups
    iv. hall generators
    v. optical pulse generators
    vi. control units.
d. The operation of amplifier units.
e. Ignition terminology:
    i. dwell angle
    ii. dwell time
    iii. dwell variations
    iv. advance and retard of ignition timing
    v. static and dynamic ignition timing.
f. The operation of electronic ignition systems under various conditions and loads to include:
    i. engine idling
    ii. during acceleration
    iii. under full load
    iv. cruising
    v. overrun
    vi. cold starting.
g. The principles of engine management systems:
    i. closed loop system
    ii. integrated ignition
    iii. injection systems
    iv. sensors.
h. The procedures used when inspecting:
    i. ignition system
    ii. engine management

iii. sensors.

i. Symptoms and faults associated with ignition system operation:
   i. Failure to start hot or cold, erratic running, poor performance, misfire, exhaust emissions misfiring and ignition noise (pinking).

Air supply and exhaust systems

a. The construction and purpose of air filtration systems.
b. The operating principles of air filtration systems.
c. The construction and purpose of the exhaust systems.
d. The operating principles of the systems.
e. Exhaust system design to include silencers and catalytic converters.
f. The procedures used when inspecting induction, air filtration and exhaust systems.
g. Symptoms and faults associated with air and exhaust systems:
   i. exhaust gas leaks
   ii. air leaks.

General

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

Unit 181 Knowledge of overhauling light vehicle steering and suspension units

UAN:	**D/601/3738**
Level:	Level 3
Credit value:	3
GLH:	20
Relationship to NOS:	This unit is linked to LV11 Overhaul Light Vehicle Mechanical Units.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of the construction and operation and overhaul of steering and suspension units.

Learning outcome	**The learner will:**
1. understand how to overhaul light vehicle steering and suspension units	
Assessment criteria	
The learner can: 1.1 identify light vehicle steering and suspension unit components 1.2 describe the construction and operation of light vehicle steering and suspension units 1.3 explain how to prepare, use and assess all of the overhauling equipment 1.4 explain how light vehicle steering and suspension units are dismantled, overhauled and reassembled 1.5 explain common symptoms, causes and faults found in light vehicle steering and suspension units 1.6 explain methods used to identify steering and suspension unit faults 1.7 explain how to examine, measure and make suitable adjustments to light vehicle steering and suspension components 1.8 explain how to evaluate and interpret test results found in diagnosing light vehicle steering and suspension unit faults and compare with manufacturers' specifications and settings 1.9 explain how to evaluate the operation of components and systems following overhauling units to confirm system performance.	

Unit 181 Knowledge of overhauling light vehicle steering and suspension 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.

How the units and assemblies being overhauled operate

a. Identify unit components.
b. Understand unit construction.
c. Describe unit operation.

How units are dismantled and reassembled

a. The dismantling procedure.
b. Tools and equipment used for stripping and rebuilding units and assemblies.
c. Methods of safe storage for removed components during overhaul activities.
d. The process for assessing the condition of sub-assemblies including:
    i. fit
    ii. tolerances
    iii. permitted limits
e. The rebuild procedure for units and assemblies.
f. Adjustment procedures during re-assembly.

Unit and assembly testing and evaluation procedures

a. Appropriate testing and evaluation procedures prior to dismantling units.
b. Appropriate testing and evaluation procedures of components after dismantling units.
c. How to use overhauling and test equipment for the task.
d. The cost-benefit relationship between reconditioning, repair and replacement of components within units.
e. How to test and evaluate the performance of the overhauled units against the operating specification.
f. How to interpret test results.
g. Adjustment procedures during final evaluation.

Faults associated with units and assemblies being overhauled

a. Causes of faults and failures within units and assemblies.
b. The faults associated with units and assemblies.
c. How to make adjustments to meet final specification after testing and evaluation of assembled units and assemblies.

The procedures for dismantling, removal and replacement of electrical and electronic units and components

a. The preparation, testing and use of:
    i. tools and equipment
    ii. removal and replacement of electrical and electronic systems and components.
b. Appropriate safety precautions:
    i. PPE
    ii. vehicle protection when dismantling
    iii. removal and replacing electrical and electronic components and systems.
c. The 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
    v. cancelling of any fault codes and warning lights.

Unit 218 Competency in removing and fitting basic light vehicle mechanical, electrical and trim (MET) components and non-permanently fixed vehicle body panels

UAN:	**J/601/3751**
Level:	Level 2
Credit value:	5
GLH:	40
Relationship to NOS:	This unit is linked to BP18 Remove and Fit Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Vehicle Body Panels.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	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.

Learning outcome	**The learner will:**
1. be able to work safely when carrying out removal and fitting of basic met components and non-permanently fixed light vehicle body panels	
Assessment criteria	
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.	

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

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment	
Assessment criteria	
The learner can: 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 out removal and fitting of basic met components and non-permanently fixed light vehicle body panels.	

Learning outcome	The learner will:
4. be able to carry out removal and fitting of basic met components and non-permanently fixed light vehicle body panels	
Assessment criteria	
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 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 4.5 complete all activities within the agreed timescale.	

Learning outcome	The learner will:
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 218 Competency in removing and fitting basic light vehicle mechanical, electrical and trim (MET) components and non-permanently fixed vehicle body panels

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

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

UAN:	**F/601/3747**
Level:	Level 2
Credit value:	2
GLH:	20
Relationship to NOS:	This unit is linked to BP18 Remove and Fit Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Vehicle Body Panels.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	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.

Learning outcome	**The learner will:**
1. understand how to carry out removal and fitting of basic light vehicle mechanical electrical and trim (met) components	
Assessment criteria	
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	1.10 explain the procedure for reporting cosmetic damage to light vehicle met components and units.

Learning outcome	**The learner will:**
2. understand how to carry out removal and fitting of basic light vehicle non-permanently fixed vehicle body panels	
Assessment criteria	
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: a. wings b. doors c. bonnets d. boot lids and tailgates e. bumper bars, covers and components
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 gases).

Types of clips and fixings

a. Identify reasons and limitations for the use of the following types of clips:
   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. Identify reasons and limitations for the use of the following types of fixings:
   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. describe processes for rectifying items that may have been 'workshop' soiled:
   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 406 Competency in diagnosing and rectifying vehicle auxiliary electrical faults

UAN:	**L/601/3749**
Level:	Level 3
Credit value:	10
GLH:	90
Relationship to NOS:	This unit is linked to AE06 Diagnose and Rectify Motor Electrical Units and Component Faults.
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit will enable the learner to demonstrate competency in diagnosing and rectifying automotive vehicle auxiliary electrical system faults. It also covers the evaluation of performance of the replaced or repaired units and systems.

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

Learning outcome	**The learner will:**
2. be able to use relevant information to carry out the task	
Assessment criteria	
The learner can: 2.1 select suitable sources of technical information to support automotive vehicle diagnostic and rectification activities including: a. vehicle technical data b. diagnostic test procedures 2.2 use sufficient diagnostic information in a systematic way to enable an accurate diagnosis of automotive auxiliary electrical system faults.	

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment	
Assessment criteria	
The learner can: 3.1 select the appropriate tools and equipment necessary for diagnostic and rectification activities 3.2 ensure that equipment has been calibrated to meet manufacturers' and legal requirements 3.3 use the equipment required correctly and safely throughout all automotive auxiliary electrical diagnostic and rectification activities.	

Learning outcome	The learner will:
4. be able to carry out automotive vehicle auxiliary electrical diagnosis, rectification and test activities	
Assessment criteria	
The learner can: 4.1 use diagnostic methods that are relevant to the symptoms presented 4.2 evaluate their assessment of dismantled sub-assemblies and identify their condition and suitability for repair or replacement accurately 4.3 carry out all diagnostic and rectification activities following: a. manufacturers' instructions b. recognised researched repair methods c. workplace procedures d. health and safety requirements 4.4 ensure all repaired or replacement components and units conform to the vehicle operating specification and any legal requirements 4.5 adjust components and units correctly to ensure that they operate to meet system requirements 4.6 use testing methods that are suitable for assessing the performance of the system rectified 4.7 ensure the rectified automotive auxiliary electrical system performs to the vehicle operating specification and any legal requirements 4.8 complete all system diagnostic activities within the agreed timescale.	

Learning outcome	The learner will:
5. be able to record information and make suitable recommendations	
Assessment criteria	
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 identify and report any expected delays in completion to the relevant person(s) promptly in the format required. 5.4 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 406 Competency in the diagnosing and rectifying of automotive vehicle auxiliary electrical faults

Supporting information

Evidence requirements

The evidence requirements are shown in full in the assessment documentation.

Unit 456 Knowledge of diagnosis and rectification of vehicle auxiliary electrical faults

UAN:	**A/601/3746**
Level:	Level 3
Credit value:	6
GLH:	45
Relationship to NOS:	This unit is linked to AE06 Diagnose and Rectify Motor Electrical Units and Component Faults.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the Sector Skills Council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of diagnosis and rectification of vehicle auxiliary electrical systems and their units. It also covers the evaluation of performance of the systems.

Learning outcome	**The learner will:**
1. understand vehicle electrical and electronic principles	
Assessment criteria	
The learner can: 1.1 explain the principles of electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics 1.2 explain the principles of sensor inputs, computer processing and actuator outputs 1.3 identify sensor types (passive and active) 1.4 identify the electrical principles that are related to light vehicle electrical circuits.	

Learning outcome	The learner will:
2. understand how light vehicle auxiliary electrical systems operate	
Assessment criteria	
The learner can: 2.1 identify advanced automotive auxiliary electrical system components 2.2 explain the construction and operation of automotive auxiliary electrical systems 2.3 explain the interaction between electrical, electronic and mechanical components within the system defined 2.4 explain the operation of the electrical and electronic systems for electric, hybrid and alternative fuel vehicles including regenerative braking systems 2.5 explain how electrical systems interlink and interact, including multiplexing and fibre optics 2.6 compare automotive auxiliary electrical system components and assemblies against alternatives to identify differences in construction and operation.	

Learning outcome	The learner will:
3. understand how to diagnose and rectify faults in auxiliary electrical systems	
Assessment criteria	
The learner can: 3.1 explain the symptoms and causes of faults found in automotive auxiliary electrical systems 3.2 explain systematic diagnostic techniques used in identifying automotive auxiliary electrical system faults 3.3 explain how to examine, measure and make suitable adjustments to components 3.4 explain how to carry out the rectification activities in order to correct the faults in the automotive auxiliary electrical systems 3.5 explain how to select, prepare and use diagnostic and rectification equipment for automotive auxiliary electrical systems 3.6 explain how to evaluate and interpret test results found in diagnosing automotive auxiliary electrical system faults against vehicle manufacturer specifications and settings 3.7 explain how to evaluate the operation of components and systems following diagnosis and repair to confirm system performance.	

Unit 456 Knowledge of diagnosis and rectification of vehicle auxiliary electrical faults

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 electrical principles that are related to light vehicle electrical circuits:

a. Ohms law.
b. Voltage.
c. Power.
d. Current (AC and DC).
e. Resistance.
f. Magnetism.
g. Electromagnetism and electromagnetic induction.
h. Digital and fibre optic principles.
i. Electrical units and symbols.
j. Electrical and electronic terminology.
k. Relevant electrical safety.

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 systems and technology

a. Lighting systems should include:
   i. Xenon lighting
   ii. gas discharge lighting
   iii. ballast system
   iv. LED
   v. intelligent front lighting
   vi. blue lights
   vii. complex reflectors
   viii. fibre optic
   ix. optical patterning.

Lighting circuits and the relationship between each circuit

a. Circuits must include:
   i. sidelights including number plate lights and marker lights
   ii. dipped beam
   iii. main beam
   iv. dim/dip
   v. indicators and hazard lights
   vi. high intensity and fog light.

Common faults and testing methods associated with external lighting system

a. Fault diagnosis for:
   i. lighting systems failing to operate correctly
   ii. switches
   iii. relays
   iv. bulbs failing to operate.

The operating principles of external lighting systems and multiplexing systems

a. To include all external lighting systems and a good knowledge of multiplexing systems.

The different types of electric windows and mirror systems and components

a. Components should include:
   i. window
   ii. mirror motors
   iii. multi-functional switches
   iv. relays
   v. total closure modules.

The function of component parts in the electric window and mirror systems

a. Components must include:
   i. motors
   ii. relays

iii. interfaces
iv. modules
v. switches.

The operating principles of electric windows and mirror systems

a. Operating principles of the following:
    i. motors
    ii. interfaces
    iii. switches
    iv. modules.

Common faults and testing methods associated with electric windows and mirror systems

a. Fault diagnosis for:
    i. electric windows failing to open or close
    ii. electric mirrors fail to adjust
    iii. slow operation on both systems.

The different types of screen heating systems and components

a. Systems must include:
    i. heated front screens
    ii. heated rear screens
    iii. heated mirrors.

The function and operating principles of components for heated screen and mirror systems

a. Components must include:
    i. front screen elements
    ii. mirror elements
    iii. time control relays
    iv. multifunction relays and switches.

Common faults and testing methods associated with heated screen and mirror systems

a. Faults must include:
    i. screen elements not operating
    ii. timer relays not operating and staying on permanently.

The different types of In Car Entertainment (I.C.E.) systems and components

a. Systems and components must include:
    i. radio CD and multi play units
    ii. DVD players
    iii. MP3 players
    iv. speakers
    v. aerial systems
    vi. amplifiers
    vii. V.D.U. screens
    viii. Satellite Navigation
    ix. communication units.

The function of components in I.C.E. systems

a. Systems include:
    i. radios

ii. CD players
iii. video players
iv. DVD players
v. aerial systems
vi. speakers
vii. amplifiers
viii. VDU screens
ix. mobile communication units.

The operating principles of I.C.E. systems

a. Operation of entertainment systems speaker and aerial systems.

Common faults and testing methods associated with I.C.E. systems

a. Faults to include:
   i. entertainment and navigation units not operating
   ii. speaker, aerial and amplifier systems not functioning correctly
   iii. excessive radio interference (suppression)
   iv. use of diagnostic computers and systems.

The different types of integrated 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 integrated 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. LEDs
   viii. horns.

The operating principles of integrated 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.

Common faults and testing methods associated with security and warning systems

a. Components to include:
   i. control units

ii. audible warning units
iii. immobiliser units
iv. horns
v. relays
vi. LEDs
vii. wiring
viii. connections and protection devices
ix. removal and refitting procedures
x. using computer diagnostics to identify faults
xi. use of manufacturer's diagnostic equipment.

The different wiper system components

a. Components must include:
   i. wiper motors
   ii. washer motors
   iii. wiper linkage
   iv. multifunction relays
   v. headlamp wash/wipe.

The function of component wiper and washer components

a. Components and systems must include:
   i. wiper motors
   ii. intermittent wash wipe relays
   iii. parking systems .

The operating principles, faults and testing methods of wiper and washer systems

a. Principles, fault diagnosis and testing for:
   i. wiper motors failing
   ii. damaged linkages
   iii. incorrect operation of intermittent and parking systems
   iv. earth faults
   v. control unit failure .

The different heater, cooling system components and air con.

a. Components include:
   i. heater motors
   ii. speed rheostats
   iii. switches
   iv. valves
   v. radiator cooling fan motors
   vi. relays
   vii. air conditioning units.

The function of component heater, cooling parts and air conditioning

a. Components include:
   i. heater motors
   ii. rheostats
   iii. valves
   iv. switches
   v. relays
   vi. cooling fan motors
   vii. air conditioning units
   viii. thermostatic switches.

The operating principles of heater, cooling systems and air conditioning

a. Principles to include:
    i. conduction
    ii. convection
    iii. radiation
    iv. circulation
    v. boiling points
    vi. states of matter (gas, liquid, solid)
    vii. temperature control
    viii. antifreeze mixtures
    ix. heat transfer.

Common faults and testing methods associated with heater, cooling systems and air conditioning

a. Fault diagnosis for:
    i. heater motor failing to operate on all/one speed
    ii. radiator cooling fan not operating
    iii. valves
    iv. relays
    v. switches not operating
    vi. electrical related faults on the air conditioning system.

The different types of locking system components

a. Door locking actuators, solenoids, deadlocking actuators and anti-theft modules.

The function of component parts in the locking system

a. Solenoids, actuators (electrical and pneumatic), multifunctional relays, anti-theft modules and release systems.

The operating principles of locking systems

a. Doors and cabs.

Common faults and testing methods associated with locking systems

a. Door locking actuators, solenoids, connections, wiring, relays, and protection devices/fuses.

The different types of Supplementary Restraint and Airbag systems

a. Components include:
    i. control units
    ii. sensors
    iii. seat belt pretensioners
    iv. airbag assemblies
    v. wiring systems
    vi. warning systems.

The function of component parts in the Supplementary Restraint and Airbag systems

a. Components include:
    i. control units
    ii. interfaces

iii. sensors
iv. airbag units
v. pretensioners.

The operating principles of Supplementary Restraint and Airbag systems

a. Operation of the sensors.
b. Operation of the airbag unit.
c. Operation of the various types of pretension.
d. Safe handling procedures and regulations.

Common faults and testing methods associated Supplementary Restraint and Airbag systems

a. Fault diagnosis for Airbag and SRS faults:
    i. fault code identification
    ii. wiring faults
    iii. component failure
    iv. earth problems
    v. sensor faults.

How to examine, measure and make suitable adjustments to components:

a. Settings
b. Input and output values
c. Voltages
d. Current consumption
e. Resistance
f. Input and output patterns with oscilloscope (including frequency and duty cycle
g. measurements)
h. Condition
i. Wear and performance

How to select, prepare and use diagnostic and rectification equipment for automotive auxiliary electrical systems:

a. Voltmeters
b. Ammeters
c. Ohmmeters
d. Multi-meters
e. Battery testing equipment
f. Dedicated and computer based diagnostic equipment
g. Oscilloscopes.

Appendix 1 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**.

Centre Manual - Supporting Customer Excellence 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, as well as updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document includes sections on:

- The centre and qualification approval process
- Assessment, internal quality assurance and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Management systems
- Maintaining records
- Assessment
- Internal quality assurance
- External quality assurance.

Our Quality Assurance Requirements encompasses all of the relevant requirements of key regulatory documents such as:

- Regulatory Arrangements for the Qualifications and Credit Framework (2008)
- SQA Awarding Body Criteria (2007)
- NVQ Code of Practice (2006)

and sets out the criteria that centres should adhere to pre and post centre and qualification approval.

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

Useful contacts

UK learners General qualification information	T: +44 (0)844 543 0033 E: **learnersupport@cityandguilds.com**
International learners General qualification information	T: +44 (0)844 543 0033 F: +44 (0)20 7294 2413 E: **intcg@cityandguilds.com**
Centres 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: **centresupport@cityandguilds.com**
Single subject qualifications 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: **singlesubjects@cityandguilds.com**
International awards 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: **intops@cityandguilds.com**
Walled Garden Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **walledgarden@cityandguilds.com**
Employer Employer solutions, Mapping, Accreditation, Development Skills, Consultancy	T: +44 (0)121 503 8993 E: **business@cityandguilds.com**
Publications Logbooks, Centre documents, Forms, Free literature	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413

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