



Content

IMI Level 1 Award in Automotive Maintenance
Qualification ID No: 603/7605/3

IMI Level 1 Certificate in Automotive Maintenance
Qualification ID No: 603/7606/5

IMI Level 1 Diploma in Automotive Maintenance
Qualification ID No: 603/7607/7

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For Office Use Only		
Issue and date	Change detail	Section/page
Issue 1 April 2021	Original	N/A
Owner: Product Development		

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Unit L1AM01: Health and Safety in the Workplace

Rationale: This unit enables learners to develop knowledge, understanding and skills of the health and safety requirements when carrying out simple maintenance and repair tasks in the workplace. This unit covers the general requirements of health and safety in the workplace including personal responsibilities, common hazards and risks, manual handling, health and safety information, fire prevention and emergency evacuation procedures.

Learners are required to complete a plan of the workplace highlighting the Health and Safety information, equipment and notices.

Unit Content	Learning Outcome
Know health and safety requirements and information used in the workplace, to include: <ul style="list-style-type: none"> a. Personal responsibilities, to include: <ul style="list-style-type: none"> i. following health and safety notices and instructions ii. complying with instructions and procedures iii. using PPE and VPE equipment iv. behaving responsibly and safely v. being aware of others b. Common hazards and risks associated with: <ul style="list-style-type: none"> i. electrical equipment and trailing leads ii. airlines and air powered tools iii. hazardous substances such as: fuels, de-greasers, cleaners, thinners iv. movement of vehicles v. waste materials vi. faulty tools and equipment vii. lifting, jacking and supporting vehicles viii. inappropriate behaviour ix. failing to use appropriate PPE and VPE c. Awareness of others, to include: <ul style="list-style-type: none"> i. the risk posed by the action and conduct of colleagues in immediate vicinity ii. the possible risks to others posed by your own actions and conduct iii. the risks posed by the type of work being carried out by colleagues d. Main health and safety information and notices, to include: <ul style="list-style-type: none"> i. fire and emergency exits ii. actions in the event of a fire or emergency iii. health and safety instructions iv. use of health and safety equipment 	1

<p>Know the safe manual handling techniques used in the workplace, to include:</p> <ul style="list-style-type: none"> a. Safe manual handling practices and procedures, to include: <ul style="list-style-type: none"> i. use of PPE ii. correct lifting technique iii. carrying technique iv. planning and moving the object to be transferred v. how to find current manual handling information b. Manual handling equipment, to include: <ul style="list-style-type: none"> i. jacking equipment ii. cranes iii. hoists iv. chains, slings and wire ropes v. vehicle lifts and stands vi. skates and dollies vii. trollies and sack trucks 	2
<p>Know the local legislation procedures associated with working in the workplace, to include:</p> <ul style="list-style-type: none"> a. Common hazardous substances include: <ul style="list-style-type: none"> i. introduction to COSHH and basic principles ii. liquids – petrol, diesel, oils, brake fluid, cleaners, paint, thinners iii. gases – exhaust, welding and heating equipment iv. solids – used and contaminated components b. Procedures for disposing of waste materials, to include: <ul style="list-style-type: none"> i. waste oil and filters ii. used and faulty units and components iii. cleaning materials iv. volatile materials – petrol filters, petrol engine components v. used vehicle body materials, paint, and thinners 	3
<p>Know about fire prevention and emergency procedures, to include:</p> <ul style="list-style-type: none"> a. Fire prevention and emergency procedures to include three elements necessary for a fire: <ul style="list-style-type: none"> i. oxygen ii. fuel iii. ignition source b. Fire extinguishers, to include: <ul style="list-style-type: none"> i. water ii. powder iii. gas – CO2 iv. foam v. fire blanket c. Procedures to follow in an emergency, to include: <ul style="list-style-type: none"> i. in the event of a colleague suffering an electric shock ii. in the event of a serious accident iii. sounding alarm iv. use of appropriate fire extinguisher v. evacuation of premises 	4

Unit L1AM02: Tools, Equipment and Consumable Materials for Vehicle Maintenance

Rationale: This unit enables learners to develop knowledge, understanding and skills relating to the use of common tools and equipment used for vehicle maintenance and repairs; the unit also covers the appropriate selection and use of consumable materials used during these activities.

Unit Content	Learning Outcome
<p>Know a range of tools and equipment used in vehicle maintenance and repair, to include:</p> <ul style="list-style-type: none"> a. Hand tools for vehicle maintenance and repair, to include: <ul style="list-style-type: none"> i. spanners – open end, ring, combination, speed and ratchet types ii. screwdrivers – flat blade, Phillips, pozidrive iii. hammers – ball pein, lump, copper/hide, rubber, neoprene iv. chisels v. saws – hacksaw, junior hacksaw vi. steel rule and tape measure vii. allen keys and torx bits viii. socket sets – different drive sizes, specialist socket and screw bits, stud remover adaptor ix. pliers and grips – long nose, engineers, side snips/cutters, pipe grips, vice grips xi. torque wrench xii. feeler blades and tyre tread depth gauges xiii. hammers – panel beating, general purpose xiv. panel gap gauges xv. pressure washer xvi. polisher xvii. sanders xviii. masking dispenser b. Equipment to include: <ul style="list-style-type: none"> i. lifting equipment – jacks, ramps, lifts, axle stands ii. air tools – air lines, tyre inflator/gauge, wrenches, hammers, blow guns iii. bench tools – grindstone, pillar drill, spray regulators and filters iv. portable electric tools – hand drills, extension leads, component cleaners v. specialist tools – tracking gauges, filter removal straps, waste oil drainers, exhaust extraction including dust vi. selecting appropriate and necessary equipment for task vii. welding equipment viii. infrared drying equipment 	1

<p>Continued from previous page.</p> <p>c. Outline the type of checks which are carried on tools and equipment prior to use, to include:</p> <ol style="list-style-type: none"> i. secure and on even ground ii. leaks iii. damage to pipes, cables or connections iv. evidence of damage or abuse v. the equipment is appropriate for the task vi. certification/'tested' stickers are visible vii. guards are in place viii. service records are up-to-date ix. stop/emergency cut off buttons or devices are working and within the operator's reach x. tools are lubricated where necessary xi. safe working loads <p>d. Using tools and equipment, to include:</p> <ol style="list-style-type: none"> i. using manufacturer's instructions ii. safe working procedures iii. safe working limits iv. specialist training requirements v. legal requirements vi. reporting of defects vii. adjust settings viii. set pressure ix. zero readings x. examine for defects xi. locate correctly – axle stands and jacks xii. use when appropriate – exhaust extraction when engine is running 	1
<p>Know a range of consumable materials used in vehicle maintenance and repair, to include:</p> <p>a. Identify a range of consumable materials used in maintenance and repair, to include:</p> <ol style="list-style-type: none"> i. lubricants ii. coolants iii. fluids iv. adhesives and cements v. sealers vi. filters vii. aerosol sprays viii. gaskets ix. cleaners x. body fillers xi. paint materials xii. anti-corrosion materials xiii. cleaning and valeting products <p>b. Locating information relating to consumable materials used in maintenance and repairs, to include:</p> <ol style="list-style-type: none"> i. product manufacturer's websites ii. manufacturer's representatives iii. manufacturer's online training videos iv. technical helplines v. promotional brochures vi. product catalogues vii. trade shows 	2

<ul style="list-style-type: none">viii. product demonstrations c. Using consumable materials used in maintenance and repairs, to include:<ul style="list-style-type: none">i. access and use of product safety informationii. the purpose and limitations of the materials and consumablesiii. how to prepare the materials and consumablesiv. the safe use of the materials and consumablesv. tools and techniques for safe usevi. the clean-up processesvii. waste disposal procedures	
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Unit L1AM03: Engine Operation and Components

Rationale: This unit enables learners to develop knowledge, understanding and skills associated with the basic operation of common internal combustion engines and components. The unit also requires learners to carry out routine engine maintenance procedures. This unit is designed to be used on a range of vehicle types which can include: light and heavy vehicle, motorcycle and ATV and, land-based vehicles as examples.

Unit Content	Learning Outcome
<p>Know the common internal combustion engine systems and components, to include:</p> <ul style="list-style-type: none"> a. 4 stroke engine components, to include: <ul style="list-style-type: none"> i. cylinder block ii. cylinder head iii. engine sump iv. crankshaft v. connecting rod vi. pistons and rings vii. camshaft viii. valves ix. inlet and exhaust manifolds x. turbocharger xi. flywheel xii. front drive pulley xiii. gaskets and seals b. 2 stroke engine, to include: <ul style="list-style-type: none"> i. cylinder: inlet, exhaust and transfer ports ii. crankshaft iii. connecting rod iv. pistons and rings v. crankcase and seals vi. rotary disc and reed valves c. Outline the purpose of the main engine systems, to include: <ul style="list-style-type: none"> i. induction system to include: fuel injector and carburettor ii. low and high-pressure fuel delivery system to include: fuel pumps, injector, filters, fuel lines iii. exhaust system including turbocharger iv. lubrication systems including total loss v. cooling system – air and liquid cooling vi. starting system d. Outline the range of vehicles and typical application of engine types, to include: <ul style="list-style-type: none"> i. light and heavy vehicle ii. motorcycle and all-terrain vehicles (ATV) iii. land-based, grass cutting equipment, tractors and combined harvesters iv. construction plant, 360 digger and back-hoe machinery v. industrial equipment, forklift trucks and powered access vehicles 	1

<p>Know how common internal combustion engines operate, to include:</p> <ul style="list-style-type: none"> a. The operating cycles for engines, to include: <ul style="list-style-type: none"> i. stages of operation - induction, compression, power and exhaust ii. piston position and movement including port timing iii. firing orders for 4-cylinder engine iv. engine terminology – bore, stroke, capacity, TDC, BDC, compression ratio v. mixing of fuel and air b. Valve and injection timing, to include: <ul style="list-style-type: none"> i. piston position when opening and closing valves and ports ii. piston position for timing of injection c. Air to fuel ratios between SI and CI engines, to include: <ul style="list-style-type: none"> i. CI: compression of air only ii. SI: 14.7 – 1 stoichiometric ratio iii. range of air/fuel ratios d. Exhaust emissions, to include: <ul style="list-style-type: none"> i. SI engine exhaust gas emissions - H₂O, O, N, CO₂, CO, HC ii. CI engine exhaust gas emissions - NO_x, particulates iii. 2 stroke exhaust gas emissions - H₂O, O, N, CO₂, CO, HC, lubricating oil 	2
<p>Know how to carry out routine maintenance to engine mechanical components, to include:</p> <ul style="list-style-type: none"> a. The correct process and procedure for: <ul style="list-style-type: none"> i. removal and replacement of a cylinder head for the engine used ii. common faults associated with coolant loss and damaged cylinder head gasket b. General: <ul style="list-style-type: none"> i. following safe working practices including risks and hazards associated with the task ii. selecting and using appropriate information, tools and equipment for the task iii. following manufacturer's procedures iv. checking correct operation of systems and components on completion of task v. correct disposal of waste materials 	3

Unit L1AM04: Lubrication System Components and Maintenance

Rationale: This unit enables learners to develop knowledge, understanding and skills associated with the basic operation of engine lubrication systems and components. The unit also requires learners to carry out routine maintenance associated with engine lubrication system components.

Unit Content	Learning Outcome
<p>Know about engine lubrication systems, to include:</p> <ol style="list-style-type: none"> a. The main components in engine lubrication systems, to include: <ol style="list-style-type: none"> i. lubricants - natural and synthetic ii. engine sump iii. oil pump and strainer iv. pressure relief valve v. oil filter vi. oil galleries b. Purpose of main engine lubrication components, to include: <ol style="list-style-type: none"> i. lubricant - purpose and function: cooling, reduce friction, remove by-products, reduce corrosion ii. lubricant - types and composition, natural and synthetic, grades, viscosity, properties iii. engine sump iv. oil pump and strainer v. pressure relief valve vi. oil filter vii. oil galleries 	1
<p>Know how engine lubrication systems operate, to include:</p> <ol style="list-style-type: none"> a. The operating principles of lubrication systems and components to include: <p>Wet sump systems:</p> <ol style="list-style-type: none"> i. spray, splash and pressurised lubrication ii. boundary lubrication iii. sump iv. oil pump v. oil filter vi. oil pressure relief valve vii. pressure monitoring: warning light, gauge b. Total loss systems: <ol style="list-style-type: none"> i. oil reservoir ii. two stroke engine oil iii. oil pump and pipes iv. mixing of the oil and fuel v. oil injector and regulation 	2

<p>Know how to carry out routine maintenance to engine lubrication systems, to include:</p> <ul style="list-style-type: none"> a. The correct process and procedure for: <ul style="list-style-type: none"> i. changing the engine oil and oil filter on an engine ii. replacing a gasket or oil seal on an engine component iii. checking an engine for oil leaks b. General: <ul style="list-style-type: none"> i. following safe working practices, including risks and hazards associated with the task ii. selecting and using appropriate information, tools and equipment for the task iii. following manufacturer's procedures iv. checking correct operation of systems and components on completion of task v. correct disposal of waste materials 	<p>3</p>
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Unit L1AM05: Engine Cooling System Components and Maintenance

Rationale: This unit enables learners to develop knowledge, understanding and skills associated with the basic operation of engine liquid cooling and air-cooling system components. The unit also requires learners to carry out routine engine cooling system maintenance procedures.

Unit Content	Learning Outcome
<p>Know about engine cooling systems, to include:</p> <ul style="list-style-type: none"> a. The main components in engine liquid cooling systems, to include: <ul style="list-style-type: none"> i. coolant – water and antifreeze mixture ii. radiator and radiator cap iii. thermostat iv. expansion tank v. pipes and hoses vi. gaskets and sealing rings vii. water pump and drive belt viii. cooling fan – mechanical and electric ix. vehicle heater b. The main components used in air cooling systems, to include: <ul style="list-style-type: none"> i. fins ii. fan iii. fan drive iv. air regulator v. thermostat vi. ducting c. Purpose of main liquid cooling system components, to include: <ul style="list-style-type: none"> i. coolant ii. radiator and radiator cap iii. thermostat iv. expansion tank v. pipes and hoses vi. gaskets and sealing rings vii. water pump and drive belt viii. cooling fan – mechanical and electric ix. vehicle heater d. Purpose of the main air-cooling system components, to include: <ul style="list-style-type: none"> i. fins ii. fan iii. fan drive iv. air regulator v. thermostat vi. ducting 	1

<p>Know how engine cooling systems operate, to include:</p> <ol style="list-style-type: none"> a. The operating principle of engine liquid and air-cooling systems and components to include: <ol style="list-style-type: none"> i. conduction, convection and radiation principles ii. thermo-siphon principle iii. pressurised systems iv. radiator v. radiator pressure cap vi. expansion tank vii. thermostat viii. mechanical and electric fans ix. fan x. heat exchangers xi. air flow ducting xii. cooling fins 	2
<p>Know how to carry out routine maintenance to engine cooling systems, to include:</p> <ol style="list-style-type: none"> a. The correct process and procedure for: <ol style="list-style-type: none"> i. removing and refitting a radiator, thermostat and refilling the cooling system ii. checking the condition of coolant pump drive belts iii. pressure testing the cooling system and checking for leaks b. General: <ol style="list-style-type: none"> i. following safe working practices, including risks and hazards associated with the task ii. selecting and using appropriate information, tools and equipment for the task iii. following manufacturer's procedures iv. checking correct operation of systems and components on completion of task v. correct disposal of waste materials 	3

Unit L1AM06: Spark Ignition System Components and Maintenance

Rationale: This unit enables learners to develop knowledge, understanding and skills associated with the basic operation of spark ignition system components. This unit also requires learners to carry out routine spark ignition maintenance procedures.

Unit Content	Learning Outcome
<p>Know spark ignition systems and components, to include:</p> <ul style="list-style-type: none"> a. The main components of a basic ignition system, to include: <ul style="list-style-type: none"> i. battery ii. ignition switch iii. ignition coil iv. spark plug v. condenser vi. contact breaker (c/b) points system vii. electronic ignition system viii. magneto ignition system b. The function of the main ignition system components, to include: <ul style="list-style-type: none"> i. battery: storage of electrical energy ii. ignition switch: turn on/off the electrical supply for ignition system components iii. ignition coil: converts low voltage to a high voltage by mutual induction; produces high voltages required by the spark plug iv. spark plug: ignites the fuel and air mixture in the engine's combustion chamber v. contact breaker (CB) points: opens and closes switching on and off the ignition coil vi. condenser: stores small amounts of electrical energy to assist in the collapse of the ignition coil's magnetic field vii. magneto: to generate sufficient voltage and current for the ignition coil viii. provide an overview of the differences in components and operation between CB points and electronic ignition systems 	1
<p>Know how spark ignition systems operate, to include:</p> <ul style="list-style-type: none"> a. The principles of modern breaker-less ignition systems: <ul style="list-style-type: none"> i. creation of magnetic field ii. electro-magnetic induction iii. coil operation iv. primary and secondary windings v. production of high voltage by breaking LT circuit vi. layout of components in a typical breakerless ignition system vii. function of the following components: battery, ignition coil, ignition switch, electronic trigger systems (simple concept of different types), capacitor, spark plugs, HT lead viii. basic operation of a typical breakerless ignition circuit ix. basic principle of ignition timing 	2

<p>Know how to carry out routine maintenance to spark ignition systems, to include:</p> <ul style="list-style-type: none"> a. The correct process and procedure for: <ul style="list-style-type: none"> i. removing, inspecting, adjusting and replacing engine spark plugs ii. checking the compression pressure of an engine iii. checking the resistance of an ignition coil b. General: <ul style="list-style-type: none"> i. following safe working practices including risks and hazards associated with the task ii. selecting and using appropriate information, and tools and equipment for the task iii. following manufacturer's procedures iv. checking correct operation of systems and components on completion of task v. correct disposal of waste materials 	<p>3</p>
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Unit L1AM07: Spark Ignition Engine Fuel System Components and Maintenance

Rationale: This unit enables learners to develop knowledge, understanding and skills associated with the basic operation of spark ignition (SI) engine fuel system components. The unit also requires learners to carry out routine SI engine fuel system maintenance procedures.

Unit Content	Learning Outcome
<p>Know about SI engine fuel systems, to include:</p> <ul style="list-style-type: none"> a. The main components of the fuel system, to include: <ul style="list-style-type: none"> i. fuel ii. fuel tank iii. fuel pump or tap iv. fuel pipes and filters v. carburettor system main components vi. fuel injection system main components vii. air filter and housing viii. throttle b. The purpose of the main fuel system components, to include: <ul style="list-style-type: none"> i. fuel: hydrocarbon fuels overview ii. fuel tank: safe storage of fuel iii. fuel pump: to deliver sufficient fuel to the carburettor or fuel injection system iv. fuel tap: on, off, reserve and filter v. fuel pipes and filter: connects fuel tank to carburettor or fuel injection system, removes dirt particles from the fuel vi. carburettor system: throttle slide and needle, mixing and float chambers, jets, adjustment screws, choke system vii. injector system: injector, regulator, pump, temperature and position sensors, ECU, idle speed control viii. air filter and housing: removes dirt particles from the air, acts as a silencer ix. throttle: provides the driver, rider and machine user with a method of regulating the engine's power 	1
<p>Know how SI engine fuel systems operate, to include:</p> <ul style="list-style-type: none"> a. The operating principles of SI fuel systems, to include: <ul style="list-style-type: none"> i. mixing of air and fuel, ratios for various engine speeds and loads ii. throttle control of engine speeds from driver, rider or machine user iii. cold starting and enrichment devices iv. basic engine exhaust emissions 	2
<p>Know how to carry out routine maintenance to SI fuel systems, to include:</p> <ul style="list-style-type: none"> a. The correct process and procedure for: <ul style="list-style-type: none"> i. removing and replacing a fuel filter ii. removing, inspecting and replacing an air filter iii. removing, inspecting and replacing a carburettor or fuel injector iv. checking engine idle speed and air/fuel mixture 	3

<p>b. General:</p> <ul style="list-style-type: none"> i. following safe working practices, including risks and hazards associated with the task ii. selecting and using appropriate information, and tools and equipment for the task iii. following manufacturer's procedures iv. checking correct operation of systems and components on completion of task v. correct disposal of waste materials 	<p>3</p>
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Unit L1AM08: Compression Ignition Engine Fuel System Components and Maintenance

Rationale: This unit enables learners to develop knowledge, understanding and skills associated with the basic operation of compression ignition (CI) engine fuel system components. The unit also requires learners to carry out routine CI engine fuel system maintenance procedures.

Unit Content	Learning Outcome
<p>Know about CI engine fuel systems, to include:</p> <ul style="list-style-type: none"> a. The main components of CI fuel systems, to include: <ul style="list-style-type: none"> i. fuel tank ii. fuel line iii. fuel filter iv. fuel pressurising system - high and low pressure v. fuel metering and delivery system - common rail, injectors vi. air intake and filtration systems vii. ECU b. The main purpose of CI fuel systems, to include: <ul style="list-style-type: none"> i. fuel: hydrocarbon fuels overview ii. fuel tank: safe storage of fuel iii. fuel pump: to deliver sufficient fuel to the fuel injection system iv. fuel pipes and filter: connects fuel tank to fuel injection system, removes dirt particles from the fuel v. mechanical injector system: lift and high-pressure pump, filter, injector, return lines vi. electronic injector system: injector, regulator, low and high-pressure pump, temperature and position sensors, ECU, idle speed control vii. air filter and housing: removes dirt particles from the air, acts as a silencer viii. throttle: provides the driver, rider and machine user with a method of regulating the engine's power 	1
<p>Know how CI engine fuel systems operate, to include:</p> <ul style="list-style-type: none"> a. The operating principles for CI fuel system engines, to include: <ul style="list-style-type: none"> i. stages of operation - induction, compression, power and exhaust ii. piston position and movement iii. firing orders for 4-cylinder engine iv. direct and indirect, and electronic injection systems v. high and low-pressure circuits vi. injection timing vii. mixing of fuel and air b. Valve and ignition timing, to include: <ul style="list-style-type: none"> i. piston position when opening and closing valves ii. piston position for fuel injection iii. need to vary injection timing with increase in engine speed 	2

<p>c. Air fuel mixture, to include:</p> <ul style="list-style-type: none"> i. Compression of air only ii. Point of fuel injection - near end of compression stroke iii. Benefits of pressure charging CI Engines compared to SI engines - less chance of detonation as no fuel during CI compression iv. wider range of air/fuel ratios <p>d. Exhaust emission, to include:</p> <ul style="list-style-type: none"> i. environmental and health concerns for exhaust emissions ii. exhaust gas emissions – H₂O, O, N, CO₂, CO, HC, NO_x 	2
<p>Know how to carry out routine maintenance to CI fuel systems, to include:</p> <p>a. The correct process and procedure for:</p> <ul style="list-style-type: none"> i. removing and replacing a fuel filter ii. removing, inspecting and replacing an air filter iii. carrying out a visual inspection for fuel leaks iv. checking/adjusting engine idle speed <p>b. General:</p> <ul style="list-style-type: none"> i. following safe working practices, including risks and hazards associated with the task ii. selecting and using appropriate information, tools and equipment for the task iii. following manufacturer's procedures iv. checking correct operation of systems and components on completion of task v. correct disposal of waste materials 	3

Unit L1AM09: Exhaust System Components and Maintenance

Rationale: This unit enables learners to develop knowledge, understanding and skills associated with the basic operation of exhaust system components. This unit also requires learners to carry out routine exhaust system maintenance procedures.

Unit Content	Learning Outcome
Know exhaust systems and components, to include: <ol style="list-style-type: none"> a. The components used in exhaust systems, to include: <ol style="list-style-type: none"> i. materials - mild steel, stainless steel ii. exhaust manifold iii. lambda sensor iv. front pipe v. expansion box vi. catalytic converter vii. diesel particulate filter (DPF) viii. silencer ix. tail pipe x. exhaust system brackets xi. exhaust system joints and gaskets b. The operation of components, to include: <ol style="list-style-type: none"> i. exhaust manifold and front pipe ii. lambda sensor iii. catalytic converter iv. expansion box v. silencer 	1
Know how exhaust systems operate, to include: <ol style="list-style-type: none"> a. Basic operation of exhaust systems, to include: <ol style="list-style-type: none"> i. noise reduction ii. reduce harmful engine exhaust emissions – basic overview of operation for both catalytic converter and DPF iii. noise regulations iv. service needs 	2
Know how to carry out routine maintenance to exhaust systems, to include: <ol style="list-style-type: none"> a. The correct process and procedure for: <ol style="list-style-type: none"> i. removing and replacing a complete exhaust system and components ii. checking an engine's exhaust emissions b. General: <ol style="list-style-type: none"> i. following safe working practices, including risks and hazards associated with the task ii. selecting and using appropriate information, tools and equipment for the task iii. following manufacturer's procedures iv. checking correct operation of systems and components on completion of task v. correct disposal of waste materials 	3

Unit L1AM10: Steering System Components and Maintenance

Rationale: This unit enables learners to develop knowledge, understanding and skills associated with the basic operation of steering system components. This unit also requires learners to carry out routine steering system maintenance procedures.

Unit Content	Learning Outcome
<p>Know steering systems and components which may include, vehicle dependant:</p> <p>a. The main components in steering systems, to include:</p> <ol style="list-style-type: none"> i. steering wheel ii. steering column iii. steering joints and couplings iv. steering gearbox - rack and pinion system and conventional steering box types v. manual and power steering vi. drag link vii. track rods viii. steering arms ix. track control arm x. track rod ends xi. rubber gaitors xii. swivel pin and front hub assembly <p>b. For motorcycle to include:</p> <ol style="list-style-type: none"> i. handlebars ii. conventional steering head iii. leading link iv. bearings v. steering stem vi. triple clamps vii. forks <p>c. Purpose of manual and power steering system components, to include:</p> <ol style="list-style-type: none"> i. steering column - including impact absorbing and telescopic aspects ii. steering joints and couplings iii. steering gearbox - rack and pinion system and conventional steering box type iv. function of drag link, track rods, steering arms, track control arm, track rod ends, rubber gaitors v. ball joints and front hub assembly vi. hydraulic oil, pump, fluid lines, drive belts 	1
<p>Know how steering systems operate, to include:</p> <p>a. The operating principles of steering system, to include:</p> <ol style="list-style-type: none"> i. Ackermann layout ii. camber iii. castor iv. swivel axis inclination (SAI) - formerly king pin inclination (KPI) v. wheel alignment vi. steering gearbox - rack and pinion system and conventional steering box types vii. front hubs 	2

<p>Know how to carry out routine maintenance to steering systems, to include:</p> <ul style="list-style-type: none"> a. The correct process and procedure for: <ul style="list-style-type: none"> i. removing and replacing a steering component ii. correctly adjusting wheel alignment within manufacturer's specification* * vehicles with 4 wheels – toe angles b. General: <ul style="list-style-type: none"> i. following safe working practices including risks and hazards associated with the task ii. selecting and using appropriate information, tools and equipment for the task iii. following manufacturer's procedures iv. checking correct operation of systems and components on completion of task v. correct disposal of waste materials 	<p>3</p>
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Unit L1AM11: Suspension System Components and Maintenance

Rationale: This unit enables learners to develop knowledge, understanding and skills associated with the basic operation of suspension system components. This unit also requires learners to carry out routine suspension system maintenance procedures.

Unit Content	Learning Outcome
<p>Know suspension systems and components which may include, vehicle dependant:</p> <ul style="list-style-type: none"> a. The main components in suspension systems, to include: <ul style="list-style-type: none"> i. springing methods - metal, rubber, fluid, air ii. spring types - leaf, coil, torsion bar, rubber, fluid, air iii. suspension damper iv. beam axle arrangement v. independent suspension vi. independent suspension types - Macpherson strut, wishbone, trailing arm vii. anti-roll bars b. Purpose of suspension components, to include: <ul style="list-style-type: none"> i. action of springs - leaf, coil, torsion bar ii. function of suspension damper 	1
<p>Know how suspension systems operate, to include:</p> <ul style="list-style-type: none"> a. The operating principle of suspension systems, to include: <ul style="list-style-type: none"> i. independent front suspension (IFS) ii. independent rear suspension (IRS) iii. beam axle arrangement - layout, disadvantages iv. independent suspension - layouts, advantages v. action of suspension - Macpherson strut, wishbone, trailing arm, anti-roll bar vi. bump and rebound including methods of damping 	2
<p>Know how to carry out routine maintenance to suspension systems, to include:</p> <ul style="list-style-type: none"> a. The correct process and procedure for: <ul style="list-style-type: none"> i. removing and refitting a suspension unit ii. visually inspecting a suspension system b. General: <ul style="list-style-type: none"> i. following safe working practices, including risks and hazards associated with the task ii. selecting and using appropriate information, tools and equipment for the task iii. following manufacturer's procedures iv. checking correct operation of systems and components on completion of task v. correct disposal of waste materials 	3

Unit L1AM12: Braking System Components and Maintenance

Rationale: This unit enables learners to develop knowledge, understanding and skills associated with the basic operation of braking system components. This unit also requires learners to carry out routine braking system maintenance procedures.

Unit Content	Learning Outcome
<p>Know braking systems and components which may include, vehicle dependant:</p> <ol style="list-style-type: none"> a. Braking system components, to include: <ol style="list-style-type: none"> i. brake actuation - master cylinder, fluid, slave/wheel cylinder, brake pedal/lever, rod/cable ii. drum brakes - brake shoes, leading shoe, trailing shoe, adjusters, return springs, backing plate, parking brake mechanism iii. disc brakes - disc pads and disc, brake calliper, parking brake mechanism b. Hydraulic components in vehicle braking systems, to include: <ol style="list-style-type: none"> i. single and dual line layout ii. master cylinder iii. wheel cylinder iv. disc brake caliper and pistons v. brake line and flexible pipes vi. brake servo 	1
<p>Know how braking systems operate, to include:</p> <ol style="list-style-type: none"> a. The operating principles of mechanical braking systems, to include: <ol style="list-style-type: none"> i. fundamental braking principles - converting kinetic energy to heat energy ii. coefficient of friction - between tyres and road, between brake shoes and brake drum, brake pad and brake disc iii. advantages/disadvantages of drum brakes and disc brakes iv. action of drum brakes, leading and trailing brake shoes, self-servo action v. action of disc brakes, brake calliper, pad retraction vi. terms associated with braking systems, braking efficiency, brake fade, brake balance, ABS b. The operating principle of hydraulic braking systems, to include: <ol style="list-style-type: none"> i. action of brake fluid - incompressible, equalising force, absorption of moisture, effect of air in system, requirement to change fluid, need to bleed system ii. action of master cylinders and wheel cylinders, brake callipers, brake pad retraction, equalising valves iii. action of brake servo iv. split braking systems v. requirements and hazards of brake fluid - boiling point, hygroscopic action, potential to damage paint surfaces vi. manufacturer's change periods for brake fluid 	2

<p>Know how to carry out routine maintenance to braking systems, to include:</p> <ul style="list-style-type: none"> a. The correct process and procedure for: <ul style="list-style-type: none"> i. removing and replacing brake pads ii. removing and replacing brake shoes iii. removing air from a hydraulic braking system b. General: <ul style="list-style-type: none"> i. following safe working practices, including risks and hazards associated with the task ii. selecting and using appropriate information, tools and equipment for the task iii. following manufacturer's procedures iv. checking correct operation of systems and components on completion of task v. correct disposal of waste materials 	<p>3</p>
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Unit L1AM13: Wheel and Tyre Construction and Maintenance

Rationale: This unit introduces learners to wheels and tyres and their routine maintenance requirements. It includes identifying the construction of wheels and tyres and the applications to different types of vehicle. The learner also covers common wheel and tyre terminology, tyre markings, legal requirements and the procedures for replacing standard tyres.

Unit Content	Learning Outcome
Know how wheel and tyres are constructed, to include: <ol style="list-style-type: none"> a. The common types of tyre used on vehicles, to include: <ol style="list-style-type: none"> i. radial ply tyre ii. cross ply iii. tube type tyres iv. tubeless tyres b. The main construction details of radial and cross ply tyres, to include: <ol style="list-style-type: none"> i. casing plies - the arrangement for cross ply and radial designs ii. speed index and load rating iii. tyre tread - types and applications for car, motorcycle, truck, caravans, trailers, specialist vehicles, on-road and off-road tyres iv. tread depth indicator v. tyre bead vi. tread bracing vii. tyre sidewall c. The common types of wheels used on road vehicles, to include: <ol style="list-style-type: none"> i. alloy wheels ii. pressed steel wheels iii. space saver wheels iv. split rim wheels v. spoked wheels 	1
Know wheel and tyre terminology, to include: <ol style="list-style-type: none"> i. tyre type marking ii. tyre and wheel diameter iii. tyre section width iv. tread depth v. tyre aspect ratio vi. speed rating vii. load index viii. selection of tyres for vehicle applications 	2

<p>Know how to carry out routine maintenance and replacement of wheels and tyres, to include:</p> <ul style="list-style-type: none"> i. visual inspection ii. legal requirements, for example minimum tread depth iii. tyre pressure iv. adjustment v. torque settings vi. damage vii. manufacturer's specifications viii. removal and replacement procedures ix. wheel and tyre balancing x. leaks xi. common faults 	<p>3</p>
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Unit L1AM14: Vehicle Transmission System Components and Maintenance

Rationale: This unit enables learners to develop knowledge, understanding and skills associated with the basic operation of vehicle transmission system components. This unit also requires learners to carry out routine transmission system maintenance procedures.

Unit Content	Learning Outcome
Know about transmission systems, to include: <ol style="list-style-type: none"> a. The transmission layouts, to include: <ol style="list-style-type: none"> i. engine ii. clutch iii. gearbox iv. final drive v. drive shafts vi. chain and sprockets vii. driveshaft viii. drive belt b. The purpose and function of transmission system components - vehicle dependant: <ol style="list-style-type: none"> i. engine ii. clutch iii. gearbox iv. final drive v. drive shafts vi. chain and sprockets vii. driveshaft viii. drive belt 	1
Know how transmission systems operate, to include: <ol style="list-style-type: none"> i. provide a permanent neutral ii. allow vehicle to accelerate iii. torque multiplication iv. increase/decrease driveshaft RPM v. change direction of drive vi. calculate simple gear ratios 	2
Know how to carry out routine maintenance to transmission systems, to include: <ol style="list-style-type: none"> i. visual inspections ii. correct function and operation of components and systems iii. fluid leaks and security of components iv. checking and changing fluids v. selecting the correct fluids for maintenance vi. alignment, adjustments and tension of components and systems 	3

Unit L1AM15: Vehicle Electrical Circuits and Components

Rationale: This unit enables learners to develop knowledge, understanding and skills associated with the basic construction and operation of vehicle electrical circuits and components. This unit also requires learners to construct and test the operation of a simple electrical lighting circuit.

Unit Content	Learning Outcome
Know vehicle lighting circuits and components, to include: <ul style="list-style-type: none"> a. Electrical units, to include: <ul style="list-style-type: none"> i. volt ii. ampere iii. ohm iv. watt b. Common electrical symbols, to include: <ul style="list-style-type: none"> i. battery ii. switches iii. motors iv. fuses v. lamps vi. earth vii. diode viii. transistor ix. relay c. The correct cable size and fuses, to include: <ul style="list-style-type: none"> i. amperage ii. voltage iii. number and diameter of strands iv. blade and cartridge type fuses d. Wiring diagrams, to include: <ul style="list-style-type: none"> i. horn circuit ii. headlamp lighting circuit iii. brake light circuit 	1
Know how vehicle lighting systems operate, to include: <ul style="list-style-type: none"> a. How light is emitted from a conventional bulb, to include: <ul style="list-style-type: none"> i. series and parallel electrical circuits ii. current and electron flow iii. battery supply and earth connections iv. current limitation v. filament temperature vi. conversion of electrical energy to heat energy 	2

<p>Know how to construct and test a simple vehicle lighting circuit, to include:</p> <ol style="list-style-type: none"> a. Correct procedures to make a 12 volt circuit, to include: <ol style="list-style-type: none"> i. selection and safe use of tools and equipment ii. methods and making of connections iii. identification of correct polarity iv. correct selection of components b. Correct use of voltmeter and ammeter, to include: <ol style="list-style-type: none"> i. correct connection of leads to electrical meter ii. correct scale selected on electrical meter iii. correct connection of electrical meter to circuit - series and parallel iv. accurate measurement of current and voltage 	<p>3</p>
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