AUTOMOTIVE SERVICE TECHNICIAN

NATIONAL OCCUPATIONAL ANALYSIS (2005)
Integrated With
INDIVIDUAL LEARNING MODULES

Revised May 7, 2009

Alberta

Apprenticeship and
Industry Training

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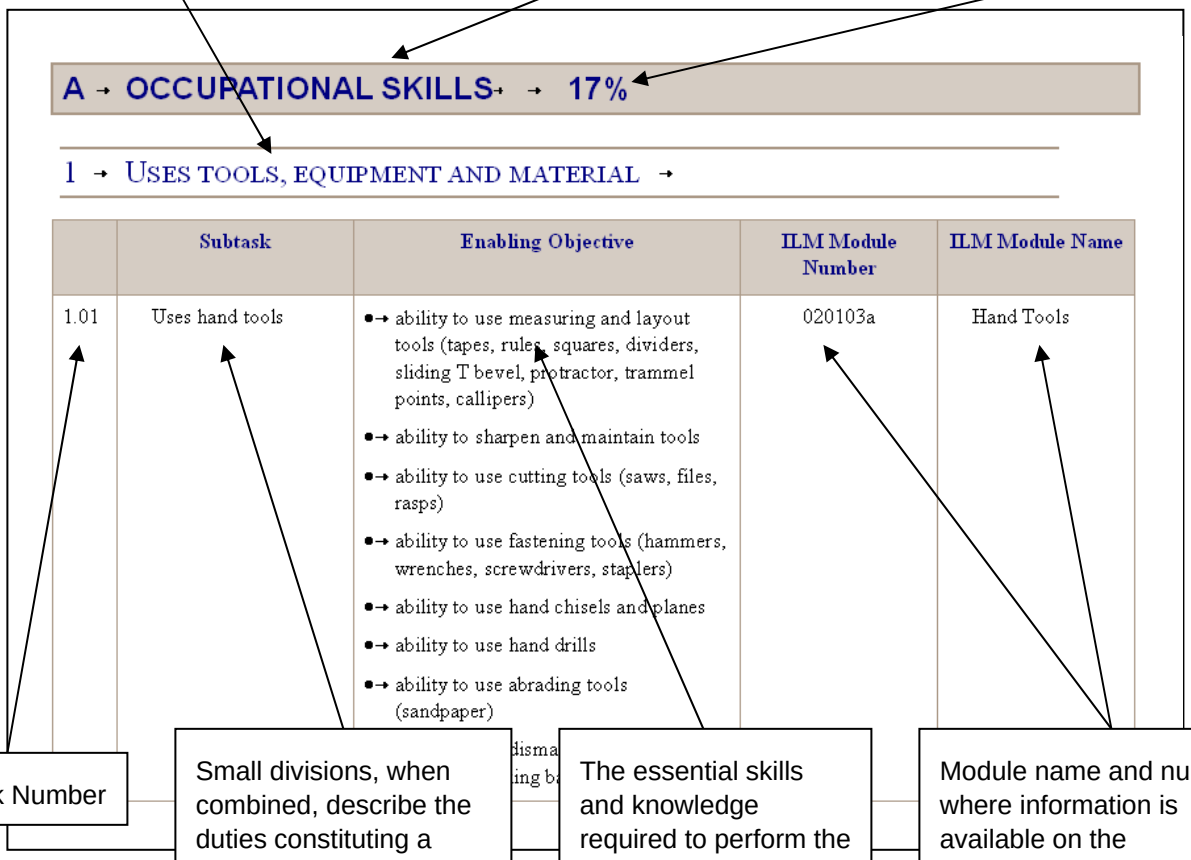
DOCUMENT DESCRIPTION

Tasks that are performed by skilled workers in this trade across Canada.

Block: A group of related tasks.

This number indicates the percentage of exam questions on the topic.



A → OCCUPATIONAL SKILLS → → 17%

1 → USES TOOLS, EQUIPMENT AND MATERIAL →

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
1.01	Uses hand tools	•→ ability to use measuring and layout tools (tapes, rules, squares, dividers, sliding T bevel, protractor, trammel points, callipers) •→ ability to sharpen and maintain tools •→ ability to use cutting tools (saws, files, rasps) •→ ability to use fastening tools (hammers, wrenches, screwdrivers, staplers) •→ ability to use hand chisels and planes •→ ability to use hand drills •→ ability to use abrading tools (sandpaper)	020103a	Hand Tools

Subtask Number

Small divisions, when combined, describe the duties constituting a task.

The essential skills and knowledge required to perform the task and subtask.

Module name and number where information is available on the subtask/enabling objective.

A OCCUPATIONAL SKILLS 8%

1 USES TOOLS AND EQUIPMENT

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
1.01	Uses hand tools	• knowledge of types of hand tools • knowledge of operating procedures • knowledge of imperial and metric systems • ability to apply hand-eye coordination • ability to organize hand tools • ability to maintain hand tools • ability to store hand tools • ability to recognize worn, damaged or defective hand tools	090101b 090101c 090101d 090201a	Measuring Tools Speciality Hand Tools Fastening Devices Engine Fundamentals
1.02	Uses power tools	• knowledge of types of power tools such as electric, pneumatic and hydraulic • knowledge of operating procedures • ability to apply hand-eye coordination	090101b 090101c 090101d	Measuring Tools Speciality Hand Tools Fastening Devices

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to organize power tools • ability to maintain power tools • ability to store power tools • ability to recognize worn, damaged or defective power tools	090201a 090102a 090102b 090106c 090201b 090201c 090201d 090201e 090201f 090201g 090201h 090201i	Engine Fundamentals Oxyacetylene Heating and Cutting Gas Metal Arc Welding (GMAW) (MIG Welding) Fundamentals of Magnetism Blocks and Related Components (Theory) Blocks and Related Components (Service) Crankshafts, Friction Bearings and Related Components (Theory) Crankshafts, Friction Bearings and Related Components (Service) Piston, Piston Rings and Connecting Rods (Theory) Piston, Piston Rings and Connecting Rods (Service) Camshafts and Valve Trains (Theory) Camshafts and Valve Trains

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
				(Service) 090202d Drive Axle Assembly, Diagnosis and Service
1.03	Uses measuring and testing devices	• knowledge of types of measuring and testing devices such as micrometers, vernier calipers, pressure gauges and digital voltage ohmmeter (DVOM) • knowledge of operating procedures • ability to use scan tools and diagnostic equipment • ability to make conversions between the metric and imperial systems • ability to organize measuring and testing devices • ability to maintain measuring and testing devices • ability to store measuring and testing devices	090101b	Measuring Tools
1.04	Uses hoisting and lifting equipment	• knowledge of operating procedures • knowledge of applications of hoisting	090101e 090401n	Safety Automatic Transmission Service

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		and lifting equipment • knowledge of limitations of lifting equipment • ability to recognize safe lifting locations or points • ability to maintain hoisting and lifting equipment • ability to recognize worn, damaged or defective hoisting and lifting equipment		and Repair
1.05	Uses welding/cutting equipment	• knowledge of welding materials such as wire and shield gases • knowledge of welding principles and considerations • ability to identify material to be welded • ability to perform welding and cutting procedures • ability to organize welding/cutting equipment • ability to maintain welding/cutting	090102a 090102b	Oxyacetylene Heating and Cutting Gas Metal Arc Welding (GMAW) MIG Welding)

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		equipment • ability to store welding/cutting equipment • ability to recognize worn, damaged or defective welding/cutting equipment and potential hazards		
1.06	Uses safety equipment	• knowledge of types of safety equipment such as respiratory, hearing, eye and body protection • knowledge of safety equipment operations • knowledge of workplace safety and health regulations • knowledge of location of safety equipment • ability to inspect and maintain safety equipment • ability to store safety equipment • ability to recognize worksite hazards	090101e	Safety
1.07	Uses shop equipment	• knowledge of types of shop equipment such as electric, pneumatic and	090103a	Drivelines

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		hydraulic • knowledge of shop computer applications • knowledge of operating procedures • ability to apply hand/eye coordination • ability to organize shop equipment • ability to maintain shop equipment • ability to store shop equipment • ability to recognize worn, damaged or defective shop equipment	090104e 090105a 090106e 090202b 090202d 090401m 090402b	Power Steering Brake System Fundamentals Electrical system Diagnosis I Differentials Drive Axle Assembly, Diagnosis and Service Automatic Transmission Testing and Adjustments Manual Transmissions

2 ORGANIZES WORK

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
2.01	Communicates with others	• knowledge of technical terminology • knowledge of government and company policies and procedures, guidelines and standards	090101aA 090101aB	Communication – Part A Communication – Part B And On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of verbal and written communication • ability to use communication equipment and media such as Internet, email and fax • ability to translate technical information into layperson's terms • ability to acquire information through questioning • ability to communicate with other related professionals such as partspersons and supervisors • ability to communicate with customers		
2.02	Uses technical information	• knowledge of types of technical information such as work orders, shop manuals, schematics and technical service bulletins (TSB) • knowledge of formats of information such as print and electronic • knowledge of automobile construction and repair procedures	090104g 090105a 090105f 090106c 090106e	Alignment Procedures Brake System Fundamentals Brake System Diagnosis and Service Fundamentals of Magnetism Electrical System Diagnosis I

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to acquire service and repair information • ability to interpret information received • ability to organize and prioritize information • ability to locate vehicle specific information such as vehicle, axle and transmission identification numbers on the vehicle • ability to access information using manufacturers' identification codes such as vehicle identification number (VIN), paint and trim codes and calibration numbers	090201L 090201m	Engine Disassembly Procedures Engine Assembly Procedures
2.03	Maintains safe work environment	• knowledge of Workplace Hazardous Materials Information System (WHMIS) • knowledge of types and operation of fire extinguisher equipment • knowledge of on-site first aid stations • knowledge of disposal and recycling procedures	090101e 090404aA 090404aB	Safety Air Conditioning - Part A Air Conditioning - Part B

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to recognize potential hazards • ability to handle and store hazardous materials		
2.04	Estimates job cost	• knowledge of vehicle construction and components • knowledge of regulations regarding consumer estimates • knowledge of industry standard labour guides • ability to use information provided by the inspection or diagnostic procedures to estimate parts and labour required • ability to use industry standard labour guides • ability to perform related mathematical calculations • ability to select parts required to perform repair		Considered On The Job Training

3 PERFORMS GENERAL MAINTENANCE AND DIAGNOSIS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
3.01	Maintains vehicle to specifications	• knowledge of lubricants and fluids • knowledge of causes of tire wear such as over inflation,, under-inflation and worn suspension components • ability to access manufacturers' maintenance schedules and specifications • ability to change filters such as fuel, air, and oil filters • ability to rotate tires • ability to exchange fluids such as transmission, coolant and brake fluid • ability to dispose of fluids according to environmental regulations • ability to replace components such as spark plugs, transmission filters, brake linings and positive crankcase ventilation (PCV) valves at specified intervals	090201s 090202d 090205a 090301c 090302c 090307i 090401m	Engine Diagnosis Drive Axle Assembly, Diagnosis and Service DC Motor Fundamentals Computer Inputs, Switches and Sensors Exhaust Gas Analysis Multiplexing and Networking Automatic Transmission Testing and Adjustments

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
3.02	Inspects for potential problems	• knowledge of common wear points such as brake lining, tire tread, ball joints and wiper blades • ability to evaluate condition of components such as tires, brakes, steering and suspension against manufacturers' specifications • ability to recognize worn, damaged or defective components such as belts, hoses, u-joints and exhaust pipes	090201s 090202d 090205a 090301c 090302c 090307i 090401m	Engine Diagnosis Drive Axle Assembly, Diagnosis and Service DC Motor Fundamentals Computer Inputs, Switches and Sensors Exhaust Gas Analysis Multiplexing and Networking Automatic Transmission Testing and Adjustments
3.03	Performs diagnostic procedures	• knowledge of expected operation • knowledge of test procedures such as road test and operational checks • ability to verify vehicle symptom • ability to identify faulty system • ability to identify faulty components • ability to isolate cause of faults • ability to access all relevant and	090105g 090106a 090106e 090301e 090104g 090105a 090105f	Antilock Brake Systems Electrical Fundamentals I Electrical System Diagnosis I Advanced Electrical Schematics Alignment Procedures Brake System Fundamentals Brake System Diagnosis and Service

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		available service data such as TSB, recalls and service history information	090106c	Fundamentals of Magnetism
			090201L	Engine Disassembly Procedures
			090201m	Engine Assembly Procedures

B ENGINE SYSTEMS 18%

4 DIAGNOSES ENGINE SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
4.01	Diagnoses cooling systems	• knowledge of types of cooling systems such as liquid and air cooled • knowledge of cooling system components such as gaskets, thermostats and water pumps • knowledge of warning systems such as lights, gauges and switches • knowledge of fan systems such as mechanical, electric and hydraulic • knowledge of types of coolants and chemical additives • knowledge of related systems such as heating, ventilation and air conditioning (HVAC) and auxiliary coolers • ability to pressurize cooling and pressure regulating devices such as	090201r	Cooling Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		radiator pressure cap • ability to analyze coolant flow • ability to identify restrictions • ability to verify thermostat operation • ability to identify worn, damaged or defective components such as radiators, hoses and belts • ability to analyze coolant properties such as freeze protection, chemistry and contamination • ability to identify air flow problems		
4.02	Diagnoses lubricating systems	• knowledge of composition of lubricants such as grades of oil, synthetics and additives • knowledge of types of oil pumps and drives such as gerotor, vane type and gear type • knowledge of oil coolers such as oil-to-air and oil-to-coolant • knowledge of oil flow and filtration	090201c 090201e 090201g 090201L 090201m	Blocks and Related Components (Service) Crankshafts, Friction Bearings and Related Components (Service) Pistons, Piston Rings and Connecting Rods (Service) Engine Disassembly Procedures Engine Assembly Procedures

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		methods • knowledge of gaskets, seals and sealants • knowledge of warning systems such as lights, gauges and switches • ability to perform oil pressure tests • ability to recognize failed gaskets and seals using leak detection methods such as black light and dye	090201q	Lubrication Systems
4.03	Diagnoses base engine	• knowledge of types of engine configurations such as inline, rotary, opposed and V • knowledge of types of valve train configurations such as push rod, overhead cam and multi-valve • knowledge of engine timing components such as timing belts, chains and gear drive • knowledge of engine component clearances and specifications • ability to interpret results of tests such as compression, leak down, vacuum	090201c 090201e 090201g 090201L 090201m	Blocks and Related Components (Service) Crankshafts, Friction Bearings and Related Components (Service) Pistons, Piston Rings and Connecting Rods (Service) Engine Disassembly Procedures Engine Assembly Procedures

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		and head gasket tests • ability to calculate engine displacement, compression ratios, horsepower, area and volume • ability to identify sources of specific engine noises such as crankshaft, valve train, piston and timing chain noise • ability to recognize worn, damaged or defective engine components • ability to recognize base engine related driveability concerns such as low power, smoke, oil consumption and rough running • ability to verify valve timing and valve adjustment		

5 REPAIRS ENGINE SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
5.01	Repairs cooling systems	• knowledge of types of coolants and chemical additives	090201r	Cooling Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of cooling system components such as gaskets, thermostats and water pumps • knowledge of fan systems such as mechanical, electric or hydraulic • knowledge of types of cooling systems such as liquid and air cooled • knowledge of related systems such as HVAC and auxiliary coolers • knowledge of water quality suitable for cooling systems • ability to follow manufacturers' specifications and recommendations • ability to remove and replace cooling system components such as water pumps, thermostats and radiators • ability to flush coolants • ability to bleed systems • ability to verify repair • ability to recycle or dispose of coolants		

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		according to environmental regulations		
5.02	Repairs lubricating systems	• knowledge of gaskets, seals and sealants • knowledge of types of oil pumps and drives such as gerotor, vane type and gear type • ability to remove and replace lubricating system components such as gaskets, seals, oil pumps and oil pan • ability to follow manufacturers' specifications and recommendations • ability to select specified sealants • ability to select specified lubricants • ability to perform maintenance procedures such as oil and filter changes • ability to verify repair • ability to dispose of lubricants according to environmental regulations	090201c 090201e 090201g 090201L 090201m 090201q	Blocks and Related Components (Service) Crankshafts, Friction Bearings and Related Components (Service) Pistons, Piston Rings and Connecting Rods (Service) Engine Disassembly Procedures Engine Assembly Procedures Lubrication Systems
5.03	Repairs base engine	• knowledge of types of engine configurations such as inline, rotary,	090201c	Blocks and Related Components

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		opposed and V • knowledge of types of valve train configurations such as push rod, overhead cam and multi-valve • knowledge of engine timing components such as timing belts, chains and gear drive • knowledge of engine component clearances and specifications • knowledge of engine hoisting and repair fixture mounting • ability to follow manufacturers' specifications and recommendations • ability to measure and adjust engine component clearances • ability to replace engine components • ability to follow engine assembly and disassembly procedures such as torque sequences and surface preparation for part or component re-installation • ability to remove and reinstall engine	090201e 090201g 090201L 090201m	(Service) Crankshafts, Friction Bearings and Related Components (Service) Pistons, Piston Rings and Connecting Rods (Service) Engine Disassembly Procedures Engine Assembly Procedures

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to verify valve timing and valve adjustment • ability to verify repair		

6 DIAGNOSES ENGINE SUPPORT SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
6.01	Diagnoses engine support systems	• knowledge of types of fuel delivery systems • knowledge of types of fuel such as gasoline, diesel and alternate fuels • knowledge of fuel handling and storage procedures • knowledge of types of gasoline fuel injection systems • knowledge of types of diesel fuel injection systems • knowledge of alternate fuel systems • knowledge of carburetion	090305aA 090305aB 090305b 090304a A090308a A090306b 090304b	Diesel Fuel Injection Systems (Mechanical) – Part A Diesel Fuel Injection Systems (Mechanical) – Part B Diesel Fuel Injection Systems (Electronic) Fuel Tanks and Supply Systems Liquefied Petroleum Gas/Compressed Natural Gas Fuel Systems Carburetors Gasoline Fuel Injection System Fundamentals

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to perform tests such as pressure, volume and fuel quality • ability to isolate fuel system problems		
6.02	Diagnoses ignition systems	• knowledge of types of ignition systems such as distributor, distributorless and electronic • knowledge of ignition system components such as wires, coils, spark plugs and distributors • knowledge of electronic circuits • ability to perform ignition measurements such as coil over plug, coil output, spark duration, wire resistance and leakage • ability to identify worn, damaged or defective components	090201m 090303b 090303d	Engine Assembly Procedures Distributor Ignition Systems Ignition System Diagnosis and Service
6.03	Diagnoses intake/exhaust systems	• knowledge of types of intake/exhaust systems • knowledge of intake air flow control systems and components • knowledge of exhaust components such	090201n 090302b 090302c	Air Induction Systems Combustion and Exhaust Emissions Exhaust Gas Analysis Evaporative Emission Control

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		as catalytic converters, heat risers, valves and mufflers • knowledge of composition of intake/exhaust systems • ability to identify leaks or blockages in intake/exhaust systems • ability to perform tests on super/turbo chargers such as boost test, shaft and bearing play	090306d 090307a	Systems Gauges and Warning Systems
6.04	Diagnoses emission systems	• knowledge of types of emission gases such as CO, CO2, NOx and HC • knowledge of types of control devices such as exhaust gas recirculation (EGR), evaporative emission control systems (EVAP) and secondary air injection • knowledge of industry standard On Board Diagnostics systems such as OBD I and OBD II • ability to test emission control devices such as EGR, EVAP and PCV • ability to test catalytic converters	090201n 090302b 090302c 090306d 090307a	Air Induction Systems Combustion and Exhaust Emissions Exhaust Gas Analysis Evaporative Emission Control Systems Gauges and Warning Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to interpret information such as OBD I and OBD II diagnostic codes and data		
6.05	Diagnoses accessory drive systems and mounts	• knowledge of types of belt drive systems • knowledge of types of belt tensioners • knowledge of engine transmission and exhaust mounts • ability to check accessory drive pulley alignment • ability to identify cause of noise and vibration • ability to measure belt tension	090201r 090204a 090204b	Cooling Systems Charging systems and Control Circuits Charging systems Testing and Diagnosis

7 REPAIRS ENGINE SUPPORT SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
7.01	Repairs fuel delivery systems	• knowledge of types of fuel delivery systems	090305aA	Diesel Fuel Injection Systems (Mechanical) – Part A

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of types of fuel such as gasoline, diesel and alternate fuels • knowledge of fuel handling and storage procedures • knowledge of types of gasoline fuel injection systems • knowledge of types of diesel fuel injection systems • knowledge of alternate fuel systems • knowledge of carburetion • knowledge of jurisdictional regulations • ability to follow manufacturers' specifications and recommendations • ability to remove and replace fuel delivery components • ability to depressurize fuel systems and recover fuel • ability to change fuel filters • ability to adjust carburetion settings	090305aB 090305b 090304a A090308a A090306b 090304b	Diesel Fuel Injection Systems (Mechanical) – Part B Diesel Fuel Injection Systems (Electronic) Tanks and Supply Systems Liquefied Petroleum Carburetors Gasoline Fuel Injection System Fundamentals

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to adjust diesel injection timing • ability to bleed diesel systems • ability to verify repairs using scan tools to analyse data such as OBD II monitors		
7.02	Repairs ignition systems	• knowledge of types of ignition systems such as distributor, distributorless and electronic • knowledge of ignition system components such as wires, coils, spark plugs and distributors • knowledge of electronic circuits • ability to adjust ignition systems to specifications such as ignition timing and spark plug gap • ability to remove and replace ignition components • ability to verify repairs using scan tools to analyse data such as OBD II monitors	090201m 090303b 090303d	Engine Assembly Distributor Ignition Systems Ignition System Diagnosis and Service
7.03	Repairs	• knowledge of types of intake/exhaust	090201n	Air Induction Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
	intake/exhaust systems	systems • knowledge of intake air flow control systems and components • knowledge of exhaust components such as catalytic converters, heat risers, valves and mufflers • knowledge of composition of intake/exhaust systems • ability to follow manufacturers' specifications and recommendations • ability to maintain intake systems such as cleaning throttle valve, servicing mass airflow sensors and replacing air filter • ability to select gaskets, seals and sealants • ability to service super/turbo chargers using procedures such as oil changes and decarbonizing • ability to remove and replace worn, damaged or defective components • ability to verify repairs using scan tools	090302b 090302c 090306d 090307a	Combustion and Exhaust Emissions Exhaust Gas Analysis Evaporative Emission Control Systems Gauges and Warning Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		to analyse data such as OBD II monitors		
7.04	Repairs emission systems	• knowledge of types of emission gases such as CO, CO2, NOx and HC • knowledge of types of control devices such as EGR, EVAP and secondary air injection • knowledge of industry standard On Board Diagnostics systems such as OBD II • ability to follow manufacturers' specifications and recommendations • ability to remove and replace emission control devices • ability to verify repairs using scan tools to analyze data such as OBD II monitors	090201n 090302b 090302c 090306d 090307a	Air Induction Systems Combustion and Exhaust Emissions Exhaust Gas Analysis Evaporative Emission Control Systems Gauges and Warning Systems
7.05	Repairs accessory drive systems and mounts	• knowledge of types of belt drive systems • knowledge of types of belt tensioners • knowledge of engine transmission and	090201r 090204a 090204b	Cooling Systems Charging systems and Control Circuits Charging systems Testing and

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		exhaust mounts • ability to follow manufacturers' specifications and recommendations • ability to remove and replace mounting components • ability to remove and replace accessory drive belt components such as pulleys, bearings and tensioners • ability to adjust and neutralize mounts • ability to adjust pulley alignment		Diagnosis

C VEHICLE MANAGEMENT SYSTEMS 19%

8 DIAGNOSES VEHICLE MANAGEMENT SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
8.01	Reads diagnostic codes	• knowledge of diagnostic code types and formats such as OBD I and OBD II industry standards • knowledge of types of networks such as International Standards Organization (ISO), high speed (HS), controller area network (CAN), air conditioning pressure (ACP) and universal asynchronous receive transmit (UART) • knowledge of diagnostic code protocols and actions • knowledge of operation and interrelationship of modules • ability to access information on code using CD, Internet and print information • ability to interpret diagnostic codes	090301d 090304d	On-Board Computers Gasoline Fuel Injection System Diagnosis and Service

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
8.02	Monitors parameters	• knowledge of types of parameters such as revolutions per minute (RPM), throttle position (TPS) and vehicle speed sensor (VSS) • knowledge of relationship of various parameters • ability to select and organize relevant parameters	090301d 090301c 090303c 090303d 090307i	On-Board Computers Computer Inputs, Switches and Sensors Electronic Ignition systems Ignition System Diagnosis and Service Multiplexing and Networking
8.03	Interprets test results	• knowledge of parameter definitions • ability to access service information • ability to compare parameter values to vehicle specifications	090301d 090304d	On-Board Computers Gasoline Fuel Injection System Diagnosis and Service
8.04	Tests components and system circuitry	• knowledge of network circuitry types • knowledge of inputs modules and outputs • ability to test network circuitry • ability to use testing equipment such as DVOM, jumper wires, test probes and break out boxes	090301d 090304d 090301d 090301c 090303c	On-Board Computers Gasoline Fuel Injection System Diagnosis and Service On-Board Computers Computer Inputs, Switches and Sensors Electronic Ignition systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			090303d	Ignition System Diagnosis and Service
			090307i	Multiplexing and Networking

9 REPAIRS VEHICLE MANAGEMENT SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
9.01	Reprograms component software	• knowledge of methods of software transfer • knowledge of basic computer processes • ability to select software • ability to interpret calibrations • ability to transfer/access software using methods such as CD, Internet and programmable read only memory (PROM) replacement	090301d 090304d 090301d 090301c 090303c 090303d 090307i	On-Board Computers Gasoline Fuel Injection System Diagnosis and Service On-Board Computers Computer Inputs, Switches and Sensors Electronic Ignition systems Ignition System Diagnosis and Service Multiplexing and Networking

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
9.02	Replaces components	• knowledge of types of components such as control module, wire harnesses, input and output devices • knowledge of replacement procedures such as transfer of PROM • ability to reconfigure modules • ability to locate components using service information • ability to follow vehicle-specific cautionary procedures such as using anti-static strap and disabling restraint systems	090301d 090304d 090301d 090301c 090303c 090303d 090307i	On-Board Computers Gasoline Fuel Injection System Diagnosis and Service On-Board Computers Computer Inputs, Switches and Sensors Electronic Ignition systems Ignition System Diagnosis and Service Multiplexing and Networking
9.03	Repairs electrical connections and wiring	• knowledge of circuit orientation such as twisted pair and shielded wire • knowledge of types of wiring procedures such as soldering and crimping • ability to interpret wiring diagrams • ability to select terminals • ability to select and use tools such as soldering tools, crimping tools and	090301d 090304d 090301d 090301c 090303c 090303d	On-Board Computers Gasoline Fuel Injection System Diagnosis and Service On-Board Computers Computer Inputs, Switches and Sensors Electronic Ignition systems Ignition System Diagnosis and

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		terminal removal tools	090307i	Service Multiplexing and Networking
9.04	Verifies repair using drive cycles	• knowledge of drive cycles using OBD II monitors • knowledge of methods of verifying repair such as clear codes, retest and road test using drive cycles • ability to use scan tools to reset system and compare parameters • ability to road test to verify repair • ability to select test environment	090301d 090304d 090301d 090301c 090303c 090303d 090307i	On-Board Computers Gasoline Fuel Injection System Diagnosis and Service On-Board Computers Computer Inputs, Switches and Sensors Electronic Ignition systems Ignition System Diagnosis and Service Multiplexing and Networking

D DRIVE LINE SYSTEMS 14%

10 DIAGNOSES DRIVE LINE SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
10.01	Diagnoses drive shafts and axles	• knowledge of drive shaft types and construction such as single, two piece and steel, aluminium and composite construction • knowledge of types of drive shaft components such as slip yoke, flex, single and double cardan joints • knowledge of types of axles such as CV axles, solid axles, floating and semi-floating • knowledge of multiple piece drive shaft phasing/indexing • knowledge of safety precautions • ability to follow diagnostic flow chart • ability to identify worn, damaged or defective components • ability to remove and inspect related	090103a 090202a 090202b 090202c 090202d	Drivelines Axles and Bearings Differentials Final Drive Gear Sets Drive Axle Assembly, Diagnosis and Service

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		components • ability to use specialized measuring gauges • ability to measure drive line angles		
10.02	Diagnoses manual transmissions/transaxles	• knowledge of types of manual transmissions/transaxles • knowledge of path of power • knowledge of types of lubricants • ability to follow diagnostic flow chart • ability to calculate gear ratios • ability to road test to identify noises, vibrations, customer concerns and driveability • ability to check level and condition of lubricants • ability to detect leaks and damage • ability to use specialty tools such as leak detectors and stethoscope	090402a 090402b 090402c 090403a 090403d	Manual Transmission Fundamentals Manual Transmissions Manual Transaxles Manual Transfer Cases 4 x 4 Front Axle Control
10.03	Diagnoses automatic	• knowledge of types of automatic	090401m	Automatic Transmission Testing

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
	transmissions/transaxles	transmissions/transaxles • knowledge of gear ratios • knowledge of path of power • knowledge of lubricants • knowledge of transmission cooling systems • knowledge of control systems • knowledge of fluid drive systems such as pumps, valves, filters and torque converters • knowledge of mechanical drive systems such as clutch packs, shafts and planetary gear sets • ability to follow diagnostic flow chart • ability to road test to identify noises, vibrations, customer concerns and driveability • ability to interpret diagnostic codes • ability to perform hydraulic pressure test	090401n 090403b	and Adjustment Automatic Transmission Service and Repair Electronic Transfer Cases

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to test transmission cooler operation and transmission lines • ability to check fluid levels and condition • ability to check for leaks, inspect for damage and test components • ability to use specialty tools such as scan tools, pressure gauges and stethoscopes • ability to follow fluid flow charts		
10.04	Diagnoses clutches	• knowledge of types of clutches/flywheels • knowledge of hydraulics/linkage systems • ability to follow diagnostic flow chart • ability to road test to detect slippage, chatter, noises and vibration • ability to detect leaks and damage • ability to detect clutch contamination	090402d	Clutches

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to test clutch safety switch operation • ability to check throw-out release bearings		
10.05	Diagnoses transfer cases	• knowledge of types of transfer cases such as active and passive • knowledge of control systems such as vacuum, manual and electronic • knowledge of types of fluids • knowledge of path of power • ability to follow diagnostic flow chart • ability to road test for operation, noises and vibration • ability to inspect fluid levels and conditions • ability to check for leaks, inspect for damage and test components • ability to interpret diagnostic codes	090403a 090403b 090403c 090403d	Manual Transfer Cases Electronic Transfer Cases All Wheel Drive (AWD) Transfer Cases 4 X 4 Front Axle Control
10.06	Diagnoses	• knowledge of types of differentials	090202a	Axles and Bearings

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
	differentials	such as integral, removable and locking • knowledge of types of axles such as fullfloating and semi-floating • knowledge of types of lubricants and additives • knowledge of path of power • knowledge of control systems • knowledge of limited slip differentials	090202b 090202c 090202d	Differentials Final Drive Gear Sets Drive Axle Assembly, Diagnosis and Service

11 REPAIRS DRIVE LINE SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
11.01	Repairs drive shafts and axles	• knowledge of drive shaft types and construction such as single, two piece and steel, aluminium and composite construction • knowledge of types of drive shaft components such as slip yoke, flex, single and double cardan joints • knowledge of types of axles such as	090103a 090202a 090202b 090202c 090202d	Drivelines Axles and Bearings Differentials Final Drive Gear Sets Drive Axle Assembly, Diagnosis and Service

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		CV axles, solid axles, floating and semi-floating • knowledge of safety precautions • ability to follow manufacturers' specifications and recommendations • ability to remove, replace or recondition drive shaft components • ability to lubricate components • ability to use specialty tools such as angle gauges and presses • ability to index components • ability to align and balance components • ability to identify worn, damaged or defective components • ability to road test to verify repair		
11.02	Repairs manual transmissions/transaxles	• knowledge of types of manual transmissions/transaxles • knowledge of gear ratios • knowledge of path of power	090402a 090402b 090402c	Manual Transmission Fundamentals Manual Transmissions Manual Transaxles

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of lubricants • ability to follow manufacturers' specifications and recommendations • ability to remove, replace or recondition assemblies • ability to replace worn, damaged or defective assembly components • ability to use specialty tools such as pullers, presses and gauges • ability to perform adjustments to components such as linkages and shifters • ability to replace VSS • ability to road test to verify repair	090403a 090403d	Manual Transfer Cases 4 x 4 Front Axle Control
11.03	Repairs automatic transmissions/transaxles	• knowledge of types of automatic transmissions/transaxles • knowledge of gear ratios • knowledge of lubricants • knowledge of control systems	090401a 090401b 090401m 090401c	Automatic Transmission Fundamentals Planetary Gear Sets Automatic Transmission Testing and Adjustment Torque Converters

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of fluid drive systems • knowledge of mechanical drive systems • ability to follow manufacturers' specifications and recommendations • ability to remove, replace or recondition assemblies • ability to replace worn, damaged or defective assembly components • ability to use specialized tools such as pullers, compressors, installers, scan tools and DVOM • ability to perform adjustments and measurements • ability to follow fluid flow charts • ability to replace electronic components such as solenoids, wiring and sensors • ability to road test to verify repair	090401d 090401e 090401f 090401g 090401h 090401i 090401j 090401k 090401L 090401n 090403b	Oil Pumps Clutches and Bands Hydraulic Valve Fundamentals Pressure Regulator Valves Throttle and Modulator Valves Governors Shift Valves Hydraulic Circuits Electronic Shift and Controls Automatic Transmission Service and Repair Electronic Transfer Cases
11.04	Repairs clutches	• knowledge of types of	090402d	Clutches

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		clutches/flywheels • knowledge of hydraulics/linkage systems • knowledge of clutch operation • ability to follow manufacturers' specifications and recommendations • ability to remove and replace clutch assembly and related components • ability to replace or refinish flywheel • ability to perform adjustments such as clutch linkage free play • ability to replace hydraulic components • ability to bleed hydraulic systems • ability to road test to verify repair		
11.05	Repairs transfer cases	• knowledge of types of transfer cases such as active and passive • knowledge of control systems such as vacuum, manual and electronic • knowledge of types of fluids	090403a 090403b 090403c	Manual Transfer Cases Electronic Transfer Cases All Wheel Drive (AWD) Transfer Cases

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of path of power • knowledge of transfer case operation • ability to follow manufacturers' specifications and recommendations • ability to remove, replace or recondition transfer case assemblies • ability to replace worn, damaged or defective assembly components • ability to use specialty tools such as pullers, compressors and DVOM • ability to road test to verify repair	090403d	4 X 4 Front Axle Control
11.06	Repairs differentials	• knowledge of types of differentials such as integral and removable • knowledge of types of axles such as full floating and semi-floating • knowledge of types of lubricants and additives • knowledge of path of power • knowledge of control systems	090202a 090202b 090202c 090202d	Axles and Bearings Differentials Final Drive Gear Sets Drive Axle Assembly, Diagnosis and Service

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of limited slip differentials • ability to follow manufacturers' specifications and recommendations • ability to remove, replace or recondition differential assemblies • ability to replace worn, damaged or defective assembly components • ability to use specialty tools such as pullers, presses, gauges, spreaders and dial indicators • ability to perform adjustments such as gear tooth contact pattern, pinion depth and backlash • ability to road test to verify repair		

E ELECTRICAL AND COMFORT CONTROL SYSTEMS 15%

12 DIAGNOSES ELECTRICAL SYSTEMS AND COMPONENTS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
12.01	Diagnoses starting/charging systems and batteries	• knowledge of types and operation of starting systems • knowledge of types and operation of charging systems • knowledge of types of batteries such as lead acid, gel and sealed • ability to test starting and charging systems and batteries	090205a 090205b 090205c 090307h 090204a 090204b 090301a 090106d 090101e	DC Motor Fundamentals Starter Motors and Control Circuits Starting System Testing and Diagnosis Safety and Security Systems Charging Systems and Control Circuits Charging system Testing and Diagnosis Electrical Fundamentals III Batteries Safety
12.02	Diagnoses basic wiring and electrical systems	• knowledge of basic wiring principles • knowledge of electrical principles such	090307a 090307b	Gauges and Warning Systems Lighting systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		as Ohm's law and electron theory • knowledge of general electrical components such as fuses, ignition switches, relays and circuit breakers • knowledge of wire characteristics such as gauge, size and insulation • ability to test circuits using equipment such as scan tools, test lights and DVOM • ability to interpret wiring diagrams • ability to probe circuitry	090307c 090307d 090307e 090307f 090307g 090307h 090105g 090106a 090106e 090301e	Wiper and Washer Systems Power Accessory Systems Heated Glass Systems Speed Control Systems Sound Systems Safety and Security Systems Antilock Brake Systems Electrical Fundamentals I Electrical System Diagnosis I Advanced Electrical Schematics
12.03	Diagnoses lighting and wiper systems	• knowledge of types and operation of lighting systems and components • knowledge of types and operation of wiper systems and components • ability to interpret wiring diagrams • ability to perform Ohm's law calculations	090307b 090307c	Lighting systems Wiper and Washer Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to use testing equipment • ability to interpret diagnostic codes • ability to inspect mechanical components such as linkages and wipers		
12.04	Diagnoses entertainment systems	• knowledge of types and operation of entertainment systems such as audio and video • knowledge of system components such as displays, speakers and power antennae • knowledge of service considerations such as temperature and location of components • ability to activate system self-diagnosis function • ability to check system integrity such as power, ground and wire continuity • ability to identify faulty components	090307g	Sound Systems
12.05	Diagnoses electrical options	• knowledge of types and operation of options such as power windows,	090307a	Gauges and Warning Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		parking aids, keyless entry, power seats and theft deterrents • ability to use test equipment • ability to perform basic circuit analysis • ability to interpret wiring diagrams • ability to interpret diagnostic codes	090307b 090307c 090307d 090307e 090307f 090307g 090307h	Lighting systems Wiper and Washer Systems Power Accessory Systems Heated Glass Systems Speed Control Systems Sound Systems Safety and Security Systems
12.06	Diagnoses electrical accessories	• knowledge of types of electrical accessories such as remote starters, brake controllers, trailer wiring and navigation systems • ability to use test equipment • ability to interpret wiring diagrams • ability to interpret diagnostic codes • ability to determine compatibility of electrical accessories	090307a 090307b 090307c 090307d 090307e 090307f 090307g 090307h	Gauges and Warning Systems Lighting systems Wiper and Washer Systems Power Accessory Systems Heated Glass Systems Speed Control Systems Sound Systems Safety and Security Systems
12.07	Diagnoses instrumentation and	• knowledge of types and operation of instrumentation systems such as	090307a	Gauges and Warning Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
	information displays	gauges, speedometers and tachometers • knowledge of types and operation of displays such as temperature, compasses and engine monitoring • ability to interpret wiring diagrams • ability to use test equipment • ability to interpret integrated diagnostic information		

13 REPAIRS ELECTRICAL SYSTEMS AND COMPONENTS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
13.01	Repairs starting/charging systems and batteries	• knowledge of types and operation of starting systems • knowledge of types and operation of charging systems • knowledge of types of batteries such as lead acid, gel and sealed • ability to follow manufacturers'	090205a 090205b 090205c 090307h 090204a	DC Motor Fundamentals Starter Motors and Control Circuits Starting System Testing and Diagnosis Safety and Security Systems Charging Systems and Control Circuits

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		specifications and recommendations • ability to determine component serviceability using methods such as costs of repair versus replacement • ability to remove and replace components	090204b 090301a 090106d 090101e	Charging system Testing and Diagnosis Electrical Fundamentals III Batteries Safety
13.02	Repairs basic wiring and electrical systems	• knowledge of basic wiring principles such as Ohm's law and electron theory • knowledge of wire characteristics such as gauge, size and insulation • ability to follow manufacturers' specifications and recommendations • ability to repair circuitry using methods such as splicing, terminal replacement, soldering and crimping • ability to replace damaged components such as harnesses, connectors, relays and fusible links	090307a 090307b 090307c 090307d 090307e 090307f 090307g 090307h 090105g 090106a 090106e 090301e	Gauges and Warning Systems Lighting systems Wiper and Washer Systems Power Accessory Systems Heated Glass Systems Speed Control Systems Sound Systems Safety and Security Systems Antilock Brake Systems Electrical Fundamentals I Electrical System Diagnosis I Advanced Electrical Schematics

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
13.03	Repairs lighting and wiper systems	• knowledge of types and operation of lighting systems • knowledge of types and operation of wiper systems • knowledge of service procedures for bulbs • knowledge of governmental regulations regarding lighting • ability to follow manufacturers' specifications and recommendations • ability to adjust and replace wiper components such as linkages and controls • ability to aim headlights • ability to replace lighting components	090307b 090307c	Lighting systems Wiper and Washer Systems
13.04	Repairs entertainment systems	• knowledge of types and operation of entertainment systems such as audio and video • knowledge of components of entertainment systems	090307g	Sound Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of service considerations such as temperature and location of components • knowledge of anti-theft features • ability to follow manufacturers' specifications and recommendations • ability to replace components such as receivers, speakers, amplifiers and equalizers • ability to determine technician service limitations		
13.05	Repairs electrical options	• knowledge of types and operation of electrical options such as sensors, programmable keys and key fobs • knowledge of repair procedures such as calibration and configuration • knowledge of special service considerations such as paint on sensors and paint on air bag covers • ability to follow manufacturers' specifications and recommendations	090307a 090307b 090307c 090307d 090307e 090307f 090307g 090307h	Gauges and Warning Systems Lighting systems Wiper and Washer Systems Power Accessory Systems Heated Glass Systems Speed Control Systems Sound Systems Safety and Security Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to adjust sensors • ability to replace components such as motor, tracks and switches		
13.06	Repairs electrical accessories	• knowledge of types of electrical accessories such as remote starters, brake controllers, trailer wiring and navigation systems • ability to follow manufacturers' specifications and recommendations • ability to interpret wiring diagrams and diagnostic codes • ability to repair wiring	090307a 090307b 090307c 090307d 090307e 090307f 090307g 090307h	Gauges and Warning Systems Lighting systems Wiper and Washer Systems Power Accessory Systems Heated Glass Systems Speed Control Systems Sound Systems Safety and Security Systems
13.07	Installs electrical accessories	• knowledge of requirements for accessories such as bracing, additional wiring and heavy duty flashers • knowledge of regulations • ability to follow manufacturers' specifications and recommendations • ability to determine suitability of	090307a 090307b 090307c 090307d 090307e	Gauges and Warning Systems Lighting systems Wiper and Washer Systems Power Accessory Systems Heated Glass Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		accessory for vehicle • ability to reconfigure vehicle control module	090307f 090307g 090307h	Speed Control Systems Sound Systems Safety and Security Systems
13.08	Repairs instrumentation and information displays	• knowledge of types and operation of instrumentation and displays • knowledge of legislation regarding odometer servicing • knowledge of safety concerns related to components such as gas tank, fuel gauge and airbags • knowledge of wiring, connectors and terminals • ability to follow manufacturers' specifications and recommendations • ability to replace components • ability to calibrate and configure instrumentation systems and displays	090307a	Gauges and Warning Systems

14 DIAGNOSES HVAC AND COMFORT CONTROL

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
14.01	Diagnoses air flow control systems	• knowledge of types and operation of air flow control systems such as manual, electrical and vacuum • knowledge of operation of components such as fans, blend doors, levers, actuators and auxiliary vacuum pumps • knowledge of causes of odours • ability to interpret diagrams and schematics • ability to use testing equipment such as scan tools and vacuum gauges • ability to perform function tests such as air flow direction, recirculation and temperature	090404aA 090404aB 090404b 090404c 090405a	Air Conditioning - Part A Air Conditioning - Part B Air Conditioning Controls Air Conditioning Service After Market Accessories
14.02	Diagnoses refrigerant systems	• knowledge of types and operation of refrigerant systems • knowledge of principles of refrigeration • knowledge of refrigerants, lubricants	090404aA 090404aB 090404b 090404c	Air Conditioning - Part A Air Conditioning - Part B Air Conditioning Controls Air Conditioning Service

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		and consequences of improper mixing • knowledge of electronic control systems • ability to interpret pressure gauge readings • ability to use equipment to identify types of refrigerants • ability to use diagnostic testing methods such as dye and leak testing • ability to use test equipment such as scan tools and thermometer • ability to identify faulty components	090405a	After Market Accessories
14.03	Diagnoses heating systems	• knowledge of types and operation of heating systems • knowledge of operation of components such as heater core, thermostats, coolant pumps and restrictors • knowledge of coolant types and characteristics • ability to perform function tests using methods such as output temperature or	090404aA 090404aB 090404b 090404c 090405a	Air Conditioning - Part A Air Conditioning - Part B Air Conditioning Controls Air Conditioning Service After Market Accessories

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		flow test • ability to test components such as vacuum and electric motors		

15 REPAIRS HVAC AND COMFORT CONTROL

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
15.01	Repairs air flow control systems	• knowledge of types and operation of air flow control systems • knowledge of procedures to correct problems such as odours, air flow restrictions and noises • ability to follow manufacturers' specifications and recommendations • ability to access faulty components • ability to test vacuum systems • ability to repair or replace components such as vacuum lines and linkages • ability to access filtration devices such	090404aA 090404aB 090404b 090404c 090405a	Air Conditioning - Part A Air Conditioning - Part B Air Conditioning Controls Air Conditioning Service After Market Accessories

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		as pollen filters • ability to clean and deodorize air flow systems		
15.02	Repairs refrigerant systems	• knowledge of types and operation of refrigerant systems • knowledge of types and operation of components such as compressors, clutches and receiver dryers • knowledge of metering devices such as orifice tubes and expansion valves • knowledge of types of refrigerants and oils • knowledge of legislation regarding licensing requirements, use, handling and disposal of refrigerants • knowledge of electronic control systems • ability to follow manufacturers' specifications and recommendations • ability to evacuate and recharge systems	090404aA 090404aB 090404b 090404c 090405a	Air Conditioning - Part A Air Conditioning - Part B Air Conditioning Controls Air Conditioning Service After Market Accessories

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to store and recycle refrigerants • ability to convert systems to run on alternate refrigerants • ability to access faulty components		
15.03	Repairs heating systems	• knowledge of types and operation of heating systems • knowledge of disposal requirements of coolants • knowledge of types of coolants and chemical additives • knowledge of water quality suitable for heating systems • ability to follow manufacturers' specifications and recommendations • ability to fill and bleed heating systems • ability to access and replace components such as heater core, thermostats and control valves	090404aA 090404aB 090404b 090404c 090405a	Air Conditioning - Part A Air Conditioning - Part B Air Conditioning Controls Air Conditioning Service After Market Accessories

F STEERING, SUSPENSION, BRAKING AND CONTROL SYSTEMS 19%

16 DIAGNOSES STEERING, SUSPENSION, BRAKING AND CONTROL SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
16.01	Diagnoses steering and control systems	• knowledge of types of steering systems such as rack-and-pinion, recirculating ball and power assist • knowledge of types of assist systems such as power, electric and hydraulic • knowledge of related components • knowledge of steering columns and their components such as tilt mechanism, steering locks and airbag clock spring • knowledge of control systems such as variable assist and four wheel steering • knowledge of safety concerns • knowledge of steering geometry • knowledge of types of pumps	090104b 090104c 090104d 090104e 090104f 090104g 090104h 090104i	Suspension and Steering Linkages Wheels, Hubs and Tires Manual Steering Power Steering Steering Angles Alignment Procedures Steering columns Suspension and Steering Diagnosis

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to disarm air bag system • ability to select and use tools such as wheel alignment equipment and measuring tools • ability to identify cause of customer concern • ability to interpret diagnostic codes • ability to identify worn, damaged or defective steering components		
16.02	Diagnoses suspension and control systems	• knowledge of types of suspension systems such as independent, double wishbone and I-beam • knowledge of types of springs such as coil, leaf and torsion bar • knowledge of types of ride height controls such as airbags and air suspension • knowledge of types of dampers such as struts and shocks • knowledge of safety concerns	090104a 090104b 090104g 090104i	Frames Suspension and Steering Linkages Alignment Procedures Suspension and Steering Diagnosis

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to perform jounce and rebound test • ability to interpret diagnostic codes • ability to select and use specialty tools such as scan tools, DVOM and gauges • ability to follow diagnostic flow chart • ability to measure ride height • ability to road test to verify complaint • ability to test control systems such as active suspension and stability control • ability to identify worn, damaged or defective components and subframes		
16.03	Diagnoses braking and control systems	• knowledge of types of braking systems • knowledge of types of control systems such as antilock braking systems (ABS) and traction control system (TCS) • knowledge of types of assist such as vacuum and hydraulic • knowledge of hydraulic principles such	090105a 090105b 090105c 090105d 090105e 090105f	Brake System Fundamentals Hydraulic System Components Drum Brake Systems Disc Brake systems Power Brakes Brake System Diagnosis & Service

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		as Pascal's law • knowledge of fluid types • knowledge of safety concerns • ability to road test to identify and verify customer concerns • ability to inspect level and condition of fluids • ability to perform Pascal's law calculations • ability to use troubleshooting flow charts • ability to use specialty tools such as pressure gauges, DVOM and scan tools • ability to identify worn, damaged or defective components	090105g	Antilock Brake systems
16.04	Diagnoses tires, wheels, hubs and wheel bearings	• knowledge of types of tires such as directional and conventional • knowledge of types of vehicle rims such as directional and conventional • knowledge of types of hubs	090104b 090104c 090104i	Suspension and Steering Linkages Wheels, Hubs and Tires Suspension and Steering Diagnosis

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of types of wheel bearings • knowledge of relationship between suspension and components • knowledge of types of fluids and lubricants • ability to road test to verify customer concerns • ability to use specialty tools and equipment such as scan tools, wheel alignment machines, wheel balancer and tire machine • ability to identify tire wear patterns • ability to interpret tire codes and sidewall markings • ability to identify worn, damaged or defective components		

17 REPAIRS STEERING, SUSPENSION, BRAKING AND CONTROL SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
17.01	Repairs steering and control systems	• knowledge of types of steering systems such as rack-and-pinion and recirculating ball • knowledge of types of assist systems such as power, electric and hydraulic • knowledge of related steering components such as tie rods, ball joints and pitman arms • knowledge of steering columns and components such as tilt mechanism, steering locks and airbag clock spring • knowledge of steering geometry • knowledge of hydraulics • knowledge of electrical theory • knowledge of types of pumps • ability to follow manufacturers' specifications and recommendations • ability to disarm airbag system • ability to use specialty tools such as scan tools, DVOM, pullers, presses and	090104b 090104c 090104d 090104e 090104f 090104g 090104h 090104i	Suspension and Steering Linkages Wheels, Hubs and Tires Manual Steering Power Steering Steering Angles Alignment Procedures Steering columns Suspension and Steering Diagnosis

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		pressure gauges • ability to remove, replace and recondition steering system components • ability to road test to verify repair		
17.02	Repairs suspension and control systems	• knowledge of types of suspension systems such as independent, double wishbone and I-beam • knowledge of types of springs such as coil, leaf and torsion bar • knowledge of types of ride height controls such as airbags and air suspension • knowledge of types of dampers such as struts and shocks • knowledge of safety concerns • ability to follow manufacturers' specifications and recommendations • ability to remove, replace or recondition suspension system components and subframes	090104a 090104b 090104g 090104i	Frames Suspension and Steering Linkages Alignment Procedures Suspension and Steering Diagnosis

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to use specialty tools such as compressors, pullers, DVOM and scan tools • ability to perform wheel alignment • ability to road test to verify repair		
17.03	Repairs braking and control systems	• knowledge of types of braking systems • knowledge of types of control systems such as ABS and TCS • knowledge of types of assist such as vacuum and hydraulic • knowledge of hydraulic principles • knowledge of fluid types • knowledge of safety concerns • ability to follow manufacturers' specifications and recommendations • ability to inspect fluid level and condition • ability to remove, repair or recondition braking system components	090105a 090105b 090105c 090105d 090105e 090105f 090105g	Brake System Fundamentals Hydraulic System Components Drum Brake Systems Disc Brake systems Power Brakes Brake System Diagnosis & Service Antilock Brake systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to identify worn, damaged or defective components • ability to machine components such as drums and rotors on or off vehicle • ability to use specialty tools such as scan tools, brake lathes, bleeders and flaring tools • ability to flush and bleed hydraulic brakes • ability to handle and store brake fluid • ability to inspect, service and adjust brakes • ability to test and replace control modules and components • ability to inspect, test and replace assist components • ability to road test to verify repair • ability to inspect, service and repair parking brake systems		
17.04	Repairs tires, wheels,	• knowledge of types of tires such as	090104b	Suspension and Steering Linkages

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
	hubs and wheel bearings	directional and conventional • knowledge of types of wheels such as directional and conventional • knowledge of types of hubs • knowledge of types of wheel bearings • knowledge of relationship between suspension and components • knowledge of types of fluids and lubricants • knowledge of types of tire repairs • ability to follow manufacturers' specifications and recommendations • ability to remove and repair tires • ability to identify worn, damaged or defective components • ability to remove, service or replace wheel bearings/seals • ability to follow safety procedures • ability to mount and dismount tires and	090104c 090104i	Wheels, Hubs and Tires Suspension and Steering Diagnosis

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		wheels • ability to inflate and seal tires • ability to align and balance tires and wheels • ability to use specialty tools such as wheel balancers, scan tools and wheel alignment machines • ability to road test vehicle to verify repair • ability to interpret diagnostic codes • ability to measure axial and radial movement		

G BODY COMPONENTS, TRIM AND RESTRAINT SYSTEMS 7%

18 DIAGNOSES BODY COMPONENTS, TRIM AND RESTRAINT SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
18.01	Diagnoses active restraint systems	• knowledge of seat belt mounting and operation • knowledge of seat belt warning system • ability to recognize seat belt defects such as burrs, frays and buckle malfunction • ability to test seat belt mechanisms such as tensioner locking	090107a 090108a	Introduction to Scan Tools Active Restraint Systems And On-The-Job-Training
18.02	Diagnoses passive restraint systems	• knowledge of airbag mounting, operation and locations • knowledge of impediments to proper air bag operation such as glass and trim items, seat covers and placement of child seats • knowledge of airbag monitoring systems • knowledge of progressive airbag	090107a 090108b	Introduction to Scan Tools Passive Restraint Systems And On-The-Job-Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		deployment • ability to handle and remove airbag modules • ability to disarm and rearm airbag systems • ability to test airbag components • ability to access and interpret diagnostic codes		
18.03	Diagnoses wind noise and water leaks	• knowledge of seals, adhesives and sealing materials • knowledge of basic aerodynamics • ability to perform tests such as smoke tests, interior pressure tests and water leak tests • ability to use listening devices such as stethoscopes and electronic ears (engine and chassis)		Considered On The Job Training
18.04	Diagnoses NVH (noise, vibration, harshness)	• knowledge of vibration emitters, conductors, generators and resonators • knowledge of basic aerodynamics		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to isolate source of vibration using frequencies • ability to identify types of noises such as chuckles, rattles, knocks and whines, and their common sources		
18.05	Diagnoses interior and exterior components and trim	• knowledge of trim hardware, fasteners, adhesives and cleaners • knowledge of upholstery, carpet and roof lining • knowledge of seat construction • ability to recognize flaws in fit, finish and function		Considered On The Job Training
18.06	Diagnoses latches, locks and movable glass	• knowledge of door components such as latches, locks and linkages • knowledge of movable glass components such as channels, regulators and weather stripping • knowledge of electrical/electronic systems associated with doors and windows • ability to remove trim components to		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		access inside of door • ability to identify misaligned, worn, damaged or defective components		

19 REPAIRS BODY COMPONENTS, TRIM, RESTRAINT SYSTEMS AND INSTALLED ACCESSORIES

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
19.01	Repairs active restraint systems	• knowledge of seat belt mounting and operation • knowledge of seat belt warning system • ability to follow manufacturers' specifications and recommendations • ability to remove and replace worn, damaged or defective seat belt components	090108a	Active Restraint Systems And On-The-Job-Training
19.02	Repairs passive restraint systems	• knowledge of airbag mounting, operation and locations • knowledge of types of passive restraint systems such as front impact airbags,	090108b	Passive Restraint Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		curtain airbags and seat belt pretensioners • knowledge of impediments to proper air bag operation such as glass and trim items, seat covers and placement of child seats • knowledge of airbag monitoring system • knowledge of progressive airbag deployment • ability to follow manufacturers' specifications and recommendations • ability to handle and remove airbag modules • ability to disarm and rearm airbag systems • ability to verify airbag self-test • ability to access and interpret diagnostic codes		
19.03	Repairs problems with wind noise and water leaks	• knowledge of seals, adhesives and sealing materials		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of basic aerodynamics • ability to perform body adjustments • ability to remove and replace worn, damaged or defective components		
19.04	Repairs problems with NVH (noise, vibration, harshness)	• knowledge of vibration emitters, conductors, generators and resonators • knowledge of basic aerodynamics • knowledge of materials used to dampen or interrupt vibration such as tapes, adhesives and dampers • ability to disassemble and re-assemble problem components or areas		Considered On The Job Training
19.05	Repairs interior and exterior components and trim	• knowledge of trim hardware, fasteners, adhesives and cleaners • knowledge of upholstery, carpet and roof lining • knowledge of seat construction • ability to follow manufacturers' specifications and recommendations		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to remove, select and re-apply adhesives and fasteners • ability to adjust components for fit, finish and function • ability to remove and replace interior components and trim • ability to remove and replace exterior components and trim		
19.06	Installs interior and exterior accessories	• knowledge of basic electrical circuitry • knowledge of hardware • knowledge of safety procedures • knowledge of regulations and safety standards • knowledge of vehicle design and construction • ability to follow manufacturers' recommendations and limitations • ability to select and use fasteners		Considered On The Job Training
19.07	Repairs latches, locks	• knowledge of door components such as		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
	and movable glass	latches, locks and linkages • knowledge of movable glass components such as channels, regulators and weather stripping • knowledge of electrical/electronic systems associated with doors and windows • ability to remove, replace and adjust defective components • ability to remove trim components to access inside of door		