



INSTITUTE
OF THE MOTOR
INDUSTRY

IMI QUALIFICATION



QUALIFICATION SPECIFICATION

Part B:

Assessment Criteria

for

IMI Level 3 Diploma in Light Vehicle Maintenance

QUALIFICATION NO: 601/7324/5

*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.

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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:
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Level 3 Diploma in Light Vehicle Maintenance

Group A: Mandatory Units

Group B: Core Unit (Synoptic Assessment)

Group C: Mandatory Specialist Units

Group D: Optional Units – 2 Units to be selected

To achieve the Level 3 Diploma in Light Vehicle Maintenance the learner will need to complete all the units in groups A, B and C. In addition to this they will need to select a minimum of two (2) units from group D. Group B 'Core Unit' must not be completed until achievement of all the units in groups A, C and the selected units in group D.

Total GLH: Min 430 – Max 491

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 Ref:	Unit Title & I.D. 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 Ref:	Unit Title & I.D. Number	Unit Level	GLH	Task		OLT
				W	P	
L3LVMS	Diagnose, Rectify and Report on Complex Light Vehicles Faults (J/507/6337)	3	54	W	P	Group B Test

Group C: Mandatory Specialist Units						
Unit Ref:	Unit Title & I.D. Number	Unit Level	GLH	Task		OLT
				W	P	
AEM06	Diagnose and Rectify Vehicle Auxiliary Electrical Faults (D/507/6344)	3	66	W	P	Group C Test
LVM07	Diagnose and Rectify Light Vehicle Engine Faults (H/507/6345)	3	66	W	P	
LVM08	Diagnose and Rectify Light Vehicle Chassis System Faults (K/507/6346)	3	74	W	P	
LVM13.1	Knowledge of Diagnosing and Rectifying Light Vehicle Transmission and Driveline Faults (M/507/6347)	3	21	W	N/A	



Group D: Optional Units						
Unit Ref:	Unit Title & I.D. Number	Unit Level	GLH	Task		OLT
				W	P	
GA6	How to Make Learning Possible Through Demonstrations and Instruction (T/507/6348)	3	30	W	P	GA6
GA8	How to Identify and Agree Motor Vehicle Customer Service Needs (K/507/6198)	3	30	W	P	GA8
GA37	Supporting Customer Service Improvements in the Automotive Sector (A/507/6349)	2	31	W	P	GA37
AEM03	Overhaul Electrical Units (J/507/6242)	2	63	W	P	AEM03
LVM0506	Inspect Light Vehicles Using Prescribed Methods (M/507/6350)	2	34	W	P	LVM0506
AEM10	Conduct Vehicle Enhancement and Installation Consultations with Customers in the Motor Vehicle Environment (T/507/6351)	3	30	W	P	AEM10
HVM10	Thermal Cutting and Joining Techniques (D/507/6196)	2	58	W	P	HVM10
LVM11.1	Overhaul Light Vehicle Engine Mechanical Units (A/507/6352)	3	58	W	P	LVM11.1
LVM11.2	Overhaul Light Vehicle Transmission Units (F/507/6353)	3	50	W	P	LVM11.2
LVM11.3	Overhaul Light Vehicle Steering and Suspension Units (J/507/6354)	3	50	W	P	LVM11.3
BR18	Remove and Fit Basic Light Vehicle Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Vehicle Body Panels (Y/507/6245)	2	46	W	P	BR18
LVM13.2	Skills in Diagnosing and Rectifying Light Vehicle Transmission and Driveline Faults (L/507/6355)	3	34	N/A	P	N/A



UNIT REF: GA0102	UNIT TITLE: HEALTH, SAFETY AND GOOD HOUSEKEEPING IN THE AUTOMOTIVE ENVIRONMENT
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Mapping: This unit is mapped to the IMI NOS G1 and G2	Level 2	GLH 37
<p>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.</p>		

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: <ul style="list-style-type: none"> 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)
- k.

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.

Content Contd.

- e. Location of safety equipment.
- f. Particular hazards associated with their work area and equipment.
- g. Prohibited areas.
- h. Plant and machinery that trainees must not use or operate.
- i. Why and how faults on unsafe equipment should be reported.
- j. Storing tools, equipment and products safely and appropriately.
- k. Using the correct PPE.
- l. Following 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

Content Contd.

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

Hazards and risks to include:

- a. The difference between a risk and a hazard.
- b. Potential risks resulting from:
 - i. the use and maintenance of machinery or equipment
 - ii. the use of materials or substances
 - iii. accidental breakages and spillages
 - iv. unsafe behaviour
 - v. working practices that do not conform to laid down policies
 - vi. environmental factors
 - vii. personal presentation
 - viii. unauthorised personal, customers, contractors etc entering your work premises
 - ix. working by the roadside
 - x. vehicle recovery
- c. The employee's responsibilities in identifying and reporting risks within their working environment.
- d. The method of reporting risks that 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
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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



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

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
- d.

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
 - 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 one occasion** whilst performing your normal duties.



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



	3.2. Explain the term: safe working load
4. Be able to prepare and use common workshop equipment	<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>
5. Understand how to select materials when fabricating, modifying and repairing vehicles and fitting components	<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>
6. Be able to select materials when fabricating, modifying and repairing vehicles and fitting components	6.1. Select and use appropriate materials whilst constructing, fitting, modifying or repairing vehicles and components
7. Understand how to apply automotive engineering, fabrication and fitting principles when modifying and repairing vehicles and components	<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>
8. Be able to apply automotive engineering, fabrication and fitting principles when modifying and repairing vehicles and components	<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:</p> <ul style="list-style-type: none">a. gasketsb. sealsc. sealantsd. fittings and fasteners <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>
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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• mechanical• pneumatic• 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• tapping threads• cutting• drilling• joining
3.	You must be observed by your assessor carrying out routine checks during stages of fabrication



UNIT REF: L3LVMS	UNIT TITLE: DIAGNOSE ,RECTIFY AND REPORT ON COMPLEX LIGHT VEHICLE FAULTS
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Mapping: This unit is mapped to the IMI NOS G0102 AE06 LVM07,LVM08, LV13	Level 3	GLH: 54
<p>Rationale: This unit enables the learner to develop their knowledge, skills and understanding of diagnosing and rectifying faults in engine, electrical, chassis and transmission systems. This unit also enables the learner to gain the knowledge and skills required to prepare the work area and produce a report upon the completion of the work activity. 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. Understand how to diagnose and rectify faults in light vehicle engine systems	1.1. Describe how to analyse symptoms and causes of faults found in light vehicle engine systems 1.2. Explain systematic diagnostic techniques used in identifying engine system faults 1.3. Explain how to examine, measure and make suitable adjustments to the components 1.4. Explain how to carry out the diagnosis and rectification activities in order to correct the faults in the light vehicle engine systems
2. Understand how to diagnose and rectify faults in auxiliary electrical systems	2.1. Explain the symptoms and causes of faults found in automotive auxiliary electrical systems 2.2. Explain systematic diagnostic techniques used in identifying automotive auxiliary electrical system faults 2.3. Explain how to examine, measure and make suitable adjustments to components 2.4. Explain how to carry out the rectification activities in order to correct the faults in the automotive auxiliary electrical systems
3. Understand how to diagnose and rectify faults in light vehicle transmission and driveline systems	3.1. Explain the symptoms and causes of faults found in light vehicle transmission and driveline systems 3.2. Explain systematic diagnostic techniques used in identifying transmission and driveline system faults 3.3. Explain how to examine, measure and make suitable adjustments components 3.4. Explain how to carry out the rectification activities in order to correct the faults in light vehicle transmission and driveline systems
4. Understand how to diagnose and rectify faults in light vehicle chassis systems	4.1. Explain symptoms and causes of faults found in light vehicle chassis systems 4.2. Explain systematic diagnostic techniques used in identifying chassis system faults 4.3. Explain how to examine, measure and make suitable adjustments to the components



	<p>4.4. Explain how to carry out the diagnosis and rectification activities in order to correct the faults in the light vehicle chassis systems</p>
<p>5. Be able to work safely when carrying out light vehicle diagnostic and rectification activities</p>	<p>5.1. Use suitable personal protective equipment and vehicle coverings when using light vehicle diagnostic methods and carrying out rectification activities</p> <p>5.2. Work in a way which minimises the risk of damage or injury to the vehicle, people and the environment</p> <p>5.3. Prepare the vehicle systems and work area for safe working procedures</p>
<p>6. Understand how to test, interpret results and evaluate light vehicle systems and components</p>	<p>6.1. Explain how to select, prepare and use diagnostic and rectification equipment for light vehicle engine, electrical, chassis and transmission systems</p> <p>6.2. Explain how to evaluate and interpret test results found in diagnosing light vehicle engine, electrical, chassis and transmission system faults against vehicle manufacturer specifications and settings</p> <p>6.3. Explain how to evaluate the operation of components and systems following diagnosis and repair to confirm system performance</p>
<p>7. Be able to use relevant information to carry out the task</p>	<p>7.1. Select suitable sources of technical information to support light vehicle diagnostic and rectification activities including:</p> <ul style="list-style-type: none"> a. vehicle technical data b. diagnostic test procedures <p>7.2. Use sufficient diagnostic information in a systematic way to enable an accurate diagnosis of light vehicle system faults</p>
<p>8. Be able to use appropriate tools and equipment</p>	<p>8.1. Select the appropriate tools and equipment necessary for diagnostic and rectification activities</p> <p>8.2. Ensure that equipment has been calibrated to meet manufacturer's and legal requirements</p> <p>8.3. Use the equipment required, correctly and safely throughout all light vehicle diagnostic and rectification activities</p>
<p>9. Be able to carry out light vehicle engine, electrical and chassis diagnosis, rectification and test activities</p>	<p>9.1. Use diagnostic methods that are relevant to the symptoms presented</p> <p>9.2. Evaluate your assessment of dismantled sub-assemblies and identify their condition and suitability for repair or replacement accurately</p> <p>9.3. Carry out all diagnostic and rectification activities following:</p> <ul style="list-style-type: none"> a. manufacturer's instructions b. recognised repair methods c. workplace procedures d. health and safety requirements



	<p>9.4. Ensure all repaired and replaced components and units conform to the vehicle operating specification and any legal requirements</p> <p>9.5. Adjust components and units correctly to ensure that they operate to meet system requirements</p> <p>9.6. Use testing methods that are suitable for assessing the performance of the system rectified</p> <p>9.7. Ensure the light vehicle system rectified performs to the vehicle operating specification and any legal requirements</p>
<p>10. Be able to record information and make suitable recommendations</p>	<p>10.1. Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required</p> <p>10.2. Make suitable and justifiable recommendations for cost effective repairs</p> <p>10.3. Record and report any additional faults noticed during the course of their work promptly in the format required</p> <p>10.4. Produce a detailed written report for one of the practical tasks completed</p>
<p>11. Be able to demonstrate the benefits of the meaningful employer involvement obtained</p>	<p>11.1. State the type and duration of the meaningful employer involvement</p> <p>11.2. Explain how the meaningful employer involvement has benefitted them during the completion of this work activity</p>

This unit has been designed to be a 'synoptic' assessment for the Level 3 Diploma in Light Vehicle Maintenance qualification. As such this **must** be the final unit to be assessed, following successful achievement of all the other mandatory units within groups A and C and any selected optional units in group D..

The content for this unit is a combination of the content within the mandatory units within the Level 3 Diploma in Light Vehicle Maintenance qualification. . Please refer to the 'content' of each of the following units when preparing to undertake this unit:

- GA0102 – Health, Safety and Good Housekeeping in the Automotive Environment
- GA4 – Materials, Fabrication, Tools and Measuring Devices used in the Automotive Environment
- AEM06 – Diagnose and Rectify Vehicle Auxiliary Electrical Faults
- LVM07 - Diagnose and Rectify Light Vehicle Engine Faults
- LVM08 - Diagnose and Rectify Light Vehicle Chassis System Faults
- LVM13.1 - Knowledge of Diagnosing and Rectifying Light Vehicle Transmission and Driveline Faults

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



Contd.

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 be observed by an assessor carrying out diagnosis and rectification activities from all of the systems listed below, which covers the learning outcomes. The fault should involve a 2 or more step diagnostic activity.
	<ul style="list-style-type: none">• Lighting systems
	<ul style="list-style-type: none">• Engine management system
	<ul style="list-style-type: none">• Braking systems
2.	You must produce a detailed written report following completion of the work to include: details of the work carried out, recommendations and faults found. (this report will be graded and will contribute to your overall qualification grade)



UNIT REF: AEM06	UNIT TITLE: DIAGNOSE AND RECTIFY VEHICLE AUXILIARY ELECTRICAL FAULTS
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Mapping: This unit is mapped to the IMI NOS AE06	Level 3	GLH: 66
Rationale: This unit enables the learner to develop an understanding, knowledge and skills in the rectification of vehicle auxiliary electrical systems and their units. It also covers the evaluation of performance of the systems.		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand vehicle electrical and electronic principles	1.1. Explain the principles of electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics 1.2. Explain the principles of sensor inputs, computer processing and actuator outputs. 1.3. Identify sensor types (passive and active) 1.4. Identify the electrical principles that are related to light vehicle electrical circuits
2. Be able to work safely when carrying out automotive vehicle auxiliary electrical diagnostic and rectification activities	2.1. Use suitable personal protective equipment and vehicle coverings throughout when carrying out auxiliary electrical diagnostic and rectification activities 2.2. Work in a way which minimises the risk of damage or injury to the vehicle, people and the environment
3. Understand how light vehicle auxiliary electrical systems operate	3.1. Identify advanced automotive auxiliary electrical system components 3.2. Explain the construction and operation of automotive auxiliary electrical systems. 3.3. Explain the interaction between electrical, electronic and mechanical components within the system defined 3.4. Explain the operation of the electrical and electronic systems for electric, hybrid and alternative fuel vehicles including regenerative braking systems 3.5. Explain how electrical systems interlink and interact, including multiplexing and fibre optics 3.6. Compare automotive auxiliary electrical system components and assemblies against alternatives to identify differences in construction and operation
4. Be able to use relevant information to carry out the task	4.1. Select suitable sources of technical information to support automotive vehicle diagnostic and rectification activities including: <ul style="list-style-type: none"> a. vehicle technical data b. diagnostic test procedures

	<p>4.2. Use sufficient diagnostic information in a systematic way to enable an accurate diagnosis of automotive auxiliary electrical system faults</p>
<p>5. Understand how to diagnose and rectify faults in auxiliary electrical systems</p>	<p>5.1. Explain the symptoms and causes of faults found in automotive auxiliary electrical systems</p> <p>5.2. Explain systematic diagnostic techniques used in identifying automotive auxiliary electrical system faults</p> <p>5.3. Explain how to examine, measure and make suitable adjustments to components</p> <p>5.4. Explain how to carry out the rectification activities in order to correct the faults in the automotive auxiliary electrical systems</p> <p>5.5. Explain how to select, prepare and use diagnostic and rectification equipment for automotive auxiliary electrical systems</p> <p>5.6. Explain how to evaluate and interpret test results found in diagnosing automotive auxiliary electrical system faults against vehicle manufacturer specifications and settings</p> <p>5.7. Explain how to evaluate the operation of components and systems following diagnosis and repair to confirm system performance</p>
<p>6. Be able to use appropriate tools and equipment</p>	<p>6.1. Select the appropriate tools and equipment necessary for diagnostic and rectification activities</p> <p>6.2. Ensure that equipment has been calibrated to meet manufacturers' and legal requirements</p> <p>6.3. Use the equipment required, correctly and safely throughout all automotive auxiliary electrical diagnostic and rectification activities</p>
<p>7. Be able to carry out automotive vehicle auxiliary electrical diagnosis, rectification and test activities</p>	<p>7.1. Use diagnostic methods that are relevant to the symptoms presented</p> <p>7.2. Evaluate your assessment of dismantled sub-assemblies and identify their condition and suitability for repair or replacement accurately</p> <p>7.3. Carry out all diagnostic and rectification activities following:</p> <ol style="list-style-type: none"> a. manufacturers' instructions b. recognised researched repair methods c. health and safety requirements <p>7.4. Ensure all repaired or replacement components and units conform to the vehicle operating specification and any legal requirements</p> <p>7.5. Adjust components and units correctly to ensure that they operate to meet system requirements</p> <p>7.6. Use testing methods that are suitable for assessing the performance of the system rectified</p>



	7.7. Ensure the rectified vehicle electrical system performs to the vehicle operating specification and any legal requirements
8. Be able to record information and make suitable recommendations	8.1. Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required 8.2. Make suitable and justifiable recommendations for cost effective repairs 8.3. Record and report any additional faults noticed during the course of their work promptly in the format required

Content:

The electrical principles that are related to light vehicle electrical circuits:

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

Battery and Charging

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

Starting

- a. The layout, construction and operation of engine starting systems: inertia and pre-engaged principles.
- b. The function and operation of the following components:
 - i. inertia and pre-engaged starter motor
 - ii. starter ring gear
 - iii. pinion
 - iv. starter solenoid
 - v. ignition/starter switch

Content Contd.

- vi. starter relay (if appropriate)
- vii. one-way clutch (pre-engaged starter motor)

Lighting systems and technology

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

Lighting circuits and the relationship between each circuit

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

Common faults and testing methods associated with external lighting system

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

The operating principles of external lighting systems and multiplexing systems

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

The different types of electric windows, and mirror systems and components

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

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

- a. Components must include:
 - i. motors
 - ii. relays
 - iii. interfaces
 - iv. modules
 - v. switches

The operating principles of electric windows and mirror systems

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

Common faults and testing methods associated with electric windows mirror systems

- a. Fault diagnosis for:
 - i. electric windows failing to open or close

Content Contd.

- ii. electric mirrors fail to adjust
- iii. slow operation on both systems

The different types of screen heating systems and components

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

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

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

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

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

The different types of In Car Entertainment (ICE) systems and components

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

The function of components in ICE systems

- a. Systems include:
 - i. radios
 - ii. CD players
 - iii. video players
 - iv. DVD players
 - v. aerial systems
 - vi. speakers
 - vii. amplifiers
 - viii. VDU screens
 - ix. mobile communication units

The operating principles of ICE systems

- a. Operation of entertainment systems speaker and aerial systems

Common faults and testing methods associated with ICE systems

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

The different types of integrated security/warning systems and components

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

The function of component heater, cooling parts and air conditioning

- a. Components include:
 - i. heater motors
 - ii. rheostats

Content Contd.

- iii. valves
- iv. switches
- v. relays
- vi. cooling fan motors
- vii. air conditioning units
- viii. thermostatic switches

The operating principles of heater, cooling systems and air conditioning

a. Principles to include:

- i. conduction
- ii. convection
- iii. radiation
- iv. circulation
- v. boiling points
- vi. states of matter (Gas, liquid, solid)
- vii. temperature control
- viii. antifreeze mixtures
- ix. heat transfer

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

a. Fault diagnosis for:

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

The different types of locking system components

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

The function of component parts in the locking system

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

The operating principles of locking systems

- a. Doors and cabs

Common faults and testing methods associated with locking systems

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

The different types of Supplementary Restraint and Airbag systems

a. Components include:

- i. control units
- ii. sensors
- iii. seat belt pretensioners
- iv. airbag assemblies
- v. wiring systems
- vi. warning systems

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

a. Components include:

- i. control units
- ii. interfaces
- iii. sensors
- iv. airbag units
- v. pretensioners
- vi.

The operating principles of Supplementary Restraint and Airbag systems

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



Content Contd.

Common faults and testing methods associated Supplementary Restraint and Airbag systems

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

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

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

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

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

Evidence Requirements
<p>1. You must be observed by an assessor carrying out diagnosis and rectification activities from 3 different systems out of the 14 listed below, which covers the learning outcomes. The fault should involve a 2 or more step diagnostic activity.</p>
<ul style="list-style-type: none"> • lighting systems
<ul style="list-style-type: none"> • heated seats
<ul style="list-style-type: none"> • electrically adjusted seats
<ul style="list-style-type: none"> • heated screens
<ul style="list-style-type: none"> • electric mirrors
<ul style="list-style-type: none"> • electric sunroofs
<ul style="list-style-type: none"> • electric windows
<ul style="list-style-type: none"> • heating and ventilation systems
<ul style="list-style-type: none"> • information and entertainment systems
<ul style="list-style-type: none"> • communication systems
<ul style="list-style-type: none"> • SRS
<ul style="list-style-type: none"> • wash wipe
<ul style="list-style-type: none"> • locking systems
<ul style="list-style-type: none"> • security and warning systems



UNIT REF: LVM07	UNIT TITLE: DIAGNOSE AND RECTIFY LIGHT VEHICLE ENGINE FAULTS
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Mapping: This unit is mapped to the IMI NOS LV07	Level 3	GLH: 66
Rationale: This unit enables the learner to develop an understanding, knowledge and skills in diagnosis and rectification of engine mechanical, electrical, hydraulic and fluid systems. It also covers light vehicle engine systems and the evaluation of their performance.		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand how the light vehicle engine systems operate	1.1. Explain the construction and operation of light vehicle engine systems to include: <ul style="list-style-type: none"> a. SI fuel systems b. CI fuel systems c. ignition systems d. engine management e. valve mechanisms f. pressure charged induction systems g. exhaust emission reduction systems h. heating, ventilation and cooling 1.2. Explain the interaction between electrical, electronic and mechanical components within light vehicle engine systems 1.3. Explain how electrical systems interlink and interact, including multiplexing and fibre optics 1.4. Compare light vehicle engine system components and assemblies against alternatives to identify differences in construction and operation 1.5. Identify the engineering principles that are related to light vehicle engine systems <ul style="list-style-type: none"> a. volumetric efficiency b. flame travel, pre ignition and detonation c. fuel properties d. composition of carbon fuels e. combustion process f. legal requirements for exhaust emissions
2. Be able to work safely when carrying out light vehicle engine diagnostic and rectification activities	2.1. Use suitable personal protective equipment and vehicle coverings when using light vehicle diagnostic methods and carrying out rectification activities 2.2. Work in a way which minimises the risk of damage or injury to the vehicle, people and the environment
3. Understand how to diagnose and rectify faults in light vehicle engine systems	3.1. Describe how to analyse symptoms and causes of faults found in light vehicle engine systems to include: <ul style="list-style-type: none"> a. engine mechanical components b. ignition systems c. fuel systems d. engine management system e. pressure charged induction systems f. heating, ventilation and cooling 3.2. Explain systematic diagnostic techniques used in identifying engine system faults



	<p>3.3. Explain how to examine, measure and make suitable adjustments to the components including:</p> <ol style="list-style-type: none"> a. settings b. input and output values c. voltages d. current consumption e. resistance f. output patterns with oscilloscope g. pressures h. condition i. wear and performance <p>3.4. Explain how to carry out the diagnosis and rectification activities in order to correct the faults in the light vehicle engine systems</p> <p>3.5. Explain how to select, prepare and use diagnostic and rectification equipment for light vehicle engine systems</p> <p>3.6. Explain how to evaluate and interpret test results found in diagnosing light vehicle engine system faults against vehicle manufacturer specifications and settings</p> <p>3.7. Explain how to evaluate the operation of components and systems following diagnosis and repair to confirm system performance</p>
<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 light vehicle diagnostic and rectification activities including:</p> <ol style="list-style-type: none"> a. vehicle technical data b. diagnostic test procedures <p>4.2. Use sufficient diagnostic information in a systematic way to enable an accurate diagnosis of light vehicle engine system faults</p>
<p>5. Be able to use appropriate tools and equipment</p>	<p>5.1. Select the appropriate tools and equipment necessary for diagnostic and rectification activities</p> <p>5.2. Ensure that equipment has been calibrated to meet manufacturers' and legal requirements</p> <p>5.3. Use the equipment required, correctly and safely throughout all light vehicle engine diagnostic and rectification activities</p>
<p>6. Be able to carry out light vehicle engine diagnosis, rectification and test activities</p>	<p>6.1. Use diagnostic methods that are relevant to the symptoms presented</p> <p>6.2. Evaluate your assessment of dismantled sub-assemblies and identify their condition and suitability for repair or replacement accurately</p> <p>6.3. Carry out all diagnostic and rectification activities following:</p> <ol style="list-style-type: none"> a. manufacturers' instructions b. recognised researched repair methods c. workplace procedures d. health and safety requirements



	<p>6.4. Ensure all repaired or replacement components and units conform to the vehicle operating specification and any legal requirements</p> <p>6.5. Adjust components and units correctly to ensure that they operate to meet system requirements</p> <p>6.6. Use testing methods that are suitable for assessing the performance of the system rectified</p> <p>6.7. Ensure the rectified light vehicle engine system performs to the vehicle operating specification and 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:

Single and Multi-Point Petrol Injection Systems

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

Valve Mechanisms

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

Pressure Charged Induction Systems

- a. The meaning of volumetric efficiency; explain the effect of volumetric efficiency on engine performance, torque and power.
- b. The methods used to improve volumetric efficiency:
 - i. variable valve timing

Content Contd.

- ii. turbo-charging
- iii. supercharging
- iv. intercoolers
- c. The operation of turbo-chargers and the purpose of:
 - i. turbo-charging
 - ii. supercharging
 - iii. intercoolers
 - iv. waste gates
 - v. exhaust gas recirculation
- d. Advantages and disadvantages of pressure charging induction systems.

Terms Associated with Combustion

- a. Flame travel, pre-ignition and detonation.
- b. Fuel properties:
 - i. octane rating
 - ii. flash point
 - iii. fire point
 - iv. volatility
 - v. composition of petrol and diesel fuels
 - vi. hydro-carbon content
- c. Composition of carbon fuels (petrol and diesel):
 - i. % hydrogen and carbon
 - ii. composition of air
 - iii. % oxygen
 - iv. % nitrogen
- d. Combustion process for spark ignition and compression ignition engines:
 - i. air fuel ratio
 - ii. lambda ratio
 - iii. stoichiometric ratio
- e. The by-products of combustion for different engine conditions and fuel mixtures:
 - i. CO
 - ii. CO₂
 - iii. O
 - iv. N
 - v. H₂O
 - vi. NO_x
- f. Describe the legal requirements for exhaust emissions;
 - i. MOT requirements
 - ii. EURO 3, 4, 5 & 6 regulations

Assessment, Repair and Restoration of Mechanical Engine Components

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

Cooling, Heating and Ventilation

- a. The components, operating principles, and functions of engine cooling systems
- b. Procedures used to remove, replace and adjust cooling system components
 - i. cooling fans and control devices
 - ii. header tanks, radiators and pressure caps

Content Contd.

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

Air Conditioning Systems

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

Climate Control Systems

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

Symptoms and Faults in Engine Mechanical Systems and Components

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

Content Contd.

- xv. filter
- xvi. turbo-charger
- xvii. supercharger

Diagnosis of Faults in Engine Mechanical Systems and Components

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

Faults and Symptoms in Ignition Systems

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

Faults and Symptoms in Electronic Petrol and Diesel Injection Systems

- a. Petrol and diesel injection system failures or malfunctions including:
 - i. cold or hot starting problems

Content Contd.

- ii. poor performance
- iii. exhaust emissions
- iv. high fuel consumption
- v. erratic running
- vi. low power
- vii. unstable idle speed

Faults and Symptoms in Engine Management Systems

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

Diagnosis of Faults in Electronic Ignition, Petrol and Diesel Injection and Engine Management Systems

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

Content Contd.

- iv. wear
- v. values
- vi. inputs and outputs
- vii. fault codes
- i. Rectification or replacement procedures.
- j. Evaluation and the operation of components and systems following diagnosis and repair to confirm system performance.

Faults and Symptoms in Vehicle Comfort Systems

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

Diagnosis of Faults in Vehicle Comfort Systems

- a. Locate and interpret information for:
 - i. diagnostic tests
 - ii. manufacturer's vehicle and equipment specifications
 - iii. use of equipment
 - iv. testing procedures
 - v. test plans
 - vi. fault codes
 - vii. legal requirements
- b. The preparation of tools and equipment for use in diagnostic testing and assessment.
- c. Conduct systematic assessment and testing of comfort systems including:
 - i. component condition and performance
 - ii. component settings
 - iii. component values
 - iv. electrical and electronic values
 - v. system performance and operation
 - vi. drive belts
 - vii. controls
 - viii. compressors
 - ix. condensers
 - x. receivers
 - xi. dryers
 - xii. connections
 - xiii. valve
 - xiv. hoses
 - xv. thermostats and refrigerants
 - xvi. sensors
 - xvii. speed controls
 - xviii. control systems
 - xix. servomotors
- d. Use of appropriate tools and equipment including:
 - i. pressure gauges
 - ii. multi-meter
 - iii. breakout box
 - iv. oscilloscope
 - v. diagnostic tester
 - vi. manufacturer's dedicated equipment
 - vii. flow meter
- e. Evaluate and interpret test results from diagnostic testing.
- f. Compare test result, values and fault codes with vehicle manufacturer's specifications and settings
- g. How to dismantle, components and systems using appropriate equipment and procedures
- h. How to assess, examine and measure components including: settings, input and output values, voltages, current consumption, resistance, output patterns with oscilloscope, pressures, condition, wear and performance of components and systems



Content Contd.

- i. Identification of probable faults and indications of faults, malfunctions, incorrect settings, wear, values, inputs and outputs, fault codes, pressures and leaks
- j. Rectification or replacement procedures
- k. Evaluation and operation of components and systems following diagnosis and repair to confirm system performance

Evidence Requirements
1. You must be observed by your assessor successfully carrying out the diagnosis and rectification of faults occurring in 3 out of the 5 engine systems listed. The faults should involve a 2 or more step diagnostic activity.
<ul style="list-style-type: none">• engine mechanical components
<ul style="list-style-type: none">• engine management system
<ul style="list-style-type: none">• pressure charged induction systems
<ul style="list-style-type: none">• exhaust emission reduction systems
<ul style="list-style-type: none">• heating, ventilation and cooling



UNIT REF: LVM08	UNIT TITLE: DIAGNOSE AND RECTIFY LIGHT VEHICLE CHASSIS SYSTEM FAULTS
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Mapping: This unit is mapped to the IMI NOS LV08	Level 3	GLH: 74
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Rationale: This unit enables the learner to develop an understanding, knowledge and skills in diagnosis and rectification of braking steering and suspension systems. It also covers light vehicle chassis systems and the evaluation of their performance.

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand how the light vehicle chassis systems operate	1.1. Explain the construction and operation of light vehicle chassis systems to include: <ul style="list-style-type: none"> a. electronic braking b. front and rear wheel geometry c. four wheel steer d. hydraulic power steering e. electronic power steering f. self levelling suspension g. ride control system 1.2. Explain the interaction between electrical, electronic and mechanical components within light vehicle chassis systems 1.3. Explain how light vehicle chassis electrical systems interlink and interact, including multiplexing 1.4. Compare light vehicle chassis system components and assemblies against alternatives to identify differences in construction and operation 1.5. Identify the engineering principles that are related to light vehicle chassis systems <ul style="list-style-type: none"> a. inertia force, mass and acceleration b. laws of friction c. static's (springs and torsion bars) d. hydraulic machines
2. Be able to work safely when carrying out light vehicle chassis diagnostic and rectification activities	2.1. Use suitable personal protective equipment and vehicle coverings when using light vehicle diagnostic methods and carrying out rectification activities 2.2. Work in a way which minimises the risk of damage or injury to the vehicle, people and the environment
3. Understand how to diagnose and rectify faults in light vehicle chassis systems	3.1. Explain symptoms and causes of faults found in light vehicle chassis systems 3.2. Explain systematic diagnostic techniques used in identifying chassis system faults 3.3. Explain how to examine, measure and make suitable adjustments to the components 3.4. Explain how to carry out the diagnosis and rectification activities in order to correct the faults in the light vehicle chassis systems



	<p>3.5. Explain how to select, prepare and use diagnostic and rectification equipment for light vehicle chassis systems</p> <p>3.6. Explain how to evaluate and interpret test results found in diagnosing light vehicle chassis system faults against vehicle manufacturer specifications and settings</p> <p>3.7. Explain how to evaluate the operation of components and systems following diagnosis and repair to confirm system performance</p>
<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 light vehicle diagnostic and rectification activities including:</p> <ul style="list-style-type: none"> a. vehicle technical data b. diagnostic test procedures <p>4.2. Use sufficient diagnostic information in a systematic way to enable an accurate diagnosis of light vehicle chassis system faults</p>
<p>5. Be able to use appropriate tools and equipment</p>	<p>5.1. Select the appropriate tools and equipment necessary for diagnostic and rectification activities</p> <p>5.2. Ensure that equipment has been calibrated to meet manufacturers' and legal requirements</p> <p>5.3. Use the equipment required, correctly and safely throughout all light vehicle chassis diagnostic and rectification activities</p>
<p>6. Be able to carry out light vehicle chassis diagnosis, rectification and test activities</p>	<p>6.1. Use diagnostic methods that are relevant to the symptoms presented</p> <p>6.2. Evaluate your assessment of dismantled sub-assemblies and identify their condition and suitability for repair or replacement accurately</p> <p>6.3. Carry out all diagnostic and rectification activities following:</p> <ul style="list-style-type: none"> a. manufacturers' instructions b. recognised researched repair methods c. workplace procedures d. health and safety requirements <p>6.4. Ensure all repaired or replacement components and units conform to the vehicle operating specification and any legal requirements</p> <p>6.5. Adjust components and units correctly to ensure that they operate to meet system requirements</p> <p>6.6. Use testing methods that are suitable for assessing the performance of the system rectified</p> <p>6.7. Ensure the rectified light vehicle chassis system performs to the vehicle operating specification and 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>
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Content:

Electrical and electronic principles of light vehicle chassis systems

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

Operation of electronic Anti-lock Braking Systems (ABS) and Electronic Brake Distribution (EBD) braking systems

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

Steering geometry for light vehicle applications

- a. Non-steered wheel geometry settings.
- b. Front/rear wheel geometry:
 - i. castor
 - ii. camber
 - iii. kingpin or swivel pin inclination
 - iv. negative offset
 - v. wheel alignment (tracking)
 - vi. toe in and toe out
 - vii. toe out on turns and steered wheel geometry
 - viii. Ackerman principle
 - ix. slip angles
 - x. self-aligning torque
 - xi. oversteer and understeer
 - xii. neutral steer
- c. The operation and layout of rear and four wheel steering.
- d. The construction and operation of power assisted steering systems:
 - i. hydraulic system
 - ii. power cylinders
 - iii. drive belts and pumps
 - iv. hydraulic valve (rotary, spool and flapper type)
- e. The operation of:
 - i. electronic power steering systems (EPS)
 - ii. electrical and electronic components

Components and operation of self-levelling suspension

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

Operation of fitting ride-controlled systems.

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

Symptoms and faults in braking systems

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

Diagnosis and faults in braking systems

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

Operation of systems following diagnosis and repair to confirm operation and performance.

Symptoms and faults associated with steering systems

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

Content Contd.

Diagnosis and faults in steering systems

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

Symptoms and faults associated with suspension systems

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

Diagnosis and faults in suspension systems

- a. Locate and interpret information for:
 - i. diagnostic tests
 - ii. vehicle and equipment specifications
 - iii. use of equipment
 - iv. testing procedures
 - v. test plans
 - vi. fault codes
 - vii. legal requirements
- b. How to prepare equipment for use in diagnostic testing.
- c. How to conduct systematic testing and inspection of:
 - i. suspension systems
 - ii. mechanical



Content Contd.

- iii. hydraulic
- iv. electrical and electronic systems
- v. conventional
- vi. self-levelling and ride controlled suspension systems
- d. Using appropriate tools and equipment including:
 - i. multi-meters
 - ii. oscilloscope
 - iii. pressure gauges
 - iv. alignment equipment
 - v. geometry equipment
- e. Evaluate and interpret test results from diagnostic testing.
- f. Compare test result and values with vehicle manufacturer's specifications and settings.
- g. How to dismantle, components and systems using appropriate equipment and procedures.
- h. Assess, examine and evaluate the operation, settings, values, condition and performance of components and systems.
 - i. Probable faults, malfunctions and incorrect settings.
 - j. Rectification or replacement procedures.
- k. Operation of systems following diagnosis and repair to confirm operation and performance.
Measurements on components to include:
 - i. settings
 - ii. input and output values
 - iii. voltages
 - iv. current consumption
 - v. resistance
 - vi. output patterns with oscilloscope
 - vii. pressures
 - viii. condition
 - ix. wear and performance

Evidence Requirements
1. You must be observed by your assessor successfully carrying out the diagnosis and rectification of 1 fault occurring in each system listed. The fault should involve a 2 or more step diagnostic activity.
<ul style="list-style-type: none">• Steering systems
<ul style="list-style-type: none">• Suspension systems
<ul style="list-style-type: none">• Braking systems



UNIT REF: LVM13.1	UNIT TITLE: KNOWLEDGE OF DIAGNOSING AND RECTIFYING LIGHT VEHICLE TRANSMISSION AND DRIVELINE UNITS
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Mapping: This unit is mapped to the IMI NOS LV13	Level: 3	GLH: 21
Rationale: This unit enables the learner to develop an understanding of diagnosis and rectification of light vehicle gearboxes, hubs and bearings, driveline shafts, clutches, differentials and final drive units. It also covers the evaluation of performance of the systems		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand how the light vehicle transmission and driveline systems operate	1.1. Explain the construction and operation of light vehicle transmission and driveline systems 1.2. Explain the interaction between electrical, electronic and mechanical components within light vehicle transmission and driveline systems 1.3. Explain how electrical systems interlink and interact, including multiplexing 1.4. Compare light vehicle transmission and driveline system components and assemblies against alternatives to identify differences in construction and operation 1.5. Identify the engineering principles that are related to light vehicle transmission and driveline systems <ul style="list-style-type: none"> a friction b torque transmission c materials d fluids & energy e potential & kinetic energy
2. Understand how to diagnose and rectify faults in light vehicle transmission and driveline systems	2.1. Explain the symptoms and causes of faults found in light vehicle transmission and driveline systems 2.2. Explain systematic diagnostic techniques used in identifying transmission and driveline system faults 2.3. Explain how to examine, measure and make suitable adjustments components 2.4. Explain how to carry out the rectification activities in order to correct the faults in light vehicle transmission and driveline systems 2.5. Explain how to select, prepare and use diagnostic and rectification equipment for light vehicle transmission and driveline systems 2.6. Explain how to evaluate and interpret test results found in diagnosing light vehicle transmission and driveline system faults against vehicle manufacturer specifications and settings 2.7. Explain how to evaluate the operation of components and systems following diagnosis and repair to confirm system performance

Content:

The construction and operation of transmission and driveline systems

- a. Including:
 - i. friction clutches
 - ii. fluid couplings
 - iii. multi-speed gearboxes
 - iv. fully automatic - including electronic control
 - v. electronically controlled gearshift systems
 - vi. hub reduction
 - vii. final drive units
 - viii. hubs & shafts
- b. Key principles relating to heavy vehicle transmission and driveline systems
 - i. friction
 - ii. torque transmission
 - iii. materials
 - iv. fluids & energy
 - v. potential & kinetic energy

Electrical and electronic principles related to light vehicle transmission systems

- a. The operation of electrical and electronic systems and components related to light vehicle transmission systems including:
 - ix. ECU
 - x. sensors and actuators
 - xi. electrical inputs & outputs
 - xii. voltages
 - xiii. oscilloscope patterns
 - xiv. digital and fibre optic principles
- b. The interaction between the electrical/electronic system, hydraulic system and mechanical components of the transmission systems.
- c. Electronic and electrical safety procedures.

The operation light vehicle clutches and fluid couplings

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

The operation of light vehicle transmissions and driveline systems

- a. The construction and operation of manual gearboxes:
 - i. 4, 5 & 6 speed gearboxes
 - ii. gear arrangements
 - iii. shaft and bearing arrangements
 - iv. synchromesh devices
 - v. interlock mechanisms
 - vi. linkages
 - vii. overdrive
 - viii. lubrication
- b. The construction and operation of automatic gearboxes including hydraulic and electronic control systems:
 - i. operations of epicyclic gears (sun, planet, annulus and carrier)
 - ii. method for achieving different gear ratios using epicyclic gearing
 - iii. hydraulic control system
 - iv. components and operation
 - v. electronic control system
 - vi. components and operation
- c. The construction and operation of continuously variable transmissions (CVT) and the benefits of this type of gearbox design.
- d. The construction and operation of the sequential manual gearbox (SMG).
- e. The construction and operation of final drive systems including:
 - i. conventional crown wheel and pinion

Content Contd.

- ii. differential gears
- iii. limited slip differential
- f. The construction and operation of light vehicle 4 wheel drive systems including third differential and differential locks.
- g. The operation of light vehicle traction control systems and launch control.
- h. The construction and operation of light vehicle hub arrangements.
- i. The construction and operation of:
 - i. drive shafts
 - ii. prop shafts including flexible joints and couplings
 - iii. universal joints
 - iv. constant velocity joints
 - v. sliding joints

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

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

Faults in light vehicle transmission systems

- a. Interpret information for diagnostic tests, vehicle and equipment specifications, use of equipment, testing procedures, test plans, fault codes and legal requirements.
- b. How to prepare equipment for use in diagnostic testing.
- c. How to conduct systematic testing and inspection of transmission system, mechanical, hydraulic, electrical and electronic systems using appropriate tools and equipment including, mullet-meters, oscilloscope and pressure gauges.



Content Contd.

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

Measurements on components to include:

- a. Settings
- b. Input and output values
- c. Voltages
- d. Current consumption
- e. Resistance
- f. Output patterns with oscilloscope
- g. Pressures
- h. Condition
- i. Wear and performance

No Evidence Requirements



UNIT REF: GA6	UNIT TITLE: HOW TO MAKE LEARNING POSSIBLE THROUGH DEMONSTRATIONS AND INSTRUCTION
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Mapping: This unit is mapped to the IMI NOS G6	Level 3	GLH 30
Rationale: This unit enables the learner to develop an understanding, knowledge and skills in carrying out demonstrations and instruction which will help the learner to learn. It includes demonstrating equipment, showing skills, giving instruction, deciding when to use demonstration or instruction, potential of technology based learning, checking on learners' progress and giving feedback		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand the nature and role of demonstrations and instruction	1.1. Classify the separate areas of demonstrations which encourage learning 1.2. Identify which types of learning are best achieved and supported through demonstrations 1.3. Explain how to identify and use different learning opportunities 1.4. Explain how to structure demonstrations and instruction sessions 1.5. Explain how to choose from a range of demonstration techniques
2. Be able to demonstrate skills and methods to learners	2.1. Perform demonstrations based on an analysis of the skills needed and the order in which they must be learnt 2.2. Perform demonstrations that are accurate and realistic 2.3. Perform structured demonstrations so that the learner can get the most out of it 2.4. Perform demonstrations whilst encouraging learners to ask questions and get explanation at appropriate stages in the demonstration 2.5. Provide positive feedback to learners whilst they are being given the opportunity to practise the skills that have been demonstrated 2.6. Perform additional demonstrations of skills being taught to reinforce learning 2.7. Perform demonstrations in a safe environment which also allows learners to see clearly 2.8. Respond to the needs of the learners during demonstrations 2.9. Reduce distractions and disruptions as much as possible
3. Understand the principles and concepts of demonstration and instruction	3.1. Describe how to put learners at ease and encourage them to take part

	<p>3.2. Justify the choice between demonstration and instruction as a learning method</p> <p>3.3. Explain how to identify individual learning needs</p> <p>3.4. Clarify which factors are likely to prevent learning and how to overcome them</p> <p>3.5. Explain how to check learners' understanding and progress</p> <p>3.6. Explain how to choose and prepare appropriate materials</p> <p>3.7. Explain the separate areas of instructional techniques which encourage learning</p> <p>3.8. Describe which types of learning are best achieved and supported through instruction</p>
<p>4. Be able to instruct learners</p>	<p>4.1. Implement instruction which is matched to the needs of learners</p> <p>4.2. Use identified learning outcomes which can be achieved through instruction</p> <p>4.3. Perform instruction, ensuring that the manner, level and speed of the instruction encourages learners to take part</p> <p>4.4. Perform instruction whilst regularly checking that the learners understand and adapt instruction as appropriate</p> <p>4.5. Give learners positive feedback on the learning experience and the outcomes achieved</p> <p>4.6. Carry out a review with the learners to identify anything that prevented learning and adapt instruction as appropriate</p>
<p>5. Understand the external factors influencing human resource development</p>	<p>5.1. Explain how to make sure everybody acts in line with health, safety and environmental protection, legislation and best practice.</p> <p>5.2. Analyse developments in technology based learning and new ways of delivery</p>

Content:

Separate areas of demonstration which encourage learning. To include:

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

Content Contd.

Types of learning which are best achieved and supported through demonstrations. To include:

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

How to structure demonstration and instruction sessions. To include:

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

How to identify individual learning needs

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

What factors are likely to prevent learning. To include:

- i. language barriers
- ii. physical barriers
- iii. specialist knowledge
- iv. pace of learning
- v. method of delivery
- vi. environmental factors
- vii. teaching styles
- viii. dyslexia

How to check learners understanding and progress

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

How to organise information and prepare materials

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

Content: Contd

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

Instructional techniques

- a. Types of instructional techniques to include:
 - i. lectures
 - ii. handouts
 - iii. team teaching
 - iv. peer teaching
 - v. discussion – individual, group and peer
 - vi. question and answer
 - vii. multimedia
 - viii. seminars
 - ix. case studies
 - x. project/assignments

Environmental factors that affect learning

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

Health and safety factors that affect learning

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

Analysis of demonstration/instruction

- a. Analysis of demonstration/instruction to include:
 - i. feedback from students
 - ii. feedback from colleagues
 - iii. organisational quality assessment
 - iv. feedback from external organisations
 - v. awarding body requirements

Developments in learning. To include:

- i. multimedia based materials
- ii. web based materials
- iii. interactive materials

How to choose and prepare appropriate materials. To include:

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



Evidence Requirements	
1.	You must be observed by your assessor providing an activity which is a combination of demonstration and instruction.
2.	You must provide records which covers a combination of demonstration and instruction.
3.	It is expected that the records must include evidence to show how you:
	<ul style="list-style-type: none">• decided on the sequence of the demonstration
	<ul style="list-style-type: none">• identified which learning outcomes were achieved
	<ul style="list-style-type: none">• ensured that the demonstration was accurate and realistic
	<ul style="list-style-type: none">• ensured a safe environment for the demonstration and allowed all learners to see the demonstration clearly
4.	In preparing the record you should consider:
	<ul style="list-style-type: none">• which types of learning are best achieved and supported through demonstrations
	<ul style="list-style-type: none">• how to choose and prepare appropriate materials, including technology based materials.
	<ul style="list-style-type: none">• how to choose between instruction and demonstration as learning methods
	<ul style="list-style-type: none">• which types of learning are best achieved through instruction
	<ul style="list-style-type: none">• how to identify individual learning needs
	<ul style="list-style-type: none">• how to make sure everybody acts in line with health, safety and environmental protection legislation and best practice
	<ul style="list-style-type: none">• which factors are likely to prevent learning and how to overcome them
	<ul style="list-style-type: none">• how to analyse developments in learning and new ways of delivery, including technology based learning



Evidence Requirements Contd.	
5.	It is also expected that evidence will show how you:
	<ul style="list-style-type: none">structured the demonstration so that the learner got the most out of it
	<ul style="list-style-type: none">reduced distractions and disruptions as much as possible
	<ul style="list-style-type: none">encouraged learners to ask questions and get explanations at appropriate stages in the demonstration
	<ul style="list-style-type: none">matched instruction to the needs of learners
	<ul style="list-style-type: none">gave learners the opportunities to practice the skill being demonstrated
	<ul style="list-style-type: none">ensured that the manner, level and speed of the instruction encourages learners to take part
	<ul style="list-style-type: none">gave learners positive feedback
	<ul style="list-style-type: none">regularly check that learners understand and adapt instruction as appropriate
	<ul style="list-style-type: none">reinforced learning by repeating demonstration
	<ul style="list-style-type: none">gave learners positive feedback on the learning experience and the outcome achieved
	<ul style="list-style-type: none">responded to the needs of learners during the demonstration
	<ul style="list-style-type: none">identified anything that prevented learning and reviewed this with the learner

Evidence from **real** or **simulated** activities and **role play** is acceptable for this unit



UNIT REF: GA8	UNIT TITLE: HOW TO IDENTIFY AND AGREE MOTOR VEHICLE CUSTOMER SERVICE NEEDS
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Mapping: This unit is mapped to the IMI NOS G8	Level 3	GLH 30
Rationale: This unit enables the learner to develop an understanding, knowledge and skills of how to gain: information from customers on their perceived needs; give advice and information and agree a course of action; contract for the agreed work and complete all necessary records and instructions.		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand legislative and organisational requirements and procedures	1.1. Describe the fundamental legal requirements of current consumer legislation and the consequences of their own actions in respect of this legislation 1.2. Describe the content and limitations of company and product warranties for the vehicles dealt with by their company 1.3. Explain the limits of their own authority for accepting vehicles 1.4. Explain the importance of keeping customers informed of progress 1.5. Describe their workplace requirements for the completion of records 1.6. Explain how to complete and process all the necessary documentation
2. Be able to obtain relevant information from the customer	2.1. Obtain and interpret sufficient and relevant information from the customer to make an assessment of their needs 2.2. Clarify customer and vehicle needs by referring to vehicle data and operating procedures
3. Understand how to communicate and care for customers	3.1. Explain how to communicate effectively with customers 3.2. Describe how to adapt your language when explaining technical matters to non-technical customers 3.3. Explain how to use effective questioning techniques 3.4. Describe how to care for customers and achieve customer satisfaction
4. Be able to provide relevant information to the customer	4.1. Provide customers with accurate, current and relevant advice and information in a form that the customer will understand 4.2. Demonstrate techniques which encourage customers to ask questions and seek clarification during conversation



5. Understand company products and services	5.1. Describe the range of options available to resolve vehicle problems 5.2. Describe the range and type of services offered by their company 5.3. Explain the effect of resource availability upon the receipt of customer vehicles and the completion work 5.4. Explain how to access costing and work completion time information
6. Be able to agree work undertaken with the customer	6.1. Summarise and record work agreed with the customer, before accepting the vehicle 6.2. implement confirmation of the agreement by ensuring customer understanding
7. Be able to ensure recording systems are implemented correctly	7.1. Use recording systems which are accurate and complete, in the required format and signed by the customer where necessary 7.2. Perform the next stage in the process by passing on completed records to the correct person promptly 7.3. Demonstrate correct procedures for customer approval where the contracted agreement is likely to be exceeded

Content:**Organisational requirements**

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

Principles of customer communication and care.

First Impressions.

Listening skills – 80:20 ratio.

Eye contact and smiling.

Showing interest and concern.

Questioning techniques and customer qualification.

Giving clear non-technical explanations.

Confirming understanding (statement/question technique, reflective summary).

Written communication – purpose, content, presentation and style.

Providing a high quality service – fulfilling (ideally exceeding) customer expectations within agreed time frames.

Obtaining customer feedback and corrective actions when dissatisfaction expressed.

Dealing with complaints.

Company products and services

- a. Service standards
 - i. national
 - ii. manufacturer
 - iii. organisational



Content Contd.

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

Vehicle Information Systems, Servicing and Repair Requirements

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

Consumer legislation: To include:

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

Evidence Requirements

1. **You must be observed by your assessor** to show that you have dealt with **3 different customers.**



UNIT REF: GA37	UNIT TITLE: SUPPORTING CUSTOMER SERVICE IMPROVEMENTS IN THE AUTOMOTIVE SECTOR
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Mapping: This unit is mapped to the IMI NOS G37	Level 2	GLH: 31
Rationale: This unit will enable the learner to develop an understanding, knowledge and skills in Supporting Customer Service Improvements in the Automotive Sector		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand how to support customer service improvements	1.1. Describe how customer experience is influenced by the way service is delivered 1.2. Identify how customer feedback is obtained 1.3. Describe how to work with others to identify and support change in the way service is delivered 1.4. Identify why it is important to give a positive impression to the customer about the changes made by their organisation, even if they disagree with the changes
2. Be able to use feedback to identify potential customer service improvements	2.1. Gather informal feedback from their customers 2.2. Use customer feedback procedures to collect information from the customers 2.3. Use the information from customers to develop a better understanding of the customer's experience 2.4. Identify ways the service they give could be improved based on information they have gathered 2.5. Share their ideas for improving customer service with colleagues
3. Be able to implement changes in customer service	3.1. Identify a possible change that could be made to improve customer service 3.2. Present their idea for improving customer service to a colleague with the appropriate authority to approve the change 3.3. Carry out changes to customer service procedures based on their own idea or proposed by the organisation 3.4. Keep their customers informed of changes to customer service 3.5. Give customers a positive impression of changes that have been made 3.6. Work positively with others to support customer service changes



4. Be able to assist with the evaluation of changes in customer service	4.1. Discuss with others how changes to customer service are working 4.2. Work with others to identify any negative effects of changes and how these can be avoided
5. Be able to support customer service improvements	5.1. Show that they know and understand how customer experience is influenced by the way service is delivered 5.2. Show that they know and understand how customer feedback is obtained 5.3. Show that they know and understand how to work with others to identify and support change in the way service is delivered 5.4. Show that they know and understand why it is important to give a positive impression to the customer about the changes made by their organisation even if they disagree with the changes

No Content

Evidence Requirements
1. You must be observed by your assessor on 3 different occasions , producing evidence and records of successfully supporting customer service improvements within the automotive sector



UNIT REF: AEM03	UNIT TITLE: OVERHAUL ELECTRICAL UNITS
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Mapping: This unit is mapped to the IMI NOS AE03	Level 2	GLH: 63
Rationale: This unit enables the learner to develop an understanding, knowledge and skills of the repair and overhauling of electrical units.		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand how to use appropriate electrical testing equipment	1.1. Identify specialist electrical test equipment used for overhauling electrical units 1.2. Describe how to use and operate specialist electrical test equipment used for overhauling electrical units 1.3. Describe how to prepare, assess and test the accuracy and operation of all the electrical repair and testing equipment
2. Be able to work safely when overhauling electrical components.	2.1. Use suitable personal protective equipment and vehicle coverings throughout when overhauling vehicle electrical components 2.2. Work in a way which minimises the risk of damage or injury to the vehicle, people and the environment
3. Understand how to find, select and use sources of overhaul information	3.1. Identify suitable sources of technical information to support electrical repair procedures including: a. technical data b. manufacturer's instructions c. legal requirements d. industry recognised repair methods 3.2. Explain how to interpret and use technical information to support the electrical repair procedures
4. Be able to use relevant information to carry out the task	4.1. Select suitable sources of technical information to support the electrical overhaul activities, by reviewing manufacturers: a. technical data b. manufacturers overhauling procedures c. test procedures 4.2. Use technical information to support the electrical overhaul activities
5. Understand how to carry out testing to electrical systems and components	5.1. Describe how to test and evaluate the performance of vehicles electrical systems against vehicle specification 5.2. Explain how to interpret test results and carry out electrical efficiency calculations 5.3. Identify common symptoms, causes and faults found in vehicle charging and starting systems 5.4. Explain methods used to identify vehicle charging and starting systems faults



	<p>5.5. Describe how the condition of the components are assessed within charging and starting systems to find faults</p> <p>5.6. Describe how to test the following alternator components: a. diode pack b. rotor field c. stator windings</p> <p>5.7. Describe the purpose and when to use torque, resistance, insulation and visual tests</p> <p>5.8. Explain the suppression requirements applicable to electrical components and the types of faults which can occur in charging, starting and motor systems</p>
<p>6. Be able to use appropriate tools and equipment</p>	<p>6.1. Select the appropriate tools and equipment necessary for carrying out the electrical overhaul activities</p> <p>6.2. Check 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 when carrying out electrical overhaul activities</p>
<p>7. Understand how to overhaul starting, charging, motor and actuator systems</p>	<p>7.1. Describe how to overhaul charging, starting, motor and actuator systems</p> <p>7.1. Describe how to carry out a solder repair</p> <p>7.3. Explain the procedures to make suitable adjustments to the starter drive setting</p> <p>7.4. Describe how to evaluate the operation of components and systems following overhaul.</p>
<p>8. Be able to overhaul electrical components.</p>	<p>8.1. Ensure initial assessment and testing methods of electrical units identifies accurately the condition and suitability for reconditioning, repair or replacement</p> <p>8.2. Use electrical testing methods which are suitable for assessing the performance of the type of electrical unit being tested</p> <p>8.3. Carry out all electrical overhauling activities following: a. manufacturer's instructions b. recognised repair methods c. health and safety requirements</p> <p>8.4. Ensure when necessary that adjustments to components are carried out to ensure correct and effective operation</p> <p>8.5. Ensure all repaired alternators and starters are secure and function as specified by the manufacturer or 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 persons 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>
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Content:

The various types of generators fitted to motor vehicles

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

The operating principles of each generator

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

The components and how they function within each type of generator

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

Test each component within each type of generator

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

Content Contd.

c. Tools must include:

- i. voltmeters
- ii. ammeters
- iii. ohmmeters
- iv. insulation testers
- v. regulator testers

Symptoms and faults associated with basic generators

a. Generators must include:

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

Test procedures for the repaired generators and evaluate the results

a. Generators must include:

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

b. Tools must include:

- i. voltmeters
- ii. ammeters
- iii. specialist test equipment

The various types of starter motor fitted to motor vehicles

a. Starter motors must include:

- i. inertia starter motors
- ii. pre-engaged starter motors
- iii. axial starter motors
- iv. co-axial starter motors

The operating principles of each type of starter motor

a. Starter motors must include:

- i. pre-engaged starter motors
- ii. axial starter motors
- iii. co-axial starter motors
- iv. gear reduction starters add

The components and how they function within each type of starter motors

a. Starter motors must include:

- i. pre-engaged starter motors
- ii. axial starter motors
- iii. co-axial starter motors
- iv. gear reduction starters add

b. Components must include:

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

Test each component within each type of starter motors

a. Starter motors must include:

- i. pre-engaged starter motors
- ii. axial starter motors
- iii. co-axial starter motors
- iv. gear reduction starters. add

Content Contd.

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

Symptoms and faults associated with starter motors

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

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

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

Evidence Requirements
1. You must be observed by your assessor carrying out electrical overhauling activities from 3 different electrical units, covering at least 2 of the areas listed below, which covers the learning outcomes.
<ul style="list-style-type: none"> • generators
<ul style="list-style-type: none"> • starters
<ul style="list-style-type: none"> • motors
<ul style="list-style-type: none"> • actuators



UNIT REF: LVM0506	UNIT TITLE: INSPECT LIGHT VEHICLES USING PRESCRIBED METHODS
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Mapping: This unit is mapped to the IMI NOS LV05 and LV06	Level 2	GLH: 34
Rationale: This unit enables the learner to develop the skills, knowledge and understanding required to carry out a range of inspections on light vehicles using a variety of prescribed testing and inspection methods		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand how to carry out inspections on light vehicle using prescribed methods	1.1. Explain the difference between the various prescribed light vehicle inspection methods to include: <ul style="list-style-type: none"> a. pre-work b. post-work c. pre-delivery d. maintenance inspection (brake, seasonal and tyre) 1.2. Identify the different systems to be inspected when using the prescribed inspection methods 1.3. Identify the procedures involved in carry out the systematic inspection of the prescribed inspection methods on light vehicles 1.4. Identify correct conformity of vehicle systems and condition on light vehicles inspections 1.5. Compare test and inspection results against light vehicle specification and legal requirements 1.6. Explain how to record and complete the inspection results in the format required 1.7. Identify the recommendations that can be made based on results of the light vehicle inspections 1.8. Explain the implications of failing to carry out light vehicle inspections activities correctly 1.9. Explain the implications of signing workplace documentation and vehicle records 1.10. Explain the procedure for reporting cosmetic damage to light vehicle components and units outside normal inspection items
2. Be able to work safely when carrying out light vehicle inspections using prescribed methods	2.1. Use suitable personal protective equipment and vehicle coverings throughout all light vehicle inspection activities 2.2. Work in a way which minimises the risk of damage or injury to the vehicle, people and the environment



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3. Be able to use relevant information to carry out the task	3.1. Select suitable sources of technical information to support light vehicle inspection activities including: a. vehicle technical data b. inspection procedures c. legal requirement 3.2. Use technical information to support light vehicle inspection activities
4. Be able to use appropriate tools and equipment	4.1. Select the appropriate tools and equipment necessary for carrying out a range of inspections on light vehicle systems 4.2. Ensure that equipment has been calibrated to meet manufacturers' and legal requirements 4.3. Use the correct tools and equipment in the way specified by manufacturers when carrying out a range of inspections on light vehicle systems
5. Be able to carry out light vehicle inspections using prescribed methods	5.1. Carry out light vehicle inspections using prescribed methods, adhering to the correct specifications and tolerances for the vehicle and following: a. the manufacturer's approved inspection methods b. recognised inspection methods c. health and safety requirements 5.2. Ensure that inspected light vehicle conforms to the vehicle operating specification and any legal requirements 5.3. Ensure any comparison of the vehicle against specification accurately identifies any: a. differences from the vehicle specification b. vehicle appearance and condition faults 5.4. use suitable testing methods to evaluate the performance of the inspected systems
6. Be able to record information and make suitable recommendations	6.1. Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required 6.2. Make suitable and justifiable recommendations for cost effective repairs 6.3. Record and report any additional faults noticed during the course of their work promptly in the format required

Content:

Pre and post work vehicle inspections and record findings

PPE and vehicle protection relating to:

- i. vehicle body panels
- ii. paint surfaces
- iii. seats
- iv. carpets and floor mats prior to conduction vehicle inspections

Pre and post work vehicle inspection procedures:

- i. aural
- ii. visual
- iii. engine systems
- iv. chassis systems
- v. wheels and tyres



Content Contd.

- vi. transmission system
- vii. electrical and electronic systems
- viii. exterior vehicle body
- ix. vehicle interior

The methods for carrying out inspections for: damage, corrosion, fluid leaks, wear, security, mounting security and condition to include;

- i. engines and engine systems
- ii. chassis systems
- iii. brakes
- iv. steering
- v. suspension
- vi. wheels
- vii. tyres
- viii. body panels
- ix. electrical and electronic systems and components
- x. vehicle seating and vehicle interior
- xi. vehicle instrumentation
- xii. driver controls

Check conformity to manufacturer’s specifications and legal requirements.

Completion of documentation to include:

- i. inspection records
- ii. job cards
- iii. vehicle records

Make recommendations based on results of vehicle inspections.

The checks necessary to ensure customer satisfaction for:

- i. vehicle body panels
- ii. paint surfaces
- iii. seats
- iv. carpets and floor mats following pre or post vehicle inspections

Prepare and use appropriate inspection equipment and tools.

Inspection procedures following inspection checklists.

Evidence Requirements	
1.	You must be observed by your assessor carrying out at least 1 inspection from the following:
	<ul style="list-style-type: none"> • Pre and post - work inspection
	<ul style="list-style-type: none"> • Pre-delivery inspection
	<ul style="list-style-type: none"> • Pre-purchase inspection
	<ul style="list-style-type: none"> • Pre-MOT test inspection
	<ul style="list-style-type: none"> • Safety inspection
	<ul style="list-style-type: none"> • Post repair inspection



UNIT REF: AEM10	UNIT TITLE: CONDUCT VEHICLE ENHANCEMENT AND INSTALLATION CONSULTATIONS WITH CUSTOMERS IN THE MOTOR VEHICLE ENVIRONMENT
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Mapping: This unit is mapped to the IMI NOS AE10	Level 3	GLH: 30
Rationale: This unit enables the learner to develop an understanding, knowledge and skills of conducting installation and system consultations with customers to improve the original vehicle features/specification and to meet customer requirements. It also includes making recommendations to ensure that the customers concerns are addressed and explaining the outcomes that the enhancements will achieve so that customers fully understand the work that will be undertaken		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand how to conduct installation and system consultations with customers	1.1. Explain how to give straight forward presentations to customers on vehicle enhancements 1.2. Identify and explain suitable communication methods to use when working with customers 1.3. Explain how to present yourself in a positive and professional manner to customers 1.4. Identify and explain different methods of handling customers who react differently 1.5. Explain how to adapt language when explaining technical matters to customers 1.6. Describe how to use effective questioning techniques with customers 1.7. Identify and explain how to care for customers and achieve customer satisfaction 1.8. Explain the organisational requirements for personal appearance and conduct when dealing with customers
2. Be able to use relevant information to carry out the consultation with customers	2.1. Select suitable sources of technical information to support the vehicle electrical enhancement activities 2.2. Interpret technical information to support the vehicle electrical enhancement activities
3. Be able to conduct pre-work vehicle electrical enhancement consultations with customers	3.1. Explain clearly the implications of any vehicle enhancement 3.2. Respond to customers concerns in a positive and friendly manner 3.3. Give a positive impression of yourself and your organisation when dealing with customers 3.4. Obtain sufficient, detailed information using suitably structured questions



	<p>3.5. Provide customers with accurate, current and relevant advice and information on any further investigation that is needed</p> <p>3.6. Give technical advice clearly and accurately and in a manner which the customer will understand</p> <p>3.7. Liaise with the customer and or other relevant person to agree your recommendations for the next course of action</p>
<p>4. Be able to carry out post work consultations and make suitable recommendations</p>	<p>4.1. Explain clearly to customers the action that has been taken regarding their vehicle</p> <p>4.2. Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required</p> <p>4.3. Suggest possible methods for improving the customer care process to your manager, when necessary</p>

Content:**The identification of different types of electrical enhancement systems and components**

a. Systems and components to include:

- i. radio/CD players
- ii. multi-play CD players
- iii. DVD
- iv. MP3 players
- v. speakers
- vi. aerial systems
- vii. amplifiers
- viii. visual display screens
- ix. satellite navigation
- x. mobile communication units
- xi. networking systems
- xii. body electrical systems

The function of component parts in the electrical enhancement systems

a. Components include:

- i. radio
- ii. CD
- iii. video
- iv. DVD players
- v. aerial systems
- vi. speakers
- vii. amplifiers
- viii. visual display screens
- ix. mobile communication systems
- x. networking systems
- xi. body electrical systems
- xii. data logging

The operating principles of electrical enhancement systems

a. Operation of electrical enhancement systems

- i. in car entertainment
- ii. audio systems
- iii. communication systems
- iv. networking systems
- v. body electrical systems

The relevant legislation relevant to the electrical enhancement systems

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



Show positive personal image

- a. The importance of achieving and maintaining a physical appearance suitable for the motor industry
- b. Why it is important to maintain good personal appearance whilst working in the motor industry
- c. The use of simple body language such as body posture, eye contact and smiling and recognise it in others
- d. How to meet and greet customers and recognize the importance of making a customer feel welcome
- e. How to start conversations.

Respond to different types of motor industry customer

- a. Why it is important to be able to assist all customers equally
- b. How best to assist customers with physical needs
- c. How best to assist customers with sensory needs
- d. How best to assist customers with learning needs
- e. How best to assist customers from other cultures
- f. The communication methods best suited to the needs of the individual customer

Respond to a motor industry customer by telephone

- a. The importance of using the correct greeting for incoming calls
- b. The correct methods for dealing with telephone enquiries
- c. The importance of obtaining and providing names
- d. The importance of creating a positive impression on the telephone
- e. Why it is important to record information
- f. Select the correct questioning techniques used to obtain information over the telephone
- g. The correct procedures for dealing with telephone calls.

Handle motor industry customer complaints

- a. The variety of emotions customers may display when complaining
- b. Identify that some customers are experienced at complaining and will need to be assisted in a specific manner
- c. Explain that some unhappy customers may be reluctant to complain and they will need to be made to feel comfortable to do so
- d. Explain why it is important to try to resolve a customer's complaint
- e. Identify the importance of active listening
- f. Explain how to approach a customer
- g. Recognise the limits of their own authority and who to refer to when customer requests are outside own limitations.

Evidence Requirements	
1.	You must be observed by your assessor carrying out 2 different installation and system consultations with customers* out of the 5 listed below, which covers the learning outcomes.
	<ul style="list-style-type: none">• in car entertainment
	<ul style="list-style-type: none">• audio systems
	<ul style="list-style-type: none">• communication equipment
	<ul style="list-style-type: none">• networking systems
	<ul style="list-style-type: none">• body electrical systems

** This can be assessed by the use of role-play if required*



UNIT REF: HVM10	UNIT TITLE: THERMAL CUTTING AND JOINING TECHNIQUES
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Mapping: This unit is mapped to the IMI BB05, VF13	Level: 2	GLH: 58
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Rationale: This unit enables the learner to develop the skills, knowledge and understanding required to cut and join materials using a variety of techniques. Learners will undertake preparation activities before cutting and joining materials using appropriate techniques. They will then carry out completion activities on conclusion of the work.

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Know how to prepare for thermal heating, cutting and joining activities	1.1. Identify the materials and components to be heated, cut and joined 1.2. Outline relevant current legislation and official guidance relating to safely heating, cutting and joining materials 1.3. List the health and safety control equipment, materials, components, consumables and equipment required 1.4. Outline organisational procedures for reporting inappropriate information, resources, emergencies and accidents 1.5. Describe the purpose of protection and how to protect the work and surrounding area from damage and contamination 1.6. Describe the procedures and safety precautions relating to the materials, components and equipment being used and the specific materials being heated, cut and joined
2. Be able to prepare for thermal cutting and joining procedures	2.1. Confirm the materials to be thermally cut 2.2. Confirm the materials to be thermally joined 2.3. Select the health and safety control equipment, materials, components, consumables and equipment required 2.4. Protect the work and surrounding area from damage and contamination
3. Know how to modify and cut materials using heating and thermal cutting techniques	3.1. Describe how to prepare the materials, equipment and surrounding area prior to modifying or cutting using heating and thermal cutting techniques 3.2. Outline the principles and techniques associated with heating and thermal cutting materials, including ferrous and non-ferrous materials 3.3. Describe how to heat materials to achieve: <ul style="list-style-type: none"> a. adjustment (localised/spot) b. expansion and contraction fit c. modifications 3.4. Describe how to cut materials by thermal cutting



<p>4. Know how to join materials using thermal joining techniques</p>	<p>4.1. Describe principles of joining ferrous and non-ferrous materials</p> <p>4.2. Outline procedures and techniques for joining materials by thermal joining including:</p> <ul style="list-style-type: none"> a. gas welding b. manual metal arc (MMA) welding c. metal inert gas (MIG/MAG) welding <p>4.3. Describe different joint types including:</p> <ul style="list-style-type: none"> a. butt b. lap c. fillet <p>4.4. Describe procedures for inspecting and conducting non-destructive and destructive testing</p> <p>4.5. Outline how to finish and dress joints</p>
<p>5. Be able to cut and join materials using thermal cutting and joining techniques</p>	<p>5.1. Prepare the materials to be heated, cut or thermally joined</p> <p>5.2. Use the appropriate PPE throughout the cutting and joining activity</p> <p>5.3. Produce cuts and joins to given work instructions using a variety of techniques</p> <p>5.4. Finish and dress joints as required</p> <p>5.5. Use tools and equipment as required</p>
<p>6. Know how to complete activities after thermal cutting and joining materials</p>	<p>6.1. Describe procedures for storing gases</p> <p>6.2. Describe how to dispose of hazardous and non-hazardous waste in accordance with environmental responsibilities, workplace procedures and any relevant legislation</p>
<p>7. Be able to complete activities after thermal cutting and joining activities</p>	<p>7.1. Store gases as appropriate</p> <p>7.2. Dispose of hazardous and non-hazardous waste in accordance with environmental responsibilities, workplace procedures and any relevant legislation</p>

<p>Content:</p> <ul style="list-style-type: none"> a. Materials and components: <ul style="list-style-type: none"> i. ferrous and non-ferrous materials ii. steering and suspension components iii. exhaust components iv. chassis sections v. exterior panels and attachments b. Legislation and official guidance related to working: <ul style="list-style-type: none"> i. in the workplace ii. below ground level (pit) iii. in confined spaces iv. at height v. with tools and equipment vi. materials and substances
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Content Contd.

- vii. manual lifting
- viii. mechanical lifting

- c. Health and Safety control equipment:**
 - i. personal protective equipment (PPE)
 - ii. respiratory protective equipment (RPE)
 - iii. local exhaust ventilation (LEV)
 - iv. fire extinguishers and their uses (water, foam, CO2 and powder)

- d. Resources:**
 - i. materials
 - ii. components
 - iii. hand tools
 - iv. power tools
 - v. pneumatic tools
 - vi. equipment (lifting, cutting, clamping)
 - vii. fuels
 - viii. lubricants

- e. Emergencies:**
 - i. fire
 - ii. spillage
 - iii. injury

- f. Safety procedures and precautions:**
 - i. risk assessments
 - ii. manufacturer's instructions
 - iii. health and safety legislation
 - iv. COSHH

- g. Prepare the materials, equipment and surrounding area:**
 - i. risk assessment
 - ii. pre-use inspection
 - iii. setting up heating equipment
 - iv. setting up cutting equipment
 - v. setting up thermal joining equipment

- h. The principles and techniques for heating and thermal cutting:**
 - i. setting up gas cylinders and regulators
 - ii. setting up thermal cutting equipment
 - iii. types of flames
 - iv. correct techniques
 - v. nozzle maintenance

- i. Methods of heating materials including:**
 - i. the effects of heat on metal

- j. Methods of cutting materials by thermal cutting:**
 - i. gas
 - ii. plasma
 - iii. nozzle types and size
 - iv. cutting aids
 - v. PPE
 - vi. Health and Safety

- k. Principles of joining ferrous and non-ferrous materials to include:**
 - i. fusion
 - ii. adhesion
 - iii. penetration
 - iv. heat affected zones



Content Contd.

Procedures and techniques for joining materials to include:

- i. temperatures
- ii. angles
- iii. settings (voltage, wire speed, amps)
- iv. pressure regulation
- v. nozzle size
- vi. rod/wire type and size

Methods of inspecting and conducting non-destructive and destructive testing to include:

- i. non-destructive testing (visual, x-ray, dye penetrates, ultraviolet and ultrasonic)
- ii. destructive testing (bend, tensile, nick break test and weld etch)
- iii. imperfections (cracks, lack of penetration, lack of fusion, slag inclusion, porosity, undercut or profile imperfections, unequal leg lengths, depth of throat)

Methods to finish and dress joints may include:

- i. grinding
- ii. polishing
- iii. buffing
- iv. brushing
- v. abrasive types (backing material, grit size, shape, hardness, flap, fibre and abrasive discs, Scotch-Brite™ pads)
- vi. equipment
- vii. types of power supply
- viii. coverings (paint, powdered coating, galvafroid, oil, grease)

Methods of storing gases:

- i. handling
- ii. transportation
- iii. lifting using mechanical aids
- iv. Storage: time scale, stock rotation, suitable area, sources of ignition, security, full and empty cylinders, signage
- v. Health and Safety

Hazardous and non-hazardous waste:

- i. environmental responsibilities
- ii. organisational procedures
- iii. manufacturer's information
- iv. statutory regulations
- v. official guidance relating to disposal

Evidence Requirements	
1.	You must be observed by your assessor carrying out all of the following on at least one occasion:
	<ul style="list-style-type: none">• Thermal heating
	<ul style="list-style-type: none">• Thermal cutting
	<ul style="list-style-type: none">• Thermal joining



UNIT REF: LVM11.1	UNIT TITLE: OVERHAUL LIGHT VEHICLE ENGINE MECHANICAL UNITS
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Mapping: This unit is mapped to the IMI NOS LV11	Level 3	GLH: 58
Rationale: This unit enables the learner to develop the skills, knowledge and understanding required in the construction, operation and overhaul of engines units.		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand how to overhaul light vehicle engine units	1.1. Identify light vehicle engine unit components 1.2. Describe the construction and operation of light vehicle engine units 1.3. Explain how to prepare, use and assess all of the overhauling equipment 1.4. Explain how light vehicle engine units are dismantled, overhauled and reassembled 1.5. Explain common symptoms, causes and faults found in light vehicle engine units 1.6. Explain methods used to identify engine unit faults 1.7. Explain how to examine, measure and make suitable adjustments to light vehicle engine components 1.8. Explain how to evaluate and interpret test results found in diagnosing light vehicle engine unit faults and compare with manufacturers specifications and settings 1.9. Explain how to evaluate the operation of components and systems following overhauling units to confirm system performance
2. Be able to work safely when overhauling light vehicle engine mechanical units	2.1. Use suitable personal protective equipment and vehicle coverings when overhauling light vehicle engine units 2.2. Work in a way which minimises the risk of damage or injury to the vehicle, people and the environment
3. Be able to use relevant information to carry out the task	3.1. Select suitable sources of technical information to support the overhauling of light vehicle engine units including: a. vehicle technical data b. overhauling procedures c. legal requirements 3.2. Use technical information to support the overhauling of light vehicle engine units
4. Be able to use appropriate tools and equipment	4.1. Select the appropriate tools and equipment necessary for overhauling light vehicle engine units 4.2. Ensure that equipment has been calibrated to meet manufacturer's and legal requirements



	4.3. Use the tools and equipment in the way specified by manufacturers to overhaul light vehicle engine units
5. Be able to carry out the overhauling of light vehicle engine mechanical units	<p>5.1. Carry out all overhauling of light vehicle engine mechanical units, adhering to the specifications and tolerances for the vehicle and following:</p> <ul style="list-style-type: none">a. the manufacturer's approved overhauling methodsb. recognised repair methodsc. health and safety requirements. <p>5.2. Ensure the assessment of the dismantled unit identifies accurately its condition and suitability for overhaul</p> <p>5.3. Inform the relevant person(s) promptly where an overhaul is uneconomic or unsatisfactory to perform</p> <p>5.4. Use testing methods that comply with the manufacturer's requirements</p> <p>5.5. Adjust the unit's components correctly where necessary to ensure that they operate to meet the vehicle operating requirements</p> <p>5.6. Ensure the overhauled units and assemblies conform to the vehicle operating specification and any legal requirements</p>
6. Be able to record information and make suitable recommendations	<p>6.1. Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required</p> <p>6.2. Make suitable and justifiable recommendations for cost effective repairs</p> <p>6.3. Record and report any additional faults noticed during the course of their work promptly in the format required</p>

Content:

How the units and assemblies being overhauled operate

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

How units are dismantled and reassembled

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

Unit and assembly testing and evaluation procedures

- a. Appropriate testing and evaluation procedures prior to dismantling units.

Content Contd.

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

Faults associated with units and assemblies being overhauled

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

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

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

Evidence Requirements

- 1. **You must be observed by your assessor** overhauling **1 unit** which includes cylinder head and block.



UNIT REF: LVM11.2	UNIT TITLE: OVERHAUL LIGHT VEHICLE TRANSMISSION UNITS
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Mapping: This unit is mapped to the IMI NOS LV11	Level 3	GLH: 50
Rationale: This unit enables the learner to develop the skills, knowledge and understanding in the construction, operation and overhaul of gearboxes and final drive assemblies.		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand how to overhaul light vehicle gearbox and final drive units	1.1. Identify light vehicle gearbox and final drive unit components 1.2. Describe the construction and operation of light vehicle gearbox and final drive units 1.3. Explain how to prepare, use and assess all of the overhauling equipment 1.4. Explain how light vehicle gearbox and final drive units are dismantled, overhauled and reassembled 1.5. Explain common symptoms, causes and faults found in light vehicle gearbox and final drive units 1.6. Explain methods used to identify gearbox and final drive unit faults 1.7. Explain how to examine, measure and make suitable adjustments to light vehicle gearbox and final drive components 1.8. Explain how to evaluate and interpret test results found in diagnosing light vehicle gearbox and final drive unit faults and compare with manufacturers specifications and settings 1.9. Explain how to evaluate the operation of components and systems following overhauling units to confirm system performance
2. Be able to work safely when overhauling light vehicle transmission units	2.1. Use suitable personal protective equipment and vehicle coverings when overhauling light vehicle transmission units 2.2. Work in a way which minimises the risk of damage or injury to the vehicle, people and the environment
3. Be able to use relevant information to carry out the task	3.1. Select suitable sources of technical information to support the overhauling of light vehicle transmission units including: a. vehicle technical data b. overhauling procedures c. legal requirements 3.2. Use technical information to support the overhauling of light vehicle transmission units



<p>4. Be able to use appropriate tools and equipment</p>	<p>4.1. Select the appropriate tools and equipment necessary for overhaul of light vehicle transmission systems</p> <p>4.2. Ensure that equipment has been calibrated to meet manufacturer's and legal requirements</p> <p>4.3. Use the tools and equipment in the way specified by manufacturers to overhaul light vehicle transmission unit</p>
<p>5. Be able to carry out the overhauling of light vehicle transmission units</p>	<p>5.1. Carry out all overhauling of light vehicle transmission units, adhering to the specifications and tolerances for the vehicle and following:</p> <ul style="list-style-type: none">a. the manufacturer's approved overhauling methodsb. recognised repair methodsc. health and safety requirements. <p>5.2. Ensure the assessment of the dismantled unit identifies accurately its condition and suitability for overhaul</p> <p>5.3. Inform the relevant person(s) promptly where an overhaul is uneconomic or unsatisfactory to perform</p> <p>5.4. Use testing methods that comply with the manufacturer's requirements</p> <p>5.5. Adjust the unit's components correctly where necessary to ensure that they operate to meet the vehicle operating requirements</p> <p>5.6. Ensure the overhauled units and assemblies conform to the vehicle operating specification and any legal requirements</p>
<p>6. Be able to record information and make suitable recommendations</p>	<p>6.1. Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required</p> <p>6.2. Make suitable and justifiable recommendations for cost effective repairs</p> <p>6.3. Record and report any additional faults noticed during the course of their work promptly in the format required</p>

Content:

How the units and assemblies being overhauled operate

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

How units are dismantled and reassembled

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

Content Contd.

- e. The rebuild procedure for units and assemblies.
- f. Adjustment procedures during re-assembly.

Unit and assembly testing and evaluation procedures

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

Faults associated with units and assemblies being overhauled

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

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

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

Evidence Requirements

1. **You must be observed by your assessor** overhauling **1 unit** which includes either a Gearbox or a Final Drive unit



UNIT REF: LVM11.3	UNIT TITLE: OVERHAUL LIGHT VEHICLE STEERING AND SUSPENSION UNITS
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Mapping: This unit is mapped to the IMI NOS LV11	Level 3	GLH: 50
Rationale: This unit enables the learner to develop the skills, knowledge and understanding in the construction, operation and overhaul of steering and suspension units.		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand how to overhaul light vehicle steering and suspension units	1.1. Identify light vehicle steering and suspension unit components 1.2. Describe the construction and operation of light vehicle steering and suspension units 1.3. Explain how to prepare, use and assess all of the overhauling equipment 1.4. Explain how light vehicle steering and suspension units are dismantled, overhauled and reassembled 1.5. Explain common symptoms, causes and faults found in light vehicle steering and suspension units 1.6. Explain methods used to identify steering and suspension unit faults 1.7. Explain how to examine, measure and make suitable adjustments to light vehicle steering and suspension components 1.8. Explain how to evaluate and interpret test results found in diagnosing light vehicle steering and suspension unit faults and compare with manufacturer's specifications and settings 1.9. Explain how to evaluate the operation of components and systems following overhauling units to confirm system performance
2. Be able to work safely when overhauling light vehicle steering and suspension units	2.1. Use suitable personal protective equipment and vehicle coverings when overhauling light vehicle steering and suspension units 2.2. Work in a way which minimises the risk of damage or injury to the vehicle, people and the environment
3. Be able to use relevant information to carry out the task	3.1. Select suitable sources of technical information to support the overhauling of light vehicle steering and suspension units including: a. vehicle technical data b. overhauling procedures c. legal requirements 3.2. Use technical information to support the overhauling of light vehicle steering and suspension units



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<p>4. Be able to use appropriate tools and equipment</p>	<p>4.2. Select the appropriate tools and equipment necessary for overhauling light vehicle steering and suspension units</p> <p>4.3. Ensure that equipment has been calibrated to meet manufacturer's and legal requirements</p> <p>4.4. use the tools and equipment in the way specified by manufacturers for overhauling light vehicle steering and suspension units</p>
<p>5. Be able to carry out the overhauling of light vehicle steering and suspension units</p>	<p>5.1. Carry out all overhauling of light vehicle steering and suspension units, adhering to the specifications and tolerances for the vehicle and following:</p> <ul style="list-style-type: none">a. the manufacturer's approved overhauling methodsb. recognised repair methodsc. health and safety requirements <p>5.2. Ensure the assessment of the dismantled unit identifies accurately its condition and suitability for overhaul</p> <p>5.3. Inform the relevant person(s) promptly where an overhaul is uneconomic or unsatisfactory to perform</p> <p>5.4. Use testing methods that comply with the manufacturer's requirements</p> <p>5.5. Adjust the unit's components correctly where necessary to ensure that they operate to meet the vehicle operating requirements</p> <p>5.6. Ensure the overhauled units and assemblies conform to the vehicle operating specification and any legal requirements</p>
<p>6. Be able to record information and make suitable recommendations</p>	<p>6.1. Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required</p> <p>6.2. Make suitable and justifiable recommendations for cost effective repairs</p> <p>6.3. Record and report any additional faults noticed during the course of their work promptly in the format required</p>

Content:

How the units and assemblies being overhauled operate

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

How units are dismantled and reassembled

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

Content Contd.

- e. The rebuild procedure for units and assemblies.
- f. Adjustment procedures during re-assembly.

Unit and assembly testing and evaluation procedures

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

Faults associated with units and assemblies being overhauled

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

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

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

Evidence Requirements	
1.	You must be observed by your assessor overhauling 2 units which includes 1 steering unit and 1 suspension unit.
	<ul style="list-style-type: none"> • Steering Unit
	<ul style="list-style-type: none"> • Suspension Unit



UNIT REF: BR18	UNIT TITLE: REMOVE AND FIT BASIC LIGHT VEHICLE MECHANICAL, ELECTRICAL AND TRIM (MET) COMPONENTS AND NON PERMANENTLY FIXED VEHICLE BODY PANELS
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Mapping: This unit is mapped to the IMI NOS BP18	Level 2	GLH: 46
Rationale: This unit enables the learner to develop the skills, knowledge and understanding to carry out a range of removal and fitting of basic mechanical, electrical and trim (MET) components and non-permanently fixed vehicle body panels. It also covers the evaluation of the operation of the components when fitted		

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Understand how to carry out removal and fitting of basic vehicle mechanical electrical and trim (MET) components	1.1. Identify the procedures involved in carry out the systematic removal and fitting of basic vehicle MET components to the standard required including: <ul style="list-style-type: none"> a. bumpers b. headlamp units c. road wheels d. batteries e. bonnet and boot trim f. interior trim components g. exterior trim components 1.2. Identify the procedures involved in working with supplementary safety systems when fitting basic vehicle MET components 1.3. Identify the procedures involved in working with high voltage systems when fitting basic vehicle MET components 1.4. Explain the methods and procedures for storing removed vehicle MET components 1.5. Identify the different types of fastenings and fixings used when removing and fitting vehicle MET components 1.6. Explain the reasons for the use of different types of fastenings and fixings used in vehicle MET components 1.7. Explain the procedures, methods and reasons for ensuring correct alignment of vehicle MET components 1.8. Identify the quality checks that can be used to ensure correct alignment and operation of vehicle MET components 1.9. Identify correct conformity of vehicle systems against vehicle specification and legal requirements on completion 1.10. Explain the procedure for reporting cosmetic damage to vehicle MET components and units



Qualification Specification Part B: L3 Diploma in Light Vehicle Maintenance

<p>2. Be able to work safely when carrying out removal and fitting of basic MET components and non-permanently fixed vehicle body panels</p>	<p>2.1. Use suitable personal protective equipment and vehicle coverings throughout all vehicle removal and fitting of basic MET components and non-permanently fixed vehicle body panels</p> <p>2.2. Work in a way which minimises the risk of damage or injury to the vehicle, people and the environment</p>
<p>3. Understand how to carry out removal and fitting of basic vehicle non permanently fixed vehicle body panels</p>	<p>3.1. Identify the procedures involved in carrying out the systematic removal and fitting of basic vehicle non-welded, non-structural body panels to the standard required, including:</p> <ul style="list-style-type: none"> a. wings b. doors c. bonnets d. boot lids and tailgates e. bumper bars, covers and components <p>3.2. Identify the procedures involved in working with supplementary safety systems when fitting basic vehicle non-welded, non-structural body panels</p> <p>3.3. Explain the methods and procedures for storing removed vehicle non-welded, non-structural body panels</p> <p>3.4. Identify the different types of fastenings and fixings used when removing and fitting vehicle non-welded, non-structural body panels</p> <p>3.5. Explain the reasons for the use of different types of fastenings and fixings used in vehicle non-welded, non-structural body panels</p> <p>3.6. Explain the procedures, methods and reasons for ensuring correct alignment of vehicle non-welded, non-structural body panels</p> <p>3.7. Identify the quality checks that can be used to ensure correct alignment and operation of vehicle non-welded, non-structural body panels</p> <p>3.8. Identify correct conformity of vehicle systems against vehicle specification and legal requirements on completion</p> <p>3.9. Explain the procedure for reporting cosmetic damage to vehicle non-welded, non-structural body panels</p>
<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 removal and fitting activities including:</p> <ul style="list-style-type: none"> a. vehicle technical data b. removal and fitting procedures c. legal requirements <p>4.2. Use technical information to support removal and fitting activities</p>



5. Be able to use appropriate tools and equipment	5.1. Select the appropriate tools and equipment necessary for carrying out removal and fitting of basic MET components and non-permanently fixed vehicle body panels 5.2. Ensure that equipment has been calibrated to meet manufacturer's and legal requirements 5.3. Use the correct tools and equipment in the way specified by manufacturers when carrying removal and fitting of basic MET components and non-permanently fixed vehicle body panels
6. Be able to carry out removal and fitting of basic MET components and non-permanently fixed vehicle body panels	6.1. Remove and fit basic MET components and non-permanently fixed vehicle body panels 6.2. Ensure that the removal and fitting of basic MET components and non-permanently fixed vehicle body panels conforms to the vehicle operating specification and any legal requirements 6.3. Ensure no damage occurs to other components when removing and fitting basic MET components and non-permanently fixed vehicle body panels 6.4. Ensure all components and panels are stored safely and in the correct location
7. Be able to record information and make suitable recommendations	7.1. Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required 7.2. Make suitable and justifiable recommendations for cost effective repairs 7.3. Record and report any additional faults noticed during the course of their work promptly in the format required

Content:

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

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

The processes involved when handling batteries

- a. The procedure for the removal, storage and refitting of lead acid batteries.
- b. The procedure for the disposal of lead acid batteries.

Content Contd.

- c. Battery checks:
 - i. electrolyte
 - ii. discharge
 - iii. specific gravity
- d. The charging process and procedures:
 - i. trickle charge
 - ii. normal charge
 - iii. boost / start
- e. The health and safety issues involved when charging (explosive gasses).

Types of clips and fixings

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

The processes involved when carrying out quality checks

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

Removing and Fitting Non-Structural Body Panels

- a. Find, interpret and use sources of information applicable to the removal and fitting of basic non-welded non-structural body panels.
- b. Select check and use all the tools and equipment required to remove and fit basic non-welded non-structural body panels including:
 - i. hinge pin removers
 - ii. spanners
 - iii. screwdrivers

Content Contd.

- c. The different types of mechanical fixings for non welded non-structural body panels and when and why they should be used including:
 - i. bolts
 - ii. self tapping bolts
 - iii. speed nuts
 - iv. washers
- d. The correct procedures and processes for removing and fitting of non welded non-structural body panels.
- e. The need for correct alignment of panels and methods to achieve this:
- f. Aperture gaps
- g. Alignment of panel features
- h. Best fit of components to panels
- i. Vehicle geometry
- j. Operation of openings such as doors, tailgates, bonnets etc.
- k. The types of quality control checks that can be used to ensure correct alignment and contour of panels and operation of components to manufacturer's specification.
- l. The method of storing removed panels and the importance of storing them correctly.

Evidence Requirements	
1.	You must be observed by your assessor removing and replacing 4 of the 13 units or components from the list below on at least 2 separate occasions .
	• bumpers
	• headlamp units
	• road wheels
	• batteries
	• bonnet fittings
	• interior trim components
	• exterior trim components
	• wings
	• doors
	• bonnets
	• boot lids and tailgates
	• bumper bars, covers and component
	• fairings and side panels



UNIT REF: LVM13.2	UNIT TITLE: SKILLS IN DIAGNOSING AND RECTIFYING LIGHT VEHICLE TRANSMISSION AND DRIVELINE FAULTS
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Mapping: This unit is mapped to the IMI NOS LV13	Level: 3	GLH: 34
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Rationale: This unit allows the learner to develop skills in diagnosing and rectifying light vehicle gearboxes, hubs and bearings, driveline shafts, clutches, differentials and final drive unit faults. This unit also covers the evaluation of performance of the replaced or repaired units and systems.

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Be able to work safely when carrying out light vehicle transmission and driveline diagnostic and rectification activities	1.1. Use suitable personal protective equipment and vehicle coverings when using light vehicle diagnostic methods and carrying out rectification activities 1.2. Work in a way which minimises the risk of damage or injury to the vehicle, people or the environment.
2. Be able to use relevant information to carry out the task	2.1. Select suitable sources of technical information to support light vehicle diagnostic and rectification activities including: a. vehicle technical data b. diagnostic test procedures 2.2. Use sufficient diagnostic information in a systematic way to enable an accurate diagnosis of light vehicle transmission and driveline system faults
3. Be able to use appropriate tools and equipment	3.1. Select the appropriate tools and equipment necessary for diagnostic and rectification activities 3.2. Ensure that equipment has been calibrated to meet manufacturers' and legal requirements 3.3. Use the equipment required, correctly and safely throughout all light vehicle transmission and driveline diagnostic and rectification activities
4. Be able to carry out light vehicle transmission and driveline diagnosis, rectification and test activities	4.1. Use diagnostic methods that are relevant to the symptoms presented 4.2. Evaluate dismantled sub-assemblies for their condition and suitability for repair or replacement 4.3. Carry out all diagnostic and rectification activities following: a. manufacturer's instructions b. recognised repair methods c. health and safety requirements 4.4. Ensure all repaired or replacement components and units conform to the vehicle operating specification and any legal requirements 4.5. Adjust components and units correctly to ensure that they operate to meet system requirements 4.6. Use testing methods that are suitable for assessing the performance of the system rectified



	4.7. Ensure the light vehicle transmission and driveline system rectified performs to the vehicle operating specification and any legal requirements
5. Be able to record information and make suitable recommendations	5.1. Produce work records that are accurate, complete and passed to the relevant person(s) promptly in the format required 5.2. Make suitable and justifiable recommendations for cost effective repairs 5.3. Record and report any additional faults noticed during the course of their work promptly in the format required

Evidence Requirements	
1.	You must be observed by your assessor successfully carrying out the diagnosis and rectification of faults occurring in 2 of the systems listed. The fault should involve a 2 or more step diagnostic activity. The evidence must include demonstration of skill in at least 2 of the following:- mechanical, electrical / electronic and hydraulic units or components.
	<ul style="list-style-type: none">• clutch
	<ul style="list-style-type: none">• gearbox
	<ul style="list-style-type: none">• drive line (shafts, couplings, hubs and bearings)
	<ul style="list-style-type: none">• final drive