City & Guilds Level 2 Extended Technical Occupational Entry Light Vehicle Service and Maintenance Technicians (Diploma) (7292-12)

Version 1.0 (September 2024)

Qualification Handbook

Qualification at a glance

Subject area	Transport
City & Guilds number	7292
Age group approved	16–18, 19+
Entry requirements	N/A
Assessment	Multiple choice question (MCQ) exams Practical assignment
Grading	Pass/Fail
Approvals	Full approval required
Support materials	Sample assessments (SAMs), Qualification handbook
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates
Occupational Standard(s)	ST0499 Autocare Technician

Title and level	City & Guilds qualification number	Regulatory reference number	GLH	TQT
City & Guilds Level 2 Extended Technical Occupational Entry Light Vehicle Service and Maintenance Technicians (Diploma)	7292-12	610/4589/5	365	365

Version and date	Change detail	Section
1.0 – Sep 2024	Initial version	N/A

Contents

1 Introduction

What is this qualification about?

Area	Description
Who is the qualification for?	This qualification is for those individuals who are looking to work in the transport industry specifically as a light vehicle technician. A light vehicle technician has the skills and knowledge to inspect, service and repair light vehicles. Learners will gain an understanding of the skills and knowledge that are important when working as a light vehicle technician or progressing to further learning and training in this area. This qualification is suitable for anyone over 16 years old.
What does the qualification cover?	This qualification aligns to the knowledge, skills and behaviours in the ST0499 Autocare Technician Occupational standard.
What opportunities for progression are there?	Learners who achieve this qualification can directly enter the automotive service sector as a service and maintenance technician. This qualification will also lead to progression for learners to enrol onto a T Level or an accelerated Level 2 or Level 3 apprenticeship.
Why choose this qualification?	This qualification has been designed with the involvement of a range of technical subject matter experts and employers, to ensure it meets the needs of the occupation. The qualification aligns to the ST0499 Autocare Technician occupational standard and will provide employers with reliable evidence of a learner's attainment against occupational standard knowledge, skills and behaviours (KSBs) which form the minimum requirements for entry into occupation.

2 Content coverage and mapping

Occupational standards

This qualification has been developed to cover as many of the Knowledge, Skills and Behaviours (KSBs) in the relevant occupational standard as it may be reasonable to attain by undertaking a course of education or training. Where KSBs in a relevant occupation standard cannot be reasonably obtained within a course of education or training in an educational setting, City & Guilds seeks the validation from credible employers to ensure that the qualification is fit for purpose.

The knowledge and skills content within this qualification has been amplified to reflect the KSBs. High level mapping to the KSBs in the Occupational Standard can be found in the 'Qualification structure' section. Detailed mapping at unit level can be found in Appendix 1 within this qualification handbook.

The table below shows the Occupational Standard the qualification aligns to:

Qualification	Occupational Standard title / Reference
City & Guilds Level 2 Extended Technical Occupational Entry Light Vehicle Service and Maintenance Technicians (Diploma)	ST0499 Autocare Technician

3 Employer engagement

City & Guilds would like to take this opportunity to thank all the employers, trade associations, professional bodies, providers, subject matter experts and consultants who have dedicated time to review and validate this qualification. These stakeholders have been used throughout the development and validation of this qualification to ensure the qualification meets the requirements of the Occupational Standard and the needs of the industry. Employer validation recognises the demand or likely demand for learners who have completed the City & Guilds Level 2 Extended Technical Occupational Entry Light Vehicle Service and Maintenance Technicians (Diploma). This collaborative work is to ensure that a learner studying the City & Guilds Level 2 Extended Technical Occupational Entry Light Vehicle Service and Maintenance Technicians (Diploma) has the best opportunities available to them as they progress through their career with a solid base as a starting point.

4 Qualification structure

Structure

To achieve the City & Guilds Level 2 Extended Technical Occupational Entry Light Vehicle Service and Maintenance Technicians (Diploma), learners must achieve:

City & Guilds unit number	Unit title	GLH
Learners must achieve all **nine** mandatory units.		
001	Health and safety and sustainability in the automotive environment	50
002	Customer service, sales principles, communication	25
003	Stock control procedures	20
004	Light vehicle chassis systems	90
005	Service, maintenance and inspection	60
006	Vehicle propulsion, internal combustion engine	40
007	Vehicle propulsion, alternative fuel systems	20
008	Electrical systems and components	40
009	Automotive industry and careers	20

Total Qualification Time (TQT)

Total Qualification Time (TQT) is the number of notional hours which represents an estimate of the total amount of time that could reasonably be expected for a learner to demonstrate the achievement of the level of attainment necessary for the award of a qualification.

TQT comprises the following two elements:

1) the number of hours that an awarding organisation has assigned to a qualification for guided learning

- an estimate of the number of hours a learner will reasonably be likely to spend in preparation, study or any other form of participation in education or training, including assessment, which takes place as directed by – but, unlike guided learning (GLH), not under the immediate guidance or supervision of – a lecturer, supervisor, tutor or other appropriate provider of education or training.

Title and level	GLH	TQT
City & Guilds Level 2 Extended Technical Occupational Entry Light Vehicle Service and Maintenance Technicians (Diploma)	365	365

5 Centre requirements

Approval

Full approval

To offer this qualification, new centres will need to gain both centre and qualification approval. Please refer to the document **Centre Approval process: Quality Assurance Standards** for further information.

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

Resource requirements

Centre staffing

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

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

Continuing Professional Development (CPD)

Centres are expected to support their staff in ensuring that their knowledge remains current of the occupational area and of best practice in delivery, mentoring, training, assessment and quality assurance, and that it takes account of any national or legislative developments.

Physical resources

Centres must be able to demonstrate that they have access to the following equipment and technical resources required to deliver this qualification and its assessment:

- Maintenance manuals and instructions
- Material safety data sheets (MSDS)
- Appropriate risk assessments
- Technical representations
- Inspection and test record sheets
- Vehicle protective equipment (VPE)
- Personal protective equipment (PPE)

- Vehicles – selection of petroleum, diesel and hybrid/electric vehicles that learners can work on
- Automotive training rigs such as:
  - transmission systems
  - chassis systems
  - electrical and electronics
  - selection of different engine arrangements
- Components that can be taken off and replace such as:
  - transmission systems
  - chassis systems
  - lighting circuits
  - batteries
  - electrical components
- Service parts:
  - filters (pollen, air, oil, fuel, transmission, electric motor coolant)
  - spark plugs
  - wiper blades
  - brakes
  - remote/intelligent key/fob battery
  - fluids (oil, transmission, power steering, coolant, screen wash, brake)
- Vehicle workshop tools such as:
  - spanners
  - screwdrivers
  - Allen keys
  - ratchets and sockets
  - universal joints
  - extension bars
  - hammers
  - mallets
  - files
  - cold chisels
  - punches
  - clamps
  - pliers
  - hacksaws
  - crimping tools
  - measuring tools
  - hydrometer
  - Vernier callipers
  - feeler gauge
  - angle gauges

  - torque wrench
  - tyre tread depth gauge
  - spark plug adaptor
  - hand diagnostic equipment
  - vehicle specific tools
  - refractometer
  - insulated tool set
  - impact wrenches
  - drills
  - power tools (cordless drill, hammer drill, electric screwdriver, compressed air driven tools)
- Lifting equipment
  - jacks (pneumatic, hydraulic, mechanical, scissor, trolley, bottle, ramps, transmission)
  - cranes
  - hoists
- Workshop machinery – pillar drill, bench grinder, hand drill, bearing puller
- Measurement and diagnostic tools and equipment:
  - multimeters
  - oscilloscopes
  - diagnostic analysers
  - data logging/self-diagnosis equipment
  - dial tester indicator (DTI)
  - emissions testers
  - frequency meter
  - hydraulic pressure
  - thermal checks
  - torque devices
  - testers (coolant, brake fluid, battery, discharge, diagnostic, compression, cooling system pressure, fuel pressure, oil pressure, vacuum gauge, emission)
  - wheel alignment with the ability to measure caster and camber
  - beam setting
  - rolling road
  - diagnostic/scan tool with reset capability – TPMS ability
- Tyre changing equipment with run flat tyre capability
- Tyre repair materials and equipment
- Specialist brake measuring and bleeding tools
- Proprietary vehicle technical data
- Cleaning materials.

Quality assurance

Approved centres must have effective quality assurance systems to ensure optimum delivery and assessment of qualifications. Quality assurance includes initial centre approval, qualification approval and the centre's own internal procedures for monitoring quality. Centres are responsible for internal quality assurance and City & Guilds is responsible for external quality assurance (EQA). All EQA processes reflect the minimum requirements for verified and moderated assessments, as detailed in the Centre Assessment Standards Scrutiny (CASS), section H2 of Ofqual's General Conditions of Recognition. For more information on both CASS and City & Guilds quality assurance processes visit: the What is CASS? and Quality Assurance Standards documents on the City & Guilds website.

Standards and rigorous quality assurance are maintained by the use of:

- internal quality assurance
- City & Guilds external quality assurance.

In order to carry out the quality assurance role, internal quality assurers must:

- have appropriate teaching and vocational knowledge and expertise
- have experience in quality management/internal quality assurance
- hold or be working towards an appropriate teaching/training/assessing qualification
- be familiar with the occupation and technical content covered within the qualification.

External quality assurance for the qualification will be provided by the City & Guilds EQA process. EQAs are appointed by City & Guilds to approve centres and to monitor the assessment and internal quality assurance carried out by centres. External quality assurance is carried out to ensure that assessment is valid and reliable, and that there is good assessment practice in centres.

The role of the EQA is to:

- provide advice and support to centre staff
- ensure the quality and consistency of assessments within and between centres by the use of systematic sampling
- provide feedback to centres and to City & Guilds.

Learner entry requirements

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

Initial assessment and induction

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

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

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

Age restrictions

This qualification is approved for learners aged 16 or above.

Access to assessment and special consideration

City & Guilds has considered the design of this qualification and its assessments in order to best support accessibility and inclusion for all learners. We understand however that individuals have diverse learning needs and may require reasonable adjustments to fully participate. Reasonable adjustments, such as additional time or alternative formats, may be provided to accommodate learners with disabilities and support fair access to assessment.

Access arrangements are adjustments that allow candidates with disabilities, special educational needs, and temporary injuries to access the assessment and demonstrate their skills and knowledge without changing the demands of the assessment. These arrangements must be made before assessment takes place.

The Equality Act 2010 requires City & Guilds to make reasonable adjustments where a disabled person would be at a substantial disadvantage in undertaking an assessment. It is the responsibility of the centre to ensure at the start of a programme of learning that candidates will be able to access the requirements of the qualification.

Please refer to the JCQ access arrangements and reasonable adjustments and Access arrangements – when and how applications need to be made to City & Guilds for more information. Both are available on the City & Guilds website: Centre document library | City & Guilds (cityandguilds.com)

6 Delivering the qualification

Inclusion and diversity

City & Guilds is committed to improving inclusion and diversity within the way we work and how we deliver our purpose which is to help people and organisations develop the skills they need for growth.

More information and guidance to support centres in supporting inclusion and diversity through the delivery of City & Guilds qualifications can be found here: **Inclusion and diversity | City & Guilds (cityandguilds.com)**

Sustainability

City & Guilds are committed to net zero. Our ambition is to reduce our carbon emissions by at least 50% before 2030, and to develop environmentally responsible operations to achieve net zero by 2040, or sooner if we can. City & Guilds is committed to supporting qualifications that support our customers to consider sustainability and their environmental footprint.

More information and guidance to support centres in developing sustainable practices through the delivery of City & Guilds qualifications can be found here: **Our Pathway to Net Zero | City & Guilds (cityandguilds.com)**

Support materials

The following resources are available for this qualification:

Description	How to access
Sample assessments	www.cityandguilds.com
Qualification handbook	www.cityandguilds.com
SmartScreen	www.smartscreen.co.uk

7 Assessment

Summary of Assessment methods

For City & Guilds Level 2 Extended Technical Occupational Entry Light Vehicle Service and Maintenance Technicians (Diploma), candidates must successfully complete:

Assessment component	Assessment method	Description and conditions
201	Externally marked MCQ exam	The exam **201 Principles of health and safety and customer service** covers units 001, 002, 003 and 009. This exam is externally set and externally marked and will be delivered online using the e-volve assessment platform. This exam is available on demand. The exam is designed to assess the candidate's depth and breadth of understanding across the theoretical content in the qualification at the end of the period of learning, using multiple choice questions. It will be sat under invigilated examination conditions. See JCQ requirements for details: **http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations** The test specification shows the coverage of the assessment across the qualification content. Sample assessment materials can be downloaded from the City & Guilds website.

Assessment component	Assessment method	Description and conditions
202	Externally marked MCQ exam	The exam **202 Technical knowledge** covers units 004, 006, 007 and 008. This exam is externally set and externally marked and will be delivered online using the e-volve assessment platform. This exam is available on demand. The exam is designed to assess the candidate's depth and breadth of understanding across the technical content in the qualification at the end of the period of learning, using multiple choice questions. It will be sat under invigilated examination conditions. See JCQ requirements for details: **http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations** The test specification shows the coverage of the assessment across the qualification content. Sample assessment materials can be downloaded from the City & Guilds website.
251	Practical assignment	The assignment covers units 001, 002, 004, 005, 006 and 008. The practical assignment is externally set and internally marked with external verification. The assignment is designed to assess the candidate's depth and breadth of knowledge, skills and understanding from across content in the qualification, at the end of their period of learning, and will be completed under supervised, controlled assessment conditions. See JCQ requirements for details: **http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations** The assessment specification shows the coverage of the assessment across the qualification content. Assignment material availability will be communicated through the publication of a key date schedule.

Scheme of assessment overview

For City & Guilds Level 2 Extended Technical Occupational Entry Light Vehicle Service and Maintenance Technicians (Diploma), candidates must successfully complete:

Candidates must complete all assessment components					
Assessment component	**Method**	**Duration**	**Marks**	**Marking approach**	**Grading**
201	On-demand e-volve online MCQ exam	45 minutes	30	Externally set and externally marked	Pass/Fail
202	On-demand e-volve online MCQ exam	1 hour	35	Externally set and externally marked	Pass/Fail
251	On-demand practical assignment	7 hours 45 minutes	N/A	Externally set, internally marked and externally verified	Pass/Fail

Assessment specifications

The assessment specifications outlined in the tables below highlight at high level the way that the qualification content will be assessed within the different assessment components.

201	Duration: 45 minutes		
Unit	**Outcome**	**Number of marks**	**Percentage %**
001	1 Understand health and safety regulations and legislation in the automotive environment	**7**	**23%**
	2 Understand how to identify, prevent or reduce exposure to hazards and risks	**6**	**20%**
	3 Maintain good housekeeping and correctly dispose of waste	**2**	**7%**
	4 Apply principles of sustainability in the automotive industry	**1**	**3%**
002	1 Know how to work effectively within the organisational structure of the automotive work environment	**3**	**10%**
	2 Communicate with and support internal and external customers effectively	**1**	**3%**
	3 Know how to sell products and services to customers and overcome objections	**1**	**3%**
003	1 Know how to carry out the process for ordering stock	**2**	**7%**
	2 Know how to carry out the different procedures relating to stock control	**3**	**10%**
009	1 Know the different businesses within the automotive industry	**2**	**7%**
	2 Know the different job roles and levels in the automotive industry	**2**	**7%**
	Total	**30**	**100%**

Permitted materials: N/A

Graded: Pass/Fail

Pass mark: The pass mark for this MCQ exam is set at 60% (18 marks out of 30).

This boundary may be subject to slight variation to ensure fairness, should any variations in the difficulty of the individual assessment versions be identified.

202	Duration: 1 hour		
Unit	**Outcome**	**Number of marks**	**Percentage %**
004	1 Understand the construction and operation of steering, suspension, braking systems and tyres	**12**	**34%**
006	1 Know engine and fuel system components	**4**	**11%**
	2 Carry out removal, inspection and replacement of vehicle emission control and exhaust systems	**4**	**11%**
	3 Know the operation and maintenance of lubrication and cooling systems and components	**3**	**9%**
007	1 Understand the functional differences between electric and non-electric vehicles	**2**	**6%**
	2 Understand the importance of working safely around alternatively fuelled vehicles	**2**	**6%**
008	1 Understand the fundamentals of electrical and electronic systems	**4**	**11%**
	2 Know electrical and auxiliary components	**2**	**6%**
	3 Know electrical circuit and component faults and testing equipment	**2**	**6%**
	Total	**35**	**100%**

Permitted materials: N/A

Graded: Pass/Fail

Pass mark: The pass mark for this MCQ exam is set at 63% (22 marks out of 35).

This boundary may be subject to slight variation to ensure fairness, should any variations in the difficulty of the individual assessment versions be identified.

251	Duration: 7 hours 45 minutes
Unit	**Outcome**
001	3 Maintain good housekeeping and correctly dispose of waste
	4 Apply principles of sustainability in the automotive industry
002	2 Communicate with and support internal and external customers effectively
004	2 Check, replace and test chassis units and components
005	1 Work safely when carrying out service, maintenance and inspection activities
	2 Complete light vehicle inspections following manufacturers' and organisational procedures
	3 Carry out routine maintenance, including adjustment and replacement activities
006	2 Carry out removal, inspection and replacement of vehicle emission control and exhaust systems
008	4 Carry out removal and replacement of electrical components

Grading: Pass/Fail

Assessment objectives

The following assessment objectives are used within the **201 and 202 assessments**.
The weightings for how the assessment objectives are applied in the assessments are shown in the table below.

Assessment objective	Description	Weighting in assessment	
		201	202
AO1a Demonstrate knowledge of the content	The ability to demonstrate basic recall of relevant knowledge in response to straightforward questioning.	27 % 8 marks	57% 20 marks
AO1b Demonstrate understanding of the content	The ability to demonstrate understanding of principles and concepts beyond recall of definitions.	53 % 16 marks	43% 15 marks
AO2 Apply knowledge and understanding of the content to different situations and contexts	The ability to take the understanding of generalities and apply them to specific situations.	20 % 6 marks	0% 0 marks

Availability of assessments

Assignment material availability will be communicated through the publication of a key date schedule. This schedule will include when the assignment materials will be released to centres.

All assessments that are on e-volve are on demand and can be booked by the provider when the candidate is ready to be entered for the assessment.

Retakes/Resits

Multiple choice question (MCQ) exams
Candidates who have failed an online MCQ exam are permitted up to **four** further retakes of the exams (total five attempts) before re-registration is required.

Practical assignment
Candidates who have failed one or more tasks in the practical assignment, will be advised to complete a further period of learning before then resitting all tasks within a different version of the assignment. Candidates can resit a different version of the assignment up to a maximum of **four** times (total five attempts) before re-registration is required.

Recognition of prior learning (RPL)

Recognition of prior learning means using a person's previous experience or qualifications which have already been achieved to contribute to a new qualification. RPL can be used to exempt learners from areas of learning previously achieved but does not exempt them from assessment.

When a learner has re-registered due to multiple attempts for the assessments, if they used the same enrolment number, then any assessment(s) they had achieved will be carried over and they will not need to repeat them. If a learner re-registers under a new enrolment number, then they will need to retake all assessments of the qualification.

8 Units

Structure of the units

These units each have the following:

- City & Guilds reference number
- title
- level
- guided learning hours (GLH)
- unit aim
- assessment method
- learning outcomes, which are comprised of a number of topics
- content elements
- supporting information
- relationship to transferrable employability skills, where applicable.

Unit guidance for delivery

This qualification comprises a number of **units**. A unit describes what is expected of a competent person in particular aspects of their job.

Each **unit** is divided into **learning outcomes** which describe in further detail the knowledge and skills that a candidate should possess.

Each **learning outcome** has a set of **topics** (knowledge or skills) that are simple and concise statements indicating to a learner something specific they will be learning in relation to the learning outcome. A topic should provide clarity to a learner at a high level on what they should be expecting to learn or be able to do about a specific area of the learning outcome.

Content elements define the 'depth and breadth' to which the teaching/learning must be delivered.

It is important that these sections define all the essential content that must be covered for learners to achieve the learning outcome. It is the information in this section that learners will be assessed on.

Transferable employability skills

The Institute for Apprenticeships have developed a transferable skills mapping framework which provides elaboration of generic, transferable employability skills that can be applied across all relevant occupational areas. This framework can be found here.

City & Guilds have considered which transferable employability skills within this framework are relevant to this qualification, and then mapped these skills to the relevant practical outcomes within the qualification content. A mapping grid that outlines how the skills are best reflected in the content is found in each relevant unit within this qualification.

Unit 001 Health and safety and sustainability in the automotive environment

Unit level:	2
Guided learning hours (GLH):	50
Unit aim:	This unit enables the learner to develop knowledge of health and safety and good housekeeping along with sustainability in the automotive environment. It will provide the learners with the skills and knowledge to monitor health and safety and allow them to evaluate and deal with risks while using resources economically.
Assessment method:	MCQ exam Practical assignment
Links to Occupational Standard:	ST0499

Learning outcomes

1. Understand health and safety regulations and legislation in the automotive environment.
2. Understand how to identify, prevent or reduce exposure to hazards and risks.
3. Maintain good housekeeping and correctly dispose of waste.
4. Apply principles of sustainability in the automotive industry.

Learning outcome 1

Understand health and safety regulations and legislation in the automotive environment.

Topics	Content elements
1.1 Health and safety regulations and legislation	1.1.1 How health and safety legislation relates to the role of a vehicle technician: a) health and safety at work act (HASAWA) i. employer duties • provide safe workplace • provide safe equipment • provide personal protective equipment (PPE) • prevent risk to health • first aid • welfare facilities • offer relevant training • carry out risk assessments ii. employee duties • follow training given • use tools and equipment appropriately

Topics	Content elements
	• take reasonable care of own and other's health and safety • cooperate with employer • report to employer any inadequate precautions putting colleagues' life in danger or serious risk of injury b) control of substances hazardous to health (COSHH) c) reporting of injuries, diseases, and dangerous occurrences regulations (RIDDOR) d) lifting operations and lifting equipment regulations (LOLER) e) provision and use of work equipment regulations (PUWER). 1.1.2 How general health and safety regulations apply to the role of a vehicle technician: a) manual handling operations b) personal protective equipment (PPE) c) display screen equipment d) first aid e) noise at work f) electricity at work g) dangerous substances and explosive atmospheres h) refrigerant handling.
1.2 Health and safety legislative duties	1.2.1 How health and safety legislation applies to the automotive workplace environment: a) the purpose of a health and safety policy i. statement of intent ii. person responsible iii. arrangements for health and safety b) the relevance of the health and safety executive (HSE) c) the importance of a health and safety induction i. training plan ii. workshop tour iii. tools and equipment iv. fire and evacuation procedures v. awareness of first aid procedures vi. accident book vii. responsibilities d) implications of non-compliance i. accidents ii. loss of life iii. fines iv. prosecution v. prison sentencing vi. loss of reputation vii. loss of income viii. business closure e) the importance of liability insurance

Topics	Content elements
	f) precautions to be taken when working with: i. vehicles ii. materials iii. chemicals iv. tools and equipment v. electricity vi. pneumatics vii. hydraulics.

Learning outcome 2

Understand how to identify, prevent or reduce exposure to hazards and risks.

Topics	Content elements
2.1 Hazards and risks in the automotive environment	2.1.1 The difference between a hazard and a risk: a) hazard: anything that can cause harm i. obstructions ii. leakages and spillages iii. moving vehicles iv. high voltages v. refrigerants vi. extreme temperatures vii. heavy loads viii. fumes b) risk: the likelihood and how serious the harm can be i. low, medium, high.
2.2 Ways to prevent and reduce hazards	2.2.1 Appropriate use and maintenance of personal protective equipment (PPE) and vehicle protective equipment (VPE): a) personal protective equipment (PPE) i. appropriate PPE for different situations to protect: • eyes: goggles, face shield • ears: ear defenders, ear plugs • head: bump cap • body: overalls, apron • feet: safety footwear • hands: gloves, barrier cream • lungs: mask, respiratory equipment ii. how to maintain PPE • replenish • replace iii. the importance of monitoring date stamps and safety markings on high voltage gloves b) vehicle protective equipment (VPE) i. seat covers ii. wing covers iii. floor mats iv. steering wheel cover v. gear lever cover vi. seatbelt protection. 2.2.2 How to reduce exposure to hazards and risks: a) safety signs i. prohibition ii. warning iii. safe condition iv. mandatory

Topics	Content elements
	b) warning labels c) different types of fire extinguishers and when to use each: i. foam ii. dry powder iii. water iv. CO_2 d) importance of maintenance and good housekeeping of tools and equipment i. hand tools ii. specialist tools iii. insulated tools • high voltage equipment iv. manufacturer tools v. hydraulic tools vi. pneumatic tools vii. corded tools viii. cordless tools e) importance of training f) risk assessments i. purpose • to prevent accidents • to reduce injuries • to generate awareness about hazards • to identify who is most at risk and make appropriate adjustments ii. when to review • new equipment • new job role • new technology • new processes • periodic review g) control measures i. prevent hazard ii. reduce hazard iii. eliminate hazard h) work in a way that minimises risks or damage to: i. vehicle ii. people iii. environment.

Learning outcome 3

Maintain good housekeeping and correctly dispose of waste.

Topics	Content elements
3.1 Maintain good housekeeping	3.1.1 Good housekeeping practices: a) clean workshop tools and equipment b) maintain tools and equipment c) store tools and equipment correctly and safely d) store stock items correctly and safely e) clean spillages and breakages f) use appropriate warning signage.
3.2 Waste disposal	3.2.1 Correct waste disposal procedures and considerations. a) procedures for the disposal of: i. oil ii. antifreeze iii. refrigerant containers (refillable, non-refillable) iv. brake fluid v. tyres vi. batteries vii. metals viii. cardboard ix. plastics x. filters b) waste disposal facilities and services i. local recycling centres ii. licensed commercial recycling companies iii. 'end of life' vehicle dismantlers c) considerations when disposing of waste i. prevent spillages from stored liquids ii. prevent contamination. 3.2.2 Consequences of incorrect waste disposal: a) environmental i. pollution ii. climate change iii. effects on wildlife b) business i. loss of reputation ii. loss of income iii. business closure. 3.2.3 Consequences of non-compliance with Environment Agency regulations: a) fines b) prison sentencing.

Learning outcome 4

Apply principles of sustainability in the automotive industry.

Topics	Content elements
4.1 Fundamentals of sustainability	4.1.1 The fundamental concepts of sustainability: a) current sustainability i. sources of electricity production for alternative fuelled vehicles • solar • wind • water • biomass b) future sustainability i. hydrogen c) requirements for 'net zero' targets i. pedestrianisation ii. low emission zones iii. reduced speed limits d) world energy resources i. renewable ii. non-renewable. 4.1.2 Principles and benefits of improving sustainability in vehicle manufacture and 'end of life' vehicles: a) considerations for energy efficient vehicles and components i. tyres ii. oils iii. vehicle weight iv. engine design b) carbon emission reduction c) duties and responsibilities of individuals d) reduce/reuse/recycle.
4.2 Work in a sustainable way in the workshop environment	4.2.1 Using resources economically and efficiently: a) the use and cost of resources i. latex gloves ii. brake cleaner iii. lubricating oil iv. grease v. consumables • cable ties • electrical terminals • nuts, bolts, washers • paper roll.

Unit guidance for delivery

Opportunities for efficiencies in delivery across/between units:	002 Customer service, sales principles, communication 003 Stock control procedures 004 Light vehicle chassis systems 005 Service, maintenance and inspection
Suggestions for formative assessment opportunities, both for knowledge and practical outcomes:	Some formative assessments may be carried out in a classroom, environment. It is important that learners can relate this knowledge and understanding to actual workshop situations, practical tasks and assessments.
Opportunities for visits/engagement with local industry and employers:	It is recommended that centres develop a method of maintaining contact with a range of employers in the sector as they may be able to help with keeping the examples of legislation, policies and codes of practice used in the taught content, up to date.
Considerations for innovative methods of delivery:	It is expected that a range of delivery methods will be used including presentations, internet research and, where applicable, visiting speakers.
Ways of ensuring content is delivered in line with current, up-to-date industry practice:	It is important that the subject content covered is relative to the automotive industry, this means that product knowledge, practical skills and testing methods taught are what is required by the industry currently. This means that the unit will always be relative to the industry that it relates to, also that local industry employers should be engaged and consulted as to how this unit will be delivered.
EDI or accessibility considerations:	Centres must deliver the unit in line with their EDI policy and organisational procedures.
Digital initiative considerations:	Learners could make recordings to demonstrate the use of PPE.
Sustainability considerations:	Disposal of PPE and VPE. Disposal of solvents and refrigerants.
Books:	• *Health and Safety Pocket Book*, Garry Hunt, Routledge, 2018 • *Level 2 Health and Safety Made Easy*, Qualsafe.com, Qualsafe, 2018
Websites:	• Environmental and sustainability policy - GOV.UK (www.gov.uk) • Personal protective equipment (PPE) at work (hse.gov.uk) • Health and Safety at Work etc. Act 1974 (legislation.gov.uk) • HSE: Information about health and safety at work

Transferrable employability skills

Workplace conduct	LO and Topic
Applies sufficient effort to enable them to complete tasks set to the standard required **(CW3)**	LO1: 1.2
Problem solving	
Gathers appropriate information or advice from different sources to help solve a specific work-related problem **(PSW1)**	LO2: 2.1
Assesses a range of potential solutions, applying appropriate problem-solving strategies **(PSW2)**	LO2: 2.1

Unit 002 Customer service, sales principles, communication

Unit level:	2
Guided learning hours (GLH):	25
Unit aim:	This unit enables the learner to develop the knowledge and skills required to maintain good working relationships in the automotive industry by using effective communication and support. The learner will be able to contribute to the sale of products and services; gain information from customers on their needs; give advice and information and overcome objections.
Assessment method:	MCQ exam Practical assignment
Links to Occupational Standard:	ST0499

Learning outcomes

1. Know how to work effectively within the organisational structure of the automotive work environment.
2. Communicate with and support internal and external customers effectively.
3. Know how to sell products and services to customers and overcome objections.

Learning outcome 1

Know how to work effectively within the organisational structure of the automotive work environment.

Topics	Content elements
1.1 How to respond to customer requests	1.1.1 How to respond promptly to requests for assistance from internal and external customers: a) respond promptly i. prioritise customer requirements ii. provide accurate timelines iii. information requested by customers • cost • availability • warranty • returns policy iv. open and honest v. courteous and respectful vi. confirm the customer's request

Topics	Content elements
	b) customers i. internal colleagues ii. external • general public (face to face or online customers) • parts suppliers. 1.1.2 Who to refer customers to, should requests fall outside of their responsibility and capability: a) refer to i. manager ii. supervisor iii. technician b) responsibility and limits of own authority c) how to work as an effective team member i. taking responsibility for own actions ii. being honest and accountable when issues arise iii. asking for help from colleagues/supervisor iv. offering help and advice to colleagues v. collaborating with team d) capability i. personal customer service skills ii. individual training iii. knowledge of the situation.
1.2 Legislation and regulations relating to customers	1.2.1 Legal and regulatory considerations when dealing with customers: a) general data protection regulation (GDPR) b) sale of goods act c) consumer rights act. 1.2.2 Consequences of non-compliance: a) prosecution b) fines c) prison sentence d) loss of reputation e) loss of income.

Learning outcome 2

Communicate with and support internal and external customers effectively.

Topics	Content elements
2.1 Methods of communication to meet customer needs	2.1.1 How to use different methods of communication to meet the needs of a range of customers: a) methods i. verbal • face to face • telephone call • online meeting ii. non-verbal • web chat • text message • social media • email • letter b) needs i. time ii. availability iii. transportation iv. distance v. price vi. convenience c) range of customers i. informed ii. uninformed iii. angry iv. dissatisfied v. new vi. loyal vii. potential viii. impulsive.
2.2 Provide customers with clear and accurate information	2.2.1 Provide customers with clear and accurate information a) clear and accurate: i. contains no errors • spelling • grammar • calculations ii. meets the customer's needs iii. easy to understand (minimal technical jargon) iv. summarise information b) information i. range of options • warranty • price • quality

Topics	Content elements
	• brands • original equipment (OE) ii. written • quote • estimate • invoice iii. verbal iv. electronic • email • web chat.
2.3 Respond to customer requests	2.3.1 Respond to customers' requests for assistance clearly and courteously: a) clearly i. questioning techniques • open • closed • probing • leading ii. active listening iii. confirm information iv. verbal communication • clear speaking • tone • volume v. body language • facial expressions • hand gestures • eye contact • posture • open • closed b) courteously i. show respect ii. do not argue iii. confirm the requests iv. be empathetic v. letting customers speak first and without interruption.

Learning outcome 3

Know how to sell products and services to customers and overcome objections.

Topics	Content elements
3.1 The sales process of products and services	3.1.1 The sales process: a) potential b) preparation c) approach d) presentation e) handling objections f) upselling g) closing h) following up i) repeat opportunities. 3.1.2 The benefits of IT systems and point-of-sale (POS) systems: a) connectivity b) security c) data storage d) ease of use e) accuracy f) software updates g) online training h) accounting features i) vehicle recognition j) automatic ordering. 3.1.3 How to overcome customer objections to buying: a) objections i. 'cost too high' ii. 'how is your organisation different' iii. 'not a priority' iv. 'already use a competitor' b) overcoming objections i. listen ii. ask questions iii. offer to resolve any current problems/issues iv. refer to legal requirements v. use it as an opportunity to promote the company.

Unit guidance for delivery

Opportunities for efficiencies in delivery across/between units:	001 Health and safety and sustainability in the automotive environment 003 Stock control procedures 004 Light vehicle chassis systems 005 Service, maintenance and inspection
Suggestions for formative assessment opportunities, both for knowledge and practical outcomes:	The majority of the content will be delivered in a classroom environment, it is important that learners can relate this knowledge and understanding to actual customer service and sales situations.
Opportunities for visits/engagement with local industry and employers:	Employer engagement is recommended in order to maximise the value of the learners' experience. A partnership approach should be adopted where possible with employers.
Considerations for innovative methods of delivery:	Learners must be encouraged to develop an independent learning approach to their studies, this means that they should be encouraged to use various means of learning resources. Learners should be challenged to explore ideas. This unit should be delivered to learners through practical experience and theoretical researching, therefore developing the independent learning ability of learners. Learners should be encouraged to design charts, posters and structure diagrams to demonstrate a greater understanding of the unit and the topics to be covered.
Ways of ensuring content is delivered in line with current, up-to-date industry practice:	It is important that the subject content covered is relative to the automotive industry, this means that product knowledge, practical skills and testing methods taught are what is required by the industry currently. This means that the unit will always be relative to the industry that it relates to, also that local industry employers should be engaged and consulted as to how this unit will be delivered.
EDI or accessibility considerations:	Centres must deliver the unit in line with their EDI policy and organisational procedures. Consideration needs to be given to neurodiverse learners, as they may have difficulty with customer interactions.
Digital initiative considerations:	Role playing exercises could be recorded, and played back to improve learning.
Sustainability considerations:	Not applicable in this unit.
Books:	• *How To Talk To Customers*, Callum Dunne, Independently published, 2023 • *Perfect Phrases For Customer Service*, Robert Bacal, McGraw Hill, 2011
Websites:	• Succeeding in Sales: 12 Habits of a Good Salesperson | Indeed.com • 11 Ways to Deliver Excellent Customer Service | Indeed.com

Transferrable employability skills

Communication in the workplace	LO and Topic
Selects appropriate formats for written communication for different purposes and audiences, in line with workplace conventions or procedures, where appropriate **(CSW1)**	LO1: 1.1 LO2: 2.1, 2.2, 2.3
Produces documents of different types that are appropriate (eg, in terms of length, style and language use) for the purpose and intended audience **(CSW2)**	LO1: 1.1 LO2: 2.1, 2.2, 2.3
Accurately and appropriately uses terminology associated with a particular workplace or sector in written communication **(CSW5)**	LO1: 1.1 LO2: 2.1, 2.2, 2.3
Communicates clearly in different situations, adjusting register and tone to match the audience and purpose of the communication **(CSW6)**	LO2: 2.1, 2.2, 2.3
Engages in discussion with colleagues, making relevant points and actively listening to the ideas of others **(CSW8)**	LO1: 1.1
Responds appropriately to queries, requests and/or complaints seeking resolutions where possible **(CSW9)**	LO2: 2.1, 2.2, 2.3 LO3: 3.1
Accurately and appropriately uses terminology associated with a particular workplace or sector when communicating orally **(CSW10)**	LO1: 1.1 LO2: 2.1, 2.2, 2.3
Workplace conduct	
Identifies and follows codes of conduct (eg, for personal presentation, timekeeping) as appropriate to own role **(CW1)**	LO1: 1.1 LO2: 2.1, 2.2, 2.3
Interacts appropriately with peers, managers and customers **(CW2)**	LO2: 2.1, 2.2, 2.3 LO3: 3.1
Outlines aspects of own conduct that need improvement, making suggestions for how to develop in these areas **(CW6)**	LO1: 1.1
Problem solving	
Gathers appropriate information or advice from different sources to help solve a specific work-related problem **(PSW1)**	LO1: 1.1 LO3: 3.1
Assesses a range of potential solutions, applying appropriate problem-solving strategies **(PSW2)**	LO1: 1.1 LO3: 3.1
Selects a specific solution, justifying why this one is the most likely to prove effective **(PSW3)**	LO1: 1.1 LO3: 3.1
Time management skills	
Plans work: • according to priority • taking into account length of time needed to complete tasks • in order to meet deadlines • including appropriate breaks **(TMS1)**	LO2: 2.1, 2.2, 2.3
Identifies areas for improvement **(TMS5)**	LO1: 1.1

Unit 003 Stock control procedures

Unit level:	2
Guided learning hours (GLH):	20
Unit aim:	This unit will enable learners to develop knowledge on the requirements and process for all aspects of stock control and the procedures and structures, the relevant organisational requirements, including health and safety considerations.
Assessment method:	MCQ exam
Links to Occupational Standard:	ST0499

Learning outcomes

1. Know how to carry out the process for ordering stock.
2. Know how to carry out the different procedures relating to stock control.

Learning outcome 1

Know how to carry out the process for ordering stock.

Topics	Content elements
1.1 Ordering stock	1.1.1 The considerations and requirements for ordering stock: a) stock items b) non-stock items c) vehicle off the road (VOR) d) part numbers e) authorisation for expensive items f) discounts g) promotions h) backorder i) timescales j) ways of ordering stock i. face to face ii. supplier websites iii. e-commerce websites k) stock control software. 1.1.2 The reasons for maintaining stock levels: a) efficiency b) cost effectiveness c) customer satisfaction.

Learning outcome 2

Know how to carry out the different procedures relating to stock control.

Topics	Content elements
2.1 Health and safety considerations for stock control	2.1.1 Health and safety considerations for managing the receipt of stock: a) use of personal protective equipment (PPE) b) manual handling c) risk assessments d) storage of explosives – air bags.
2.2 The process for receiving stock	2.2.1 The steps in the process for receiving and placing stock into storage: a) delivery documentation, paper/email/web based b) inaccuracies in order c) check for damage d) storage space. 2.2.2 Stock procedures: a) timescales b) returns policy c) storage i. bins ii. racks iii. lockable cabinet iv. weight v. height vi. hazardous materials/chemicals.
2.3 The process for stock rotation	2.3.1 The principles of stock rotation: a) expiration dates b) efficient placement c) storage space d) first in first out (FIFO) e) first expire first out (FEFO) f) return of stock g) promotions/offers. 2.3.2 Sources of information used for stock rotation: a) stock lists b) vehicle manufacturer c) databases.

Unit guidance for delivery

Opportunities for efficiencies in delivery across/between units:	001 Health and safety and sustainability in the automotive environment 002 Customer service, sales principles, communication
Suggestions for formative assessment opportunities, both for knowledge and practical outcomes:	Even though the majority of the content will be delivered in a classroom environment, it is important that learners can relate this knowledge and understanding to actual stock control and stock control procedures.
Opportunities for visits/engagement with local industry and employers:	Employer engagement is recommended in order to maximise the value of learners' experience. A partnership approach should be adopted where possible with employers.
Considerations for innovative methods of delivery:	Learners must be encouraged to develop an independent learning approach to their studies, this means that they should be encouraged to use various means of learning resources. Learners should be challenged to explore ideas. This unit should be delivered to learners through practical experience and theoretical researching, therefore developing the independent learning ability of learners. Learners should be encouraged to design charts, posters and structure diagrams to demonstrate a greater understanding of the unit and understanding of the topics to be covered. Including role playing in stock control situations.
Ways of ensuring content is delivered in line with current, up-to-date industry practice:	It is important that the subject content covered is relative to the automotive industry; this means that product knowledge, practical skills and testing methods taught are what is required by the industry currently. That way the unit will always be relative to the motor vehicle industry. Local industry employers should be engaged and consulted as to how this unit will be delivered.
EDI or accessibility considerations:	Centres must deliver the unit in line with their EDI policy and organisational procedures. Consideration needs to be given to neurodiverse learners, as they may have difficulty with customer interactions.
Digital initiative considerations:	Role playing exercises in stock control could be recorded and played back to improve learning.
Sustainability considerations:	Not applicable to this unit.
Books:	N/A
Websites:	• Stock control - Supply chain - Eduqas - GCSE Business Revision - Eduqas - BBC Bitesize • What Is Stock Control & How Do You Improve It? (unleashedsoftware.com)

Transferrable employability skills

Problem solving	**LO and Topic**
Gathers appropriate information or advice from different sources to help solve a specific work-related problem **(PSW1)**	LO2: 2.3
Time management skills	
Plans work: • according to priority • taking into account length of time needed to complete tasks • in order to meet deadlines • including appropriate breaks **(TMS1)**	LO2: 2.3

Unit 004 Light vehicle chassis systems

Unit level:	2
Guided learning hours (GLH):	90
Unit aim:	The purpose of this unit is for learners to understand and develop both knowledge and skills used in the automotive industry. Learners will develop the skills and understanding needed to use tools and equipment to remove and replace a range of chassis components in steering, suspension, braking, wheels and tyres and assessing their serviceability. Learners will also develop the understanding of any health and safety considerations when using equipment during these vehicle operations. Learners will also have the opportunity to understand the practical application of these systems and units and be able to identify the various different types fitted to light vehicles.
Assessment method:	MCQ exam Practical assignment
Links to Occupational Standard:	ST0499

Learning outcomes

1. Understand the construction and operation of steering, suspension, braking systems and tyres.
2. Check, replace and test chassis units and components.

Learning outcome 1

Understand the construction and operation of steering, suspension, braking systems and tyres.

Topics	Content elements
1.1 Steering system components and assemblies	1.1.1 Steering system layout, components and terminology: a) the construction and operation of power steering systems i. electric power steering (EPS) ii. hydraulic power steering iii. electrohydraulic power steering (EHPS) b) steering components i. steering wheel ii. column iii. intermediate shaft iv. universal joint v. pinion vi. rack

Topics	Content elements
	vii. gaiters viii. tie rod ix. track rod end x. electric motor xi. electronic control unit xii. hydraulic pump xiii. warning lights c) relevant terminology: i. castor angle ii. camber angle i. kingpin or swivel pin inclination ii. wheel offset iii. wheel alignment (tracking) (toe in and toe out) iv. toe out on turns v. four-wheel alignment vi. Ackerman principle vii. slip angles viii. self-aligning torque ix. oversteer x. understeer xi. neutral steer xii. hydraulic forces xiii. stress and strain d) considerations when inspecting the serviceability and condition of steering systems: i. tools used ii. health and safety iii. manual steering iv. power assisted steering v. uneven tyre wear vi. steering vibrations vii. wear in linkage viii. damaged linkage ix. incorrect wheel alignment x. incorrect steering geometry.
1.2 Suspension system components and assemblies	1.2.1 Suspension system layout, components and terminology: a) the layout of suspension systems i. non-independent suspensions ii. independent front suspension (IFS) iii. independent rear suspension (IRS) iv. hydraulic v. pneumatic vi. rigid axle types b) the components of suspension systems

Topics	Content elements
	i. leaf and coil springs ii. torsion bar iii. MacPherson strut system iv. hydraulic v. pneumatic vi. hydraulic dampers vii. trailing arms viii. wish bones ix. ball joints x. track control arms xi. bump stops xii. anti-roll bars xiii. stabiliser bars xiv. swinging arms xv. parallel link xvi. transverse link xvii. semi-swinging arms xviii. electronic suspension systems. c) suspension terminology i. rebound ii. bump iii. float iv. dive v. pitch vi. roll vii. compliance d) considerations when inspecting the serviceability and condition of suspension systems i. tools used ii. health and safety iii. ride height (unequal and low) iv. noises under operation v. fluid leakage vi. excessive tyre wear vii. bounce viii. poor vehicle handling ix. worn dampers and joints x. damaged linkages.
1.3 Braking system components and assemblies	1.3.1 Braking system layout, components and relevant terminology: a) the construction and operation of drum brakes i. leading and trailing shoe construction ii. self-servo action iii. automatic adjusters iv. backing plates

Topics	Content elements
	v. parking brake system b) the construction and operation of disc brakes i. disc pads ii. calliper iii. brake disc iv. ventilated disc v. disc pad retraction vi. parking brake system vii. electrical and electronic components viii. wear indicators and warning lamps c) the construction and operation of the hydraulic braking system i. dual line layout ii. master cylinder iii. wheel cylinders iv. disc brake calliper and pistons v. brake pipe vi. brake servo vii. warning lights viii. parking brakes d) the requirements and hazards of brake fluid i. properties ii. boiling point iii. freezing point iv. non-corrosive v. free flowing vi. hygroscopic action vii. air ingress viii. brake fluid testing ix. manufacturer's change periods x. fluid classification and rating xi. potential to damage paint surfaces e) relevant terminology i. braking efficiency ii. brake drag iii. brake grab iv. brake fade v. brake imbalance vi. laws of friction f) the principles of electronic anti-lock braking systems (ABS) i. operation ii. sensors

Topics	Content elements
	iii. reluctor ring iv. modulator v. electronic control unit (ECU) g) considerations when inspecting the serviceability and condition of braking systems i. tools used ii. health and safety iii. worn shoes or pads iv. worn or scored brake surfaces v. abnormal brake noises vi. brake judder vii. fluid contamination of brake surfaces viii. fluid leaks ix. pulling to one side x. poor braking efficiency xi. lack of servo assistance xii. brake drag xiii. brake grab xiv. brake fade.
1.4 Wheel and tyre components and assemblies	1.4.1 Wheels and tyres and terminology: a) the construction of different types of tyres i. radial ii. tread patterns iii. tyre applications • symmetrical • asymmetrical • directional • unidirectional • run flat • ultra low profile • tyre pressure monitoring systems (TPMS) • space saver • homologated b) tyre and wheel markings i. wheel dimensions ii. speed rating iii. direction of rotation iv. date of manufacture v. profile vi. load rating vii. ply rating viii. tread-wear indicators c) EU tyre labelling i. noise level

Topics	Content elements
	ii. fuel efficiency iii. wet weather performance d) wheel construction i. light alloy ii. pressed steel iii. well based wheel rims e) types of bearing used for wheel bearing arrangements i. roller ii. taper roller iii. needle iv. ball and plain f) relevant terminology i. friction ii. un-sprung weight iii. dynamic and static balance g) considerations when undertaking a tyre replacement and repair i. health and safety ii. tyre replacement and repair equipment • tyre machine • wheel balancer • tyre bath • drills • reamers • glues • plugs h) the defects associated with tyres and wheels i. abnormal tyre wear ii. cuts iii. puncture and puncture repair iv. side wall damage v. wheel vibrations vi. tyre noise (squeal during cornering) vii. tyre overheating (low pressure) viii. tread separation ix. tyre pressure monitoring systems (TPMS) including valves.

Learning outcome 2

Check, replace and test chassis units and components.

Topics	Content elements
2.1 Follow safe working methods when working on chassis units and components	2.1.1 Work safely on chassis units and components: a) use suitable personal and vehicle protective equipment throughout all activities b) minimise the risk of damage to the vehicle and its systems c) minimise the risk of damage to the surrounding area d) avoid injury to self and others e) avoid contact with hazardous substances f) prepare the vehicle systems and work area for safe working procedures, as appropriate to the vehicle.
2.2 Select, prepare and check the appropriate tools and equipment for removal and replacement of chassis systems	2.2.1 Select, prepare and check the appropriate tools and equipment: a) tools i. hand ii. pneumatic iii. electrical • corded • cordless b) equipment i. specialist ii. manufacturer specific. 2.2.2 Chassis systems: a) systems i. steering ii. suspension iii. braking iv. wheels and tyres. 2.2.3 Tools and equipment calibrated to meet manufacturer and legal requirements. 2.2.4 Tools and equipment used in line with manufacturer recommendations.
2.3 Remove and replace chassis units and components	2.3.1 The reasons why replacement components and units must meet the original specifications, including original equipment manufacturer (OEM): a) warranty requirements b) manufacturer recall c) maintain performance d) safety requirements. 2.3.2 Inspect and test chassis units and components to ensure compliance with: a) manufacturer's performance requirements b) legal requirements.

Topics	Content elements
	2.3.3 Remove and replace chassis units and components, adhering to: a) the correct specifications and tolerances b) the manufacturer's approved removal and replacement methods c) recognised researched repair methods d) health and safety and environmental requirements. 2.3.4 Ensure that replacement chassis units and components conform to: a) the vehicle operating specification b) legal requirements. 2.3.5 Use suitable testing methods to evaluate the performance of the reassembled system: a) aural b) visual c) functional. 2.3.6 Complete system diagnostic checks: a) fault codes b) data. 2.3.7 Recalibrate the units and components. 2.3.8 Work in a logical and systematic way.
2.4 Remove, repair and replace wheels and tyres	2.4.1 Remove and inspect tyres for: a) condition b) wear c) damage d) compliance with legal requirements e) compliance with manufacturer requirements. 2.4.2 Repair tyres adhering to legal requirements, using appropriate tools: a) tools i. drills ii. reamers iii. valves iv. glues v. plugs vi. rollers. 2.4.3 Replace tyres adhering to manufacturer and legal requirements: a) manufacturer requirements

Topics	Content elements
	i. inside ii. outside iii. directional iv. construction b) legal requirements i. speed rating ii. load rating iii. date of manufacture. 2.4.4 Carry out wheel balancing activity, using appropriate equipment: a) equipment i. wheel balancer ii. wheel weights, appropriate to wheel type iii. hand tools.
2.5 Record information and make suitable recommendations	2.5.1 Ensure records are completed accurately and passed to the relevant person(s): a) accurately i. spelling ii. grammar iii. calculations iv. vehicle details v. parts used vi. repair time vii. labour cost. 2.5.2 Make suitable and justifiable recommendations for cost effective repairs. 2.5.3 Communicate any expected delays to the relevant person(s): a) relevant person(s) i. customer ii. supervisor iii. manager iv. service advisor. 2.5.4 Record and report any additional faults found.
2.6 Carry out vehicle handover	2.6.1 Vehicle handover requirements: a) cleanliness of vehicle interior and exterior b) removal of vehicle protective equipment c) explanation to customer of all work completed.

Unit guidance for delivery

Opportunities for efficiencies in delivery across/between units:	001 Health and safety and sustainability in the automotive environment 002 Customer service, sales principles, communication 005 Service, maintenance and inspection
Suggestions for formative assessment opportunities, both for knowledge and practical outcomes:	Some formative assessments may be carried out in a classroom, environment, these could be multiple choice questions identifying components. It is important that learners can relate this knowledge and understanding to actual workshop situations, practical tasks and assessments.
Opportunities for visits/engagement with local industry and employers:	It is recommended that assessors develop a method of maintaining contact with a range of employers in the sector as they may be able to help with keeping the examples of legislation, policies and codes of practice used in the taught content, up to date.
Considerations for innovative methods of delivery:	It is expected that a range of delivery methods will be used including presentations, internet research and, where applicable, visiting speakers.
Ways of ensuring content is delivered in line with current, up-to-date industry practice:	It is important that the subject content covered is relative to the automotive industry, this means that product knowledge, practical skills and testing methods taught are what is required by the industry currently. This means that the unit will always be relative to the industry that it relates to, also that local industry employers should be engaged and consulted as to how this unit will be delivered.
EDI or accessibility considerations:	Centres must deliver the unit in line with their EDI policy and organisational procedures.
Digital initiative considerations:	Access to electronic technical information. Websites.
Sustainability considerations:	Considerations should be given to disposal of components and waste products. Use of solvents (brake cleaner)
Books:	• *STOP! And Learn About Brakes*, David Hobson, Independently published, 2022 • *Hillier's Fundamentals Of Motor Vehicle Technology Book 1*, VAW Hillier and Peter Coombes, Nelson Thornes, 2004 • *Automotive Technician Training: Theory*, Tom Denton and Hayley Pells, Routledge, 2021

Websites:	• How To Repair Brakes By Yourself? Step-By-Step Guide (brakeshub.com) • Puncture & Car Tyre Repair - What You Need To Know | Kwik Fit (kwik-fit.com) • How to replace front suspension and ball joints | Auto Express • Types of Suspension System (Explained in Detail) with PDF (theengineerspost.com) • Every Types of Brakes and Braking Systems Explained [PDF] (theengineerspost.com) • What is Power Steering System? Types, Working with (PDF) (theengineerspost.com)

Transferrable employability skills

Communication in the workplace	LO and Topic
Produces documents of different types that are appropriate (eg, in terms of length, style and language use) for the purpose and intended audience **(CSW2)**	LO2: 2.5, 2.6
Accurately and appropriately uses terminology associated with a particular workplace or sector in written communication **(CSW5)**	LO2: 2.5, 2.6
Responds appropriately to queries, requests and/or complaints seeking resolutions where possible **(CSW9)**	LO2: 2.5, 2.6
Accurately and appropriately uses terminology associated with a particular workplace or sector when communicating orally **(CSW10)**	LO2: 2.5, 2.6
Workplace conduct	
Identifies and follows codes of conduct (eg, for personal presentation, timekeeping) as appropriate to own role **(CW1)**	LO2: 2.5, 2.6
Interacts appropriately with peers, managers and customers **(CW2)**	LO2: 2.5, 2.6
Applies sufficient effort to enable them to complete tasks set to the standard required **(CW3)**	LO2: 2.2, 2.3, 2.4, 2.5, 2.6
Problem solving	
Gathers appropriate information or advice from different sources to help solve a specific work-related problem **(PSW1)**	LO2: 2.1, 2.2, 2.3, 2.4
Assesses a range of potential solutions, applying appropriate problem-solving strategies **(PSW2)**	LO2: 2.1, 2.2, 2.3, 2.4
Time management skills	
Plans work: • according to priority • taking into account length of time needed to complete tasks • in order to meet deadlines • including appropriate breaks **(TMS1)**	LO2: 2.2
Works at an appropriate pace to carry out tasks in accordance with plan **(TMS2)**	LO2: 2.2, 2.3, 2.4
Adjusts approach in response to any change of circumstance (eg, one task over running), as appropriate, to ensure remaining time is spent effectively **(TMS3)**	LO2: 2.2, 2.3, 2.4

Unit 005 Service, maintenance and inspection

Unit level:	2
Guided learning hours (GLH):	60
Unit aim:	Learners will develop the skills and understanding needed to use tools and equipment and to remove and replace service components to carry out a range of services and inspections on light vehicles using a variety of prescribed testing and inspection methods including a video health check (VHC). Learners will also develop the understanding of any health and safety considerations when using equipment during these vehicle operations.
Assessment method:	Practical assignment
Links to Occupational Standard:	ST0499

Learning outcomes

1. Work safely when carrying out service, maintenance and inspection activities.
2. Complete light vehicle inspections following manufacturers' and organisational procedures.
3. Carry out routine maintenance, including adjustment and replacement activities.

Learning outcome 1

Work safely when carrying out service, maintenance and inspection activities.

Topics	Content elements
1.1 Use appropriate safety equipment when carrying out service, maintenance and inspection activities	1.1.1 Safety equipment and considerations: a) personal protective equipment (PPE) b) vehicle protective equipment (VPE) c) select correct tools and equipment.
1.2 Follow safe working methods when working on vehicle units and components	1.2.1 Safe methods to prepare the vehicle systems and work area for safe working procedures: a) safety precautions i. avoid injury to self/others ii. avoid damage to vehicle systems iii. avoid contact with hazardous substances iv. waste disposal (including environmental impact).

Learning outcome 2

Complete light vehicle inspections following manufacturers' and organisational procedures.

Topics	Content elements
2.1 Carry out different types of service and inspections	2.1.1 The different inspection and testing types: a) pre-work b) post-work c) pre-delivery d) used car checks e) maintenance i. full service ii. interim service f) safety inspection g) seasonal checks. 2.1.2 Legal and manufacturer requirements: a) legal i. MOT (DVSA) b) manufacturer i. service schedules ii. warranty iii. recall.
2.2 Carry out scheduled maintenance activities	2.2.1 Considerations when inspecting the serviceability and condition of different vehicle systems: a) damage b) corrosion c) fluid levels d) leaks e) wear f) security g) serviceability. 2.2.2 Methods to check for conformity: a) aural b) visual c) functional.
2.3 Identify the different vehicle systems relevant to service and inspection	2.3.1 Inspection of different vehicle systems: a) mechanical systems: i. engine ii. chassis iii. wheels and tyres iv. transmission and driveline v. electrical and electronic b) body: i. exterior vehicle body ii. vehicle interior iii. electronic

	• on board vehicle display • advanced driver assistance systems.
2.4 Use appropriate sources of technical information	2.4.1 Use the correct sources of technical information: a) technical information i. vehicle specification data ii. manufacturer's warranty iii. manufacturer's recommendations iv. inspection records v. job cards vi. identification codes • registration number • vehicle identification number (VIN) • engine number vii. vehicle repair records viii. vehicle service history • manual • electronic.

Learning outcome 3

Carry out routine maintenance, including adjustment and replacement activities.

Topics	Content elements
3.1 Select, prepare and use the appropriate tools and equipment required	3.1.1 Select, prepare and check appropriate tools and equipment: a) tools and equipment i. hand tools ii. specialist tools iii. manufacturer tools iv. hydraulic tools v. pneumatic tools vi. corded tools vii. cordless tools. 3.1.2 Ensure that equipment has been calibrated to meet manufacturer and legal requirements. 3.1.3 Use the correct tools and equipment in line with manufacturers' instructions.
3.2 Carry out light vehicle maintenance using prescribed methods, adhering to the correct specifications and tolerances for the vehicle	3.2.1 Inspect and test units and systems to ensure compliance with manufacturer's, legal and performance requirements: a) manufacturer's approved inspection methods b) manufacturer's maintenance recognised repair methods c) health and safety requirements d) environmental requirements i. economical use of resources • brake cleaners • lubricants

Topics	Content elements
	• consumables ii. disposal of waste • fluids • metals • cardboard • plastics • filters • batteries e) working methods and procedures i. manufacturer's procedures ii. manufacturer's warranty requirements iii. organisational procedures. 3.2.2 Inspect the condition and serviceability of the following: a) engine b) chassis c) transmission d) electrical. 3.2.3 Check, replenish and replace fluid levels, including identification of the recommended grade: a) fluids i. oil ii. coolant iii. washer fluid iv. hydraulic fluids v. exhaust emissions treatment b) considerations i. cleanliness ii. accuracy iii. efficiency iv. consequences of using incorrect lubricants and fluids • premature wear • component failure • safety • cost implications • customer dissatisfaction. 3.2.4 Adjustments that need to be carried out: a) clearances b) settings c) alignment d) pressures e) tensions. 3.2.5 Check electrical and electronic systems:

Topics	Content elements
	a) operation b) security c) system scan d) software updates.
3.3 Produce a vehicle health check (VHC) recording as part of the inspection procedure	3.3.1 Considerations when preparing to record a VHC: a) appropriate surroundings b) preparation of equipment c) preparation of the vehicle d) personal presentation e) sufficient lighting f) private data protection g) suitable recording equipment. 3.3.2 Record a VHC: a) personal introduction b) vehicle identification c) language used i. avoiding technical jargon ii. professional conduct d) logical sequence. 3.3.3 Outcomes and recommendations following the VHC: a) sharing the VHC with the customer i. following organisational procedures ii. upload on designated platform b) contact the customer to discuss recommendations i. immediate repair needs ii. future recommendations iii. upselling iv. agree timescales v. time taken, cost implications and productivity vi. report anticipated delays to colleagues and customers promptly.
3.4 Ensure compliance when completing vehicle documentation and records	3.4.1 Record and complete inspection and test results: a) following inspection checklists b) checking conformity to manufacturer's specifications c) any adjustments and calibrations d) UK and European legal requirements. 3.4.2 Complete all relevant documentation accurately: a) documentation: i. inspection records ii. job cards iii. update repair records iv. update service history • manual

Topics	Content elements
	• electronic.
3.5 Ensure customer satisfaction	3.5.1 Inspect and reinstate the vehicle following repair: a) post-repair requirements i. cleanliness of vehicle interior and exterior ii. security of components and fittings iii. reinstatement of components and fittings iv. testing and programming components for correct operation (as necessary) v. checking operational performance vi. clearing of any fault codes and warning lights vii. documentation completed prior to handover to customer • electronic • written viii. explanation to customer of work completed (if applicable) ix. professional presentation of vehicle x. customer perceptions.

Unit guidance for delivery

Opportunities for efficiencies in delivery across/between units:	001 Health and safety and sustainability in the automotive environment 004 Light vehicle chassis systems 006 Vehicle propulsion, internal combustion engine 007 Vehicle propulsion, alternative fuel systems 008 Electrical systems and components
Suggestions for formative assessment opportunities, both for knowledge and practical outcomes:	Some formative assessments may be carried out in a classroom, environment, these could be multiple choice questions identifying components. It is important that learners can relate this knowledge and understanding to actual workshop situations, practical tasks and assessments.
Opportunities for visits/engagement with local industry and employers:	It is recommended that centres develop a method of maintaining contact with a range of employers in the sector as they may be able to help with keeping the examples of legislation, policies and codes of practice used in the taught content, up to date.
Considerations for innovative methods of delivery:	It is expected that a range of delivery methods will be used including presentations, internet research and, where applicable, visiting speakers.
Ways of ensuring content is delivered in line with current, up-to-date industry practice:	It is important that the subject content covered is relative to the automotive industry, this means that product knowledge, practical skills and testing methods taught are what is required by the industry currently. This means that the unit will always be relative to the industry that it relates to, also that local industry employers should be engaged and consulted as to how this unit will be delivered.
EDI or accessibility considerations:	Centres must deliver the unit in line with their EDI policy and organisational procedures.
Digital initiative considerations:	Access to electronic technical information. Websites. Recording of VHC.
Sustainability considerations:	Waste disposal. Disposal and storage of oil and fluids. Environmental policy.
Books:	• *Caring for your car: How to maintain & service your car (RAC Handbook)*, Trevor Fry, Veloce, 2011
Websites:	• MOT inspection manual: cars and passenger vehicles - Guidance - GOV.UK (www.gov.uk) • Car Service | What's included and what's the cost? | The AA • How to service your car: car servicing checklist | RAC Drive

Transferrable employability skills

Communication in the workplace	LO and Topic
Produces documents of different types that are appropriate (eg, in terms of length, style and language use) for the purpose and intended audience **(CSW2)**	LO3: 3.4, 3.5
Accurately and appropriately uses terminology associated with a particular workplace or sector in written communication **(CSW5)**	LO3: 3.4, 3.5
Responds appropriately to queries, requests and/or complaints seeking resolutions where possible **(CSW9)**	LO3: 3.5
Accurately and appropriately uses terminology associated with a particular workplace or sector when communicating orally **(CSW10)**	LO3: 3.4, 3.5
Workplace conduct	
Identifies and follows codes of conduct (eg, for personal presentation, timekeeping) as appropriate to own role **(CW1)**	LO3: 3.3, 3.5
Interacts appropriately with peers, managers and customers **(CW2)**	LO3: 3.3, 3.5
Applies sufficient effort to enable them to complete tasks set to the standard required **(CW3)**	LO2: 2.1, 2.2, 2.3, 2.4 LO3: 3.1, 3.2, 3.3, 3.4
Problem solving	
Gathers appropriate information or advice from different sources to help solve a specific work-related problem **(PSW1)**	LO2: 2.4
Assesses a range of potential solutions, applying appropriate problem-solving strategies **(PSW2)**	LO2: 2.1, 2.2
Time management skills	
Plans work: • according to priority • taking into account length of time needed to complete tasks • in order to meet deadlines • including appropriate breaks **(TMS1)**	LO2: 2.1, 2.2, 2.3, 2.4 LO3: 3.1, 3.2, 3.3, 3.4
Works at an appropriate pace to carry out tasks in accordance with plan **(TMS2)**	LO2: 2.1, 2.2, 2.3, 2.4 LO3: 3.1, 3.2, 3.3, 3.4
Adjusts approach in response to any change of circumstance (eg, one task over running), as appropriate, to ensure remaining time is spent effectively **(TMS3)**	LO2: 2.1, 2.2, 2.3, 2.4 LO3: 3.1, 3.2, 3.3, 3.4

Unit 006 Vehicle propulsion – internal combustion engine

Unit level:	2
Guided learning hours (GLH):	40
Unit aim:	This unit will enable learners to develop the knowledge on the identification of components in the light vehicle propulsion system, an awareness of vehicle propulsion systems, including internal combustion engines, fuel systems, emission and exhaust systems, lubrication systems, cooling systems air conditioning and transmission systems and considerations when removing and replacing components including legal.
Assessment method:	MCQ exam Practical assignment
Links to Occupational Standard:	ST0499

Learning outcomes

1. Know engine and fuel system components.
2. Carry out removal, inspection and replacement of vehicle emission control and exhaust systems.
3. Know the operation and maintenance of lubrication and cooling systems and components.

Learning outcome 1

Know engine and fuel system components.

Topics	Content elements
1.1 Engine components	1.1.1 Identification of petrol and diesel engine components: a) cylinder head b) cylinder block c) crankshaft d) pistons e) camshaft f) valves g) timing belt h) spark plugs i) glow plugs j) turbocharger k) supercharger l) auxiliary drive belts m) engine sensors.

Topics	Content elements
1.2 Fuel system components	1.2.1 Awareness of components and terms of fuel systems: a) fuel injectors b) fuel pump c) fuel pump relay d) throttle control e) fuel filters f) electronic control units (ECU).
1.3 Considerations when removing and replacing fuel system components	1.3.1 Considerations when removing and replacing fuel system components: a) tools used b) health and safety c) removal and replacement of fuel filters i. petrol ii. diesel iii. bleeding process.
1.4 Transmission and clutch components	1.4.1 Identification of transmission types: a) manual b) automatic c) constantly variable d) dual clutch e) single speed gear reduction. 1.4.2 Identification of clutch components: a) pressure plate b) friction plate c) dual mass d) release mechanisms i. hydraulic • primary cylinder • secondary cylinder ii. cable • manual adjustment • self-adjusting e) drive shafts f) propeller shaft. 1.4.3 Identification of final drive. 1.4.4 Awareness of transmission faults: a) clutch drag b) clutch judder c) clutch slip.

Learning outcome 2

Carry out removal, inspection and replacement of vehicle emission control and exhaust systems.

Topics	Content elements
2.1 Emission control and exhaust systems	2.1.1 Identification and basic operation of emission control and exhaust components: a) exhaust manifold b) silencers c) positive crankcase ventilation (PCV) valve d) lambda sensors e) pressure sensors. 2.1.2 Identification and basic operation of exhaust emission control systems: a) exhaust emission treatments b) exhaust gas recirculation (EGR) systems c) catalytic convertors d) diesel particulate filters. 2.1.3 Identification of exhaust gas contents: a) water vapour (H_2O) b) nitrogen (N) c) carbon monoxide (CO) d) carbon dioxide (CO_2) e) carbon (C) f) hydrocarbon (HC) g) oxides of nitrogen (NO_x, NO_2, NO) h) particulates.
2.2 Considerations when inspecting and repairing emission control and exhaust systems	2.2.1 Considerations when inspecting and repairing emission control and exhaust systems: a) health and safety i. leaking gases ii. burns from hot components iii. rotating components iv. engine running in confined spaces b) measuring exhaust emissions i. petrol ii. diesel c) legal considerations for exhaust modification i. effects on warranty ii. noise level iii. system security iv. MOT requirements.
2.3 Remove and replace emission control and exhaust systems	2.3.1 Remove exhaust emission control systems: a) exhaust emission treatments b) exhaust gas recirculation (EGR) systems c) catalytic convertors

Topics	Content elements
	d) diesel particulate filters e) silencers f) exhaust pipes. 2.3.2 Inspect exhaust emission control systems for: a) condition b) damage. 2.3.3 Replace exhaust emission control systems, following manufacturers' specifications: a) considerations when replacing exhaust emission control systems i. alignment (contact with body parts) ii. leakage (gases) iii. condition of components • gaskets • seals • Mountings.

Learning outcome 3

Know the operation and maintenance of lubrication and cooling systems and components.

Topics	Content elements
3.1 Lubrication systems and components	3.1.1 Lubrication system component layout and terminology: a) component layout i. engine sump ii. oil pump iii. oil cooler iv. oil galleries v. oil filter vi. oil pressure relief valve vii. oil pressure switch viii. gaskets ix. seals b) the meaning of lubrication terminology i. oil viscosity ii. multigrade iii. semi and fully synthetic iv. emulsification v. additives.
3.2 Cooling systems and components	3.2.1 Cooling system component layout: a) radiator b) hoses c) expansion bottle d) coolant

Topics	Content elements
	e) thermostat i. conventional ii. electric f) water pump i. conventional ii. electric g) heater matrix h) heater motor and pollen filter i) radiator cooling fan.
3.3 Air conditioning systems	3.3.1 Basic operating principles of air conditioning systems: a) heat transfer i. conduction ii. convection iii. radiation b) refrigeration cycle i. compression ii. condensation iii. evaporation iv. refrigerant state • saturated vapour • superheated vapour • subcooled liquid. 3.3.2 Purpose of air conditioning components: a) compressor b) condenser c) receiver dryer d) thermal expansion valve e) evaporator f) fixed orifice tube g) suction accumulator. 3.3.3 Types of refrigerants and associated environmental issues: a) types of refrigerants i. R134A ii. R1234yf iii. ozone layer b) environmental issues i. greenhouse effect ii. global warming potential iii. climate change.

Unit guidance for delivery

Opportunities for efficiencies in delivery across/between units:	005 Service, maintenance and inspection 007 Vehicle propulsion, alternative fuel systems
Suggestions for formative assessment opportunities, both for knowledge and practical outcomes:	Some formative assessments may be carried out in a classroom, environment, these could be multiple choice questions identifying components. It is important that learners can relate this knowledge and understanding to actual workshop situations, practical tasks and assessments.
Opportunities for visits/engagement with local industry and employers:	It is recommended that centres develop a method of maintaining contact with a range of employers in the sector as they may be able to help with keeping the examples of legislation, policies and codes of practice used in the taught content, up to date.
Considerations for innovative methods of delivery:	It is expected that a range of delivery methods will be used including presentations, internet research and, where applicable, visiting speakers.
Ways of ensuring content is delivered in line with current, up-to-date industry practice:	It is important that the subject content covered is relative to the automotive industry, this means that product knowledge, practical skills and testing methods taught are what is required by the industry currently. This means that the unit will always be relative to the industry that it relates to, also that local industry employers should be engaged and consulted as to how this unit will be delivered.
EDI or accessibility considerations:	Centres must deliver the unit in line with their EDI policy and organisational procedures.
Digital initiative considerations:	Access to electronic technical information. Websites.
Sustainability considerations:	Waste disposal of cloths and rags. Environmental policy.
Books:	• *Hillier's Fundamentals Of Motor Vehicle Technology Book 1*, VAW Hillier and Peter Coombes, Nelson Thornes, 2004 • *OBD-II & Electronic Engine Management Systems 1996+ Haynes Techbook*, John Haynes, 2006
Websites:	• A Beginner's Guide to NO_x, NO and NO_2 as Air Pollutants (aeroqual.com) • Internal Combustion Engine Basics | Department of Energy • 30 Basic Parts of The Car Engine With Diagram (engineeringchoice.com) • Getting to Know Your Engine Management System (delphiautoparts.com) • How A Clutch Works | Functions | M & T Transmissions (mandttransmissions.co.uk) • How a car clutch works | How a Car Works

Transferrable employability skills

Workplace conduct	LO and Topic
Applies sufficient effort to enable them to complete tasks set to the standard required **(CW3)**	LO2: 2.3
Problem solving	
Gathers appropriate information or advice from different sources to help solve a specific work-related problem **(PSW1)**	LO2: 2.3
Assesses a range of potential solutions, applying appropriate problem-solving strategies **(PSW2)**	LO2: 2.3
Time management skills	
Plans work: • according to priority • taking into account length of time needed to complete tasks • in order to meet deadlines • including appropriate breaks **(TMS1)**	LO2: 2.3
Works at an appropriate pace to carry out tasks in accordance with plan **(TMS2)**	LO2: 2.3
Adjusts approach in response to any change of circumstance (eg, one task over running), as appropriate, to ensure remaining time is spent effectively **(TMS3)**	LO2: 2.3

Unit 007 Vehicle propulsion – alternative fuel systems

Unit level:	2
Guided learning hours (GLH):	20
Unit aim:	This unit enables the learner to develop knowledge to recognise alternative propulsion systems and their components, including electric, gas and hydrogen light vehicles. The learner will also be able to know the applicable legislation and understand the hazards associated with working around alternatively fuelled propulsion systems and safe working practices.
Assessment method:	MCQ exam
Links to Occupational Standard:	ST0499

Learning outcomes

1. Understand the functional differences between electric and non-electric vehicles.
2. Understand the importance of working safely around alternatively fuelled vehicles.

Learning outcome 1

Understand the functional differences between electric and non-electric vehicles.

Topics	Content elements
1.1 Electric vehicle types and charging systems	1.1.1 Types of electric vehicles: a) pure (PEV)/battery electric vehicle (BEV) b) extended range (ER-EV) c) range extended (RE-EV) d) fuel cell (FCEV) e) hybrid (HEV) f) plug-in hybrid (PHEV). 1.1.2 Charging systems: a) AC charging b) DC charging c) self-charging systems.
1.2 Electric vehicle components	1.1.2 Components: a) high voltage traction batteries b) invertor c) high voltage cables

Topics	Content elements
	d) DC to DC convertor i. low voltage battery ii. high voltage traction battery e) fuel cell f) motor generator units (MGU).

Learning outcome 2

Understand the importance of working safely around alternatively fuelled vehicles.

Topics	Content elements
2.1 Specific safe working considerations when working on alternatively fuelled vehicles	2.1.1 The considerations that contribute to a safe working environment: a) warning signs b) barriers c) awareness of correct jacking points d) key safe. 2.1.2 Awareness of hazards: a) electric shock b) fire/thermal runaway c) flood damaged vehicles d) chemical leakage e) explosion f) gases/fumes g) magnetic fields.
2.2 Alternative fuel types and their hazards	2.2.1 Alternative fuel types and their associated hazards: a) alternative fuel types i. hydrogen ii. liquified petroleum gas (LPG) iii. compressed natural gas (CNG) b) hazards iv. pressures • storage • operation v. fuel leakage vi. combustion/explosion vii. lack of oxygen/hypoxia.

Unit guidance for delivery

Opportunities for efficiencies in delivery across/between units:	001 Health and safety and sustainability in the automotive environment 005 Service, maintenance and inspection 006 Vehicle propulsion, internal combustion engine 008 Electrical systems and components
Suggestions for formative assessment opportunities, both for knowledge and practical outcomes:	It is important that learners have a full understanding of the underpinning knowledge of each of the topics. The practical application of this knowledge and understanding in the working environment is very important. Learners must be able to apply their knowledge and understanding to a range of vehicle types, different types of equipment and working environments.
Opportunities for visits/engagement with local industry and employers:	It is recommended that centres develop a method of maintaining contact with a range of employers in the sector as they may be able to help with keeping the examples of legislation, policies and codes of practice used in the taught content, up to date.
Considerations for innovative methods of delivery:	It is expected that a range of delivery methods will be used including presentations, internet research and, where applicable, visiting speakers.
Ways of ensuring content is delivered in line with current, up-to-date industry practice:	It is important that the subject content covered is relative to the automotive industry, this means that product knowledge, practical skills and testing methods taught are what is required by the industry currently. This means that the unit will always be relative to the industry that it relates to, also that local industry employers should be engaged and consulted as to how this unit will be delivered.
EDI or accessibility considerations:	Centres must deliver the unit in line with their EDI policy and organisational procedures.
Digital initiative considerations:	Access to electronic technical information. Websites.
Sustainability considerations:	Zero emission at the tail pipe. Green energy.
Books:	• *Electric and Hybrid Vehicles*, Tom Denton, Routledge, 2020 • *Electric Vehicle Technologies (Electric Vehicles)*, David J. Bricknell, Independently published, 2020 • *Hydrogen, Batteries and Fuel Cells*, Bengt Sundén, Academic Press, 2019
Websites:	• All you need to know about electric vehicles - Energy Saving Trust • What is an EV (Electric Vehicle)? | McKinsey • Hydrogen Cars | Fuel Cell Electric Vehicles | Toyota UK • Hydrogen cars: are they the future? | RAC Drive • LPG Cars: Ultimate Guide To Liquid Petroleum Gas Cars (2023 Update) | Motorway • Natural gas vehicle - Wikipedia

Unit 008 Electrical systems and components

Unit level:	2
Guided learning hours (GLH):	40
Unit aim:	This unit enables the learner to develop the knowledge and skills on the principles, operation and testing methods of electrical l systems and components, including batteries, starting and charging and lighting circuits. It also enables the learner to develop skills to remove and replace l electrical components, ensuring they conform to manufactures' specifications and legal requirements.
Assessment method:	MCQ exam Practical assignment
Links to Occupational Standard:	ST0499

Learning outcomes

1. Understand the fundamentals of electrical and electronic systems.
2. Know electrical and auxiliary components.
3. Know electrical circuit and component faults and testing equipment.
4. Carry out removal and replacement of electrical components.

Learning outcome 1

Understand the fundamentals of electrical and electronic systems.

Topics	Content elements
1.1 Components in an electrical circuit	1.1.1 Different types of low voltage automotive batteries: a) flooded b) enhanced c) advanced glass mat (AGM) d) lithium ion. 1.1.2 Characteristics of cables, terminals and connectors/connection devices: a) size/cross sectional b) colours c) insulation d) cabling structures e) connector locking devices f) integrity of cables. 1.1.3 Types of switches:

Topics	Content elements
	a) on/off b) relays c) transistors. 1.1.4 The purpose of a current consuming device. 1.1.5 The operation of circuit protection devices: a) fuse b) fusible link c) residual current device (RCD).
1.2 The operation of electrical system components	1.2.1 The operation of low voltage charging and starting systems: a) charging systems i. alternator • conventional charging • smart charging ii. starter/alternator iii. alternator drive system • belts • pulleys • tensioners b) starting systems i. starter motor • pre-engaged • gear reduction • one way clutch ii. starter relay/solenoid iii. ignition/starter switch • key • button.
1.3 Principles of electrical circuits	1.3.1 Electrical units: a) Volt (electrical pressure) b) Ampere (electrical current) c) Ohm (electrical resistance) d) Watt (electrical power). 1.3.2 Types of electrical circuits: a) series b) parallel c) series/parallel. 1.3.3 Principle and application of Ohm's law. 1.3.4 Vehicle earthing systems: a) chassis earth

Topics	Content elements
	b) insulated earth return systems.

Learning outcome 2

Know electrical and auxiliary components.

Topics	Content elements
2.1 Lighting systems	2.1.1 The characteristics and types of lighting components: a) incandescent bulbs i. halogen ii. tungsten b) high intensity discharge (HID) bulbs i. xenon c) light emitting diodes (LED).
2.2 Advanced driver assistance system (ADAS)	2.2.1 The functions and types of ADAS sensors and their locations: a) sensors i. cameras ii. radar iii. sonar iv. light detection and ranging (lidar) v. height sensor vi. ultrasonics b) locations i. windscreen ii. interior mirror iii. exterior mirrors iv. grilles v. bumpers vi. suspension components c) functions i. braking ii. lane assist iii. parking iv. crash avoidance v. blind spot monitoring vi. adaptive cruise control d) calibration i. self-calibration ii. requires calibration.

Learning outcome 3

Know electrical circuit and component faults and testing equipment.

Topics	Content elements
3.1 Basic electrical circuit and component faults	3.1.1 Recognition different types of faults: a) electrical circuit faults i. open circuit ii. short circuit iii. high resistance b) battery faults i. overheating ii. poor starting iii. sulphating iv. failure to hold charge c) charging faults i. overcharging ii. undercharging iii. intermittent d) starting faults i. slow cranking ii. no cranking iii. intermittent cranking.
3.2 Equipment used for checking and testing electrical circuits	3.2.1 The purpose of electrical test equipment: a) multimeter b) voltmeter c) ammeter/amp clamp d) ohmmeter e) fault code reader f) live data.

Learning outcome 4

Carry out removal and replacement of electrical components.

Topics	Content elements
4.1 Follow safe working methods when removing and replacing electrical components	4.1.1 Work safely on electrical systems and components: a) use suitable personal and vehicle protective equipment throughout all activities b) minimise the risk of damage to the vehicle and its systems c) minimise the risk of damage to the surrounding area d) avoid injury to self and others e) avoid contact with hazardous substances f) prepare the vehicle systems and work area for safe working procedures, as appropriate to the vehicle.

Topics	Content elements
4.2 Prepare for the removal and replacement of electrical components	4.2.1 Use technical information for removal and replacement activities: a) vehicle technical data b) removal and replacement procedures c) regulatory requirements i. headlamp alignment/self levelling. 4.2.2 Select, prepare and check tools and equipment following manufacturers' instructions: a) tools i. hand ii. pneumatic iii. electrical • corded • cordless b) equipment i. specialist ii. manufacturer specific. 4.2.3 Tools and equipment calibrated to meet manufacturer and legal requirements. 4.2.4 Tools and equipment used in line with manufacturer recommendations: a) tool manufacturers b) vehicle manufacturers.
4.3 Remove, replace and test electrical components	4.3.1 Remove and replace the vehicle's electrical systems and components adhering to manufacturers' specifications: a) components i. low voltage batteries ii. alternators iii. starters iv. lighting units • side repeaters • headlamps • tail lamps v. ADAS components in: • interior mirrors • exterior mirrors • bumpers • grilles vi. ADAS sensors • parking sensors • cameras • radar units • lidar units

Topics	Content elements
	• sonar units. 4.3.2 Complete the system removal and replacement activities within manufacturers' timescales. 4.3.3 Use suitable testing methods to evaluate the performance of the reassembled system: a) aural b) visual c) functional. 4.3.4 Work in a logical and systematic way.
4.4 Record information and make suitable recommendations	4.4.1 Ensure records are completed accurately and passed to the relevant person(s): a) accurately i. spelling ii. grammar iii. calculations iv. vehicle details v. parts used vi. repair time vii. labour cost. 4.4.2 Make suitable and justifiable recommendations for cost effective repairs. 4.4.3 Record and report any additional faults found.
4.5 Carry out vehicle handover	4.5.1 Vehicle handover requirements: a) cleanliness of vehicle interior and exterior b) removal of vehicle protective equipment c) explanation to customer of all work completed.

Unit guidance for delivery

Opportunities for efficiencies in delivery across/between units:	001 Health and safety and sustainability in the automotive environment 007 Vehicle propulsion, alternative fuel systems
Suggestions for formative assessment opportunities, both for knowledge and practical outcomes:	Some formative assessments may be carried out in a classroom, environment, these could be multiple choice questions identifying components. It is important that learners can relate this knowledge and understanding to actual workshop situations, practical tasks and assessments.
Opportunities for visits/engagement with local industry and employers:	It is recommended that centres develop a method of maintaining contact with a range of employers in the sector as they may be able to help with keeping the examples of legislation, policies and codes of practice used in the taught content, up to date.
Considerations for innovative methods of delivery:	It is expected that a range of delivery methods will be used including presentations, internet research and, where applicable, visiting speakers.
Ways of ensuring content is delivered in line with current, up-to-date industry practice:	It is important that the subject content covered is relative to the automotive industry, this means that product knowledge, practical skills and testing methods taught are what is required by the industry currently. This means that the unit will always be relative to the industry that it relates to, also that local industry employers should be engaged and consulted as to how this unit will be delivered.
EDI or accessibility considerations:	Centres must deliver the unit in line with their EDI policy and organisational procedures.
Digital initiative considerations:	Access to electronic technical information. Websites.
Sustainability considerations:	Considerations should be given to disposal of components and waste products.
Books:	• *Haynes Car Electrical Systems Manual*, Martynn Randall, Haynes, 2006 • *The Haynes Manual on Practical Electrical Systems*, Martynn Randall, Haynes, 2005 • *Automobile Electrical and Electronic Systems*, Tom Denton, Routledge, 2017 • *Automobile Mechanical and Electrical Systems*, Tom Denton, Routledge, 2011

Websites:	• How car electrical systems work | How a Car Works • Car Electrical System Basics, Function, Working, Diagram - Learn Quickly How Automotive Electrical System Works (easycarelectrics.com) • Yuasa UK - The world's leading battery manufacturer • How Does an Alternator Work? | Parts of an Alternator (realpars.com) • How a Starter Motor Works: A Detailed Insight - Easy Car Electrics • Car lights and headlights: what they are and when to use them | RAC Drive • HELLA Lighting | HELLA

Transferrable employability skills

Workplace conduct	LO and Topic
Applies sufficient effort to enable them to complete tasks set to the standard required **(CW3)**	LO4: 4.1, 4.2, 4.3, 4.4, 4.5
Problem solving	
Gathers appropriate information or advice from different sources to help solve a specific work-related problem **(PSW1)**	LO4: 4.1, 4.2, 4.3, 4.4, 4.5
Assesses a range of potential solutions, applying appropriate problem-solving strategies **(PSW2)**	LO4: 4.1, 4.2, 4.3, 4.4, 4.5
Time management skills	
Plans work: • according to priority • taking into account length of time needed to complete tasks • in order to meet deadlines • including appropriate breaks **(TMS1)**	LO4: 4.1, 4.2, 4.3, 4.4, 4.5
Works at an appropriate pace to carry out tasks in accordance with plan **(TMS2)**	LO4: 4.1, 4.2, 4.3, 4.4, 4.5
Adjusts approach in response to any change of circumstance (eg, one task over running), as appropriate, to ensure remaining time is spent effectively **(TMS3)**	LO4: 4.1, 4.2, 4.3, 4.4, 4.5

Unit 009 Automotive industry and careers

Unit level:	2
Guided learning hours (GLH):	20
Unit aim:	This unit introduces the learner to a variety of business types and career paths in the automotive repair industry. The learner will also be aware of the different job roles and the different professional levels in the automotive repair industry.
Assessment method:	MCQ exam
Links to Occupational Standard:	ST0499

Learning outcomes

1. Know the different businesses within the automotive industry.
2. Know the different job roles and levels in the automotive industry.

Learning outcome 1

Know the different businesses within the automotive industry.

Topics	Content elements
1.1 Different business types	1.1.1 The purpose and roles of different businesses within the automotive industry: a) specialised repair (for specific brands/makes) b) franchise/main dealer c) independent repair d) classic vehicle restoration e) mechanical, electrical and trim (MET) f) insurance g) body repair h) paint repair i) recovery service j) vehicle fit (fast fit) k) vehicle leasing/renting l) mobile repair m) vehicle dismantling n) parts supply o) vehicle valeting p) smart repair q) motorcycle repair r) motorsport repair s) heavy goods vehicle repair (HGV) t) passenger service vehicle repair (PSV).

Topics	Content elements
1.2 Commercial awareness	1.2.1 The importance of principles of commercial awareness: a) competition i. national ii. local iii. advertising iv. social media presence v. word of mouth vi. reputation b) profitability c) trends d) impact of commercial challenges i. skills shortages ii. supply chain issues iii. inflation.

Learning outcome 2

Know the different job roles and levels in the automotive industry.

Topics	Content elements
2.1 Types of employment	2.1.1 Types of employment within the automotive industry: a) part time b) full time c) fixed term contracts d) flexible hours e) self employed f) internship g) freelance/contractor.
2.2 Career paths and levels of roles in the automotive industry	2.2.1 Career paths within the automotive industry: a) work experience b) further education c) apprenticeship d) higher education e) internships f) employment g) self-employment h) owner/director. 2.2.2 Levels of technical and non-technical roles: a) levels of technical roles i. apprentice ii. technician iii. senior technician iv. master technician b) levels of non-technical roles

Topics	Content elements
	i. administrator • warranty • finance • payroll • sales • marketing • human resources ii. department manager iii. workshop supervisor iv. workshop control v. senior manager vi. dealer principal vii. chief executive officer (CEO) viii. director (executive, non-executive) ix. consultant.

Unit guidance for delivery

Opportunities for efficiencies in delivery across/between units:	N/A
Suggestions for formative assessment opportunities, both for knowledge and practical outcomes:	The majority of the content will be delivered in a classroom environment, it is important that learners can relate this knowledge and understanding to actual workshop situations, practical tasks.
Opportunities for visits/engagement with local industry and employers:	Employer engagement is recommended in order to maximise the value of the learners' experience. A partnership approach should be adopted where possible with employers.
Considerations for innovative methods of delivery:	Learners must be encouraged to develop an independent learning approach to their studies, this means that they should be encouraged to use various means of learning resources. Learners should be challenged to explore ideas. This unit should be delivered to learners through practical experience and theoretical researching, therefore developing the independent learning ability of learners. Learners should be encouraged to design charts, posters and structure diagrams to demonstrate a greater understanding of the unit and understanding of the topics to be covered.
Ways of ensuring content is delivered in line with current, up-to-date industry practice:	It is important that the subject content covered is relative to the automotive industry, this means that product knowledge, practical skills and testing methods taught are what is required by the industry currently. This means that the unit will always be relative to the industry that it relates to, also that local industry employers should be engaged and consulted as to how this unit will be delivered.
EDI or accessibility considerations:	Centres must deliver the unit in line with their EDI policy and organisational procedures.
Digital initiative considerations:	Websites.
Sustainability considerations:	Not applicable in this unit.
Books:	• *Careers in the Automobile Industry*, Salem Press, Grey House Publishing, 2022
Websites:	• Autocity - World Of Work (camart.co.uk) • Careers | Institute of The Motor Industry (theimi.org.uk) • 15 Careers in the Automotive Industry To Explore | Indeed.com • Career opportunities (automotivecouncil.co.uk)

Appendix 1 Qualification content mapping to Occupational Standard

The table below contains the mapping of the Occupational Standard ST0499 Autocare Technician Knowledge, Skills and Behaviours (KSBs) to the City & Guilds Level 2 Extended Technical Occupational Entry Light Vehicle Service and Maintenance Technicians (Diploma).

NB – The KSB reference to each unit in this document is not exhaustive.

7292 Unit	ST0499 KSB reference
001 Health and safety and sustainability in the automotive environment	K5 S1
002 Customer service, sales principles, communication	K4, K7, K8, K9 S11, S12 B1, B2, B3, B4, B5
003 Stock control procedures	S2, S9
004 Light vehicle chassis systems	K1, K2, K3 S4, S5, S6, S7, S8 B5
005 Service, maintenance and inspection	K10, K11 S3, S4, S8, S10 B1
006 Vehicle propulsion, internal combustion engine	K2 S6
007 Vehicle propulsion, alternative fuel systems	K6
008 Electrical systems and components	K2 S6 B5
009 Automotive industry and careers	K9

Appendix 2 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centre Document Library** on **www.cityandguilds.com** or click on the links below:

Centre Handbook: Quality Assurance Standards

This document is for all approved centres and provides guidance to support their delivery of our qualifications. It includes information on:

- centre quality assurance criteria and monitoring activities
- administration and assessment systems
- centre-facing support teams at City & Guilds/ILM
- centre quality assurance roles and responsibilities.

The Centre Handbook should be used to ensure compliance with the terms and conditions of the centre contract.

Centre Assessment: Quality Assurance Standards

This document sets out the minimum common quality assurance requirements for our regulated and non-regulated qualifications that feature centre-assessed components. Specific guidance will also be included in relevant qualification handbooks and/or assessment documentation.

It incorporates our expectations for centre internal quality assurance and the external quality assurance methods we use to ensure that assessment standards are met and upheld. It also details the range of sanctions that may be put in place when centres do not comply with our requirements or actions that will be taken to align centre marking/assessment to required standards. Additionally, it provides detailed guidance on the secure and valid administration of centre assessments.

Access arrangements: When and how applications need to be made to City & Guilds provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **Centre Document Library** also contains useful information on such things as:

- conducting examinations
- registering learners
- appeals and malpractice.

Useful contacts

Please visit the **Contact us** section of the City & Guilds website.

City & Guilds

For over 140 years, we have worked with people, organisations and economies to help them identify and develop the skills they need to thrive. We understand the life-changing link between skills development, social mobility, prosperity and success. Everything we do is focused on developing and delivering high-quality training, qualifications, assessments and credentials that lead to jobs and meet the changing needs of industry.

We partner with our customers to deliver work-based learning programmes that build competency to support better prospects for people, organisations and wider society. We create flexible learning pathways that support lifelong employability because we believe that people deserve the opportunity to (re)train and (re)learn again and again – gaining new skills at every stage of life, regardless of where they start.

The City & Guilds community of brands includes Gen2, ILM, Intertrain, Trade Skills 4U, Kineo and The Oxford Group.

Copyright

Published by City & Guilds, a registered charity established to promote education and training.

City & Guilds of London Institute
Giltspur House
5–6 Giltspur Street
London
EC1A 9DE

cityandguildsgroup.com