T Level Technical Qualification in Engineering and Manufacturing – Maintenance, Installation and Repair

8712-315 Light & Electric Vehicle

Grade standard exemplification material

Pass - summer 2024

Version 1-0

Version and date	Change detail	Section	Question
v1-0 Oct 2024			

Contents

Introduction

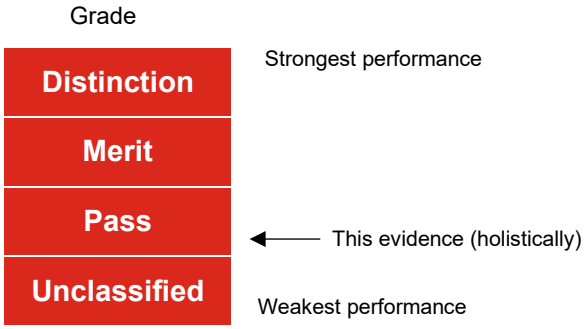
Summer 2024 Results

This document is aimed at providers and learners to help understand the standard that was required in the summer 2024 assessment series to achieve a pass grade for the 8712-315 Maintenance, Installation and Repair in Light & Electric Vehicle engineering Occupational Specialism (OS)

The grade standard exemplification evidence (Grade SEM) provided for the pass grade displays the holistic standard required across the tasks to achieve the pass grade boundary in the summer 2024 series.

The aim of these materials is to provide examples of knowledge, skills and understanding that attested to **four marks above** pass standard (threshold competence) in summer 2024. It is important to note that in live assessments a candidate's performance is very likely to exhibit a spikey profile and standard of performance will vary across tasks.

The Occupational Specialism is graded Distinction, Merit, Pass or Unclassified.



The pass grade boundary is based on a synoptic mark across all tasks. The materials in this Grade SEM are separated into two sections as described below. Materials are presented against a number of tasks from the assignment.

Tasks

This section details the tasks that the candidate has been asked to carry out. What needs to be submitted for marking and any additional evidence required including any photograph/video evidence. Candidate evidence that was or was not included in this Grade SEM has also been identified within this section.

In this Grade SEM there is candidate evidence from:

Task 1 Plan and prepare the service, maintenance and repair activities
Task 2A Perform a full service and maintenance on vehicle 1
Task 2B Perform the joining activity
Task 2C Perform maintenance and repair activities on vehicle 2
Task 3A Review and report the service, maintenance and repair activities

Task 3B Peer review
Task 4 Complete handover

Candidate evidence

This section includes exemplars of candidate work, photographs of the work in production (or completed) and practical observation records of the assessment completed by provider assessors. This was evidence that was captured as part of the assessment and then internally marked by the provider assessor.

The Occupational Specialism brief and tasks can be downloaded from here.

Important things to note:

- We discussed the approach to standard setting/maintaining with Ofqual and the other awarding organisations before awarding this year. We have agreed to take account of the newness of qualifications in how we award this year to recognise that students and teachers are less familiar with the assessments (grading-arrangements-for-vtqsand-technical-qualifications-within-t-levels-in-the-academic-year-2023-to-2024), whilst also recognising the standards required for these qualifications.

- The evidence presented, as a whole, was **four marks** above the pass grade. However, performance across the tasks may vary (i.e. some tasks completed to a higher/lower standard than pass grade).

Grade descriptors

To achieve a pass (threshold competence), a candidate will be able to:

Interpret technical information, plan, assess risk and follow safe working methods appropriately when applying practical skills to an acceptable standard to satisfy the requirements of the brief.

Adequately prepare working areas to allow safe working, acknowledging potential risks and applying acceptable housekeeping techniques during tasks.

Demonstrate basic technical skills for diagnosing components, assemblies and sub-assemblies to complete maintenance, service, and repair activities, in line with the requirements of the brief.

Demonstrate adequate skills using tools and equipment for light and electric vehicle maintenance, service, and repair, ensuring safe isolation, removal, and replacement of components.

Demonstrate basic knowledge and understanding of the principles and processes required for disassembly, repair, configuration, and re-assembly of light and electric vehicle systems, ensuring that most tolerances, calibrations and tightening torques are in-line with specification.

Work safely showing an understanding and suitable level of awareness in the preparation and application of processes, selection and use of tools, equipment, materials and components for maintenance, service, and repair activities.

Mostly use industry and technical terminology accurately across different communication methods with some consideration of technical and non-technical audiences.

Task 1 Plan and prepare the service, maintenance and repair activities

Assessment number (eg 1234-033)	8712-315
Assessment title	Light and Electric Vehicle Occupational Specialism

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	1
Evidence title / description	A list of requirements and resources Completed risk assessment Job cards for each vehicle and welding activity
Date submitted by candidate	DD/MM/YY

Task 1

Assessment themes:

- Health and safety
- Planning and preparation
- Systems and components

You must analyse the brief and technical information about both vehicles provided and then:

- create a list of the requirements and resources needed to complete the activities on both vehicles, including the full service, maintenance and bonding/joining activities, justifying your selections. This should include:
    - all necessary technical information to confirm the type, scope and requirements of the activities
    - tools and equipment
    - materials, components and consumables
    - wastage and disposal requirements
    - time needed to carry out the activity
    - fault diagnosis methods to be used
    - any access requirements
- produce and complete a risk assessment to cover both vehicles, including the full service, maintenance working with high voltage systems and bonding/joining activity
- produce a job card template for each vehicle and bonding/joining activity.

Additional evidence of your performance that must be captured for marking:
none

Candidate evidence

Task 1 - A list of requirements and resources

Service and maintenance tools

Tools	reason	Amount
Autel tread depth gauge	To check the cars tread depth and make sure that it is in regulation	1
Torx set	To undo and tighten things	1
Hex set	^	1
Breaker bar	To undo wheel nuts	1
Screwdriver set	To undo screws	1
Battery test kit	To test the batteries condition	1
Hydrometer	To test the coolant	1
Brake fluid tester	To test the brake fluids boiling point	1
Tire pressure gauge	To check the tire pressures and raise/lower them if required	1
Ratchet	Undo do things up	1
Torque bar	To torque thing up	1
Torch	To enable me to see	1
Wrench	To do things up or loosen	1
Battery maintainer	Maintain battery charge	1

Welding/joining	**Reason**	**Amount**
Plastic welder	To join the cars, bumper together	1
Plastic filler gun	To fill the join with plastic and make it sturdy	1
Grinder	To grind the extra plastic away	1
High voltage	**Reason**	**Amount**
insulated ratchet	to undo and do things up on a HV car which is still live	**1**
Insulated torque bar	To do things up on the HV system	**1**

Fault diagnostics		
Autel scan tool	To scan the car for a fault,	1
E3 technical	Look up fault codes	
Auto data	Look up fault codes	

Time needed	For
1 hr	Service

20 mins	Fault diagnostics
30 mins	Fixing part

Wastage	Disposal requirements
Dirty oil	Needs to be removed by a special bin, not an everyday use one and to be removed from the site it must be through a professional company with the rights to dispose of it properly
Air filter	Disposed of properly in a separate bin
Rag/ paper towel	Disposed of normally unless it has came into contact with oil in which it needs to be put into the same waste disposal bin as the dirty oil

PPE and VPE

PPE (**HV included**)	Reason	VPE (**HV included**)	Reason
Safety Boots	In case something is dropped onto the feet the steel toe caps will stop it from injury	Rubber mats	Stops you from being a gateway for electricity to jump through to earth
Overalls	Protect your body from harmful liquids and splashes like oil	Floor mats	Protect the car from any dirt or harmful substances you might bring in on your feet
Gloves/protection cream	To protect your hands from substances that are harmful and can cause things like dermatitis	Wing covers	To protect the wings from areas of work, being scratched or dented
Safety glasses	To prevent any liquids from getting in your eyes and being harmful	Steering wheel covers	Stop substances being transmitted from your hands to the customers steering wheel
Safety gloves	Gloves that are rated high enough to prevent the electricity jumping	Seat covers	Prevents dirty overalls from getting the customers seat dirty
Face shield	Stops the HV from arcing to your nose		
HV overalls	Overalls that are rated high enough to stop the HV from being able to penetrate it		
Plastic welding gloves	To protect hands from the boiling tools		

Task 1 – Risk assessment

Risk assessment for task 1, Petrol diesel car:

Hazard	Risk	Prevention	Likeliness	Damage
Arc eye	Having arc flash/ becoming visually impaired	Don't let the electricity jump by wearing correct ppe	1	2
Hot liquids	Burning	Wear gloves and other ppe, don't stand under where hot liquid is	1	1
Tripping	Falling	Make sure the work area is clear and clean	1	1
Trap	Fingers getting stuck, if severe enough fingers getting stuck and ripping off	Don't put fingers where there is a chance for them to be trapped	2	1-3
Crushing	Squished/ crushed	Don't stand under unsteady things	1	2-3
Electrocution	Electrocution	Wear the correct ppe	1	2-4
Rust	impaling	Be careful of rust and watch for it	1	1
Boiling tools	Burning	Don't touch hot parts of equipment	1	2
Oil	Dermatitis	Wear gloves or put protective cream on	1-2	1-2

Task 1 – Job cards

Work to be carried out: Service/ EML

Job description	Tools used
I would start by doing a quick VHC around the car checking for any damage/scratches then I would apply the VPE to the car, this includes things such as, wing covers, floor mats, steering wheel covers, seat covers, at this stage I would also put the rubber blocks under the jackings points. I would then use a scan tool to check the cars diagnostic trouble codes, to see if doing the service would interfere with the EML. I would then begin the service, I would check the interior of the car, seatbelts, and doors then I would check that the lights work, this includes, dipped, main beam, side lights, indicators, brake lights, reverse and both front and back fogs. Note down all that do not work, whilst in the driver's side id pop the bonnet of the car. Once outside the car and under the bonnet id attach the battery maintainer, then id check that the fluids are all within the limits. If all are in the limits then test the liquids, check the coolant using a hydrometer and check the brake fluid with a brake fluid tester. Make sure the power steering is also full. It is now that I would loosen the oil filter, if the filters accessible from the top. Next, I would assess the batteries condition, using the battery tester I would conclude whether the battery needed replacing, charging or if it is a good battery. I would write down the reading of all the tests taken place (brake fluid, coolant, battery. I would then go to the back of the car and test the air pressure of the spare tire id compare this to what is stated for the spare tire on E3 technical. Once everything has been tested, I would raise the car a small amount before shaking the car to make sure that the supports are properly under the jacking points. I would then, if the car is stable, raise it too halfway up. When halfway up I would test for	Battery maintainer Hydrometer Brake fluid test Battery tester E3 technical Torch Oil drainer Fresh oil Sump plug too

play in all the tires before testing the air pressure, I would lower/raise it to what is specified on E3 technical for the tires. I would also look inside of the tires using a torch to visually check the brakes. I would also have a quick look and feel of the suspension to make sure that it is not snapped or warped. I would also make sure that the wheels can be spun and turned. I would then raise the car the whole way up, whilst its up this high I would be able to check the tread depth, it should be above 1.6mm if it isn't the tires are illegal, if above but close recommend the customer change his tires, this would give me access to check behind all the tires, starting with the front, id turn it out and check that all the cables and pipes are connected and haven't got a ear in them, then id turn the wheels inwards and check the other side of the same tire before moving onto the other side of the car, I would perform the same checks before moving the oil drainer and removing the sump plug to drain the oil into it. Whilst the oil drains into the drainer I would check the exhaust system and make sure that the rubber bushings that hold the exhaust are in good health and that the exhaust itself does not have any issues. Moving down the car, at the rear I would then check the rear tires, same checks as the front but just not turning it. Whilst the oil is draining, I would go and obtain the new filter and the container of new oil and the new air filter for later. Once the oil is drained, if not taken off already I would remove the filter to remove the access oil stuck in the filter. I would then re-install the sump plug before lowering the car to the ground. Once on the ground I would install the new filter and check on E3 technical how much oil the car is supposed to have and that is the amount of oil I would put in it. Back under the bonnet I would change the air filter for a new one and fill the engine with the specified amount of oil, then id check the dip stick, wipe it off put it back in and check again to see if the oils amount is correct. Now	

that the car has had a complete service, I would run the car after putting the exhaust extractor on. Whilst running the car hot I would fault diagnose again but this time go into the specific area for EML. If the fault does not show it must be a mechanical fault however if the fault does show it could be an electrical fault. Once the fault has been located, I would then go and check E3 technical to see what the code is, I would then diagnose where the fault is also using E3 technical. Once I have diagnosed where the fault is I would go to live data on the autel device and check whether there are any readings on the graphs, if there is an abnormality or no reading at all then it reinforces that there is a fault with it. I would then go to the fault area and diagnose which item it is using the help from the E3 technical, once I have diagnosed which it is I would replace this part. Once replaced I would run the car for a couple minutes before re-scanning the car, if the fault is still present on the autel, clear the code, then rescan again and if the fault doesn't return then the fault has been fixed, if the fault does return then the fault is still present, and id restart the process of checking for it.	

Work to be carried out: Vehicle not powering up

Job description:	**Tools used:**
As this is a hybrid car with HV systems in place I would first block the area off that I'm working in, using barriers, then I would have a quick look around and under the car to see if anything is leaking or damaged, then id apply the VPE to the car, this is a HV car, so HV VPE is to be used, seat covers, steering wheel covers, wing covers, floor mats and a lot of signage to be put out. Once all the signage is put out, I would go inside the car and since it does not require a service, I would start by using my scan tool to scan the car, with the exhaust extractor on, to find if it is an electrical fault or mechanical fault, If it is an electrical fault, I would diagnose	Autel Exhaust extractor PPE wrench

where it is using the code given and looking it up on E3 technical, once I have found where the issue is located I would put on my specialised PPE, overalls, gloves, face shield, and I would put a rubber matt at the floor near the 12V battery, I would then disconnect the 12v battery using insulated tools and making sure that the 12v is then secured so that someone couldn't just re-attach it. Once the battery is disconnected, I would move the mat to where the service plug is, id then whilst standing on the mat remove the service plug, once removed the keys and the service plug need to go into a lockbox far enough away. Id look up how long the cars discharge time is on E3 technical, I would then wait this long, whilst waiting I could grab the new part that is going to be fitted. Once the discharge time is over id, if required, raise the car safely on rubber blocks. Id then locate where the fault is, also using E3 technical to assist me in finding it and then I would remove the part and fit a new one, once fitted I would lower the car if required then id re install the service plug, making sure that I do this whilst wearing correct PPE, id also make sure that the service plug is correctly in and that the mat was under me, then id go and re install the 12v battery. The system is now live again, so id get the keys from the lockbox and turn the ignition on and rescan the car, clear codes and rescan again. If the fault is still present then I would have to relocate it and make sure I changed the correct thing I would have to do a safe disconnect again, if the fault is not present then the car should be able to power up and switch on.	

Work to be carried out: Plastic welding a bumper

Job description:	**Tools used:**
With the Plastic joining, I would first set up my table with all the necessary items of use, the welding tool that melts the plastics together, the Filler and the grinder it is also important that the worktable is underneath a ventilation system so that I don't breath in toxic fumes from the plastic joining, these could be paint if it has not been taken off or the plastic itself. The most important thing is to make sure that the bumper has its natural curve in is still, if the bumper is straightened then the bumper, once put back on might be deformed or the join might come apart, therefore when I'm putting the staples in, I will leave the bumper on the worktable so that it is free to move and it won't deform. Then I would put it in the vice grip in a way that doesn't distort the bumper, this is key as the vice needs to hold the piece of bumper still enough that force can be applied onto it but not tight enough to distort the piece, once the piece is in the vice id start using the welding tool to melt the plastic into one another (on the rear side) moving in a V shape to get the most optimum join. Once I have joined the plastic the entire length of the cut, I would then use the filler gun to fill the plastic join with more plastic to make it a neat join and a full join so that there is not any weakness where the join is. Once all is joined and filled id use the grinder to take off any excess plastic, this is just to make it neater and to assist in seeing if there are any inconsistencies with the join. If there are any inconsistencies with the join, then id re-join over the part of the inconsistency and fill then grind it down.	Welding tool Filler Grinder Vice grip

Task 2A Perform a full service and maintenance on vehicle 1

Assessment number (eg 1234-033)	8712-315
Assessment title	Light and Electric Vehicle Occupational Specialism

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	2A
Evidence title / description	Completed job card for vehicle 1 Completed manufacturers records Assessor observation Service sheet fault diagnosis Photographic evidence
Date submitted by candidate	DD/MM/YY

Task 2A

Assessment themes:

- Health and safety
- Planning and preparation
- Systems and components
- Working with faults

You must:

- prepare the working area to complete the full service and maintenance on vehicle 1
- perform the full service and maintenance on vehicle 1 in accordance with the planning documents produced in Task 1. This should include:
    - decommissioning and inspection of the vehicle systems
    - diagnosing and recording faults within the vehicle systems, including carrying out appropriate tests and measurements
    - replacing components and consumables as required in the service schedule and any fault diagnosis
    - safely using the appropriate tools and equipment
    - recommissioning of the vehicle
    - re-instating the work area
- record the full service and maintenance, to include:
    - completed service schedule sheet
    - completed job card with description of all work carried out.

Additional evidence of your performance that must be captured for marking:
none

Candidate evidence

Task 2a - Completed job card for vehicle 1

Work to be carried out: Service/ EML

Make: Vauxhall

Model: Astra

Reg: MW57EPK

Mileage: 121083

Job description:	Tools used:
I started by doing a VHC around the car checking for any damage/scratches then I applied the VPE to the car, this includes items such as, wing covers, floor mats, steering wheel covers, seat covers, at this stage I also put the rubber blocks under the jackings points. I then used a scan tool to check the cars diagnostic trouble codes, to see if doing the service would interfere with the EML which it didn't as the fault was a O2 sensor. I then began the service, I checked the interior of the car, the seatbelts, and the doors then I checked that the lights worked, this includes, dipped, main beam, side lights, indicators, brake lights, reverse and both front and back fogs. I Noted down all that do not work (All were working in good condition), whilst in the driver's side I opened the bonnet of the car. Once outside the car and under the bonnet I attach the battery maintainer, then I checked that the fluids are all within the limits which they all were so I test the liquids, I did this by, checking the coolant using a hydrometer, this coolant was able to go to -23 and then I checked the brake fluid with a brake fluid tester the boiling point of the brake fluid was 168 degrees E3 technical stated that it required Dot 4+ (LV) ISO class 6. I also made sure the power steering was also full. It is now that I loosened the oil filter. Next, I assessed the batteries condition, using the battery tester I concluded the battery was a good battery with voltage of 12.72. I then went to the back of the car and tested the air pressure of the spare tire, on E3 technical it stated that all tires including the spare had to be of 1.9 bar. Once everything had been tested, I raised the car a small amount before shaking the car to make sure that the supports are properly under the jacking points which it was. I then raised it to halfway up. While it was halfway up, I tested for play in all the tires before testing the air pressure, I raise a couple tires and lowered one all of them had to be 1.9 bar. I also looked inside of the tires using a torch to visually check the brakes. I also had a quick look and feel of the suspension to make sure that it was not snapped or warped. I also made sure that the wheels could be spun and turned. I then raised the car the whole	Battery maintainer Hydrometer Brake fluid test Battery tester E3 technical Torch Oil drainer Fresh oil Sump plug Tool 19 socket Ratchet Spark plug too

way up, whilst its up this high I was able to check the tread depth, the tread of all of the tires where of a good standard, not dropping below 5mm, the fronts were, Front Left was, 5.7, 6.1 and 6 Front Right was, 5.9, 6.5 and 6.2 the Rear Left was 5.7, 6 and 5.7 the Rear Right was 5.7, 6.1 and 5.8. Whilst being up on the ramp I was able to check behind all the tires, starting with the front, I turned it out and check that all the cables and pipes were connected and had not had a tear in them, then I turned the wheel inwards and check the other side of the same tire before moving onto the other side of the car, I then performed the same checks before moving the oil drainer and removing the sump plug to drain the oil into it, the sump plug required a 19 socket to be removed. Whilst the oil drained into the drainer, I checked the exhaust system and made sure that the rubber bushings that hold the exhaust are in good health and that the exhaust itself does not have any issues. Moving down the car, at the rear I checked the tires, performing the same checks as the front. Whilst the oil is draining, i got the new filter and the container of new oil and the new air filter for later. Once the oil is drained. I re-installed the sump plug before lowering the car to the ground. Once on the ground I installed the new oil filter and checked on E3 technical how much oil the car is supposed to have, E3 technical stated that the engine required 4.5L of oil, this oil being 5w 40. Back under the bonnet I changed the air filter for a new one and filled the engine with the specified amount of oil, then I checked the dip stick, wiped it off and put it back in and checked it again to see if the oil amount was correct. After filling the oil I used a torx screw driver so undo all the screws holding the air filter in place, then I replaced the air filter with a new one, then I reinstalled the screws and the cover. Now that the car has had a complete service, I ran the car after putting the exhaust extractor on. Whilst running the car hot I would fault diagnose again but this time go into the specific area for EML. The fault that appeared was P0135-04, E3 technical showed me that the fault was at the front of the engine bay. Once I diagnosed where the fault was I went to live data on the autel device and checked whether there were any readings on the graphs, I would then go to the fault area, since there was only one oxygen sensor at the front of the car I deducted that it was either broken or faulty, either way needing to be replaced, I took the oxygen sensor out and asked for a new one which I replaced it with. Once replaced I ran the car for a couple minutes before rescanning the car, once re scanned nothing came back as a fault, which means I had successfully fixed to oxygen sensor, however the car was still rough running which is an issue, I first ran the car to get the engine warm, then I diagnosed the engine control module which had no faults in it, as no faults where displayed I had no reason to expect that it was a sensor however to be sure I visually checked for sensor that was disconnected or had a poor connection, I found nothing so I checked if there was an air leak in the air filter pipes, there was no audible tell or any visual issues so this was	

then voided from the issues, the only thing left that could have caused it to rough run and have an issue idling is the spark plugs themselves, I ran the car some more before scanning again and seeing If there was a code, a code came up but it wasn't present, the code stated that there was an issue with spark plug 3. Although the fault wasn't present on the autel I decided to check the spark plug, I took off the cover and looked at the spark plugs, I took out spark plug 3 with the spark plug tool, the gap between the spark plug was not sufficient so I obtained a new plug, I then put the plug into the car and re installed everything I had taken off to get to the spark plugs, once everything was back together I ran the car for a short length of time to see that the rough running had stopped and the car was idling nicely. I then asked a trained technician to take the car for a test drive to make sure that the faults had been sorted, I took off the wing covers before it was taken for a test drive and the rest of the VPE when they returned, once all VPE was taken off I cleared all codes and removed the service light. **Technician's notes:** Suggest that the customer gets his rear brakes replaced	

Task 2a - Completed manufacturers records

Maintenance Schedule and Records

Equipment/System type	Identification No.
Vehicle 1 (Petrol/Diesel)	8712-315
Brand/Model	**Location**
City & Guilds	Workshop

Equipment/System specification
• Please refer to manufacturer's vehicle specification documentation (supplied by provider).

Maintenance records					
Service No	Maintenance date	Maintenance type (fault/repair, scheduled/routine, requested)	Checked by	Repair details (where relevant)	Technician signature
01	20/4/2022	Scheduled	JS	• Carried out an annual service to manufacturer specifications.	J Smith

				• Vehicle functioning as per vehicle specification following annual maintenance activity.	
02	28/5/2023	Repair	AB	• Diagnosed fault to N/S/R ABS sensor, replaced sensor and checked vehicle working to manufacturer specifications. • Noted rear brake pads at 2 mm.	A Bloggs
03	03/05/2024	Fault/repair, requested			
04					
05					
06					

Maintenance Schedule – annual unless specified otherwise					
Service No	Year	Detail inspection	Recommended planned maintenance	Service advisor signature	Technician signature
01	2022	Annual	Annual- routine/scheduled	D Jones	J Smith

02	2023	Annual	Annual- routine/scheduled	D Jones	A Bloggs
03	2024	Annual	Annual- routine/scheduled	D Jones	
04	2024	Requested	Scheduled – 3 months		
05					
06					

Commentary	
Service No	Recommendations for future maintenance activity
04	Suggested customer comes in after three months to replace the rear brakes and for a check up on the O2 sensor and spark plugs, if one spark plug is having an issue and the rest aren't there is an issue

Task 2a – Assessor observation

Task 2a - Practical observation form

8712-315 Maintenance Engineering Technologies: Light and Electric Vehicles - Summer 2024

Candidate Name	Candidate number
Provider name	**Date**
	03/05/2024

Complete the table below referring to the relevant marking grid, found in the assessment pack.

Do not allocate marks at this stage.

This observation must cover	Assessor observation should include:	Assessment Themes
Work area preparation	• The work area preparation.	• Health and Safety • Planning and Preparation • Systems and Components
Service and maintenance activities – vehicle 1	• decommissioning and inspection of the vehicle system • diagnosis and recording of faults within the vehicle system, including carrying out appropriate tests and measurements • replacing components and consumables as required in the service schedule and any faults diagnosis • use of tools and equipment • recommissioning of the system • re-instating the work area.	• Health and Safety • Planning and Preparation • Systems and Components

Notes – *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*

Work area preparation:

The student was wearing the correct PPE, including Boots and overalls, to adhere to health and safety.

The candidate set out all tools and equipment in readiness to start work on the vehicle 1. This include hand tools, scan tool, battery maintainer.

The documentation was checked and car details match to the vehicle. Any paper printer off to then be used for a vehicle body work check.

The Vehicle was then prepared with VPE to protect from damage and contamination. This included the use of magnetic wing covers, disposable floor mats, seat covers and steering wheel cover.

VPE has been fitted and positioned but seat cover could have been more accurately secured.

Service and maintenance activities – vehicle 1:

- decommissioning and inspection of the vehicle system

The candidate first carried out a basic check of the body work to the vehicle. The candidate then procced to start the service process with lights and interior check. At this time the candidate carried out diagnostic checks with the Autel scan tool which a DTC was discovered. No further diagnosis was perform at this stage.

The LEV was correctly connected to the vehicle while engine was running. The candidate could also have run the engine to achieve full operating temperature.

The candidate then continued with the service process. Following a good robust schedule which included under bonnet, halfway and fully up inspection. A thorough underside check was performed to a high standard. The service was performed in line with manufacture specification. Using a selection of service tools and equipment, this concluded with replacement of service components.

During the service process the use of a vehicle ramp was used and blocks were correctly placed to support the vehicle. I would like to have observed the student checking the stability and balance of the vehicle before raising the vehicle

- diagnosis and recording of faults within the vehicle system, including carrying out appropriate tests and measurements

The candidate preformed fault diagnosis with only basic step performed. Only using DTC information from the scan tool and research on E3 Technical, the student concluded that the fault was confined to the component, I would like to have observed the candidate performing multi-set diagnostics using none-disturbance testing.

Although during the second fault tracing exercise there were more diagnostic steps applied although limited

Basic technical information was accessed, and records were made by the candidate.

- replacing components and consumables as required in the service schedule and any faults diagnosis

While replacing component and performing the service the candidate work to a well-planned process. This unfortunately did not flow with the fault diagnosis process, which at times prevent from working in a timely manner.

- use of tools and equipment

As already stated, the candidate used a wide selection of tools and equipment during the service. These were used to evaluate the serviceability of the vehicle. These included battery tester, coolant hydrometer and brake fluid boiling point tester.

The battery maintainer was correctly connected while carrying out fault diagnosis. The scan tool could have been used to extract further information and technical data. Allowing for more accurate diagnostics.

- recommissioning of the system

On completion of the task the candidate confirmed that the service was correctly completed to manufactures standards. All levels checks and paperwork completed, service maintenance sheet completed.

The faults were confirmed as repaired by the candidate as no EML light was displayed and there was no DTC's stored in the engine management system.

The Engine was also confirm as running correctly.

- re-instating the work area.

The candidate returned the work area back to a tidy condition with tools and equipment stored safely and correctly.

Area was cleared of all waste material and placed in the appropriate areas. I would have like to have seen the candidate sweep the floor area and clear the slight spills left during the work carried out, along with removing the ramp blocks place under the vehicle,

The vehicle was clear of all VPE and ready for the customer.

Internal assessor signature	Date
X	

Task 2a – Service sheet fault diagnosis

MW57EPK
VAUXHALL ASTRA DESIGN
Engine Code: Z18XER(2H0)

120,000 MILES/72 MONTHS

02 sensor broken

SERVICE CHECK SHEET

PARTS REQUIRED FOR SERVICE

Engine oil
Oil filter
Filter, cabin air

* Indicates parts may be required

ENGINE COMPARTMENT

Check the power steering fluid level; top up if necessary	✓
Check the battery magic eye	✓
Check/clean the battery connections **(Battery location Electrical system) (Engine compartment Electrical system)**	✓
Check the headlight alignment; adjust if necessary	✓
Check the brake fluid level; top up if necessary dot 4+ 4v iso class 6 1.2 boil point	✓
Check the condition of the ancillary drive belt; renew if necessary	✓
Cooling system: check the condition of the hoses and connections	✓

UNDER THE VEHICLE

Check the steering assembly for damage, leaks and wear	✓
Check the tread depth and wear pattern on all the tyres, including the spare	✓
Re-tighten the wheel nuts/bolts **(Wheel bolts (Clean the contact surfaces and wheel bolts/nuts; lightly grease the hub centre and the wheel bolt taper only but do not lubricate the threads) 110 (Nm) Wheels and tyres)**	✓
Suspension: check for damage and wear	✓
Check the power steering electro-hydraulic system	☐
Check the entire underside of the vehicle for leaks, corrosion and damage	✓
Check the chassis for corrosion and damage	☐
Check the tyre pressures; adjust if necessary 1.9 front 1.9 back	✓
Check the level control air pressure	☐
Check the brake pad thickness Max 14 Min 2	✓
Check the condition of the disc brakes	✓
Check the brake lines, hoses and connections for leaks and damage	✓
Manual transmission: check for leaks	☐

- [ ] Automatic transmission: check for leaks
- [ ] CV joint boots: check for damage and leaks
- [x] * Renew the engine oil **(Engine sump, including filter 4.5 (l) Engine) (Engine oil drain plug 14 (Nm) Engine)**
- [x] * Renew the oil filter **(Oil filter 25 (Nm) Engine)**
- [x] Check for oil leaks
- [x] Check the fuel lines, hoses and connections for leaks and damage
- [x] Check the exhaust system
- [ ] Cooling system: check for leaks. Check the level and anti-freeze strength; correct if necessary

EXTERIOR

- [x] Check the operation of the exterior lights
- [x] Check the windscreen wipers and washing system View Procedure
- [x] Check the headlight washing system
- [x] Check/lubricate the locks, hinges and catches
- [x] Check the body for corrosion and damage

INTERIOR

- [x] Check the tyre sealant can expiry date
- [ ] Carry out the vehicle diagnostic check; read out the fault codes *(a diagnostic tool is required)*
- [x] Air conditioning: check the hoses and lines for damage and leaks **(Air conditioning : General data)**
- [x] Check the first-aid kit *(check the expiry date)*
- [x] Air conditioning: check the compressor *(check for leaks)*
- [x] Check the operation of the heating/air conditioning
- [x] Visually check the airbag units for external damage
- [x] Check the operation of the lighting system and horn *(including interior and dashboard panel lights)*
- [x] Check the operation of the instrument cluster
- [x] Check the operation of the ignition key interlock
- [ ] Reset the service indicator View Procedure
- [x] Check/adjust the parking brake

GENERAL

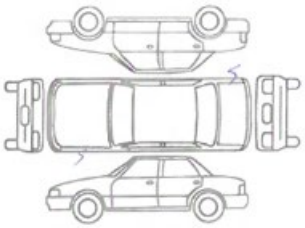
- [ ] Check the engine performance
- [ ] Check the vehicle performance
- [ ] Check the operation of the steering
- [ ] Check the operation of the brakes
- [ ] Test drive
- [ ] Record the service details in the customer service handbook

Mileage:

Tyre Condition:

	Pressures		Tread Depth (mm)		
	Before	After	Inside	Middle	Outside
L/F	1.9	1.9	5.7	6.1	6
R/F	2	1.9	5.9	6.5	6.2
R/R	1.3	1.9	5.7	6.1	5.8
L/R	1.8	1.9	5.7	6	5.7
Spare	2	1.9			

Vehicle Condition:



D=Dent S=Scratch B=Broken M=Missing

Brake Disc/Drum Measurement:

	(mm)		(mm)	Min/Max	(mm)
L/F		R/F		F	
L/R		R/R		R	

Brake Pad Measurement:

	Inner(mm)	Outer(mm)		Inner(mm)	Outer(mm)
L/F		6	R/F		6
L/R		2	R/R		2

Comments:

Task 2a – Photographic evidence

Vehicle 1 Service - Faults

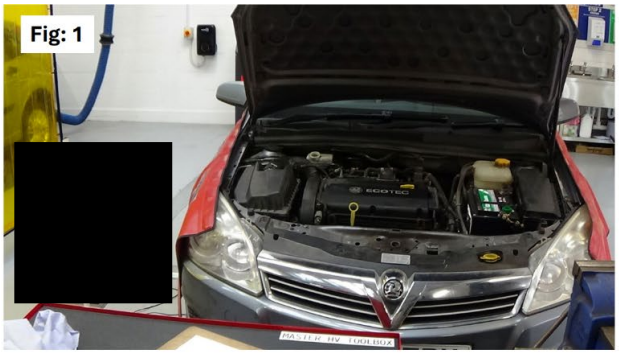


Fig 1 and 2 photographic evidence, shows the vehicle 1 is prepared using VPE before work commences. The use of magnetic wing covers, disposable floor mats, seat covers and steering wheel cover.

VPE has been fitted and positioned but seat cover could have been more accurately secured.

Fig 3 photographic evidence, shows that the student has prepared the work area in readiness to start the task.

All tools are available to use with some other equipment available the scan tool. The battery maintainer is connection ready for fault diagnosis.

Documentation ready.

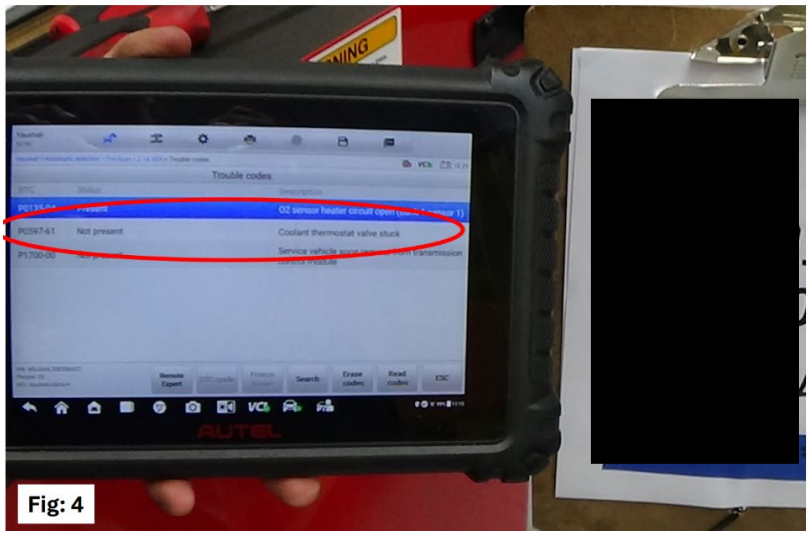


Fig 4 photographic evidence, displays the candidate's basic use of the scan tool to extract a diagnostic trouble code.

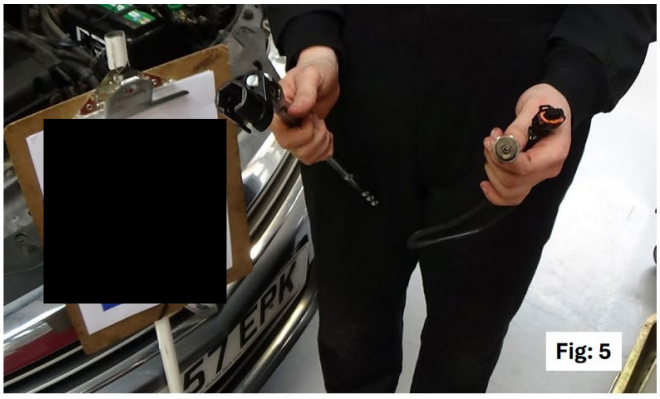


Fig 5 photographic evidence, shows the candidate holding the faulty Os2 sensor requiring replacement.

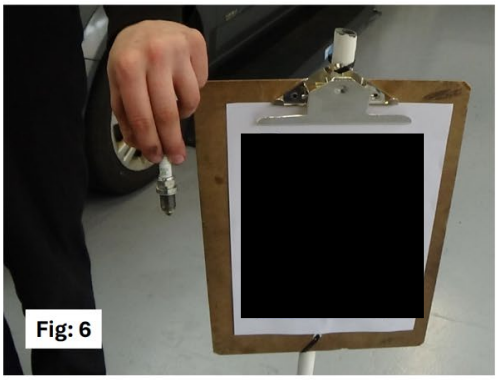


Fig 6 photographic evidence, shows the faulty spark plug with damaged electrode that required replacement.

Fig 7 photographic evidence shows the candidates work area re-instated on completion of the task.

Tools and work bench correctly cleared and tidy.

Vehicle operating correctly, no EML light displayed.

Fig 8 photographic evidence shows the ramp blocks were also left under the vehicle.

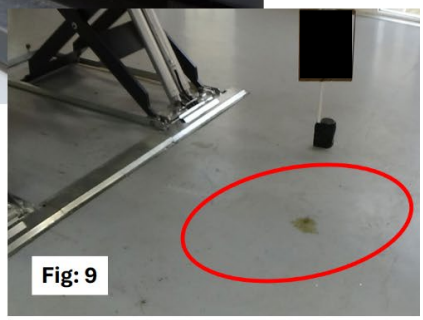


Fig 9 shows that although the candidates attempted to clean the floor but there was still remanence of oil on the floor.

Task 2B Perform the joining activity

Assessment number (eg 1234-033)	8712-315
Assessment title	Light and Electric Vehicle Occupational specialism

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	2B
Evidence title / description	Completed job card of the welding activity with description of the work carried out Assessor observation Photographic evidence
Date submitted by candidate	DD/MM/YY

Task 2B

Assessment themes:

- Health and safety
- Planning and preparation
- Systems and components
- Working with faults
- Reviewing and reporting

You must:

- prepare the working area to complete bonding/joining activity
- perform the activity in accordance with the planning documents produced in Task 1, which should include:
    - preparing the bumper for bonding/joining activity
    - complete the bonding/joining activity
    - safely using the appropriate tools and equipment
    - re-instating the work area
    - completing the job card for the bonding/joining activity with a description of work carried out.

Additional evidence of your performance that must be captured for marking:
none

Candidate evidence

Task 2b – Completed job card

Work to be done: Plastic welding a bumper

Job description:	**Tools used:**
With the Plastic joining, I first set up my table with all the necessary items of use, the welding tool that melts the plastics together, the Filler gunand the grinder, it is also important to have the staple gun to heat them into the split that was on the bumper. It is also important that the worktable is underneath a ventilation system (exhaust extractor) so that I don't breathe in toxic fumes from the plastic joining, these could be paint if it has not been taken off or the plastic itself. The most important thing is to make sure that the bumper has its natural curve in is still, if the bumper is straightened then the bumper, once put back on might be deformed or the join might have come apart, therefore when I put the staples in, I left the bumper on the worktable so that it is free to move and it wouldn't deform I then used a cutter to cut the staples legs, once the legs were cut I used a grinder to grind the access staples away and leave a flat staple. I then started using the welding tool to melt the plastic into one another (on the rear side) making sure that the tool was hot enough to glide into the plastic, moving in a V shape to get the most optimum join, I also needed to go deep enough that the join would hold but not deep to the point that it would distort or melt through. Once I had joined the plastic the entire length of the cut, I used the filler gun to fill the plastic join with more plastic using a high heat level and a low speed which made it easier to melt it into it, therefore it made it a neater join and a full join so that there are not any weaknesses where the join was. If there are any inconsistencies with the join, then id re-join over the part of the inconsistency and fill it using the filler tool. Once it is all done, I	Welding tool Filler Grinder Exhaust extractor Staples Staple gun cutters

went back over it with the welding tool to flatten the whole join, this just makes it neater and less bumpy on the inside. **Technician's notes:** I went deeper than intended next time use a lower heat for a more controlled join.	

Task 2b – Assessor observation

Task 2b - Practical observation form

8712-315 Maintenance Engineering Technologies: Light and Electric Vehicles - Summer 2024

Candidate Name	Candidate number
Provider name	**Date**
	08/05/2024

Complete the table below referring to the relevant marking grid, found in the assessment pack.

Do not allocate marks at this stage.

This observation must cover	Assessor observation should include:	Assessment Themes
Work area preparation for bonding/joining	• The work area preparation for bonding/joining.	• Health and Safety • Planning and Preparation • Systems and Components
The bonding/welding activity	• preparing the bumper for bonding/joining activity • complete the bonding/joining activity • safely using the appropriate tools and equipment • re-instating the work area	• Health and Safety • Planning and Preparation • Systems and Components

Notes – *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*

Work area preparation for bonding/joining:

The candidate correctly set up equipment and tools ready for starting the task. Tools and equipment laid out and positioned to easily access. All candidate's paperwork available if required.

The candidate was correctly protected with PPE and access to additional PPE eye protection and heat resistance gloves. All equipment checked in good condition.

The bonding/welding activity:

- preparing the bumper for bonding/joining activity

First the candidate positioned correctly LEV system and switched on. The surface was correctly prepared using the appropriate sanding discs.

I would like to have observed the student securing the work piece to prevent injury when using the equipment such as the grinder.

The equipment was allowed to heat up before starting work.

- complete the bonding/joining activity

The candidate followed a procedure first using the staples to secure the crack moving on to joining the plastic together and applying fill material.

The candidate applied too much heat and penetrated too deep causing some distortion to the front of the work piece which will require some additional work. The candidate provided a good join and an adequate amount of build-up on the back of the work piece to support the repair.

Overall, the candidate's technique was adequate, and the final repair was also adequate.

- safely using the appropriate tools and equipment

During the task the candidate used all tools and equipment with health and safety in mind.

Heat protective gloves were used when using all hot equipment and care taken when equipment was not in use but still hot, which could prove a hazard.

Eye protection was used during grinding and cutting staples to prevent eye damage.

- re-instating the work area.

The candidate re-instated the area correctly with all equipment stored only once it had cooled.

All waste was placed in the correct area and the area was cleared and swept.

Internal assessor signature	Date
X	

Task 2b – Photographic evidence

Vehicle 1 Jointing - Bonding

Fig 1 photographic evidence, shows that the candidate has set up the work area. The student has laid out all tools and equipment required to be used within the task.

All PPE has been set out and boots and overalls were worn.

Fig 2 photographic evidence, demonstrates the candidates completed work piece shown from the underside which the repair was carried out to.

This show the joint and a completed repair and join.

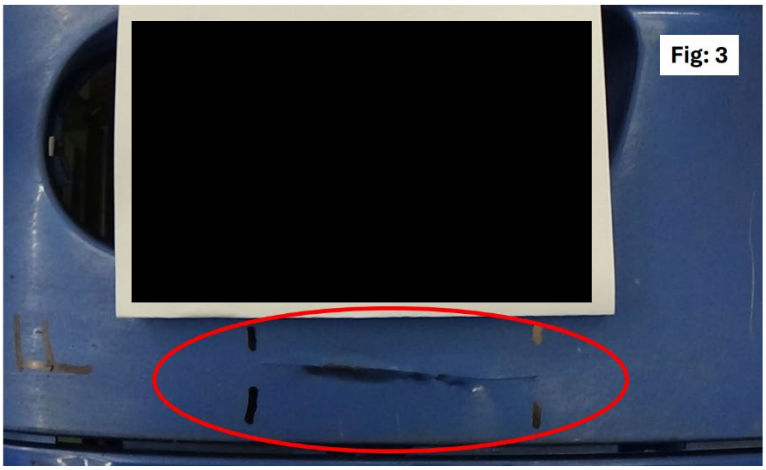


Fig 3 photographic evidence, demonstrates the candidates completed work piece shown from the outside of the repair.

This shows the join where the surface will require some further work to touch up the finish.

Fig: 4

Fig 4 photographic evidence, show the candidates has re-installed the work area.

The area has been thoroughly cleaned and swept. All equipment and tool returned, once cooled stored away.

LEV has been removed and place out of the way.

Task 2C Perform maintenance and repair activities on vehicle 2

Assessment number (eg 1234-033)	8712-315
Assessment title	Light and Electric Vehicle Occupational specialism

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	2C
Evidence title / description	Completed job card for vehicle 2 Maintenance schedule and records Assessor observation Photographic evidence
Date submitted by candidate	DD/MM/YY

Task 2C

Assessment themes:

- Health and safety
- Planning and preparation
- Systems and components
- Working with faults
- Reviewing and reporting

You must:

- prepare the work area for the maintenance and repair activities on vehicle 2
- perform the maintenance and repair activities on vehicle 2 in accordance with the planning documents produced in Task 1. This should include:
    - decommissioning and inspection of the vehicle systems
    - disassemble and reassemble the relevant system(s)
    - diagnosing and recording faults within the systems, including carrying out appropriate tests and measurements
    - safe isolation of the high voltage system
    - repairing faults and replacing components as required
    - safely using the appropriate tools and equipment
    - re-energising the high voltage system and recommissioning the vehicle
    - re-instating the work area
- record the maintenance and repair activities, to include:
    - completed job card and control documents
    - record of measurements and test results completed.

Additional evidence of your performance that must be captured for marking:
none

Candidate Evidence

Task 2c – Completed job card

Make: Toyota

Model: corolla

Reg: AO72VGN

Mileage: 9282

Work to be carried out: Vehicle not powering up

New compressor, VHC

Job description:	**Tools used:**
As this is a hybrid car with HV systems in place I blocked off the area that I was working in, using hazard barriers, since the car required a VHC to be completed I checked all the lights and the inside of the car as well as the horn, I did not check the AC compressor as I knew it needed to be removed and changed out. I raised the car and checked for leaks or any issues with the exhaust or pipes or leads, none were present, I then checked the tires tread depth and all were within a reasonable amount all around 6mm, I lowered the car, then I applied the VPE to the car, this is a HV car, so HV VPE is to be used, seat covers, steering wheel covers, wing covers, floor mats and a lot of signage to be put out, this includes signs on top of the car, near the car (like wet floor signs but for high voltage) one sign inside the car stating that I was the technician working on it and one on the steering wheel saying not to turn the car on or drive it. Once all the signage is put out, I would go inside the car and since it does not require a service, I started by using my scan tool, this gave me the code P0A0A92 which I used E3 technical to investigate and stated that it was an interlock issue. Once the interlock issue was found/located on E3 I put on my specialised PPE, overalls, gloves, face shield, and I put a rubber matt at the floor near the 12V battery, I then disconnected the 12v battery using insulated tools and made sure that the 12v is then secured so that someone couldn't just re-attach it. Once the battery was disconnected, I moved the mat to where the service plug was, i then whilst standing on the mat removed the service plug, once removed the keys and the service plug needed to go into a lockbox far enough away. I looked up how long the cars discharge time is on E3 technical, it was 10 minutes, I then waited this long, whilst waiting I obtained the new compressor that was going to be	Autel PPE Wrench E3 technical Calibrated multimer 12mm 10mm sockets

fitted. Once the discharge time was over I first completed a live dead live test which needed to have a insulated calibrated multimeter, testing it off of a 12v battery then against the pins, first with both pins on the pins and then one on a pin and the other on the car earth for both pins, if the number is negligible then the car is dead, I had to test it again on the live battery to see if it gave me the correct reading, I then unbolted the AC compressor from above to give me access to take it off from below. I required a 12mm socket and a 10mm socket. I then raised the car safely on the rubber blocks. Once raised I removed the pipes attached to the compressor and removes the hoses, once the hoses were off, I was able to take off the compressor and replace it with the new one. Once back on the ground and re attached from above, I obtained a new service plug. I then moved the rubber mat back to the door before installing the service plug, making sure that I did this whilst wearing correct PPE, I also made sure that the service plug is correctly in, then i went and re-instated the 12v battery. The system is now live again, so I got the keys from the lockbox and turn the ignition on, and I rescanned the car, clear codes and rescan again. No faults came back so the engine could switch on at any time I then removed all the VPE and signage stating that I was working on the car and that it was a live system.	

Task 2c – Maintenance Schedule and Records

Equipment/System type	Identification No.
Vehicle 2 (Electric/Hybrid)	8712-315
Brand/Model	**Location**
City and Guilds	Workshop

Equipment/System specification
• Please refer to manufacturer's vehicle specification documentation (supplied by provider).

Maintenance records					
Service No	Maintenance date	Maintenance type (fault/repair, scheduled/routine, requested)	Checked by	Repair details (where relevant)	Technician signature
01	20/4/2022	Scheduled	JS	• Carried out an annual service to manufacturer specifications.	J Smith

				Vehicle functioning as per vehicle specification following annual maintenance activity.	
02	28/5/2023	Repair	AB	• Replaced front brake discs and pads to manufacturer specifications. • Noted both front tyres are close to the legal limit.	A Bloggs
03	10/05/2024	Repair		Replaced the compressor	

Maintenance Schedule – annual unless specified otherwise					
Service No	Year	Detail inspection	Recommended planned maintenance	Service Advisor signature	Technician signature
01	2022	Annual	Annual- routine/scheduled	D Jones	J Smith
02	2023	Annual	Annual- routine/scheduled	D Jones	A Bloggs
03	2024	Annual	Annual- routine/scheduled	D Jones	

Commentary	
Service No	Recommendations for future maintenance activity
	I recommend the person comes in every 6 months or 10 000 miles

Task 2c – Assessor observation

Practical observation form

8712-315 Maintenance Engineering Technologies: Light and Electric Vehicles - Summer 2024

Candidate Name	Candidate number
Provider name	**Date**
	10/05/2024

Complete the table below referring to the relevant marking grid, found in the assessment pack.

Do not allocate marks at this stage.

This observation must cover	Assessor observation should include:	Assessment Themes
Work area preparation	• The work area preparation.	• Health and Safety • Planning and Preparation • Systems and Components
Maintenance and repair activities – vehicle 2	• decommissioning and inspection of the vehicle systems • disassemble and reassemble the relevant system(s) • diagnosing and recording faults within the systems, including carrying out appropriate tests and measurements • safe isolation of the high voltage system • repairing faults and replacing components as required • safely using the appropriate tools and equipment • re-energising the high voltage system and recommissioning the vehicle • re-instating the work area.	• Health and Safety • Planning and Preparation • Systems and Components

Notes – *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*

Work area preparation:

The candidate set up the work area by selecting the required tools and equipment and setting them out on the bench ready to access. These included HV hand tools and diagnostic scan tool and a battery maintainer.

The candidate wore standard PPE but also set out additional PPE for when HV system would be accessed. This included arch: face shield, over coat and insulated 3 piece glove set.
VPE was placed on the vehicle, this included insulated wing covers, insulated floor mat along with disposable floor mats, steering wheel and re-useable seat covers. All VPE is accurately positioned.

Area is correctly cordoned off to restrict access to area and high voltage warning signage fitted to the vehicle windows and roof. In addition, a warning sign could have been placed on the steering wheel.

Maintenance and repair activities – vehicle 2:

- decommissioning and inspection of the vehicle systems

The vehicle was fitted with a battery maintainer and the candidate used the Autel scan tool to extract DTC from the vehicle, noted on paperwork. At this stage the candidate carried out no more diagnostics and proceeded to perform a VHC. I would like to have seen some basic diagnostic checks carried out before the VHC, research the DTC using E3 Technical for example. This would have shown better sequencing of the task.

VHC was correctly preformed, and all systems checked, VHC report sheet filled in.
On completion of the VHC the candidate proceeded on to the safe disconnect. See section below.

- disassemble and reassemble the relevant system(s)

On performing the repair to the HV AC compressor the process that the candidate followed a logical process showing high level of hand skills. HV AC compressor was correctly mounted, and pipes located and secured correctly. There was a basic use of technical information although no use of a calibrated torque wrench to tighten bolts were observed.

- diagnosing and recording faults within the systems, including carrying out appropriate tests and measurements

The candidate demonstrate basic level's fault diagnosis for the HVIL, and the conclusion drawn from a single step process. All students were required to be closely observed during the service disconnect stage (CCN risk assessment) and the service plug was not inspected

before placing into the secure lock box. I would have like to have seen none-disturbance test using live data along with visual checks earlier as a supportive diagnosis procedure. A copy of the DTC technical information was requested along with a wiring diagram.

- safe isolation of the high voltage system

The candidate preformed a safe disconnect to the high voltage system.

Correct procedure was followed to check all HV PPE, and the candidate demonstrate the inspection of the insulated gloves. The candidate also demonstrate the pre-check to the multimeter, ensuring the leads and meter was in good working order and correctly rated.
Lock box was used for both the ignition key and service plug, with the 12-volt aux battery disconnected.

Then candidate also made safe the open connector on the service plug port, using insulation tape.

The candidate preformed a live dead live check to confirm an absents of voltage. One handed rule also shown. The candidate researched on E3 Technical and adhered to the discharge time before proceeding on to the LDL test. Candidate was reminded of the use of some HV PPE during the LDL test.

- repairing faults and replacing components as required

The faulty HV AC compressor was replaced and reconnected to the HV system before re-energising the high voltage. All components removed to access the HV AC compressor were refitted correctly.
The candidate requested a new service plug and was also correctly and safely refitted. (see below re-energising the HV)

- safely using the appropriate tools and equipment

All tools and equipment was checked for damage and correctly rated before performing work on the HV system. While carrying out a calibration check to the HV multi-meter the candidate selected volts instead of ohms this was then rectified. The correct and appropriate tools were selected and used during the task.

- re-energising the high voltage system and recommissioning the vehicle

The system was re-energised, and the use of PPE was used along with insulated rubber mats the one-handed rule.

The vehicle was the scanned by the candidate for DTCs and none were recorded. The exhaust

extractor was also attached, and the ready light was then displayed on the dash.
The Vehicle was then completed and ready for road test

- re-instating the work area.

The candidate returned the work area back to a tidy condition with tools and equipment stored correctly. The bench was cleaned, and floors swept.
Area was cleared of all waste material and placed in the appropriate areas.
HV tools and equipment along with the HV PPE was stored correctly and safely to prevent any damage or wear.
The vehicle was clear of all VPE and ready for the customer.

Internal assessor signature	Date
X	

Task 2c – Photographic evidence

Vehicle 2 Hybrid Electric

Fig 1 photographic evidence, shows that the student has completely prepared the work area in readiness to start the task.

All protection barriers fitted to HV work area before commencing work.

Area is correctly cordoned off to restrict access to area. HV PPE has been set out ready to use.

Tools are available to use with the battery maintainer.

Fig 2 photographic evidence, shows that the student has, *High voltage warning signage fitted to the vehicle windows and roof.*

A signature of candidate on the relevant document card placed on the dash, to assign responsibility for the work carried out on the HV system.

Fig 3 photographic evidence, shows vehicle 2 has insulated VPE wing covers fitted.

Fig 4 photographic evidence, clearly shows the interior of vehicle 2 is correctly prepare using VPE before work commences. The use of disposable floor mats, steering wheel and re-useable seat covers. All VPE is accurately positioned.

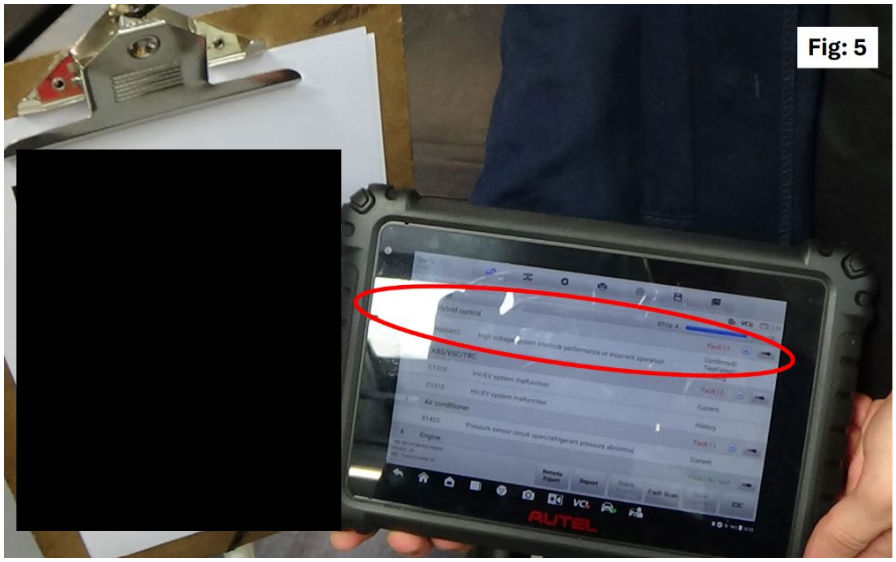


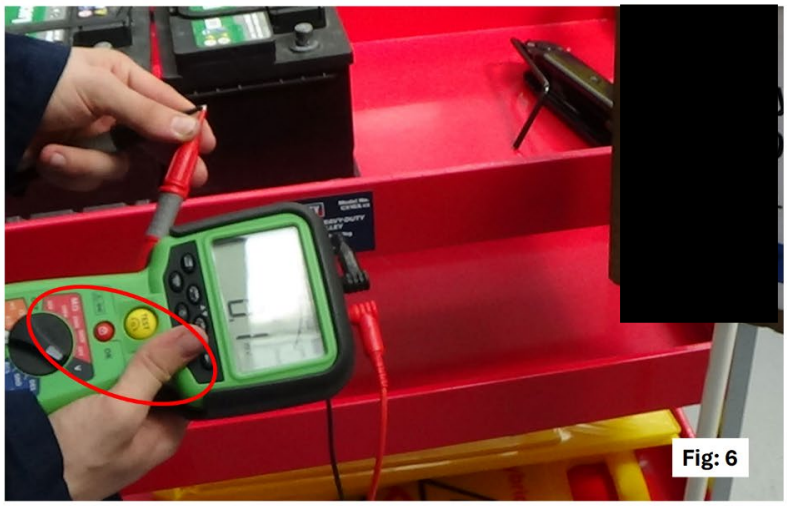
Fig 5 photographic evidence, displays the candidate's use of the scan tool to extract a diagnostic trouble code.

Fig 6 photographic evidence, displays the candidate's use of the HV multi-meter.

The candidate demonstrated the calibration of the multi-meter before using to perform LDL, safe isolation test.

During the calibration process the candidate incorrectly set the multi-meter to volts not ohms. This was addressed before the safe isolation test.

The correct HV PPE worn during the disconnect



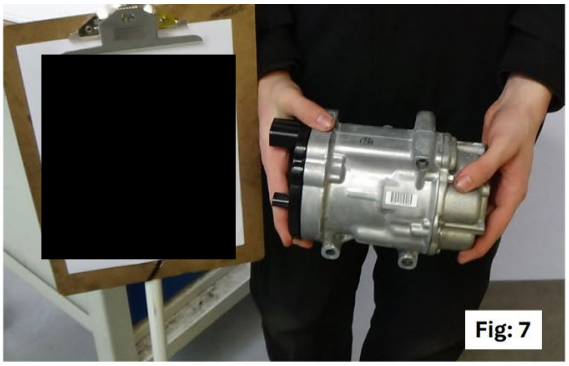


Fig 7 photographic evidence, shows the candidate holding the faulty HV AC compressor before replacing with a new unit.

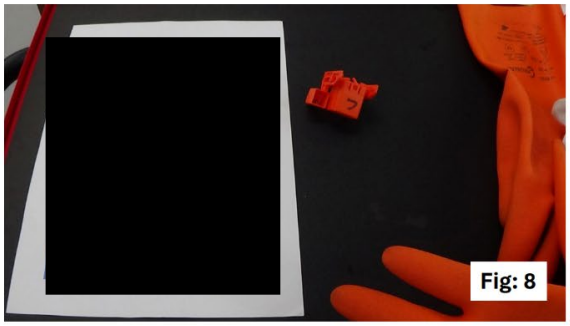


Fig 8 photographic evidence, shows the faulty Service disconnect plug, before replacing with a new plug.

Fig: 9

Fig 9 photographic evidence shows the candidates work area re-instated on completion of the task.

Vehicle return to correct operation. Ready light displayed.

Work area has been cleaned and swept with all tools and equipment return

All tools and equipment correctly return to correct place.

Warning signage and some barriers removed and store.

All HV PPE correctly stored and safety.

Task 3A Review and report the service, maintenance and repair activities

Assessment number (eg 1234-033)	8712-315
Assessment title	Light and Electric Vehicle Occupational specialism

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	3A
Evidence title / description	A technical report Revised maintenance schedule
Date submitted by candidate	DD/MM/YY

Task 3A

Assessment themes:

- Health and safety
- Systems and components
- Reviewing and reporting

You must:

- produce a technical report for your manager, covering both vehicles and includes the service, maintenance and bonding/joining activities. This should typically be 850 words and must include:
    - a review of the service, maintenance and bonding/joining activities, including fault diagnosis/detection techniques used and suggestions for future improvements
    - the faults found and how they were rectified
    - any outstanding faults, including recommendations that may require attention before the next planned maintenance activity according to the current maintenance schedule
    - reporting of stock levels and waste disposal
- produce a revised maintenance schedule for vehicle 1 from your activities and findings, this should include:
    - recommendations for future planned maintenance including justifications
    - due date of next service and maintenance activity.

Additional evidence of your performance that must be captured for marking:
none

Candidate Evidence

Task 3a – Technical report

Technical Report	**Car regs: MW57 EPK** **EV car reg: AO72 VGN**
On the sixteenth of April I conducted a service on the Vauxhall astra H this car had 121083 miles on it so I conducted the service for 120000 miles, before I started the service, I would apply all my VPE this includes the cars steering wheel cover and the floor mat along with the seat covers and the wing covers. This service included checking all the seatbelts checking the horn and all of the lights I also checked the AC was working and that the wipers worked which they both did, the once outside I checked the wiper blades condition they were fine, then I checked all the fluids under the bonnet, making sure that they were acceptable tolerances' this included the battery's health, the battery was tested with a battery test kit and the condition was "good and pass". I then took off the oil filter as it was accessible from the top of the engine bay, I then checked the air pressure of the spare tyre making sure that it was at an acceptable level. Once the car was fully tested under the bonnet I put blocks underneath to secure the jacking points on the car as the lift was going to be raised, once I was done putting the blocks under I raised the car to half way checking a little off the floor for an obligatory check of whether the car was going to rock or not, I rocked the car and it didn't move which means its secure. Then I raised the car to the half way point, once half way I checked all of the tyres pressures, and had a look inside of the wheels with a torch to visually check the vehicle the front brakes looked brand new, the back ones however were getting to the end of their life, I would recommend the customer gets them replaced, once all tyre pressures and brakes have been checked I would raise the car fully, checking underneath he car as well as the walls of the tyres and the tread depths with the tread depth tools all the tyres were above 5mm which is an acceptable amount and no comment on the life of them, they should last a while. Once the tread depths have been registered, I would start to drain the oil into the oil drainer, whilst the oil is draining, I went down the car checking the exhaust and the rear wheels and insides, brake lines pipes and hoses, also checking that the sensors were okay. When the oil was drained I re attached the sump plug and lowered the car, once	

lowered I would attach a new oil filter and refill the car with fresh oil, I had the specified amount of oil the car needed on E3 technical, it required 4.5L which is how much I put into the car. I reinforced this by checking that the dip stick was displaying an appropriate level of oil. I then changed out the air filter under the bonnet. I then ran the car whilst diagnostic scanning to find the EML issue which turned out to be a O2 sensor not working, I used E3 technical to find where the fault was and it was at the front of the engine, using the correct tools I then removed the O2 sensor. Once removed it was disposed of before I obtained a new one, once I obtained the new one, I installed it making sure to connect both sides of it. The engine was also rough running which I struggled to find at first, I checked the whole engine visually and auditorily for anything out of place, I could not see or hear anything though so I tried to fault find it, it did not display on the scan tool, however a historic code showed that there had been a fault with the third spark plug in the engine before, therefore I took the engine cover off and removed the ignition pack, then removed the spark plug from cylinder three, once removed I could see clearly that the spark plug had been bent closed. I replaced the spark plug with a new one. Once replaced I re-instated all of the engine and ran it listening to see if it was still rough running which it wasn't. if I were to do this again, I would fault scan first to find the fault in the car and be able to sort it as I'm going through the service as long as it doesn't affect the cars performance Now that the car was re-instated it was ready however the bumper needed to be repaired. On the 18/04/2024 I repaired the bumper, I done this by plastic joining the sides of the cut together. I don't this by using a plastic welding tool, a heat gun, plastic filler and a grinder along with some staples, I started by putting the piece onto the table, making sure that it was as flat as possible but still holding its natural curve, once it was on the table I turned the ventilator on before I started to use the tool to melt the staples into the bumper to close the gap and make sure it's all together flat. Once it was together flat, I ground the staples legs off. Once ground off it allowed for more access with the welding tool. I used it in a way that melted into the plastic before pulling it out and moving down slightly allowing it to melt itself into the plastic again going deep enough that the split was being joined but not too deep to go through the other side. Once I had done this the whole length of the split, I turned the joiner off and swapped to the plastic heat gun to soften the joins, I then used the filler gun to fill the split with plastic to make it sturdy and hold. Once filled I would have sanded the back down to make it so that the bumper behind is back to how it was, the bumper on the front side should be flat without a lip on it. Id then clean the bay that I was using.	

On the 17/04/2024 I repaired the hybrid car, the Toyota corolla 1.8L it had done 9283 miles, but it did not require the service to be completed just a simple VHC to start the VHC I checked all around the car making sure that there were no leaks or spillages near it, that the work area was clean and that the vehicle did not have any scratches or dents. I then blocked off the area of work so no one could get in I done this using barriers. Then I applied all the VPE floor mats steering wheel covers seat covers and wing covers. Once the car has been canvased and I've made sure that there were no leaks I would make it so that the blocks were under the car so that It is ready to lift up, then id check inside the car making sure that the lights and horn work, id also plug in the scan port to get ready to be able to scan the car for its fault, I used the scan tool and found the code which related to the interlock not being closed or not found. I went onto E3 technical and researched the code which told me that it was in the battery in the rear passenger area. Once diagnosed I removed the keys and the scan port, I put the keys into a lockbox far enough away that there isn't any chance of the car being accidentally switched on. I then disconnected the 12V battery from the car making it so that the earth cable was covered with something so someone couldn't just re attach it. Once disconnected I moved the rubber mat to the side of the car which had the interlock plug on it. I then equipped all my special PPE to deal with electric cars which was HV gloves HV overalls and a face shield to prevent the car for arcing to my nose. Once all PPE was on, I then using the one-handed rule disconnected the service plug fully, replacing it with a bit of tape so that it is distinguishable that it is supposed to be left alone whilst walking to the lockbox I saw that the interlock part of the service plug was bent which was what was causing the fault to come up and the ready light to not come on. Once in the lockbox I waited 10 minutes (the discharge time for this car) whilst I was waiting, I requested a new AC compressor and a new service plug with interlock to be put into the lock box and the compressor to be put near the work area. Now that the car is discharged, I would test it bby moving the rubber mat to the side of the area to perform a live dead live test, testing a live battery then the pins to make sure that the voltage is negligible, then back to the battery to make sure the multimeter isn't faulty. Then I would start to undo the compressor from on top down through the engine bay, since the car is discharged I can use the non-insulated tools, using these tools I would disconnect the top parts of the AC compressor, once they are disconnected I removed the bottom parts of the AC compressor, having the car up in the air also allowed me to have a reach on the ac compressor to pull it out easier, using gravity to let it down, once the bolts were removed I detached the AC compressor and disposed of it. I would also test the tread depth whilst it is up above. Then I re-attached the new one putting the bolts in from below first then	

lowering the car and putting the top bolts in. once the bolts are in and the compressor hoses are connected again I can go to the lockbox and get the new interlock service plug out to get ready to re attach it, wearing the PPE again and standing on the mat I would using one hand make sure that the service plug is connected properly. Once the service plug is connected properly I would re attach the 12V battery. Once the 12V is reconnected I would re attach the scan plug to scan the car again, and get the keys from the lockbox, once scanned the car came back with no faults, once the car came back with no faults then I tried to run the car, no ready light came on though, so I believe that there is another fault, a mechanical fault. In future if I had more time, I would research into it more to be able to figure out what was stopping the ready light.	

Task 3a – Revised maintenance schedule

Revised schedule -	Reason
2 months	Due to the brakes of the car at the rear being low but not past the limit I'm suggesting that the customer comes in in 2 months to get the brakes replaced
Then a month later	Come in to check the tread depth and the vehicle fluid levels, to make sure that there are no leaks and that the tread depth hasn't decreased a substantial amount
From then come in every 3 months for VHCs and a service	This is because the car has over 100k miles on it. If it were a newer car, it would be every 6 months
	I would suggest for the service that when the new oil filter is delivered you obtain a new sump plug as well to swap out for the older one to make sure that they don't get destroyed or over tightened/ sheared off I would also suggest that the dust pollen filter is done every 3 months

Task 3B Peer Review

Assessment number (eg 1234-033)	8712-315
Assessment title	Light and Electric Vehicle Occupational specialism

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	3B
Evidence title / description	Completed peer review forms Candidates amended document following peer review
Date submitted by candidate	DD/MM/YY

Task 3B

Assessment themes:

- Health and safety
- Systems and components
- Reviewing and reporting

You must:

- produce a technical report for your manager, covering both vehicles and includes the service, maintenance and bonding/joining activities. This should typically be 850 words and must include:
    - a review of the service, maintenance and bonding/joining activities, including fault diagnosis/detection techniques used and suggestions for future improvements
    - the faults found and how they were rectified
    - any outstanding faults, including recommendations that may require attention before the next planned maintenance activity according to the current maintenance schedule
    - reporting of stock levels and waste disposal
- produce a revised maintenance schedule for vehicle 1 from your activities and findings, this should include:
    - recommendations for future planned maintenance including justifications
    - due date of next service and maintenance activity.

Additional evidence of your performance that must be captured for marking:
none

Candidate evidence

Task 3b – Peer review forms

Assessment ID	Qualification number
Candidate name	**Candidate number**
Provider name	**Provider number**
Date	**Series**

Question	Feedback
How well does the job card for vehicle 1 record the service work completed and align to the planned maintenance activity?	The service is recorded in a timely manner and in a way that is approachable by anyone Maintenance was completed in a straightforward way, making sure that the faults were diagnosed quickly to make sure that the service didn't impair the readings.
How appropriate are the recommended service works to complete and why?	The recommended service is very appropriate as it completes all the main points of a service, air filter oil filter new oil and fluid checks/ top ups. They even included an obligatory check of a VHC before starting anything on the car
What are the implications to the business of the proposed job card for vehicle 1?	There are very small implications to the business as the only thing taken from the business is time and new parts, this costs money. The disposal of the oil is also a part which the business will need to do by specialised people, this will also cost more money.

How could the job card be optimised/ improved?	For a while it seems that the values are pulled from air, no technical data is mentioned till over halfway into the service. He waited to complete the service to fix the faults, I recommend fixing the faults before the service in this case as they did not affect the service. Although it is not required, they could have mentioned about the disposal of the oil correctly, yes it goes into a oil drainer but it shouldn't just sit in it forever and will need to be disposed of properly. They also do not mention a exhaust extractor in any of the VPE or when running the car which is bad for pollution

Assessment ID	**Qualification number**
Candidate name	**Candidate number**
Provider name	**Provider number**
Date	**Series**

Question	**Feedback**
How well does the job card for vehicle 1 record the service work completed and align to the planned maintenance activity?	The service includes all that a service should, it even mentions about the regulations and acts that each thing is relevant to, the services progression in the way of doing things is exceptional, The maintenance is also done in a timely manner, they done the service so that they could solely focus on one thing which was the maintenance issues.

How appropriate are the recommended service works to complete and why?	The recommended service is appropriate as it contains all the under-bonnet items such as fluids and battery tests, but it also contains things such as the oil filter being replaced and the cabin/air filter being replaced.
What are the implications to the business of the proposed job card for vehicle 1?	The only implications to the business that the vehicle having a service on it has is that the ramp is being used and that the disposables, oil filter, oil, air filter, are being used up and will need replacing costing the company money and their time.
How could the job card be optimised/ improved?	The job card could be improved by including the maintenance that is required in the “task to perform” area, They could also improve by, when replacing the air filter, they mention taking out the air filer/cabin filter and then replacing it, they talk about both tasks twice. They could shorten their job card and make it easier to understand by removing this duplication.

Task 3b – Candidates amended document

Make: Vauxhall

Model: astra H

Reg: MW57EPK

Mileage: 121083

Job Description:	**Tools used:**
I started by doing a ~~VHC~~ body health check around the car checking for any damage/scratches then I applied the VPE to the car, this includes items such as, wing covers, floor mats, steering wheel covers, seat covers, at this stage I also put the rubber blocks under the jackings points. I then used a scan tool to check the cars diagnostic trouble codes, to see if doing the service would interfere with the EML which it didn't as the fault was a O2 sensor I could have then gone and got the wiring diagram for the O2 sensor and for the fuse box to be able to tell what fuse it is. I then began the service, I checked the interior of the car, the seatbelts, and the doors then I checked that the lights worked, this includes, dipped, main beam, side lights, indicators, brake lights, reverse and both front and back fogs. I Noted down all that do not work (All were working in good condition), whilst in the driver's side I opened the bonnet of the car. Once outside the car andunder the bonnet I attach the battery maintainer, then I checked that the fluids are all within the limits which they all were so I test the liquids, I did this by, checking the coolant using a hydrometer, this coolant was able to go to -23 and then I checked the brake fluid with a brake fluid tester the boiling point of the brake fluid was 168 degrees E3 technical stated that it required Dot 4+ (LV) ISO class 6. I also made sure the power steering was also full. It is now that I loosened the oil filter. Next, I assessed the batteries condition, using the battery tester I concluded the battery was a good battery with voltage of 12.72. I then went to the back of the car and tested the air pressure of the spare tire, on E3 technical it stated that all tires including the spare had to be of 1.9 bar. Once everything had been tested, I raised the car a small amount before shaking the car to make sure that the supports are properly under the jacking points which it was. I then raised it to halfway up. While it was halfway up, I tested for play in all the tires before testing the air pressure, I raise acouple tires and lowered one, all of them had to be 1.9 bar. I also looked inside of the tires using a torch to visually check the brakes. I also had a quick look and feel of the suspension to make sure that it	Battery maintainer Hydrometer Brake fluid test Battery tester E3 technical Torch Oil drainer Fresh oil Sump plug tool 19 socket

was not snapped or warped. I also made sure that the wheels could be pun and turned. I then raised the car the whole way up, whilst its up this high I was able to check the tread depth, the tread of all of the tires where of a good standard, not dropping below 5mm, the fronts were, Front Left was, 5.7, 6.1 and 6 Front Right was, 5.9, 6.5 and 6.2 the Rear Left was 5.7, 6 and 5.7 the Rear Right was 5.7, 6.1 and 5.8. Whilst being up on the ramp I was able to check behind all the tires, starting with the front, I turned it out and check that all the cables and pipes were connected and had not had a tear in them, then I turned the wheel inwards and check the other side of the same tire before moving onto the other side of the car, I then performed the same checks before moving the oil drainer and removing the sump plug to drain the oil into it, the sump plug required a 19 socket to be removed. Whilst the oil drained into the drainer, I checked the exhaust system and made sure that the rubber bushings that hold the exhaust are in good health and that the exhaust itself does not have any issues I should have also checked the brake pad depth whilst the car was up top to give an accurate reading so that the customer is able to have a defined date on when the car needs its next set of brakes. Moving down the car, at the rear I checked the tires, performing the same checks as the front. Whilst the oil is draining, il got the new filter and the container of new oil and the new air filter for later. Once the oil is drained. I re-installed the sump plug I should have torqued up the sump plug to what was required on E3 technical, before lowering the car to the ground. Once on the ground I installed the new oil filter the oil filter should also be torqued up at the correct NM for the filter and checked on E3 technical how much oil the car is supposed to have, E3 technical stated that the engine required 4.5L of oil, this oil being 5w 40. Back under the bonnet I changed the air filter for a new one and filled the engine with the specified amount of oil, then I checked the dip stick, wiped it off and put it back in and checked it again to see if the oil amount was correct. After filling the oil I used a torx screw driver so undo all the screws holding the air filter in place, then I replaced the air filter with a new one, then I reinstalled the screws and the cover. Now that the car has had a complete service, ~~I ran the car after putting~~	5W 40 oil Ratchet Oxygen sensor tool Spark plug tool

~~the exhaust extractor on. Whilst running the car hot I would fault diagnose again but this time go into the specific area for EML~~. The fault that appeared ~~was~~ when I used the DTC at the start of the service was P0135-04, E3 technical showed me that the fault was at the front of the engine bay. ~~Once I diagnosed where the fault was I went to live data on the autel device and checked whether there were any readings on the graphs,~~ I would then go to the fault area, since there was only one oxygen sensor at the front of the car I could have tested the fuses to make sure that the oxygen sensor was getting power, if it wasn't then there would have been a completely different fault. deducted that it was either broken or faulty, either way needing to be replaced, I took the oxygen sensor out and asked for a new one which I replaced it with check if it has a torque setting. Once replaced I ran the car for a couple minutes with the exhaust extractor onbefore rescanning the car, once re scanned nothing came back as a fault, which means I had successfully fixed to oxygen sensor, however the car was still rough running which is an issue. I first ran the car to get the engine warm, then I diagnosed the engine control module which had no faults in it, as no faults where displayed I had no reason to expect that it was a sensor, I now had to wait a short while to make sure that I did not burn myself on the engine now that it was warm. ~~h~~However to be sure I visually checked for a sensor that was disconnected or had a poor connection, I found nothing so I checked if there was an air leak in the air filter pipes, there was no audible tell or any visual issues so this was then voided from the issues, the only thing left that could have caused it to rough run and have an issue idling is the spark plugs themselves, I ran the car some more before scanning again and seeing If there was a code, a code came up but it wasn't present, it was a historic code, the code stated that there was an issue with spark plug 3. Although the fault wasn't present on the autel I decided to check the spark plug, I took off the cover and looked at the spark plugs, I took out spark plug 3 with the spark plug tool, the gap between the spark plug was not sufficient to create a spark so I obtained a new plug, I then put the plug into the car and made sure to torque it up to the required amount, I then re installed everything I had taken off to get to the spark plugs, once everything was back together I ran the car for a short length of time to see that the rough running had stopped and the car was idling nicely. I then asked a trained technician to take the car for a test drive to make sure that the faults had been sorted, I took off the wing covers before it was taken for a test drive and the rest of the VPE when they returned, once all VPE was taken off I cleared all codes and removed the service light.	

Suggest that the customer comes back for a check up on their brake fluid and their brake pads to make sure that they are sufficient. **Technicians' notes:** Suggest that the customer gets his rear brakes replaced	

Task 4 Complete Handover

Assessment number (eg 1234-033)	8712-315
Assessment title	Light and Electric Vehicle Occupational specialism

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	4
Evidence title / description	Handover document Assessor observation
Date submitted by candidate	DD/MM/YY

Task 4

Assessment themes:

- Reviewing and reporting

You must now hold a meeting with the manager to return to service and complete handover procedures, including:

- demonstration of vehicles' functionality
- welded/joined bumper repair
- confirmation of work completed
- amended job card for vehicle 1 and how they addressed peer review feedback, including any suggested changes that were not made and why
- appropriate handover documentation.

Additional evidence of your performance that must be captured for marking:
none

Candidate evidence

Vehicles:

Vauxhall astra H (MW57EPK)

Toyota corolla (AO72VGN)

Work completed:

Service and maintenance on a petrol car (vehicle one)

VHC and an electrical fault on a EV, also changed the AC compressor

Repaired a bumper for vehicle one

Repair done on vehicle one:

Completed a service,

Changed the O2 sensor after using scan tool

Changed spark plug after diagnosing it from trial and error.

Repair done on vehicle two:

Completed a VHC

Discharged, live dead live,

Changed AC Compressor.

Installed new interlock plug as it was bent.

Repair done on the bumper:

Plastic welding on the rear to close the split and create a sturdy join

Technician signature:

Manager signature:

Task 4 – Assessor Observation

Task 4 Practical observation form

8712-315 Maintenance Engineering Technologies: Light and Electric Vehicles - Summer 2024

Candidate Name	Candidate number
Provider name	**Date**

Complete the table below referring to the relevant marking grid, found in the assessment pack.

Do not allocate marks at this stage.

This observation must cover	Assessor observation should include:	Assessment Themes
Handover	• the handover of the work completed.	• Health and Safety • Reviewing and Reporting

Notes – *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
Handover: Introduction Overview of tasks - Candidate introduced themselves and made a very brief overview to the tasks carried out. • Details of Vehicle 1 - Operation/functionality demonstration VPE discussed. Demonstrated vehicle operating correctly with no warning lamp shown. Described faults and the repairs. Explained fault procedure and use of scan tool. Details on the service procedure and use of WIS for technical information. • Details of Joining task - Described process in good, detail of all tools and their use. Reflection on how the quality of the work could be improved.

Discussed the use of PPE during the task.

- Details of vehicle 2 - Operation/functionality demonstration

Discussed and described the use of all VPE barriers, signage, and insulated equipment.
Cover all the HV PPE and demonstrated how to test the gloves.
Explain the fault (HVIL) and the use scan tools and showed the area of the service plug.
Describe some of the process to safe disconnect of the HV system, including discharge time.
Described element of the live dead live process.
Describe the second fault HV AC compressor.
Out lined the re-energising process.
Included that the candidate carried out a VHC.
Demonstrated the ready light displayed – included the use of LEV required.

- Peer Review Job Card vehicle 1

Candidate described in brief some changes made to his vehicle 1 job card based around the peer review. There was also some brief justifications as the why they were made.

- Handover documents

All documentation was handed over, including all job cards service sheet, fault diagnostic research. Also included was the reports, reviews and handover document. Although no explanation of these documents were given

- Communication Skills

The candidate was relaxed and had a confident tone. He was also clear to understand and communicated his knowledge well. The candidate used limited basic technical language.

- Overall Presentation

During the handover a logical process was shown to progress around the vehicles. The correct operation of both vehicles were covered and demonstrated. Although it would have benefited from more time taken to explain detail using increased technical language. Health and safety was addressed with some detail.

Internal assessor signature	Date
X	

Get in touch

The City & Guilds Quality team are here to answer any queries you may have regarding your T Level Technical Qualification delivery.

Should you require assistance, please contact us using the details below:

Monday - Friday | 08:30 - 17:00 GMT

T: 0300 303 53 52

E: **technicals.quality@cityandguilds.com**

W: **http://www.cityandguilds.com/tlevels**

Web chat available **here**.