QUALIFICATION HANDBOOK

Level 1 Certificate and Diploma in Vehicle Maintenance (4290-11)

June 2017 Version 3.4

City & Guilds

Qualification at a glance

Subject area	Vehicle Maintenance and Repair
City & Guilds number	4290
Age group approved	14+
Entry requirements	There are no entry requirements
Assessment	Online multiple choice tests and assignments
Fast track	Not available; automatic approval applies in some cases
Support materials	Centre handbook Practical assessment workbook Online practice tests
Registration and certification	See online catalogue/Walled Garden for last dates.

Title and level	City & Guilds number	Accreditation number
Level 1 Certificate in Vehicle Maintenance (QCF)	4290-11	501/1230/2
Level 1 Diploma in Vehicle Maintenance (QCF)	4290-11	501/1010/X

Version and date	Change detail	Section
2.0 July 2012	Add Range – Units 026 & 027	**Units**
2.1 December 2012	Amendment to range – Unit 027/077	**Units**
3.0 May 2013	Additional units	**Structure /Units**
3.1 August 2013	Unit structure table amended	**Structure**
3.2 September 2013	Unit supporting information updated with introductory text	**Units**
3.3 February 2014	Updated structure to include unit list for units 801-822	**Structure**
3.4 June 2017	Unit structure table amended	**Structure**

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Unit 104	Skills in Removing and Replacing Light Vehicle Chassis Units and Components	53
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Unit 162	Knowledge of Light Vehicle Transmission and Driveline Units and Components	78
Unit 172	Knowledge of Light Vehicle Fuel, Ignition, Air and Exhaust System Units and Components	80
Unit 218	Skills in Removing and Fitting of Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Vehicle Body Panels	86
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Unit 551	**Knowledge in Inspection, Repair and Replacement of Standard Light Vehicle Tyres**	**111**
Unit 553	**Knowledge of Inspection, Repair and Replacement of Commercial Vehicle Tyres**	**113**
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1 Introduction

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

Area	Description
Who are the qualifications for?	They are for candidates wanting to develop some of the key skills and understanding in motor vehicle systems. Successful candidates will have the basic skills needed to apply for an automotive apprenticeship or similar engineering pathway. These qualifications could also be used as an 'interest' course for a wide range of learners.
What do the qualifications cover?	They allow candidates to learn, develop and practise the skills required for employment and/or career progression in the automotive industry.
Is the qualification part of a framework or initiative?	These qualifications are available within the foundation learning framework.
Who did we develop these qualifications with?	These qualifications were developed in collaboration with the Institute of the Motor Industry (IMI) the sector skills council for the automotive retail industry and other awarding organisations.
What opportunities for progression are there?	They allow candidates to progress into employment or to the following City & Guilds qualifications: • 4290 -12 City & Guilds Level 2 Diploma in Light Vehicle Maintenance & Repair Principles • 4270 -12 City & Guilds Level 2 Diploma in Light Vehicle Maintenance & Repair Competence • 4290 -22 City & Guilds Level 2 Diploma in Heavy Vehicle Maintenance & Repair Principles • 4270 -22 City & Guilds Level 2 Diploma in Heavy Vehicle Maintenance & Repair Competence • 4290 -32 City & Guilds Level 2 Diploma in Motorcycle Maintenance & Repair Principles • 4270 -32 City & Guilds Level 2 Diploma in Motorcycle Maintenance & Repair Competence

These qualifications replace the existing City & Guilds Level 1 Certificate/Diploma in Automotive Vehicle Maintenance and Repair (4101-45) which closed for registration on 31/12/2010.

Structure

Qualification	Credits			
	Total	**Mandatory**	**Optional**	**Additional**
City & Guilds Level 1 Certificate in Vehicle Maintenance (QCF) (4290-11)	**25**		**25 credits**	**6 (max)**
			any from 001 031 051 081 (026 and 076) (027 and 077) (302 and 352) (305 and 355) (501 and 551) (503 and 553) (544 and 594) 701-709 712	from 801 to 822
City & Guilds Level 1 Diploma in Vehicle Maintenance (QCF) (4290-11)	**41**	**37 credits**	**4 (min)**	**6 (max)**
		001 031 051 081 (026 and 076) (027 and 077)	(102, 152, 172) (103 and 153) (104 and 154) (112 and 162) (218 and 268) (302 and 352) (305 and 355) (501 and 551) (503 and 553) (544 and 594) 701-709 712	from 801 to 822

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Y/601/7254	4290-001	Skills in Health, Safety and Good Housekeeping in the Automotive Environment	7
D/601/6171	4290-051	Knowledge of Health, Safety and Good Housekeeping in the Automotive Environment	3
Y/601/6265	4290-031	Skills to Support Working Relationships in the Automotive Work Environment	3

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
F/601/6180	4290-081	Knowledge to Support working relationships in the Automotive Work Environment	3
L/502/1646	4290-026 4290-076	Introduction to vehicle technology and workshop methods and processes	6
L/502/1663	4290-027 4290-077	Carry out basic routine vehicle maintenance	15
K/601/3872	4290-102	Skills in Removing and Replacing Light Vehicle Engine Units and Components	5
R/601/3719	4290-152	Knowledge of Light Vehicle Engine Mechanical, Lubrication and Cooling System Units and Components	3
H/601/3725	4290-172	Knowledge of Light Vehicle Fuel, Ignition, Air and Exhaust System Units and Components	3
T/601/3874	4290-103	Skills in Removing and Replacing Light Vehicle Electrical Units and Components	5
T/601/3731	4290-153	Knowledge of Removing and Replacing Light Vehicle Electrical Units and Components	6
F/601/3876	4290-104	Skills in Removing and Replacing Light Vehicle Chassis Units and Components	5
A/601/3732	4290-154	Knowledge of Removing and Replacing Light Vehicle Chassis Units and Components	6
K/601/3886	4290-112	Skills in Removing and Replacing Light Vehicle Driveline Units and Components	5
Y/601/3740	4290-162	Knowledge of Light Vehicle Transmission and Driveline Units and Components	6
K/601/3869	4290-218	Skills in Removing and Fitting of Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Vehicle Body Panels	3
F/601/3747	4290-268	Knowledge of Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Vehicle Body Panels	2
R/601/5597	4290-302	Skills in motorcycle internal engine systems	5

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Y/601/5617	4290-305	Skills in motorcycle preparation and inspection	2
Y/601/5519	4290-352	Knowledge of motorcycle internal engine systems	3
F/601/5563	4290-355	Knowledge of motorcycle preparation and inspection	2
T/601/6872	4290-544	Skills in Receiving and Storing Stock	4
Y/601/6086	4290-594	Knowledge of Receiving and Storing Stock	4
H/601/6091	4290-501	Skills in Inspection, Repair and Replacement of Standard Light Vehicle Tyres	5
D/601/6025	4290-551	Knowledge in Inspection, Repair and Replacement of Standard Light Vehicle Tyres	3
M/601/6093	4290-503	Skills in Inspection Repair and Replacement of Commercial Vehicle Tyres	5
L/601/6036	4290-553	Knowledge of Inspection, Repair and Replacement of Commercial Vehicle Tyres	3
F/600/4563	4290-701 (3902-101)	Vehicle Engine Lubrication Systems	5
H/600/4569	4290-702 (3902-102)	Vehicle Engine Cooling Systems	4
K/600/4573	4290-703 (3902-103)	Vehicle Fuel and Exhaust Systems	5
H/600/4586	4290-704 (3902-104)	Vehicle Spark Ignition Systems	5
A/600/4593	4290-705 (3902-105)	Vehicle Electrical Systems	5
D/600/4893	4290-706 (3902-106)	Vehicle Braking Systems	5
M/600/4901	4290-707 (3902-107)	Vehicle Transmission Systems	5
J/600/4905	4290-708 (3902-108)	Vehicle Steering and Suspension Systems	5
L/600/5120	4290-709 (3902-109)	Vehicle Wheels and Tyre Systems	4
R/600/5121	4290-712 (3902-112)	Vehicle Hand Skills and Manufacturing Techniques	4
H/501/6923	4290-801	Career planning and making applications	3

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
K/501/6924	4290-802	Rights and responsibilities in the workplace	3
M/501/6925	4290-803	Introduction to ICT	3
F/501/6931	4290-804	Managing personal finance	3
K/501/6938	4290-805	Supporting others	3
L/501/6947	4290-806	Enterprise activity: producing products or services	3
K/501/6941	4290-807	Work-based experience	3
M/501/6942	4290-808	Community project	3
T/501/6943	4290-809	Contributing to a team	3
J/501/6946	4290-810	Candidate project	3
F/501/6945	4290-811	Personal skills	3
F/501/6878	4290-812	Planning for progression	3
J/501/6879	4290-813	Effective skills, qualities and attitudes for learning and work	3
A/501/6880	4290-814	Career planning and making applications	3
L/501/6883	4290-815	Rights and responsibilities in the workplace	3
R/501/6884	4290-816	Managing personal finance	3
H/501/6887	4290-817	Supporting others	3
H/501/6890	4290-818	Enterprise activity: producing products or services	3
K/501/6891	4290-819	Work-based experience	3
T/501/6893	4290-820	Community project	3
A/501/6894	4290-821	Contributing to a team	3
Y/501/6899	4290-822	Candidate project	3

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

In addition, learners registered for this qualification will be able to take as additional units any of the following (801-822) as part of their foundation learning programme. These units have been imported from qualification (7546) Award/Certificate/Diploma in Employability and Personal Development. For more information about these units, please check (7546) qualification handbook on our website **www.cityandguilds.com**

2 Centre requirements

Approval

Centres already approved to offer the Level 1 Certificate in Automotive Vehicle Maintenance (4101-45) will be automatically approved to register and certificate candidates on the 4290-11 complex (unless the centre is already subject to sanctions).

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

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

Physical resources and site agreements

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

Centre staffing

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

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

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

Assessor and verifiers

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

Continuing professional development (CPD)

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

Candidate entry requirements

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

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

Age restrictions

There is no age restriction for these qualifications.

Guidance on risk management of pre 16 candidates

Centres offering the City & Guilds Level 1 Certificate/Diploma in Vehicle Maintenance (4290-11) to candidates under the age of 16 must assume responsibility for the safe delivery of the qualification. This will include those units that require using and working with power tools and machinery and using and working under lifts and hoists.

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

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

3 Delivering the qualification

Initial assessment and induction

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

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

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

Support materials

The following resources are available for these qualifications:

Description	How to access
Centre handbook	**www.cityandguilds.com/automotive**
Practical assessment workbook	**www.cityandguilds.com/automotive**
Online practice tests	Walled Garden

Amendable (MS Word) versions of the forms are available on the City & Guilds website.

4 Assessment

Assessment of the qualification

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

- Assignments (practical assessment workbooks) comprising of practical tasks and knowledge based questions to cover all learning outcomes. Graded Pass only.
- Online multiple choice tests graded as Pass, Merit, Distinction.

Assignments can be downloaded from 4290 page at **www.cityandguilds.com/automotive**.

These assessments are carried out in centres and must be completed to current industry standards and practice. It is important to note that although the units within these qualifications bear a close relationship to the VCQ units, they do not imply occupational competence.

Time constraints

Candidates must complete their assessments within their registration period.

Test specifications

Summary test specifications for all 4290 online tests can be found in the *4290 Online test specifications* document, downloadable from **www.cityandguilds.com/automotive**, 4290 page.

Level 1 Certificate/Diploma in Vehicle Maintenance

City & Guilds unit number	Level	Unit title	Credit value	Assessment method
4290-001	Level 2	Skills in Health, Safety and Good Housekeeping in the Automotive Environment	7	Assignment
4290-051	Level 2	Knowledge of Health, Safety and Good Housekeeping in the Automotive Environment	3	Assignment
4290-031	Level 1	Skills to Support Working Relationships in the Automotive Work Environment	3	Assignment
4290-081	Level 1	Knowledge to Support working relationships in the Automotive Work Environment	3	Assignment

City & Guilds unit number	Level	Unit title	Credit value	Assessment method
4290-026 4290-076	Level 1	Introduction to vehicle technology and workshop methods and processes	6	Multiple choice test
4290-027 4290-077	Level 1	Carry out basic routine vehicle maintenance	15	Multiple choice test
4290-102	Level 2	Skills in Removing and Replacing Light Vehicle Engine Units and Components	5	Assignment
4290-152	Level 2	Knowledge of Light Vehicle Engine Mechanical, Lubrication and Cooling System Units and Components	3	Multiple choice test
4290-172	Level 2	Knowledge of Light Vehicle Fuel, Ignition, Air and Exhaust System Units and Components	3	Multiple choice test
4290-103	Level 2	Skills in Removing and Replacing Light Vehicle Electrical Units and Components	5	Assignment
4290-153	Level 2	Knowledge of Removing and Replacing Light Vehicle Electrical Units and Components	6	Multiple choice test
4290-104	Level 2	Skills in Removing and Replacing Light Vehicle Chassis Units and Components	5	Assignment
4290-154	Level 2	Knowledge of Removing and Replacing Light Vehicle Chassis Units and Components	6	Multiple choice test
4290-112	Level 2	Skills in Removing and Replacing Light Vehicle Driveline Units and Components	5	Assignment
4290-162	Level 2	Knowledge of Light Vehicle Transmission and Driveline Units and Components	6	Multiple choice test
4290-218	Level 2	Skills in Removing and Fitting of Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Vehicle Body Panels	3	Assignment
4290-268	Level 2	Knowledge of Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Vehicle Body Panels	2	Multiple choice test

City & Guilds unit number	Level	Unit title	Credit value	Assessment method
4290-302	Level 2	Skills in motorcycle internal engine systems	5	Assignment
4290-305	Level 2	Skills in motorcycle preparation and inspection	2	Assignment
4290-352	Level 2	Knowledge of motorcycle internal engine systems	3	Multiple choice test
4290-355	Level 2	Knowledge of motorcycle preparation and inspection	2	Multiple choice test
4290-544	Level 1	Skills in Receiving and Storing Stock	4	Assignment
4290-594	Level 1	Knowledge of Receiving and Storing Stock	4	Multiple choice test
4290-501	Level 1	Skills in Inspection, Repair and Replacement of Standard Light Vehicle Tyres	5	Assignment
4290-551	Level 1	Knowledge in Inspection, Repair and Replacement of Standard Light Vehicle Tyres	3	Multiple choice test
4290-503	Level 1	Skills in Inspection Repair and Replacement of Commercial Vehicle Tyres	5	Assignment
4290-553	Level 1	Knowledge of Inspection, Repair and Replacement of Commercial Vehicle Tyres	3	Multiple choice test
4290-701 (3902-101)	Level 1	Vehicle Engine Lubrication Systems	5	Assignment
4290-702 (3902-102)	Level 1	Vehicle Engine Cooling Systems	4	Assignment
4290-703 (3902-103)	Level 1	Vehicle Fuel and Exhaust Systems	5	Assignment
4290-704 (3902-104)	Level 1	Vehicle Spark Ignition Systems	5	Assignment
4290-705 (3902-105)	Level 1	Vehicle Electrical Systems	5	Assignment
4290-706 (3902-106)	Level 1	Vehicle Braking Systems	5	Assignment
4290-707 (3902-107)	Level 1	Vehicle Transmission Systems	5	Assignment
4290-708 (3902-108)	Level 1	Vehicle Steering and Suspension Systems	5	Assignment
4290-709 (3902-109)	Level 1	Vehicle Wheels and Tyre Systems	4	Assignment
4290-712 (3902-112)	Level 1	Vehicle Hand Skills and Manufacturing Techniques	4	Assignment

5 Units

Structure of units

Each unit contains the following:

- City & Guilds reference number
- unit accreditation number (UAN)
- title
- level
- credit value (and GLH)
- unit aim
- learning outcomes which are comprised of a number of assessment criteria
- notes for guidance.

Summary of units

City & Guilds unit number	Unit title	Unit accreditation number
4290-001	Skills in Health, Safety and Good Housekeeping in the Automotive Environment	Y/601/7254
4290-026 4290-076	Introduction to vehicle technology and workshop methods and processes	L/502/1646
4290-027 4290-077	Carry out basic routine vehicle maintenance	L/502/1663
4290-031	Skills to Support Working Relationships in the Automotive Work Environment	Y/601/6265
4290-051	Knowledge of Health, Safety and Good Housekeeping in the Automotive Environment	D/601/6171
4290-081	Knowledge to Support working relationships in the Automotive Work Environment	F/601/6180
4290-102	Skills in Removing and Replacing Light Vehicle Engine Units and Components	K/601/3872
4290-103	Skills in Removing and Replacing Light Vehicle Electrical Units and Components	T/601/3874
4290-104	Skills in Removing and Replacing Light Vehicle Chassis Units and Components	F/601/3876
4290-112	Skills in Removing and Replacing Light Vehicle Driveline Units and Components	K/601/3886
4290-152	Knowledge of Light Vehicle Engine Mechanical, Lubrication and Cooling System Units and Components	R/601/3719

City & Guilds unit number	Unit title	Unit accreditation number
4290-153	Knowledge of Removing and Replacing Light Vehicle Electrical Units and Components	T/601/3731
4290-154	Knowledge of Removing and Replacing Light Vehicle Chassis Units and Components	A/601/3732
4290-162	Knowledge of Light Vehicle Transmission and Driveline Units and Components	Y/601/3740
4290-172	Knowledge of Light Vehicle Fuel, Ignition, Air and Exhaust System Units and Components	H/601/3725
4290-218	Skills in Removing and Fitting of Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Vehicle Body Panels	K/601/3869
4290-268	Knowledge of Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Vehicle Body Panels	F/601/3747
4290-302	Skills in motorcycle internal engine systems	R/601/5597
4290-305	Skills in motorcycle preparation and inspection	Y/601/5617
4290-352	Knowledge of motorcycle internal engine systems	Y/601/5519
4290-355	Knowledge of motorcycle preparation and inspection	F/601/5563
4290-501	Skills in Inspection, Repair and Replacement of Standard Light Vehicle Tyres	H/601/6091
4290-503	Skills in Inspection Repair and Replacement of Commercial Vehicle Tyres	M/601/6093
4290-544	Skills in Receiving and Storing Stock	T/601/6872
4290-551	Knowledge in Inspection, Repair and Replacement of Standard Light Vehicle Tyres	D/601/6025
4290-553	Knowledge of Inspection, Repair and Replacement of Commercial Vehicle Tyres	L/601/6036
4290-594	Knowledge of Receiving and Storing Stock	Y/601/6086
4290-701 (3902-101)	Vehicle Engine Lubrication Systems	F/600/4563
4290-702 (3902-102)	Vehicle Engine Cooling Systems	H/600/4569
4290-703 (3902-103)	Vehicle Fuel and Exhaust Systems	K/600/4573
4290-704 (3902-104)	Vehicle Spark Ignition Systems	H/600/4586
4290-705 (3902-105)	Vehicle Electrical Systems	A/600/4593
4290-706 (3902-106)	Vehicle Braking Systems	D/600/4893

City & Guilds unit number	Unit title	Unit accreditation number
4290-707 (3902-107)	Vehicle Transmission Systems	M/600/4901
4290-708 (3902-108)	Vehicle Steering and Suspension Systems	J/600/4905
4290-709 (3902-109)	Vehicle Wheels and Tyre Systems	L/600/5120
4290-712 (3902-112)	Vehicle Hand Skills and Manufacturing Techniques	R/600/5121

Unit 001 Skills in Health, Safety and Good Housekeeping in the Automotive Environment

Level:	**2**
Credit value:	7 (GLH 60)
UAN:	Y/601/7254
Aim:	This unit is about the skills required to • carry out day to day work area cleaning, clearing away, dealing with spillages and disposal of waste, used materials and debris. • identify hazards and risks in the automotive workplace and complying with relevant legislation and good practice • work safely at all times within the automotive workplace, both as an individual and with others

Learning outcome	**The learner will:**
1. be able to use correct personal and vehicle protection within the automotive 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 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 026/076 Introduction to vehicle technology and workshop methods and processes

Level:	**1**
Credit value:	6 (GLH 60)
UAN:	L/502/1646
Aim:	This unit is about carrying out basic routine maintenance and carrying out adjustment or replacement activities of components during the maintenance activity.

Learning outcome	**The learner will:**
1. be able to understand the operation and use of workshop equipment	
Assessment criteria	
The learner can: 1.1 identify and use common workshop equipment 1.2 state safety precautions and regular checks for the above	

Learning outcome	**The learner will:**
2. be able to understand the use of tools and measuring equipment; identify joining methods and materials	
Assessment criteria	
The learner can: 2.1 identify and use common hand tools 2.2 identify locking and securing devices 2.3 describe the principles of measurement 2.4 identify and use measuring equipment 2.5 identify materials and their properties 2.6 restore threads and remove broken studs	

Learning outcome	**The learner will:**
3. be able to understand basic electrical principles and basic use of test equipment	
Assessment criteria	
The learner can: 3.1 describe the principles of electricity and electrical circuits 3.2 identify and use electrical measuring equipment	

Learning outcome	The learner will:
4. be able to understand vehicle construction materials, components, methods and safety features	
Assessment criteria	
The learner can: 4.1 identify materials used in vehicle construction 4.2 identify the components used in vehicle construction 4.3 describe the types of vehicle chassis and different construction methods 4.4 describe the safety features used in vehicle construction 4.5 state current regulations controlling design, construction and use of vehicles.	

Unit 026/076 Introduction to vehicle technology and workshop methods and processes

Unit content

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.

Workshop equipment

a) inspection lamps
b) trolley jacks
c) axle stands
d) ramps and wheel chocks
e) single post lifts
f) two post lifts
g) four post lifts
h) compressors and air lines
i) oil drainage equipment
j) tyre changing machines
k) wheel balancing equipment
l) deegreasing and cleaning equipment
m) cranes, slings and chains
n) pillar and hand held drills
o) bench grinders
p) battery chargers
q) welding equipment (basics only)
r) headlamp alignment

Safety precautions

Safety regulations:

a) Health and Safety at Work Act
b) COSHH
c) RIDDOR

Hand tools

a) files
b) saws
c) hammers
d) pliers and grips
e) screwdrivers
f) drills and drill bits
g) spanners
h) punches and chisels

i) air tools
j) taps and dies
k) holding equipment (vices etc.)
l) sockets.

Locking and securing devices

a) fixing devices
    i. nuts
    ii. bolts
    iii. screws
    iv. ties
    v. rivets
b) locking and securing devices
    i. locking nuts
    ii. split pins
    iii. locking wire
    iv. locking washers

Materials

a) ferrous metals
b) non ferrous metals
c) steel
d) aluminium
e) brass
f) copper
g) lead
h) cast iron
i) plastic
j) kevlar
k) rubber
l) carbon fibre
m) safety glass

Properties

a) ductility
b) malleability
c) hardness
d) toughness
e) strength
f) elasticity
g) conductivity

Principles

a) symbols, switches, conductors, insulators and fuses
b) Ohm's Law and the power equation
    i. amps
    ii. watts
    iii. ohms
    iv. volts
c) series and parallel circuits
d) production of electricity
    i. alternating current
    ii. direct current
e) wiring diagrams
    i. flow
    ii. layout
    iii. destination

Measuring equipment

a) test lamp
b) ammeter
c) voltmeter
d) ohmmeter

Components

a) sills, wings and inner wings
b) scuttle and valances
c) doors, roof
d) sub frames and assemblies
e) spoilers and air dams
f) wheel arches
g) bonnet and boot panels
h) door, bonnet and boot fixings

Vehicle chassis types and construction methods

a) monocoque
b) composite
c) integral types
d) commercial vehicle ladder and cruciform

Safety features

a) crumple zones
b) side impact protection
c) bumpers
d) safety glass
e) seat belts and pre-tensioners
f) air bags

Regulations

a) MOT testing frequency of new unused vehicles
b) minimum requirement for exterior vehicle lighting
c) statutory standard setting bodies for the motor industry.

Unit 027/077 Carry out basic routine vehicle maintenance

Level:	**1**
Credit value:	15 (GLH 90)
UAN:	L/502/1663
Aim:	This unit allows the learner to develop the knowledge and skills to carry out basic vehicle routine maintenance, adjustments and replacement activities which are part of the periodic servicing of vehicles.

Learning outcome	**The learner will:**
1. be able to understand the purpose of routine maintenance; identify sources of information and regulations; describe the purpose of inspections.	
Assessment criteria	
The learner can: 1.1 state the purpose of routine maintenance 1.2 state the reasons for observing time scales 1.3 state the types of documentations used 1.4 identify sources of information and regulations 1.5 describe the purpose and methods of inspections 1.6 explain the need for vehicle protection prior to maintenance activities 1.7 identify the current regulations relating to the repair and use of light vehicles	

Learning outcome	**The learner will:**
2. be able to understand the basic operating principles, components and features of petrol and diesel engines	
Assessment criteria	
The learner can: 2.1 describe the basic operating principles of petrol engines 2.2 describe the basic operating principles of four stroke diesel engines 2.3 identify and state the functions of petrol and diesel engine components 2.4 describe engine configurations 2.5 describe engine layouts using single and twin camshafts 2.6 describe the operation of and service requirements of the exhaust/air supply system.	

Learning outcome	The learner will:
3. be able to understand the basic operating principles, components, features and maintenance requirements of lubrication and cooling systems.	
Assessment criteria	
The learner can: 3.1 describe the principles of engine lubrication systems 3.2 explain the routine maintenance requirements for engine lubrication systems 3.3 describe the basic operating principles of cooling systems 3.4 identify and state the functions of the components used in liquid cooled systems 3.5 state the routine maintenance requirements for cooling systems	

Learning outcome	The learner will:
4. be able to understand the basic operating principles, components, features and maintenance requirements of ignition and petrol fuel systems	
Assessment criteria	
The learner can: 4.1 identify ignition systems 4.2 identify components 4.3 identify ignition system controls during changes in engine load and speed 4.4 explain the reasons for ignition timing checking / adjustment 4.5 state the safety implications when handling petrol 4.6 state the regulations regarding petrol storage and handling 4.7 state the basic principles of carburation 4.8 identify the layout and basic operation of single /multi point	

Learning outcome	The learner will:
5. be able to understand the basic operating principles, components and features of diesel fuel systems.	
Assessment criteria	
The learner can: 5.1 state the safety implications when handling diesel 5.2 state the regulations regarding diesel storage and handling 5.3 describe the basic operating principles of diesel fuel systems 5.4 identify fuel tanks, pipes, water traps and filters, tank venting and emission systems, injection pumps and governors, injectors, cold starting aids, fuel cut-off devices, sensors, ecu control of fuelling 5.5 explain the reasons for injection timing 5.6 explain the reasons for injection timing checking/adjustment.	

Learning outcome	The learner will:
6. be able to understand the basic operating principles, components and features of clutches and gearboxes	

Assessment criteria
The learner can: 6.1 identify and state the functions of clutches 6.2 identify pressure plates and driven/centre plates 6.3 identify release and spigot bearings 6.4 identify cables 6.5 identify master and slave cylinders 6.6 identify the reasons for fitting a clutch 6.7 identify and state the functions of manual gearboxes 6.8 identify and state the functions of gear selector mechanisms, gears, bearings and shafts, constant mesh gears, oil seals and gaskets 6.9 identify and state the functions of gearbox lubrication and venting 6.10 identify and state the functions of automatic gearboxes 6.11 identify and state the functions of torque converters, gear selector mechanisms, gears, bearings and shafts, clutches and control mechanisms, oil seals and gaskets, sensors and actuators and ecu.

Learning outcome	The learner will:
7. be able to understand the basic operating principles, components and features of driveline and final drive systems.	
Assessment criteria	
The learner can: 7.1 identify and state the functions of drive shafts 7.2 identify and state the functions of universal joints, sliding couplings and constant velocity joints 7.3 identify final drive systems 7.4 identify components and basic operation of final drive gears (helical and hypoid) (also heavy) 7.5 identify components and basic operation of differentials (also heavy) 7.6 identify components and basic operation of hubs, bearings and half shafts. (also heavy)	

Learning outcome	The learner will:
8. be able to understand the basic operating principles, components and features of steering.	
Assessment criteria	
The learner can: 8.1 identify and state the basic functions of steering systems 8.2 identify and state the basic functions of steering boxes, steering arms and linkages, steering joints and bushes (also heavy), headstock, bearings, steering columns (collapsible and absorbing), wheels and handlebars (also heavy), hydraulic pump and control valves (also heavy) 8.3 describe steering geometry measurement and adjustments	

Learning outcome	The learner will:
9. be able to understand the basic operating principles, components and features of suspension, wheels and tyres	
Assessment criteria	

The learner can:

9.1 identify and state the functions of suspension systems (non-independent and independent)

9.2 identify and state the functions of springs, dampers, struts, arms and swivels

9.3 describe the current legal requirements governing the use of tyres

9.4 identify the markings on tyres (speed rating, direction of rotation profile, load handling and ply rating, pressure, tread wear indicators).

9.5 identify the different types of wheel and rim construction (steel wheels, alloy wheels, wire wheels, space saver wheels).

9.6 identify methods of tyre construction (tubed and tubeless, radial, bias belted tyres, braced tyres, valves).

Learning outcome	**The learner will:**
10. be able to understand the basic operating principles, components, service requirements and features of brakes.	

Assessment criteria

The learner can:

10.1 identify and state the basic functions of disc and drum brake systems; divided (split) systems, dual systems (also heavy), antilock brake systems

10.2 identify and state the basic functions of hydraulic cylinders and calipers, discs and drums, brake pads and shoes, pipes and cables, vacuum servos and hydraulic servos (also heavy), warning lights and sensors, brake fluid and its specifications, pressure controlling valves, parking brakes, wheel speed sensors

10.3 explain the routine maintenance requirements for braking systems (acceptable levels of component wear)

10.4 explain the checks required for breaking systems; components for wear, security and serviceability, fluid levels and contamination, efficiency.

Learning outcome	**The learner will:**
11. be able to understand the basic operating principles, components, service requirements and features of electrical and electronic systems.	

Assessment criteria

The learner can:

11.1 identify and state the functions of battery and charging systems

11.2 identify and state the function and basic operation of lead acid battery, alternator, alternator drive systems

11.3 identify and state the functions of engine starting systems

11.4 identify and state the function and basic operation of starter motor, starter ring gear, ignition switch.

11.5 explain the purpose and use of electrical wiring diagrams

11.6 identify and state the functions of auxiliary and lighting systems

11.7 identify and state the functions and basic operation of exterior and interior lights and bulbs (filament and arc) (also heavy), indicators, fan, heater and de-misting systems (also heavy)

11.8 describe the routine maintenance requirements for electrical and electronic systems.

Unit 027/077 Carry out basic routine vehicle maintenance

Unit content

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.

Reasons for observing time scales

a) to adhere to completion times
b) to keep customers and management informed of progress

Types of documentation used

a) job cards
b) stores and material records

Sources of information and regulations

a) information
    i. technical manuals
    ii. technical bulletins
    iii. servicing schedules
    iv. job card instructions
    v. inspection records
    vi. check lists
b) regulations
    i. Road Traffic Act
    ii. VOSA regulations
    iii. Highway Code

Purpose of inspections

a) malfunction of systems and components
b) damage and corrosion to structural and support regions
c) leaks
d) water ingress
e) component and system wear and security

Vehicle inspection techniques

a) aural
b) visual
c) functional assessments

Fault finding techniques

a) road tests
b) questioning

c) review of symptom
d) ECU/fault code interrogation

Importance of recording details
a) audit trail of data
b) warranty protection
c) insurance requirements
d) legal requirements
e) costing
f) customer support
g) sales and marketing

Vehicle protection
a) vehicle body panels
b) paint surfaces
c) seats
d) carpet
e) floor mats

Petrol engines
a) four stroke
b) two stroke
c) cycles of operation
d) valve control systems
e) compression ratios

Four stroke diesel engine
a) cycles of operation
b) fuel injection and ignition principles
c) injection timing
d) compression ratios

Petrol and diesel engine components
a) engine block and cylinder liners
b) cylinder head and valves
c) crankshafts, camshafts and drives
d) pistons, piston rings and connecting rods
e) bearings/shells bushes and thrust bearings
f) flywheel and flywheel ring gear
g) gaskets and oil seals
h) crankcases and sumps
i) vehicle inspection techniques
j) engine components (main castings, reciprocating/rotating components, valve/timing gear, gaskets and fasteners)

Engine configurations
a) inline
b) flat
c) Vee

Engine lubrication systems

a) overview and layout of engine lubrication systems
b) oil pan / sump and oil tanks
c) oil pumps (gear, vane, eccentric rotor)
d) oil pump drives and relief valves
e) filters (full flow and by-pass) and strainers
f) sensors, pressure gauges and warning lights
g) coolers
h) crankcase ventilation

Routine maintenance requirements

a) checking levels
b) lubricant selection
c) filter removal and replacement
d) lubricant refilling
e) waste disposal

Principles of cooling systems

a) layout of liquid cooled systems
b) basic air cooling

Components used in liquid cooled systems

a) radiator, hoses, pressure caps and expansion tanks
b) coolant pumps (mechanical and electrical)
c) thermostats and fans
d) temperature sensors, warning systems and control valves
e) antifreeze and corrosion inhibitors

Components

a) battery, wiring and ignition switch
b) coils (separate, distributorless, direct) and LT switching devices
c) spark plugs and HT leads
d) distributor
e) timing control devices
f) pulse generators and ECUs
g) pinion

Carburation

a) operating systems and basic principles of a simple carburettor
b) throttle components
c) stoichiometric ratio
d) atomisation/vaporisation
e) manifold depression
f) basic Venturi effect
g) cold start devices

Mechanisms

a) sliding mesh
b) synchromesh

Single /multi point

a) fuel tanks, pipelines and filters
b) tank venting and emission control systems
c) fuel gauges and warning systems
d) fuel pumps
e) injectors
f) throttle potentiometer and switch
g) idle speed control valve / auxiliary air device
h) lambda and coolant sensors
i) air flow sensors (air flow meter and air mass meter)
j) MAP and air temperature sensors
k) electronic control units
l) fuel pumps and fuel pressure regulators
m) relays
n) EGR systems

Diesel fuel systems

a) inline pump systems
b) rotary pump systems
c) common rail system

Checks required for braking systems

a) hygrometer

Markings on tyres

a) width
b) rim size
c) aspect ratio
d) pressure

Tyre construction

a) crossply / bias

Auxilary drive belts

a) vee
b) multi-rib
c) serpentine

Starter motors

a) inertia
b) pre-engaged
c) gear reduction

Bulb types

a) tungsten filament
b) halogen
c) high Intensity Discharge (HID)
d) light Emitting Diode (LED)

Unit 031 Skills to Support Working Relationships in the Automotive Work Environment

Level:	**1**
Credit value:	3 (GLH 27)
UAN:	Y/601/6265
Aim:	This unit is about the skills needed to develop and keep good working relationships with all colleagues in the workplace by using effective communication and support skills

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 show a prompt and willing response to requests from customers and colleagues in the work environment 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 identify, locate and use relevant information, in an automotive work environment.	

Learning outcome	**The learner will:**
3. be able to communicate with and support colleagues and customers 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 communicate with customers and colleagues clearly and courteously	

Learning outcome	The learner will:
4. be able to demonstrate good working relationships in the automotive work environment	
Assessment criteria	
The learner can: 4.1 demonstrate positive team work within an automotive environment 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 identify and inform colleagues promptly of anything likely to affect their own work	

Unit 051 Knowledge of Health, Safety and Good Housekeeping in the Automotive Environment

Level:	**2**
Credit value:	3 (GLH 30)
UAN:	D/601/6171
Aim:	This unit enables the learner to develop an understanding of: • routine maintenance and cleaning of the automotive environment and using resources economically • Health & 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 automotive environment. 3.4 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

Unit content

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 etc.

Requirement to maintain work area effectively

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

Spillages, leaks and waste materials

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

Basic legislative requirements

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

Routine maintenance of the workplace

a. 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

i. HASAWA
ii. COSHH
iii. EPA
iv. Manual Handling Operations Regulations 1992
v. PPE Regulations 1992.

General regulations to include an awareness of:

i. Health and Safety (Display Screen Equipment) Regulations 1992
ii. Health and Safety (First Aid) Regulations 1981
iii. Health and Safety (Safety Signs and Signals) Regulations 1996
iv. Health and Safety (Consultation with Employees) Regulations 1996
v. Employers Liability (Compulsory Insurance) Act 1969 and Regulations 1998
vi. Confined Spaces Regulations 1997
vii. Noise at Work Regulations 1989
viii. Electricity at Work Regulations 1989
ix. Electricity (Safety) Regulations 1994
x. Fire Precautions Act 1971
xi. Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1985
xii. Pressure Systems Safety Regulations 2000
xiii. Waste Management 1991
xiv. Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002
xv. 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.

d. unserviceable PPE.
e. 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. CO_2
    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 personal, customers, contractors etc entering your 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 is outside your 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 081 Knowledge to Support working relationships in the Automotive Work Environment

Level:	**1**
Credit value:	3 (GLH 28)
UAN:	F/601/6180
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. know key organisational structures, functions and roles within the automotive work environment	
Assessment criteria	
The learner can: 1.1 list the main sections which may be found within a typical automotive work environment. 1.2 outline typical organisational structures and lines of communication within an automotive work environment. to include: a. non franchised dealer b. franchised dealer 1.3 state typical levels of responsibility within specific job roles in an automotive work environment. to include a: a. trainee b. skilled technician c. supervisor	

Learning outcome	**The learner will:**
2. know 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 give examples of different sources of information and when they would be used within the automotive environment 2.2 give examples of the legal requirements relating to the use of a vehicle on the road, including safety requirements 2.3 state the importance of obtaining correct information and working to recognised procedures and processes	

2.4	give examples of when replacement units and components must meet the original equipment specification
2.5	give examples of identification codes and how they are used

Learning outcome	**The learner will:**
3.	know where different types of communication within the automotive work environment can be used
Assessment criteria	
The learner can:	
3.1	give examples of alternative methods of communication and where they could be used within the automotive environment

Learning outcome	**The learner will:**
4.	know communication requirements when carrying out vehicle repairs in the automotive work environment
Assessment criteria	
The learner can:	
4.1	give examples of when it is important to communicate with a supervisor whilst carrying out repairs in the automotive environment
4.2	state the importance of keeping records of vehicle repair information
4.3	state why it is important to work to agreed timescales

Learning outcome	**The learner will:**
5.	know how to develop good working relationships with colleagues and customers in the automotive workplace
Assessment criteria	
The learner can:	
5.1	outline how to develop positive working relationships with colleagues and customers
5.2	give examples of why it is important to accept other peoples' views and opinions within the workplace
5.3	state why it is important to make and honour realistic commitments to colleagues and customers

Unit 081 Knowledge to Support working relationships in the Automotive Work Environment

Unit content

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.

Sections within a typical vehicle repair business

a. Reception.
b. Body shop.
c. Service repair workshop.
d. Valeting.
e. Parts.
f. Sales.
g. Administration.

Different sources of information in an automotive work environment

a. Other staff.
b. Manuals.
c. Parts lists.
d. Computer software / internet.
e. Manufacturer.
f. Diagnostic equipment.

Locating and using correct documentation and information for:

a. recording vehicle maintenance and repairs
b. vehicle specifications
c. component specifications
d. oil and fluid specifications
e. equipment and tools
f. identification codes.

Alternative 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.

Communication with a supervisor

a. Referral of problems.
b. Reporting delays.
c. Additional work identified during repair or maintenance.
d. Keep others informed of progress.

Agreed timescales

a. Relationship between time and cost.
b. Customer expectation.

Typical levels of responsibility within specific job roles in an automotive work environment

a. To include a:
    i. trainee
    ii. skilled technician
    iii. supervisor.

Unit 102 Skills in Removing and Replacing Light Vehicle Engine Units and Components

Level:	**2**
Credit value:	5 (GLH 45)
UAN:	K/601/3872
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. 4.2 ensure that replaced 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	

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 record and report any additional faults noticed during the course of their work promptly in the format required	

Unit 103 Skills in Removing and Replacing Light Vehicle Electrical Units and Components

Level:	**2**
Credit value:	5 (GLH 54)
UAN:	T/601/3874
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	

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 performs to the vehicle operating specification and meets any legal requirements	

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 record and report any additional faults noticed during the course of their work promptly in the format required	

Unit 104 Skills in Removing and Replacing Light Vehicle Chassis Units and Components

Level:	**2**
Credit value:	5 (GLH 45)
UAN:	F/601/3876
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 & 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	

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 record and report any additional faults noticed during the course of their work promptly in the format required	

Unit 112 Skills in Removing and Replacing Light Vehicle Driveline Units and Components

Level:	**2**
Credit value:	5 (GLH 45)
UAN:	K/601/3886
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	

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 record and report any additional faults noticed during the course of their work promptly in the format required	

Unit 152 Knowledge of Light Vehicle Engine Mechanical, Lubrication and Cooling System Units and Components

Level:	**2**
Credit value:	3 (GLH 20)
UAN:	R/601/3719
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 ratio's 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

Unit content

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 matrix's 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.
d. System pressure testers:
    i. pressure cap testers
    ii. hydrometer, or anti-freeze testing equipment
    iii. chemical tests for the detection of combustion gas.
e. The layout and construction of internal heater systems.
f. The controls and connections within internal heater system.
g. 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.
h. 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 important 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

Level:	**2**
Credit value:	6 (GLH 45)
UAN:	T/601/3731
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
3.3	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
3.4	compare key light vehicle auxiliary system components and assemblies against alternatives to identify differences in construction and operation
3.5	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

Unit content

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 component.
k. Interpret vehicle wiring diagrams to include:
   i. vehicle lighting
   ii. auxiliary circuits

iii. indicators
iv. starting and charging systems.

l. Function and construction of electrical components including:
   i. circuit relays
   ii. bulb types
   iii. fan and heater
   iv. circuit protection.

m. The safety precautions when working on electrical and electronic systems to include:
   i. disconnection and connection of battery
   ii. avoidance of short circuits
   iii. power surges
   iv. prevention of electric shock
   v. protection of electrical and electronic components
   vi. protection of circuits from overload or damage.

n. The set-up and use of:
   i. digital and analogue multi-meters
   ii. voltmeter
   iii. ammeter
   iv. ohmmeter
   v. oscilloscope
   vi. manufacturer's dedicated test equipment.

o. Electrical and electronic checks for electrical and electronic systems to include:
   i. connections
   ii. security
   iii. functionality
   iv. performance to specifications
   v. continuity, open circuit
   vi. short circuit
   vii. high resistance
   viii. volt drop
   ix. current consumption
   x. output patterns (oscilloscope).

p. Symptoms and faults associated with electrical and electronic systems to include:
   i. high resistance
   ii. loose and corroded connections
   iii. short circuit
   iv. excessive current consumption
   v. open circuit
   vi. malfunction
   vii. poor performance
   viii. battery faults to include flat battery
   ix. failure to hold charge
   x. low state of charge
   xi. overheating
   xii. poor starting.

Battery and Charging

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

Starting

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

Lighting

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

Auxiliary Systems

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

General

a. The preparation, testing and use of:
   i. tools and equipment
   ii. electrical meters and equipment used for dismantling
   iii. removal and replacement of electrical and electronic systems and components.
b. Appropriate safety precautions:
   i. PPE
   ii. vehicle protection when dismantling
   iii. removal and replacing electrical and electronic components and systems.
c. The 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

Level:	**2**
Credit value:	6 (GLH 45)
UAN:	A/601/3732
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

Unit content

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
   vii. wear in linkage

viii. damage linkage
ix. incorrect wheel alignment
x. 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 & 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 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.

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

f. The procedures used for inspecting the serviceability and condition of the braking system
i. braking system defects:
ii. worn shoes or pads
iii. worn or scored brake surfaces
iv. abnormal brake noises
v. brake judder
vi. fluid contamination of brake surfaces
vii. fluid leaks
viii. pulling to one side
ix. poor braking efficiency
x. lack of servo assistance
xi. brake drag
xii. brake grab
xiii. 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 & 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 important 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 162 Knowledge of Light Vehicle Transmission and Driveline Units and Components

Level:	**2**
Credit value:	5 (GLH 45)
UAN:	Y/601/3740
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 172 Knowledge of Light Vehicle Fuel, Ignition, Air and Exhaust System Units and Components

Level:	**2**
Credit value:	3 (GLH 20)
UAN:	H/601/3725
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

Unit content

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 system.

Fuel – Diesel

a. The layout and construction of inline and rotary diesel systems.

b. The principles and requirements of compression ignition engines.
c. Combustion chambers (direct and indirect injection).
d. 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.
e. The purpose and operation of:
    i. turbochargers
    ii. construction
    iii. use of inter-coolers.
f. Explain the procedures for injection pump timing and bleeding the system.
g. 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 (H2O)
    ii. nitrogen (N)
    iii. carbon monoxide (CO)
    iv. carbon dioxide (CO2)
    v. carbon (C)
    vi. hydrocarbon (HC)
    vii. oxides of nitrogen (NOx, NO2, 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.
j. 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 important 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 218 Skills in Removing and Fitting of Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Vehicle Body Panels

Level:	**2**
Credit value:	3 (GLH 20)
UAN:	K/601/3869
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 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	

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 record and report any additional faults noticed during the course of their work promptly in the format required	

Unit 268 Knowledge of Removing and Fitting Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Vehicle Body Panels

Level:	**2**
Credit value:	2 (GLH 20)
UAN:	F/601/3747
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 carry 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 carry 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 302 Skills in motorcycle internal engine systems

UAN:	**R/601/5597**
Level:	2
Credit value:	5
GLH:	45
Relationship to NOS:	This unit is linked to MC02 Remove and Replace Motorcycle Engine Units and Components.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
Aim:	This unit enables the learner to develop an understanding of the construction and operation of common motorcycle engine systems: mechanical, lubrication and cooling systems. It also covers the clutch and transmission systems. It covers the procedures involved in the removal and replacement of system components and the evaluation of their performance.

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 motorcycle coverings throughout all light motorcycle routine maintenance activities 1.2 work in a way which minimises the risk of damage or injury to the motorcycle, 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 motorcycle engine power train unit and component removal and replacement activities including: a. motorcycle technical data b. removal and replacement procedures c. legal requirements 2.2 use technical information to support motorcycle engine power train 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 motorcycle engine power train 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 motorcycle engine systems.	

Learning outcome	The learner will:
4. be able to carry out removal and replacement of motorcycle electrical units and components	
Assessment criteria	
The learner can: 4.1 remove and replace the motorcycle electrical systems and components, adhering to the correct specifications and tolerances for the motorcycle and following: a. the manufacturer's approved and workplace removal and replacement methods b. recognised researched repair methods c. health and safety requirements 4.2 check that replaced motorcycle electrical units and components conform to the motorcycle 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 motorcycle electrical system performs to the motorcycle operating specification and meets any legal requirements.	

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 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 305 Skills in motorcycle preparation and inspection

UAN:	**Y/601/5617**
Level:	2
Credit value:	2
GLH:	20
Relationship to NOS:	This unit is linked to MC05 Carry Out Motorcycle Preparation and Inspections.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
Aim:	This unit enables the learner to develop skills in the assembly and pre delivery inspection preparation of motorcycles. In accordance with manufacturers' and legal requirements.

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

Learning outcome	**The learner will:**
2. be able to use relevant information to carry out preparation activities and inspections of motorcycles	
Assessment criteria	
The learner can: 2.1 select suitable sources of technical information to support motorcycle inspection activities including: a. motorcycle technical data b. inspection procedures c. legal requirements 2.2 use technical information to support motorcycle inspection activities.	

Learning outcome	The learner will:
3. be able to use appropriate tools and equipment to carry out preparation activities and inspections of motorcycles	
Assessment criteria	
The learner can: 3.1 select the appropriate tools and equipment necessary for carrying out preparation and inspections 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 motorcycle systems.	

Learning outcome	The learner will:
4. be able to carry out the preparation activities and inspections of motorcycles	
Assessment criteria	
The learner can: 4.1 carry out motorcycle preparation and inspections using prescribed methods, adhering to the correct specifications and tolerances for the motorcycle 4.2 ensure that inspected motorcycle conforms to the motorcycle operating specification and any legal requirements 4.3 ensure any comparison of the motorcycle against specification accurately identifies any differences from the motorcycle specification 4.4 use suitable testing methods to evaluate the performance of the inspected systems.	

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 record and report any additional faults noticed during the course of their work promptly in the format required.	

Unit 352 Knowledge of motorcycle internal engine systems

UAN:	**Y/601/5519**
Level:	2
Credit value:	3
GLH:	20
Relationship to NOS:	This unit is linked to MC02 Remove and Replace Motorcycle Engine Units and Components.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
Aim:	This unit enables the learner to develop an understanding of the construction and operation of common engine power train systems: mechanical, lubrication and cooling systems. It also covers the clutch and transmission systems. It 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 motorcycle engine mechanical systems operate	
Assessment criteria	
The learner can: 1.1 identify motorcycle engine mechanical system components 1.2 describe the construction and operation of motorcycle engine mechanical systems. 1.3 compare key 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 engine mechanical systems: a. compression ratios b. cylinder capacity c. power d. torque	

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

Learning outcome	**The learner will:**
2. understand how motorcycle engine lubrication systems operate	
Assessment criteria	
The learner can: 2.1 identify motorcycle engine lubrication system components 2.2 describe the construction and operation of motorcycle engine lubrication components and systems 2.3 compare key motorcycle engine lubrication system components and assemblies to identify differences in construction and operation 2.4 identify the key engineering principles that are related to motorcycle engine lubrication systems: a. classification of lubricants b. properties of lubricants c. methods of reducing friction 2.5 state common terms used in motorcycle engine lubrication system design.	

Learning outcome	**The learner will:**
3. understand how motorcycle engine cooling systems operate	
Assessment criteria	
The learner can: 3.1 identify motorcycle engine cooling system components 3.2 describe the construction and operation of motorcycle engine cooling systems 3.3 compare key motorcycle engine cooling system components and assemblies against alternatives to identify differences in construction and operation 3.4 identify the key engineering principles that are related to motorcycle engine cooling 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 motorcycle engine cooling system design.	

Learning outcome	The learner will:
4. understand how motorcycle clutch and transmission systems operate	
Assessment criteria	
The learner can: 4.1 identify motorcycle clutch and transmission system components 4.2 describe the construction and operation of motorcycle clutch and transmission system components 4.3 compare key motorcycle clutch and transmission system components and assemblies against alternatives to identify differences in construction and operation.	

Learning outcome	The learner will:
5. understand how to check, replace and test power train systems, units and components	
Assessment criteria	
The learner can: 5.1 describe how to remove and replace power train systems, units and components 5.2 describe common types of testing methods used to check the operation of engine power train systems and their purpose 5.3 explain how to test and evaluate the performance of replacement units against motorcycle specification 5.4 explain common faults found in motorcycle power train systems and their causes.	

Unit 352 Knowledge of motorcycle internal engine systems

Supporting information

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

Engines

a. Engine types and configurations:
   i. inline
   ii. flat
   iii. vee
   iv. four-stroke and two-stroke cycle for spark ignition engines
   v. naturally aspirated and turbo-charged 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, 3, 4, 6 cylinder types)
   iii. port design: inlet, transfer and exhaust.

d. Cylinder head layout and design, combustion chamber and piston design.

e. The procedures used when inspecting engines.

f. 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.

g. 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

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. fins and cowlings

iii. header tanks, radiators and pressure caps
iv. expansion tanks hoses, clips and pipes
v. thermostats impellers and coolant.

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. anti-freeze testing equipment
iv. chemical tests for the detection of combustion gas.

d. Symptoms and faults associated with cooling systems:
i. water leaks
ii. water in oil
iii. blocked fins
iv. excessively low or high coolant temperature.

e. The procedures used when inspecting cooling systems.

Clutch

a. The components, operating principles, and functions of clutches:
i. wet clutch
ii. dry clutch
iii. centrifugal
iv. cable control
v. hydraulic control.

b. Procedures used to remove, replace and adjust clutch systems and components.

c. The preparation and method of use of appropriate specialist equipment used to evaluate system performance following component replacement.

d. Symptoms and faults associated with clutch systems:
i. slip
ii. drag.

Transmission

a. The components, operating principles, and function of transmission systems:
i. conventional gear
ii. CVT
iii. automatic.

b. The operating components within transmission systems:
i. gears
ii. shafts
iii. selectors
iv. shift lever and drum mechanisms
v. bearings
vi. pulleys.

c. The preparation and method of use of appropriate specialist equipment used to evaluate transmission system performance following component replacement.

d. Procedures used to remove, replace and adjust transmission systems and components.

e. Symptoms and faults associated with transmission systems:
    i. abnormal noises
    ii. vibration
    iii. fluid leaks
    iv. wear
    v. gear selection.

General

a. The preparation, testing and use of tools and equipment used for:
    i. dismantling
    ii. removal and replacement of engine mechanical and power train system components.
b. Appropriate safety precautions:
    i. PPE
    ii. motorcycle protection when dismantling
    iii. removal of and replacing engine mechanical and power train units and components.
c. The importance of logical and systematic processes.
d. The inspection and testing of engine mechanical and power train 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. Re-fitting 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 motorcycle following repair to ensure customer satisfaction:
    i. cleanliness of motorcycle
    ii. security of components and fittings
    iii. re-instatement of components and fittings.
j. Construction and operation of motorcycle engine mechanical systems
    i. four stroke
    ii. two stroke.
k. Key engineering principles that are related to engine mechanical systems
    i. compression ratios
    ii. volumetric efficiency
    iii. cylinder capacity.
l. Common terms used in motorcycle engine mechanical system design
    i. tdc
    ii. bdc
    iii. stroke
    iv. ibore
    v. ports.
m. Construction and operation of motorcycle engine lubrication components and systems
    i. full flow
    ii. by pass
    iii. wet sump

iv. dry sump
v. total loss.

n. Key engineering principles that are related to motorcycle engine lubrication systems
   i. classification of lubricants
   ii. properties of lubricants
   iii. methods of reducing friction.
o. Common terms used in motorcycle engine lubrication system design
p. Identify motorcycle engine cooling system components
   i. air cooling
   ii. liquid cooling
q. Key engineering principles that are related to motorcycle engine cooling systems
   i. heat transfer
   ii. linear and cubical expansion
   iii. specific heat capacity
   iv. boiling point of liquids.
r. Construction and operation of motorcycle clutch and transmission system components
   i. dry clutch
   ii. wet clutch
   iii. constant mesh
   iv. CVT
   v. automatic
   vi. chain and sprocket
   vii. shaft and gear
   viii. belt and pulley.

Unit 355 Knowledge of motorcycle preparation and inspection

UAN:	**F/601/5563**
Level:	2
Credit value:	2
GLH:	20
Relationship to NOS:	This unit is linked to MC05 Carry Out Motorcycle Preparation and Inspections.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.
Aim:	This unit enables the learner to develop an understanding of the assembly and pre delivery inspection preparation of both new and used motorcycles.

Learning outcome	**The learner will:**
1. understand how to carry out preparation activities and inspections of motorcycles	
Assessment criteria	
The learner can: 1.1 explain the difference between the various motorcycle preparation activities and inspections 1.2 identify the different systems to be inspected when using inspection methods 1.3 identify the procedures involved in carrying out the preparation and inspection of motorcycles 1.4 identify correct conformity of motorcycle systems and condition on motorcycle inspections 1.5 compare test and inspection results against motorcycle specifications and legal requirements 1.6 explain how to record and complete the preparation and inspection results in the format required 1.7 identify the recommendations that can be made based on results of the motorcycle inspections 1.8 explain the implications of failing to carry out motorcycle preparation and inspection activities correctly 1.9 explain the implications of signing workplace documentation and motorcycle records 1.10 explain the procedure for reporting cosmetic damage to motorcycle components and units outside normal inspection items.	

Unit 355 Knowledge of motorcycle preparation and inspection

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.

Assembly, pre and post work motorcycle inspections

a. PPE and motorcycle protection relating to:
   i. motorcycle body panels and frame
   ii. paint surfaces
   iii. polished surfaces
   iv. seats.
b. Assembly, pre and post work motorcycle 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 motorcycle body panels and frame.
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. transmission systems
   iv. brakes
   v. steering
   vi. suspension
   vii. wheels
   viii. tyres
   ix. body panels and frame
   x. electrical and electronic systems and components
   xi. motorcycle seating and mirrors
   xii. motorcycle instrumentation
   xiii. 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. motorcycle records.
a. Make recommendations based on results of motorcycle inspections.
b. The checks necessary to ensure customer satisfaction for:

i. motorcycle body panels
ii. paint surfaces
iii. polished surfaces
iv. chromed surfaces
v. seats and mirrors.

c. Prepare and use appropriate inspection equipment and tools.
d. Inspection procedures following inspection checklists.
e. Various motorcycle preparation activities and inspections to include:-
i. new motorcycle assembly
ii. pre and post work
iii. pre-delivery on new and used motorcycles
iv. MOT test
v. safety
vi. post repair.

Unit 501 Skills in Inspection, Repair and Replacement of Standard Light Vehicle Tyres

Level:	**1**
Credit value:	5 (GLH 46)
UAN:	H/601/6091
Aim:	This unit will help the learner to develop the skills required to inspect, fit, repair and maintain standard light vehicle tyres.

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 vehicles 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 light vehicle tyre inspection techniques	
Assessment criteria	
The learner can: 2.1 carry out inspection of wheels and tyres using appropriate techniques, suitable tools, equipment and manufacturers instructions where relevant. to include: a. visual inspection b. measurement of tread depth c. tyre pressures d. balance	

Learning outcome	**The learner will:**
3. be able to carry out the repair and replacement of standard light vehicle tyres	
Assessment criteria	
The learner can: 3.1 carry out tyre repair activities within appropriate timescales, using: a. suitable tools and equipment b. correct repair and replacement techniques	

c. correct type and size of replacement components d. correct materials 3.2 carry out tyre replacement activities within appropriate timescales

Learning outcome	**The learner will:**
4. be able to balance wheels and carry out final checks on the vehicle	
Assessment criteria	
The learner can: 4.1 carry out wheel balancing to within acceptable limits 4.2 carry out final vehicle safety checks in the workshop, prior to releasing the vehicle to the customer	

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 record and report any additional faults noticed during the course of their work promptly in the format required	

Unit 503 Skills in Inspection Repair and Replacement of Commercial Vehicle Tyres

Level:	**1**
Credit value:	5 (GLH 44)
UAN:	M/601/6093
Aim:	This unit will help the learner to develop the skills required to inspect, fit, repair and maintain high performance light vehicle tyres.

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 vehicles 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 inspect commercial vehicle wheels and tyres	
Assessment criteria	
The learner can: 2.1 inspect commercial vehicle wheels and tyres using appropriate techniques, suitable tools, equipment, technical information and manufacturers instructions where relevant. to include: a. visual inspection b. measurement of tread depth c. tyre pressures	

Learning outcome	**The learner will:**
3. be able to carry out the repair and replacement of commercial vehicle tyres, wheels and tubes	
Assessment criteria	
The learner can: 3.1 carry out tyre repair activities within appropriate timescales using: a. suitable tools and equipment b. correct repair techniques c. correct type and size of replacement components	

d. correct materials 3.2 carry out tyre replacement activities within appropriate timescales 3.3 carry out final checks to ensure that replaced and refitted tyres and valves are correctly fitted and conform to legal requirements prior to releasing the vehicle to the customer

Learning outcome	**The learner will:**
4. be able to carry out tread regrooving on commercial vehicle tyres	
Assessment criteria	
The learner can: 4.1 carry out tread re-grooving on suitable tyres, complying with legal requirements using: a. suitable tools and equipment b. correct re-grooving techniques c. suitable personal protection 4.2 carry out final checks to ensure that re-grooved tyres meet manufacturer's and legal requirements prior to release to the customer	

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 record and report any additional faults noticed during the course of their work promptly in the format required	

Unit 544 Skills in Receiving and Storing Stock

Level:	**1**
Credit value:	4 (GLH 34)
UAN:	T/601/6872
Aim:	This unit will help the learner to develop the skills required to: • receive parts into storage • put them into the required location • update stock control systems • complete documentation in a dealership, fast fit centre, parts distribution centre or similar situation.

Learning outcome	**The learner will:**
1. be able to accept parts deliveries	
Assessment criteria	
The learner can: 1.1 check that parts delivered conform to the type, quality and quantity expected 1.2 report any discrepancies in deliveries and storage to the relevant person promptly 1.3 identify and use location systems and place parts in the correct location for storage 1.4 store parts in a way that makes the best use of the space available and conforms to relevant regulations and practice and conforms with stock rotation requirements	

Learning outcome	**The learner will:**
2. be able to deal with stock control systems and documentation	
Assessment criteria	
The learner can: 2.1 enter details of stock received into the stock control system accurately 2.2 complete receipt and storage documentation accurately, following company procedures	

Unit 551 Knowledge in Inspection, Repair and Replacement of Standard Light Vehicle Tyres

Level:	**2**
Credit value:	3 (GLH 24)
UAN:	D/601/6025
Aim:	This unit will help the learner to develop an understanding of inspecting, fitting, repairing and maintaining standard light vehicle tyres and wheels.

Learning outcome	**The learner will:**
1. know about light vehicle standard tyre's, legislation and special workplace procedures	
Assessment criteria	
The learner can: 1.1 state the main purpose of tyres 1.2 identify the different types of standard light vehicle wheel and rim construction 1.3 identify the types and application of light vehicle tyre construction. 1.4 state the legal requirements for light vehicle tyres. 1.5 state the relevant parts of the british and european standard for the repair of light vehicle tyres 1.6 give examples of how to deal with specialist waste materials in their workplace.	

Learning outcome	**The learner will:**
2. know about the tools and equipment used when working with light vehicle tyres	
Assessment criteria	
The learner can: 2.1 list the tools and equipment used when working with standard light vehicle tyres. 2.2 state specialist maintenance requirements of wheel balancing and tyre removal and refitting machinery	

Learning outcome	**The learner will:**
3. know about materials used in the repair of light vehicle tyres	
Assessment criteria	
The learner can: 3.1 state the types of repair materials available and when they would be used	

Learning outcome	The learner will:
4. know about the inspection, removal and replacement of light vehicle tyres	
Assessment criteria	
The learner can: 4.1 state the meaning of markings on standard light vehicle tyres. 4.2 state the inspection and fault identification methods and procedures associated with light vehicle tyres. 4.3 give examples of the common faults associated with standard light vehicle tyres and wheels. 4.4 describe standard light vehicle tyre, wheel and valve removal and refitting methods and procedures. 4.5 outline the principles of interchanging tyres or wheels 4.6 outline the principles of wheel balancing. to include: a. static balancing b. dynamic balancing	

Unit 553 Knowledge of Inspection, Repair and Replacement of Commercial Vehicle Tyres

Level:	**2**
Credit value:	3 (GLH 26)
UAN:	L/601/6036
Aim:	This unit enables the learner to develop and understanding of inspection, fitting, repairing and maintaining high performance light vehicle tyres.

Learning outcome	**The learner will:**
1. understand commercial vehicle wheel and tyre construction, legislation and special workplace procedures	
Assessment criteria	
The learner can: 1.1 state the purpose, function and construction of commercial vehicle wheels and tyres. 1.2 state the current legal requirements for commercial vehicle tyres. 1.3 state the relevant parts of the prevailing british and european standard for the repair of commercial vehicle tyres 1.4 give examples of how to deal with specialist waste materials in their workplace. 1.5 outline manufacturers' recommendations on the 'repairability' of their tyres	

Learning outcome	**The learner will:**
2. understand the tools and equipment used when working with commercial vehicle tyres	
Assessment criteria	
The learner can: 2.1 give examples of how to select, prepare and use tools and equipment appropriate to working with commercial vehicle tyres. 2.2 state specialist maintenance requirements of commercial vehicle wheel and tyre removal and refitting machinery	

Learning outcome	The learner will:
3. understand the construction of, and the materials used in the manufacture and repair of commercial vehicle tyres	
Assessment criteria	
The learner can: 3.1 state the types of repair materials available and when they should be used. 3.2 state the difference between a 'remould' and a 'recut' when applied to commercial vehicle tyre	

Learning outcome	The learner will:
4. understand how to inspect, remove, repair and replace of commercial vehicle tyres	
Assessment criteria	
The learner can: 4.1 state the different types of commercial vehicle tyre valve and their installation techniques 4.2 state the meaning of markings on commercial vehicle tyres and where these can be found 4.3 state the inspection and fault identification methods and procedures associated with commercial vehicle tyres 4.4 give examples of the common faults associated with commercial vehicle tyres and wheels 4.5 describe commercial vehicle tyre, tube and wheel and rim removal and refitting methods and procedures 4.6 outline the principles of wheel balancing. to include: a static balancing b dynamic balancing 4.7 state the process to re-groove a commercial vehicle tyre	

Unit 594 Knowledge of Receiving and Storing Stock

Level:	**1**
Credit value:	4 (GLH 28)
UAN:	Y/601/6086
Aim:	This unit enables the learner to develop an understanding of: • receiving parts into storage, • putting parts into the required location, • updating stock control systems • completing documentation in a dealership, fast fit centre, parts distribution centre or similar situation.

Learning outcome	**The learner will:**
1. know their organisation's systems and procedures	
Assessment criteria	
The learner can: 1.1 state their organisation's systems and procedures for: a. the receipt and storage of goods, including 'special order' parts. b. parts storage, rotation and management c. update of stock records d. completion of parts receipt and storage documentation. e. reporting damage or incomplete deliveries 1.2 identify the person to whom discrepancies and storage problems should be reported 1.3 give examples of the differing security, safety (coshh) and environmental conditions required for parts storage, including the storage and handling of replacement air bags, and the reasons for these. 1.4 state the requirements for and the importance of, wearing personal protective equipment when handling and moving parts. 1.5 state the costs associated with damaged parts and why it is important that damaged parts are reported promptly.	

Learning outcome	The learner will:
2. know about parts handling and storage	
Assessment criteria	
The learner can: 2.1 give examples of how to perform visual and physical quality checks at the time of receipt of parts. 2.2 give examples of how to locate where parts are stored using the parts information system in operation in your organisation. 2.3 give examples of how to handle and move parts safely 2.4 give examples of how to use the mechanical handling equipment available in their parts operation. 2.5 state how to store parts to make best use of available space and to adhere to regulations. to include: a. adjustable storage racking b. tyre racking c. exhaust racking d. drawers e. wall bins f. battery storage g. lockable cabinets 2.6 state how to store parts to conform with any stock rotation requirements. 2.7 identify when and where handling equipment should be used 2.8 state the storage requirements for special and or easily damaged parts and consumables. to include: a. body panels b. air bags c. tyres d. exhaust components e. batteries f. brake parts g. oil. h. paint and thinners i. gases	

Learning outcome	The learner will:
3. know about stock records and stock control	
Assessment criteria	
The learner can: 3.1 give examples of how to access and interpret information to determine what parts deliveries are expected. 3.2 give examples of how to update stock records on the receipt of goods. 3.3 give examples of how to complete relevant parts receipt and storage documentation. 3.4 state the parts numbering system for the makes and types of parts they deal with 3.5 state how their parts stock control system works	

Unit 701 Vehicle Engine Lubrication Systems (3902-101)

Level: 1	**Level 1**
Credit value:	5 (GLH 38) TBC
UAN:	F/600/4563
Aim:	This unit can be adapted to suit a range of vehicle and engine types. • Light vehicle • Heavy vehicle • Motorcycle • Quad bike • Horticulture vehicles It is important is that candidates have a good understanding of: • how to remove and refit a cylinder head • how to check cylinder head for flatness • correct tightening procedures It is important is that candidates • show ability to check their own work for missing parts/components • identify basic faults which include oil leaks to the areas worked upon Two stroke engine: if carrying out this activity on a two stroke engine, it will be necessary to demonstrate you are also able to check gaps and clearances correctly; this could be on another engine.

Learning outcome	**The learner will:**
1. know legislative and organisational requirements	
Assessment criteria	
The learner can: 1.1 describe and demonstrate the manufacturers and legal requirements relating to removal and replacement activities for the types of vehicles worked upon 1.2 ensure the legal requirements relating to the activity are maintained 1.3 demonstrate the health and safety legislation and workplace procedures relevant to vehicle maintenance activities including personal protective equipment 1.4 demonstrate and describe workplace procedures for a. handling and disposal of used and waste oils b. handling and disposal of used and waste oil filters	

c. Starting and safe running of engines in a confined space 1.5 work in a way which minimises the risk of damage to the vehicle, its systems, other people and their property 1.6 demonstrate that they have shown an awareness of education for sustainable development and global citizenship

Learning outcome	**The learner will:**
2. know how to locate and use relevant sources of information	
Assessment criteria	
The learner can: 2.1 ensure their records are accurate for a. documenting vehicle type b. specification c. maintenance information d. tightening torque figures e. types of oils used 2.2 demonstrate the importance of following correct technical data for removal and replacement activities of a. oil b. filter c. valve cover d. engine cover/casing gasket 2.3 demonstrate the importance of working to agreed timescales and keeping others informed of progress	

Learning outcome	**The learner will:**
3. understand how the vehicle engine lubrication system operates	
Assessment criteria	
The learner can: 3.1 describe the concept of the engine and major components which are relevant to the engines cylinder head and its systems they are working on a. petrol four stroke b. diesel four stroke c. two stroke 3.2 describe the operation and purpose of the main engine components which include: a. crankshaft and bearings b. cylinder head gasket c. lubricating oils d. cylinder head e. valves or ports f. piston and rings	

Learning outcome	The learner will:
4. know how to select and use the appropriate tools and equipment to carry out the removal and replacement activities to the engine lubrication system	
Assessment criteria	
The learner can: 4.1 demonstrate and describe how to prepare, test and use all the equipment required to carry out removal and replacement activities to the engine cylinder head and its systems. a. Tightening angle gauge b. General hand tools c. Specialist tools d. Torque wrench e. Straight edge f. Feeler blades	

Learning outcome	The learner will:
5. know how to carry out the removal and replacement activities on engine lubrication systems	
Assessment criteria	
The learner can: 5.1 demonstrate the correct procedure for carrying out cylinder head removal and replacement activities: a. checking cylinder head flatness b. tightening bolt torque procedure c. filling of liquids and lubricants d. tightening using angle gauge e. removing cylinder head f. selecting hand tools g. disposal of waste h. draining fluids 5.2 demonstrate the correct procedure for carrying out cylinder head inspection for flatness a. clean off old gasket b. straight edge and feeler blades 5.3 demonstrate basic examination methods which include a. aural b. visual c. functional d. measurements 5.4 describe how to recognise and report cosmetic damage to vehicle components and units outside normal engine mechanical systems activities 5.5 describe how to identify codes and grades of lubricants and coolants	

Unit 702 Vehicle Engine Cooling Systems (3902-102)

Level: 1	**Level 1**
Credit value:	4 (GLH 32)
UAN:	H/600/4569
Aim:	This unit can be adapted to suit a range of vehicle and engine types. • light vehicle • heavy vehicle • motorcycle / quad bike • horticulture vehicles It is important is that candidates have a good understanding of: • how to remove and refit cooling system electrical components • how to carry out basic electrical/electronic functional testing • how to make and fit a new gasket • correct tightening procedures Demonstrate the ability to check their own work for missing parts/components Identify basic faults which include coolant leaks to the areas worked upon

Learning outcome	**The learner will:**
1. know legislative and organisational requirements	
Assessment criteria	
The learner can: 1.1 describe and demonstrate the manufacturers and legal requirements relating to removal and replacement activities for the types of vehicles worked upon 1.2 ensure the legal requirements relating to the activity are maintained 1.3 demonstrate the health and safety legislation and workplace procedures relevant to vehicle maintenance activities including personal protective equipment 1.4 demonstrate and describe workplace procedures for a. handling and disposal of used and waste coolant b. handling and disposal of waste cooling system components c. starting and safe running of engines in a confined space 1.5 work in a way which minimises the risk of damage to the vehicle, its systems, other people and their property 1.6 demonstrate that they have shown an awareness of education for	

sustainable development and global citizenship

Learning outcome	**The learner will:**
2. know how to locate and use relevant sources of information	
Assessment criteria	
The learner can: 2.1 ensure their records are accurate for a. vehicle types b. specification c. replacement information d. tightening torque figures e. electrical and electronic readings f. types of coolant and percentages of antifreeze used 2.2 demonstrate the importance of following correct technical data for removal and replacement activities for a. thermostat b. thermistor c. fan control thermal switch 2.3 demonstrate the importance of following correct cooling system test technical data for: a. fan control thermal switch b. thermostat opening time c. thermistor 2.4 demonstrate the importance of working to agreed timescales and keeping others informed of progress	

Learning outcome	**The learner will:**
3. understand how the vehicle engine cooling system operates	
Assessment criteria	
The learner can: 3.1 describe the concept of the engine and components which are relevant to the cooling system they are working on a. petrol four stroke b. diesel four stroke c. two stroke 3.2 describe the basic operation and purpose of the a. fan control thermal switch b. thermostat c. thermistor	

Learning outcome	The learner will:
4. know how to select and use the appropriate tools and equipment to carry out the removal and replacement activities to the engine cooling system	
Assessment criteria	
The learner can: 4.1 demonstrate and describe how to prepare, test and use all the equipment required to carry out removal and replacement activities to the engine cooling system a. electrical test equipment b. pressure test equipment c. antifreeze equipment d. general hand tools e. torque wrench	

Learning outcome	The learner will:
5. know how to carry out the relevant removal and replacement activities on engine cooling systems	
Assessment criteria	
The learner can: 5.1 demonstrate the correct procedure for carrying out cooling system removal and replacement activities: a. fan control thermal switch b. coolant thermistor c. thermostat 5.2 carry out basic electrical functional tests on the a. fan control thermal switch b. coolant thermistor 5.3 carry out functional tests to the thermostat 5.4 demonstrate they can manufacture a gasket to fit the thermostat casing gasket 5.5 demonstrate basic examination methods which include a. aural b. visual c. functional d. measurements 5.6 describe how to recognise and report cosmetic damage to vehicle components and units outside normal service items 5.7 describe how to identify codes and grades of coolant additives	

Unit 703 Vehicle Fuel and Exhaust Systems (3902-103)

Level:	**Level 1**
Credit value:	5 (GLH 39)
UAN:	K/600/4573
Aim:	This unit can be adapted to suit a range of vehicle and engine types. • Spark ignition • Compression ignition • Motorcycle • Horticulture vehicles It is important is that candidates have a good understanding of: • how to remove and refit fuel injectors • lambda sensors and exhaust catalyser • system components • correct tightening procedures. Demonstrate the ability to check their own work for missing parts/components. Identify basic faults which include fuel and exhaust leaks to the areas worked upon

Learning outcome	**The learner will:**
1. know legislative and organisational requirements	
Assessment criteria	
The learner can: 1.1 describe and demonstrate the manufacturers and legal requirements relating to removal and replacement activities for the types of vehicles worked upon. 1.2 ensure the legal requirements relating to the activity are maintained 1.3 demonstrate the health and safety legislation and workplace procedures relevant to vehicle maintenance activities including personal protective equipment 1.4 demonstrate and describe workplace procedures for handling and disposal of: a. fuel and exhaust components b. engine lambda sensor c. starting and safe running of engines in a confined space. 1.5 work in a way which minimises the risk of damage to the vehicle, its systems, other people and their property. 1.6 demonstrate that they have shown an awareness of education for	

sustainable development and global citizenship

Learning outcome	The learner will:
2. know how to locate and use relevant sources of information	
Assessment criteria	
The learner can: 2.1 ensure their records are accurate for: a. vehicle type and specification b. types of fuel and lambda sensor c. maintenance information d. tightening torque figures e. exhaust catalyst 2.2 demonstrate the importance of following correct technical data for removal and replacement activities for all of the following components: a. a fuel injector b. exhaust catalyst c. lambda sensor 2.3 demonstrate the importance of working to agreed timescales and keeping others informed of progress.	

Learning outcome	The learner will:
3. understand how the vehicle fuel and exhaust systems operate	
Assessment criteria	
The learner can: 3.1 describe and demonstrate the concept of the engine and major components which are relevant to the fuel injector, lambda sensor and exhaust system they are working on; either systems 3.2 describe the operation and purpose of the a. exhaust catalyst b. lambda sensor c. fuel injector	

Learning outcome	The learner will:
4. know how to select and use the appropriate tools and equipment to remove and replace fuel and exhaust systems	
Assessment criteria	
The learner can: 4.1 demonstrate and describe how to prepare, test and use all the equipment required to carry out removal and replacement activities to the engine fuel injector, lambda sensor and exhaust catalyst. a. general hand tools b. torque wrench c. electrical test equipment d. exhaust emissions tester	

Learning outcome	The learner will:
5. know how to carry removal and replacement activities for fuel and exhaust systems	
Assessment criteria	
The learner can: 5.1 demonstrate the correct procedure for carrying out removal and replacement activities to a. engine fuel injectors b. lambda sensors c. exhaust catalysts d. check for fuel leaks e. check for exhaust leaks f. disposal of waste components 5.2 demonstrate examination methods which include a. aural b. visual c. functional d. measurements 5.3 demonstrate and describe operational test procedures for: a. lambda sensor b. exhaust catalyst 5.4 describe how to recognise and report cosmetic damage to vehicle components and units outside normal service items 5.5 describe how to identify for correct replacement component codes.	

Unit 704 Vehicle Spark Ignition Systems (3902-104)

Level:	**Level: 1**
Credit value:	5 (GLH 43)
UAN:	H/600/4586
Aim:	This unit can be adapted to suit a range of engine types. • Spark ignition • Compression ignition: (see notes below) • Motorcycle • Quad bike • Horticulture vehicles It is important is that candidates have a good understanding of: • how to remove and refit ignition system components • correct tightening procedures Demonstrate the ability to check their own work for missing parts/components. Identify basic faults which include: • visual damage to ignition coil • basic resistance checks (high/low/open circuit) • diagnostic fault codes Compression Ignition engine: The unit is about testing ignition system components: engine position sensor, ECU and ignition coil. The compression ignition engine does not use an ignition coil, however this unit is about using electronic test equipment, substitute this item with a similar component for the candidate to test resistance and continuity. Example could be an electrical relay

Learning outcome	**The learner will:**
1. know legislative and organisational requirements	
Assessment criteria	
The learner can: 1.1 describe and demonstrate the manufacturers and legal requirements relating to removal and replacement activities for the types of vehicles worked upon. 1.2 ensure the legal requirements relating to the activity are maintained 1.3 demonstrate the health and safety legislation and workplace procedures relevant to vehicle maintenance activities including personal protective equipment 1.4 demonstrate and describe workplace procedures for:	

a. handling and disposal of spark ignition components
b. starting and safe running of engines in a confined space.

1.5 work in a way which minimises the risk of damage to the vehicle, its systems, other people and their property.

1.6 demonstrate that they have shown an awareness of education for sustainable development and global citizenship

Learning outcome	The learner will:
2. know how to locate and use relevant sources of information	
Assessment criteria	

The learner can:

2.1 ensure their records are accurate for
a. vehicle types
b. specification
c. maintenance information
d. tightening torque figures
e. types of ignition components used

2.2 demonstrate the importance of following correct technical data for removal and replacement activities for all of the following components
a. electronic engine sensor
b. engine electronic control unit
c. ignition coil

2.3 demonstrate the importance of working to agreed timescales and keeping others informed of progress.

Learning outcome	The learner will:
3. understand how the vehicle system operates	
Assessment criteria	

The learner can:

3.1 describe the concept of the engine and major components which are relevant to the ignition system they are working on.

3.2 describe the basic operation and purpose of the
a. engine position sensor
b. engine electronic control unit
c. ignition coil/s

Learning outcome	The learner will:
4. know how to select and use the appropriate tools and equipment to carry out removal and replacement activities to the engine ignition system	
Assessment criteria	

The learner can:

4.1 demonstrate and describe how to prepare, test and use all the equipment required to carry out removal and replacement activities to the engine ignition system.
a. general hand tools
b. torque wrench

c. electrical test equipment

Learning outcome	The learner will:
5. know how to carry out the relevant removal and replacement activities	
Assessment criteria	
The learner can: 5.1 demonstrate the correct procedure for carrying out engine ignition system removal and replacement activities: a. engine position sensor b. engine electronic control unit c. ignition coil/s 5.2 demonstrate a diagnostic fault code reader activity (eobd) and search system for stored fault codes/data 5.3 measure the internal resistance of a. engine position sensor b. ignition coil/s 5.4 demonstrate basic examination methods which include a. aural b. visual c. functional d. measurements e. comparisons 5.5 describe how to recognise and report cosmetic damage to vehicle components and units outside normal service items	

Unit 705 Vehicle Electrical Systems (3902-105)

Level:	**Level: 1**
Credit value:	5 (GLH 38)
UAN:	A/600/4593
Aim:	This unit can be adapted to suit a range of vehicle and engine types. • Light vehicle • Heavy vehicle • Motorcycle • Quad bike • Horticulture vehicles It is important is that candidates have a good understanding of how to: • carry out simple electrical function tests for the type of vehicle worked upon • adapt the electrical system checks to the vehicles worked upon • remove and refit electrical system components as listed.

Learning outcome	**The learner will:**
1. know legislative and organisational requirements	
Assessment criteria	
The learner can: 1.1 describe and demonstrate the manufacturers and legal requirements relating to removal and replacement activities for the types of vehicles worked upon. 1.2 ensure the legal requirements relating to the activity are maintained 1.3 demonstrate the health and safety legislation and workplace procedures relevant to vehicle maintenance activities including personal protective equipment 1.4 demonstrate and describe workplace procedures for: a. handling and disposal of electrical system components b. starting and safe running of engines in a confined space. 1.5 work in a way which minimises the risk of damage to the vehicle, its systems, other people and their property. 1.6 demonstrate that they have shown an awareness of education for sustainable development and global citizenship	

Learning outcome	The learner will:
2. know how to locate and use relevant sources of information	
Assessment criteria	
The learner can: 2.1 ensure their records are accurate for a. vehicle type b. specification c. maintenance information d. tightening torque figures e. types electrical components used 2.2 demonstrate the importance of following correct technical data for removal and replacement activities for all of the following components a. battery b. starter motor c. alternator 2.3 demonstrate the importance of working to agreed timescales and keeping others informed of progress.	

Learning outcome	The learner will:
3. understand how the vehicle system operates	
Assessment criteria	
The learner can: 3.1 describe the concept of the engines components which are relevant to the electrical system they are working on. 3.2 describe the basic operation and purpose of the a. battery b. starter motor c. alternator	

Learning outcome	The learner will:
4. know how to select and use the appropriate tools and equipment to carry out removal and replacement activities to the vehicle electrical system	
Assessment criteria	
The learner can: 4.1 demonstrate and describe how to prepare, test and use all the equipment required to carry out removal and replacement activities to the vehicle electrical system. a. general hand tools b. general multi-meter c. torque wrench d. jump leads	

Learning outcome	The learner will:
5. know how to carry out basic system checks and relevant removal, repair and replacement activities	
Assessment criteria	
The learner can: 5.1 describe the correct procedure for carrying out system checks to the vehicle electrical systems a. battery b. alternator c. starter motor 5.2 carry out removal and replacement activities to: a. battery b. alternator c. starter motor 5.3 carry out a simple starter motor test with: a. battery b. jump leads 5.4 carry out a simple alternator charge test with: a. voltmeter 5.5 carry out a simple battery test with: a. voltmeter 5.6 demonstrate basic examination methods which include a. aural b. visual c. functional d. measurements e. comparisons 5.7 describe how to recognise and report cosmetic damage to vehicle components and units outside normal service items	

Unit 706 Vehicle Braking Systems (3902-106)

Level:	**Level: 1**
Credit Value:	5 (GLH 35)
UAN:	D/600/4893
Aim:	This unit can be adapted to suit a range of vehicle and engine types. • Light vehicle • Heavy vehicle • Motorcycle • Quad bike • Horticulture vehicles Its important is that candidates have a good understanding of how to: • remove and refit braking system components • top up brake fluid levels • correctly use dial test equipment • manufacture a brake pipe Demonstrate the ability to check their own work for missing parts/components Identify basic faults which include worn and damaged brake components to the vehicles worked upon

Learning outcome	**The learner will:**
1. know legislative and organisational requirements	
Assessment criteria	
The learner can: 1.1 describe and demonstrate the manufacturers and legal requirements relating to removal and replacement activities for the types of vehicles worked upon. 1.2 ensure the legal requirements relating to the activity are maintained 1.3 demonstrate the health and safety legislation and workplace procedures relevant to vehicle maintenance activities including personal protective equipment 1.4 demonstrate and describe workplace procedures for a. handling and disposal of used and waste brake fluid b. handling and disposal of waste braking system components c. starting and safe running of engines in a confined space. 1.5 work in a way which minimises the risk of damage to the vehicle, its systems, other people and their property. 1.6 demonstrate that they have shown an awareness of education for	

sustainable development and global citizenship

Learning outcome	**The learner will:**
2. know how to locate and use relevant sources of information	
Assessment criteria	
The learner can: 2.1 ensure their records are accurate for a. vehicle types b. specification c. maintenance information d. brake disc run-out e. tightening torque figures f. types of brake fluid used g. brake pipe materials 2.2 demonstrate the importance of following correct technical data for removal and replacement activities for the following a. brake calliper b. brake pads c. brake fluid 2.3 demonstrate the importance of working to agreed timescales and keeping others informed of progress	

Learning outcome	**The learner will:**
3. understand how the vehicle system operates	
Assessment criteria	
The learner can: 3.1 describe the concept of the vehicles major components which are relevant to the braking system they are working on. 3.2 describe the basic operation and purpose of the following a. master cylinder b. brake calliper c. brake pipes d. brake pads e. brake disc f. brake fluid	

Learning outcome	The learner will:
4. know how to select and use the appropriate tools and equipment to carry out removal and replacement activities to the vehicles braking system	
Assessment criteria	
The learner can: 4.1 demonstrate and describe how to prepare, test and use all the equipment required to carry out removal and replacement activities to the vehicles braking system. a. general hand tools b. brake bleed tools c. torque wrench 4.2 demonstrate and describe how to prepare, test and use all the equipment required to carry out brake disc run out inspection a. dial test equipment 4.3 demonstrate and describe how to prepare, test and use all the equipment required to carry out brake pipe manufacture a. brake flaring tool b. brake pipe bend equipment	

Learning outcome	The learner will:
5. know how to carry out the relevant removal and replacement activities and level checks, including basic manufacturing techniques and system checks	
Assessment criteria	
The learner can: 5.1 describe and demonstrate the correct procedure for carrying out braking system removal and replacement activities: to a. brake calliper b. brake pads c. Brake disc 5.2 carry out a brake disc run-out inspection and use a. dial test equipment 5.3 manufacture a brake pipe and use a. brake flaring tools b. pipe bending equipment 5.4 check and top up brake fluid a. Hygrometer (boil test) 5.5 demonstrate examination methods which include a. aural b. visual c. functional d. measurements 5.6 describe how to recognise and report cosmetic damage to vehicle components and units outside normal service items 5.7 describe how to identify codes and grades of brake fluid.	

Unit 707 Vehicle Transmission Systems (3902-107)

Level:	**Level: 1**
Credit value:	5 (GLH 38)
UAN:	M/600/4901
Aim:	This unit can be adapted to suit a range of vehicle and engine types. • Light vehicle • Heavy vehicle • Motorcycle/Quad • Horticulture vehicles It is important is that candidates have a good understanding of: • how to remove and refit transmission system components • how to top up transmission fluid levels • correct tightening procedures. Demonstrate the ability to check their own work for missing parts/components Identify basic faults which include worn and damaged transmission components to the vehicles worked upon

Learning outcome	**The learner will:**
1. know legislative and organisational requirements	
Assessment criteria	
The learner can: 1.1 describe and demonstrate the manufacturers and legal requirements relating to removal and replacement activities for the types of vehicles worked upon. 1.2 ensure the legal requirements relating to the activity are maintained 1.3 demonstrate the health and safety legislation and workplace procedures relevant to vehicle maintenance activities including personal protective equipment 1.4 demonstrate and describe workplace procedures for a. handling and disposal of used transmission lubricants b. handling and disposal of waste transmission system components c. starting and safe running of engines in a confined space. 1.5 work in a way which minimises the risk of damage to the vehicle, its systems, other people and their property. 1.6 demonstrate that they have shown an awareness of education for sustainable development and global citizenship	

Learning outcome	The learner will:
2. know how to locate and use relevant sources of information	
Assessment criteria	
The learner can: 2.1 ensure their records are accurate for a. vehicle types b. specification c. maintenance information d. tightening torque figures e. types of transmission fluid used 2.2 demonstrate the importance of following correct technical data for removal and replacement activities for any **one** of the following a. manual gearbox b. automatic gearbox c. range change device d. P.T.O. Device 2.3 demonstrate the importance of working to agreed timescales and keeping others informed of progress.	

Learning outcome	The learner will:
3. understand how the vehicle system operates	
Assessment criteria	
The learner can: 3.1 describe the concept of the vehicles major components which are relevant to the transmission system they are working upon, from a. manual gearbox b. automatic gearbox c. range change device d. P.T.O. Device 3.2 describe the basic purpose of the following a. clutch b. torque converter c. manual gearbox d. automatic gearbox e. range change device	

Learning outcome	The learner will:
4. know how to select and use the appropriate tools and equipment to carry out removal and replacement activities to the vehicles transmission system	
Assessment criteria	
The learner can: 4.1 demonstrate and describe how to prepare, test and use all the equipment required to carry out removal and replacement activities to the vehicles transmission system. a. general hand tools b. lifting equipment c. torque wrench	

Learning outcome	The learner will:
5. know how to carry out the relevant removal and replacement activities and level checks	
Assessment criteria	
The learner can: 5.1 describe and demonstrate the correct procedure for carrying out transmission system removal and replacement activities: to one of the following a. manual gearbox b. automatic gearbox c. range change device d. P.T.O. device 5.2 check and top up transmission lubricants 5.3 demonstrate basic examination methods which include a. aural b. visual c. functional d. measurements 5.4 describe how to recognise and report cosmetic damage to vehicle components and units outside normal service items 5.5 describe how to identify codes and grades of transmission lubricants.	

Unit 708 Vehicle Steering and Suspension Systems (3902-108)

Level:	**Level :1**
Credit Value:	5 (GLH 36)
UAN:	J/600/4905
Aim:	This unit can be adapted to suit a range of vehicle and engine types. • Light vehicle • Heavy vehicle • Motorcycle / Quad • Horticulture vehicles It is important is that candidates have a good understanding of: • how to remove and refit steering and suspension system components • how to strip down evaluate and compare • how to check alignment • correct tightening procedures. Demonstrate the ability to check their own work for missing parts/components Identify faults which include worn and damaged steering and suspension components to the vehicles worked upon

Learning outcome	**The learner will:**
1. know legislative and organisational requirements	
Assessment criteria	
The learner can: 1.1 describe and demonstrate the manufacturers and legal requirements relating to removal and replacement activities for the types of vehicles worked upon. 1.2 ensure the legal requirements relating to the activity are maintained 1.3 demonstrate the health and safety legislation and workplace procedures relevant to vehicle maintenance activities including personal protective equipment 1.4 demonstrate and describe workplace procedures for a. handling and disposal of used steering and suspension lubricants b. handling and disposal of waste steering and suspension system components	

c. starting and safe running of engines in a confined space. 1.5 work in a way which minimises the risk of damage to the vehicle, its systems, other people and their property. 1.6 demonstrate that they have shown an awareness of education for sustainable development and global citizenship

Learning outcome	**The learner will:**
2. know how to locate and use relevant sources of information	
Assessment criteria	
The learner can: 2.1 ensure their records are accurate for a. vehicle types b. specification c. maintenance information d. tightening torque figures e. types of steering and suspension fluids used 2.2 demonstrate the importance of following correct technical data for removal and replacement activities for steering and suspension components 2.3 demonstrate the importance of working to agreed timescales and keeping others informed of progress.	

Learning outcome	**The learner will:**
3. understand how the vehicle suspension and steering systems operate	
Assessment criteria	
The learner can: 3.1 describe the basic concept of the vehicles major components which are relevant to the steering and suspension system they are working upon. 3.2 describe the operation and purpose of the following a. suspension b. steering system c. steering components d. suspension components	

Learning outcome	**The learner will:**
4. know how to select and use the appropriate tools and equipment to carry out removal and replacement activities to the vehicles steering and suspension system	
Assessment criteria	
The learner can: 4.1 demonstrate and describe how to prepare, test and use all the equipment required to carry out removal and replacement activities to the vehicles steering and suspension system. a. general hand tools b. spring compressor c. alignment equipment d. torque wrench	

Learning outcome	The learner will:
5. know how to carry out the relevant removal and replacement activities and alignment checks	
Assessment criteria	
The learner can: 5.1 demonstrate the correct procedure for carrying out steering and suspension system removal and replacement activities: to the following a. suspension strut unit b. steering joint or bearing 5.2 carry out strip down procedure a. suspension strut unit b. steering joint or bearing 5.3 evaluate and report on unit components a. suspension strut unit b. steering joint or bearing 5.4 reassemble unit components a. suspension strut unit b. steering joint or bearing 5.5 adjust and align unit components a. suspension strut unit b. steering joint or bearing 5.6 demonstrate examination methods which include a. aural b. visual c. functional d. measurements 5.7 describe how to recognise and report cosmetic damage to vehicle components and units outside normal service items 5.8 describe how to identify codes and grades of steering and suspension lubricants.	

Unit 709 Vehicle Wheel and Tyre Systems (3902-109)

Level:	**Level: 1**
Credit Value:	4 (GLH 32)
UAN:	L/600/5120
Aim:	This unit can be adapted to suit a range of vehicle and engine types. • Light vehicle, Heavy vehicle, Motorcycle, Quad bike, Horticulture vehicles It is important is that candidates have a good understanding of: • how to remove and refit wheel and tyre system components • how to repair a puncture to a tyre • how to balance a wheel • how to check for leaks • correct tightening procedures. • tyre markings and types Demonstrate the ability to check their own work for missing parts/components Identify faults which include worn and damaged wheel and tyre components to the vehicles worked upon

Learning outcome	**The learner will:**
1. know legislative and organisational requirements	
Assessment criteria	
The learner can: 1.1 describe and demonstrate the manufacturers and legal requirements relating to removal and replacement activities for the types of vehicles worked upon. 1.2 ensure the legal requirements relating to the activity are maintained 1.3 demonstrate the health and safety legislation and workplace procedures relevant to vehicle maintenance activities including personal protective equipment 1.4 demonstrate and describe workplace procedures for a. handling and disposal of used wheels and tyres b. correct use of air supply systems c. starting and safe running of engines in a confined space. 1.5 work in a way which minimises the risk of damage to the vehicle, its systems, other people and their property. 1.6 demonstrate that they have shown an awareness of education for sustainable development and global citizenship	

Learning outcome	The learner will:
2. know how to locate and use relevant sources of information	
Assessment criteria	
The learner can: 2.1 ensure their records are accurate for a. vehicle types b. specification c. maintenance information d. tightening torque figures 2.2 demonstrate the importance of following correct technical data for removal and replacement activities for: a. wheels b. tyres 2.3 demonstrate the importance of following correct technical data for tyre repair activities on a. puncture b. balance c. air valve (schrader) 2.4 demonstrate the importance of working to agreed timescales and keeping others informed of progress	

Learning outcome	The learner will:
3. understand how the vehicle system operates	
Assessment criteria	
The learner can: 3.1 describe the basic concept of the vehicles major components which are relevant to the wheels and tyres system they are working upon 3.2 describe the construction, operation and purpose of the following a. tyres b. valves c. wheels d. balance weights 3.3 describe legal impacts relating to repair activities to the tyre and further use	

Learning outcome	The learner will:
4. know how to select and use the appropriate tools and equipment to carry out the activity	
Assessment criteria	
The learner can: 4.1 demonstrate and describe how to prepare, test and use all the equipment required carrying out removal and replacement activities to the vehicles wheels and tyres system. a. wheel balance equipment b. puncture repair equipment c. pressure test equipment d. general hand tools e. tyre depth gauge f. torque wrench g. water bath h. air line	

Learning outcome	The learner will:
5. know how to carry out the relevant removal and replacement activities and checks	
Assessment criteria	
The learner can: 5.1 demonstrate the correct procedure for carrying out wheels and tyres system removal and replacement activities to the types of vehicle worked upon 5.2 demonstrate wheel and tyre checks including examination procedures for a. wear limits and characteristics b. tyre types and side wall marking c. damage d. balance e. leaks 5.3 carry out a puncture repair to a tyre and making good for use, using a. wheel balance equipment b. puncture repair equipment c. pressure test equipment d. general hand tools e. tyre depth gauge f. torque wrench g. water bath h. air line 5.4 demonstrate basic examination methods which include a. visual b. functional c. measurements 5.5 describe how to recognise and report cosmetic damage to vehicle components and units outside normal service items 5.6 describe how to identify wheel and tyre types and markings	

Unit 712 Vehicle Hand Skills and Manufacturing Techniques (3902-112)

Level:	**Level: 1**
Credit Value:	4 (GLH 28)
UAN:	R/600/5121
Aim:	This unit can be adapted to suit a range of vehicle and engine types. • light vehicle • heavy vehicle • motorcycle • quad bike • horticulture vehicles It is important is that candidates have a good understanding of: • basic engineering drawings • how to use tools and equipment safely • how to manufacture a simple tool • how to carry out the hand skills and techniques as listed in section 3 Examples of tools which can be manufactured by candidates which include all the skills and equipment needed to undertaking this unit are: • brake pipe clamp • pad saw • flywheel locking tool • bearing puller • vice clamp Drawing may be available from the awarding body

Learning outcome	**The learner will:**
1. know legislative and organisational requirements	
Assessment criteria	
The learner can: 1.1 describe and demonstrate the manufacturers and legal requirements relating to vehicle hand skills and manufacturing techniques. 1.2 ensure the legal requirements relating to the activity are maintained 1.3 demonstrate the health and safety legislation and workplace procedures relevant to vehicle hand skills and manufacturing	

techniques including personal protective equipment

1.4 demonstrate and describe workplace procedures for
   a. handling and disposal of used lubricants
   b. handling and disposal of waste metals

1.5 work in a way which minimises the risk of damage to the vehicle, its systems, other people and their property.

1.6 demonstrate that they have shown an awareness of education for sustainable development and global citizenship

Learning outcome	The learner will:
2. know how to locate and use relevant sources of information	
Assessment criteria	

The learner can:

2.1 ensure their records are accurate for
   a. specification
   b. maintenance information
   c. dimensions
   d. materials
   e. equipment

2.2 demonstrate the importance of following correct technical data for vehicle hand skills and manufacturing techniques

2.3 demonstrate the importance of working to agreed timescales and keeping others informed of progress.

Learning outcome	The learner will:
3. understand how to carry vehicle hand skills and manufacturing techniques	
Assessment criteria	

The learner can:

3.1 describe and illustrate vehicle hand skills and manufacturing techniques for
   a. joining techniques
   b. making threads
   c. cutting metals
   d. measuring
   e. filing

3.2 describe the importance of using correct materials for carrying out vehicle hand skills and manufacturing techniques

3.3 illustrate examples of understanding simple engineering drawings for
   a. dimensions
   b. materials
   c. joining
   d. threads

Learning outcome	The learner will:
4. know how to select and use the appropriate tools and equipment to carry out the activity	
Assessment criteria	
The learner can: 4.1 describe and demonstrate how to prepare, test and use all the equipment required for carrying out vehicle hand skills and manufacturing techniques a. general hand tools b. files c. taps d. dies e. hammer f. drills g. vice h. centre punch i. micrometer j. rule	

Learning outcome	The learner will:
5. know how to carry vehicle hand skills and manufacturing techniques	
Assessment criteria	
The learner can: 5.1 illustrate they are able to understand basic engineering drawings for a. dimensions b. materials c. joining d. threads 5.2 demonstrate the correct procedure for manufacturing a simple vehicle service tool using techniques of a. making threads b. cutting metals c. measuring d. joining e. filing 5.3 demonstrate and use all the equipment required to carrying out vehicle hand skills and manufacturing techniques a. general hand tools b. files c. taps d. dies e. hammer f. drill g. vice h. centre punch i. micrometer j. rule	

Appendix 1 Relationships to other qualifications

Links to other qualifications

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

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

This qualification has connections to the: Entry Level 3 and Level 1 Award, Certificate and Diploma in Vehicle Systems and Body & Paint Maintenance (3902)

Literacy, language, numeracy and ICT skills development

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

- Functional Skills (England) – see **www.cityandguilds.com/functionalskills**
- Essential Skills (Northern Ireland) – see **www.cityandguilds.com/essentialskillsni**
- Essential Skills Wales (from September 2010).

Appendix 2 Sources of general information

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

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

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

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

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

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

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

- ***Walled Garden*** 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 GOLA assessments.

Centre Guide – Delivering International Qualifications contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification. Specifically, the document includes sections on:

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

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**
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