

# Appendix A

## 2018 ASE Automobile Accreditation Task List Correlation Guide

Task List	MAST	AST	MLR	<i>Fundamentals of Automotive Technology, Third Edition</i> Chapter
<b>REQUIRED SUPPLEMENTAL TASKS</b>				
<b>Shop and Personal Safety</b>				
1. Identify general shop safety rules and procedures.	R	R	R	3
2. Utilize safe procedures for handling of tools and equipment.	R	R	R	8, 10
3. Identify and use proper placement of floor jacks and jack stands.	R	R	R	5
4. Identify and use proper procedures for safe lift operation.	R	R	R	5
5. Utilize proper ventilation procedures for working within the lab/shop area.	R	R	R	3
6. Identify marked safety areas.	R	R	R	3
7. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.	R	R	R	3
8. Identify the location and use of eye wash stations.	R	R	R	3
9. Identify the location of the posted evacuation routes.	R	R	R	3
10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.	R	R	R	4
11. Identify and wear appropriate clothing for lab/shop activities.	R	R	R	4
12. Secure hair and jewelry for lab/shop activities.	R	R	R	4
13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	R	R	R	3
14. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge [HID] lamps, ignition systems, injection systems, etc.).	R	R	R	3
15. Locate and demonstrate knowledge of safety data sheets (SDS).	R	R	R	3
<b>Tools and Equipment</b>				
1. Identify tools and their usage in automotive applications.	R	R	R	8
2. Identify standard and metric designation.	R	R	R	8
3. Demonstrate safe handling and use of appropriate tools.	R	R	R	8
4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	R	R	R	8
5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).	R	R	R	9

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<b>Preparing Vehicle for Service</b>				
1. Identify information needed and the service requested on a repair order.	R	R	R	6
2. Identify purpose and demonstrate proper use of fender covers, mats.	R	R	R	5
3. Demonstrate use of the three C's (concern, cause, and correction).	R	R	R	7
4. Review vehicle service history.	R	R	R	7
5. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	R	R	R	7
<b>Preparing Vehicle for Customer</b>				
1. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).	R	R	R	5
<b>WORKPLACE EMPLOYABILITY SKILLS</b>				
<b>Personal Standards (see Standard 7.9)</b>				
1. Reports to work daily on time; able to take directions and motivated to accomplish the task at hand.	R	R	R	14
2. Dresses appropriately and uses language and manners suitable for the workplace.	R	R	R	14
3. Maintains appropriate personal hygiene.	R	R	R	14
4. Meets and maintains employment eligibility criteria, such as drug/alcohol-free status, clean driving record, etc.	R	R	R	14
5. Demonstrates honesty, integrity and reliability.	R	R	R	14
<b>Work Habits/Ethic (see Standard 7.10)</b>				
1. Complies with workplace policies/laws.	R	R	R	3, 14
2. Contributes to the success of the team, assists others and requests help when needed.	R	R	R	14
3. Works well with all customers and coworkers.	R	R	R	14
4. Negotiates solutions to interpersonal and workplace conflicts.	R	R	R	14
5. Contributes ideas and initiative.	R	R	R	14
6. Follows directions.	R	R	R	14
7. Communicates (written and verbal) effectively with customers and coworkers.	R	R	R	14–15
8. Reads and interprets workplace documents; writes clearly and concisely.	R	R	R	15
9. Analyzes and resolves problems that arise in completing assigned tasks.	R	R	R	15
10. Organizes and implements a productive plan of work.	R	R	R	15
11. Uses scientific, technical, engineering and mathematics principles and reasoning to accomplish assigned tasks.	R	R	R	15
12. Identifies and addresses the needs of all customers, providing helpful, courteous and knowledgeable service and advice as needed.	R	R	R	15

Task List	MAST	AST	MLR	<i>Fundamentals of Automotive Technology, Third Edition</i> Chapter
<b>I. ENGINE REPAIR</b>				
<b>A. General: Engine Diagnosis; Removal and Reinstallation (R &amp; R)</b>				
1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P-1	P-1		6–7
2. Research vehicle service information including fluid type, internal engine operation, vehicle service history, service precautions, and technical service bulletins.	P-1	P-1	P-1	6–7
3. Verify operation of the instrument panel engine warning indicators.	P-1	P-1	P-1	13
4. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action.	P-1	P-1	P-1	13
5. Install engine covers using gaskets, seals, and sealers as required.	P-1	P-1	P-1	26
6. Verify engine mechanical timing.	P-1	P-1	P-2	22
7. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.	P-1	P-1	P-1	12
8. Inspect, remove and/or replace engine mounts.	P-2	P-2		22
9. Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.	P-2	P-2	P-2	3, 74
10. Remove and reinstall engine on a newer vehicle equipped with OBD; reconnect all attaching components and restore the vehicle to running condition.	P-3	P-3		22
<b>B. Cylinder Head and Valve Train Diagnosis and Repair</b>				
1. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturers' specification and procedure.	P-1	P-1		23
2. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1	P-1		23, 26
3. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-2	P-2		23
4. Adjust valves (mechanical or hydraulic lifters).	P-1	P-1	P-3	23, 25
5. Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing.	P-1	P-1		26
6. Establish camshaft position sensor indexing.	P-1	P-1		22
7. Inspect valve springs for squareness and free height comparison; determine needed action.	P-3			23
8. Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action.	P-3			23
9. Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action.	P-3			23, 25
10. Inspect valves and valve seats; determine needed action.	P-3			23, 25

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11. Check valve spring assembled height and valve stem height; determine needed action.	P-3			23, 25
12. Inspect valve lifters; determine needed action.	P-2			23
13. Inspect and/or measure camshaft for runout, journal wear and lobe wear.	P-3			23
14. Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action.	P-3			23, 25
15. Identify components of the cylinder head and valve train.			P-1	23, 25
<b>C. Engine Block Assembly Diagnosis and Repair</b>				
1. Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-1	P-2		24
2. Disassemble engine block; clean and prepare components for inspection and reassembly.	P-1			24
3. Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.	P-2			24
4. Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.	P-2			24
5. Deglaze and clean cylinder walls.	P-2			24
6. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.	P-3			24
7. Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine needed action.	P-1			24
8. Inspect main and connecting rod bearings for damage and wear; determine needed action.	P-2			24
9. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.	P-3			24
10. Inspect and measure piston skirts and ring lands; determine needed action.	P-2			24
11. Determine piston-to-bore clearance.	P-2			24, 26
12. Inspect, measure, and install piston rings.	P-2			26
13. Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance and/or silencer); inspect shaft(s) and support bearings for damage and wear; determine needed action; reinstall and time.	P-2			24
14. Assemble engine block.	P-1			26
<b>D. Lubrication and Cooling Systems Diagnosis and Repair</b>				
1. 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 needed action.	P-1	P-1	P-1	21
2. Identify causes of engine overheating.	P-1	P-1		21



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3. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1	P-1	P-1	21
4. Inspect and/or test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.	P-1	P-1	P-1	21
5. Inspect, remove, and replace water pump.	P-2	P-2		21
6. Remove and replace radiator.	P-2	P-2		21
7. Remove, inspect, and replace thermostat and gasket/seal.	P-1	P-1	P-1	21
8. Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.	P-1	P-1		21
9. Perform oil pressure tests; determine needed action.	P-1	P-1		19
10. Perform engine oil and filter change; use proper fluid type per manufacturer specification.	P-1	P-1	P-1	19
11. Inspect auxiliary coolers; determine needed action.	P-3	P-3		19
12. Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2	P-2		19
13. Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.	P-2			24
14. Identify components of the lubrication and cooling systems.			P-1	18–19
<b>II. AUTOMATIC TRANSMISSION AND TRANSAXLE</b>				
<b>A. General: Transmission and Transaxle Diagnosis</b>				
1. Identify and interpret transmission/transaxle concerns, differentiate between engine performance and transmission/transaxle concerns; determine needed action.	P-1	P-1		31
2. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	P-1	P-1	6–7, 31
3. Diagnose fluid loss and condition concerns; determine needed action.	P-1	P-1		31
4. Check fluid level in a transmission or a transaxle equipped with a dip-stick.	P-1	P-1	P-1	31
5. Check fluid level in a transmission or a transaxle not equipped with a dip-stick.	P-1	P-1	P-1	31
6. Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine needed action.	P-1			31
7. Diagnose noise and vibration concerns; determine needed action.	P-2			31
8. Perform stall test; determine needed action.	P-2	P-2		31
9. Perform lock-up converter system tests; determine needed action.	P-3	P-3		31
10. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.	P-1	P-1		31
11. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.	P-1			31
12. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).	P-2	P-2		31

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13. Demonstrate knowledge of pressure test including transmissions/transaxles equipped with electronic pressure control.		P-3		31
14. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.		P-2		31
15. Check transmission fluid condition; check for leaks.			P-2	31
16. Identify drive train components and configuration.			P-1	27, 33, 38
<b>B. In-Vehicle Transmission/Transaxle Maintenance and Repair</b>				
1. Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.	P-1	P-1	P-2	31
2. Inspect for leakage; replace external seals, gaskets, and bushings.	P-2	P-2	P-1	31
3. Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses; demonstrate understanding of the relearn procedure.	P-1	P-1		31, 33
4. Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.	P-1	P-1	P-1	31
5. Inspect, replace and align powertrain mounts.	P-2	P-2	P-2	31
<b>C. Off-Vehicle Transmission and Transaxle Repair</b>				
1. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mounting surfaces.	P-2	P-2		32
2. Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings.	P-1	P-1		32
3. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.	P-2	P-2		32
4. Describe the operational characteristics of a continuously variable transmission (CVT).	P-3	P-3	P-3	33
5. Describe the operational characteristics of a hybrid vehicle drive train.	P-3	P-3	P-3	33, 54
6. Disassemble, clean, and inspect transmission/transaxle.	P-1			32
7. Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, switches, solenoids, sleeves, retainers, brackets, check valves/balls, screens, spacers, and gaskets).	P-2			32
8. Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine needed action.	P-2			32
9. Assemble transmission/transaxle.	P-1			32
10. Inspect, measure, and reseal oil pump assembly and components.	P-2			32
11. Measure transmission/transaxle end play and/or preload; determine needed action.	P-1			32
12. Inspect, measure, and/or replace thrust washers and bearings.	P-2			32
13. Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.	P-2			32

Task List	MAST	AST	MLR	<i>Fundamentals of Automotive Technology, Third Edition</i> Chapter
14. Inspect bushings; determine needed action.	P-2			32
15. Inspect and measure planetary gear assembly components; determine needed action.	P-2			32
16. Inspect case bores, passages, bushings, vents, and mating surfaces; determine needed action.	P-2			32
17. Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform needed action.	P-2			32
18. Inspect, measure, repair, adjust or replace transaxle final drive components.	P-2			32
19. Inspect clutch drum, piston, check-balls, springs, retainers, seals, friction plates, pressure plates, and bands; determine needed action.	P-2			32
20. Measure clutch pack clearance; determine needed action.	P-1			32
21. Air test operation of clutch and servo assemblies.	P-1			32
22. Inspect one-way clutches, races, rollers, sprags, springs, cages, retainers; determine needed action.	P-2			32
<b>III. MANUAL DRIVE TRAIN AND AXLES</b>				
<b>A. General: Drive Train Diagnosis</b>				
1. Identify and interpret drive train concerns; determine needed action.	P-1	P-1		36
2. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	P-1	P-1	6–7, 36
3. Check fluid condition; check for leaks; determine needed action.	P-1	P-1	P-2	36
4. Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification.	P-1	P-1	P-1	36
5. Identify manual drive train and axle components and configuration.			P-1	34, 38
<b>B. Clutch Diagnosis and Repair</b>				
1. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action.	P-1	P-1		35
2. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform needed action.	P-1	P-1		35
3. Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable).	P-1	P-1		35
4. Bleed clutch hydraulic system.	P-1	P-1		35
5. Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.	P-1	P-1	P-1	35
6. Inspect flywheel and ring gear for wear, cracks, and discoloration; determine needed action.	P-1	P-1		35
7. Measure flywheel runout and crankshaft end play; determine needed action.	P-2	P-2		35
8. Describe the operation and service of a system that uses a dual mass flywheel.	P-3	P-3		35
9. Check for hydraulic system leaks.			P-1	35

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<b>C. Transmission/Transaxle Diagnosis and Repair</b>				
1. Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers.	P-2	P-2		36
2. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.	P-2	P-2	P-2	34
3. Diagnose noise concerns through the application of transmission/transaxle powerflow principles.	P-2			36
4. Diagnose hard shifting and jumping out of gear concerns; determine needed action.	P-2			36
5. Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action.	P-3			36
6. Disassemble, inspect, clean, and reassemble internal transmission/transaxle components.	P-2			37
<b>D. Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair (Front, Rear, All-wheel, and Four-wheel drive)</b>				
1. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action.	P-1	P-1		38
2. Diagnose universal joint noise and vibration concerns; perform needed action.	P-2	P-2		38
3. Inspect, remove, and/or replace bearings, hubs, and seals.	P-1	P-1	P-2	38
4. Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.	P-1	P-1	P-2	38
5. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.	P-2	P-2		38
6. Inspect locking hubs.			P-3	38
7. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.			P-2	38
<b>E. Drive Axle Diagnosis and Repair</b>				
<b>E.1 Ring and Pinion Gears and Differential Case Assembly</b>				
1. Clean and inspect differential case; check for leaks; inspect housing vent.	P-1	P-1	P-1	38
2. Check and adjust differential case fluid level; use proper fluid type per manufacturer specification.	P-1	P-1	P-1	38
3a. Drain and refill differential housing.			P-1	38
3b. Drain and refill differential case; use proper fluid type per manufacturer specification.	P-1	P-1		38
4. Diagnose noise and vibration concerns; determine needed action.	P-2			38
5. Inspect and replace companion flange and/or pinion seal; measure companion flange runout.	P-2	P-2		38
6. Inspect ring gear and measure runout; determine needed action.	P-3			38
7. Remove, inspect, reinstall and/or replace drive pinion and ring gear, spacers, sleeves, and bearings.	P-3			38



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8. Measure and adjust drive pinion depth.	P-3			38
9. Measure and adjust drive pinion bearing preload.	P-3			38
10. Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types).	P-3			38
11. Check ring and pinion tooth contact patterns; perform needed action.	P-3			38
12. Disassemble, inspect, measure, adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.	P-3			38
13. Reassemble and reinstall differential case assembly; measure runout; determine needed action.	P-3			38
<b>E.2 Limited Slip Differential</b>				
1. Diagnose noise, slippage, and chatter concerns; determine needed action.	P-3			38
2. Measure rotating torque; determine needed action.	P-3			38
<b>E.3 Drive Axles</b>				
1. Inspect and replace drive axle wheel studs.	P-1	P-1	P-1	38, 51
2. Remove and replace drive axle shafts.	P-1	P-1		38
3. Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2	P-2		38, 54
4. Measure drive axle flange runout and shaft end play; determine needed action.	P-2	P-2		38
5. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine needed action.	P-2			38, 54
<b>F. Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair</b>				
1. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-3	P-3		39
2. Inspect locking hubs; determine needed action.	P-3	P-3		39
3. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P-3	P-3		39
4. Identify concerns related to variations in tire circumference and/or final drive ratios.	P-2	P-2		39
5. Diagnose noise, vibration, and unusual steering concerns; determine needed action.	P-3			39
6. Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive/all-wheel drive systems.	P-2			39
7. Disassemble, service, and reassemble transfer case and components.	P-2			39
<b>IV. SUSPENSION AND STEERING</b>				
<b>A. General: Suspension and Steering Systems</b>				
1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	P-1	P-1	6–7, 43
2. Identify and interpret suspension and steering system concerns; determine needed action.	P-1	P-2	P-1	43, 45

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<b>B. Steering Systems Diagnosis and Repair</b>				
1. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1	P-1	P-1	43
2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).	P-1	P-1		43
3. Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action.	P-2	P-2		43
4. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2	P-2		43
5. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2	P-2		43
6. Inspect steering shaft universal joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.	P-2	P-2		43
7. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.	P-2	P-2		43
8. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.	P-1	P-1	P-1	43
9. Inspect power steering fluid level and condition.	P-1	P-1	P-1	43
10. Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.	P-2	P-2	P-2	43
11. Inspect for power steering fluid leakage; determine needed action.	P-1	P-1	P-1	43
12. Remove, inspect, replace, and/or adjust power steering pump drive belt.	P-1	P-1	P-1	43
13. Remove and reinstall power steering pump.	P-2	P-2		43
14. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.	P-2	P-2		43
15. Inspect, remove and/or replace power steering hoses and fittings.	P-2	P-2	P-2	43
16. Inspect, remove and/or replace pitman arm, relay (centerlink/intermediate) rod, idler arm, mountings, and steering linkage damper.	P-2	P-2	P-1	43
17. Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps.	P-1	P-1	P-1	43
18. Inspect, test and diagnose electrically-assisted power steering systems (including using a scan tool); determine needed action.	P-2			43
19. Identify hybrid vehicle power steering system electrical circuits and safety precautions.	P-2	P-2	P-2	43
20. Test power steering system pressure; determine needed action.	P-2			43
21. Inspect electric power steering assist system.		P-3	P-2	43
<b>C. Suspension Systems Diagnosis and Repair</b>				
1. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1	P-1		45

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2. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1	P-1		45
3. Inspect, remove, and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.	P-3	P-3	P-1	45
4. Inspect, remove, and/or replace strut rods and bushings.	P-3	P-3		45
5. Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators).	P-2	P-2	P-1	45
6. Inspect, remove, and/or replace steering knuckle assemblies.	P-3	P-3		45
7. Inspect, remove and/or replace short and long arm suspension system coil springs and spring insulators.	P-3	P-3		45
8. Inspect, remove, and/or replace torsion bars and mounts.	P-3	P-3	P-1	45
9. Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.	P-3	P-3	P-1	45
10. Inspect, remove, and/or replace strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.	P-3	P-3	P-2	45
11. Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings.	P-3	P-3	P-1	45
12. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.	P-1	P-1	P-1	45
13. Inspect front strut bearing and mount.			P-1	45
14. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms.			P-1	45
<b>D. Related Suspension and Steering Service</b>				
1. Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.	P-1	P-1	P-1	45
2. Remove, inspect, service and/or replace front and rear wheel bearings.	P-1	P-1		54
3. Describe the function of suspension and steering control systems and components, (i.e., active suspension and stability control).	P-3	P-3	P-3	44, 55
<b>E. Wheel Alignment Diagnosis, Adjustment, and Repair</b>				
1. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action.	P-1	P-1		46
2a. Describe alignment angles (camber, caster, and toe).			P-1	46
2b. Perform pre-alignment inspection; measure vehicle ride height; determine needed action.	P-1	P-1	P-1	46
3. Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber and toe as required; center steering wheel.	P-1	P-1		46
4. Check toe-out-on-turns (turning radius); determine needed action.	P-2	P-2		46
5. Check steering axis inclination (SAI) and included angle; determine needed action.	P-2	P-2		46

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6. Check rear wheel thrust angle; determine needed action.	P-1	P-1		46
7. Check for front wheel setback; determine needed action.	P-2	P-2		46
8. Check front and/or rear cradle (subframe) alignment; determine needed action.	P-3	P-3		46
9. Reset steering angle sensor.	P-2	P-2		46
<b>F. Wheels and Tires Diagnosis and Repair</b>				
1. 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.	P-1	P-1	P-1	41
2. Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.	P-2	P-2		41
3. Rotate tires according to manufacturers' recommendation including vehicles equipped with tire pressure monitoring systems (TPMS).	P-1	P-1	P-1	41
4. Measure wheel, tire, axle flange, and hub runout; determine needed action.	P-2	P-2		41
5. Diagnose tire pull problems; determine needed action.	P-1	P-1		41
6. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.	P-1	P-1	P-1	41
7. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-1	P-1	P-1	41
8. Inspect tire and wheel assembly for air loss; perform needed action.	P-1	P-1	P-1	41
9. Repair tire following vehicle manufacturer approved procedure.	P-1	P-1	P-1	41
10. Identify indirect and direct tire pressure monitoring system (TPMS); calibrate system; verify operation of instrument panel lamps.	P-1	P-1	P-2	41
11. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure.	P-1	P-1	P-1	41
<b>V. BRAKES</b>				
<b>A. General: Brake Systems Diagnosis</b>				
1. Identify and interpret brake system concerns; determine needed action.	P-1	P-1		49, 51, 53
2. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	P-1	P-1	6–7, 49, 51, 54
3. Describe procedure for performing a road test to check brake system operation including an anti-lock brake system (ABS).	P-1	P-1	P-1	51, 53
4. Install wheel and torque lug nuts.	P-1	P-1	P-1	41, 51, 53
5. Identify brake system components and configuration.			P-1	47–48, 50, 52
<b>B. Hydraulic System Diagnosis and Repair</b>				
1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).	P-1	P-1		49
2a. Describe proper brake pedal height, travel, and feel.			P-1	49
2b. Measure brake pedal height, travel, and free play (as applicable); determine needed action.	P-1	P-1		49



<b>Task List</b>	<b>MAST</b>	<b>AST</b>	<b>MLR</b>	<b>Fundamentals of Automotive Technology, Third Edition Chapter</b>
3. Check master cylinder for internal/external leaks and proper operation; determine needed action.	P-1	P-1	P-1	49
4. Remove, bench bleed, and reinstall master cylinder.	P-1	P-1		49
5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.	P-1	P-3		49
6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports; determine needed action.	P-1	P-1	P-1	49
7. Replace brake lines, hoses, fittings, and supports.	P-2	P-2		49
8. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).	P-2	P-2		49
9. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P-1	P-1	P-1	49
10. Inspect, test, and/or replace components of brake warning light system.	P-3	P-3		49
11. Identify components of hydraulic brake warning light system.	P-2	P-2	P-3	49
12. Bleed and/or flush brake system.	P-1	P-1	P-1	49
13. Test brake fluid for contamination.	P-1	P-1	P-1	49
<b>C. Drum Brake Diagnosis and Repair</b>				
1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.	P-1	P-1		53
2. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P-1	P-1	P-1	53
3. Refinish brake drum and measure final drum diameter; compare with specification.	P-1	P-1	P-1	53
4. 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.	P-1	P-1	P-1	53
5. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2	P-2	P-2	53
6. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	P-1	P-1	P-1	53
<b>D. Disc Brake Diagnosis and Repair</b>				
1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.	P-1	P-1		51
2. Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action.	P-1	P-1	P-1	51
3. Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action.	P-1	P-1	P-1	51
4. Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action.	P-1	P-1	P-1	51

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5. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks.	P-1	P-1	P-1	51
6. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.	P-1	P-1	P-1	51
7. Remove and reinstall/replace rotor.	P-1	P-1	P-1	51
8. Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P-1	P-1	P-1	51
9. Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-1	P-1	P-1	51
10. Retract and re-adjust caliper piston on an integrated parking brake system.	P-2	P-2	P-2	51
11. Check brake pad wear indicator; determine needed action.	P-1	P-1	P-1	51
12. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturers' recommendations.	P-1	P-1	P-1	51
<b>E. Power-Assist Units Diagnosis and Repair</b>				
1. Check brake pedal travel with and without engine running to verify proper power booster operation.	P-2	P-2	P-2	49
2. Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.	P-1	P-1	P-1	48–49
3. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine needed action.	P-1	P-1		49
4. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine needed action.	P-3	P-3		49
5. Measure and adjust master cylinder pushrod length.	P-3	P-3		49
<b>F. Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair</b>				
1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action.	P-1	P-2		54
2. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.	P-2	P-2	P-1	54
3. Check parking brake system and components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.	P-1	P-1	P-2	53
4. Check parking brake operation and parking brake indicator light system operation; determine needed action.	P-1	P-1	P-1	53
5. Check operation of brake stop light system.	P-1	P-1	P-1	49
6. Replace wheel bearing and race.	P-3	P-3	P-2	54
7. Remove, reinstall, and/or replace sealed wheel bearing assembly.	P-1	P-1		54
8. Inspect and replace wheel studs.	P-1	P-1	P-1	51

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<b>G. Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) Systems Diagnosis and Repair</b>				
1a. Identify traction control/vehicle stability control system components.			P-3	55
1b. Identify and inspect electronic brake control system components (ABS, TCS, ESC); determine needed action.	P-1	P-1		55
2. Describe the operation of a regenerative braking system.	P-3	P-3	P-3	33, 47
3. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action.	P-2			55
4. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action.	P-2			55
5. Depressurize high-pressure components of an electronic brake control system.	P-2			55
6. Bleed the electronic brake control system hydraulic circuits.	P-1			55
7. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).	P-2			55
8. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).	P-1			39, 55
<b>VI. ELECTRICAL/ELECTRONIC SYSTEMS</b>				
<b>A. General: Electrical System Diagnosis</b>				
1. Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.	P-1	P-1	P-1	6–7
2a. Use wiring diagrams to trace electrical/electronic circuits.			P-1	57
2b. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1	P-1	P-1	56, 58
3. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.	P-1	P-1	P-1	58
4. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1	P-1	P-1	56, 58
5. Demonstrate proper use of a test light on an electrical circuit.	P-1	P-1	P-2	58
6. Use fused jumper wires to check operation of electrical circuits.	P-1	P-1	P-2	58
7. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.	P-1	P-1		57–58
8a. Measure key-off battery drain (parasitic draw).			P-1	59
8b. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.	P-1	P-1		59
9. Inspect and test fusible links, circuit breakers, and fuses; determine needed action.	P-1	P-1	P-1	58

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10. Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.	P-1	P-1	P-1	57
11. Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.	P-2			58
12. Repair data bus wiring harness.	P-1			57
13. Identify electrical/electronic system components and configurations.			P-1	56–57, 63
<b>B. Battery Diagnosis and Service</b>				
1. Perform battery state-of-charge test; determine needed action.	P-1	P-1	P-1	59
2. Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action.	P-1	P-1	P-1	59
3. Maintain or restore electronic memory functions.	P-1	P-1	P-1	59
4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1	P-1	P-1	59
5. Perform slow/fast battery charge according to manufacturers' recommendations.	P-1	P-1	P-1	59
6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1	P-1	P-1	59
7. Identify safety precautions for high voltage systems on electric, hybrid, hybrid-electric, and diesel vehicles.	P-2	P-2	P-2	3, 59, 74
8. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery.	P-1	P-1	P-1	59
9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.	P-2	P-2	P-2	59, 74
<b>C. Starting System Diagnosis and Repair</b>				
1. Perform starter current draw tests; determine needed action.	P-1	P-1	P-1	60
2. Perform starter circuit voltage drop tests; determine needed action.	P-1	P-1	P-1	60
3. Inspect and test starter relays and solenoids; determine needed action.	P-2	P-2	P-2	60
4. Remove and install starter in a vehicle.	P-1	P-1	P-1	60
5. Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.	P-2	P-2	P-2	60
6. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.	P-2	P-2		60
7. Demonstrate knowledge of an automatic idle-stop/start-stop system.	P-2	P-2	P-3	33, 60, 74
<b>D. Charging System Diagnosis and Repair</b>				
1. Perform charging system output test; determine needed action.	P-1	P-1	P-1	61
2. Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.	P-1	P-1		61



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3. Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P-1	P-1	P-1	61
4. Remove, inspect, and/or replace generator (alternator).	P-1	P-1	P-2	61
5. Perform charging circuit voltage drop tests; determine needed action.	P-1	P-1	P-2	61
<b>E. Lighting Systems Diagnosis and Repair</b>				
1. Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action.	P-1	P-1		62
2. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.	P-1	P-1	P-1	62
3. Aim headlights.	P-2	P-2	P-2	62
4. Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2	P-2	P-2	3, 62
<b>F. Instrument Cluster and Driver Information Systems Diagnosis and Repair</b>				
1. Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action.	P-2	P-2		19, 21
2. Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine needed action.	P-2	P-2		19, 21
3. Reset maintenance indicators as required.	P-2	P-2		19
<b>G. Body Electrical Systems Diagnosis and Repair</b>				
1. Diagnose operation of comfort and convenience accessories and related circuits (such as: power window, power seats, pedal height, power locks, truck locks, remote start, moon roof, sun roof, sun shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, parking assist, cruise control, and auto dimming headlamps); determine needed repairs.	P-2	P-3		63–65
2. Diagnose operation of security/anti-theft systems and related circuits (such as: theft deterrent, door locks, remote keyless entry, remote start, and starter/fuel disable); determine needed repairs.	P-2	P-3		64–65
3. Diagnose operation of entertainment and related circuits (such as: radio, DVD, remote CD changer, navigation, amplifiers, speakers, antennas, and voice-activated accessories); determine needed repairs.	P-3	P-3		64–65
4. Diagnose operation of safety systems and related circuits (such as: horn, air-bags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, parking assist, and back-up camera); determine needed repairs.	P-1	P-3		64–65
5. Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action.	P-2	P-3		64
6. Describe the process for software transfer, software updates, or reprogramming of electronic modules.	P-2	P-3		64
7. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.			P-1	43, 65

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8. Remove and reinstall door panel.			P-1	64
9. Describe the operation of keyless entry/remote-start systems.			P-3	65
10. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.			P-1	13, 19, 21
11. Verify windshield wiper and washer operation; replace wiper blades.			P-1	13, 64
<b>VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)</b>				
<b>A. General: A/C System Diagnosis and Repair</b>				
1. Identify and interpret heating and air conditioning problems; determine needed action.	P-1	P-1		67
2. Research vehicle service information including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.	P-1	P-1	P-1	6–7, 67
3a. Identify heating, ventilation and air conditioning (HVAC) components and configuration.			P-1	67
3b. Performance test A/C system; identify problems.	P-1	P-1		67
4. Identify abnormal operating noises in the A/C system; determine needed action.	P-2	P-2		67
5. Identify refrigerant type; select and connect proper gauge set/test equipment; record temperature and pressure readings.	P-1	P-1		67
6. Leak test A/C system; determine needed action.	P-1	P-1		67
7. Inspect condition of refrigerant oil removed from A/C system; determine needed action.	P-2	P-2		67
8. Determine recommended oil and oil capacity for system application.	P-1	P-1		67
9. Using a scan tool, observe and record related HVAC data and trouble codes.	P-3	P-3		68, 72
<b>B. Refrigeration System Component Diagnosis and Repair</b>				
1. Inspect, remove, and/or replace A/C compressor drive belts, pulleys, and tensioners; visually inspect A/C components for signs of leaks; determine needed action.	P-1	P-1	P-1	67
2. Inspect, test, service and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.	P-2	P-2		67
3. Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity.	P-2	P-2		67
4. Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	P-2	P-2	P-2	3, 74
5. Determine need for an additional A/C system filter; perform needed action.	P-3	P-3		67
6. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform needed action.	P-2	P-2		67
7a. Inspect A/C condenser for airflow restrictions; determine necessary action.			P-1	67
7b. Inspect for proper A/C condenser airflow; determine needed action.	P-1	P-1		67

<b>Task List</b>	<b>MAST</b>	<b>AST</b>	<b>MLR</b>	<b>Fundamentals of Automotive Technology, Third Edition Chapter</b>
8. Remove, inspect, and replace receiver/drier or accumulator/drier; determine recommended oil type and quantity.	P-2	P-2		67
9. Remove, inspect, and install expansion valve or orifice (expansion) tube.	P-1	P-1		67
10. Inspect evaporator housing water drain; perform needed action.	P-1	P-1		67
11. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action.	P-2			67
12. Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.	P-2	P-2		67
13. Remove, inspect, reinstall, and/or replace condenser; determine required oil type and quantity.	P-2			67
<b>C. Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair</b>				
1. Inspect engine cooling and heater systems hoses and pipes; perform needed action.	P-1	P-1	P-1	21
2. Inspect and test heater control valve(s); perform needed action.	P-2	P-2		21, 68
3. Diagnose temperature control problems in the HVAC system; determine needed action.	P-2			68
4. Determine procedure to remove, inspect, reinstall, and/or replace heater core.	P-2	P-2		67
<b>D. Operating Systems and Related Controls Diagnosis and Repair</b>				
1. Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.	P-1	P-1		68
2. Diagnose A/C compressor clutch control systems; determine needed action.	P-2	P-2		67
3. Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine needed action.	P-2	P-2		68
4. Inspect and test HVAC system control panel assembly; determine needed action.	P-3	P-3		68
5. Inspect and test HVAC system control cables, motors, and linkages; perform needed action.	P-3	P-3		68
6. Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; perform needed action.	P-1	P-1	P-1	68
7. Identify the source of HVAC system odors.	P-2	P-2	P-2	67
8. Check operation of automatic or semi-automatic HVAC control systems; determine needed action.	P-2	P-2		68
<b>E. Refrigerant Recovery, Recycling, and Handling</b>				
1. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturers' standards.	P-1	P-1		67
2. Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.	P-1	P-1		67
3. Recycle, label, and store refrigerant.	P-1	P-1		67

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<b>VIII. ENGINE PERFORMANCE</b>				
<b>A. General: Engine Diagnosis</b>				
1. Identify and interpret engine performance concerns; determine needed action.	P-1	P-1		69–73
2. Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.	P-1	P-1	P-1	6–7
3. Diagnose abnormal engine noises or vibration concerns; determine needed action.	P-3	P-3		17
4. Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.	P-2	P-2		13, 73
5. Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action.	P-1	P-1	P-2	17
6. Perform cylinder power balance test; determine needed action.	P-2	P-2	P-2	17
7. Perform cylinder cranking and running compression tests; determine needed action.	P-1	P-1	P-2	17
8. Perform cylinder leakage test; determine needed action.	P-1	P-1	P-2	17
9. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.	P-2	P-2		17, 63, 69–70
10. Verify engine operating temperature; determine needed action.	P-1	P-1	P-1	21
11. Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT).	P-1	P-1		26
12. Remove and replace spark plugs; inspect secondary ignition components for wear and damage.			P-1	69
<b>B. Computerized Controls Diagnosis and Repair</b>				
1. Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable.	P-1	P-1	P-1	72
2. Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1	P-1		6–7
3. Perform active tests of actuators using a scan tool; determine needed action.	P-1	P-2		72
4. Describe the use of OBD monitors for repair verification.	P-1	P-1	P-1	72–73
5. Diagnose the causes of emissions or drivability concerns with stored or active diagnostic trouble codes (DTC); obtain, graph, and interpret scan tool data.	P-1			72–73
6. Diagnose emissions or drivability concerns without stored or active diagnostic trouble codes; determine needed action.	P-1			72–73
7. Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform needed action.	P-2			58, 72
8. Diagnose drivability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, HVAC, automatic transmissions, non-OEM installed accessories, or similar systems); determine needed action.	P-2			63, 65, 72–73



Task List	MAST	AST	MLR	<i>Fundamentals of Automotive Technology, Third Edition</i> Chapter
<b>C. Ignition System Diagnosis and Repair</b>				
1. Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns; determine needed action.	P-2	P-2		69
2. Inspect and test crankshaft and camshaft position sensor(s); determine needed action.	P-1	P-1		69
3. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as needed.	P-3	P-3		69
4. Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1	P-1		69
<b>D. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair</b>				
1. Diagnose (troubleshoot) hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine needed action.	P-2			69–73
2. Check fuel for contaminants; determine needed action.	P-2	P-2		70
3. Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; perform needed action.	P-1	P-1		70
4. Replace fuel filter(s) where applicable.	P-2	P-2	P-2	70
5. Inspect, service, or replace air filters, filter housings, and intake duct work.	P-1	P-1	P-1	71
6. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2	P-2		71
7. Inspect, test, and/or replace fuel injectors.	P-2	P-2		70
8. Verify idle control operation.	P-1	P-1		72
9. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform needed action.	P-1	P-1	P-1	71–72
10. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.	P-1	P-1	P-1	71
11. Perform exhaust system back-pressure test; determine needed action.	P-2	P-2		71
12. Check and refill diesel exhaust fluid (DEF).	P-2	P-2	P-2	13
13. Test the operation of turbocharger/supercharger systems; determine needed action.	P-2			71
<b>E. Emissions Control Systems Diagnosis and Repair</b>				
1. Diagnose oil leaks, emissions, and drivability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.	P-3	P-3		73
2. Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform needed action.	P-2	P-2	P-2	73

# Appendix A

Task List	MAST	AST	MLR	<i>Fundamentals of Automotive Technology, Third Edition</i> Chapter
3. Diagnose emissions and drivability concerns caused by the exhaust gas recirculation (EGR) system; inspect, test, service, and/or replace electrical/electronic sensors, controls, wiring, tubing, exhaust passages, vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) systems; determine needed action.	P-2	P-3		72–73
4a. Inspect and test electrical/electronically-operated components and circuits of secondary air injection systems; determine needed action.		P-3		72–73
4b. Diagnose emissions and drivability concerns caused by the secondary air injection system; inspect, test, repair, and/or replace electrical/electronically-operated components and circuits of secondary air injection systems; determine needed action.	P-2			72–73
5. Diagnose emissions and drivability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.	P-1			72–73
6. Diagnose emission and drivability concerns caused by catalytic converter system; determine needed action.	P-2	P-3		72–73
7. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.	P-2	P-2		72–73