

# Instructional Framework

Automotive Technologies  
47.0600.20



## Domain 1: Basic Automotive Systems and Safety

Instructional Time: 60-65%

### STANDARD 1.0 PERFORM ENGINE SERVICES—GENERAL

1.1 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins	<ul style="list-style-type: none"> <li>• Vehicle information Online Resources (i.e Mitchell, All Data, Google)</li> </ul>
1.2 Verify operation of the instrument panel engine warning indicators	<ul style="list-style-type: none"> <li>• Indicator Lights and definitions</li> </ul>
1.3 Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action	<ul style="list-style-type: none"> <li>• Fluid Identification (Color, Texture, Odor)</li> <li>• Visual Inspection</li> </ul>
1.4 Install engine covers using gaskets, seals, and sealers as required	<ul style="list-style-type: none"> <li>• Gasket Materials</li> <li>• Repair Procedures and Assembly Specifications</li> </ul>
1.5 Verify engine mechanical timing	<ul style="list-style-type: none"> <li>• Repair Procedures and Assembly Specifications</li> </ul>
1.6 Perform common fastener and thread repair to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert	<ul style="list-style-type: none"> <li>• Thread Repair</li> <li>• Tap and Die</li> <li>• Bolt Extraction</li> </ul>
1.7 Identify service precautions related to service of the internal combustion engine of a hybrid vehicle	<ul style="list-style-type: none"> <li>• Warning Label Identification</li> <li>• Hybrid Wire Color Identification</li> <li>• Research Hybrid</li> </ul>
1.8 Adjust valves (mechanical or hydraulic lifters)	<ul style="list-style-type: none"> <li>• Repair Procedures and Assembly Specifications</li> </ul>
1.9 Identify components of the cylinder head and valve train	<ul style="list-style-type: none"> <li>• Repair Procedures and Assembly Specifications</li> </ul>
1.10 Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core and galley plugs; determine necessary action	<ul style="list-style-type: none"> <li>• Procedure for using cooling system testing equipment</li> <li>• Cooling System Specifications</li> </ul>

1.11 Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment	<ul style="list-style-type: none"> <li>● Repair Procedures and Assembly Specifications</li> <li>● Identify Abnormal Noise</li> <li>● Identifying Location of noises</li> </ul>
1.12 Remove, inspect, and replace thermostat and gasket/seal	<ul style="list-style-type: none"> <li>● Thermostat Location and Operation</li> <li>● Repair Procedures and Assembly Specifications</li> </ul>
1.13 Inspect and test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required	<ul style="list-style-type: none"> <li>● Use of Coolant Testing devices and equipment</li> <li>● Repair Procedures and Specifications</li> </ul>
1.14 Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required	<ul style="list-style-type: none"> <li>● Engine oil and filter change</li> <li>● Proper fluid type per manufacturer specification</li> <li>● Reset maintenance reminder (as required)</li> </ul>
1.15 Identify components of the lubrication and cooling systems	<ul style="list-style-type: none"> <li>● Lubrication System Components</li> <li>● Cooling System Components</li> </ul>
<b>STANDARD 5.0 PERFORM BRAKE SYSTEM SERVICES—GENERAL</b>	
5.1 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins	<ul style="list-style-type: none"> <li>● Vehicle service information <ul style="list-style-type: none"> <li>○ Fluid type</li> <li>○ Vehicle service history</li> <li>○ Service precautions</li> <li>○ Technical service bulletins</li> </ul> </li> </ul>
5.2 Describe procedure for performing a road test to check brake system operation including an anti-lock brake system (ABS)	<ul style="list-style-type: none"> <li>● Road Test Parameters</li> <li>● Check Brake Operation</li> <li>● Check ABS Brake Operation</li> </ul>
5.3 Install wheel and torque lug nuts	<ul style="list-style-type: none"> <li>● Lug Nut Torque Specification</li> <li>● Lug Nut Torque Sequence</li> </ul>
5.4 Identify brake system components and configuration	<ul style="list-style-type: none"> <li>● Brake System Components</li> <li>● Brake System Configurations</li> <li>● Brake Parts Identification</li> </ul>
5.5 Describe proper brake pedal height, travel, and feel	<ul style="list-style-type: none"> <li>● Brake Pedal Height</li> <li>● Brake Pedal Travel</li> <li>● Brake Pedal Feel</li> </ul>

5.6 Check master cylinder for external leaks and proper operation	<ul style="list-style-type: none"> <li>● Master Cylinder Inspection for Leaks</li> <li>● Master Cylinder Proper Operation</li> </ul>
5.7 Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports	<ul style="list-style-type: none"> <li>● Brake Line Inspection</li> </ul>
5.8 Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification	<ul style="list-style-type: none"> <li>● Brake Fluid Handling</li> <li>● Proper Brake Fluid Filling Procedure</li> <li>● Identifying Correct Brake Fluid for Vehicle Type</li> </ul>
5.9 Identify components of hydraulic brake warning light system	<ul style="list-style-type: none"> <li>● Brake Warning Light Symbol</li> <li>● Brake Warning Light Components</li> </ul>
5.10 Bleed and/or flush brake system	<ul style="list-style-type: none"> <li>● Bleed and Flush Brake Fluid</li> </ul>
5.11 Test brake fluid for contamination	<ul style="list-style-type: none"> <li>● Brake Fluid Testing</li> </ul>
5.12 Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability	<ul style="list-style-type: none"> <li>● Brake Drum Removal</li> <li>● Brake Drum Inspection</li> <li>● Brake Drum Measuring</li> </ul>
5.13 Refinish brake drum and measure final drum diameter; compare with specification	<ul style="list-style-type: none"> <li>● Brake Drum Refinishing</li> <li>● Brake Drum Measurements</li> <li>● Brake Drum Specifications</li> </ul>
5.14 Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble	<ul style="list-style-type: none"> <li>● Drum Brake Hardware Identification</li> <li>● Drum Brake Hardware Assembly Procedure</li> </ul>
5.15 Inspect wheel cylinders for leaks and proper operation; remove and replace as necessary	<ul style="list-style-type: none"> <li>● Wheel Cylinder Inspection</li> <li>● Wheel Cylinder Operation</li> </ul>
5.16 Pre Adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments	<ul style="list-style-type: none"> <li>● Drum Brake Adjustment Procedure</li> <li>● Drum Brake Assembly Procedure</li> <li>● Drum Post Inspection</li> </ul>
5.17 Remove and clean caliper assembly; inspect for leaks and damage/wear; determine necessary action	<ul style="list-style-type: none"> <li>● Brake Caliper Removal Procedure</li> <li>● Brake Caliper Inspection</li> </ul>
5.18 Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action	<ul style="list-style-type: none"> <li>● Brake Caliper Mounting Bracket</li> <li>● Brake Caliper Slide Lubrication Procedure</li> </ul>

5.19 Remove, inspect, and/or replace brake pads and retaining hardware; determine necessary action	<ul style="list-style-type: none"> <li>● Brake Pad Removal Procedure</li> <li>● Brake Pad and Hardware Inspection</li> </ul>
5.20 Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads and inspect for leaks	<ul style="list-style-type: none"> <li>● Brake Pad Installation Procedure</li> <li>● Brake Caliper Installation Procedure</li> </ul>
5.21 Clean and inspect rotor and mounting surface, measure rotor thickness, thickness variation, and lateral runout; determine necessary action	<ul style="list-style-type: none"> <li>● Brake Rotor Inspection</li> <li>● Brake Rotor Measurements</li> <li>● Brake Rotor Specifications</li> </ul>
5.22 Remove and reinstall/replace rotor	<ul style="list-style-type: none"> <li>● Brake Rotor Removal</li> <li>● Brake Rotor Installation</li> </ul>
5.23 Refinish rotor on vehicle; measure final rotor thickness and compare with specification	<ul style="list-style-type: none"> <li>● Brake Rotor on the Car Refinishing/Machining</li> <li>● Brake Rotor Specifications</li> </ul>
5.24 Refinish rotor off vehicle; measure final rotor thickness and compare with specification	<ul style="list-style-type: none"> <li>● Brake Rotor Off Vehicle Refinishing</li> <li>● Brake Rotor Specifications</li> </ul>
5.25 Retract and re-adjust caliper piston on an integral parking brake system	<ul style="list-style-type: none"> <li>● Integral Parking Brake Caliper Removal Procedure</li> <li>● Integral Parking Brake Caliper Installation Procedure</li> </ul>
5.26 Check brake pad wear indicator; determine necessary action	<ul style="list-style-type: none"> <li>● Brake Pad wear Indicator</li> <li>● Brake Pad wear Indicator Types</li> </ul>
5.27 Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendation	<ul style="list-style-type: none"> <li>● Brake Burnishing Procedure</li> <li>● Reasons for Burnishing Brakes</li> </ul>
5.28 Check brake pedal travel with, and without, engine running to verify proper power booster operation	<ul style="list-style-type: none"> <li>● Brake Booster Operation</li> <li>● Engine Off Brake Pedal Height Check</li> </ul>
5.29 Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster	<ul style="list-style-type: none"> <li>● Identify Power Brake System between Vacuum and Hydraulic Assist</li> <li>● Identify Power Brake System between Vacuum and Hydraulic Assist Components</li> </ul>
5.30 Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings	<ul style="list-style-type: none"> <li>● Wheel Bearing Inspection</li> <li>● Wheel Bearing Repack</li> <li>● Wheel Bearing Hub Replacement</li> </ul>

5.31 Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as necessary	<ul style="list-style-type: none"> <li>● Inspect Parking Brake Components</li> <li>● Inspect Parking Brake Cable for Kinks or Binding</li> <li>● Lubricate Portions of Parking Brake assembly if Recommended by Manufacturer</li> </ul>
5.32 Check parking brake operation and parking brake indicator light system operation; determine necessary action	<ul style="list-style-type: none"> <li>● Operation of parking brake indicator light system</li> <li>● Repair Procedures of parking brake indicator light system</li> </ul>
5.33 Check operation of brake stop light system	<ul style="list-style-type: none"> <li>● Visual inspection of the brake light system</li> </ul>
5.34 Replace wheel bearing and race	<ul style="list-style-type: none"> <li>● Repair Procedures for wheel bearings and seals and Assembly Specifications</li> </ul>
5.35 Inspect and replace wheel studs	<ul style="list-style-type: none"> <li>● Repair Procedures for wheel studs and Assembly Specifications</li> <li>● Visual inspection</li> </ul>
5.36 Identify traction control/vehicle stability control system components	<ul style="list-style-type: none"> <li>● Operation of traction control/vehicle stability control system using Online Resources (i.e Mitchell, All Data, Google)</li> </ul>
5.37 Describe the operation of a regenerative braking system	<ul style="list-style-type: none"> <li>● Operation of a regenerative braking system</li> </ul>
<b>STANDARD 6.0 PERFORM ELECTRICAL/ELECTRONIC SYSTEM SERVICES—GENERAL</b>	
6.1 Research vehicle service information including vehicle service history, service precautions, and technical service bulletins	<ul style="list-style-type: none"> <li>● Vehicle information Online Resources (i.e Mitchell, All Data, Google)</li> </ul>
6.2 Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law)	<ul style="list-style-type: none"> <li>● Series circuits</li> <li>● Parallel circuits</li> <li>● Electrical principles</li> </ul>
6.3 Use wiring diagrams to trace electrical/electronic circuits	<ul style="list-style-type: none"> <li>● Wire diagrams</li> </ul>
6.4 Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance	<ul style="list-style-type: none"> <li>● Digital multimeter</li> <li>● Voltage drop test</li> <li>● Current Flow</li> <li>● Resistance</li> </ul>
6.5 Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits	<ul style="list-style-type: none"> <li>● Shorts</li> <li>● Grounds</li> <li>● Opens</li> </ul>

6.6 Use a test light to check operation of electrical circuits	<ul style="list-style-type: none"> <li>• Test light procedures</li> </ul>
6.7 Use fused jumper wires to check operation of electrical circuits	<ul style="list-style-type: none"> <li>• Jumper wire procedures</li> </ul>
6.8 Measure key-off battery drain (parasitic draw)	<ul style="list-style-type: none"> <li>• Parasitic draw</li> <li>• Battery drain</li> </ul>
6.9 Inspect and test fusible links, circuit breakers, and fuses; determine necessary action	<ul style="list-style-type: none"> <li>• Fusible links</li> <li>• Circuit breakers</li> <li>• Fuse operations</li> </ul>
6.10 Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair)	<ul style="list-style-type: none"> <li>• Electrical connectors</li> <li>• Repair procedures</li> </ul>
6.11 Identify electrical/electronic system components and configuration	<ul style="list-style-type: none"> <li>• Electrical components</li> </ul>
6.12 Perform battery state-of-charge test; determine necessary action	<ul style="list-style-type: none"> <li>• State of charge test procedures</li> </ul>
6.13 Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine necessary action	<ul style="list-style-type: none"> <li>• Battery capacity</li> <li>• Load test procedure</li> </ul>
6.14 Maintain or restore electronic memory functions	<ul style="list-style-type: none"> <li>• Memory function restoration procedures</li> </ul>
6.15 Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold downs	<ul style="list-style-type: none"> <li>• Clean battery</li> <li>• Fill battery</li> <li>• Proper connection procedure</li> </ul>
6.16 Perform slow/fast battery charge according to manufacturer's recommendations	<ul style="list-style-type: none"> <li>• Battery charging procedures</li> <li>• Positive post</li> <li>• Negative post</li> </ul>
6.17 Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply	<ul style="list-style-type: none"> <li>• Proper jump start procedures</li> <li>• Positive post</li> <li>• Negative post</li> </ul>
6.18 Identify safety precautions for high-voltage systems on electric, hybrid-electric, and diesel vehicles	<ul style="list-style-type: none"> <li>• Safety precautions</li> </ul>
6.19 Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery	<ul style="list-style-type: none"> <li>• Radio system</li> <li>• Security system</li> </ul>

6.20 Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures	<ul style="list-style-type: none"> <li>● Hybrid 12v battery systems</li> </ul>
6.21 Perform starter current draw test; determine necessary action	<ul style="list-style-type: none"> <li>● Current draw procedures</li> </ul>
6.22 Perform starter circuit voltage drop tests; determine necessary action	<ul style="list-style-type: none"> <li>● Voltage drop procedures</li> </ul>
6.23 Inspect and test starter relays and solenoids; determine necessary action	<ul style="list-style-type: none"> <li>● Starter relay</li> <li>● Starter solenoid</li> <li>● Proper testing procedures</li> </ul>
6.24 Remove and install starter in a vehicle	<ul style="list-style-type: none"> <li>● Starter removal and installation procedures</li> </ul>
6.25 Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action	<ul style="list-style-type: none"> <li>● Switch testing procedures</li> </ul>
6.26 Demonstrate knowledge of an automatic idle-stop/start-stop system	<ul style="list-style-type: none"> <li>● Start/stop idle</li> </ul>
6.27 Perform charging system output test; determine necessary action	<ul style="list-style-type: none"> <li>● Charging output test procedure</li> </ul>
6.28 Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment	<ul style="list-style-type: none"> <li>● Generator</li> <li>● Drive Belts</li> <li>● Pulley</li> <li>● Visual inspection</li> </ul>
6.29 Remove, inspect, and/or reinstall generator (alternator)	<ul style="list-style-type: none"> <li>● Generator removal and installation procedures</li> </ul>
6.30 Perform charging circuit voltage drop tests; determine necessary action	<ul style="list-style-type: none"> <li>● Charging circuit voltage drop test procedures</li> </ul>
6.31 Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as necessary	<ul style="list-style-type: none"> <li>● Exterior lamp inspections</li> <li>● Removal and installation procedure</li> </ul>
6.32 Aim headlights	<ul style="list-style-type: none"> <li>● Headlight aiming procedure</li> </ul>
6.33 Identify system voltage and safety precautions associated with high-intensity discharge headlights	<ul style="list-style-type: none"> <li>● Safety precautions for HID lights</li> </ul>

6.34 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation	<ul style="list-style-type: none"> <li>• SRS enable and disable procedures</li> </ul>
6.35 Remove and reinstall door panel	<ul style="list-style-type: none"> <li>• Door panel removal</li> </ul>
6.36 Describe the operation of keyless entry/remote-start systems	<ul style="list-style-type: none"> <li>• Keyless entry</li> </ul>
6.37 Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators	<ul style="list-style-type: none"> <li>• Instrument panel gauges</li> <li>• Reset procedures for maintenance indicator</li> </ul>
6.38 Verify windshield wiper and washer operation; replace wiper blades	<ul style="list-style-type: none"> <li>• Windshield wiper operation</li> <li>• Windshield wiper blade replacement procedures</li> </ul>
<b>STANDARD 9.0 PERFORM AUTOMOTIVE SHOP AND SAFETY TASKS</b>	
9.1 Identify general shop safety rules and procedures	<ul style="list-style-type: none"> <li>• General shop rules</li> <li>• General shop procedures</li> </ul>
9.2 Utilize safe procedures for handling of tools and equipment	<ul style="list-style-type: none"> <li>• Safe procedures for handling of tools and equipment</li> </ul>
9.3 Identify and use proper placement of floor jacks and jack stands	<ul style="list-style-type: none"> <li>• Safe procedures for placement of floor jacks and jack stands</li> </ul>
9.4 Identify and use proper procedures for safe lift operation	<ul style="list-style-type: none"> <li>• Safe procedures for proper procedures of safe lift operations</li> </ul>
9.5 Utilize proper ventilation procedures for working within the lab/shop area	<ul style="list-style-type: none"> <li>• Safe procedures for utilizing proper ventilation procedures for working within the lab/shop areas</li> </ul>
9.6 Identify marked safety areas	<ul style="list-style-type: none"> <li>• Marked Safety Areas</li> </ul>
9.7 Identify the location and the types of fire extinguishers and other fire safety equipment	<ul style="list-style-type: none"> <li>• Location and the types of fire extinguishers and other fire safety equipments</li> </ul>
9.9 Identify the location and use of eye wash stations	<ul style="list-style-type: none"> <li>• Location and use of eye wash stations</li> </ul>
9.10 Identify the location of the posted evacuation routes	<ul style="list-style-type: none"> <li>• Location of the posted evacuation routes</li> </ul>
9.11 Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities	<ul style="list-style-type: none"> <li>• Safety glasses</li> <li>• Ear protection</li> <li>• Proper Shoes</li> </ul>
9.12 Identify and wear appropriate clothing for lab/shop activities	<ul style="list-style-type: none"> <li>• Proper lab clothing</li> </ul>
9.13 Secure hair and jewelry for lab/shop activities	<ul style="list-style-type: none"> <li>• Proper hair and jewelry attire</li> </ul>

9.14 Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits	<ul style="list-style-type: none"> <li>● SRS systems</li> <li>● Electronic brake control</li> <li>● Hybrid high voltage systems</li> </ul>
9.15 Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)	<ul style="list-style-type: none"> <li>● High voltage safety procedures</li> <li>● HID lamps</li> <li>● Ignition systems</li> <li>● Injection systems</li> </ul>
9.16 Locate and demonstrate knowledge of material safety data sheets (MSDS)	<ul style="list-style-type: none"> <li>● MSDS usage</li> </ul>
9.17 Identify tools and their usage in automotive applications	<ul style="list-style-type: none"> <li>● Tool Usage</li> </ul>
9.18 Identify standard and metric designation	<ul style="list-style-type: none"> <li>● Standard designation</li> <li>● Metric designation</li> </ul>
9.19 Demonstrate safe handling and use of appropriate tools	<ul style="list-style-type: none"> <li>● Safety of tools</li> </ul>
9.20 Demonstrate proper cleaning, storage, and maintenance of tools and equipment	<ul style="list-style-type: none"> <li>● Tool Maintenance</li> <li>● Proper cleaning procedures</li> </ul>
9.21 Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper)	<ul style="list-style-type: none"> <li>● Micrometer operation</li> <li>● Dial-indicator operation</li> <li>● Dial-Caliper operation</li> </ul>
9.22 Identify information necessary and the service requested on a repair order	<ul style="list-style-type: none"> <li>● Service requests</li> <li>● Information on repair</li> </ul>
9.23 Identify purpose and demonstrate proper use of fender covers and mats	<ul style="list-style-type: none"> <li>● Proper use of fender covers and mats</li> </ul>
9.24 Demonstrate use of the three C's (concern, cause, and correction)	<ul style="list-style-type: none"> <li>● Cause</li> <li>● Concern</li> <li>● Correction</li> </ul>
9.25 Review vehicle service history	<ul style="list-style-type: none"> <li>● Service history information</li> </ul>
9.26 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction	<ul style="list-style-type: none"> <li>● Work orders</li> <li>● Needed customer information</li> <li>● Privacy law</li> </ul>

9.27 Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel)	<ul style="list-style-type: none"> <li>• Proper procedure for vehicle return</li> </ul>
--	---

## Domain 2: Advanced Automotive Systems

Instructional Time: 30-40%

### STANDARD 4.0 PERFORM SUSPENSION AND STEERING SYSTEM SERVICES—GENERAL

4.1 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins	<ul style="list-style-type: none"> <li>• Vehicle information Online Resources (i.e Mitchell, All Data, Google)</li> <li>• Fluid Types</li> <li>• Service History</li> </ul>
4.2 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation	<ul style="list-style-type: none"> <li>• SRS systems</li> <li>• Indicator lamp operation</li> </ul>
4.3 Identify suspension and steering system components and configurations	<ul style="list-style-type: none"> <li>• Steering systems</li> <li>• Suspension systems</li> <li>• Component locations</li> </ul>
4.4 Inspect rack and pinion steering gear inner tie rod ends (sockets) bellows boots	<ul style="list-style-type: none"> <li>• Rack and Pinion</li> <li>• Tie Rods</li> <li>• Bellow Boots</li> <li>• Wear out symptoms</li> </ul>
4.5 Inspect power steering fluid level and condition	<ul style="list-style-type: none"> <li>• Power steering fluid</li> <li>• Dipsticks/ Reservoirs</li> </ul>
4.6 Flush, fill, and bleed power steering system using proper fluid type per manufacturer specification	<ul style="list-style-type: none"> <li>• Research vehicle bleed information using Online Resources</li> <li>• Power steering fluid</li> </ul>
4.7 Inspect for power steering fluid leakage	<ul style="list-style-type: none"> <li>• Power steering fluid</li> <li>• Visual inspection</li> </ul>
4.8 Remove, inspect, replace, and/or adjust power steering pump drive belt	<ul style="list-style-type: none"> <li>• Power steering pump</li> <li>• Drive Belts</li> <li>• Proper removal and installation procedure</li> </ul>

4.9 Inspect and replace power steering hoses and fittings	<ul style="list-style-type: none"> <li>● Power Steering hoses</li> <li>● Fittings</li> <li>● Proper removal and installation procedure</li> </ul>
4.10 Inspect pitman arm, relay (centrelink/intermediate) rod, idler arm, mountings, and steering linkage damper	<ul style="list-style-type: none"> <li>● Pitman arm</li> <li>● Center Link</li> <li>● Idler Arm</li> <li>● Steering linkage damper</li> </ul>
4.11 Inspect tie rod ends (sockets), tie rod sleeves, and clamps	<ul style="list-style-type: none"> <li>● Tie rods</li> <li>● Tie rod sleeves</li> <li>● Clamps</li> <li>● Visual inspection</li> <li>● Check for wear</li> </ul>
4.12 Inspect upper and lower control arms, bushings, and shafts	<ul style="list-style-type: none"> <li>● Upper and lower control arms</li> <li>● Bushings</li> <li>● Visual inspection</li> <li>● Check for wear</li> </ul>
4.13 Inspect and replace rebound bumpers	<ul style="list-style-type: none"> <li>● Rebound bumpers</li> <li>● Visual inspection</li> </ul>
4.14 Inspect track bar, strut rods/radius arms, and related mounts and bushings	<ul style="list-style-type: none"> <li>● Track bar</li> <li>● Strut rods</li> <li>● Bushings</li> <li>● Visual inspection</li> </ul>
4.15 Inspect upper and lower ball joints (with or without wear indicators)	<ul style="list-style-type: none"> <li>● Upper and lower ball joints</li> <li>● Visual inspection</li> </ul>
4.16 Inspect suspension system coil springs and spring insulators (silencers)	<ul style="list-style-type: none"> <li>● Coil Spring</li> <li>● Spring insulator</li> <li>● Visual inspection</li> </ul>
4.17 Inspect suspension system torsion bars and mounts	<ul style="list-style-type: none"> <li>● Torsion Bars</li> <li>● Torsion Bar mount</li> <li>● Visual inspection</li> </ul>

4.18 Inspect and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links	<ul style="list-style-type: none"> <li>● Stabilizer bar</li> <li>● Bushings</li> <li>● Brackets</li> <li>● Visual inspection</li> <li>● Check for wear</li> </ul>
4.19 Inspect, remove and/or replace strut cartridge or assembly; inspect mounts and bushings	<ul style="list-style-type: none"> <li>● Proper procedure for strut disassembly and assembly</li> <li>● Struts</li> </ul>
4.20 Inspect front strut bearing and mount	<ul style="list-style-type: none"> <li>● Strut Bearing</li> <li>● Visual inspection</li> </ul>
4.21 Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms	<ul style="list-style-type: none"> <li>● Lateral Links</li> <li>● Control arms</li> <li>● Visual inspection</li> </ul>
4.22 Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts	<ul style="list-style-type: none"> <li>● Visual inspection</li> <li>● Leaf Springs</li> <li>● Spring insulator</li> <li>● Shackles</li> </ul>
4.23 Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings	<ul style="list-style-type: none"> <li>● Shock absorbers</li> <li>● Proper procedure for removal and installation</li> </ul>
4.24 Inspect electric power steering assist system	<ul style="list-style-type: none"> <li>● Electric power steering</li> <li>● Visual inspection</li> </ul>
4.25 Identify hybrid vehicle power steering system electrical circuits and safety precautions	<ul style="list-style-type: none"> <li>● Hybrid vehicle power steering</li> <li>● Safety precautions</li> </ul>
4.26 Describe the function of steering and suspension control systems and components (e.g., active suspension and stability control)	<ul style="list-style-type: none"> <li>● Function of steering control systems</li> </ul>
4.27 Perform pre alignment inspection; measure vehicle ride height	<ul style="list-style-type: none"> <li>● Alignment</li> <li>● Vehicle height</li> </ul>
4.28 Describe alignment angles (camber, caster and toe)	<ul style="list-style-type: none"> <li>● Angles</li> <li>● Camber</li> <li>● Caster</li> </ul>

	<ul style="list-style-type: none"> <li>• Toe</li> </ul>
4.29 Inspect tire condition; identify tire wear patterns; check for correct tire size, application (load and speed ratings), and air pressure as listed on the tire information placard/label	<ul style="list-style-type: none"> <li>• Tire wear patterns</li> <li>• Tire size</li> <li>• Visual inspection</li> </ul>
4.30 Rotate tires according to manufacturer's recommendation including vehicles equipped with tire pressure monitoring systems (TPMS)	<ul style="list-style-type: none"> <li>• Tire pressure monitoring systems</li> </ul>
4.31 Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly	<ul style="list-style-type: none"> <li>• Tire</li> <li>• Wheel</li> <li>• Tire machine</li> </ul>
4.32 Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor	<ul style="list-style-type: none"> <li>• TPMS</li> <li>• Tire machine</li> <li>• Dismount procedure</li> </ul>
4.33 Inspect tire and wheel assembly for air loss; determine necessary action	<ul style="list-style-type: none"> <li>• Air Pressure</li> </ul>
4.34 Repair tire following vehicle manufacturer-approved procedure	<ul style="list-style-type: none"> <li>• Proper procedure for tire repair</li> </ul>
4.35 Identify indirect and direct tire pressure monitoring systems (TPMS); calibrate system; verify operation of instrument panel lamps	<ul style="list-style-type: none"> <li>• Indirect tire pressure monitoring system</li> <li>• Calibration</li> </ul>
4.36 Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS), including relearn	<ul style="list-style-type: none"> <li>• Removal and replacement of TPMS</li> </ul>
<b>STANDARD 7.0 PERFORM HEATING, VENTILATION AND AIR CONDITIONING (HVAC) SYSTEM SERVICES—GENERAL</b>	
7.1 Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins	<ul style="list-style-type: none"> <li>• Vehicle information Online Resources (i.e Mitchell, All Data, Google)</li> </ul>
7.2 Identify heating, ventilation and air conditioning (HVAC) components and configuration	<ul style="list-style-type: none"> <li>• Heating</li> <li>• Ventilation</li> <li>• HVAC</li> </ul>

7.3 Inspect and replace A/C compressor drive belts, pulleys, and tensioners; visually inspect A/C components for signs of leaks; determine necessary	<ul style="list-style-type: none"> <li>● Drive Belts</li> <li>● Pulleys</li> <li>● Signs of leakage</li> </ul>
7.4 Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions	<ul style="list-style-type: none"> <li>● Hybrid A/C electrical</li> </ul>
7.5 Inspect A/C condenser for airflow restrictions; determine necessary action	<ul style="list-style-type: none"> <li>● AC condenser</li> <li>● Visual inspection</li> <li>● Blockage</li> </ul>
7.6 Inspect engine cooling and heater systems hoses and pipes; determine necessary action	<ul style="list-style-type: none"> <li>● Cooling hoses</li> <li>● Heater system</li> <li>● Visual inspection</li> </ul>
7.7 Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; determine necessary action	<ul style="list-style-type: none"> <li>● Heater ducts</li> <li>● Heater hoses</li> <li>● Cabin Filters</li> <li>● Visual inspection</li> </ul>
7.8 Identify the source of A/C system odors	<ul style="list-style-type: none"> <li>● Odor location</li> </ul>
<b>STANDARD 8.0 PERFORM ENGINE PERFORMANCE SERVICES—GENERAL</b>	
8.1 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins	<ul style="list-style-type: none"> <li>● Research vehicle information using Online Resources (i.e Mitchell, All Data, Google)</li> </ul>
8.2 Perform engine absolute manifold pressure tests (vacuum/boost); document results	<ul style="list-style-type: none"> <li>● Manifold pressure test procedures</li> </ul>
8.3 Perform cylinder power balance test; document results	<ul style="list-style-type: none"> <li>● Cylinder power balance test procedure</li> </ul>
8.4 Perform cylinder cranking and running compression tests; document results	<ul style="list-style-type: none"> <li>● Cylinder cranking and compression test procedures</li> </ul>
8.5 Perform cylinder leakage test; document results	<ul style="list-style-type: none"> <li>● Cylinder leakage procedures</li> </ul>
8.6 Verify engine operating temperature	<ul style="list-style-type: none"> <li>● Normal operating temperature</li> </ul>
8.7 Remove and replace spark plugs; inspect secondary ignition components for wear and damage	<ul style="list-style-type: none"> <li>● Spark plugs</li> <li>● Secondary ignition</li> </ul>

	<ul style="list-style-type: none"> <li>• Proper procedure for spark plug removal</li> </ul>
8.8 Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable	<ul style="list-style-type: none"> <li>• Diagnostic trouble codes</li> <li>• Freeze frame data</li> <li>• Code clearing procedure</li> </ul>
8.9 Describe the use of the OBD monitors for repair verification	<ul style="list-style-type: none"> <li>• OBD monitor usage</li> </ul>
8.10 Replace fuel filter(s) where applicable	<ul style="list-style-type: none"> <li>• Fuel filter replacement procedures</li> </ul>
8.11 Inspect, service, or replace air filters, filter housings, and intake duct work	<ul style="list-style-type: none"> <li>• Air filters</li> <li>• Filter housings</li> <li>• Visual inspections</li> </ul>
8.12 Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action	<ul style="list-style-type: none"> <li>• Exhaust manifold</li> <li>• Catalytic convertor</li> <li>• Resonator</li> <li>• Tail pipes</li> <li>• Visual inspection</li> </ul>
8.13 Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine necessary action	<ul style="list-style-type: none"> <li>• Exhaust system hangers</li> <li>• Visual inspections</li> </ul>
8.14 Check and refill diesel exhaust fluid (DEF)	<ul style="list-style-type: none"> <li>• DEF fluid</li> </ul>
8.15 Inspect, test, and service positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform necessary action	<ul style="list-style-type: none"> <li>• Positive crankcase ventilation</li> <li>• Visual inspection</li> </ul>

### **Domain 3: Drivetrain Systems**

**Instructional Time: 10-15%**

#### **STANDARD 2.0 PERFORM AUTOMATIC TRANSMISSION AND TRANSAXLE SERVICES—GENERAL**

2.1 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins

- Vehicle information Online Resources (i.e Mitchell, All Data, Google)

2.2 Check fluid level in a transmission or a transaxle equipped with a dipstick	<ul style="list-style-type: none"> <li>● Fluid Identification (Color, Texture, Odor)</li> <li>● Transmission Fluid level Procedures and Assembly Specifications</li> </ul>
2.3 Check fluid level in a transmission or a transaxle not equipped with a dipstick	<ul style="list-style-type: none"> <li>● Fluid Identification (Color, Texture, Odor)</li> <li>● Transmission Fluid level Procedures and Assembly Specifications</li> </ul>
2.4 Check transmission fluid condition; check for leaks	<ul style="list-style-type: none"> <li>● Fluid Identification (Color, Texture, Odor)</li> <li>● Visual Inspection</li> </ul>
2.5 Identify drive train components and configuration	<ul style="list-style-type: none"> <li>● Vehicle drive train information using Online Resources (i.e Mitchell, All Data, Google)</li> </ul>
2.6 Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch	<ul style="list-style-type: none"> <li>● Transmission linkage, Transmission Range Sensor, and/or P/N position Procedures and Specifications</li> </ul>
2.7 Inspect for leakage at external seals, gaskets, and bushings	<ul style="list-style-type: none"> <li>● Fluid Identification (Color, Texture, Odor)</li> <li>● Visual Inspection</li> </ul>
2.8 Inspect, replace and/or align powertrain mounts	<ul style="list-style-type: none"> <li>● Visual Inspection of powertrain mounts</li> </ul>
2.9 Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification	<ul style="list-style-type: none"> <li>● Repair Procedures of removal of Transmission and filter and Specifications</li> </ul>
2.10 Describe the operational characteristics of a continuously variable transmission (CVT)	<ul style="list-style-type: none"> <li>● Operation of Continuously Variable Transmission (CVT) drive train using Online Resources (i.e Mitchell, All Data, Google)</li> </ul>
2.11 Describe the operational characteristics of a hybrid vehicle drivetrain	<ul style="list-style-type: none"> <li>● Operation of hybrid vehicle drive train using Online Resources (i.e Mitchell, All Data, Google)</li> </ul>
<b>STANDARD 3.0 PERFORM MANUAL DRIVETRAIN AND AXLE SERVICES—DRIVE SHAFT, HALF SHAFTS, UNIVERSAL JOINTS AND CONSTANT VELOCITY (CV) JOINTS (FRONT, REAR, ALL WHEEL AND 4-WHEEL DRIVE)</b>	
3.1 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins	<ul style="list-style-type: none"> <li>● Vehicle information Online Resources (i.e Mitchell, All Data, Google)</li> </ul>
3.2 Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification	<ul style="list-style-type: none"> <li>● Fluid Identification (Color, Texture, Odor)</li> <li>● Manual Transmission Fluid refill Procedures and Assembly Specifications</li> </ul>

3.3 Check fluid condition; check for leaks	<ul style="list-style-type: none"> <li>● Fluid Identification (Color, Texture, Odor)</li> <li>● Visual Inspection</li> </ul>
3.4 Identify manual drivetrain and axle components and configuration	<ul style="list-style-type: none"> <li>● Vehicle manual drive train information using Online Resources (i.e Mitchell, All Data, Google)</li> </ul>
3.5 Check and adjust clutch master cylinder fluid level; use proper fluid type per manufacturer specification	<ul style="list-style-type: none"> <li>● Hydraulic Clutch Adjustment and Bleed Procedures and Specifications</li> </ul>
3.6 Check for hydraulic system leaks	<ul style="list-style-type: none"> <li>● Visual Inspection</li> </ul>
3.7 Describe the operational characteristics of an electronically controlled manual transmission/transaxle	<ul style="list-style-type: none"> <li>● Operation of electronically controlled manual transmission/transaxle using Online Resources (i.e Mitchell, All Data, Google)</li> </ul>
3.8 Inspect, remove, and/or replace bearings, hubs, and seals	<ul style="list-style-type: none"> <li>● Visual Inspection</li> <li>● Manual Transmission/Transaxle bearing,hubs and seal Procedures and Assembly Specifications</li> </ul>
3.9 Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints	<ul style="list-style-type: none"> <li>● Visual Inspection</li> <li>● Repair Procedures of drive axles and yokes and Assembly Specifications</li> </ul>
3.10 Inspect locking hubs	<ul style="list-style-type: none"> <li>● Visual Inspection</li> <li>● Locking hubs Repair Procedures and Assembly Specifications</li> </ul>
3.11 Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification	<ul style="list-style-type: none"> <li>● Fluid Identification (Color, Texture, Odor)</li> <li>● Visual Inspection</li> </ul>
3.12 Clean and inspect differential case; check for leaks; inspect housing vent	<ul style="list-style-type: none"> <li>● Visual Inspection</li> </ul>
3.13 Check and adjust differential case fluid level; use proper fluid type per manufacturer specification	<ul style="list-style-type: none"> <li>● Fluid Identification (Color, Texture, Odor)</li> <li>● Differential Fluid level Procedures and Assembly Specifications</li> </ul>
3.14 Drain and refill differential housing	<ul style="list-style-type: none"> <li>● Differential Fluid Procedures and Specifications</li> </ul>
3.15 Inspect and replace drive axle wheel studs	<ul style="list-style-type: none"> <li>● Drive axle and wheel studs procedures</li> <li>● Visual Inspection</li> </ul>