



INSTITUTE
OF THE MOTOR
INDUSTRY

IMI QUALIFICATION



QUALIFICATION SPECIFICATION

Part B:

Assessment Criteria

for

IMI Level 2 Certificate in Motorcycle Maintenance

QUALIFICATION NO: 601/7048/7

*To be used in conjunction with Candidate Assessment
Summary, Practical and Written Support Materials
(Optional)*

*For assessor use only: Refer to Qualification Specification
Part A and Assessor and Quality Assurer Guidance
document*

CENTRE INFORMATION

Please be aware that any **legislation** referred to in this qualification may be subject to amendment/s during the life of this qualification. Therefore IMI Approved Centres must ensure they are aware of and comply with any amendments, e.g. to health and safety legislation and employment practices.

Please be aware that **vehicle technologies** referred to in this qualification reflect current practice, but may be subject to amendment/s, updates and replacements during the life of this qualification. Therefore IMI Approved Centres must ensure they are aware of the latest developments and emerging technologies to ensure the currency of this qualification.

Please note: the relevance of the information contained in the **unit content** will vary depending upon the vehicle types being worked upon. The unit content is for guidance only and is not meant to be prescriptive.

© 2016 IMI

All rights reserved. No part of this publication may be reproduced, stored in retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of IMI

Requests should be made in writing and addressed to:
Institute of the Motor Industry (IMI)
Fanshaws, Brickendon, Hertford SG13 8PQ



CONTACT SHEET

Learner Name:	
Learner Registration No:	
Learner Address:	
Learner Tel No:	
Learner Email:	
Employer Contact:	
Employer Name & Address:	
Employer Tel No:	

Please complete as appropriate:	
Witness Name:	Witness Name:
Witness Job Title:	Witness Job Title:
Witness Signature:	Witness Signature:
Witness Name:	Witness Name:
Witness Job Title:	Witness Job Title:
Witness Signature:	Witness Signature:
Assessor Name:	Assessor Name:
Assessor Signature:	Assessor Signature:
Assessor Name:	
Assessor Signature:	
Internal Verifier Name:	Internal Verifier Name:
Internal Verifier Signature:	Internal Verifier Signature:



TABLE CONTENTS

Level 2 Certificate in Motorcycle Maintenance (Qualification Structure).....5

UNIT REF: GA0102 - Health, Safety and Good Housekeeping in the Automotive Environment 6

UNIT REF: GA3 - Support for Job Roles in the Automotive Environment 13

UNIT REF: GA4 - Materials, Fabrication, Tools and Measuring Devices used in the Automotive Environment 17

UNIT REF: L2MCMS - Plan, Prepare, Carry Out and Report on Routine Motorcycle Maintenance 20

UNIT REF: MCM02.1 - Remove and Replace Motorcycle Engine, Power Train and Lubrication System Units and Components..... 25

UNIT REF: MCM02.2 - Remove and Replace Motorcycle Cooling System Units and Components 31

UNIT REF: MCM02.3 - Remove and Replace Motorcycle Fuel, Ignition, Air and Exhaust System Units and Components..... 34

UNIT REF: MCM02.4 - Remove and Replace Motorcycle Starting and Charging System Units and Components . 39

UNIT REF: MCM04 - Remove and Replace Motorcycle Steering, Brakes and Suspension Units and Components..... 44



Level 2 Certificate in Motorcycle Maintenance

Group A: Mandatory Units

Group B: Core Unit – Synoptic Assessment

Group C: Mandatory Specialist Units

To achieve the Level 2 Certificate in Motorcycle Maintenance the learner will need to complete all the units in groups A, B and C. Group B 'Core Unit' must not be completed until achievement of all the units in groups A and C.

Total GLH: 362

TQT = 585

Key: W = Written Task/s (support material)

P = Practical Task/s (support materials)

Please see Qualification Specification Part A for further information on support materials.

Group A: Mandatory Units						
Unit No.	Unit Title & ID number	Unit Level	GLH	Task		OLT
				W	P	
GA0102	Health, Safety and Good Housekeeping in the Automotive Environment (A/507/6089)	2	37	W	P	Group A Test
GA3	Support for Job Roles in the Automotive Environment (M/507/6090)	3	26	W	P	
GA4	Materials, Fabrication, Tools and Measuring Devices used in the Automotive Environment (T/507/6091)	2	26	W	P	
Group B: Core Unit (Synoptic Assessment)						
Unit No.	Unit Title & ID number	Unit Level	GLH	Task		OLT
				W	P	
L2MCMS	Plan, Prepare, Carry Out and Report on Routine Motorcycle Maintenance (J/507/6211)	2	50	W	P	Group B Test
Group C: Specialist Mandatory Units						
Unit No.	Unit Title & ID Number	Unit Level	GLH	Task		OLT
				W	P	
MCM02.1	Remove and Replace Motorcycle Engine, Power Train and Lubrication System Units and Components (L/507/6212)	2	65	W	P	Group C Test
MCM02.2	Remove and Replace Motorcycle Cooling System Units and Components (R/507/6213)	2	25	W	P	
MCM02.3	Remove and Replace Motorcycle Fuel, Ignition, Air and Exhaust System Units and Components (Y/507/6214)	2	33	W	P	
MCM02.4	Remove and Replace Motorcycle Starting and Charging System Units and Components (D/507/6215)	2	34	W	P	
MCM04	Remove and Replace Motorcycle Steering, Brakes and Suspension Units and Components (H/507/6216)	2	66	W	P	



UNIT REF: GA0102	UNIT TITLE: HEALTH, SAFETY AND GOOD HOUSEKEEPING IN THE AUTOMOTIVE ENVIRONMENT
-------------------------	---

Mapping: This unit is mapped to the IMI NOS G1 and G2	Level: 2	GLH: 37
--	-----------------	----------------

Rationale: This unit enables the learner to develop an understanding, knowledge and skills in routine maintenance and cleaning of the automotive environment and using resources economically and 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 OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand the correct personal and vehicle protective equipment to be used within the automotive environment	1.1. Explain the importance of wearing the types of personal protective equipment required for a range of 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
2. Be able to use correct personal and vehicle protection within the automotive environment	2.1. Select and use personal protective equipment throughout activities. To include appropriate protection of: a. eyes b. ears c. head d. skin e. feet f. hands g. lungs 2.2. Select and use vehicle protective equipment throughout all activities
3. Understand effective housekeeping practices in the automotive environment	3.1. Describe why the automotive environment should be properly cleaned and maintained 3.2. Describe requirements and systems, which may be put in place to ensure a clean automotive environment 3.3. Describe how to minimise waste when using utilities and consumables 3.4. State the procedures and precautions necessary when cleaning and maintaining an automotive environment 3.5. Describe the selection and use of cleaning equipment when dealing with general cleaning, spillages and leaks in the automotive environment 3.6. Describe procedures for correct disposal of waste materials from an automotive environment 3.7. Describe procedures for starting and ending the working day which ensure effective housekeeping practices are followed



<p>4. Be able to carry out effective housekeeping practices in the automotive environment</p>	<p>4.1. Select and use cleaning equipment which is of the right type and suitable for the task</p> <p>4.2. Use utilities and appropriate consumables, avoiding waste</p> <p>4.3. Use materials and equipment to carry out cleaning and maintenance duties in allocated work areas, following automotive work environment policies, schedules and manufacturer's instructions</p> <p>4.4. Perform housekeeping activities safely and in a way which minimises inconvenience to customers and staff</p> <p>4.5. Keep the work area clean and free from debris and waste materials</p> <p>4.6. Keep tools and equipment fit for purpose by regular cleaning and keeping tidy</p> <p>4.7. Dispose of used cleaning agents, waste materials and debris to comply with legal and workplace requirements</p>
<p>5. Understand key health and safety requirements relevant to the automotive environment</p>	<p>5.1. List the main legislation relating to automotive environment health and safety</p> <p>5.2. Describe the general legal duties of employers and employees required by current health and safety legislation</p> <p>5.3. Describe key and current health and safety requirements relating to the automotive environment</p> <p>5.4. Describe why workplace policies and procedures relating to health and safety are important</p>
<p>6. Be able to recognise and deal with dangers in order to work safely within the automotive workplace</p>	<p>6.1. Name and locate the responsible persons for health and safety in their relevant workplace</p> <p>6.2. Identify and report working practices and hazards which could be harmful to themselves or others</p> <p>6.3. Carry out safe working practices whilst working with equipment, materials and products in the automotive environment</p> <p>6.4. Rectify health and safety risks encountered at work, within the scope and capability of their job role</p>
<p>7. Understand about hazards and potential risks relevant to the automotive environment</p>	<p>7.1. Identify key hazards and risks in an automotive environment</p> <p>7.2. Describe policies and procedures for reporting hazards, risks, and health and safety matters in the automotive environment</p> <p>7.3. State precautions and procedures which need to be taken when working with vehicles, associated materials, tools and equipment</p>



	<p>7.4. Identify fire extinguishers in common use and which types of fire they should be used on</p> <p>7.5. Identify key warning signs and their characteristics that are found in the vehicle repair environment.</p> <p>7.6. State the meaning of common product warning labels used in an automotive environment</p>
8. Be able to conduct themselves responsibly	<p>8.1. Show personal conduct in the workplace which does not endanger the health and safety of themselves or others</p> <p>8.2. Display suitable personal presentation at work which ensures the health and safety of themselves and others at work</p>
9. Understand personal responsibilities	<p>9.1. Explain the importance of personal conduct in maintaining the health and safety of the individual and others</p> <p>9.2. Explain the importance of personal presentation in maintaining health safety and welfare</p>

Content:**Economic use of resources**

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

Requirement to maintain work area effectively

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

Spillages, leaks and waste materials

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

Basic legislative requirements

- a. Provision and Use of Work Equipment Regulations 1992.
- b. Power Presses Regulations 1992.
- c. Pressure Systems and Transportable Gas Containers Regulations 1989.
- d. Electricity at Work Regulations 1989.
- e. Noise at Work Regulations 1989.
- f. Manual Handling Operations Regulations 1992.
- g. Health and Safety (Display Screen Equipment) Regulations 1992.
- h. Abrasive Wheel Regulations.
- i. Safe Working Loads.
- j. Working at Height Regulations (2005)

Routine maintenance of the workplace

- a. Trainee's personal responsibilities and limits of their authority with regard to work equipment.
- b. Risk assessment of the workplace activities and work equipment.
- c. Workplace person responsible for training and maintenance of workplace equipment.
- d. When and why safety equipment must be used.
- e. Location of safety equipment

Content Contd.

- 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 manufacturer's recommendations.
- m. Location of routine maintenance information e.g. electrical safety check log.

Legislation relevant to Health and Safety

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

General regulations to include an awareness of:

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

Legislative duties:

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

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

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

PPE to include:

- a. Typical maintenance procedures for PPE equipment to include:
 - i. typical maintenance log
 - ii. cleaning procedures
 - iii. filter maintenance
 - iv. variation in glove types
 - v. air quality checks

Content Contd:

- b. Choice and fitting procedures for masks and air breathing equipment.
- c. Typical workplace processes which would require the use of PPE to include:
 - i. welding
 - ii. sanding and grinding
 - iii. filling
 - iv. panel removal and replacement
 - v. drilling
 - vi. cutting
 - vii. chiselling
 - viii. removal of broken glass
 - ix. removal of rubber seals from fire damaged vehicles
 - x. removal of hypodermic needles
 - xi. servicing activities
 - xii. roadside recovery
- d. Unserviceable PPE.
- e. PPE required for a range automotive repair activities. To include appropriate protection of:
 - i. eyes
 - ii. ears
 - iii. head
 - iv. skin
 - v. feet
 - vi. hands
 - vii. lungs

Fire and extinguishers

- a. Classification of fire types
- b. Using a fire extinguisher effectively.
- c. Types of Extinguishers
 - i. foam
 - ii. dry powder
 - iii. 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, to include:
 - 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.

Content Contd.

- e. The meaning of warning notices in common use.
- f. General design of safe place warning signs

Hazards and risks to include:

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

Personal responsibilities

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

Action to be taken in the event of colleagues suffering accidents

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



Evidence Requirements	
1.	You must be observed by your assessor using personal and vehicle protection, cleaning the work environment and disposal of waste on 2 separate occasions .
2.	You must be observed by your assessor identifying risks which may result from at least 2 of the items listed below:
	<ul style="list-style-type: none">• the use and maintenance of machinery or equipment
	<ul style="list-style-type: none">• the use of materials or substances
	<ul style="list-style-type: none">• working practices which do not conform to laid down policies
	<ul style="list-style-type: none">• unsafe behaviour
	<ul style="list-style-type: none">• accidental breakages and spillages
	<ul style="list-style-type: none">• environmental factors
3.	You must be observed by your assessor identifying risks.
4.	You must be observed by your assessor following at least 2 of the workplace policies listed below:
	<ul style="list-style-type: none">• the use of safe working methods and equipment
	<ul style="list-style-type: none">• the safe use of hazardous substances
	<ul style="list-style-type: none">• smoking, eating, drinking and drugs
	<ul style="list-style-type: none">• what to do in the event of an emergency
	<ul style="list-style-type: none">• personal presentation



UNIT REF: GA3	UNIT TITLE: SUPPORT FOR JOB ROLES IN THE AUTOMOTIVE ENVIRONMENT
----------------------	--

Mapping: This unit is mapped to the IMI NOS G3	Level: 3	GLH: 26
Rationale: This unit enables the learner to develop an understanding, knowledge and skills of how to keep good working relationships with all colleagues in the automotive work environment by using effective communication and support skills.		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand key organisational structures, functions and roles within the automotive work environment	1.1. Identify the purpose of different sections of a typical automotive work environment 1.2. Explain organisational structures and lines of communication within the automotive work environment 1.3. Explain levels of responsibility within specific job roles in automotive workplace. To include: a. trainee b. skilled technician c. supervisor d. manager
2. Be able to work effectively within the organisational structure of the automotive work environment	2.1. Respond promptly and willingly to requests for assistance from customers and colleagues 2.2. Refer customers and colleagues to the correct person should requests fall outside their responsibility and capability
3. Understand the importance of obtaining, interpreting and using information in order to support their job role within the automotive work environment	3.1. Explain the importance of different sources of information in an automotive work environment. 3.2. Explain how to find, interpret and use relevant sources of information 3.3. Describe the main legal requirements relating to the vehicle, including road safety requirements 3.4. Explain the importance of working to recognised procedures and processes 3.5. Explain when replacement units and components must meet the manufacturers' original equipment specification. 3.6. Explain the purpose of how to use identification codes
4. Be able to obtain and use information in order to support their job role within the automotive work environment	4.1. Select and use legal and technical information, in an automotive work environment
5. Understand the importance of different types of communication within the automotive work environment	5.1. Explain where different methods of communication would be used within the automotive environment 5.2. Explain the factors, which can determine your choice of communication. 5.3. Explain how the communication of information can change with the target audience to include uninformed and informed people



Qualification Specification Part B: L2 Certificate in Motorcycle Maintenance

6. Be able to communicate with and support colleagues and customers effectively within the automotive work environment	6.1. Use methods of communication with customers and colleagues which meet their needs 6.2. Give customers and colleagues accurate information 6.3. Make requests for assistance from or to customers and colleagues clearly and courteously
7. Understand communication requirements when carrying out vehicle repairs in the automotive work environment	7.1. Explain how to report using written and verbal communication 7.2. Explain the importance of documenting information relating to work carried out in the automotive environment 7.3. Explain the importance of working to agreed timescales
8. Be able to develop and keep good working relationships in the automotive work environment	8.1. Contribute to team work by initiating ideas and co-operating with customers and colleagues 8.2. Treat customers and colleagues in a way which shows respect for their views and opinions 8.3. Make and keep achievable commitments to customers and colleagues 8.4. Inform colleagues promptly of anything likely to affect their own work
9. Understand how to develop good working relationships with colleagues and customers in the automotive workplace	9.1. Describe how to develop positive working relationships with colleagues and customers 9.2. Explain the importance of developing positive working relationships 9.3. Explain the importance of accepting other peoples' views and opinions 9.4. Explain the importance of making and honouring realistic commitments to colleagues and customers
10. Know the purpose of the Automotive Charity, BEN and how the automotive industry supports it	10.1. Describe the purpose of the Automotive Charity, BEN 10.2. Outline how BEN can help employees in the automotive and transportation sector 10.3. State how the automotive industry supports the charity 10.4. Give examples of ways to contact the charity 10.5. State how to make a donation to BEN

Content:

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
- b. Sources of information
 - i. other staff
 - ii. manuals
 - iii. parts lists
 - iv. computer software and the internet
 - v. manufacturer
 - vi. 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 & customer requirements:

- a Importance of time scales to customer and organisation
- 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

Know the purpose of the Automotive Charity BEN and how it is supported:

- a They provide support and advice to people in the automotive / transportation industries
- b Who the charity supports:
 - i. those in the automotive industry in times of hardship or distress
- c What they support:
 - i. welfare
 - ii. illness



Content Contd.

- iii. money
- iv. relationship worries
- v. stress
- vi. relationship problems
- vii. care and retirement living
- d How to contact the charity:
 - i. using the website
 - ii. helpline numbers
 - iii. text
 - iv. leave a message
 - v. email
 - vi. phone
 - vii. online form
 - viii. social media
 - ix. referral process
- e How to support the charity:
 - i. volunteering
 - ii. hosting events
 - iii. company involvement
 - iv. backing BEN
 - v. performance related giving
 - vi. adopt BEN as a charity
- f How to make a donation:
 - i. online
 - ii. purchases from the online shop
 - iii. donation form
 - iv. gift aid
 - v. through your salary
 - vi. phone
 - vii. post
 - viii. direct debit
- g Raise awareness of BEN by locating the charity website and their social media links

Evidence Requirements

1. **You must be observed by your assessor** working well with others **on at least 1 occasion** whilst performing your normal duties.



UNIT REF: GA4	UNIT TITLE: MATERIALS, FABRICATION, TOOLS AND MEASURING DEVICES USED IN THE AUTOMOTIVE ENVIRONMENT
----------------------	---

Mapping: This unit is mapped to the IMI NOS G4	Level: 2	GLH: 26
<p>Rationale: This unit enables the learner to develop an understanding, knowledge and skills of the correct selection, care and use of key hand tools and measuring devices for modification, fabrication and repair in the automotive environment, the correct preparation and use of common automotive environment equipment, the correct selection and fabrication of materials used when modifying and repairing and the correct application of automotive engineering fabrication and fitting principles</p>		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
<p>1. Understand how to select, use and care for hand tools and measuring devices in the automotive environment</p>	<p>1.1. Identify and explain the use of common types of hand tools used for fabricating and fitting in the automotive environment</p> <p>1.2. Identify and explain the use of common measuring devices used for fabrication and fitting in the automotive environment</p> <p>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</p> <p>1.4. State the limitations of common hand tools and measuring devices used for fabricating, repair and fitting in the automotive workplace</p> <p>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</p> <p>1.6. Identify common electrical measuring tools used in the repair of vehicles and components</p> <p>1.7. Explain the preparation and safe and correct use of common electrical tools when measuring voltage, current and resistance</p>
<p>2. Be able to select, maintain and use and hand tools and measuring devices in the automotive environment</p>	<p>2.1. Select, maintain and use suitable hand tools safely when fabricating and fitting in the automotive workplace</p> <p>2.2. Select, maintain and use suitable measuring devices safely when fabricating and fitting in the automotive environment</p> <p>2.3. Select, maintain and use suitable PPE for fabrication, repair and fitting in the automotive environment</p> <p>2.4. Select, maintain and use suitable electrical measuring tools safely when repairing vehicles and components</p>
<p>3. Understand how to prepare and use common workshop equipment</p>	<p>3.1. Describe the preparation and safe use of workshop equipment</p> <p>3.2. Explain the term: safe working load</p>



<p>4. Be able to prepare and use common workshop equipment</p>	<p>4.1. Use suitably maintained workshop equipment safely</p> <p>4.2. Use correct interpretation of 'safe working load' on lifting and supporting equipment</p> <p>4.3. Report any faulty or damaged tools and equipment to the relevant persons clearly and promptly</p> <p>4.4. Store work tools and equipment in a safe manner, which permits ease of access and identification for use</p>
<p>5. Understand how to select materials when fabricating, modifying and repairing vehicles and fitting components</p>	<p>5.1. Describe the properties, application and limitations of ferrous and non-ferrous metals, including their safe use</p> <p>5.2. Describe the properties, application and limitations of common non-metallic materials, including their safe use</p> <p>5.3. Define common terms relating to the properties of materials</p>
<p>6. Be able to select materials when fabricating, modifying and repairing vehicles and fitting components</p>	<p>6.1. Select and use appropriate materials whilst constructing, fitting, modifying or repairing vehicles and components</p>
<p>7. Understand how to apply automotive engineering, fabrication and fitting principles when modifying and repairing vehicles and components</p>	<p>7.1. Describe how to tap threads, file, cut and drill plastics and metals when modifying or repairing vehicles</p> <p>7.2. Describe how to measure, mark out, shape and join materials when fabricating</p> <p>7.3. Describe the selection and fitting procedures of the following: a. gaskets and seals b. sealants and adhesives c. fittings and fasteners d. electrical circuit components</p> <p>7.4. Identify locking, fastening and fixing devices</p> <p>7.5. State the importance of correct operating specifications for limits, fits and tolerances in the automotive environment</p>
<p>8. Be able to apply automotive engineering, fabrication and fitting principles when modifying and repairing vehicles and components</p>	<p>8.1. Use correct procedures when: a. filing b. tapping threads c. cutting plastics and metals d. drilling plastics and metals. e. fitting</p> <p>8.2. Use appropriate techniques when fabricating, repairing and modifying vehicles and components</p> <p>8.3. Select and use: a. gaskets b. seals c. sealants d. fittings and fasteners</p>



	<p>8.4. Apply modification and repair techniques to automotive electrical circuits</p> <p>8.5. Select and use locking, fixing and fastening devices</p>
--	---

Evidence Requirements	
1.	You must be observed by your assessor undertaking basic routine checks of hand tools, measuring devices and workshop equipment covering all of those listed below:
	<ul style="list-style-type: none">• electrical
	<ul style="list-style-type: none">• mechanical
	<ul style="list-style-type: none">• pneumatic
	<ul style="list-style-type: none">• hydraulic
2.	You must be observed by your assessor fabricating at least 1 item from suitable materials to known tolerances, which includes the following processes
	<ul style="list-style-type: none">• filing
	<ul style="list-style-type: none">• tapping threads
	<ul style="list-style-type: none">• cutting
	<ul style="list-style-type: none">• drilling
	<ul style="list-style-type: none">• joining
3.	You must be observed by your assessor carrying out routine checks during stages of fabrication



UNIT REF: L2MCMS	UNIT TITLE: PLAN, PREPARE, CARRY OUT AND REPORT ON ROUTINE MOTORCYCLE MAINTENANCE
-------------------------	--

Mapping: This unit is mapped to the IMI NOS MC01	Level: 2	GLH: 50
<p>Rationale: This unit enables the learner to develop the skills, knowledge and understanding required to conduct routine maintenance, adjustment and replacement activities as part of the periodic servicing of motorcycles. This unit also enables the learner to gain the knowledge and skills required to plan the work activity, prepare the work area and produce a report upon the completion of the work activity.</p> <p>The learner must demonstrate how meaningful employer involvement has benefitted them during the delivery and/or the assessment of this synoptic unit.</p>		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Be able to produce a plan and prepare the work area	1.1. Produce a detailed plan, prior to carrying out the work activity, of the work to be completed including: <ul style="list-style-type: none"> a. tools and equipment required b. replacement parts required c. replacement fluids required d. consumables required e. technical data required 1.2. Prepare the work area prior to commencement of the work activity
2. Understand how to carry out routine motorcycle maintenance	2.1 Explain how to conduct a scheduled motorcycle routine examination and assessment against the motorcycle manufacturer's specification 2.2 Identify the assessment methods used to check for conformity 2.3 Identify the different systems to be inspected while carrying out motorcycle routine maintenance including: <ul style="list-style-type: none"> a. engine b. steering, brakes and suspension c. systems d. wheels and tyres e. transmission and driveline f. electrical and electronic g. motorcycle bodywork 2.4 Describe the procedures used for checking the condition and serviceability of motorcycle units and components 2.5 Describe the procedures for checking and replenishing fluid levels 2.6 Identify different lubricants and their application 2.7 Describe the procedures for checking and replacing lubricants 2.8 Identify adjustments that need to be carried out during motorcycle routine maintenance 2.9 Explain the procedure for reporting cosmetic damage to motorcycle components and units outside normal service items



	<p>2.10 Identify the operating specifications for the systems being checked while carrying out motorcycle routine maintenance</p> <p>2.11 Identify the hazards associated with high energy electrical motorcycle components</p>
3. Be able to work safely when carrying out motorcycle routine maintenance	<p>3.1 Use suitable personal protective equipment and motorcycle coverings throughout all motorcycle routine maintenance activities</p> <p>3.2 Work in a way which minimises the risk of damage or injury to the motorcycle, people and the environment</p> <p>3.3 Prepare the motorcycle systems and work area for safe working procedures</p>
4. Understand the importance of carrying out motorcycle maintenance	<p>4.1 Describe the requirements of correct maintenance in order to maintain the motorcycle in a roadworthy and legal condition</p> <p>4.2 Describe the importance of correct maintenance for warranty purposes</p>
5. Be able to use relevant information to carry out the task	<p>5.1 Select suitable sources of technical information to support motorcycle routine maintenance activities including:</p> <ul style="list-style-type: none"> a. motorcycle technical data b. maintenance procedures c. legal requirements <p>5.2 Use technical information to support motorcycle inspection activities</p> <p>5.3 Retrieve, record and act on on-board data, where applicable</p>
6. Be able to use appropriate tools and equipment	<p>6.1 Select the appropriate tools and equipment necessary for carrying out routine maintenance</p> <p>6.2 Ensure that equipment has been calibrated to meet manufacturer's and legal requirements</p> <p>6.3 Use the correct tools and equipment in the way specified by manufacturer when carrying out routine maintenance</p>
7. Be able to carry out motorcycle routine maintenance	<p>7.1 Carry out motorcycle maintenance using prescribed methods, adhering to the correct specifications and tolerances for the motorcycle and following:</p> <ul style="list-style-type: none"> a. the manufacturer's approved inspection methods b. recognised inspection methods c. health and safety requirements <p>7.2 Carry out adjustments, replacement of motorcycle components and replenishment of consumable materials following the manufacturer's current specification</p>



	<p>7.3 Ensure the examination methods identify accurately any motorcycle system and or component problems falling outside the maintenance schedule are specified</p> <p>7.4 Ensure any comparison of the motorcycle against specification accurately identifies any:</p> <ol style="list-style-type: none"> a. differences from the motorcycle specification b. motorcycle appearance and condition faults c. variation from legal requirements <p>7.5 Use suitable testing methods to evaluate the performance of all replaced and adjusted components and systems accurately</p>
<p>8. Be able to carry out removal and replacement of motorcycle electrical units and components</p>	<p>8.1 Remove and replace the motorcycle electrical systems and components, adhering to the correct specifications and tolerances for the motorcycle and following:</p> <ol style="list-style-type: none"> a. the manufacturer's approved and workplace removal and replacement methods b. recognised repair methods c. health and safety requirements <p>8.2 Ensure that replaced motorcycle electrical units and components conform to the motorcycle operating specification and any legal requirements</p> <p>8.3 Use suitable testing methods to evaluate the performance of the reassembled system</p> <p>8.4 Ensure that the reassembled motorcycle electrical systems performs to the motorcycle operating specification and meets any legal requirements</p>
<p>9. Be able to record information and make suitable recommendations</p>	<p>9.1 Produce a detailed report of the work carried out to include:</p> <ol style="list-style-type: none"> a. parts, consumables and fluids used b. the systems inspected, maintained and adjusted c. the overall time spent d. additional faults/work found <p>9.2 Complete a motorcycle inspection check sheet</p> <p>9.3 Make suitable and justifiable recommendations for cost effective repairs</p>
<p>10. Be able to demonstrate the benefits of the meaningful employer involvement obtained</p>	<p>10.1 State the type and duration of the meaningful employer involvement</p> <p>10.2 Explain how the meaningful employer involvement has benefitted them during the completion of this work activity</p>

Content:

- a. Motorcycle maintenance, inspection and adjustment and record findings
- b. Motorcycle inspection techniques used in routine maintenance including:
 - i. aural
 - ii. visual and functional assessments on engine
 - iii. engine systems
 - iv. steering, brakes and suspension systems
 - v. wheels and tyres
 - vi. transmission system
 - vii. electrical and electronic systems
 - viii. motorcycle bodywork
- c. The procedures used for inspecting the condition and serviceability of the following:
 - i. filters
 - ii. drive belts
 - iii. brake linings
 - iv. pads
 - v. tyres
 - vi. lights
- d. Preparation and use appropriate use of equipment to include:
 - i. test instruments
 - ii. emission equipment
 - iii. wheel alignment
 - iv. beam setting equipment
 - v. tyre tread depth gauges
- e. Procedures for checking and replenishing fluid levels:
 - i. oil
 - ii. water
 - iii. hydraulic fluids
- f. 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
- g. Procedures for carrying out adjustments on motorcycle systems or components:
 - i. clearances
 - ii. settings
 - iii. alignment
 - v. operational performance (engine idle, exhaust gas)
- h. Procedures for checking electrical systems:
 - i. operation
 - ii. security
 - iii. performance
- i. Importance and process of detailed inspection procedures:
 - i. following inspection checklists
 - ii. checking conformity to manufacturer's specifications
 - iii. UK and European legal requirements
- j. Importance and process of completing all relevant documentation relating to routine maintenance:
 - i. inspection records
 - ii. job cards
 - iii. motorcycle repair records
 - iv. motorcycle service history

Requirements and methods used for protecting

- a. The need to use motorcycle protection prior to repair
 - i. motorcycle body panels
 - ii. paint surfaces
 - iii. seats
- b. The need to check the motorcycle following routine maintenance
- c. The need to inspect the motorcycle following routine maintenance:
 - i. professional presentation of the motorcycle
 - ii. customer perceptions

Content Contd.

- d. The checks of the motorcycle following routine maintenance:
 - i. removal of oil and grease marks
 - ii. bodywork panels
 - iii. paint surfaces
 - iv. seats
 - v. re-instatement of components

Lighting & Auxiliary Systems

- 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. headlamp flash
 - vi. horn
- b. The circuit diagram and operation of components for:
 - i. side and tail lamps
 - ii. headlamps
 - iii. direction indicators
 - iv. horn
- c. The statutory requirements for motorcycle lighting and auxiliary units when using a motorcycle on the road.
- d. Headlamp adjustment and beam setting.

Examples of recognised meaningful employer involvement are limited to:

- a. structured work experience which develops skills and knowledge relevant to the qualification
- b. structured work placement which develops skills and knowledge relevant to the qualification
- c. undertaking project(s), exercises and/or assessments/examination(s) set with input from industry practitioners
- d. taking one or more units delivered or co-delivered by an industry practitioner(s) (master class or guest lectures)
- e. industry practitioners operating as ‘expert witnesses’ which contributes to the assessment of the learner’s work or practice, operating within a specified assessment framework. This could be a specific project(s), exercise(s) or assessment for the qualification

Examples of unrecognised employer involvement include:

- a. employer hosted visits
- b. employers providing premises, facilities or equipment
- c. employers or industry practitioners providing talks or contributing to delivery on employability, careers advice, CV writing or interview training
- d. learner attendance at careers fairs, events or other networking opportunities
- e. simulated or provider-based working environments
- f. employers providing learners with job references

Evidence Requirements
1. You must produce a plan prior to carrying out the service. The plan must include tools, equipment, parts, fluids, consumables and technical data required.
2. You must be observed by your assessor successfully preparing the work area prior to carrying out the service.
3. You must be observed by your assessor successfully carrying out servicing activities on at least 1 motorcycle which collectively covers the Learning Outcomes.
4. You must be observed by your assessor successfully carrying out the removal and replacement of electrical lighting units and components
5. You must produce a report following completion of the service – this must include details of further work required, recommendations, faults found and a completed inspection sheet.



UNIT REF: MCM02.1	UNIT TITLE: REMOVE AND REPLACE MOTORCYCLE ENGINE, POWER TRAIN AND LUBRICATION SYSTEM UNITS AND COMPONENTS
--------------------------	--

Mapping: This unit is mapped to the IMI NOS MC02	Level: 2	GLH: 65
Rationale: This unit allows the learner to develop skills, knowledge and understanding required to remove and replace motorcycle engine, powertrain and lubrication system components. It also covers the evaluation of performance of the replaced units and systems		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Be able to work safely when carrying out removal and replacement activities	1.1 Use suitable personal protective equipment and motorcycle coverings throughout all motorcycle engine unit and component removal and replacement activities 1.2 Work in a way which minimises the risk of damage or injury to the motorcycle, people and the environment
2. Understand how the main motorcycle engine mechanical systems operate	2.1 Identify motorcycle engine mechanical system components 2.2 Describe the construction and operation of motorcycle engine mechanical systems a. four stroke b. two stroke c. rotary 2.3 Compare key motorcycle engine mechanical 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 mechanical systems a. compression ratio's b. cylinder capacity c. power d. torque 2.5 State common terms used in motorcycle engine mechanical system design a. tdc b. bdc c. stroke d. bore
3. Understand how motorcycle engine lubrication systems operate	3.1 Identify motorcycle engine lubrication system components 3.2 Describe the construction and operation of motorcycle engine lubrication components and systems a. full flow b. by pass c. wet sump d. dry sump 3.3 Identify motorcycle engine lubrication system components



	<p>3.4 Describe the construction and operation of motorcycle engine lubrication components and systems</p> <ol style="list-style-type: none"> a. full flow b. by pass c. wet sump d. dry sump <p>3.5 Compare key motorcycle engine lubrication system components and assemblies to identify differences in construction and operation</p> <p>3.6 Identify the key engineering principles that are related to motorcycle engine lubrication systems</p> <ol style="list-style-type: none"> a. classification of lubricants b. properties of lubricants c. methods of reducing friction <p>3.5 State common terms used in motorcycle engine lubrication system design</p>
<p>4. Understand how motorcycle powertrain systems operate, including; clutch and transmission</p>	<p>4.1. Identify motorcycle clutch and transmission system components</p> <p>4.2. Describe the construction and operation of motorcycle clutch and transmission system components</p> <p>4.3. Compare key motorcycle clutch and transmission system components and assemblies against alternatives to identify differences in construction and operation.</p>
<p>5. Be able to use relevant information to carry out the task</p>	<p>5.1 Select suitable sources of technical information to support motorcycle engine unit and component removal and replacement activities including:</p> <ol style="list-style-type: none"> a. motorcycle technical data b. removal and replacement procedures c. legal requirements <p>5.2 Use technical information to support motorcycle engine unit and component removal and replacement activities</p>
<p>6. Be able to use appropriate tools and equipment</p>	<p>6.1 Select the appropriate tools and equipment necessary for the removal and replacement activity</p> <p>6.2 Ensure that equipment has been calibrated to meet manufacturer's and legal requirements</p> <p>6.3 Use the correct tools and equipment in the way specified by manufacturers</p>
<p>7. Understand how to check, replace and test motorcycle engine, powertrain and lubrication system units and components</p>	<p>7.1 Describe how to remove and replace engine, powertrain and lubrication system units and components</p> <p>7.2 Describe common types of testing methods used to check the operation of engine, powertrain and lubrication systems and their purpose</p>



	<p>7.3 Describe how to test and evaluate the performance of replacement units against motorcycle specification</p> <p>7.4 Identify common faults found in motorcycle engine, powertrain and lubrication systems and their causes</p>
<p>8. Be able to carry out removal and replacement of motorcycle engine, powertrain and lubrication system units and components</p>	<p>8.1 Remove and replace the motorcycle engine powertrain and lubrication system units and components, adhering to the correct specifications and tolerances for the motorcycle and following:</p> <ul style="list-style-type: none">a. the manufacturer's approved removal and replacement methodsb. recognised repair methodsc. health and safety requirements <p>8.2 Ensure that replacement motorcycle engine, powertrain and lubrication units and components conform to the motorcycle operating specification and any legal requirements</p> <p>8.3 Use suitable testing methods to evaluate the performance of the reassembled system</p> <p>8.4 Ensure that the reassembled motorcycle engine systems performs to the motorcycle operating specification and meets any legal requirements</p>
<p>9. Be able to record information and make suitable recommendations</p>	<p>9.1 Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required</p> <p>9.2 Make suitable and justifiable recommendations for cost effective repairs</p> <p>9.3 Record and report any additional faults noticed during the course of their work promptly in the format required</p>
<p>10. Be able to demonstrate the benefits of the meaningful employer involvement obtained</p>	<p>9.1 State the type and duration of the meaningful employer involvement</p> <p>9.2 Explain how the meaningful employer involvement has benefitted them during the completion of this work activity</p>

Content Contd.**Engines**

- a. Engine types and configurations:
 - i. inline
 - ii. flat
 - iii. vee
 - iv. four-stroke cycle and two-stroke cycle 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, 4, 6 cylinder types)
- d. Cylinder head layout and design, combustion chamber and piston design.
- e. Calculate compression ratios from given data.

Content Contd.

- f. The procedures used when inspecting engines
- g. The procedures to assess:
 - i. serviceability
 - ii. wear
 - iii. condition
 - iv. clearances
 - v. settings
 - vi. linkages
 - vii. joints
 - viii. fluid systems
 - ix. adjustments
 - x. operation and functionality
 - xi. security
- h. Symptoms and faults associated with mechanical engine operation:
 - i. poor performance
 - ii. abnormal or excessive mechanical noise
 - iii. erratic running
 - iv. low power
 - v. exhaust emissions
 - vi. abnormal exhaust smoke
 - vii. unable to start
 - viii. exhaust gas leaks to cooling system
 - ix. exhaust gas leaks

Lubrication

- a. The advantages and disadvantages of wet and dry systems.
- b. Engine lubrication system:
 - i. splash and pressurised systems
 - ii. pumps
 - iii. pressure relief valve
 - iv. filters
 - v. oil ways
 - vi. oil coolers
 - vii. total loss
- 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

Content Contd.

- v. oil contamination
- f. The procedures used when inspecting lubrication system

Powertrain Clutch

- a. The components, operating principles, and functions of clutch's
 - i. wet clutch
 - ii. dry clutch
 - iii. slipper clutch
 - iv. centrifugal
 - v. cable control
 - vi. 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
 - iii. judder

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

Content Contd.

- j. re-instatement of components and fittings

Examples of recognised meaningful employer involvement are limited to:

- a. structured work experience which develops skills and knowledge relevant to the qualification
- b. structured work placement which develops skills and knowledge relevant to the qualification
- c. undertaking project(s), exercises and/or assessments/examination(s) set with input from industry practitioners
- d. taking one or more units delivered or co-delivered by an industry practitioner(s) (master class or guest lectures)
- e. industry practitioners operating as 'expert witnesses' which contributes to the assessment of the learner's work or practice, operating within a specified assessment framework. This could be a specific project(s), exercise(s) or assessment for the qualification

Examples of unrecognised employer involvement include:

- a. employer hosted visits
- b. employers providing premises, facilities or equipment
- c. employers or industry practitioners providing talks or contributing to delivery on employability, careers advice, CV writing or interview training
- d. learner attendance at careers fairs, events or other networking opportunities
- e. simulated or provider-based working environments
- f. employers providing learners with job references

Evidence Requirements
<p>1. You must be observed by your assessor successfully carrying out the removal and replacement of engine mechanical units and components on at least 1 occasion</p> <ul style="list-style-type: none"> • engine mechanical systems
<p>2. You must be observed by your assessor successfully carrying out the removal and replacement of engine lubrication units and components on at least 1 occasion</p> <ul style="list-style-type: none"> • lubrication systems (not including standard external filters)
<p>3. You must be observed by your assessor successfully carrying out the removal and replacement of powertrain units and components on at least 1 occasion</p> <ul style="list-style-type: none"> • powertrain systems



UNIT REF: MCM02.2	UNIT TITLE: REMOVE AND REPLACE MOTORCYCLE COOLING SYSTEM UNITS AND COMPONENTS
--------------------------	--

Mapping: This unit is mapped to the IMI NOS MC02	Level: 2	GLH: 25
Rationale: This unit allows the learner to develop skills, knowledge and understanding required to remove and replace motorcycle cooling system units and components. It also covers the evaluation of performance of the replaced units and systems		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Be able to work safely when carrying out removal and replacement activities	1.1 Use suitable personal protective equipment and motorcycle coverings throughout all motorcycle cooling system unit and component removal and replacement activities 1.2 Work in a way which minimises the risk of damage or injury to the motorcycle, people and the environment
2. Understand how motorcycle engine cooling systems operate	2.1 Identify motorcycle engine cooling system components 2.2 Describe the construction and operation of motorcycle engine cooling systems 2.3 Compare key motorcycle engine cooling 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 cooling systems <ol style="list-style-type: none"> a. heat transfer b. linear and cubical expansion c. specific heat capacity d. boiling point of liquids 2.5 State common terms used in key motorcycle engine cooling system design
3. Be able to use relevant information to carry out the task	3.1 Select suitable sources of technical information to support motorcycle cooling system unit and component removal and replacement activities including: <ol style="list-style-type: none"> a. motorcycle technical data b. removal and replacement procedures c. legal requirements 3.2 Use technical information to support motorcycle cooling system unit and component removal and replacement activities
4. Be able to use appropriate tools and equipment	4.1 Select the appropriate tools and equipment necessary for the removal and replacement activity 4.2 Ensure that equipment has been calibrated to meet manufacturer's and legal requirements 4.3 Use the correct tools and equipment in the way specified by manufacturers



<p>5. Understand how to check, replace and test motorcycle cooling system units and components</p>	<p>5.1 Describe how to remove and replace cooling system units and components</p> <p>5.2 Describe common types of testing methods used to check the operation of cooling systems and their purpose</p> <p>5.3 Describe how to test and evaluate the performance of replacement units against motorcycle specification</p> <p>5.4 Identify common faults found in motorcycle cooling systems and their causes</p>
<p>6. Be able to carry out removal and replacement of motorcycle cooling units and components</p>	<p>6.1. Remove and replace motorcycle cooling system units and components, adhering to the correct specifications and tolerances for the motorcycle and following:</p> <ul style="list-style-type: none"> a. the manufacturer's approved removal and replacement methods b. recognised repair methods c. health and safety requirements <p>6.2. Ensure that replacement motorcycle cooling system units and components conform to the motorcycle operating specification and any legal requirements</p> <p>6.3. Use suitable testing methods to evaluate the performance of the reassembled system</p> <p>6.4. Ensure that the reassembled system performs to the motorcycle operating specification and meets any legal requirements</p>
<p>7. Be able to record information and make suitable recommendations</p>	<p>7.1. Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required</p> <p>7.2. Make suitable and justifiable recommendations for cost effective repairs</p> <p>7.3. Record and report any additional faults noticed during the course of their work promptly in the format required</p>

Content:

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. header tanks, radiators and pressure caps
 - iii. expansion tanks hoses, clips and pipes
 - iv. 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. hydrometer, or anti-freeze testing equipment
 - iv. chemical tests for the detection of combustion gas



Content Contd.

- d. Symptoms and faults associated with cooling systems:
 - i. water leaks
 - ii. water in oil
 - iii. excessively low or high coolant temperature
- e. The procedures used when inspecting
 - i. cooling system

General

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

Evidence Requirements
1. You must be observed by your assessor successfully carrying out the removal and replacement of cooling system units and components
<ul style="list-style-type: none">• cooling system



UNIT REF: MCM02.3	UNIT TITLE: REMOVE AND REPLACE MOTORCYCLE FUEL, IGNITION, AIR AND EXHAUST SYSTEM UNITS AND COMPONENTS
--------------------------	--

Mapping: This unit is mapped to the IMI NOS MC02	Level: 2	GLH: 33
Rationale: This unit allows the learner to develop skills, knowledge and understanding required to remove and replace motorcycle fuel, ignition, air and exhaust system units and components. It also covers the evaluation of performance of the replaced units and systems		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Be able to work safely when carrying out removal and replacement activities	1.1 Use suitable personal protective equipment and motorcycle coverings throughout all motorcycle fuel, ignition, air and exhaust system unit and component removal and replacement activities 1.2 Work in a way which minimises the risk of damage or injury to the motorcycle, people and the environment
2. Understand how motorcycle engine fuel systems operate	2.1 Identify motorcycle engine fuel system components 2.2. Describe the construction and operation of motorcycle engine fuel systems 2.3. Compare key motorcycle engine fuel 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 fuel systems <ol style="list-style-type: none"> a. properties of fuels b. combustion processes c. exhaust gas constituents 2.5. State common terms used in motorcycle engine fuel system design
3. Understand how motorcycle engine ignition systems operate	3.1 Identify motorcycle engine ignition system components 3.2 Describe the construction and operation of motorcycle engine ignition systems 3.3 Compare key motorcycle engine ignition 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 ignition systems <ol style="list-style-type: none"> a. flame travel b. ignition timing 3.5. State common terms used in key motorcycle engine ignition system design
4. Understand how motorcycle engine air supply and exhaust systems operate	4.1 Identify motorcycle engine air supply and exhaust system components



	<p>4.2 Describe the construction and operation of motorcycle engine air supply and exhaust systems</p> <ol style="list-style-type: none"> a. turbo charging b. exhaust gas recirculation (EGR) c. secondary air injection d. catalytic converters <p>4.3 Compare key motorcycle engine air supply and exhaust system components and assemblies against alternatives to identify differences in construction and operation</p> <p>4.4 Identify the key engineering principles that are related to motorcycle engine air supply and exhaust systems</p> <ol style="list-style-type: none"> a. sound absorption b. reduction of harmful emissions <p>4.5. State common terms used in key motorcycle engine air supply and exhaust system design</p>
<p>5. Be able to use relevant information to carry out the task</p>	<p>5.1 Select suitable sources of technical information to support motorcycle fuel, ignition, air and exhaust system unit and component removal and replacement activities including:</p> <ol style="list-style-type: none"> a. motorcycle technical data b. removal and replacement procedures c. legal requirements <p>5.2 Use technical information to support motorcycle fuel, ignition, air and exhaust system unit and component removal and replacement activities</p>
<p>6. Be able to use appropriate tools and equipment</p>	<p>6.1 Select the appropriate tools and equipment necessary for the removal and replacement activity</p> <p>6.2 Ensure that equipment has been calibrated to meet manufacturer's and legal requirements</p> <p>6.3 Use the correct tools and equipment in the way specified by manufacturers</p>
<p>7. Understand how to check, replace and test motorcycle fuel, ignition, air and exhaust system units and components</p>	<p>7.1 Describe how to remove and replace fuel and ignition system units and components</p> <p>7.2 Describe how to remove and replace air and exhaust system units and components</p> <p>7.3 Describe common types of testing methods used to check the operation of fuel and ignition systems and their purpose</p> <p>7.4 Describe how to test and evaluate the performance of replacement units against motorcycle specification</p> <p>7.5 Identify common faults found in motorcycle fuel and ignition systems and their causes</p> <p>7.6 Identify common faults found in motorcycle air and exhaust systems and their causes</p>



<p>8. Be able to carry out removal and replacement of motorcycle fuel, ignition, air and exhaust system units and components</p>	<p>8.1 Remove and replace motorcycle fuel, ignition, air and exhaust system units and components, adhering to the correct specifications and tolerances for the motorcycle and following:</p> <ul style="list-style-type: none">a. the manufacturer's approved removal and replacement methodsb. recognised repair methodsc. health and safety requirements <p>8.2 Ensure that replacement units and components conform to the motorcycle operating specification and any legal requirements</p> <p>8.3 Use suitable testing methods to evaluate the performance of the reassembled system</p> <p>8.4 Ensure that the reassembled motorcycle system performs to the motorcycle operating specification</p>
<p>9. Be able to record information and make suitable recommendations</p>	<p>9.1 Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required</p> <p>9.2 Make suitable and justifiable recommendations for cost effective repairs</p> <p>9.3 Record and report any additional faults noticed during the course of their work promptly in the format required</p>

Content:**Fuel**

- a. The meaning of terms related to:
 - i. hydro-carbon fuels
 - ii. volatility
 - iii. calorific value
 - iv. flash point
 - v. octane value
- b. The composition of hydro-carbon fuels:
 - i. % hydrogen and carbon in petrol fuels
- c. The composition of air (% nitrogen, oxygen), % of oxygen.
- d. The chemically correct air/fuel ratio for petrol engines as 14.7:1 (lambda 1, stoichiometric ratio).
- e. Weak and rich air/fuel ratios for petrol engines.
- f. Exhaust composition and by-products for chemically correct, rich and weak air/fuel ratios of petrol engines:
 - i. water vapour (H₂O)
 - ii. nitrogen (N)
 - iii. carbon monoxide (CO)
 - iv. carbon dioxide (CO₂)
 - v. carbon (C)
 - vi. hydrocarbon (HC)
 - vii. oxides of nitrogen (NO_x, NO₂, NO) and particulates
- g. Symptoms and faults associated with fuel systems
 - i. water in fuel, filter blockage, leaks, difficult starting, erratic running, excessive smoke (black, blue, white), engine knock, turbocharger faults
 - ii. petrol injection system: leaks, erratic running, excessive smoke, poor starting, poor performance, poor fuel economy, failure to start, exhaust emissions, running-on, excessive fuel consumption and surging

Fuel - Petrol

- a. The function and layout of petrol injection systems:
 - i. port injection systems
 - ii. direct injection systems

Content Contd.

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

Ignition

- a. The layout of electronic ignition systems, advantages over conventional systems (points).
- b. Electronic ignition circuits and components:
- i. LT Circuit
 - ii. battery
 - iii. ignition switch
 - iv. electronic trigger devices
 - v. capacitor discharge ignition (CDI)
 - vi. HT Circuit
 - vii. spark plugs (reach, heat range, electrode features and electrode polarity)
 - viii. ignition leads
 - ix. ignition coil
 - x. ignition timing advance system
- c. The operation of electronic system components:
- i. amplifiers
 - ii. triggering systems
 - iii. inductive pick-ups
 - iv. hall generators
 - v. optical pulse generators
 - vi. control units
 - vii. CDI units
- d. The operation of amplifier units.
- e. Ignition terminology:
- i. dwell angle
 - ii. dwell time
 - iii. dwell variations
 - iv. advance and retard of ignition timing
 - v. static and dynamic ignition timing
- f. The operation of electronic ignition systems under various conditions and loads to include:
- i. engine idling
 - ii. during acceleration
 - iii. under full load
 - iv. cruising
 - v. overrun
 - vi. cold starting

Content Contd.

- g. The principles of engine management systems:
 - i. closed loop system
 - ii. integrated ignition
 - iii. injection systems
 - iv. sensors
- h. The procedures used when inspecting
 - i. ignition system
 - ii. engine management
 - iii. sensors
- i. Symptoms and faults associated with ignition system operation
 - i. failure to start hot or cold, erratic running, poor performance, misfire, exhaust emissions misfiring and ignition noise (pinking)

Air supply and exhaust systems

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

General

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

Evidence Requirements
<p>1. You must be observed by your assessor successfully carrying out the removal and replacement of fuel, ignition, air and exhaust system units and components from 2 of the 3 different systems listed below.</p>
<ul style="list-style-type: none"> • fuel system
<ul style="list-style-type: none"> • engine management (ignition system)
<ul style="list-style-type: none"> • air supply and exhaust system



UNIT REF: MCM02.4	UNIT TITLE: REMOVE AND REPLACE MOTORCYCLE STARTING AND CHARGING SYSTEM UNITS AND COMPONENTS
--------------------------	--

Mapping: This unit is mapped to the IMI NOS MC02	Level: 2	GLH: 34
Rationale: This unit allows the learner to develop skills, knowledge and understanding required to remove and replace motorcycle starting and charging system units and components. It also covers the evaluation of performance of the replaced units and systems		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand how motorcycle batteries, starting and charging systems operate	1.1. Identify motorcycle batteries, starting and charging system components 1.2. Describe the construction and operation of motorcycle batteries, starting and charging system components 1.3. Compare motorcycle batteries, starting and charging system components and assemblies against alternatives to identify differences in construction and operation 1.4. State common terms used in conjunction with motorcycle batteries, starting and charging systems
2. Be able to work safely when carrying out removal and replacement activities	2.1 Use suitable personal protective equipment and motorcycle coverings throughout all motorcycle starting and charging system unit and component removal and replacement activities 2.2 Work in a way which minimises the risk of damage or injury to the motorcycle, people and the environment
3. Understand motorcycle electrical and electronic principles	3.1 Identify electrical symbols and units found in motorcycle circuits 3.2. Describe how to interpret motorcycle wiring diagrams 3.3. Describe the operation of key motorcycle circuit safety protection devices and why these are necessary 3.4. Describe motorcycle earthing principles and earthing methods 3.5. Identify the use of different cables and connectors used in motorcycle circuits 3.6. Describe the operation of electrical and electronic sensors and actuators and their application 3.7. Describe the key electrical and electronic control principles that are related to motorcycle electrical circuits 3.8. State common terms used in motorcycle electrical circuits



<p>4. Be able to use relevant information to carry out the task</p>	<p>4.1 Select suitable sources of technical information to support motorcycle starting and charging system unit and component removal and replacement activities including:</p> <ul style="list-style-type: none"> a. motorcycle technical data b. removal and replacement procedures c. legal requirements <p>4.2 Use technical information to support motorcycle starting and charging system unit and component removal and replacement activities</p>
<p>5. Be able to use appropriate tools and equipment</p>	<p>5.1 Select the appropriate tools and equipment necessary for the removal and replacement activity</p> <p>5.2 Ensure that equipment has been calibrated to meet manufacturer's and legal requirements</p> <p>5.3 Use the correct tools and equipment in the way specified by manufacturers</p>
<p>6. Understand how to check, replace and test motorcycle starting and charging system units and components</p>	<p>6.1 Describe how to remove and replace starting and charging system units and components</p> <p>6.2 Describe common types of testing methods used to check the operation of starting and charging systems and their purpose</p> <p>6.3 Describe how to test and evaluate the performance of replacement units against motorcycle specification</p> <p>6.4 Identify common faults found in motorcycle starting and charging systems and their causes</p>
<p>7. Be able to carry out removal and replacement of motorcycle starting and charging system units and components</p>	<p>7.1. Remove and replace motorcycle starting and charging system units and components, adhering to the correct specifications and tolerances for the motorcycle and following:</p> <ul style="list-style-type: none"> a. the manufacturer's approved removal and replacement methods b. recognised repair methods c. health and safety requirements <p>7.2. Ensure that replacement units and components conform to the motorcycle operating specification and any legal requirements</p> <p>7.3 Use suitable testing methods to evaluate the performance of the reassembled system</p> <p>7.4 Ensure that the reassembled motorcycle system performs to the motorcycle operating specification and meets any legal requirements</p>
<p>8. Be able to record information and make suitable recommendations</p>	<p>8.1 Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required</p> <p>8.2 Make suitable and justifiable recommendations for cost effective repairs</p> <p>8.3 Record and report any additional faults noticed during the course of their work promptly in the format required</p>

Content:

Battery and Charging

- a. The construction and operation of motorcycle 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 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)

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.

Content Contd.

- i. The meaning of:
 - i. short circuit
 - ii. open circuit
 - iii. bad earth
 - iv. high resistance
 - v. electrical capacity

The principles of motorcycle electronic systems and component.

- a. Interpret motorcycle wiring diagrams to include:
 - i. auxiliary circuits
 - ii. starting and charging systems
- b. Function and construction of electrical components including:
 - i. circuit relays
 - ii. bulb types
 - iii. circuit protection
- c. 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
- d. 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
- e. 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)
- f. 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

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 and replacing electrical and electronic components and systems



Content Contd.

- c. The importance of logical and systematic processes.
- d. Preparation of replacement units for re-fitting or replacement electrical and electronic components and systems.
- e. The reasons why replacement components and units must meet the original specifications (OES) – warranty requirements, to maintain performance, safety requirements.
- f. Refitting procedures.
- g. The inspection and testing of units and systems to ensure compliance with manufacturer's, legal and performance requirements.
- h. Inspection and re-instatement of the motorcycle following repair to ensure:
 - i. customer satisfaction
 - ii. cleanliness of motorcycle interior and exterior
 - iii. security of components and fittings
 - iv. re-instatement of components and fittings

Evidence Requirements	
1.	You must be observed by your assessor successfully carrying out the removal and replacement of starting and charging system units and components from both of the systems listed below.
	<ul style="list-style-type: none">• Starter system
	<ul style="list-style-type: none">• Charging system



UNIT REF: MCM04	UNIT TITLE: REMOVE AND REPLACE MOTORCYCLE STEERING, BRAKES AND SUSPENSION UNITS AND COMPONENTS
------------------------	---

Mapping: This unit is mapped to the IMI NOS MC04	Level: 2	GLH: 66
Rationale: This unit enables the learner to develop the skills, knowledge and 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 OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand how motorcycle steering and suspension systems operate	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 <ul style="list-style-type: none"> a. steering angles b. hydraulic forces c. stress and strain 1.5. State common terms used in motorcycle steering and suspension system design
2. Be able to work safely when carrying out removal and replacement activities	2.1 Use suitable personal protective equipment and motorcycle coverings throughout all motorcycle steering, brakes and suspension unit and component removal and replacement activities 2.2. Work in a way which minimises the risk of damage or injury to the motorcycle, people and the environment
3. Understand how motorcycle braking systems operate	3.1 Identify motorcycle braking system components 3.2. Describe the construction and operation of motorcycle braking systems 3.3. Compare key motorcycle braking 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 braking systems <ul style="list-style-type: none"> a. laws of friction b. hydraulics c. properties of fluids d. properties of air e. braking efficiency 3.5. State common terms used in motorcycle braking system design



<p>4. Be able to use relevant information to carry out the task</p>	<p>4.1 Select suitable sources of technical information to support motorcycle steering, brakes and suspension unit and component removal and replacement activities including:</p> <ul style="list-style-type: none">a. motorcycle technical datab. removal and replacement proceduresc. legal requirements <p>4.2. Use technical information to support motorcycle steering, brakes and suspension unit and component removal and replacement activities</p>
<p>5. Understand how motorcycle wheel and tyres systems operate</p>	<p>5.1 Identify motorcycle wheel and tyre components</p> <p>5.2. Describe the construction and operation of motorcycle wheels and tyres</p> <p>5.3. Compare key motorcycle wheel and tyre components and assemblies against alternatives to identify differences in construction and operation</p> <p>5.4. Identify the key engineering principles that are related to motorcycle wheel and tyre systems</p> <ul style="list-style-type: none">a. frictionb. un-sprung weightc. dynamic and static balance <p>5.5. State common terms used in motorcycle wheel and tyre design</p>
<p>6. Be able to use appropriate tools and equipment</p>	<p>6.1 Select the appropriate tools and equipment necessary for removal and replacement of motorcycle systems including:</p> <ul style="list-style-type: none">a. steeringb. suspensionc. brakingd. wheels & tyres <p>6.2. Ensure that equipment has been calibrated to meet manufacturers' and legal requirements</p> <p>6.3. Use the correct tools and equipment in the way specified by manufacturers to remove and replace motorcycle steering, braking and suspension systems</p>
<p>7. Understand how to check, replace and test motorcycle steering, brakes and suspension, parts, and components</p>	<p>7.1 Describe how to remove and replace steering, brakes and suspension units and components</p> <p>7.2. Describe common types of testing methods used to check the operation of steering, brakes and suspension units and components and their purpose</p> <p>7.3. Explain how to test and evaluate the performance of replacement units against motorcycle specification</p> <p>7.4. Identify common faults found in motorcycle steering, brakes and suspension units and components</p>



<p>8. Be able to carry out removal and replacement of motorcycle steering, brakes and suspension units and components.</p>	<p>8.1 Remove and replace motorcycle steering, brakes and suspension systems and components, adhering to the correct specifications and tolerances for the motorcycle and following:</p> <ul style="list-style-type: none">a. the manufacturer's approved removal and replacement methodsb. recognised researched repair methodsc. health and safety requirements. <p>8.2. Ensure that replacement motorcycle steering, brakes and suspension units and components conform to the motorcycle operating specification and any legal requirements</p> <p>8.3. Use suitable testing methods to evaluate the performance of the reassembled system</p> <p>8.4. Ensure that the reassembled motorcycle steering, brakes and suspension system performs to the motorcycle operating specification and meets any legal requirements</p>
<p>9. Be able to record information and make suitable recommendations</p>	<p>9.1 Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required</p> <p>9.2. Make suitable and justifiable recommendations for cost effective repairs</p> <p>9.3. Record and report any additional faults noticed during the course of their work promptly in the format required</p>

Content:

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

Content Contd.

- 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. convention 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. convention 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

Content Contd.

- ii. disc brake calliper & pistons
- iii. brake pipe
- iv. warning lights
- v. linked brakes
- d. The principles and components of electronically linked brakes, ABS and traction control 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 & 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 steering, braking and suspension units, parts and system components

- a. The preparation:
 - i. testing and use of tools and equipment
 - ii. electrical meters and equipment used for dismantling



Content Contd.

- b. Appropriate safety precautions:
 - i. PPE
 - ii. Motorcycle protection when dismantling
 - iii. removing and replacing motorcycle steering, braking and suspension units, parts and system components
- c. The important of logical and systematic processes.
- d. The inspection and testing systems and components.
- e. The preparation of replacement units for re-fitting or replacement of motorcycle steering, braking and suspension 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. Refitting 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 motorcycle following repair to ensure customer satisfaction:
 - i. cleanliness of motorcycle
 - ii. security of components and fittings
 - iii. re-instatement of components and fittings

Evidence Requirements
1. You must be observed by your assessor successfully carrying out the removal and replacement of 3 different units or components – one from each system. Your evidence must include demonstration of skill in each aspect of mechanical and hydraulic/fluid units or component removal and replacement.
<ul style="list-style-type: none">• Steering
<ul style="list-style-type: none">• Suspension
<ul style="list-style-type: none">• Braking