

Level 2 and 3 Diploma in Motorcycle Maintenance and Repair Competence (4270-32/33)

October 2013 Version 2.1



Qualification at a glance

Subject area	Motorcycle Maintenance and Repair
City & Guilds number	4270
Age group approved	16-18, 19 +
Assessment	Portfolio of Evidence and Online Multiple Choice
Fast track	Not available. Automatic approval applies in some cases
Support materials	Centre handbook Candidate logbook
Registration and Certification	See Online Catalogue/Walled Garden for last registration and certification dates

Title and level	City & Guilds number	Accreditation number
Level 2 Diploma in Motorcycle Maintenance and Repair Competence	4270-32	500/9990/5
Level 3 Diploma in Motorcycle Maintenance and Repair Competence	4270-33	501/0023/3

Version and date	Change detail	Section
Version 2 (September 2012)	Unit 001 range deleted; Units 051, 053, 054, 058 - range corrected; spelling errors corrected; NOS references and some unit aims corrected; Addition of statements in Section 4	Various
Version 2.1 (October 2013)	Unit supporting information updated with introductory text	Units



Contents

1	Introduction	5
	Structure	6
2	Centre requirements	9
	Approval	9
	Resource requirements	9
	Candidate entry requirements	10
3	Delivering the qualification	11
	Initial assessment and induction	11
	Support materials	11
	Health and safety	12
	Data protection and confidentiality	12
	Initial assessment and induction	12
	Equal opportunities	12
	Access to assessment	13
	Appeals	13
4	Assessment	14
	Assessment of the qualification	14
	Recognition of prior learning (RPL)	14
5	Units	17
Unit 001	Competency in health, safety and good housekeeping in the automotive environment	19
Unit 003	Competency in supporting job roles in the automotive work environment	22
Unit 004	Skills in materials, fabrication, tools and measuring devices in the automotive environment	25
Unit 006	Competency in making learning possible through demonstrations and instruction	28
Unit 008	Competency in identifying and agreeing motor vehicle customer service needs	31
Unit 051	Knowledge of health, safety and good housekeeping in the automotive environment	34
Unit 053	Knowledge of support for job roles in the automotive work environment	43
Unit 054	Knowledge of materials, fabrication, tools and measuring devices used in the automotive environment	48
Unit 056	Knowledge of how to make learning possible through demonstrations and instruction	52
Unit 058	Knowledge of how to identify and agree motor vehicle customer service needs	58
Unit 301	Competency in routine motorcycle maintenance	62

Unit 302	Competency in motorcycle internal engine systems	65
Unit 303	Competency in removing and replacing motorcycle electrical units and components	69
Unit 304	Competency in removing and replacing motorcycle chassis units and components	73
Unit 305	Competency in motorcycle preparation and inspection	77
Unit 307	Competency in diagnosing and rectifying motorcycle engine faults	80
Unit 308	Competency in diagnosing and rectifying motorcycle chassis system faults	84
Unit 312	Competency in diagnosing and rectifying motorcycle transmission and driveline faults	88
Unit 351	Knowledge of routine motorcycle maintenance	92
Unit 352	Knowledge of motorcycle internal engine systems	97
Unit 353	Knowledge of removing and replacing motorcycle electrical units and components	105
Unit 354	Knowledge of removing and replacing motorcycle chassis units and components	111
Unit 355	Knowledge of motorcycle preparation and inspection	118
Unit 357	Knowledge of diagnosis and rectification of motorcycle engine faults	121
Unit 358	Knowledge in diagnosis and rectification of motorcycle chassis faults	130
Unit 362	Knowledge of diagnosis and rectification of motorcycle transmission and driveline faults	136
Unit 372	Knowledge of motorcycle fuel, ignition, air and exhaust system units and components	141
Unit 436	Skills in diagnosing and rectifying motorcycle electrical faults	147
Unit 486	Knowledge of diagnosis and rectification of motorcycle electrical faults	149
Appendix 1	Sources of general information	155



1 Introduction

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

Area	Description
Who are the qualifications for?	<p>These Levels 2 and 3 Diplomas in Motorcycle Maintenance and Repair Competence are for anyone developing a career in the motorcycle industry. These practical qualifications demonstrate your skills on the job, in your own workplace, showing that you meet national standards for automotive workers.</p> <p>Their structure and assessment strategy have been produced by the Institute of the Motor Industry, who are the sector skills council for the Automotive Industry.</p>
What do the qualifications cover?	<p>Candidates cover areas such as routine vehicle maintenance, removal and replacement of vehicle units and components and diagnosis and rectification of vehicle faults. They are assessed in the workplace by using the following methods:</p> <ul style="list-style-type: none"> • workplace observation • witness testimony • verbal questioning of essential knowledge • City & Guilds' GOLA multiple choice test.
Are the qualifications part of a framework or initiative?	<p>These qualifications are part of the Automotive Maintenance and Repair Intermediate Apprenticeship and Advanced Apprenticeship Frameworks (framework 1) which will replaced framework 4 from April 201</p>
What opportunities for progression are there?	<p>After taking these qualifications candidates will have a qualification that shows employers and customers they have the skills of a competent technician - for example to work on motorcycles and will be able to progress into employment.</p> <p>In addition, candidates who enjoy leading teams of people at work could also move onto a qualification as a Team Leader or Supervisor such as qualifications at Levels 2, 3 and 4 through the Institute of Leadership and Management (ILM) as a Team Leader or Supervisor such as qualifications at Levels 2, 3 and 4 through the Institute of Leadership and Management (ILM).</p>

Structure

To achieve the **Level 2 Diploma in Motorcycle Maintenance and Repair Competence**, learners must achieve a minimum of **95** credits, **86** credits from the mandatory units and a minimum of **9** credits from **one** optional group.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Mandatory			
A/601/6338	001	Competency in health, safety and good housekeeping in the automotive environment	7
K/601/6366	003	Competency in supporting job roles in the automotive work environment	5
Y/601/6279	004	Skills in materials, fabrication, tools and measuring devices in the automotive environment	7
D/601/6171	051	Knowledge of health, safety and good housekeeping in the automotive environment	3
T/601/6175	053	Knowledge of support for job roles in the automotive work environment	3
K/601/6237	054	Knowledge of materials, fabrication, tools and measuring devices used in the automotive environment	4
D/601/5442	301	Competency in routine motorcycle maintenance	7
L/601/5484	302	Competency in motorcycle internal engine systems	10
K/601/5489	303	Competency in removing and replacing motorcycle electrical units and components	10
T/601/5494	304	Competency in removing and replacing motorcycle chassis units and components	10
F/601/5515	351	Knowledge of routine motorcycle maintenance	2
Y/601/5519	352	Knowledge of motorcycle internal engine systems	3
H/601/5555	353	Knowledge of removing and replacing motorcycle electrical units and components	6
T/601/5558	354	Knowledge of removing and replacing motorcycle chassis units and components	6
T/601/5527	372	Knowledge of motorcycle fuel, ignition, air and exhaust system units and components	3

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Optional Group 1			
K/601/6383	008	Competency in identifying and agreeing motor vehicle customer service needs	5
R/601/6247	058	Knowledge of how to identify and agree motor vehicle customer service needs	5
Optional Group 2			
J/601/5497	305	Competency in motorcycle preparation and inspection	7
F/601/5563	355	Knowledge of motorcycle preparation and inspection	2

To achieve the **Level 3 Diploma in Motorcycle Maintenance and Repair Competence**, learners must achieve a total of **102** credits, **92** credits from the mandatory units and a minimum of **10** credits from **one** optional group.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Mandatory			
A/601/6338	001	Competency in health, safety and good housekeeping in the automotive environment	7
K/601/6366	003	Competency in supporting job roles in the automotive work environment	5
Y/601/6279	004	Skills in materials, fabrication, tools and measuring devices in the automotive environment	7
D/601/6171	051	Knowledge of health, safety and good housekeeping in the automotive environment	3
T/601/6175	053	Knowledge of support for job roles in the automotive work environment	3
K/601/6237	054	Knowledge of materials, fabrication, tools and measuring devices used in the automotive environment	4
J/601/5497	305	Competency in motorcycle preparation and inspection	7
F/601/5501	307	Competency in diagnosing and rectifying motorcycle engine faults	10
L/601/5503	308	Competency in diagnosing and rectifying motorcycle chassis systems	10

K/601/5508	312	Competency in diagnosing and rectifying motorcycle transmission and driveline faults	7
F/601/5563	355	Knowledge of motorcycle preparation and inspection	2
R/601/5566	357	Knowledge of diagnosis and rectification of motorcycle engine faults	6
D/601/5568	358	Knowledge of diagnosis and rectification of motorcycle chassis faults	6
L/601/5582	362	Knowledge of diagnosis and rectification of motorcycle transmission and driveline faults	4
Y/601/5441	436	Competency in diagnosing and rectifying motorcycle electrical faults	7
M/601/5512	486	Knowledge of diagnosis and rectification of motorcycle electrical faults	4
Optional Group 1			
Y/601/6380	006	Competency in making learning possible through demonstrations and instruction	5
T/601/6242	056	Knowledge of how to make learning possible through demonstrations and instruction	5
Optional Group 2			
K/601/6383	008	Competency in identifying and agreeing motor vehicle customer service needs	5
R/601/6247	058	Knowledge of how to identify and agree motor vehicle customer service needs	5



2 Centre requirements

Approval

If your Centre is approved to offer the Level 2 or Level 3 NVQ in Automotive Maintenance and Repair - Motorcycle (4101-03/08) you will be granted automatic approval for the 4270 Level 2 or Level 3 Diploma in Motorcycle Maintenance and Repair Competence (4270-32/33) at the same level and will be able to make registrations straight away.

For any other cases, centres will need to gain both centre and qualification approval. Please refer to the *Centre Manual – Supporting Customer Excellence* for further information.

Resource requirements

Physical resources and site agreements

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

Centre staffing

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

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

Assessors and internal verifiers

All assessors must:

- have sufficient and relevant technical/occupational competence in the Unit, at or above the level of the Unit being assessed
- have in depth knowledge of the Qualification or credit based unit evidence requirements.
- hold or be working towards a relevant assessors' award as specified by the sector skills council. This will include, but not be limited to the Assessor qualifications, Level 3 Award in Understanding the Principles and Practices of Assessment, Level 3 Award in Assessing Competence in the Work Environment, Level 3 Award in Assessing Vocationally Related Achievement, Level 3 Certificate in Assessing Vocational Achievement. (and by implication legacy Assessor units A1, A2 and

D32/33 unit) but may be an appropriate equivalent as defined by the SSC).

- assessors working towards a relevant assessor qualification must achieve their qualification within 12 months.
- demonstrate knowledge and understanding of the competencies that a learner is required to demonstrate for the qualification that they are undertaking
- provide evidence of completing 5 days working/job shadowing in industry within their professional area in a 24 month period.
- provide evidence of 30 hours of technical/qualification related CPD within a 12 month period. (This is in addition to working / job shadowing).

All internal verifiers must:

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

Continuing professional development (CPD)

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

Candidate entry requirements

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

Age restrictions

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



3 Delivering the qualification

Initial assessment and induction

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

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

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

Support materials

City & Guilds will provide the following learning and support resources which will be posted on our website.

www.cityandguilds.com/automotive

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

Recording documents

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

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

www.cityandguilds.com/eportfolios.

City & Guilds has developed training and assessment documentation specifically for these qualifications which are available from City & Guilds website. Although new centres are expected to use these forms, centres may devise or customise alternative forms, which must be approved for use by the external verifier, before they are used by candidates and assessors at the centre.

Health and safety

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

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

Data protection and confidentiality

Centres offering this qualification may need to provide City & Guilds with personal data for staff and candidates. Guidance on data protection and the obligations of City & Guilds and centres are explained in *Centre Manual – Supporting Customer Excellence*.

Initial assessment and induction

Centres will need to make an initial assessment of each candidate prior to the start of their programme to ensure they are entered for an appropriate type and level of qualification. The initial assessment should identify any specific training needs the candidate may have, and the support and guidance they may require when working towards their qualification.

City & Guilds recommends that centres provide an induction programme to ensure the candidate fully understands the requirements of the qualification they will work towards, their responsibilities as a candidate, and the responsibilities of the centre. It may be helpful to record the information on a learning contract. Further guidance about initial assessment and induction, as well as a learning contract that centres may use, are available in the Centre Manual.

Equal opportunities

It is a requirement of centre approval that centres have an equal opportunities policy (see *Centre Manual – Supporting Customer Excellence*).

The regulatory authorities require City & Guilds to monitor centres to ensure that equal opportunity policies are being followed. The City & Guilds equal opportunities policy is set out on the City & Guilds website, in *Centre Manual – Supporting Customer Excellence*, in the *Directory of qualifications*, and is also available from the City & Guilds Customer Relations department.

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

Access to assessment

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

Appeals

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

Further information on appeals is given in *Centre Manual – Supporting Customer Excellence*. There is also information on appeals for centres and learners on the City & Guilds website or available from the Customer Relations department.



4 Assessment

Assessment of the qualification

Candidates must:

- successfully complete one online examination for each knowledge unit
- have a completed portfolio of evidence for each competence unit

Time constraints

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

Recognition of prior learning (RPL)

Recognition of prior learning means using a learner's previous experience, or qualifications which have already been achieved, to contribute to a new qualification.

RPL is allowed and is also sector specific.

Proxy units / credit transfer

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

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

Level 2 Diploma in Motorcycle Maintenance and Repair Competence

Unit number	Unit title	Assessment method
001	Competency in health, safety and good housekeeping in the automotive environment	Portfolio
003	Competency in supporting job roles in the automotive work environment	Portfolio

Unit number	Unit title	Assessment method
004	Skills in materials, fabrication, tools and measuring devices in the automotive environment	Portfolio
008	Competency in identifying and agreeing motor vehicle customer service needs	Portfolio
051	Knowledge of health, safety and good housekeeping in the automotive environment	Portfolio
053	Knowledge of support for job roles in the automotive work environment	Portfolio
054	Knowledge of materials, fabrication, tools and measuring devices used in the automotive environment	Portfolio
058	Knowledge of how to identify and agree motor vehicle customer service needs	Portfolio
301	Competency in routine motorcycle maintenance	Portfolio
302	Competency in motorcycle internal engine systems	Portfolio
303	Competence in removing and replacing motorcycle electrical units and components	Portfolio
304	Competence in removing and replacing motorcycle chassis units and components	Portfolio
305	Competency in motorcycle preparation and inspection	Portfolio
351	Knowledge of routine motorcycle maintenance	Multiple Choice
352	Knowledge of motorcycle internal engine systems	Multiple Choice
353	Knowledge of removing and replacing motorcycle electrical units and components	Multiple Choice
354	Knowledge of removing and replacing motorcycle chassis units and components	Multiple Choice
355	Knowledge of motorcycle preparation and inspection	Multiple Choice
372	Knowledge of motorcycle fuel, ignition, air and exhaust system units and components	Multiple Choice

Level 3 Diploma in Motorcycle Maintenance and Repair Competence

Unit number	Unit title	Assessment method
001	Competency in health, safety and good housekeeping in the automotive environment	Portfolio
003	Competency in supporting job roles in the automotive work environment	Portfolio
004	Skills in materials, fabrication, tools and measuring devices in the automotive environment	Portfolio

Unit number	Unit title	Assessment method
006	Competency in making learning possible through demonstrations and instruction	Portfolio
008	Competency in identifying and agreeing motor vehicle customer service needs	Portfolio
051	Knowledge of health, safety and good housekeeping in the automotive environment	Portfolio
053	Knowledge of support for job roles in the automotive work environment	Portfolio
054	Knowledge of materials, fabrication, tools and measuring devices used in the automotive environment	Portfolio
056	Knowledge of how to make learning possible through demonstrations and instruction	Portfolio
058	Knowledge of how to identify and agree motor vehicle customer service needs	Portfolio
305	Competency in motorcycle preparation and inspection	Portfolio
307	Competency in diagnosing and rectifying motorcycle engine faults	Portfolio
308	Competency in diagnosing and rectifying motorcycle chassis systems	Portfolio
312	Competency in diagnosing and rectifying motorcycle transmission and driveline faults	Portfolio
355	Knowledge of motorcycle preparation and inspection	Multiple Choice
357	Knowledge of diagnosis and rectification of motorcycle engine faults	Multiple Choice
358	Knowledge of diagnosis and rectification of motorcycle chassis faults	Multiple Choice
362	Knowledge of diagnosis and rectification of motorcycle transmission and driveline faults	Multiple Choice
436	Competency in diagnosing and rectifying motorcycle electrical faults	Portfolio
486	Knowledge of diagnosis and rectification of motorcycle electrical faults	Multiple Choice



5 Units

Structure of units

These units each have the following:

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

Summary of units

City & Guilds unit number	Unit title	Unit accreditation number (UAN)
001	Competency in health, safety and good housekeeping in the automotive environment	A/601/6338
003	Competency in supporting job roles in the automotive work environment	K/601/6366
004	Skills in materials, fabrication, tools and measuring devices in the automotive environment	Y/601/6279
006	Competency in making learning possible through demonstrations and instruction	Y/601/6380
008	Competency in identifying and agreeing motor vehicle customer service needs	K/601/6383
051	Knowledge of health, safety and good housekeeping in the automotive environment	D/601/6171
053	Knowledge of support for job roles in the automotive work environment	T/601/6175
054	Knowledge of materials, fabrication, tools and measuring devices used in the automotive environment	K/601/6237
056	Knowledge of how to make learning possible through demonstrations and instruction	T/601/6242

City & Guilds unit number	Unit title	Unit accreditation number (UAN)
058	Knowledge of how to identify and agree motor vehicle customer service needs	R/601/6247
301	Competency in routine motorcycle maintenance	D/601/5442
302	Competency in motorcycle internal engine systems	L/601/5484
303	Competency in removing and replacing motorcycle electrical units and components	K/601/5489
304	Competency in removing and replacing motorcycle chassis units and components	T/601/5494
305	Competency in motorcycle preparation and inspection	J/601/5497
307	Competency in diagnosing and rectifying motorcycle engine faults	F/601/5501
308	Competency in diagnosing and rectifying motorcycle chassis systems	L/601/5503
312	Competency in diagnosing and rectifying motorcycle transmission and driveline faults	K/601/5508
351	Knowledge of routine motorcycle maintenance	F/601/5515
352	Knowledge of motorcycle internal engine systems	Y/601/5519
353	Knowledge of removing and replacing motorcycle electrical units and components	H/601/5555
354	Knowledge of removing and replacing motorcycle chassis units and components	T/601/5558
355	Knowledge of motorcycle preparation and inspection	F/601/5563
357	Knowledge of diagnosis and rectification of motorcycle engine faults	R/601/5566
358	Knowledge of diagnosis and rectification of motorcycle chassis faults	D/601/5568
362	Knowledge of diagnosis and rectification of motorcycle transmission and driveline faults	L/601/5582
372	Knowledge of motorcycle fuel, ignition, air and exhaust system units and components	T/601/5527
436	Competency in diagnosing and rectifying motorcycle electrical faults	Y/601/5441
486	Knowledge of diagnosis and rectification of motorcycle electrical faults	M/601/5512

Unit 001

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

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

Learning outcome	The learner will:
1.	be able to use correct personal and vehicle protection within the automotive work environment
Assessment criteria	
The learner can:	
1.1	select and use personal protective equipment throughout activities. to include appropriate protection of: <ul style="list-style-type: none">a. eyesb. earsc. headd. skine. feetf. handsg. lungs
1.2	select and use vehicle protective equipment throughout all activities

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

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

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

Unit 001

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

Evidence requirements

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

Unit 003

Competency in supporting job roles in the automotive work environment

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

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

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

Learning outcome	The learner will:
3.	be able to communicate with and support colleagues and customers effectively within the automotive work environment
Assessment criteria	
The learner can:	
3.1	use methods of communication with customers and colleagues which meet their needs
3.2	give customers and colleagues accurate information
3.3	make requests for assistance from or to customers and colleagues clearly and courteously
3.4	report any anticipated delays in completion to the relevant persons promptly.

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

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

Supporting information

Evidence requirements

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

Unit 004

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

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

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

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

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

Learning outcome	The learner will:
4.	be able to apply automotive engineering, fabrication and fitting principles when modifying and repairing vehicles and components
Assessment criteria	
The learner can:	
4.1	use correct procedures when: <ul style="list-style-type: none"> a. filing b. tapping threads c. cutting plastics and metals d. drilling plastics and metals e. fitting.
4.2	use appropriate techniques when fabricating, repairing and modifying vehicles and components.
4.3	select and use: <ul style="list-style-type: none"> a. gaskets b. seals c. sealants d. fittings and fasteners
4.4	apply modification and repair techniques to automotive electrical circuits
4.5	select and use locking, fixing and fastening devices.

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

Supporting information

Assessment requirements

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

Unit 006

Competency in making learning possible through demonstrations and instruction

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

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

Learning outcome	The learner will:
2.	be able to instruct learners
Assessment criteria	
<p>The learner can:</p> <ul style="list-style-type: none"> 2.1 implement instruction which is matched to the needs of learners 2.2 use identified learning outcomes which can be achieved through instruction 2.3 perform instruction, ensuring that the manner, level and speed of the instruction encourages learners to take part 2.4 perform instruction whilst regularly checking that the learners understand and adapt instruction as appropriate 2.5 give learners positive feedback on the learning experience and the outcomes achieved 2.6 carry out a review with the learners to identify anything that prevented learning and adapt instruction as appropriate. 	

Unit 006 **Competence in making
learning possible through
demonstrations and
instruction**

Supporting information

Evidence requirements

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

Unit 008

Competency in identifying and agreeing motor vehicle customer service needs

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

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

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

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

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

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

Supporting information

Evidence requirements

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

Unit 051

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

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

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

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

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

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

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

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

Supporting information

Evidence requirements

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

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

Economic use of Resources

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

Requirement to maintain work area effectively

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

Spillages, leaks and waste materials

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

Basic legislative requirements

- a. Provision and Use of Work Equipment Regulations 1992
- b. Provision and Use of Work Equipment Regulations 1998 as applied to power presses
- c. Pressure Systems and Transportable Gas Containers Regulations 1989
- d. Electricity at Work Regulations 1989
- e. Noise at Work Regulations 1989
- f. Manual Handling Operations Regulations 1992
- g. Health and Safety (Display Screen Equipment) Regulations 1992
- h. Abrasive Wheels Regulations 1970
- i. The Lifting Operations and Lifting Equipment Regulations 1998
- j. Work at Height Regulations 2005.

Routine maintenance of the workplace

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

Legislation relevant to Health and Safety

- a. Health And Safety At Work Act 1974
- b. Control of Substances Hazardous to Health Regulations 2002
- c. Environmental Protection Agency
- d. Manual Handling Operations Regulations 1992
- e. Personal Protective Equipment Regulations 1992.

General regulations to include an awareness of:

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

Legislative duties

- a. The purpose of a Health and Safety Policy.

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

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

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

PPE to include:

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

- ii ears
- iii head
- iv skin
- v feet
- vi hands
- vii lungs.

Fire and extinguishers

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

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

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

Product warning labels to include:

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

Warning signs and notices

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

Hazards and risks to include:

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

Personal responsibilities

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

Action to be taken in the event of colleagues suffering accidents

- a. The typical sequence of events following the discovery of an accident such as:
 - i make the area safe
 - ii remove hazards if appropriate i.e. switch off power
 - iii administer minor first aid
 - iv take appropriate action to re-assure the injured party
 - v raise the alarm
 - vi get help
 - vii report on the accident.
- b. Typical examples of first aid which can be administered by persons at the scene of an accident:
 - i check for consciousness
 - ii stem bleeding
 - iii keep the injured person's airways free

- iv place in the recovery position if injured person is unconscious
 - v issue plasters for minor cuts
 - vi action to prevent shock i.e. keep the injured party warm
 - vii administer water for minor burns or chemical injuries
 - viii wash eyes with water to remove dust or ingress of chemicals (battery acid)
 - ix need to seek professional help for serious injuries.
- c. Examples of bad practice which may result in further injury such as:
- i moving the injured party
 - ii removing foreign objects from wounds or eyes
 - iii inducing vomiting
 - iv straightening deformed limbs.

Unit 053

Knowledge of support for job roles in the automotive work environment

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

Learning outcome	The learner will:
1.	understand key organisational structures, functions and roles within the automotive work environment
Assessment criteria	
The learner can:	
1.1	identify the purpose of the main sections of a typical automotive work environment.
1.2	explain organisational structures and lines of communication within the automotive work environment
1.3	explain levels of responsibility within specific job roles in automotive workplace. to include: <ul style="list-style-type: none">a. traineeb. skilled technicianc. supervisord. manager.

Learning outcome	The learner will:
2.	understand the importance of obtaining, interpreting and using information in order to support their job role within the automotive work environment
Assessment criteria	
The learner can:	
2.1	explain the importance of different sources of information in an automotive work environment.
2.2	explain how to find, interpret and use relevant sources of information.
2.3	describe the main legal requirements relating to the vehicle, including road safety requirements
2.4	explain the importance of working to recognised procedures and processes
2.5	explain when replacement units and components must meet the manufacturers' original equipment specification.
2.6	explain the purpose of how to use identification codes.

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

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

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

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

Supporting information

Evidence requirements

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

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

The structure of a typical vehicle repair business

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

Sources of information:

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

Communication requirements when carrying out vehicle repairs

- a. Locating and using correct documentation and information for:
 - i recording vehicle maintenance and repairs
 - ii vehicle specifications
 - iii component specifications
 - iv oil and fluid specifications
 - v equipment and tools
 - vi identification codes
- b. Procedures for:
 - i referral of problems
 - ii reporting delays
 - iii additional work identified during repair or maintenance

iv keeping others informed of progress.

Methods of communication:

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

Organisational and customer requirements:

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

Choice of communication

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

Importance of maintaining positive working relationships:

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

Unit 054

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

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

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

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

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

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

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

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

Supporting information

Evidence requirements

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

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

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

- a. Files.
- b. Hacksaws and snips.
- c. Hammers.
- d. Screwdrivers.
- e. Pliers.
- f. Spanners.
- g. Sockets.
- h. Punches.
- i. Types of drill and drill bits.
- j. Taps and dies.
- k. Stud removers.
- l. Marking out tools.

Common measuring devices used for fabrication and fitting in the automotive workplace, to include:

- a. Rule or tape.
- b. Callipers.
- c. Feeler gauge.
- d. Volume measures.
- e. Micrometer.
- f. Dial gauges.
- g. Torque wrenches.
- h. Depth gauges.

Common electrical measuring tools used in the repair of vehicles and components, to include:

- a. Ammeter.
- b. Voltmeter.

- c. Ohmmeter.
- d. Multi-meter.

Common electrical terms when measuring:

- a. Voltage.
- b. Current.
- c. Resistance.

Workshop equipment (including appropriate PPE) to include:

- a. Hydraulic jacks.
- b. Axle stands.
- c. Pillar drills.
- d. Air tools.
- e. Vehicle lifts.
- f. Cranes.
- g. Hoists.
- h. Electrical power tools.

Properties, application and limitations (to include safe use) of ferrous and non-ferrous metals used when constructing, modifying and repairing vehicles and components. Materials to include:

- a. Carbon steels.
- b. Alloy steels.
- c. Cast iron.
- d. Aluminium alloys.
- e. Brass.
- f. Copper.
- g. Lead.

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

- a. Glass.
- b. Plastics (inc GRP).
- c. Kevlar.
- d. Rubber.

Terms relating to the properties of materials, to include:

- a. Hardness.
- b. Toughness.
- c. Ductility.
- d. Elasticity.
- e. Tenacity.
- f. Malleability.
- g. Plasticity.

Unit 056

Knowledge of how to make learning possible through demonstrations and instruction

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

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

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

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

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

Supporting information

Evidence requirements

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

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

Separate areas of demonstration which encourage learning, to include:

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

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

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

How to structure demonstration and instruction sessions, to include:

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

- iv. ensure all students can see even small equipment and processes
- v. time the demonstration
- vi. consider how to make students participate
- vii. consider how to emphasise safe working practices.
- b. During the demonstration and/or instruction good practice is to:
 - i. give a clear introduction
 - ii. identify any tools/equipment
 - iii. determine the current audience level of knowledge
 - iv. complete the demonstration correctly (do not show how not to do it)
 - v. stress key points and show links between them
 - vi. monitor safety aspects
 - vii. check learner understanding.
- c. After the demonstration (if possible):
 - i. enable the audience to practice the techniques
 - ii. provide feedback on their performance.

How to identify individual learning needs

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

What factors are likely to prevent learning to include:

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

How to check learners understanding and progress

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

How to organise information and prepare materials

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

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

Instructional techniques

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

Environmental factors that effect learning

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

Health and safety factors that affect learning

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

Analysis of demonstration/instruction to include:

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

Developments in learning to include:

- a. Multimedia based materials.

- b. Web based materials.
- c. Interactive materials.

How to choose and prepare appropriate materials, to include:

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

Unit 058

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

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

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

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

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

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

Supporting information

Evidence requirements

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

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

Organisational requirements

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

Principles of customer communication and care

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

Company products and services

- a. Service standards:
 - i. national

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

Vehicle information systems, servicing and repair requirements

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

Consumer legislation to include:

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

Unit 301

Competency in routine motorcycle maintenance

UAN:	D/601/5442
Level:	Level 2
Credit value:	7
GLH:	60
Relationship to NOS:	This unit is linked to MC01C Demonstrate Competence in Routine Motorcycle Maintenance.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the sector skills council for the automotive retail industry.
Aim:	This unit enables the learner to develop an understanding of conducting routine maintenance, adjustment and replacement activities as part of the periodic servicing of motorcycles.

Learning outcome	The learner will:
1.	be able to work safely when carrying out motorcycle routine maintenance
Assessment criteria	
The learner can:	
1.1	use suitable personal protective equipment and motorcycle coverings throughout all 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 routine maintenance activities including: a. motorcycle technical data b. maintenance 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
Assessment criteria	
The learner can:	
3.1	select the appropriate tools and equipment necessary for carrying out routine maintenance
3.2	ensure that equipment has been calibrated to meet manufacturers' and legal requirements
3.3	use the correct tools and equipment in the way specified by manufacturers when carrying out routine maintenance.

Learning outcome	The learner will:
4.	be able to carry out motorcycle routine maintenance
Assessment criteria	
The learner can:	
4.1	carry out motorcycle inspections using prescribed methods, adhering to the correct specifications and tolerances for the motorcycle and following: <ul style="list-style-type: none"> a. the manufacturer's approved inspection methods b. recognised researched inspection methods c. health and safety requirements
4.2	carry out adjustments, replacement of motorcycle components and replenishment of consumable materials following the manufacturer's current specification
4.3	ensure the examination methods identify accurately any motorcycle system and or component problems falling outside the maintenance schedule are specified
4.4	ensure that the inspected motorcycle conforms to the motorcycle operating specification and any legal requirements
4.5	use suitable testing methods to evaluate the performance of all replaced and adjusted components and systems accurately
4.6	work to the specified timescale for the activity.

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

Unit 301 Competency in routine motorcycle maintenance

Supporting information

Evidence requirements

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

Unit 302

Competency in motorcycle internal engine systems

UAN:	L/601/5484
Level:	Level 2
Credit value:	10
GLH:	90
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 IMI, the sector skills council for the automotive retail industry.
Aim:	<p>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.</p> <p>It covers the procedures involved in the removal and replacement of system components and the evaluation of their performance.</p>

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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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 systems performs to the motorcycle operating specification and meets any legal requirements
4.5	work to the specified timescale for the activity.

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

Unit 302 Competency in motorcycle internal engine systems

Supporting information

Evidence requirements

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

Unit 303

Competency in removing and replacing motorcycle electrical units and components

UAN:	K/601/5489
Level:	Level 2
Credit value:	10
GLH:	90
Relationship to NOS:	This unit is linked to MC03 Remove and Replace Motorcycle Electrical Units and Components.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the sector skills council for the automotive retail industry.
Aim:	This unit enables the learner to develop competency in the 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.	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 electrical unit and component removal and replacement activities including: <ul style="list-style-type: none"> a. motorcycle technical data and codes b. removal and replacement procedures c. legal requirements
2.2	use technical information to support motorcycle 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 motorcycle electrical system components
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 motorcycle electrical 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: <ul style="list-style-type: none"> a. the manufacturer's approved and workplace removal and replacement methods b. recognised researched repair methods c. health and safety requirements.
4.2	ensure 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 systems performs to the motorcycle operating specification and meets any legal requirements
4.5	work to the specified timescale for the activity.

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

Unit 303 Competency in removing and replacing motorcycle electrical units and components

Supporting information

Evidence requirements

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

Unit 304

Competency in removing and replacing motorcycle chassis units and components

UAN:	T/601/5494
Level:	Level 2
Credit value:	10
GLH:	90
Relationship to NOS:	This unit is linked to MC04 Remove and Replace Motorcycle Chassis Units and Components.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the sector skills council for the automotive retail industry.
Aim:	This unit enables the learner to develop competency in 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. 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 chassis unit and component removal and replacement activities including: <ul style="list-style-type: none"> a. motorcycle technical data b. removal and replacement procedures c. legal requirements
2.2	use technical information to support motorcycle 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 motorcycle chassis systems including: <ul style="list-style-type: none"> a. steering b. suspension c. braking d. wheels and tyres
3.2	ensure that equipment has been calibrated to meet manufacturers' and legal requirements
3.3	use the correct tools and equipment in the way specified by manufacturers to remove and replace motorcycle chassis systems.

Learning outcome	The learner will:
	4. be able to carry out removal and replacement of motorcycle chassis units and components.
Assessment criteria	
The learner can:	
4.1	remove and replace the motorcycle chassis systems and components, adhering to the correct specifications and tolerances for the motorcycle and following: <ul style="list-style-type: none"> a. the manufacturer's approved removal and replacement methods b. recognised researched repair methods c. health and safety requirements
4.2	ensure that replaced motorcycle chassis 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 chassis system performs to the operating specification and meets any legal requirements
4.5	work to the specified timescale for the activity.

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, completed and passed to the relevant person(s) promptly in the format required
5.2	make suitable and justifiable recommendations for cost effective repairs
5.3	identify and report any expected delays in completion to the relevant person(s) promptly in the format required
5.4	record and report any additional faults noticed during the course of their work promptly in the format required.

Unit 304 Competency in removing and replacing motorcycle chassis units and components

Supporting information

Evidence requirements

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

Unit 305

Competency in motorcycle preparation and inspection

UAN:	J/601/5497
Level:	Level 2
Credit value:	7
GLH:	60
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 IMI, the sector skills council for the automotive retail industry.
Aim:	This unit enables the learner to carry out motorcycle preparation activities and inspection according to manual 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
4.5	complete all system diagnostic activities within the agreed timescale.

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

Unit 305 Competency in motorcycle preparation and inspection

Supporting information

Evidence requirements

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

Unit 307

Competency in diagnosing and rectifying motorcycle engine faults

UAN:	F/601/5501
Level:	Level 3
Credit value:	10
GLH:	90
Relationship to NOS:	This unit is linked to MC07 Diagnose and Rectify Motorcycle Engine and Component Faults.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the sector skills council for the automotive retail industry.
Aim:	This unit enables the learner to develop competency in the diagnosis and rectification of motorcycle related system faults.

Learning outcome	The learner will:
1.	be able to work safely when carrying out motorcycle engine diagnostic and rectification activities
Assessment criteria	
The learner can:	
1.1	use suitable personal protective equipment and motorcycle coverings when using diagnostic methods and carrying out rectification 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 diagnostic and rectification activities including: a. motorcycle technical data b. diagnostic test procedures
2.2	use sufficient diagnostic information in a systematic way to enable an accurate diagnosis of motorcycle engine system faults.

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

Learning outcome	The learner will:
4.	be able to carry out motorcycle engine diagnosis, rectification and test activities
Assessment criteria	
The learner can:	
4.1	use diagnostic methods that are relevant to the symptoms presented
4.2	evaluate your assessment of dismantled sub-assemblies and identify their condition and suitability for repair or replacement accurately
4.3	carry out all diagnosis and rectification activities following: <ul style="list-style-type: none"> a. manufacturers instructions b. recognised researched repair methods c. workplace procedures d. health and safety requirements
4.4	ensure all repaired or replacement components and units conform to the motorcycle operating specification and any legal requirements
4.5	adjust components and units correctly to ensure that they operate to meet system requirements
4.6	use testing methods that are suitable for assessing the performance of the system rectified
4.7	ensure the rectified motorcycle engine system performs to the motorcycle operating specification and any legal requirements
4.8	complete all system diagnostic activities within the agreed timescale.

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

Unit 307 Competency in diagnosing and rectifying motorcycle engine faults

Supporting information

Evidence requirements

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

Unit 308

Competency in diagnosing and rectifying motorcycle chassis system faults

UAN:	L/601/5503
Level:	Level 3
Credit value:	10
GLH:	90
Relationship to NOS:	This unit is linked to MC08 Diagnose and Rectify Motorcycle Chassis System Faults.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the sector skills council for the automotive retail industry.
Aim:	This unit enables the learner to develop competency in the diagnosis and rectification of motorcycle chassis system faults.

Learning outcome	The learner will:
1.	be able to work safely when carrying out motorcycle chassis diagnostic and rectification activities
Assessment criteria	
The learner can:	
1.1	use suitable personal protective equipment and use motorcycle coverings when using motorcycle diagnostic methods and carrying out rectification 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 diagnostic and rectification activities including: <ol style="list-style-type: none"> a. motorcycle technical data b. diagnostic test procedures
2.2	use sufficient diagnostic information in a systematic way to enable an accurate diagnosis of motorcycle chassis system faults.

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

Learning outcome	The learner will:
4.	be able to carry out motorcycle chassis diagnosis, rectification and test activities
Assessment criteria	
The learner can:	
4.1	use diagnostic methods that are relevant to the symptoms presented
4.2	evaluate your assessment of dismantled sub-assemblies and identify their condition and suitability for repair or replacement accurately
4.3	carry out all diagnosis and rectification activities following: <ul style="list-style-type: none"> a. manufacturers instructions b. recognised researched repair methods c. workplace procedures d. health and safety requirements
4.4	ensure all repaired or replacement components and units conform to the motorcycle operating specification and any legal requirements
4.5	adjust components and units correctly to ensure that they operate to meet system requirements
4.6	use testing methods that are suitable for assessing the performance of the system rectified
4.7	ensure the rectified motorcycle chassis system performs to the motorcycle operating specification and any legal requirements
4.8	complete all system diagnostic activities within the agreed timescale.

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

Unit 308 Competency in diagnosing and rectifying motorcycle chassis system faults

Supporting information

Evidence requirements

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

Unit 312

Competency in diagnosing and rectifying motorcycle transmission and driveline faults

UAN:	K/601/5508
Level:	Level 3
Credit value:	7
GLH:	58
Relationship to NOS:	This unit is linked to MC12 Diagnose and Rectify Motorcycle Transmission and Drive System Faults.
Assessment requirements specified by a sector or regulatory body:	This unit was developed by IMI, the sector skills council for the automotive retail industry.
Aim:	This unit allows the learner to develop competency in the diagnosis and rectification of faults within motorcycle transmission systems.

Learning outcome	The learner will:
1.	be able to work safely when carrying out motorcycle transmission diagnostic and rectification activities
Assessment criteria	
The learner can:	
1.1	use suitable personal protective equipment and motorcycle coverings when using diagnostic methods and carrying out rectification 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 diagnostic and rectification activities including: a. motorcycle technical data b. diagnostic test procedures
2.2	use sufficient diagnostic information in a systematic way to enable an accurate diagnosis of motorcycle transmission system faults.

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

Learning outcome	The learner will:
4.	be able to carry out motorcycle transmission diagnosis, rectification and test activities
Assessment criteria	
The learner can:	
4.1	use diagnostic methods that are relevant to the symptoms presented
4.2	evaluate your assessment of dismantled sub-assemblies and identify their condition and suitability for repair or replacement accurately
4.3	carry out all diagnosis and rectification activities following: <ul style="list-style-type: none"> a. manufacturers instructions b. recognised researched repair methods c. workplace procedures d. health and safety requirements
4.4	ensure all repaired or replacement components and units conform to the motorcycle operating specification and any legal requirements
4.5	adjust components and units correctly to ensure that they operate to meet system requirements
4.6	use testing methods that are suitable for assessing the performance of the system rectified
4.7	ensure the rectified motorcycle transmission system performs to the motorcycle operating specification and any legal requirements
4.8	complete all system diagnostic activities within the agreed timescale.

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

Unit 312 Competency in diagnosing and rectifying motorcycle transmission and driveline faults

Supporting information

Evidence requirements

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

Unit 351

Knowledge of routine motorcycle maintenance

UAN:	F/601/5515
Level:	2
Credit value:	2
GLH:	20
Relationship to NOS:	This unit is linked to MC01 Carry Out Routine Motorcycle Maintenance.
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 conducting routine maintenance, adjustment and replacement activities as part of the periodic servicing of motorcycles.

Learning outcome	The learner will:
1.	understand how to carry out routine motorcycle maintenance
Assessment criteria	
The learner can:	
1.1	explain how to conduct a scheduled motorcycle routine examination and assessment against the motorcycle manufacturers' specification, legal and road safety requirements
1.2	identify the different systems to be inspected while carrying out motorcycle routine maintenance
1.3	identify adjustments that need to be carried out on a motorcycle routine maintenance.

Learning outcome	The learner will:
2.	understand the procedures required to carry out routine motorcycle maintenance
Assessment criteria	
The learner can:	
2.1	describe the procedures used for checking the condition and serviceability of motorcycle units and components
2.2	describe the procedures used for checking gaps and clearances
2.3	describe the procedures for checking and replenishing fluid levels
2.4	describe the procedures for checking and replacing lubricants
2.5	explain the procedure for reporting cosmetic damage to motorcycle components and units outside normal service items
2.6	Identify the operating specifications for the systems being checked while carrying out motorcycle routine maintenance.

Unit 351 Knowledge of Routine Motorcycle Maintenance

Supporting information

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

Motorcycle maintenance, inspection and adjustment and record findings

Motorcycle inspection techniques used in routine maintenance including:

- i. aural
- ii. visual and functional assessments on engine systems
- iii. visual and functional assessments on transmission power train
- iv. chassis systems
- v. wheels and tyres
- vi. electrical and electronic systems
- vii. motorcycle frame and components.

The procedures used for inspecting the condition and serviceability of the following:

- i. filters
- ii. drive belts
- iii. cables
- iv. brake linings
- v. pads
- vi. ignition components
- vii. hoses
- viii. tyres
- ix. lights
- x. chain and sprockets
- xi. steering and suspension
- xii. battery and charging.

The procedures used for checking gaps and clearances:

- i. ignition components
- ii. carburettor
- iii. valve clearances
- iv. clutch
- v. drive train
- vi. brakes.

Preparation and appropriate use of equipment to include:

- i. test instruments
- ii. emission equipment

- iii. wheel alignment
- iv. beam setting equipment
- v. tyre tread depth gauges.

Procedures for checking and replenishing fluid levels:

- i. oil
- ii. water
- iii. hydraulic fluids
- iv. greases.

Procedures for checking and replacement of lubricants:

- i. replace oil filters
- ii. check levels
- iii. types of oil
- iv. cleanliness
- v. disposal of old oil and filters.

Procedures for carrying out adjustments on motorcycle systems or components:

- i. clearances
- ii. settings
- iii. alignment
- iv. operational performance (engine idle, exhaust gas).

Procedures for checking electrical systems:

- i. operation
- ii. security
- iii. performance.

Importance and process of detailed inspection procedures:

- i. following inspection checklists
- ii. checking conformity to manufacturer's specifications
- iii. UK and European legal requirements.

Importance and process of completing all relevant documentation relating to motorcycle maintenance:

- i. inspection records
- ii. job cards
- iii. motorcycle repair records
- iv. motorcycle service history.

The need to use motorcycle protection prior to service and repair

Requirements and methods used for protecting:

- i. motorcycle body panels
- ii. paint surfaces
- iii. chrome surfaces.

The need to check the motorcycle prior to routine maintenance

The need to inspect the motorcycle following routine maintenance:

- i. professional presentation of motorcycle

ii. customer perceptions.

The basic checks of motorcycle following routine maintenance:

- i. removal of oil and grease marks
- ii. body panels
- iii. chrome
- iv. paint surfaces
- v. motorcycle controls
- vi. re-instatement of components.

Different systems to be inspected while carrying out motorcycle routine maintenance.

- i. engine and power train systems
- ii. chassis systems
- iii. wheels and tyres
- iv. electrical and electronic systems
- v. motorcycle frame and components.

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:	<p>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.</p> <p>It covers the procedures involved in the removal and replacement of system components and the evaluation of their performance.</p>

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: <ol style="list-style-type: none"> 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 353

Knowledge of removing and replacing motorcycle electrical units and components

UAN:	H/601/5555
Level:	2
Credit value:	6
GLH:	45
Relationship to NOS:	This unit is linked to MC03 Remove and Replace Motorcycle Electrical 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 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 motorcycle electrical and electronic principles
Assessment criteria	
The learner can:	
1.1	identify electrical symbols and units found in motorcycle circuits
1.2	describe how to interpret motorcycle wiring diagrams
1.3	describe the operation of key motorcycle circuit safety protection devices and why these are necessary
1.4	describe motorcycle earthing principles and earthing methods
1.5	identify the use of different cables and connectors used in motorcycle 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 motorcycle electrical circuits
1.8	state common terms used in motorcycle electrical circuits.

Learning outcome	The learner will:
2.	understand how motorcycle batteries, starting and charging systems operate
Assessment criteria	
The learner can:	
2.1	identify motorcycle batteries, starting and charging system components
2.2	describe the construction and operation of motorcycle batteries, starting and charging system components
2.3	compare motorcycle batteries, starting and charging system components and assemblies against alternatives to identify differences in construction and operation
2.4	state common terms used in conjunction with motorcycle batteries, starting and charging systems.

Learning outcome	The learner will:
3.	understand how motorcycle auxiliary electrical systems operate
Assessment criteria	
The learner can:	
3.1	identify motorcycle auxiliary system components
3.2	describe the construction and operation of motorcycle auxiliary systems
3.3	compare key motorcycle auxiliary system components and assemblies against alternatives to identify differences in construction and operation
3.4	state common terms used in motorcycle auxiliary system design.

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

Unit 353 Knowledge of removing and replacing motorcycle electrical units and components

Supporting information

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

Electrical/electronic principles

- a. Electrical units:
 - i. volt (electrical pressure)
 - ii. ampere (electrical current)
 - iii. OHM (electrical resistance)
 - iv. watt (power).
- b. The requirements for an electrical circuit:
 - i. battery
 - ii. cables
 - iii. switch
 - iv. current consuming device
 - v. continuity.
- c. The direction of current flow and electron flow.
- d. Series and parallel circuits to include:
 - i. current flow
 - ii. voltage of components
 - iii. volt drop
 - iv. resistance
 - v. the effect on circuit operation of open circuit component(s).
- e. Earth and insulated return systems.
- f. Cable sizes and colour codes.
- g. Different types of connectors, terminals and circuit protection devices.
- h. Common electrical and electronic symbols.
- i. The meaning of:
 - i. short circuit
 - ii. open circuit
 - iii. bad earth
 - iv. high resistance
 - v. electrical capacity.
- j. The principles of vehicle electronic systems and components.
- k. Interpret vehicle wiring diagrams to include:
 - i. vehicle lighting
 - ii. auxiliary circuits

- iii. indicators
 - iv. starting and charging systems.
- I. Function and construction of electrical components including:
 - i. circuit relays
 - ii. bulb types
 - iii. cooling fan
 - 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.

Starting

- a. The layout, construction and operation of engine starting systems.
- b. The function and operation of the following components:
 - i. starter motor
 - ii. starter clutch mechanism
 - iii. pinion
 - iv. starter solenoid
 - v. clutch and gear safety switch
 - vi. ignition/starter switch
 - vii. stand switches
 - viii. starter relay (if appropriate).

Lighting

- a. Function and construction of electrical components including:
 - i. front and tail lamps
 - ii. main and dip beam headlamps
 - iii. lighting and dip switch
 - iv. directional indicators
 - v. flash.
- b. The circuit diagram and operation of components for:
 - i. side and tail lamps
 - ii. headlamps
 - iii. 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. anti theft devices
 - ii. horn
 - iii. heated grips
 - iv. power screen.
- b. The circuit diagram and operation of components for:
 - i. anti theft devices
 - ii. horn
 - iii. heated grips
 - iv. power screen.

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. motorcycle protection when dismantling
 - iii. removal of and replacing electrical and electronic components and systems.
- c. The importance of logical and systematic processes.
- d. Preparation of replacement units for re-fitting or replacement electrical and electronic components and systems.
- e. The reasons why replacement components and units must meet the original specifications (OES) – warranty requirements, to maintain performance, safety requirements.
- f. Re-fitting 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.
- i. Construction and operation of motorcycle auxiliary systems. Auxiliary systems to include:
 - i. lighting systems
 - ii. security and alarm systems
 - iii. comfort and convenience systems
 - iv. information system
 - v. communication systems
 - vi. monitoring and instrumentation systems.

Unit 354

Knowledge of removing and replacing motorcycle chassis units and components

UAN:	T/601/5558
Level:	2
Credit value:	6
GLH:	45
Relationship to NOS:	This unit is linked to MC04 Remove and Replace Motorcycle Chassis 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 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 motorcycle steering and suspension systems operate	
Assessment criteria	
The learner can:	
1.1	identify motorcycle and suspension system components
1.2	describe the construction and operation of motorcycle steering and suspension systems
1.3	compare key motorcycle 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 motorcycle steering and suspension systems: a. steering angles b. hydraulic forces c. stress and strain
1.5	state common terms used in motorcycle steering and suspension system design.

Learning outcome	The learner will:
2.	understand how motorcycle braking systems operate
Assessment criteria	
The learner can:	
2.1	identify motorcycle braking system components
2.2	describe the construction and operation of motorcycle braking systems
2.3	compare key motorcycle 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 motorcycle braking systems:
	a. laws of friction
	b. hydraulics
	c. properties of fluids
	d. properties of air
	e. braking efficiency
2.5	state common terms used in motorcycle braking system design.

Learning outcome	The learner will:
3.	understand how motorcycle wheel and tyre systems operate
Assessment criteria	
The learner can:	
3.1	identify motorcycle wheel and tyre components
3.2	describe the construction and operation of motorcycle wheels and tyres
3.3	compare key motorcycle 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 motorcycle wheel and tyre systems:
	a. friction
	b. un-sprung weight
	c. dynamic and static balance
3.5	state common terms used in motorcycle wheel and tyre design.

Learning outcome	The learner will:
4.	understand how to check, replace and test chassis units, parts, 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 test and evaluate the performance of replacement units against vehicle specification
4.4	identify common faults found in motorcycle chassis units and components.

Unit 354 Knowledge of removing and replacing motorcycle chassis units and components

Supporting information

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

Steering

- a. The action and purpose of steering geometry:
 - i. castor angle
 - ii. trail angle
 - iii. wheel alignment.
- b. The following terms associated with steering:
 - i. castor angle
 - ii. trail angle
 - iii. rake angle
 - iv. wheel alignment.
- c. The components and layout of steering systems:
 - i. handlebar
 - ii. conventional steering head
 - iii. leading link
 - iv. bearings
 - v. steering stem
 - vi. yolk.
- d. The procedures used for inspecting the serviceability and condition of:
 - i. conventional steering head
 - ii. leading link.
- e. Steering system defects to include:
 - i. uneven tyre wear
 - ii. steering vibrations
 - iii. wear in linkage
 - iv. bearing failure
 - v. damage linkage
 - vi. excessive play
 - vii. incorrect fork alignment
 - viii. incorrect steering geometry.

Suspension

- a. The layout and components of suspension systems:
 - i. conventional telescopic fork and tube
 - ii. upside down telescopic fork and tube
 - iii. hossack/Fior (Duolever) fork

- iv. springer fork
- v. leading link.
- b. The operation of suspension systems and components:
 - i. conventional telescopic fork and tube
 - ii. upside down telescopic fork and tube
 - iii. hydraulic damper
 - iv. double swinging arm
 - v. single swing arm
 - vi. mono shock
 - vii. adjustable damper
 - viii. adjustable spring.
- c. The advantages of different systems including:
 - i. conventional telescopic fork and tube
 - ii. upside down telescopic fork and tube
 - iii. hydraulic damper
 - iv. double swinging arm
 - v. single swing arm
 - vi. mono shock
 - vii. adjustable damper
 - viii. adjustable spring.
- d. The forces acting on suspension systems during braking, riding and cornering.
- e. The methods of locating the road wheels against braking, driving and cornering forces.
- f. Suspension terms:
 - i. rebound
 - ii. bump
 - iii. dive.
- g. The procedures used for inspecting the serviceability and condition of the suspension system.
- h. Suspension system defects:
 - i. wheel hop
 - ii. ride height
 - iii. wear
 - iv. noises under operation
 - v. fluid leakage
 - vi. excessive travel
 - vii. excessive tyre wear
 - viii. poor handling
 - ix. worn dampers
 - x. worn joints
 - xi. damaged linkages.

Brakes

- a. The construction and operation of drum brakes:
 - i. leading and trailing shoe construction
 - ii. drum designs
 - iii. cable
 - iv. hydraulic
 - v. self-servo action

- vi. adjustment.
- b. The construction and operation of disc brakes:
 - i. disc pads
 - ii. calliper
 - iii. brake disc
 - iv. ventilated disc
 - v. disc pad retraction.
- c. The construction and operation of the hydraulic braking system:
 - i. master cylinders
 - ii. disc brake calliper and pistons
 - iii. brake pipe
 - iv. warning lights.
- d. The principles and components of electronic ABS systems, electrical and electronic components.
- e. The requirements and hazards of brake fluid:
 - i. boiling point
 - ii. hygroscopic action
 - iii. manufacturer's change periods
 - iv. fluid classification and rating
 - v. potential to damage paint surfaces.
- f. Terms associated with mechanical and hydraulic braking systems:
 - i. braking efficiency
 - ii. brake fade
 - iii. ABS.
- g. The procedures used for inspecting the serviceability and condition of the braking system.
- h. Braking system defects:
 - i. worn brake shoes or pads
 - ii. worn or scored brake drums
 - iii. worn or scored brake discs
 - iv. abnormal brake noises
 - v. brake judder
 - vi. brake adjustments
 - vii. fluid contamination of brake surfaces
 - viii. antilock brake failure
 - ix. fluid leaks
 - x. poor braking efficiency
 - xi. brake bind
 - xii. brake grab
 - xiii. brake fade.

Wheel and tyres

- a. The construction of different types of tyre:
 - i. radial
 - ii. tread patterns
 - iii. tyre mixing regulations
 - iv. tyre applications.
- b. Tyre markings:
 - i. tyre and wheel size markings
 - ii. speed rating

- iii. direction of rotation
- iv. profile
- v. tread-wear indicators.
- c. Wheel construction:
 - i. light alloy
 - ii. wire wheels
 - iii. bearing arrangement
 - iv. roller ball
 - v. taper.
- d. The procedures used for inspecting the serviceability and condition of:
 - i. tyres and wheels
 - ii. bearings.
- e. The defects associated with tyres and wheels:
 - i. abnormal tyre wear
 - ii. cuts
 - iii. side wall damage
 - iv. wheel vibrations.

General

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

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

- iv. single swing arm.
- j. Key engineering principles that are related to motorcycle steering and suspension systems:
 - i. steering geometry
 - ii. steering angles
 - iii. hydraulic damping
 - iv. stress and strain.
- k. Key engineering principles that are related to motorcycle steering and suspension systems:
 - i. steering geometry
 - ii. steering angles
 - iii. hydraulic damping
 - iv. stress and strain.
- l. Construction and operation of motorcycle braking systems:
 - i. cable
 - ii. hydraulic braking
 - iii. electronic ABS system.
- m. Key engineering principles that are related to motorcycle braking systems:
 - i. laws of friction
 - ii. hydraulics
 - iii. properties of fluids
 - iv. braking efficiency.
- n. Construction and operation of motorcycle wheels and tyres:
 - i. tyre construction
 - ii. tyre markings
 - iii. wheel construction.
- o. Key engineering principles that are related to motorcycle wheel and tyre systems:
 - i. friction
 - ii. un-sprung weight
 - iii. dynamic and static balance.

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.
- f. Make recommendations based on results of motorcycle inspections.
- g. 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.
- h. Prepare and use appropriate inspection equipment and tools.
- i. Inspection procedures following inspection checklists.
- j. 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 357

Knowledge of diagnosis and rectification of motorcycle engine faults

UAN:	R/601/5566
Level:	3
Credit value:	6
GLH:	45
Relationship to NOS:	This unit is linked to MC07 Diagnose and Rectify Motorcycle Engine and Component Faults.
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 diagnosis and rectification of motorcycle power train and related system faults.

Learning outcome	The learner will:
1.	understand how motorcycle engine systems operate
Assessment criteria	
The learner can:	
1.1	explain the construction and operation of motorcycle engine systems
1.2	explain the interaction between electrical, electronic and mechanical components within motorcycle engine systems
1.3	explain how electrical systems interlink and interact, including multiplexing and fibre optics
1.4	compare motorcycle engine system components and assemblies against alternatives to identify differences in construction and operation
1.5	identify the engineering principles that are related to motorcycle engine systems:
	a. volumetric efficiency
	b. flame travel, pre ignition and detonation
	c. fuel properties
	d. composition of carbon fuels
	e. combustion process.

Learning outcome	The learner will:
2.	understand how to diagnose and rectify faults in motorcycle engine systems
Assessment criteria	
<p>The learner can:</p> <ul style="list-style-type: none"> 2.1 describe how to analyse symptoms and causes of faults found in motorcycle engine systems 2.2 explain systematic diagnostic techniques used in identifying engine system faults 2.3 explain how to examine, measure and make suitable adjustments to the components 2.4 explain how to carry out the diagnosis and rectification activities in order to correct the faults in motorcycle engine systems 2.5 explain how to select, prepare and use diagnostic and rectification equipment for motorcycle engine systems 2.6 explain how to evaluate and interpret test results found in diagnosing motorcycle engine system faults against vehicle manufacturer specifications and settings 2.7 explain how to evaluate the operation of components and systems following diagnosis and repair to confirm system performance. 	

Unit 357 Knowledge of diagnosis and rectification of motorcycle engine faults

Supporting information

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

Single cylinder and multi-cylinder fuel injection systems

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

Engine management

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

Valve mechanisms

- a. The reasons for variable valve timing and multi-valve arrangements and the effect on performance.
- b. Layout of multi-valve arrangements, components, operation and drive arrangements.

- c. Construction features and operation of variable valve timing engines and electronic control.

Terms associated with combustion

- a. Flame travel, pre-ignition and detonation.
- b. Fuel properties:
 - i. octane rating
 - ii. flash point
 - iii. fire point
 - iv. volatility
 - v. composition of petrol fuels
 - vi. hydro-carbon content.
- c. Composition of carbon fuels
- d. Combustion process for spark ignition engines:
 - i. air fuel ratio
 - ii. lambda ratio
 - iii. stoichiometric ratio.
- e. The by-products of combustion for different engine conditions and fuel mixtures:
 - i. CO
 - ii. CO₂
 - iii. O
 - iv. N
 - v. H₂O
 - vi. NO_x.
- f. Describe the legal requirements for exhaust emissions:
 - i. MOT requirements
 - ii. EURO regulations.

Assessment, repair and restoration of mechanical engine components

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

Symptoms and faults in engine mechanical systems and components

- a. Symptoms and faults related to:
 - i. worn cylinders
 - ii. cylinder liners
 - iii. pistons
 - iv. piston rings
 - v. crankshaft

- vi. camshaft
- vii. bearings
- viii. cylinder head and gasket
- ix. valves
- x. valve seats and valve guides
- xi. cambelts tensioned and pulleys
- xii. cam chains tension systems and guides
- xiii. lubrication system and components
- xiv. oil pump
- xv. relief valve
- xvi. filter.

Diagnosis of faults in engine mechanical systems and components

- a. Interpret information for:
 - i. diagnostic tests
 - ii. manufacturer's motorcycle and equipment specifications
 - iii. use of equipment
 - iv. testing procedures
 - v. test plans
 - vi. legal requirements.
- b. The preparation of tools and equipment for use in diagnostic testing and assessment.
- c. Systematic assessment, testing and inspection of engine components and systems including:
 - i. mechanical system and component condition
 - ii. engine balance
 - iii. power balance
 - iv. performance and operation
 - v. wear
 - vi. run out
 - vii. alignment.
- d. Use of appropriate tools and equipment including:
 - i. compression gauges
 - ii. leakage testers
 - iii. cylinder balance tester
 - iv. pressure gauges
 - v. micrometers
 - vi. vernier gauges.
- e. Evaluate and interpret test results from diagnostic testing.
- f. Compare test result and values with motorcycle manufacturer's specifications and settings.
- g. The procedures for dismantling, components and systems and the use of appropriate equipment and procedures.
- h. Assess, examine and measure components including:
 - i. settings
 - ii. values
 - iii. condition
 - iv. wear and performance of components and systems.
- i. Probable faults:
 - i. malfunctions

- ii. incorrect settings
- iii. wear.
- j. Rectification or replacement procedures.

Evaluate operation of components and systems following diagnosis and repair to confirm system performance.

Faults and symptoms in ignition systems

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

Faults and symptoms in electronic petrol injection systems

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

Faults and symptoms in petrol carburetion systems

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

Faults and symptoms in engine management systems

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

- ix. low power
- x. unstable idle speed.

Diagnosis of faults in electronic engine management systems

- a. Locate and interpret information for:
 - i. diagnostic tests
 - ii. manufacturer's vehicle and equipment specifications
 - iii. use of equipment
 - iv. testing procedures
 - v. test plans
 - vi. fault codes
 - vii. legal requirements.
- b. The preparation of tools and equipment for use in diagnostic testing and assessment.
- c. Conduct systematic assessment, testing of engine systems including:
 - i. component condition and performance
 - ii. component settings
 - iii. component values
 - iv. electrical and electronic values
 - v. system performance and operation
 - vi. use of appropriate tools and equipment including gauges
 - vii. multi-meter
 - viii. breakout box
 - ix. oscilloscope
 - x. diagnostic tester
 - xi. manufacturer's dedicated equipment
 - xii. exhaust gas analyser
 - xiii. pressure gauges.
- d. Evaluate and interpret test results from diagnostic testing.
- e. Compare test result, values and fault codes with motorcycle manufacturer's specifications and settings.
- f. The procedures for dismantling, components and systems using appropriate equipment.
- g. Assess, examine and measure components including:
 - i. settings
 - ii. input and output values
 - iii. voltages
 - iv. current consumption
 - v. resistance
 - vi. output patterns with oscilloscope
 - vii. condition
 - viii. wear and performance of components and systems.
- h. Identify probable faults and indications of:
 - i. faults
 - ii. malfunctions
 - iii. incorrect settings
 - iv. wear
 - v. values
 - vi. inputs and outputs
 - vii. fault codes.

- i. Rectification or replacement procedures.
- j. Evaluation and the operation of components and systems following diagnosis and repair to confirm system performance.
 - i. speed controls
 - ii. control systems.
- k. Use of appropriate tools and equipment including:
 - i. pressure gauges
 - ii. multi-meter
 - iii. breakout box
 - iv. oscilloscope
 - v. diagnostic tester
 - vi. manufacturer's dedicated equipment
 - vii. flow meter.
- l. Evaluate and interpret test results from diagnostic testing.
- m. Compare test result, values and fault codes with motorcycle manufacturer's specifications and settings.
- n. How to dismantle, components and systems using appropriate equipment and procedures.
- o. How to assess, examine and measure components including: settings, input and output, values, voltages, current consumption, resistance, output patterns with oscilloscope, pressures, condition, wear and performance of components and systems.
- p. Identification of probable faults and indications of faults, malfunctions, incorrect settings, wear, values, inputs and outputs, fault codes, pressures and leaks.
- q. Rectification or replacement procedures.
- r. Evaluation and operation of components and systems following diagnosis and repair to confirm system performance.

Construction and operation of motorcycle engine systems to include:

- a. engine mechanical
- b. lubrication systems
- c. fuel systems
- d. ignition systems
- e. cooling system
- f. air and exhaust systems
- g. engine management.

Engineering principles that are related to motorcycle engine systems

- a. volumetric efficiency
- b. flame travel, pre ignition and detonation
- c. fuel properties
- d. composition of carbon fuels
- e. combustion process
- f. legal requirements for exhaust emissions.

Symptoms and causes of faults found in motorcycle engine systems to include:

- a. engine mechanical
- b. lubrication systems

- c. fuel systems
- d. ignition systems
- e. cooling system
- f. air and exhaust systems
- g. engine management.

Examine, measure and make suitable adjustments to the components including:

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

Unit 358

Knowledge in diagnosis and rectification of motorcycle chassis faults

UAN:	D/601/5568
Level:	3
Credit value:	6
GLH:	45
Relationship to NOS:	This unit is linked to MC08 Diagnose and Rectify Motorcycle Chassis System Faults.
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 diagnosis and rectification of chassis system faults.

Learning outcome	The learner will:
1.	understand how the motorcycle chassis systems operate
Assessment criteria	
The learner can:	
1.1	explain the construction and operation of motorcycle chassis systems
1.2	explain the interaction between electrical, electronic and mechanical components within motorcycle chassis systems
1.3	explain how motorcycle chassis electrical systems interlink and interact, including multiplexing
1.4	compare motorcycle chassis system components and assemblies against alternatives to identify differences in construction and operation
1.5	identify the engineering principles that are related to motorcycle chassis systems:
	a. inertia force, mass and acceleration
	b. laws of friction
	c. statics (springs and torsion)
	d. hydraulic machines.

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

Unit 358 Knowledge in diagnosis and rectification of motorcycle chassis faults

Supporting information

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

Electrical and electronic principles of motorcycle chassis systems

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

Operation of electronic ABS and traction control systems

- a. Layout of:
 - i. ABS and traction control systems
 - ii. warning systems.
- b. Operation of:
 - i. hydraulic and electronic control units
 - ii. wheel speed sensor
 - iii. hoses
 - iv. cables and connectors.
- c. The relationship and interaction of braking with other motorcycle systems – traction control.

Steering geometry for motorcycle applications

- a. Front/rear wheel geometry.

Symptoms and faults in braking systems

- a. Symptoms and faults associated with braking systems:
 - i. mechanical
 - ii. hydraulic
 - iii. electrical and electronic systems
 - iv. fluid leaks
 - v. warning light operation
 - vi. poor brake efficiency

- vii. wheel locking under braking.

Diagnosis and faults in braking systems

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

Symptoms and faults associated with steering systems

- a. Symptoms and faults associated with steering systems:
 - i. mechanical
 - ii. steering joints and bushes
 - iii. bearings.

Diagnosis and faults in steering systems

- a. Locate and interpret information for:
 - i. diagnostic tests
 - ii. motorcycle and equipment specifications
 - iii. use of equipment
 - iv. testing procedures
 - v. test plans
 - vi. legal requirements.
- b. How to prepare equipment for use in diagnostic testing.

- c. Conduct systematic testing and inspection of:
 - i. steering systems
 - ii. mechanical.
- d. Using appropriate tools and equipment including:
 - i. wheel alignment equipment.
- e. Evaluate and interpret test results from diagnostic testing.
- f. Compare test result and values with motorcycle manufacturer's specifications and settings.
- g. How to dismantle, components and systems using appropriate equipment and procedures.
- h. Assess, examine and evaluate the:
 - i. operation
 - ii. settings
 - iii. values
 - iv. condition and performance of components and systems.
- i. Probable faults, malfunctions, and incorrect settings.
- j. Rectification or replacement procedures.
- k. Operation of systems following diagnosis and repair to confirm operation and performance.

Symptoms and faults associated with suspension systems

- a. Symptoms and faults associated with suspension systems:
 - i. mechanical
 - ii. hydraulic
 - iii. ride height
 - iv. wear
 - v. noises under operation
 - vi. fluid leakage
 - vii. excessive travel
 - viii. excessive tyre wear.

Diagnosis and faults in suspension systems

- a. Locate and interpret information for:
 - i. diagnostic tests
 - ii. motorcycle and equipment specifications
 - iii. use of equipment
 - iv. testing procedures
 - v. test plans
 - vi. legal requirements.
- b. How to prepare equipment for use in diagnostic testing.
- c. How to conduct systematic testing and inspection of:
 - i. suspension systems
 - ii. mechanical
 - iii. hydraulic.
- d. Using appropriate tools and equipment including:
 - i. alignment equipment
- e. Evaluate and interpret test results from diagnostic testing.
- f. Compare test result and values with motorcycle manufacturer's specifications and settings.
- g. How to dismantle, components and systems using appropriate equipment and procedures.

- h. Assess, examine and evaluate the operation, settings, values, condition and performance of components and systems.
- i. Probable faults, malfunctions and incorrect settings.
- j. Rectification or replacement procedures.
- k. Operation of systems following diagnosis and repair to confirm operation and performance.

Construction and operation of motorcycle chassis systems to include:

- a. steering
- b. suspension
- c. anti-lock-braking system (ABS)
- d. traction control
- e. front and rear wheel geometry.

Engineering principles that are related to motorcycle chassis systems

- a. inertia force, mass and acceleration
- b. laws of friction
- c. statics
- d. hydraulic machines.

Examine, measure and make suitable adjustments to the components including:

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

Unit 362

Knowledge of diagnosis and rectification of motorcycle transmission and driveline faults

UAN:	L/601/5582
Level:	3
Credit value:	4
GLH:	30
Relationship to NOS:	This unit is linked to MC12 Diagnosis and Rectification of Motorcycle Transmission and Drive System Faults.
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 allows the learner to develop the knowledge to diagnose and rectify faults within motorcycle transmission systems.

Learning outcome	The learner will:
1.	understand how the motorcycle transmission and driveline systems operate
Assessment criteria	
The learner can:	
1.1	explain the construction and operation of motorcycle transmission and driveline systems
1.2	explain the interaction between electrical, electronic and mechanical components within motorcycle transmission and driveline systems
1.3	compare motorcycle transmission and driveline system components and assemblies against alternatives to identify differences in construction and operation
1.4	identify the advanced engineering principles that are related to motorcycle transmission and driveline systems: <ul style="list-style-type: none">a. frictionb. torque transmissionc. materialsd. fluids and energye. potential and kinetic energy.

Learning outcome	The learner will:
2.	understand how to diagnose and rectify faults in motorcycle transmission and driveline systems
Assessment criteria	
<p>The learner can:</p> <ul style="list-style-type: none"> 2.1 explain the symptoms and causes of faults found in motorcycle transmission and driveline systems 2.2 explain systematic diagnostic techniques used in identifying advanced transmission and driveline system faults 2.3 explain how to examine, measure and make suitable adjustments to components 2.4 explain how to carry out the rectification activities in order to correct the faults in the motorcycle transmission and driveline systems 2.5 explain how to select, prepare and use diagnostic and rectification equipment for motorcycle transmission and driveline systems 2.6 explain how to evaluate and interpret test results found in diagnosing motorcycle transmission and driveline system faults against manufacturer specifications and settings 2.7 explain how to evaluate the operation of components and systems following diagnosis and repair to confirm system performance. 	

Unit 362 Knowledge of diagnosis and rectification of motorcycle transmission and driveline faults

Supporting information

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

Electrical and electronic principles related to motorcycle transmission systems

- a. The operation of electrical and electronic systems and components related to motorcycle transmission systems including:
 - i. Control units
 - ii. sensors and actuators
 - iii. electrical inputs & outputs
 - iv. voltages
 - v. oscilloscope patterns
- b. The interaction between the electrical/electronic system, and mechanical components of the transmission systems.
- c. Electronic and electrical safety procedures.

The operation of motorcycle clutches

- a. The construction and operation of friction clutches (wet, and dry) including single and multi-plate clutch designs.

The operation of motorcycle transmissions and driveline systems

- a. The construction and operation of manual gearboxes:
 - i. gear arrangements
 - ii. shaft and bearing arrangements
 - iii. selector mechanisms
 - iv. linkages
 - v. lubrication.
- b. The construction and operation of automatic gearboxes and method for achieving different gear ratios.
- c. Interaction between mechanical, electrical and electronic components
- d. The construction and operation of continuously variable transmissions (CVT) and the benefits of this type of gearbox design.
- e. The construction and operation of final drive systems including:
 - i. chain and sprocket
 - ii. belt systems
 - iii. conventional crown wheel and pinion.
- f. The construction and operation of motorcycle hub arrangements.

- g. The construction and operation of:
 - i. drive shafts and couplings.

Symptoms and faults in motorcycle transmissions and drive-line systems

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

Faults in motorcycle transmission systems

- a. Interpret information for diagnostic tests, vehicle and equipment specifications, use of equipment, testing procedures, test plans, fault codes and legal requirements.
- b. How to prepare equipment for use in diagnostic testing.
- c. How to conduct systematic testing and inspection of transmission system, mechanical, hydraulic, electrical and electronic systems using appropriate tools and equipment including, mullet-meters,
- d. How to carry out workshop based and road testing of vehicle and transmission system.
- e. Evaluate and interpret test results from diagnostic and/or road testing
- f. Compare test result and values with vehicle manufacturer's specifications and settings.
- g. How to dismantle, components and systems using appropriate equipment and procedures.

- h. Assess, examine and evaluate the operation, settings, values, condition and performance of components and systems.
- i. Probable faults, malfunctions and incorrect settings.
- j. Rectification or replacement procedures.
- k. Operation of systems following diagnosis and repair to confirm operation and performance.

Construction and operation of motorcycle transmission and driveline systems to include:

- a. clutches
- b. manual gearboxes
- c. automatics
- d. electronic control
- e. CVT (continuously variable transmission)
- f. chain and sprocket
- g. belt and pulley
- h. drive shaft
- i. final drive unit
- j. hubs.

Advanced engineering principles that are related to motorcycle transmission and driveline systems:

- a. friction
- b. torque transmission
- c. material
- d. potential and kinetic energy.

Symptoms and causes of faults found in motorcycle transmission and driveline systems to include:

- a. clutches
- b. manual gearboxes
- c. automatics
- d. electronic control
- e. CVT (continuously variable transmission)
- f. chain and sprocket
- g. drive shaft
- h. final drive unit
- i. hubs.

Examine, measure and make suitable adjustments components including:

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

Unit 372

Knowledge of motorcycle fuel, ignition, air and exhaust system units and components

UAN:	T/601/5527
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 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 motorcycle engine fuel systems operate
Assessment criteria	
The learner can:	
1.1	identify motorcycle engine fuel system components
1.2	describe the construction and operation of motorcycle engine fuel systems
1.3	compare key motorcycle 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 motorcycle engine fuel systems: a. properties of fuels b. combustion processes c. exhaust gas constituents
1.5	state common terms used in motorcycle engine fuel system design.

Learning outcome	The learner will:
2.	understand how motorcycle engine ignition systems operate
Assessment criteria	
The learner can:	
2.1	identify motorcycle engine ignition system components
2.2	describe the construction and operation of fundamental motorcycle engine ignition systems
2.3	compare key motorcycle 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 motorcycle engine ignition systems <ul style="list-style-type: none"> a. flame travel b. ignition timing
2.5	state common terms used in key motorcycle engine ignition system design.

Learning outcome	The learner will:
3.	understand how motorcycle engine air supply and exhaust systems operate
Assessment criteria	
The learner can:	
3.1	identify motorcycle engine air supply and exhaust system components
3.2	describe the construction and operation of motorcycle engine air supply and exhaust systems
3.3	compare key motorcycle 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 motorcycle engine air supply and exhaust systems: <ul style="list-style-type: none"> a. sound absorption b. reduction of harmful emissions
3.5	state common terms used in key motorcycle engine air supply and exhaust system design.

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

Unit 372 Knowledge of motorcycle fuel, ignition, air and exhaust system units and components

Supporting information

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

Fuel - petrol

- a. The function and layout of carburettor systems:
 - i. carburettor, single and multi-type
 - ii. fuel tank and control lever
 - iii. fuel pumps.
- b. The operation of carburettor systems:
 - i. carburettor, single and multi-type
 - ii. float chamber and designs
 - iii. vacuum and piston assembly
 - iv. needles and jets
 - v. adjustment for idle and mixture
 - vi. choke and enrichment device
 - vii. fuel tank and control lever
 - viii. fuel pumps.
- c. The function of petrol injection systems and components:
 - i. petrol injection 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.
- d. The operation 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).
- e. The procedures used when inspecting petrol system.
- f. The chemically correct air/fuel ratio for petrol engines.
- g. Weak and rich air/fuel ratios for petrol engines.
- h. 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 (NO_x, NO₂, NO) and particulates.
- i. Symptoms and faults associated with fuel systems:
 - i. erratic running
 - ii. weak mixture
 - iii. rich mixture
 - iv. two stroke mixtures
 - v. excessive smoke
 - vi. leaks
 - vii. failure to start
 - viii. poor economy
 - ix. failure to meet emission control.

Ignition

- a. The layout of ignition systems.
- b. Ignition circuits and components:
 - i. LT Circuit
 - ii. battery
 - iii. ignition switch
 - iv. electronic trigger devices
 - v. HT Circuit
 - vi. spark plugs (reach, heat range, electrode features)
 - vii. ignition leads
 - viii. ignition coil
 - ix. ignition timing advance system.
- c. The operation electronic system components:
 - i. amplifiers
 - ii. triggering systems
 - iii. inductive pick-ups
 - iv. amplifier units.
 - v. control units.
- d. Ignition terminology:
 - i. dwell angle
 - ii. dwell time
 - iii. advance and retard of ignition timing
 - iv. static and dynamic ignition timing.
- e. 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.
- f. Basic principle of engine management systems:
 - i. closed loop system
 - ii. integrated ignition
 - iii. injection systems
 - iv. sensors.
- g. The procedures used when inspecting:
 - i. ignition system
 - ii. engine management
 - iii. sensors.
- h. Symptoms and faults associated with ignition system operation:
 - i. failure to start hot or cold
 - ii. exhaust emissions
 - iii. poor performance
 - iv. ignition noise
 - v. misfire
 - vi. damp.

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.

General

- a. The preparation, testing and use of tools and equipment used for:
 - i. dismantling
 - ii. removal and replacement of engine units and components.
- b. Appropriate safety precautions:
 - i. PPE
 - ii. vehicle protection when dismantling
 - iii. removal and replacing engine units and components.
- c. The importance of logical and systematic processes.
- d. The inspection and testing of engine units and components.
- e. The preparation of replacement units for re-fitting or replacement.
- f. The reasons why replacement components and units must meet the original specifications (OES) – warranty requirements, to maintain performance and safety requirements.
- g. 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-statement 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.
- j. Construction and operation of motorcycle engine fuel systems
 - i. carburettor
 - ii. multi point injection.
- k. Key engineering principles that are related to motorcycle engine fuel systems:
 - i. properties of fuels
 - ii. combustion processes
 - iii. exhaust gas constituents.
- l. Key engineering principles that are related to motorcycle engine ignition systems:
 - i. flame travel
 - ii. ignition timing
 - iii. voltages.
- m. Construction and operation of motorcycle engine air supply and exhaust systems
 - i. manifolds
 - ii. filters
 - iii. silencers, including two stroke
 - iv. catalytic converter.
- n. Key engineering principles that are related to motorcycle engine air supply and exhaust systems
 - i. sound absorption
 - ii. reduction of harmful emissions.

Unit 436

Skills in diagnosing and rectifying motorcycle electrical faults

UAN:	K/601/5590
Level:	3
Credit value:	3
GLH:	25
Relationship to NOS:	This unit is linked to AE06MC Diagnose and Rectify Motorcycle Electrical Faults.
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 the skills to diagnose and rectify motorcycle electrical systems and their units. It also covers the evaluation of performance of the systems. This includes SI, CI, hybrid and alternative fuel vehicles.

Learning outcome	The learner will:
1.	be able to work safely when carrying out motorcycle electrical diagnostic and rectification activities
Assessment criteria	
The learner can:	
1.1	wear suitable personal protective equipment and use suitable motorcycle coverings throughout when carrying out electrical diagnostic and rectification 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 diagnostic and rectification activities including: a. motorcycle technical data b. diagnostic test procedures
2.2	use sufficient diagnostic information in a systematic way to enable an accurate diagnosis of motorcycle electrical system faults.

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

Learning outcome	The learner will:
4.	be able to carry out motorcycle electrical diagnosis, rectification and test activities
Assessment criteria	
The learner can:	
4.1	use diagnostic methods that are relevant to the symptoms presented
4.2	evaluate their assessment of dismantled sub-assemblies and identify their condition and suitability for repair or replacement accurately
4.3	carry out all diagnostic and rectification activities following: <ul style="list-style-type: none"> a. manufacturers' instructions b. recognised researched repair methods c. workplace procedures d. health and safety requirements
4.4	ensure all repaired or replacement components and units conform to the motorcycle operating specification and any legal requirements
4.5	adjust components and units correctly to ensure that they operate to meet system requirements
4.6	use testing methods that are suitable for assessing the performance of the system rectified
4.7	ensure the rectified motorcycle electrical system performs to the motorcycle operating specification and 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 486

Knowledge of diagnosis and rectification of motorcycle electrical faults

UAN:	M/601/5512
Level:	3
Credit value:	4
GLH:	30
Relationship to NOS:	This unit is linked to AE06MC Diagnose and Rectify Motorcycle Electrical Faults.
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 diagnosis and rectification of motorcycle electrical systems and their units. It also covers the evaluation of performance of the systems. This includes SI, CI, hybrid and alternative fuel vehicles.

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

Learning outcome	The learner will:
2.	understand how motorcycle electrical systems operate
Assessment criteria	
The learner can:	
2.1	identify motorcycle electrical system components
2.2	explain the construction and operation of motorcycle electrical systems
2.3	explain the interaction between electrical, electronic and mechanical components within the system defined
2.4	explain how electrical systems interlink and interact, including multiplexing and fibre optics.
2.5	compare motorcycle electrical system components and assemblies against alternatives to identify differences in construction and operation

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

Unit 486 Knowledge of diagnosis and rectification of motorcycle electrical faults

Supporting information

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

The electrical principles that are related to motorcycle electrical circuits:

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

Charging

- a. The operation of the motorcycle 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.

Starting

- a. The layout, construction and operation of engine starting systems:
- b. The function and operation of the following components:
 - i. starter motor
 - ii. starter clutch mechanism
 - iii. pinion
 - iv. starter solenoid
 - v. clutch and gear safety switch

- vi. ignition/starter switch
- vii. stand switches
- viii. starter relay (if appropriate).

Common faults and testing methods associated with charging and starting systems

- a. fault code identification
- b. wiring faults
- c. component failure
- d. earth problems
- e. sensor faults.

Lighting systems and technology

- a. Lighting systems should include:
 - i. Xenon lighting
 - ii. gas discharge lighting
 - iii. ballast system
 - iv. LED
 - v. intelligent front lighting
 - vi. blue lights
 - vii. complex reflectors
 - viii. fibre optic
 - ix. optical patterning.
- b. Circuits must include:
 - i. sidelights
 - ii. dipped beam
 - iii. main beam
 - iv. dim/dip.

Common faults and testing methods associated with external lighting system

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

The operating principles of external lighting systems and multiplexing systems

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

The different types of auxiliary electrical components

- a. Components should include:
 - i. heated grip
 - ii. electrically operated screens
 - iii. horn
 - iv. multi-functional switches
 - v. relays
 - vi. heated mirrors.

Common faults and testing methods associated with heated mirror systems

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

The different types of entertainment and information systems and components

- a. Systems and components must include:
 - i. radio CD and multi play units
 - ii. MP3 players
 - iii. speakers
 - iv. aerial systems
 - v. amplifiers
 - vi. Satellite Navigation
 - vii. communication units.

Common faults and testing methods associated with entertainment and information systems

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

The different types of integrated security/warning systems and components

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

The function of component parts in integrated security and warning systems

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

The relevant legislation relevant to security and warning systems

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

Common faults and testing methods associated with security and warning systems

- a. Components to include:
 - i. control units
 - ii. audible warning units
 - iii. immobiliser units
 - iv. horns
 - v. relays
 - vi. diodes
 - vii. wiring
 - viii. connections and protection devices
 - ix. removal and refitting procedures
 - x. using computer diagnostics to identify faults
 - xi. use of manufacturers diagnostic equipment.

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

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

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

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



Appendix 1 Sources of general information

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

Centre Manual - Supporting Customer Excellence contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification, as well as updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document includes sections on:

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

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**: information on how to register for online assessments.

Useful contacts

UK learners General qualification information	T: +44 (0)844 543 0033 E: learnersupport@cityandguilds.com
International learners General qualification information	T: +44 (0)844 543 0033 F: +44 (0)20 7294 2413 E: intcg@cityandguilds.com
Centres Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: centresupport@cityandguilds.com
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