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Norman Pattarozzi, Osbourn Park High School, Prince William County Public Schools

Correlations to the Virginia Standards of Learning were reviewed and updated by:
Course Description

**Suggested Grade Level:** 11 or 12  
**Prerequisites:** 8506 or 8502

In this course, students build upon their basic knowledge of automotive technology, exploring more advanced tasks in engine repair, automatic transmission and transaxle, manual drive train and axles, suspension and steering systems, and brakes. They also learn about electrical, electronic, and HVAC systems in automobiles. Upon successful completion of the course, students may be eligible to take the Automotive Service Excellence (ASE) Student Certification examination.

Automotive Technology I and II are closely aligned with the 2017 ASE Education Foundation automobile program standards for Maintenance and Light Repair (MLR).

*For every task in this course, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.*
Legislation enacted in the 2011 Virginia General Assembly (HB 1493) and amended in 2012 (HB 1108) requires where there is a national industry certification for career and technical education instructional personnel or programs for automotive technology, the Board of Education must make such certification mandatory. The provisions of this act shall become effective July 1, 2013. To comply with the requirements, all Career and Technical Education (CTE) automotive technology programs must be ASE Education Foundation accredited and the instructors must be certified by the National Institute for Automotive Service Excellence (ASE).

As noted in Superintendent’s Memo #058-17 (2-28-2017), this Career and Technical Education (CTE) course must maintain a maximum pupil-to-teacher ratio of 20 students to one teacher, due to safety regulations. The 2016-2018 biennial budget waiver of the teacher-to-pupil ratio staffing requirement does not apply.

Task Essentials List

- Tasks/competencies designated by plus icons (⊕) in the left-hand column(s) are essential
- Tasks/competencies designated by empty-circle icons (○) are optional
- Tasks/competencies designated by minus icons (⊖) are omitted
- Tasks marked with an asterisk (*) are sensitive.

<table>
<thead>
<tr>
<th>Task Number</th>
<th>8507</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
</table>

REQUIRED SUPPLEMENTAL TASKS

Lab/Shop and Personal Safety

39  ⊕  Identify general lab/shop safety rules and procedures.
40  ⊕  Utilize safe procedures for handling tools and equipment.
41  ⊕  Identify and use proper placement of floor jacks and jack stands.
42  ⊕  Identify and use proper procedures for safe lift operation.
43  ⊕  Use proper ventilation procedures for working in the lab/shop area.
44  ⊕  Identify marked safety areas.
<table>
<thead>
<tr>
<th>Task Number</th>
<th>8507</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>46</td>
<td></td>
<td>Identify the location and use of eye wash stations.</td>
</tr>
<tr>
<td>47</td>
<td></td>
<td>Identify the location of posted evacuation routes.</td>
</tr>
<tr>
<td>48</td>
<td></td>
<td>Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.</td>
</tr>
<tr>
<td>49</td>
<td></td>
<td>Identify and wear appropriate clothing for lab/shop activities.</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>Secure hair and jewelry for lab/shop activities.</td>
</tr>
<tr>
<td>51</td>
<td></td>
<td>Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high-voltage circuits.</td>
</tr>
<tr>
<td>52</td>
<td></td>
<td>Demonstrate awareness of the safety aspects of high-voltage circuits such as high intensity discharge (HID) lamps, ignition systems, and injection systems.</td>
</tr>
<tr>
<td>53</td>
<td></td>
<td>Locate and demonstrate knowledge of safety data sheets (SDS).</td>
</tr>
</tbody>
</table>

**ENGINE REPAIR**

**General**

<p>| 54          |      | Install engine covers using gaskets, seals, and sealers as required. |
| 55          |      | Verify engine mechanical timing. |
| 56          |      | Verify operation of the instrument panel engine warning indicators. |
| 57          |      | Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. |</p>
<table>
<thead>
<tr>
<th>Task Number</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>58</td>
<td>Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.</td>
</tr>
<tr>
<td></td>
<td>Cylinder Head and Valve Train</td>
</tr>
<tr>
<td>59</td>
<td>Adjust valves (mechanical or hydraulic lifters).</td>
</tr>
<tr>
<td>60</td>
<td>Identify components of the cylinder head and valve train.</td>
</tr>
<tr>
<td></td>
<td>AUTOMATIC TRANSMISSION AND TRANSAXLE</td>
</tr>
<tr>
<td>In-Vehicle Transmission/Transaxle</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.</td>
</tr>
<tr>
<td>62</td>
<td>Inspect for leakage at external seals, gaskets, and bushings.</td>
</tr>
<tr>
<td>63</td>
<td>Inspect, replace, and/or align power train mounts.</td>
</tr>
<tr>
<td>Off-Vehicle Transmission and Transaxle</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Describe the operational characteristics of a continuously variable transmission (CVT).</td>
</tr>
<tr>
<td>65</td>
<td>Describe the operational characteristics of a hybrid vehicle drive train.</td>
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<tr>
<td></td>
<td>MANUAL DRIVE TRAIN AND AXLES</td>
</tr>
<tr>
<td>Transmission/Transaxle</td>
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</tr>
<tr>
<td>66</td>
<td>Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.</td>
</tr>
<tr>
<td>Drive Shaft, Half Shafts, Universal Joints, and Constant-Velocity (CV) Joints (Front, Rear, All, and Four-wheel Drive)</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>Inspect, remove, and/or replace bearings, hubs, and seals.</td>
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<td>Task Number</td>
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<td>69</td>
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<td>70</td>
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<tr>
<td>Differential Case Assembly</td>
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<td>71</td>
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<tr>
<td>SUSPENSION AND STEERING SYSTEMS</td>
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<td>General</td>
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<td>72</td>
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<tr>
<td>Wheel Alignment</td>
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<td>74</td>
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<tr>
<td>BRAKES</td>
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<tr>
<td>Electronic Brakes, Traction Control, and Stability Control Systems</td>
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<td>75</td>
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<td>76</td>
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<tr>
<td>ELECTRICAL/ELECTRONIC SYSTEMS</td>
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<tr>
<td>General</td>
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<td>77</td>
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<td>Task Number</td>
<td>Tasks/Competencies</td>
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<tr>
<td>78</td>
<td>Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm’s law).</td>
</tr>
<tr>
<td>79</td>
<td>Identify lane departure and radar cruise systems.</td>
</tr>
<tr>
<td>80</td>
<td>Use wiring diagrams to trace electrical/electronic circuits.</td>
</tr>
<tr>
<td>81</td>
<td>Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.</td>
</tr>
<tr>
<td>82</td>
<td>Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.</td>
</tr>
<tr>
<td>83</td>
<td>Check operation of electrical circuits using a test light.</td>
</tr>
<tr>
<td>84</td>
<td>Use fused jumper wires to check operation of electrical circuits.</td>
</tr>
<tr>
<td>85</td>
<td>Measure key-off battery drain (parasitic draw).</td>
</tr>
<tr>
<td>86</td>
<td>Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.</td>
</tr>
<tr>
<td>87</td>
<td>Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair).</td>
</tr>
</tbody>
</table>

**Battery Service**

<table>
<thead>
<tr>
<th>Task Number</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>88</td>
<td>Perform battery state-of-charge test; determine necessary action.</td>
</tr>
<tr>
<td>89</td>
<td>Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine necessary action.</td>
</tr>
<tr>
<td>90</td>
<td>Maintain or restore electronic memory functions.</td>
</tr>
<tr>
<td>91</td>
<td>Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.</td>
</tr>
<tr>
<td>92</td>
<td>Perform slow/fast battery charge according to manufacturer’s recommendations.</td>
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<td>Task Number</td>
<td>8507</td>
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<tr>
<td>8507</td>
<td><strong>Tasks/Competencies</strong></td>
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</tbody>
</table>

**Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems**

<table>
<thead>
<tr>
<th>Task Number</th>
<th>Task/Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>107</td>
<td>Inspect interior and exterior lamps and sockets, including headlights and auxiliary lights (fog lights/driving lights); replace as needed.</td>
</tr>
<tr>
<td>108</td>
<td>Aim headlights.</td>
</tr>
<tr>
<td>109</td>
<td>Identify system voltage and safety precautions associated with high-intensity discharge (HID) headlights.</td>
</tr>
<tr>
<td>110</td>
<td>Disable and enable supplementary restraint system (SRS); verify indicator lamp operation.</td>
</tr>
<tr>
<td>111</td>
<td>Remove and reinstall door panel.</td>
</tr>
<tr>
<td>112</td>
<td>Describe the operation of keyless entry/remote-start systems.</td>
</tr>
<tr>
<td>113</td>
<td>Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.</td>
</tr>
<tr>
<td>114</td>
<td>Verify windshield wiper and washer operation; replace wiper blades.</td>
</tr>
</tbody>
</table>

**HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

**General**

<table>
<thead>
<tr>
<th>Task Number</th>
<th>Task/Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>115</td>
<td>Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.</td>
</tr>
<tr>
<td>116</td>
<td>Identify heating, ventilation and air conditioning (HVAC) components and configuration.</td>
</tr>
</tbody>
</table>

**Refrigeration System Components**

<table>
<thead>
<tr>
<th>Task Number</th>
<th>Task/Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>117</td>
<td>Inspect and replace air conditioning (AC) compressor drive belts, pulleys, and tensioners; visually inspect AC components for signs of leaks; determine needed action.</td>
</tr>
<tr>
<td>118</td>
<td>Identify hybrid vehicle AC system electrical circuits and the service/safety precautions.</td>
</tr>
<tr>
<td>Task Number</td>
<td>Tasks/Competencies</td>
</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td>119</td>
<td>Inspect AC condenser for airflow restrictions; determine necessary action.</td>
</tr>
<tr>
<td>120</td>
<td>Inspect engine cooling and heater system hoses and pipes; determine necessary action.</td>
</tr>
<tr>
<td>121</td>
<td>Inspect AC-heater ducts, doors, hoses, cabin filters, and outlets; determine necessary action.</td>
</tr>
<tr>
<td>122</td>
<td>Identify the source of HVAC system odors.</td>
</tr>
<tr>
<td>123</td>
<td>Research vehicle service information, including fuel type, vehicle service history, service precautions, and technical service bulletins.</td>
</tr>
<tr>
<td>124</td>
<td>Perform engine absolute manifold pressure tests (vacuum/boost); document results.</td>
</tr>
<tr>
<td>125</td>
<td>Perform cylinder power balance test; document results.</td>
</tr>
<tr>
<td>126</td>
<td>Perform cylinder cranking and running compression tests; document results.</td>
</tr>
<tr>
<td>127</td>
<td>Perform cylinder leakage test; document results.</td>
</tr>
<tr>
<td>128</td>
<td>Verify engine operating temperature.</td>
</tr>
<tr>
<td>129</td>
<td>Remove and replace spark plugs; inspect secondary ignition components for wear and damage.</td>
</tr>
<tr>
<td>130</td>
<td>Retrieve and record diagnostic trouble codes (DTC), on-board diagnostic (OBD) monitor status, and freeze frame data; clear codes when applicable.</td>
</tr>
<tr>
<td>Task Number</td>
<td>Tasks/Competencies</td>
</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td>131</td>
<td>Describe the use of the OBD monitors for repair verification.</td>
</tr>
</tbody>
</table>

**Fuel, Air Induction, and Exhaust Systems**

<table>
<thead>
<tr>
<th>Task Number</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>132</td>
<td>Replace fuel filter(s) where applicable.</td>
</tr>
<tr>
<td>133</td>
<td>Inspect, service, or replace air filters, filter housings, and intake duct work.</td>
</tr>
<tr>
<td>134</td>
<td>Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action.</td>
</tr>
<tr>
<td>135</td>
<td>Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine necessary action.</td>
</tr>
<tr>
<td>136</td>
<td>Check and refill diesel exhaust fluid (DEF).</td>
</tr>
</tbody>
</table>

**Emissions Control Systems**

<table>
<thead>
<tr>
<th>Task Number</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>137</td>
<td>Inspect, test, and service positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform necessary action.</td>
</tr>
</tbody>
</table>

Legend: ✍ Essential ☐ Non-essential ☐ Omitted

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**Curriculum Framework**

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**REQUIRED SUPPLEMENTAL TASKS**

**Lab/Shop and Personal Safety**

**Task Number 39**

**Identify general lab/shop safety rules and procedures.**
Definition

Identification should include

- wearing correct protective eyewear and clothing
- following all Occupational Safety and Health Administration (OSHA) standards for the task performed
- following the lab/shop rules set by the local school board.

Process/Skill Questions

- Why is eye protection important in the automotive lab/shop?
- Why should OSHA guidelines be followed when performing service on an automobile?

Task Number 40

Utilize safe procedures for handling tools and equipment.

Definition

Utilization should include conducting a visual inspection to ensure that equipment is in good working order and always reading the manufacturer procedures for the safe use of hand tools, power tools, and equipment.

Process/Skill Questions

- Why is it essential to read manufacturer procedures for the proper use of the tool?
- Why is it important for an individual to be trained on proper use of equipment and tools?

Task Number 41

Identify and use proper placement of floor jacks and jack stands.

Definition

Identification should include

- following manufacturer recommendations for jack placement
• ensuring the vehicle is on level ground before jacking
• using jacks and jack stands that are rated for the capacity of the vehicle on which the service is to be performed.

Process/Skill Questions

• Why should proper jack placement be checked?
• Why are jack stands used to support a vehicle?

Task Number 42

Identify and use proper procedures for safe lift operation.

Definition

Identification and use should include

• reviewing all lift-safety information
• identifying the correct placement of lift arms on vehicle
• lowering vehicle on safety locks before performing under-carriage service.

Process/Skill Questions

• Why is it important to read all lift-safety material supplied by the lift manufacturer?
• Why is it important to lower the vehicle onto the safety locks?

Task Number 43

Use proper ventilation procedures for working in the lab/shop area.

Definition

Use of proper ventilation procedures should include

• keeping bay doors open when possible
• operating shop exhaust fans
• using an exhaust ventilation hose on running vehicles.
Process/Skill Questions

- What are the gases emitted by a running vehicle?
- Why is proper ventilation so important?
- What are the dangers of running a vehicle engine in a confined space?

Task Number 44

Identify marked safety areas.

Definition

Identification should include describing and translating signage and special markings (e.g., floor paint) that identify work and caution areas.

Process/Skill Questions

- What are the different types of work zones?
- When is additional safety equipment or clothing needed to enter an area?
- How are walkways identified in the lab/shop area?

Task Number 45

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.

Definition

Identification should include

- the different types of fires encountered in the automotive technology field (Classes A, B, C, and D) and the hazards and the precautions associated with each type of fire
- the locations and types fire safety equipment, including the appropriate type of extinguishers and their use and identification of relevant signage and labels
- fire emergency procedures, in accordance with government regulations, building specifications, and instructor's guidelines.
Process/Skill Questions

- How are fire extinguisher locations marked?
- What types of extinguishers are used in the automotive lab/shop?
- What other fire safety equipment might be found in an automotive lab/shop?

---

**Task Number 46**

**Identify the location and use of eye wash stations.**

**Definition**

Identification should include describing the signage and operating procedures of the eye wash station.

**Process/Skill Questions**

- What is the color of the sign that signifies an eye wash station?
- When should an eye wash station be used?
- What safety equipment provides additional eye protection?

---

**Task Number 47**

**Identify the location of posted evacuation routes.**

**Definition**

Identification should include

- events that could trigger an evacuation
- the location of the posted evacuation route, including destination
- interpretation of the procedures for evacuation.

**Process/Skill Questions**

- What route should be followed in the event of an evacuation?
- Where is the evacuation route posted?
- Why is it important to establish a meeting place in the case of an evacuation?
Task Number 48

Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.

Definition

Compliance should include

- wearing safety glasses at all times in the automotive lab/shop area
- wearing additional personal safety equipment, when necessary
- adhering to governmental and classroom safety policies.

Process/Skill Questions

- Why are safety glasses in the automotive lab/shop required at all times?
- What kinds of shoes are appropriate in the lab/shop area?
- Why might ear protection be necessary in the automotive lab/shop?

Task Number 49

Identify and wear appropriate clothing for lab/shop activities.

Definition

Identification should include

- selecting clothing that will not hinder operations or be a danger to self or others
- following the school or lab/shop policy
- adhering to professional dress requirements and expectations.

Process/Skill Questions

- What can result from wearing loose clothing around moving objects in the lab/shop?
- What is the school dress code?
- What are the benefits of following standard workplace policies for apparel in the lab/shop?
Task Number 50

Secure hair and jewelry for lab/shop activities.

Definition

Securing hair and jewelry should include

- restraining hair to keep it from inadvertently getting caught in moving parts
- not wearing jewelry that can short circuit electrical components, cause electrical burns, or get caught in moving parts
- adhering to lab/shop safety policies.

Process/Skill Questions

- What is your lab/shop’s policy concerning hair safety?
- Why should long hair be tied up?
- What is the best way to secure hair so that it does not cause serious injury?

Task Number 51

Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high-voltage circuits.

Definition

Demonstration should include following manufacturer guidelines when working with supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high-voltage circuits. When working with hybrid vehicles, workers should be able to identify

- location of the battery
- physical appearance of the disconnects (i.e., small, plastic pieces that fit into the side of a hybrid battery)
- location of high voltage circuits, according to service materials and manufacturer guidelines
- specific protective gear and clothing that technicians should wear when working with the service plug (i.e., class OO insulating/voltage gloves).

Process/Skill Questions
• Why is it important to follow manufacturer guidelines when disabling an SRS?
• What could happen if the air bag deploys at the wrong time?
• What precautions should be taken when handling removed airbags?
• What are the components of electronic brake control systems?
• What are the types of electronic brake control systems?
• How does the wheel speed sensor operate?
• What color are the high voltage circuits?
• What are the shock dangers involving electric/hybrid vehicles?
• What is the electrocution threshold for humans?

Task Number 52

Demonstrate awareness of the safety aspects of high-voltage circuits such as high intensity discharge (HID) lamps, ignition systems, and injection systems.

Definition

Demonstration should include identifying the manufacturer’s warning and guidelines regarding shock hazard.

Process/Skill Questions

• What is the typical system voltage of an HID headlight?
• What gas is used in most HID bulbs?
• What do HID bulbs use in place of filaments?

Task Number 53

Locate and demonstrate knowledge of safety data sheets (SDS).

Definition

Demonstration should include identifying

• the purpose of SDS
• the administration’s (ownership’s) responsibility for workers’ health and safety
- laws, regulations, and practices affecting workers’ health and safety
- health and safety hazards
- health and safety programs
- the responsibility for environmental stewardship
- environmental laws, regulations, and practices
- sustainability initiatives.

**Process/Skill Questions**

- What environmental concerns should the automotive industry address?
- What environmentally-friendly practices and resources are available to the automotive industry?
- What methods can motivate employees to become involved in effective health, safety, and environmental practices?

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**ENGINE REPAIR**

**General**

**Task Number 54**

Install engine covers using gaskets, seals, and sealers as required.

**Definition**

Installation should include

- cleaning, inspecting, and replacing pans, covers, gaskets, and seals, in accordance with industry standards
- comparing and contrasting aerobic and anaerobic sealers.
Process/Skill Questions

- What are the consequences of using improper cleaning procedures?
- How can excessive use of Room-Temperature-Vulcanizing (RTV) silicone cause damage to the engine?

Task Number 55

Verify engine mechanical timing.

Definition

Verification should include conducting a visual inspection, using specialized tools and service materials, and following manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
I. Engine Repair
A. General
Task 5

Process/Skill Questions

- How often should the timing belt be checked, and when should it be replaced?
- What is the function of timing belt tensioners?
- What is variable valve timing?

Task Number 56

Verify operation of the instrument panel engine warning indicators.

Definition

Verification should include

- inspecting for intermittent, high, low, or no-gauge readings
- inspecting gauges and gauge sending units
- inspecting for incorrect operation of warning devices and other driver information
• checking coolant temperature, fuel, vehicle speed, odometer, oil pressure, and tachometer
• using related service materials and following manufacturer guidelines.

Note: Typically, digital and fiber optic gauges and warning circuits are not serviceable by the automotive service technician and are sent to special repair centers when servicing is required.

Task Number 57

Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.

Definition

Inspection should include

• raising the vehicle on a lift to a level position
• conducting a visual inspection, using dye and ultraviolet light or a smoke machine, if necessary
• making repairs as necessary.
- Why are fluids different colors? What are the colors of various fluids?
- How does the use of dye and an ultraviolet light save time in locating leaks?
- How does the use of a smoke machine save time?
- What are the safety considerations when searching for leaks?
- Why is the origin of a leak usually higher than or forward from where the leak appears?

Task Number 58

Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.

Definition

Procedures should include:

- removing broken bolts
- restoring internal and external threads
- repairing internal threads with thread inserts.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level I. Engine Repair
A. General
Task 6

Process/Skill Questions

- What are two ways to remove a broken bolt?
- What are the differences between tools and processes used for restoring internal threads vs. external threads?
- What are the different types of thread inserts?

Cylinder Head and Valve Train

Task Number 59

Adjust valves (mechanical or hydraulic lifters).
Definition

Adjustments should include referring to service materials and following manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
I. Engine Repair
B. Cylinder Head and Valve Train
Task 1

Process/Skill Questions

- How does valve adjustment affect valve timing?
- What problems can result from incorrect valve adjustment?
- How often should valves be checked, and when should they be adjusted?

Task Number 60

Identify components of the cylinder head and valve train.

Definition

Identification should include

- valves
- cam shafts
- lifters
- springs
- keepers
- gears.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
I. Engine Repair
B. Cylinder Head and Valve Train
Task 2

Process/Skill Questions

- What is the difference between an intake and an exhaust valve?
- What is a hydraulic lifter?
- How does a technician differentiate between a single or dual overhead cam?
AUTOMATIC TRANSMISSION AND TRANSAXLE

In-Vehicle Transmission/Transaxle

Task Number 61

Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.

Definition

Procedures should include

- using proper methods to adjust transmission linkages
- replacing switches when necessary.

Process/Skill Questions

- What are the proper procedures for adjusting a manual valve shift linkage?
- What are some problems related to incorrect range switch adjustment or manual valve adjustment?
- What are the different types of transmission range switches?

Task Number 62

Inspect for leakage at external seals, gaskets, and bushings.

Definition
Inspection should include visually examining bushings and seals and replacing as needed.

Task Number 63

Inspect, replace, and/or align power train mounts.

Definition

Inspection should include

- testing, replacing, or adjusting powertrain mounts and subframes
- checking for proper wheel alignment.

Process/Skill Questions

- What are the procedures to inspect power train mounts?
- What are the procedures for proper cradle alignment?
- What are causes of broken or worn power train mounts?

Off-Vehicle Transmission and Transaxle
Task Number 64

Describe the operational characteristics of a continuously variable transmission (CVT).

Definition

Description should include the operations of the internal components of a CVT transmission/transaxle.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
II. Automatic Transmission and Transaxle
C. Off-Vehicle Transmission and Transaxle
Task 1

Process/Skill Questions

• What are phasers?
• What service precautions should be taken when working with a CVT?
• What are the shifting characteristics of a CVT?

Task Number 65

Describe the operational characteristics of a hybrid vehicle drive train.

Definition

Description should include the various operations of different drive trains from different manufacturers and their associated safety precautions.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
II. Automatic Transmission and Transaxle
C. Off-Vehicle Transmission and Transaxle
Task 2

Process/Skill Questions

• What service precautions should be used when working with hybrid vehicles?
• What special tools are needed when working with hybrid vehicles?
• How could the power flow through a hybrid transmission be described?

MANUAL DRIVE TRAIN AND AXLES

Transmission/Transaxle

Task Number 66

Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.

Definition

Description should include the characteristics of an electronic current flow and the operation of solenoids within the transmission/transaxle for powerflow.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
III. Manual Drive Train and Axles
C. Off-Vehicle Transmission/Transaxle
Task 1

Process/Skill Questions

• How does an electronically controlled manual transmission/transaxle operate?
• How are diagnostic trouble codes (DTCs) retrieved from an electronically controlled manual transmission/transaxle?
• How are electronic components in the electronically controlled manual transmission/transaxle tested?

Drive Shaft, Half Shafts, Universal Joints, and Constant-Velocity (CV) Joints (Front, Rear, All, and Four-wheel Drive)

Task Number 67

Inspect, remove, and/or replace bearings, hubs, and seals.
Definition

Procedures should include removing the wheel and replacing bearing, according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
III. Manual Drive Train and Axles
D. Drive Shaft, Half Shafts, Universal Joints and Constant-Velocity (CV) Joints (Front, Rear, All and Four-wheel Drive)

Task 1

Process/Skill Questions

• What precautions should be taken when replacing front-wheel-drive front wheel bearings?
• What procedures should be used when replacing front-wheel-drive front wheel bearings?
• What tools should be used when replacing front-wheel-drive front wheel bearings?

Task Number 68

Inspect, service, and/or replace shafts, yokes, boots, and universal/constant-velocity (CV) joints.

Definition

Inspection should include checking for damaged boots and joints and replacing worn/damaged components.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
III. Manual Drive Train and Axles
D. Drive Shaft, Half Shafts, Universal Joints and Constant-Velocity (CV) Joints (Front, Rear, All and Four-wheel Drive)

Task 2

Process/Skill Questions

• When should yokes, shafts, boots, and CV joints be inspected?
• What are the procedures for replacing shafts, yokes, boots, and CV joints?
• How is the runout of shafts and yokes checked?

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**Task Number 69**

**Inspect locking hubs.**

**Definition**

Inspection should include checking the operation of front-wheel bearings and locking hubs and repairing as necessary.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
III. Manual Drive Train and Axles
D. Drive Shaft, Half Shafts, Universal Joints and Constant-Velocity (CV) Joints (Front, Rear, All and Four-wheel Drive)
Task 3

**Process/Skill Questions**

- How is a front locking hub assembly removed?
- What procedures are used to check front-wheel bearings and locking hubs?
- What are the types of locking hubs?

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**Task Number 70**

**Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.**

**Definition**

Checking should include

- front axle assembly for leaks
- seals
- vents
- fluid level
• condition of fluid.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
III. Manual Drive Train and Axles
D. Drive Shaft, Half Shafts, Universal Joints and Constant-Velocity (CV) Joints (Front, Rear, All and Four-wheel Drive)
Task 4

Process/Skill Questions

• If the drive assembly continues to operate with a restricted vent, what are the probable consequences?
• How are the fluid level and the condition of the fluid checked?
• What should be replaced when replacing seals?

Differential Case Assembly

Task Number 71

Clean and inspect differential case; check for leaks; inspect housing vent.

Definition

Procedures should include cleaning and visually checking for fluid leaks while removing drums and/or rotors and vent tubes.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
III. Manual Drive Train and Axles
E. Differential Case Assembly
Task 1

Process/Skill Questions

• What are the causes of fluid leakage in differential assembly?
• What should be inspected during a seal-and-gasket replacement?
• What are the effects of a restricted vent?

SUSPENSION AND STEERING SYSTEMS
General

Task Number 72

Disable and enable supplemental restraint system (SRS).

Definition

Procedure should be based on manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
A. General
Task 2

Process/Skill Questions

- Why is it important to follow manufacturer guidelines when disabling an SRS?
- What could happen if the air bag deploys at the wrong time?
- What precautions should be taken when handling removed airbags?

Wheel Alignment

Task Number 73

Perform prealignment inspection; measure vehicle ride height.

Definition

Procedure should include conducting a visual inspection according to state inspection procedures and using specialized tools, according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
C. Wheel Alignment
Task 1

Process/Skill Questions
Why is ride height important to alignment?
How does tire pressure relate to ride height?
Can a vehicle with a space-saver spare be aligned? Explain.

Task Number 74

Describe alignment angles (camber, caster, and toe).

Definition

Description should include:

- steering axis inclination (SAI)
- how the angles affect tire wear
- how the angles interact with each other.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
C. Wheel Alignment
Task 2

Process/Skill Questions

- How do angles affect tire wear?
- How do angles interact with each other?
- How do alignment angles affect control of the vehicle?

BRAKES

Electronic Brakes, Traction Control, and Stability Control Systems

Task Number 75

Identify traction control/vehicle stability control system components.
Definition

Identification should include determining the braking components involved and their proper operation.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
G. Electronic Brakes, Traction Control, and Stability Control Systems
Task 1

Process/Skill Questions

• What are the components of electronic brake control systems?
• What are the types of electronic brake control systems?
• How does the wheel-speed sensor operate?

Task Number 76

Describe the operation of a regenerative braking system.

Definition

Description should include series, parallel, and series-parallel hybrids and how they operate.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
G. Electronic Brakes, Traction Control, and Stability Control Systems
Task 2

Process/Skill Questions

• What is the purpose of a regenerative braking system?
• What are the components of a regenerative braking system?
• What type of vehicle(s) have a regenerative braking system?

ELECTRICAL/ELECTRONIC SYSTEMS

General
Task Number 77

Research vehicle service information, including vehicle service history, service precautions, and technical service bulletins.

Definition

Research should include

- checking related technical service bulletins (TSBs) and manufacturer recalls
- using electronic service information and time-labor guides
- obtaining procedures from service manuals
- using strategy-based diagnostic procedures to collect information, progressing from a general to a more specific focus.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
A. General
Task 1

Process/Skill Questions

- What information should the technician look for?
- Why does the technician need vehicle service history?
- What vehicle information is necessary before the technician can begin his/her research?

Task Number 78

Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm’s law).

Definition

Demonstration should require the application of Ohm’s law when troubleshooting and repairing electrical concerns, including a correlation between cause and effect (i.e., applying Ohm’s law and the decision-making process).
ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
A. General
Task 2

Process/Skill Questions

- What is a parallel circuit?
- What is an example of a device on a vehicle that uses a series-parallel circuit? Where is the circuit located?
- How would one describe a series circuit?

Task Number 79

Identify lane departure and radar cruise systems.

Definition

Identification should include

- determining whether the vehicle has a lane departure or radar cruise system
- determining what kind of system is on the vehicle.

Process/Skill Questions

- How does an adaptive cruise system operate?
- How does a lane departure system operate?

Task Number 80

Use wiring diagrams to trace electrical/electronic circuits.

Definition

Use should include

- locating appropriate diagram based on concern
- interpreting diagram symbols by using legends/keys
- applying system knowledge and troubleshooting methods.
Process/Skill Questions

- What does the ground symbol look like?
- What is the translation of the acronym AWG? (American wire gauge)
- What does a fuse symbol look like?

Task Number 81

Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.

Definition

Demonstration should include using the DMM as a(n)

- voltmeter
- ammeter
- ohmmeter.

Technician should demonstrate an applied understanding of voltage drop principles and be able to measure voltage drop.

Process/Skill Questions

- How should an ammeter be connected?
- What is the maximum amperage on most handheld DMMs? What does this mean?
- What needs to happen to a circuit to measure resistance?
Task Number 82

Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.

Definition

Demonstration should include

- checking electrical circuits with a testing light/digital multimeter and determining needed repairs
- checking electrical circuits, using jumper wires, and determining needed repairs
- finding shorts, grounds, opens, and resistance problems in electrical/electronic circuits and determining needed repairs.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
A. General
Task 5

Process/Skill Questions

- What tools are used to locate a short to ground?
- How might a burned bulb affect a fuse?
- What are the types of resistance issues found in electrical circuits?

Task Number 83

Check operation of electrical circuits using a test light.

Definition

Check should include using a test light to evaluate

- power
- ground
- fuses

only when manufacturer recommends use.
ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
A. General
Task 6

Process/Skill Questions

- Where should a technician avoid using a test light?
- What does a dim light mean?
- What is the difference between a self-powered and a conventional test light?

Task Number 84

Use fused jumper wires to check operation of electrical circuits.

Definition

Procedure should include using fused jumper wire to check for lack of continuity in suspect components or sections of circuits.

Task Number 85

Measure key-off battery drain (parasitic draw).

Definition
Measurement should include

- using an ammeter, according to manufacturer standards
- diagnosing the cause by isolating the excessively drawing circuit by disabling/disconnecting portions of the circuits or components (methodically from maxifuses to minifuses)
- diagnosing the causes of abnormal key-off battery drain
- determining needed repairs.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
A. General
Task 8

Process/Skill Questions

- What is the typical allowable range for a parasitic draw?
- What is key-off load?
- How would a technician perform a parasitic draw test? Why is this test conducted?

Task Number 86

Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.

Definition

Procedure should include conducting a visual inspection or using appropriate test equipment.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
A. General
Task 9

Process/Skill Questions

- How would one describe a fusible link?
- How do circuit breakers function?
- How would a technician recognize an open fuse?
Task Number 87

Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair).

Definition

Repair/replacement should require

- using specialized tools
- referring to service materials
- following manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
A. General
Task 10

Process/Skill Questions

- What tools might be required when replacing a terminal?
- What holds the terminal in the connector?
- What condition would necessitate the replacement of a connector?

Battery Service

Task Number 88

Perform battery state-of-charge test; determine necessary action.

Definition

Performance should include referencing service materials and following manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
B. Battery Service

Task 1

Process/Skill Questions

- When should a battery state-of-charge test be performed? How often?
- What type of acid is in a lead/acid battery?
- What types of batteries are available?

Task Number 89

Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine necessary action.

Definition

Procedure should include

- exploring load and high-rate discharge
- referring to service materials and manufacturer guidelines.

Task Number 90

Maintain or restore electronic memory functions.

Definition
Procedure should include

- using auxiliary battery/storage device connected to vehicle
- returning vehicle to former condition and operation (may require manual recording or use of a scan tool).

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
B. Battery Service
Task 3

Process/Skill Questions

- How can an auxiliary battery be connected to the vehicle?
- How much voltage does it take to maintain memory function?
- While connected to auxiliary battery, what actions should be avoided?

Task Number 91

Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.

Definition

Procedure should include

- cleaning battery case and terminals
- replacing battery by disconnecting and reconnecting specified battery size (group number), with respect to polarity
- replacing cables by using the same or larger gauge than manufacturer specifications
- replacing connectors, clamps/terminals, and with same-as-original equipment.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
B. Battery Service
Task 4

Process/Skill Questions

- Of what materials are most battery clamps made?
• What precautions should be taken when servicing a battery?
• What product(s) can neutralize battery acid?

Task Number 92

Perform slow/fast battery charge according to manufacturer’s recommendations.

Definition

Performance should include

• maintaining or restoring electronic memory functions
• inspecting, cleaning, and replacing battery.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
B. Battery Service
Task 5

Process/Skill Questions

• Why is slow charging preferred?
• How does a technician charge an absorbed glass mat (AGM) battery?
• What gas is produced when charging a battery?

Task Number 93

Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.

Definition

Jump start should include using jumper cables and a battery or auxiliary power supply to start a vehicle.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
B. Battery Service
Task 6

Process/Skill Questions

- What are the steps in performing a jump start?
- Why is the last connection made away from the battery?
- What personal protective equipment (PPE) should be worn when performing a jump start?

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Task Number 94

Identify safety precautions for high-voltage systems on electric, hybrid-electric, and diesel vehicles.

Definition

Identification should include

- location of the battery
- physical appearance of the disconnects (i.e., small, plastic pieces that fit into the side of a hybrid battery)
- specific gear that technicians should wear when working with the service plug (i.e., class 00 insulating/voltage gloves)
- location of high-voltage circuits, according to service materials and manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
B. Battery Service
Task 7

Process/Skill Questions

- What color are the high-voltage circuits?
- What are the shock dangers involved with electric/hybrid vehicles?
- What is the electrocution threshold in humans?
Task Number 95

Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery.

Definition

Identification should include following service manuals and manufacturer guidelines. (Note: This information is not always readily available.)

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
B. Battery Service
Task 8

Process/Skill Questions

- Where would one find the reinitialization code?
- What is nonvolatile memory?
- Why would a technician need to reinitialize? How might he/she prevent reinitialization?

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Task Number 96

Identify hybrid vehicle auxiliary (12V) battery service, repair, and test procedures.

Definition

Identification should include following service materials and manufacturer guidelines. (Note: Servicing requirements are similar to those of other 12V batteries.)

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
B. Battery Service
Task 9

Process/Skill Questions
• How does battery service for a hybrid auxiliary differ from that of a conventional vehicle?
• How is the 12V battery charged in a hybrid vehicle?
• What does the 12V battery do in a hybrid vehicle?

Starting System

Task Number 97

Perform starter current draw test; determine necessary action.

Definition

Procedure should include

• disabling ignition/fuel system
• using an induction amperage tester
• cranking the engine to test current draw.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
C. Starting System
Task 1

Process/Skill Questions

• What is the purpose of a starter current draw test?
• What does excessive current draw mean?
• What does lower-than-normal current draw mean?

Task Number 98

Perform starter circuit voltage drop tests; determine necessary action.

Definition

Procedure should include performing positive- and negative-side voltage drop tests.
ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
C. Starting System
Task 2

Process/Skill Questions

- What is the typical voltage drop range in a starter circuit?
- At what connection points are voltage drop tests performed?
- What are the effects of using a gauge wire that is too small in a starter circuit?

Task Number 99

Inspect and test starter relays and solenoids; determine necessary action.

Definition

Procedure should include using voltage drop testing for power source (i.e., available voltage) and checking the ground.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
C. Starting System
Task 3

Process/Skill Questions

- What is the function of a relay?
- What is (are) the function(s) of a solenoid?
- How would a technician test a relay?

Task Number 100

Remove and install starter in a vehicle.

Definition
Procedure should include

- disconnecting the battery positive and negative cables
- conducting a visual inspection of the flywheel/ring gear
- removing and installing the starter, according to service materials and manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
C. Starting System
Task 4

Process/Skill Questions

- What should be inspected when removing a starter motor?
- What is the first step in removing a starter motor?
- How many wires are on a typical starter motor?

---

Task Number 101

Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.

Definition

Procedure should include

- checking the ignition switch
- checking the neutral safety switch
- checking the clutch safety switch
- checking the starter relay
- conducting a visual inspection of the wiring harness
- testing components, according to service materials and manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
C. Starting System
Task 5

Process/Skill Questions
What components are in a starter control circuit?
• How much voltage drop is allowed across the connector?
• How does a positive-engagement starter work?

Task Number 102

Demonstrate knowledge of an automatic idle-stop/start-stop system.

Definition

Demonstration should include

• identifying vehicles that have idle-stop/start-stop systems
• explaining how these systems operate
• identifying what components are included in this system.

Charging System

Task Number 103

Perform charging system output test; determine necessary action.

Definition

Procedure should include

• using appropriate testing equipment
referring to appropriate service information
determining if additional diagnosis is needed.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
D. Charging System
Task 1

Process/Skill Questions

• What is the proper charging voltage with the vehicle running?
• Where should the technician place the inductive pickup during an output test?
• What procedures could be used to full field test an alternator?
• Where would one find the amperage specification for an alternator?

Task Number 104

Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.

Definition

Procedure should include

• differentiating between procedures for V-belts and serpentine belts
• conducting a visual inspection of all belt surfaces
• aligning belts, using a straight-edge, visual inspection, or specialized tools (e.g., laser aligner)
• inspecting tensioners visually for wear indicators and freedom of motion
• following service manuals and manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
D. Charging System
Task 2

Process/Skill Questions

• How is correct belt alignment determined?
• How is the drive belt tension adjusted?
• How should a drive belt be removed?

Task Number 105

Remove, inspect, and/or replace generator (alternator).

Definition

Procedure should be completed according to service materials and manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
D. Charging System
Task 3

Process/Skill Questions

• What function do diodes have in an alternator?
• What is the first step in removing an alternator?
• What effect would pulley size have on alternator output?

Task Number 106

Perform charging circuit voltage drop tests; determine necessary action.

Definition

Procedure should include

• conducting a visual inspection of terminals, alternator, junction block, or battery
• performing positive- and negative-side voltage drop tests.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
D. Charging System
Task 4

Process/Skill Questions

- How should a voltage drop test on an alternator be performed?
- What is maximum voltage drop across the cable?
- What is the result of excessive voltage drop?

Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems

Task Number 107

Inspect interior and exterior lamps and sockets, including headlights and auxiliary lights (fog lights/driving lights); replace as needed.

Definition

Inspection should include

- checking for proper function of headlights and bulbs, including cracked, broken, or hazy lenses, lights that will not hold adjustment, and dull reflectors
- checking for proper function of bulbs, flashers, turn signals, and hazard switches
- testing related components
- referring to service materials and manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
E. Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems
Task 1

Process/Skill Questions

- Why should one avoid touching halogen bulbs?
- How can a glazed headlight be repaired?
- What is the function of the flasher?
- What condition might cause a tail light to go out when a signal light flashes?
- What could cause flashing that is too rapid or too slow?
Task Number 108

Aim headlights.

Definition

Aiming of headlights should include

- checking for proper function of headlights and bulbs including cracked, broken, or hazy lenses, lights that will not hold adjustment, and dull reflectors
- following state inspection guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
E. Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems
Task 2

Process/Skill Questions

- What tool is typically used to aim the headlights?
- Why should one avoid touching halogen bulbs?
- How can a glazed headlight be repaired?

Task Number 109

Identify system voltage and safety precautions associated with high-intensity discharge (HID) headlights.

Definition

Identification should include following manufacturer warnings and guidelines regarding shock hazards.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
E. Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems
Task 3
Process/Skill Questions

- What is the typical system voltage of an HID headlight?
- What gas is used in most HID bulbs?
- What do HID bulbs use in place of filaments?

Task Number 110

Disable and enable supplementary restraint system (SRS); verify indicator lamp operation.

Definition

Procedure should include referring service materials and strictly following manufacturer safety guidelines prior to operating on the system.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
E. Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems
Task 4

Process/Skill Questions

- Where would one find information on disarming the airbag?
- Why would the technician disarm the airbag?
- Where are airbags located?

Task Number 111

Remove and reinstall door panel.

Definition

Procedure should include referring to service materials and following manufacturer guidelines to complete the necessary repair.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
E. Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems

Task 5

Process/Skill Questions

- What specialized tools are required when removing a door panel?
- What repairs would require the removal of a door panel?
- What is the function of the plastic shielding behind the door panel?

Task Number 112

Describe the operation of keyless entry/remote-start systems.

Definition

Description should include

- defining the operation of the keyless-entry system
- defining the operation of the remote-start system
- listing the locations of system components.

Task Number 113

Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.
Definition

Verification should include

- checking coolant temperature, fuel, vehicle speed, odometer, oil pressure, tachometer
- following procedures for each individual circuit. (Note: Typically, digital and fiber-optic gauges and warning circuits are not serviceable by the automotive service technician but are sent to special repair centers when servicing is required.)

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
E. Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems
Task 7

Process/Skill Questions

- What tool might be used to test sensors?
- What is a common fault of connectors?
- What is the difference between a weather pack connector and a standard connector?

Task Number 114

Verify windshield wiper and washer operation; replace wiper blades.

Definition

Diagnosis should include

- demonstrating proper wiper function
- testing wiper motor and park switch, wiper switch, control module, wiring, and related components
- referring to service materials and following manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VI. Electrical/Electronic Systems
E. Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems
Task 8

Process/Skill Questions
• What would cause a phantom wipe?
• What condition would prevent wipers from parking?
• How do intermittent wipers work?

HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

General

Task Number 115

Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.

Definition

Research should include

• checking related TSBs and manufacturer recalls
• using electronic service information and time-labor guides
• obtaining procedures from service manuals
• using strategy-based diagnostic procedures to collect information, progressing from a general to a more specific focus.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VII. Heating, Ventilation, and Air Conditioning (HVAC)
A. General
Task 1

Process/Skill Questions

• What information is most important when receiving a vehicle for servicing?
• Why does a technician need a full vehicle service history?
• What vehicle information does the technician need before beginning his/her research?

Task Number 116
Identify heating, ventilation and air conditioning (HVAC) components and configuration.

Definition

Identification should include components (i.e., HVAC actuators, heater core, evaporator core, condenser, compressor).

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VII. Heating, Ventilation, and Air Conditioning (HVAC)
A. General
Task 2

Process/Skill Questions

• How does a heater core function?
• What should the technician do if the air conditioning (A/C) is blowing warm?
• Are actuators vacuum- or electrically controlled?

Refrigeration System Components

Task Number 117

Inspect and replace air conditioning (AC) compressor drive belts, pulleys, and tensioners; visually inspect AC components for signs of leaks; determine needed action.

Definition

Inspection should include

• differentiating between procedures for V-belts and serpentine belts
• checking all belt surfaces
• determining and adjusting for proper belt alignment through use of straight-edge or specialized tools
• checking the wear indicators of tensioners and ensuring freedom of motion
• following service manuals and manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VII. Heating, Ventilation, and Air Conditioning (HVAC)
B. Refrigeration System Components
Task 1

Process/Skill Questions

• What are the specialized tools that enable inspection and replacement of A/C compressor drive belts?
• What are the procedures to replace a belt, including belt diagram?
• What might result if the A/C system has improper belt tension?

Task Number 118

Identify hybrid vehicle AC system electrical circuits and the service/safety precautions.

Definition

Identification should include referring to service materials and following manufacturer guidelines, with special attention to the risk of high voltage/shock, a major safety hazard when working with these circuits.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VII. Heating, Ventilation, and Air Conditioning (HVAC)
B. Refrigeration System Components
Task 2

Process/Skill Questions

• What are the safety procedures when working with hybrid AC systems?
• How are electrical circuits identified?
• At what voltage does an AC compressor typically operate?

Task Number 119

Inspect AC condenser for airflow restrictions; determine necessary action.

Definition
Inspection should include visually checking for blockage, checking for proper air flow, and flushing with water to remove debris, if necessary.

ASE Education Foundation  
2017 Maintenance and Light Repair (MLR) Level  
VII. Heating, Ventilation, and Air Conditioning (HVAC)  
B. Refrigeration System Components  
Task 3

Process/Skill Questions

- What is one method for checking air flow?  
- What might result from insufficient air flow across the air condenser?  
- Why is air flow important?

### Heating, Ventilation, and Engine Cooling Systems

#### Task Number 120

Inspect engine cooling and heater system hoses and pipes; determine necessary action.

**Definition**

Procedure should include

- checking hoses for bulges, softness, leaks, and cracks  
- checking hose clamps  
- following service manuals and manufacturer guidelines.

ASE Education Foundation  
2017 Maintenance and Light Repair (MLR) Level  
VII. Heating, Ventilation, and Air Conditioning (HVAC)  
C. Heating, Ventilation, and Engine Cooling Systems  
Task 1

Process/Skill Questions

- What specialized tools should be required to inspect engine cooling and heater system hoses and belts?  
- What procedures are used to inspect engine cooling and heater system hoses?
• What are some common failures of hoses?

Operating Systems and Related Controls

Task Number 121

Inspect AC-heater ducts, doors, hoses, cabin filters, and outlets; determine necessary action.

Definition

Procedure should include

• checking ducts, doors, and outlets for proper air flow
• determining the cause of any obstructions or abnormal noise
• checking the cabin filter for needed service.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VII. Heating, Ventilation, and Air Conditioning (HVAC)
D. Operating Systems and Related Controls
Task 1

Process/Skill Questions

• How would a technician inspect AC-heater ducts, doors, hoses, cabin filters, and outlets?
• How often should cabin filters be serviced?
• What might happen if the cabin filter was restricted?

Task Number 122

Identify the source of HVAC system odors.

Definition

Identification should include determining

• where the odor is most prominent
• the conditions (i.e., heat only, AC only, both) in which the odor occurs.
Process/Skill Questions

- What type of disinfectant can be used to clean the HVAC evaporator system?
- What are the most common causes of HVAC system odors?
- What service precaution should be used when cleaning HVAC systems?
- What is an after-blow system?

ENGINE PERFORMANCE

General

Task Number 123

Research vehicle service information, including fuel type, vehicle service history, service precautions, and technical service bulletins.

Definition

Research should include

- checking related TSBs and manufacturer recalls
- using electronic service information and time-labor guides
- obtaining procedures from service manuals
- using strategy-based diagnostic procedures to collect information, progressing from a general to a more specific focus.

Process/Skill Questions

- Where can TSBs be found?
• Why is vehicle service history important?
• What is a safety recall?

Task Number 124

Perform engine absolute manifold pressure tests (vacuum/boost); document results.

Definition

Performance should include

• using a vacuum gauge
• comparing the vacuum gauge reading to map tool data
• searching for a non-ported vacuum source
• performing an idle-vacuum test
• performing a cranking-vacuum test
• performing an exhaust-restriction test.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VIII. Engine Performance
A. General
Task 2

Process/Skill Questions

• How does a vacuum gauge respond to a restricted exhaust system?
• What is normal idle vacuum?
• What is a ported vacuum?

Task Number 125

Perform cylinder power balance test; document results.

Definition

Performance should include
- connecting scan tool
- analyzing misfire data to determine necessary action
- referring to service materials and following manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VIII. Engine Performance
A. General
Task 3

Process/Skill Questions

- What precautions should be taken when performing a cylinder power balance test?
- What does a low RPM (revolutions per minute) charge indicate?
- Why does the idle air control need to be disabled when testing?

Task Number 126

Perform cylinder cranking and running compression tests; document results.

Definition

Performance should include

- installing the compression gauge with the Schrader valve removed
- using specialized tools
- analyzing data to determine necessary action
- referring to service materials and following manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VIII. Engine Performance
A. General
Task 4

Process/Skill Questions

- What is the percentage of cylinder variation on a cranking test?
- What is the purpose of performing a running compression test?
- Why should the throttle be open while performing a cranking compression test?
- What is the purpose of performing a wet compression test?
Task Number 127

Perform cylinder leakage test; document results.

Definition

Performance should include

- installing a cylinder leakage tool
- using specialized tools
- analyzing data to determine necessary action
- referring to service materials and following manufacturer guidelines.

Task Number 128

Verify engine operating temperature.

Definition

Verification should include

- researching manufacturer specifications for normal operating temperature and duration required for achieving this temperature after ignition
- using thermometers (e.g., laser, contact, DMM).
A. General
Task 6

Process/Skill Questions

- What tools might be used to verify engine operating temperature?
- What mechanical components affect engine temperature?
- What is one common customer complaint associated with improper operating temperature?

Task Number 129

Remove and replace spark plugs; inspect secondary ignition components for wear and damage.

Definition

Procedure should include

- cleaning the area around the spark plugs prior to removing them
- labeling wires before removing plugs
- selecting the correct tool and plug for replacement
- visually checking the secondary ignition components.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VIII. Engine Performance
A. General
Task 7

Process/Skill Questions

- Why and how often should spark plugs be checked?
- What is the function of spark plugs?
- Why should the gap on a spark plug be adjusted?
- What safety precautions should be observed when replacing the spark plugs?

Computerized Engine Controls

Task Number 130
Retrieve and record diagnostic trouble codes (DTC), on-board diagnostic (OBD) monitor status, and freeze frame data; clear codes when applicable.

Definition

Procedure should include

- determining the connector location
- entering the correct vehicle data
- using the scan tool
- acquiring DTCs, OBD monitor status, freeze frame data, and clearing DTCs, when applicable.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VIII. Engine Performance
B. Computerized Engine Controls
Task 1

Process/Skill Questions

- What does the DTC prefix indicate about the system?
- When is a freeze frame generated?
- Where would the technician find information about monitor-run conditions?

Task Number 131

Describe the use of the OBD monitors for repair verification.

Definition

Description should include that a lack of verification may result in a DTC being set when the testing parameters have been met and the monitor has run.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VIII. Engine Performance
B. Computerized Engine Controls
Task 2
Process/Skill Questions

- What is a monitor?
- Why do some DTCs set without a monitor?
- When do monitors run?

Fuel, Air Induction, and Exhaust Systems

Task Number 132

Replace fuel filter(s) where applicable.

Definition

Replacement should include

- depressurizing the fuel system
- checking for leaks
- using appropriate tools
- referring to service materials and manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VIII. Engine Performance
C. Fuel, Air Induction, and Exhaust Systems
Task 1

Process/Skill Questions

- Where are fuel filters located?
- What is an acceptable way to depressurize the fuel system?
- How could fuel filter orientation/direction affect fuel flow?

Task Number 133

Inspect, service, or replace air filters, filter housings, and intake duct work.

Definition
Procedure should include

- visual inspection of engine air filters and cabin air filters and housings
- determining needed action.

Task Number 134

Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action.

Definition

Inspection should include

- conducting a visual inspection for leaks and proper operation
- adjusting/correcting heat shield placement
- using scan tool to check performance of the exhaust system components.

Process/Skill Questions

- What does the heat shield protect?
- What noise might be caused by a failed catalytic converter?
- What can noise indicate about exhaust issues? How might noise help pinpoint problems?
Task Number 135

Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine necessary action.

Definition

Inspection should include

- checking for fit/looseness
- ensuring there is no rust
- ensuring the rubber mounted devices are intact.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VIII. Engine Performance
C. Fuel, Air Induction, and Exhaust Systems
Task 4

Process/Skill Questions

- What are the components of the exhaust system?
- What is the life span of a catalytic converter?
- What are the active ingredients in a catalytic converter?

Task Number 136

Check and refill diesel exhaust fluid (DEF).

Definition

Procedure should require following manufacturer’s recommendations and servicing at regular/recommended intervals.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VIII. Engine Performance
C. Fuel, Air Induction, and Exhaust Systems
Task 5
Process/Skill Questions

- How is the quality of diesel fuel determined?
- Why is diesel fuel quality important?
- How does diesel fuel quality affect performance?

Emissions Control Systems

Task Number 137

Inspect, test, and service positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform necessary action.

Definition

Procedure should include

- checking for proper PCV filter/breather function
- referring to service materials and following manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
VIII. Engine Performance
D. Emissions Control Systems
Task 1

Process/Skill Questions

- Why does a crankcase need ventilation?
- What is the function of a PCV valve?
- What is the difference between a vehicle that uses a PCV vs. an orifice system?

SOL Correlation by Task

<table>
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<tr>
<th>SOL</th>
<th>Identify general lab/shop safety rules and procedures.</th>
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<td>History and Social Science: GOVT.14</td>
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<td>40</td>
<td>Utilize safe procedures for handling tools and equipment.</td>
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<td>Identify and use proper placement of floor jacks and jack stands.</td>
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<td>Identify and use proper procedures for safe lift operation.</td>
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<td>43</td>
<td>Use proper ventilation procedures for working in the lab/shop area.</td>
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<td>44</td>
<td>Identify marked safety areas.</td>
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<td>45</td>
<td>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.</td>
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<td>46</td>
<td>Identify the location and use of eye wash stations.</td>
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<td>47</td>
<td>Identify the location of posted evacuation routes.</td>
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<td>48</td>
<td>Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.</td>
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<td>49</td>
<td>Identify and wear appropriate clothing for lab/shop activities.</td>
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<td>50</td>
<td>Secure hair and jewelry for lab/shop activities.</td>
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<td>51</td>
<td>Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high-voltage circuits.</td>
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<tr>
<td>52</td>
<td>Demonstrate awareness of the safety aspects of high-voltage circuits such as high intensity discharge (HID) lamps, ignition systems, and injection systems.</td>
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<td>Locate and demonstrate knowledge of safety data sheets (SDS).</td>
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<td>Install engine covers using gaskets, seals, and sealers as required.</td>
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<td>Verify engine mechanical timing.</td>
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<td>Verify operation of the instrument panel engine warning indicators.</td>
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<td>57</td>
<td>Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.</td>
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<td>Description</td>
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<tr>
<td>58</td>
<td>Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.</td>
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<td>Adjust valves (mechanical or hydraulic lifters).</td>
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<td>Identify components of the cylinder head and valve train.</td>
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<td>61</td>
<td>Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.</td>
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<td>62</td>
<td>Inspect for leakage at external seals, gaskets, and bushings.</td>
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<td>63</td>
<td>Inspect, replace, and/or align power train mounts.</td>
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<td>64</td>
<td>Describe the operational characteristics of a continuously variable transmission (CVT).</td>
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<td>65</td>
<td>Describe the operational characteristics of a hybrid vehicle drive train.</td>
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<td>66</td>
<td>Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.</td>
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<td>67</td>
<td>Inspect, remove, and/or replace bearings, hubs, and seals.</td>
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<td>68</td>
<td>Inspect, service, and/or replace shafts, yokes, boots, and universal/constant-velocity (CV) joints.</td>
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<td>69</td>
<td>Inspect locking hubs.</td>
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<td>70</td>
<td>Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.</td>
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<td>71</td>
<td>Clean and inspect differential case; check for leaks; inspect housing vent.</td>
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<td>72</td>
<td>Disable and enable supplemental restraint system (SRS).</td>
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<td>73</td>
<td>Perform prealignment inspection; measure vehicle ride height.</td>
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<td>Describe alignment angles (camber, caster, and toe).</td>
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<td>Describe the operation of a regenerative braking system.</td>
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<td>77</td>
<td>Research vehicle service information, including vehicle service history, service precautions, and technical service bulletins.</td>
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<tr>
<td>78</td>
<td>Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm’s law).</td>
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<td>Use wiring diagrams to trace electrical/electronic circuits.</td>
<td>English: 11.5, 12.5</td>
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<td>81</td>
<td>Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.</td>
<td>Science: PH.11</td>
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<td>82</td>
<td>Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.</td>
<td>Science: PH.11</td>
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<td>Check operation of electrical circuits using a test light.</td>
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<td>Measure key-off battery drain (parasitic draw).</td>
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<td>Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.</td>
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<td>Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair).</td>
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<td>Perform battery state-of-charge test; determine necessary action.</td>
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<td>Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine necessary action.</td>
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<td>90</td>
<td>Maintain or restore electronic memory functions.</td>
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<td>91</td>
<td>Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.</td>
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<td>Perform slow/fast battery charge according to manufacturer’s recommendations.</td>
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<td>Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.</td>
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<td>Identify safety precautions for high-voltage systems on electric, hybrid-electric, and diesel vehicles.</td>
<td>Science: PH.11</td>
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<td>95</td>
<td>Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery.</td>
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<td>Perform starter current draw test; determine necessary action.</td>
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<td>Inspect and test starter relays and solenoids; determine necessary action.</td>
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<td>Remove and install starter in a vehicle.</td>
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<td>Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.</td>
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<td>102</td>
<td>Demonstrate knowledge of an automatic idle-stop/start-stop system.</td>
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<td>103</td>
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<tr>
<td>104</td>
<td>Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>Remove, inspect, and/or replace generator (alternator).</td>
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</tr>
</tbody>
</table>
| 106         | Perform charging circuit voltage drop tests; determine necessary action.  
|             | Science: PH.11 |
| 107         | Inspect interior and exterior lamps and sockets, including headlights and auxiliary lights (fog lights/driving lights); replace as needed. |
| 108         | Aim headlights. |
| 109         | Identify system voltage and safety precautions associated with high-intensity discharge (HID) headlights.  
|             | Science: PH.11 |
| 110         | Disable and enable supplementary restraint system (SRS); verify indicator lamp operation. |
| 111         | Remove and reinstall door panel.  
|             | English: 11.5, 12.5 |
| 112         | Describe the operation of keyless entry/remote-start systems.  
|             | English: 11.3, 11.6, 12.3, 12.6 |
| 113         | Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. |
| 114         | Verify windshield wiper and washer operation; replace wiper blades.  
|             | English: 11.8, 12.8 |
| 115         | Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.  
|             | English: 11.5, 12.5 |
| 116         | Identify heating, ventilation and air conditioning (HVAC) components and configuration. |
| 117         | Inspect and replace air conditioning (AC) compressor drive belts, pulleys, and tensioners; visually inspect AC components for signs of leaks; determine needed action.  
|             | English: 11.5, 12.5 |
| 118         | Identify hybrid vehicle AC system electrical circuits and the service/safety precautions.  
|             | English: 11.5, 12.5 |
| 119         | Inspect AC condenser for airflow restrictions; determine necessary action. |
| 120         | Inspect engine cooling and heater system hoses and pipes; determine necessary action. |
| 121         | Inspect AC-heater ducts, doors, hoses, cabin filters, and outlets; determine necessary action.  
|             | English: 11.5, 12.5 |
| 122         | Identify the source of HVAC system odors.  
|             | English: 11.8, 12.8 |
| 123         | Research vehicle service information, including fuel type, vehicle service history, service precautions, and technical service bulletins. |
Perform engine absolute manifold pressure tests (vacuum/boost); document results.

Perform cylinder power balance test; document results.

Perform cylinder cranking and running compression tests; document results.

Perform cylinder leakage test; document results.

Verify engine operating temperature.

Remove and replace spark plugs; inspect secondary ignition components for wear and damage.

Retrieve and record diagnostic trouble codes (DTC), on-board diagnostic (OBD) monitor status, and freeze frame data; clear codes when applicable.

Describe the use of the OBD monitors for repair verification.

Replace fuel filter(s) where applicable.

Inspect, service, or replace air filters, filter housings, and intake duct work.

Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action.

Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine necessary action.

Check and refill diesel exhaust fluid (DEF).

Inspect, test, and service positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform necessary action.

Customer Service Infusion Units

Customer Service Infusion Units (CSIU) were designed to be infused with designated CTE courses to help students in those programs achieve additional, focused, validated tasks/competencies in customer service. These units are not mandatory, and, as such, the tasks/competencies are marked as "optional," to be taught at the instructor's discretion. Teachers can find the infusion/unit in the course listing.

Entrepreneurship Infusion Units

Entrepreneurship Infusion Units may be used to help students achieve additional, focused competencies and enhance the validated tasks/competencies related to identifying and starting a new business venture. Because the unit is a complement to certain designated courses and is not
mandatory, all tasks/competencies are marked “optional.” Teachers can find the infusion/unit in the course listing.

SkillsUSA Championship Competitive Events

SkillsUSA is a national membership association serving high school, college and middle school students who are preparing for careers in trade, technical and skilled service occupations, including health occupations, and for further education. SkillsUSA is a partnership of students, teachers and industry working together to ensure America has a skilled workforce. SkillsUSA helps each student excel.

SkillsUSA is an Applied Method of Learning where students practice skills and build self-confidence while helping their schools and communities. SkillsUSA provides experiences in leadership, teamwork, citizenship and character development. The program emphasizes high ethical standards, superior work skills, lifelong education and pride. These are qualities employers value and look for when hiring or promoting workers.

**Mission:** SkillsUSA empowers its members to become world-class workers, leaders and responsible American citizens. SkillsUSA improves the quality of our nation’s future skilled workforce through the development of Framework skills that include personal, workplace and technical skills grounded in academics.

**Vision:** SkillsUSA produces the most highly skilled workforce in the world, providing every member the opportunity for career success.

**Resources:** SkillsUSA offers many resources for educators and students. For additional information about the student organization, see SkillsUSA National Website at [www.skillsusa.org](http://www.skillsusa.org) and the SkillsUSA Virginia Website at [www.skillsusava.org](http://www.skillsusava.org).

**SkillsUSA Championships Events:** The official regulations for the following events are published in the SkillsUSA Championships Technical Standards. New contests are added each year.

The SkillsUSA Championships brings together industry and labor representatives, educators and the public to watch students compete in leadership and hands-on skill events for a full day. The SkillsUSA Championships begin at the local level with contests in classrooms nationwide. Winners advance through district, regional and state competition, and only the best make it to the national event. Students benefit no matter how they place in their contests. They test their skills, frequently make job contacts, and have a chance for recognition. State and national winners receive gold, silver and bronze medallions, scholarships, tools and other awards as provided by business and industry partners.

(#{contest not currently offered in Virginia}
(*) Contest for students with IEP only
**Leadership Development**

Action Skills *  
American Spirit Chapter  
Business Procedure #  
Chapter Display  
Community Action Project*  
Community Service  
Employment Application Process *  
Extemporaneous Speaking  
Job Interview  
Job Skill Demonstration A  
Job Skill Demonstration Open  
Occupational Health and Safety  
Opening and Closing Ceremonies  
Outstanding Chapter  
Pin Design (State Conference)  
Prepared Speech  
Promotional Bulletin Board  
Quiz Bowl  
T-shirt Design

**Occupationally Related**

Career Pathways Showcase  
Customer Service  
Engineering Technology/Design  
Entrepreneurship  
First Aid/CPR  
Health Knowledge Bowl #  
Health Occupations Professional Portfolio  
Medical Math  
Medical Terminology  
Principles of Engineering/Technology  
Related Technical Math  
Team Engineering Challenge #

**Skilled and Technical Sciences**

3-D Visualization and Animation  
Additive Manufacturing  
Advertising Design  
Architectural Drafting  
Audio/Radio Production  
Automated Manufacturing Technology #  
Automotive Refinishing Technology  
Automotive Service Technology  
Automotive: Maintenance and Light Repair (S)  
Aviation Maintenance Technology  
Barbering
Basic Health Care Skills #
Broadcast News Production
Building Maintenance
Cabinetmaking
Carpentry
CNC Milling Specialist
CNC Technician
CNC Turning Specialist
Collision Damage Appraisal #
Collision Repair Technology
Commercial Baking
Computer Programming
Cosmetology
Crime Scene Investigation
Criminal Justice
Culinary Arts
Dental Assisting
Diesel Equipment Technology
Digital Cinema Technology
Early Childhood Education
Electrical Construction Wiring
Electronics Technology
Esthetics
Firefighting
Graphic Communications
Graphics Imaging – Sublimation
Heating, Ventilation, Air Conditioning and Refrigeration
Humanoid Robotics #
Industrial Motor Control
Information Technology Services
Interactive Application and Video Game Development
Internetworking
Major Appliance and Refrigeration Technology #
Marine Service Technology
Masonry
Mechatronics
Medical Assisting #
Mobile Electronics Installation #
Mobile Robotics Technology
Motorcycle Service Technology
Nail Care
Nurse Assisting
Photography
Plumbing
Power Equipment Technology
Practical Nursing #
Residential Systems Installation and Maintenance #
Restaurant Service
Robotics: Urban Search and Rescue
Robotics and Automation Technology #
Screen Printing Technology
Sheet Metal #
TeamWorks
Technical Computer Applications
Technical Drafting
Telecommunications Cabling
Television (Video) Production
Web Design
Welding
Welding Fabrication
Welding Sculpture

State Only Contest (not national contest)
Auto Maintenance *
Barbering Bricklayer *
Club Scrapbook
Current Events
Emergency Medical Technician
Essay
Extemporaneous Writing
Fantasy Manikin (Live)
Food Preparation Assistant *
Occupational Display
Occupational Scrapbook
Poster
Precision Machining Technology
Promotional Flyer
Radio Communications (Pre-Produced)
Spelling
Student of the Year
Television Production (Pre-Produced Cut-Only)
Television Production (Pre-Produced Special Effects)
Veterinary Assisting
Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- ASE Certification Examinations
- ASE Entry-Level Certification Examinations
- Automotive Technician Advanced Assessment
- Automotive Technician Core Assessment
- College and Work Readiness Assessment (CWRA+)
- Customer Service Examination
- Customer Service Specialist (CSS) Examination
- Mobile Communications and Electronics Installer (MCEI) Examination
- National Career Readiness Certificate Assessment
- Professional Communications Certification Examination
- Virginia Motor Vehicle Safety Inspection Program Examination
- Workplace Readiness Skills for the Commonwealth Examination

Concentration sequences: A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.

- Automotive Technology I (8506/36 weeks, 280 hours)
- Automotive Technology I (MLR 3-Year Program) (8502/36 weeks, 140 hours)

Career Cluster: Transportation, Distribution and Logistics

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
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<tbody>
<tr>
<td>Facility and Mobile Equipment Maintenance</td>
<td>Aircraft Mechanic and Service Technician</td>
</tr>
<tr>
<td></td>
<td>Aircraft Structure, Surfaces, Rigging, and Systems Assembler</td>
</tr>
<tr>
<td></td>
<td>Automotive Body and Related Repairer</td>
</tr>
<tr>
<td></td>
<td>Automotive Glass Installer and Repairer</td>
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<tr>
<td></td>
<td>Automotive Service Technician, Mechanic</td>
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<tr>
<td></td>
<td>Diesel Service Technician</td>
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<tr>
<td></td>
<td>Electrical and Electronic Installer</td>
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<tr>
<td></td>
<td>Electrical and Electronic Repairer</td>
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<tr>
<td></td>
<td>Marine Watercraft Repair and Maintenance Worker</td>
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<tr>
<td></td>
<td>Motorboat Mechanic</td>
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<tr>
<td></td>
<td>Service Technician</td>
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<tr>
<td></td>
<td>Small Engine Mechanic</td>
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