Automotive Technology I
(MLR 3-Year Program)

8502 36 weeks / 140 hours

Table of Contents

Acknowledgments ......................................................................................................................................... 2
Course Description........................................................................................................................................ 3
Task Essentials Table .................................................................................................................................... 4
Curriculum Framework ............................................................................................................................... 13
REQUIRED SUPPLEMENTAL TASKS ................................................................................................... 13
Lab/Shop and Personal Safety ..................................................................................................................... 13
Tools and Equipment .................................................................................................................................. 21
Preparing Vehicle for Service ..................................................................................................................... 24
Preparing Vehicle for Customer ................................................................................................................ 26
ENGINE REPAIR ...................................................................................................................................... 27
General........................................................................................................................................................ 27
Lubrication and Cooling Systems ............................................................................................................... 30
AUTOMATIC TRANSMISSION AND TRANSAXLE ............................................................................ 33
General........................................................................................................................................................ 33
In-Vehicle Transmission/Transaxle ............................................................................................................ 36
MANUAL DRIVE TRAIN AND AXLES ................................................................................................. 37
General........................................................................................................................................................ 37
Clutch.......................................................................................................................................................... 39
Drive Shaft, Half Shafts, Universal Joints and Constant-Velocity (CV) Joints (Front, Rear, All, and Four-wheel Drive). .................................................................................................................. 41
Differential Case Assembly ........................................................................................................................ 41
SUSPENSION AND STEERING SYSTEMS ......................................................................................... 43
General........................................................................................................................................................ 43
Related Suspension and Steering Service ................................................................................................. 44
Wheel Alignment ........................................................................................................................................ 57
Wheels and Tires......................................................................................................................................... 58
Acknowledgments

The components of this instructional framework were developed by the following business panelists:

Kevin Berry, District Manager, Chevrolet Motor Division, General Motors
Thomas Kerns, Fixed Operations Director, Haley Auto Group
Doug Paterson, Fixed Operations Director, Haley Toyota of Richmond
Mark Smith, Owner, Midas of Richmond
Harlan Wrenn, Manager, Electude

The following educators served on the curriculum development panel:

James Bruce, Virginia Beach Technical and Career Education Center, Virginia Beach City Public Schools
Wayne Champigny, Virginia Beach Technical and Career Education Center, Virginia Beach City Public Schools
Rebecca Fenton, T.C. Williams High School, Alexandria City Public Schools
Douglas Haga, Smyth Career and Technology Center, Smyth County Public Schools
Kobe Jackson, T.C. Williams High School, Alexandria City Public Schools
Mark Mathia, Bedford Science and Technology Center, Bedford County Public Schools
Norman Pattarozzi, Osbourn Park High School, Prince William County Public Schools

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

Leslie Bowers, English Teacher (ret.), Newport News Public Schools
Vickie L. Inge, Mathematics Committee Member, Virginia Mathematics and Science Coalition
Anne F. Markwith, New Teacher Mentor (Science), Gloucester County Public Schools
Course Description

**Suggested Grade Level:** 10 or 11

In this course, students explore, handle, and perform basic functions in engine repair, automatic transmission and transaxle, manual drive train and axles, suspension and steering systems, and brakes. Students who successfully complete the Automotive Technology program may be eligible to take the Automotive Service Excellence (ASE) Student Certification examination. The ASE Student Certification is the first step in building a career as a service professional in the automotive industry.

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 Table

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

<table>
<thead>
<tr>
<th>Task Number</th>
<th>8502</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REQUIRED SUPPLEMENTAL TASKS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lab/Shop and Personal Safety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>ç</td>
<td>Identify general lab/shop safety rules and procedures.</td>
</tr>
<tr>
<td>40</td>
<td>ç</td>
<td>Utilize safe procedures for handling tools and equipment.</td>
</tr>
<tr>
<td>41</td>
<td>ç</td>
<td>Identify and use proper placement of floor jacks and jack stands.</td>
</tr>
<tr>
<td>42</td>
<td>ç</td>
<td>Identify and use proper procedures for safe lift operation.</td>
</tr>
<tr>
<td>43</td>
<td>ç</td>
<td>Use proper ventilation procedures for working in the lab/shop area.</td>
</tr>
<tr>
<td>44</td>
<td>ç</td>
<td>Identify marked safety areas.</td>
</tr>
<tr>
<td>45</td>
<td>ç</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>ç</td>
<td>Identify the location and use of eye wash stations.</td>
</tr>
<tr>
<td>47</td>
<td>ç</td>
<td>Identify the location of posted evacuation routes.</td>
</tr>
<tr>
<td>Task Number</td>
<td>8502</td>
<td>Tasks/Competencies</td>
</tr>
<tr>
<td>-------------</td>
<td>------</td>
<td>--------------------</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>

**Tools and Equipment**

<table>
<thead>
<tr>
<th>Task Number</th>
<th>8502</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>54</td>
<td></td>
<td>Identify tools and their usage in automotive applications.</td>
</tr>
<tr>
<td>55</td>
<td></td>
<td>Identify standard and metric measurement designations.</td>
</tr>
<tr>
<td>56</td>
<td></td>
<td>Demonstrate safe handling and use of appropriate tools.</td>
</tr>
<tr>
<td>57</td>
<td></td>
<td>Demonstrate cleaning, storage, and maintenance of tools and equipment.</td>
</tr>
<tr>
<td>58</td>
<td></td>
<td>Demonstrate use of precision measuring tools (i.e., micrometer, dial-indicator, dial-caliper).</td>
</tr>
</tbody>
</table>

**Preparing Vehicle for Service**

<table>
<thead>
<tr>
<th>Task Number</th>
<th>8502</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>59</td>
<td></td>
<td>Identify information needed and the service requested on a repair order.</td>
</tr>
<tr>
<td>60</td>
<td></td>
<td>Identify purpose and demonstrate proper use of fender covers and mats.</td>
</tr>
<tr>
<td>61</td>
<td></td>
<td>Demonstrate use of the three Cs (i.e., concern, cause, and correction).</td>
</tr>
<tr>
<td>62</td>
<td></td>
<td>Review vehicle service history.</td>
</tr>
<tr>
<td>Task Number</td>
<td>8502</td>
<td>Tasks/Competencies</td>
</tr>
<tr>
<td>-------------</td>
<td>------</td>
<td>--------------------</td>
</tr>
<tr>
<td>63</td>
<td>+</td>
<td>Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.</td>
</tr>
<tr>
<td><strong>Preparing Vehicle for Customer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>+</td>
<td>Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).</td>
</tr>
<tr>
<td><strong>ENGINE REPAIR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>+</td>
<td>Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.</td>
</tr>
<tr>
<td>66</td>
<td>+</td>
<td>Verify operation of the instrument panel engine warning indicators.</td>
</tr>
<tr>
<td>67</td>
<td>+</td>
<td>Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.</td>
</tr>
<tr>
<td>68</td>
<td>+</td>
<td>Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.</td>
</tr>
<tr>
<td><strong>Lubrication and Cooling Systems</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>+</td>
<td>Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs; determine needed action.</td>
</tr>
<tr>
<td>70</td>
<td>+</td>
<td>Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.</td>
</tr>
<tr>
<td>71</td>
<td>+</td>
<td>Remove, inspect, and replace thermostat and gasket/seal.</td>
</tr>
<tr>
<td>72</td>
<td>+</td>
<td>Inspect and test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.</td>
</tr>
<tr>
<td>73</td>
<td>+</td>
<td>Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required.</td>
</tr>
<tr>
<td>Task Number</td>
<td>Tasks/Competencies</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------</td>
<td></td>
</tr>
<tr>
<td>AUTOMATIC TRANSMISSION AND TRANSAXLE</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>Check fluid level in a transmission or a transaxle equipped with a dipstick.</td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>Check fluid level in a transmission or a transaxle not equipped with a dipstick.</td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>Check transmission fluid condition; check for leaks.</td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>Identify drive-train components and configuration.</td>
<td></td>
</tr>
<tr>
<td><strong>In-Vehicle Transmission/Transaxle</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>Inspect for leakage at external seals, gaskets, and bushings.</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.</td>
<td></td>
</tr>
<tr>
<td>MANUAL DRIVE TRAIN AND AXLES</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.</td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification.</td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>Check fluid condition; check for leaks.</td>
<td></td>
</tr>
<tr>
<td><strong>Clutch</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>Check and adjust clutch master cylinder fluid level; use proper fluid type per manufacturer specifications.</td>
<td></td>
</tr>
<tr>
<td>Task Number</td>
<td>Processes</td>
<td>Tasks/Competencies</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------</td>
<td>--------------------</td>
</tr>
<tr>
<td>85</td>
<td></td>
<td>Check for hydraulic system leaks.</td>
</tr>
<tr>
<td>86</td>
<td></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>
</tr>
<tr>
<td>87</td>
<td></td>
<td>Check and adjust differential case fluid level; use proper fluid type per manufacturer specification.</td>
</tr>
<tr>
<td>88</td>
<td></td>
<td>Drain and refill differential housing.</td>
</tr>
<tr>
<td>89</td>
<td></td>
<td>Inspect and replace drive axle wheel studs.</td>
</tr>
<tr>
<td>90</td>
<td></td>
<td>Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.</td>
</tr>
<tr>
<td>91</td>
<td></td>
<td>Inspect rack-and-pinion steering gear inner tie-rod ends (sockets) and bellows boots.</td>
</tr>
<tr>
<td>92</td>
<td></td>
<td>Inspect power steering fluid level and condition.</td>
</tr>
<tr>
<td>93</td>
<td></td>
<td>Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.</td>
</tr>
<tr>
<td>94</td>
<td></td>
<td>Inspect for power steering fluid leakage.</td>
</tr>
<tr>
<td>95</td>
<td></td>
<td>Remove, inspect, replace, and/or adjust power steering pump drive belt.</td>
</tr>
<tr>
<td>96</td>
<td></td>
<td>Inspect and replace power steering hoses and fittings.</td>
</tr>
<tr>
<td>Task Number</td>
<td>8502</td>
<td>Tasks/Competencies</td>
</tr>
<tr>
<td>-------------</td>
<td>------</td>
<td>--------------------</td>
</tr>
<tr>
<td>97</td>
<td></td>
<td>Inspect pitman arm, relay (center link/intermediate) rod, idler arm, mountings, and steering linkage damper.</td>
</tr>
<tr>
<td>98</td>
<td></td>
<td>Inspect tie rod ends (sockets), tie rod sleeves, and clamps.</td>
</tr>
<tr>
<td>99</td>
<td></td>
<td>Inspect upper and lower control arms, bushings, and shafts.</td>
</tr>
<tr>
<td>100</td>
<td></td>
<td>Inspect and replace rebound and/or jounce bumpers.</td>
</tr>
<tr>
<td>101</td>
<td></td>
<td>Inspect track bar, strut rods/radius arms, and related mounts and bushings.</td>
</tr>
<tr>
<td>102</td>
<td></td>
<td>Inspect upper and lower ball joints (with or without wear indicators).</td>
</tr>
<tr>
<td>103</td>
<td></td>
<td>Inspect suspension system coil springs and spring insulators (silencers).</td>
</tr>
<tr>
<td>104</td>
<td></td>
<td>Inspect suspension system torsion bars and mounts.</td>
</tr>
<tr>
<td>105</td>
<td></td>
<td>Inspect and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.</td>
</tr>
<tr>
<td>106</td>
<td></td>
<td>Inspect, remove, and/or replace strut cartridge or assembly; inspect mounts and bushings.</td>
</tr>
<tr>
<td>107</td>
<td></td>
<td>Inspect front strut bearing and mount.</td>
</tr>
<tr>
<td>108</td>
<td></td>
<td>Inspect rear suspension system lateral links/arms (track bars) and control (trailing) arms.</td>
</tr>
<tr>
<td>109</td>
<td></td>
<td>Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.</td>
</tr>
<tr>
<td>110</td>
<td></td>
<td>Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.</td>
</tr>
<tr>
<td>111</td>
<td></td>
<td>Inspect electric power steering assist system.</td>
</tr>
<tr>
<td>112</td>
<td></td>
<td>Identify hybrid vehicle power steering system electrical circuits and safety precautions.</td>
</tr>
<tr>
<td>Task Number</td>
<td>Tasks/Competencies</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------</td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>Describe the function of suspension and steering control systems and components (i.e., active suspension and stability control).</td>
<td></td>
</tr>
<tr>
<td>114</td>
<td>Perform prealignment inspection; measure vehicle ride height.</td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>Describe alignment angles (camber, caster, and toe).</td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>Inspect tire condition; identify tire wear patterns; check for correct tire size, application (load and speed ratings), and air pressure as listed on the tire information placard/label.</td>
<td></td>
</tr>
<tr>
<td>117</td>
<td>Rotate tires according to manufacturer’s recommendations including vehicles equipped with tire pressure monitoring systems (TPMS).</td>
<td></td>
</tr>
<tr>
<td>118</td>
<td>Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.</td>
<td></td>
</tr>
<tr>
<td>119</td>
<td>Dismount, inspect, and remount tire on wheel equipped with TPMS sensor.</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>Inspect tire and wheel assembly for air loss; determine necessary action.</td>
<td></td>
</tr>
<tr>
<td>121</td>
<td>Repair tire following vehicle manufacturer approved procedure.</td>
<td></td>
</tr>
<tr>
<td>122</td>
<td>Identify tire pressure monitoring systems (indirect and direct); calibrate system; verify operation of instrument panel lamps.</td>
<td></td>
</tr>
<tr>
<td>123</td>
<td>Demonstrate knowledge of steps required to remove and replace sensors in a TPMS including relearn procedure.</td>
<td></td>
</tr>
<tr>
<td>124</td>
<td>Research vehicle service information, including fuel type, vehicle service history, service precautions, and technical service bulletins.</td>
<td></td>
</tr>
<tr>
<td>Task Number</td>
<td>Tasks/Competencies</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).</td>
<td></td>
</tr>
</tbody>
</table>

**Hydraulic System**

| 126 | Describe proper brake pedal height, travel, and feel. |
| 127 | Check master cylinder for external leaks and proper operation. |
| 128 | Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports. |
| 129 | Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification. |
| 130 | Identify components of hydraulic brake warning light system. |
| 131 | Bleed and/or flush brake system. |
| 132 | Test brake fluid for contamination. |

**Drum Brakes**

<p>| 133 | Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability. |
| 134 | Refinish brake drum and measure final drum diameter; compare with specification. |
| 135 | Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. |
| 136 | Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. |
| 137 | Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments. |
| 138 | Install wheel and torque lug nuts. |</p>
<table>
<thead>
<tr>
<th>Task Number</th>
<th>8502</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disc Brakes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>139</td>
<td>+</td>
<td>Remove and clean caliper assembly; inspect for leaks and damage/wear; determine necessary action.</td>
</tr>
<tr>
<td>140</td>
<td></td>
<td>Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.</td>
</tr>
<tr>
<td>141</td>
<td></td>
<td>Remove, inspect, and/or replace brake pads and retaining hardware; determine necessary action.</td>
</tr>
<tr>
<td>142</td>
<td></td>
<td>Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads and inspect for leaks.</td>
</tr>
<tr>
<td>143</td>
<td></td>
<td>Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine necessary action.</td>
</tr>
<tr>
<td>144</td>
<td></td>
<td>Remove and reinstall/replace rotor.</td>
</tr>
<tr>
<td>145</td>
<td></td>
<td>Refinish rotor on vehicle; measure final rotor thickness and compare with specification.</td>
</tr>
<tr>
<td>146</td>
<td></td>
<td>Refinish rotor off vehicle; measure final rotor thickness and compare with specification.</td>
</tr>
<tr>
<td>147</td>
<td></td>
<td>Retract and readjust caliper piston on an integrated parking brake system.</td>
</tr>
<tr>
<td>148</td>
<td></td>
<td>Check brake pad wear indicator; determine necessary action.</td>
</tr>
<tr>
<td>149</td>
<td></td>
<td>Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer’s recommendations.</td>
</tr>
<tr>
<td><strong>Power-Assist Units</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>+</td>
<td>Check brake pedal travel with and without engine running to verify proper power booster operation.</td>
</tr>
<tr>
<td>151</td>
<td></td>
<td>Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.</td>
</tr>
<tr>
<td>Task Number</td>
<td>8502</td>
<td>Tasks/Competencies</td>
</tr>
<tr>
<td>-------------</td>
<td>------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>152</td>
<td>Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.</td>
<td></td>
</tr>
<tr>
<td>153</td>
<td>Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.</td>
<td></td>
</tr>
<tr>
<td>154</td>
<td>Check parking brake operation and parking brake indicator light system operation; determine necessary action.</td>
<td></td>
</tr>
<tr>
<td>155</td>
<td>Check operation of brake stop light system.</td>
<td></td>
</tr>
<tr>
<td>156</td>
<td>Replace wheel bearing and race.</td>
<td></td>
</tr>
</tbody>
</table>

Legend: ❌Essential ◯Non-essential ❍Omitted

Curriculum Framework

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 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?

Tools and Equipment

Task Number 54

Identify tools and their usage in automotive applications.

Definition

Identification should include

• all tools to be used at Automotive Service Excellence (ASE) Education Foundation’s Maintenance and Light Repair (MLR) level
• end wrenches
• socket set components
• wrenches
• screwdrivers
• pliers
• hammers
• punches and chisels
• specialty cutting tools (e.g., hacksaw, tubing cutter, hand reamer, and file)
• specialty electrical system tools (e.g., volt/ohmmeter, dwell/tachometer, continuity light, timing light, and remote starter switch)
• battery specialty tools (e.g., cable puller, terminal and post cleaner, and battery lifting or carrying strap)
• lubrication specialty tools (e.g., transmission funnel, oil filter-removing tool, and grease gun)
• other specialty tools (e.g., air nozzles, C-clamp, puller set, pressure gauge, and screw extractor)
• automotive fasteners (e.g., tapes, dies, nuts, bolts, and studs).

Process/Skill Questions

• What is the difference between an impact socket and a regular socket?
• Why is using a quality tool important?
• Where can one buy quality tools?
• What does a damaged/mushroomed tool (e.g., chisel, punch) look like?
• Why is it important to inspect tools for damage?

Task Number 55

Identify standard and metric measurement designations.

Definition

Identification should include

• the function and application of each system
• the relationship among measurements, tools, and systems used.

Process/Skill Questions

• Why is it important not to mix the systems?
• What determines the measurement system used?
• How are fractions converted to decimals? Why is such a conversion necessary?

Task Number 56

Demonstrate safe handling and use of appropriate tools.

Definition

Demonstration should include

• wearing associated protective gear and adhering to clothing guidelines and lab/shop policies
• identifying the associated government policies
• describing manufacturer, shop, and government guidelines and policies
• selecting the right tool for the job
• describing each tool’s intended application.

Process/Skill Questions

• Why is maintenance of tools important?
• Why is it important to use the right tool for the job?
• What are some habits of good tool use?

Task Number 57

Demonstrate cleaning, storage, and maintenance of tools and equipment.

Definition

Demonstration should include safety and maintenance procedures for pneumatic, electric, and hydraulic tools and equipment.

Process/Skill Questions

• Why is it important to lubricate air tools?
• How is a drop light used?
• How do impact sockets differ from conventional sockets?

Task Number 58

Demonstrate use of precision measuring tools (i.e., micrometer, dial-indicator, dial-caliper).

Definition

Demonstration should include using and reading

• outside and inside micrometers
• plastigage
• dial-indicator tool
• feeler gauge
• vernier caliper
• depth micrometer.

Process/Skill Questions

• When are precision measuring tools required?
• What factors can influence precision measurement devices? In what ways?
• How does one know if the measuring equipment is functioning properly?

Preparing Vehicle for Service

Task Number 59

Identify information needed and the service requested on a repair order.

Definition

Identification should include

• owner and vehicle information
• description of concern, cause, and correction based on the technician's diagnosis
• name/description/price of needed parts
• hourly/total charges for labor and outside work, sales tax, and total cost.

Process/Skill Questions

• What information should be included in the electronic work order?
• Why is a work order important?
• Why should the customer sign the work order?

Task Number 60

Identify purpose and demonstrate proper use of fender covers and mats.
Definition

Identification should include

- keeping the customer’s property clean (or as it was brought in)
- using a fender cover whenever the hood is opened
- using mats whenever the car door is opened (interior work) and covering everything
- using latex gloves for interior work.

Process/Skill Questions

- Why is customer satisfaction so important?
- How does one avoid soiling the customer’s property?
- Why are protective supplies (e.g., covers, mats, gloves) intended for single use?

Task Number 61

Demonstrate use of the three Cs (i.e., concern, cause, and correction).

Definition

Demonstration should include

- concern—paying attention and following the work order
- cause—listening to the customer complaint
- correction—troubleshooting and repairing.

Process/Skill Questions

- What is the purpose of knowing and following the three Cs?
- Why is it important to listen to the customer?
- What is the problem-solving process?

Task Number 62

Review vehicle service history.

Definition
Review should include

- accessing and interpreting information for repairs and modifications made to the vehicle, based on the Vehicle Identification Number (VIN)
- sharing data with the customer.

**Process/Skill Questions**

- Why is service history important?
- Where is the VIN located on vehicles?
- What tools allow the technician to access the service history?
- What are the benefits of access to a dealer management system (DMS)?

---

**Task Number 63**

**Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.**

**Definition**

Completion should include

- task, based on employer requirements
- appropriate customer-service etiquette.

**Process/Skill Questions**

- Why is it crucial to be polite when interacting with the customer?
- Why is a vehicle pre-inspection (walk-around) necessary when completing or agreeing to a new work order?
- What are the most important elements of the customer’s contact information?

---

**Preparing Vehicle for Customer**

**Task Number 64**
Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).

Definition

Preparation of vehicle should include

- ensuring gloves are worn and that floor mats, steering wheel cover, fender covers, and other protective materials are in place
- adjusting the seat position for the customer
- ensuring audio/electronics are off or have not been changed.

Process/Skill Questions

- Why is self-representation and professional dress important when dealing with customers?
- How should a technician properly address the customer?
- How should a technician deal with customer complaints?

ENGINE REPAIR

General

Task Number 65

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

Definition

Research should include

- filtering/sorting by engine type or concern
- checking related technical service bulletins and manufacturer recalls
- obtaining procedures from service manuals
- using strategy-based diagnostic procedures to collect information, progressing from a general to a more specific focus.
Task Number 66

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.

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.
• What is the purpose of the instrument voltage regulator (IVR)?
• What is a driver information center?
• What is a common problem with connectors?
• What is the difference between a weather-pack connector and a standard connector?

Task Number 67

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.

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

Process/Skill Questions

• 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 68

Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.

Definition
Identification should be based on service materials and manufacturer guidelines. (Note: Engine may start at any time.)

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

Process/Skill Questions

- Why is it important to place the key fob at least 20 feet away from the vehicle when servicing?  
- How should the high voltage system be disabled in a hybrid?

# Lubrication and Cooling Systems

**Task Number 69**

**Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs; determine needed action.**

**Definition**

Procedures should include

- using a pressure tester  
- using a refractometer or test strips  
- conducting a visual inspection.

ASE Education Foundation  
2017 Maintenance and Light Repair (MLR) Level  
I. Engine Repair  
C. Lubrication and Cooling Systems  
Task 1

Process/Skill Questions

- What are the procedures for conducting a cooling system pressure test?  
- What tools are needed to perform a cooling system pressure test?
• What is the function of a coolant recovery tank?

Task Number 70

Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.

Definition

Procedures should include

- using tensioner tools
- using a belt tension gauge
- conducting a visual inspection.

ASE Education Foundation

Process/Skill Questions

- When should a drive belt be replaced?
- How is belt alignment checked?
- How should a drive belt be replaced?

Task Number 71

Remove, inspect, and replace thermostat and gasket/seal.

Definition

Procedures should include using

- infrared thermometer
- pressure tester.
Task Number 72

Inspect and test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.

Definition

Procedures should include

- using refractometer or test strips to test coolant
- recovering coolant for recycling
- flushing and refilling cooling system
- bleeding air
- following manufacturer guidelines.

Process/Skill Questions

- What are the different types of coolants?
- How should a technician drain, recover, flush, and refill a cooling system?
- How should a technician bleed air from a cooling system? Why should this be done?
Task Number 73

Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required.

Definition

Performance should include following manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
I. Engine Repair
C. Lubrication and Cooling Systems
Task 5

Process/Skill Questions

- How should the proper oil and correct amount be determined when adding oil to a particular vehicle?
- What are the steps for changing the oil and filter?
- What safety steps should be followed when changing oil?
- What are the different fluid types/weights and ratings of oil?

AUTOMATIC TRANSMISSION AND TRANSAXLE

General

Task Number 74

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

Definition

Research should include
• checking related technical service bulletins 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
II. Automatic Transmission and Transaxle
A. General
Task 1

Process/Skill Questions

• What are technical service bulletins?
• Why is it preferable to have a complete history of vehicle service?
• What vehicle information is needed prior to conducting research?

Task Number 75

Check fluid level in a transmission or a transaxle equipped with a dipstick.

Definition

Procedures should include

• conducting a visual inspection for leaks
• checking fluid loss, fluid level, and condition of fluid
• performing proper adjustments and necessary repairs.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
II. Automatic Transmission and Transaxle
A. General
Task 2

Process/Skill Questions

• What are the procedures for checking fluid levels in various transmissions/transaxles?
• How should fluid condition be checked?
Task Number 76

Check fluid level in a transmission or a transaxle not equipped with a dipstick.

Definition

Procedures should include

- conducting a visual inspection for leaks
- determining whether vehicle has a sealed system
- checking condition of fluid
- performing proper adjustments and necessary repairs.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
II. Automatic Transmission and Transaxle
A. General
Task 3

Process/Skill Questions

- What are the procedures for checking fluid levels in various transmissions/transaxles?
- How should fluid condition be checked?

Task Number 77

Check transmission fluid condition; check for leaks.

Definition

Procedures should include

- conducting a visual inspection for leaks
- checking fluid loss, fluid level, and condition of fluid
- performing proper adjustments and necessary repairs, according to manufacturer specifications.
Task Number 78

Identify drive-train components and configuration.

Definition

Identification should include type of drive-train system (e.g., front wheel, rear wheel, all-wheel drive, four-wheel drive).

Task Number 79

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

Definition

Inspection should include visually examining bushings and seals and replacing as needed.
ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
II. Automatic Transmission and Transaxle
B. In-Vehicle Transmission/Transaxle
Task 2

Process/Skill Questions

- What tools are used to replace seals, gaskets, and bushings?
- What are some indicators that seals and gaskets need replacing?
- What are some causes of seal and gasket failure?

Task Number 80

Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.

Definition

Procedures should include

- draining transmission
- replacing filters
- refilling fluid to proper specifications.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
II. Automatic Transmission and Transaxle
B. In-Vehicle Transmission/Transaxle
Task 4

Process/Skill Questions

- What tools are used to service transmissions?
- What service precautions should be used?
- Why does a transmission need to be serviced?

MANUAL DRIVE TRAIN AND AXLES

General
Task Number 81

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

Definition

Research should include

- checking related technical service bulletins 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 III. Manual Drive Train and Axles
A. General
Task 1

Process/Skill Questions

- What information should one look for in the technical service bulletins?
- How can vehicle service history benefit automotive maintenance?
- What vehicle information is needed to begin research?
- Why would it be an advantage to be able to drive a manual transmission vehicle?

Task Number 82

Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification.

Definition

Drain and refill should include using service information to perform transmission/transaxle fluid service.
ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
III. Manual Drive Train and Axles
A. General
Task 2

Process/Skill Questions

- How is a manual transmission/transaxle drained and refilled?
- What service precautions should be followed when draining and refilling a manual transmission/transaxle?
- What tools and equipment are used when draining and refilling a manual transmission/transaxle?

Task Number 83

Check fluid condition; check for leaks.

Definition

Procedures should include visually inspecting for fluid leaks, color, and level to determine necessary action.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
III. Manual Drive Train and Axles
A. General
Task 3

Process/Skill Questions

- What are the procedures for checking fluid levels in various transmissions/transaxles?
- How is fluid condition checked?
- What type of lubricant is used in a manual transmission/transaxle?

Clutch

Task Number 84
Check and adjust clutch master cylinder fluid level; use proper fluid type per manufacturer specifications.

Definition

Procedures should include checking for leaks and repairing or replacing as necessary.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
III. Manual Drive Train and Axles
B. Clutch
Task 1

Process/Skill Questions

- What type of fluid goes into a hydraulic clutch system?
- What are some failures of a hydraulic clutch system?
- How are internal and external fluid leaks checked?

---

Task Number 85

Check for hydraulic system leaks.

Definition

Checking for system leaks should include conducting a visual inspection of the clutch hydraulic system and describing common problems and failures that cause leaks.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
III. Manual Drive Train and Axles
B. Clutch
Task 2

Process/Skill Questions

- What are the components of a hydraulic clutch system?
- What are some possible failures of a hydraulic clutch system?
- What problems can be caused by leaks in the hydraulic clutch system?
Drive Shaft, Half Shafts, Universal Joints and Constant-Velocity (CV) Joints (Front, Rear, All, and Four-wheel Drive)

Task Number 86

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 1

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 87
Check and adjust differential case fluid level; use proper fluid type per manufacturer specification.

Definition

Checking and adjusting should include removing the fill plug, checking the fluid, and filling it with lubricant to the proper level.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
III. Manual Drive Train and Axles
E. Differential Case Assembly
Task 2

Process/Skill Questions

- What types of lubricants are used in a limited-slip differential?
- What are the procedures for checking differential fluid levels?
- What type of sealant or gasket is used on the differential cover?

Task Number 88

Drain and refill differential housing.

Definition

Procedure should include

- removing the inspection cover
- draining the fluid
- cleaning and inspecting the internal components
- reinstalling the cover, using a new gasket
- refilling with the specified fluid to the correct level.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
III. Manual Drive Train and Axles
E. Differential Case Assembly
Task 3

Process/Skill Questions
• What are possible causes for worn parts in a differential assembly?
• What should be inspected during fluid replacement?
• Why/when should the fluid be changed?

Task Number 89
Inspect and replace drive axle wheel studs.

Definition

Inspection should include

• removing wheel
• checking studs for damage
• replacing as needed.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
III. Manual Drive Train and Axles
E. Differential Case Assembly
Task 4

Process/Skill Questions

• What tools are needed to replace drive axle shaft wheel studs?
• What are causes of wheel stud failure?
• How is stud runout checked?
• How should studs be inspected for damage (e.g., cross-threading, cracking, etc.)?

SUSPENSION AND STEERING SYSTEMS

General

Task Number 90

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

Research should include

- checking related technical service bulletins 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
IV. Suspension and Steering Systems
A. General
Task 1

Process/Skill Questions

- Where are technical-service materials found?
- What is a technical service bulletin (TSB)? Where is it located? How is it accessed?
- Why is vehicle service history important?

Related Suspension and Steering Service

Task Number 91

Inspect rack-and-pinion steering gear inner tie-rod ends (sockets) and bellows boots.

Definition

Inspection should include

- conducting a visual inspection, according to state inspection standards
- following manufacturer guidelines and specifications
- using specialized tools.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service

Task 1

Process/Skill Questions

- What causes "morning sickness" in steering (i.e., hard steering when cold)?
- What should a technician look for during a visual inspection?
- How does power steering fluid color and condition affect performance?
- Why is it important to support the rack tube when removing the inner tie rod?
- What are the different inspection techniques for rubber/flexible vs. more rigid bellows boots?

Task Number 92

Inspect power steering fluid level and condition.

Definition

Inspection should be conducted visually, according to state inspection standards and following manufacturer guidelines and specifications.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 2

Process/Skill Questions

- What are the consequences of using the wrong type of fluid or too much fluid?
- How is fluid condition assessed?
- What are the characteristics of power steering fluid?

Task Number 93

Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.

Definition
Procedure should include conducting a visual inspection according to state inspection standards and following manufacturer guidelines and specifications. Procedure may require the use of an infrared thermometer.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 3

Process/Skill Questions

- What would happen if flushing the system ran the system dry (i.e., run out of fluid)?
- What are the consequences of not bleeding the power steering system?
- Why is it important to flush the system after installing a new power steering pump?
- Would it ever be appropriate to add a steering fluid filter? Why or why not?

Task Number 94

Inspect for power steering fluid leakage.

Definition

Procedure should include conducting a visual inspection according to state inspection standards to determine location and necessary action.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 4

Process/Skill Questions

- Where do you look for power steering fluid leakage?
- What are the consequences of a long-term power steering fluid leak?
- What causes power steering fluid leaks?

Task Number 95
Remove, inspect, replace, and/or adjust power steering pump drive belt.

Definition

Procedure should include

- using hand tools
- using belt-tensioning tools
- using belt-tensioning gauge
- following state inspection standards.

Task Number 96

Inspect and replace power steering hoses and fittings.

Definition

Procedure should include conducting a visual inspection and using hand tools.

Process/Skill Questions

- When should a hose be replaced?
- What is the best wrench to use on hydraulic fittings?
Why is it important to use swage fittings on power steering lines?

Task Number 97

Inspect pitman arm, relay (center link/intermediate) rod, idler arm, mountings, and steering linkage damper.

Definition

Inspection should include using front-end puller set impact wrench with impact socket set.

Process/Skill Questions

- Why should a front-end puller set be used?
- What is the disadvantage of using a pickle fork?
- What is the proper way to install a cotter pin?

Task Number 98

Inspect tie rod ends (sockets), tie rod sleeves, and clamps.

Definition

Inspection should include using hand tools and an alignment machine to align all four wheels to manufacturer specifications.

Process/Skill Questions
• How is the clamp properly aligned to the adjuster sleeve?
• Why is anti-seize important to use?
• What might be the consequences of using heat for straightening steering components?

Task Number 99

Inspect upper and lower control arms, bushings, and shafts.

Definition

Inspection should be conducted visually, according to state inspection procedures. Inspection requires the use of specialized tools, according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 9

Process/Skill Questions

• What safety precautions should be taken when servicing the spring/torsion bar?
• When is it acceptable to torque the control arm bushings?
• Why is it necessary to preserve alignment angles when removing components?

Task Number 100

Inspect and replace rebound and/or jounce bumpers.

Definition

Inspection should be conducted visually, according to state inspection procedures, using specialized tools; replacement should follow manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 10
Process/Skill Questions

- What safety precautions should be taken when servicing the spring/torsion bar?
- When is it acceptable to torque the control arm bushings?
- Why is it necessary to preserve alignment angles when removing components?

---

Task Number 101

Inspect track bar, strut rods/radius arms, and related mounts and bushings.

Definition

Inspection should be conducted visually, according to state inspection procedures, using specialized tools according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 11

Process/Skill Questions

- What are some methods of preserving alignment when servicing strut rods and bushings?
- Why is inspection important?
- How do strut rods and bushings affect caster and braking?
- Will a bent strut rod cause a vehicle to pull? Explain.

---

Task Number 102

Inspect upper and lower ball joints (with or without wear indicators).

Definition

Inspection should be conducted visually, according to state inspection procedures, using specialized tools according to manufacturer guidelines.
Process/Skill Questions

- What are the various types of ball joints?
- How is a spring-loaded ball joint checked?
- What is a wear indicator for a ball joint?

Task Number 103
Inspect suspension system coil springs and spring insulators (silencers).

Definition

Inspection should be conducted visually, according to state inspection procedures, using specialized tools according to manufacturer guidelines.

Process/Skill Questions

- What precautions should be taken when working with coil springs?
- What can happen if the spring is not removed according to established safety procedures?
- Is it recommended to perform an alignment after replacing springs? Explain.

Task Number 104
Inspect suspension system torsion bars and mounts.

Definition
Inspection should be conducted visually, according to state inspection procedures, using specialized tools according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 14

Process/Skill Questions

- Are torsion bars interchangeable from one side to the other? Explain.
- What are the effects of compromising the integrity of a torsion bar through application of a stress raiser?
- What safety precautions should be taken when servicing torsion bars?

Task Number 105

Inspect and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.

Definition

Inspection should be conducted visually, 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
B. Related Suspension and Steering Service
Task 15

Process/Skill Questions

- What is the purpose of the stabilizer bar and how does it work?
- What effect would changing the diameter of the stabilizer bar have on the vehicle handling?
- How does the condition of sway bar bushings affect vehicle handling?

Task Number 106
Inspect, remove, and/or replace strut cartridge or assembly; inspect mounts and bushings.

Definition

Inspection should be conducted visually, according to state inspection procedures, using specialized tools according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 16

Process/Skill Questions

- What is a strut compressor?
- What safety precautions should be taken to protect the technicians and the spring when compressing the spring?
- When should the upper strut bearing mount be checked? Explain.

Task Number 107

Inspect front strut bearing and mount.

Definition

Inspection should include

- removing the strut bearing from the strut assembly
- conducting a visual inspection of bearing plates and seals.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 17

Process/Skill Questions

- What is the purpose of the strut bearing plate?
- Does the strut bearing plate need to be replaced each time the strut is replaced?
Task Number 108

Inspect rear suspension system lateral links/arms (track bars) and control (trailing) arms.

Definition

Inspection of all bushings, brackets, and links should be conducted visually, according to state inspection procedures, using specialized tools according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 18

Process/Skill Questions

- What is the purpose of rear lateral links?
- How does a vehicle with rear lateral links affect the need for a four-wheel alignment?

Task Number 109

Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.

Definition

Inspection should be conducted visually, according to state inspection procedures, using specialized tools according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 19
Process/Skill Questions

- What safety precautions should be taken when handling leaf springs?
- What is the purpose of the center bolt? How can it affect alignment?
- What is the purpose of the spring shackle?

Task Number 110

Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.

Definition

Inspection should be conducted visually, according to state inspection criteria. Procedure should include removing and replacing as necessary, using specialized tools according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 20

Process/Skill Questions

- What does oil leaking from the shock absorber indicate?
- What is the difference between a low-pressure and a high-pressure shock absorber?

Task Number 111

Inspect electric power steering assist system.

Definition

Inspection should include using a scan tool to establish center.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 21

Process/Skill Questions

- What happens if the technician does not center the steering?
- How does electric power assist steering compare with hydraulic assist steering?
- How does losing engine power affect the ability to use steering assist? How does this apply to hybrid vehicles? Explain.

Task Number 112

Identify hybrid vehicle power steering system electrical circuits and safety precautions.

Definition

Identification should include following manufacturer guidelines.

Note: Working with the electrical system of hybrid vehicles requires factory training and strict attention to safety procedures.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 22

Process/Skill Questions

- Does the power steering work off of a 12V battery or a high-voltage battery?
- What safety concerns are related to hybrid vehicles?
- What safety equipment should be used when servicing steering systems on hybrid vehicles?

Task Number 113
Describe the function of suspension and steering control systems and components (i.e., active suspension and stability control).

**Definition**

Description should include testing the power steering pressure switch by turning the steering wheel from lock to lock while watching sensor data with a scan tool.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
B. Related Suspension and Steering Service
Task 23

**Process/Skill Questions**

- How can the power steering pressure switch affect idle speed?
- How does the power steering switch affect air-conditioning operation?
- How does the Power Control Module (PCM) monitor power steering switch operations?

**Wheel Alignment**

**Task Number 114**

**Perform prealignment inspection; measure vehicle ride height.**

**Definition**

Performance 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 installed be aligned? Explain.

Task Number 115

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?

Wheels and Tires

Task Number 116

Inspect tire condition; identify tire wear patterns; check for correct tire size, application (load and speed ratings), and air pressure as listed on the tire information placard/label.

Definition

Inspection should be conducted visually, according to state inspection procedures, and using specialized tools according to manufacturer guidelines.
Task 1

Process/Skill Questions

- How can tire wear patterns indicate under-inflation, over-inflation, camber problems, or toe problems?
- How can tire wear patterns indicate loose suspension parts, faulty shocks/struts, or out-of-balance tires?
- Where are tire-pressure specifications found?
- How does a technician determine the age of a tire?

Task Number 117

Rotate tires according to manufacturer’s recommendations including vehicles equipped with tire pressure monitoring systems (TPMS).

Definition

Rotation should include conducting a visual inspection, according to state inspection procedures, using specialized tools according to manufacturer guidelines, and resetting the TPMS.

Task 2

Process/Skill Questions

- What might happen if the tires are not rotated at manufacturer-recommended intervals?
- What is a directional tire? How does it affect tire rotation?
- What is the difference between hub-piloted and stud-piloted wheel centers?
Task Number 118

Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.

Definition

Procedure should include conducting a visual inspection, according to state inspection procedures, and using specialized tools (e.g., tire machine) according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
D. Wheels and Tires
Task 3

Process/Skill Questions

- What is the difference between static and dynamic balance?
- What is the purpose of the drop-center rim?
- How are tires removed from AH2 rims?
- What is the maximum bead seating pressure of typical automobile radial tires or run-flat tires?

Task Number 119

Dismount, inspect, and remount tire on wheel equipped with TPMS sensor.

Definition

Procedure should include

- conducting a visual inspection
- using specialized tools (e.g., tire machine)
- following manufacturer guidelines
- applying torque to the valve core and TPMS nut.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
D. Wheels and Tires
Task 4

Process/Skill Questions

- What happens if the TPMS sensor is damaged?
- What precautions should be taken when dismounting TPMS tires?
- Is the valve core interchangeable with non-TPMS tires? Explain.

Task Number 120

Inspect tire and wheel assembly for air loss; determine necessary action.

Definition

Inspection should be conducted visually and should include applying a soap-and-water solution to test for air loss.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
D. Wheels and Tires
Task 5

Process/Skill Questions

- What is the difference between air loss from the tire and air loss from the wheel?
- Why is air pressure on a cold tire lower than that on a warm tire?
- How does a technician test a valve stem for air loss?

Task Number 121

Repair tire following vehicle manufacturer approved procedure.

Definition

Repair should include
• removing tire from wheel
• reaming injury hole
• cleaning area
• applying glue
• installing patch
• applying liner sealer
• reinstalling tire
• verifying integrity of patch.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
D. Wheels and Tires
Task 6

Process/Skill Questions

• Why should a technician use an internal patch as opposed to a rope plug?
• What is the repairable area of the tire? Explain.
• What is the largest hole that can be successfully repaired?

Task Number 122

Identify tire pressure monitoring systems (indirect and direct); calibrate system; verify operation of instrument panel lamps.

Definition

Procedure should include

• observing the tire pressure monitoring lamp
• checking each tire for proper inflation
• adjusting to manufacturer specifications.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
D. Wheels and Tires
Task 7

Process/Skill Questions
• Where is the manufacturer-recommended tire inflation pressure level for most vehicles located?
• What tools are required to reset the tire pressure monitoring system?

Task Number 123

Demonstrate knowledge of steps required to remove and replace sensors in a TPMS including relearn procedure.

Definition

Demonstration should include

• conducting a visual inspection
• using the tire pressure monitoring reset tool
• following manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
IV. Suspension and Steering Systems
D. Wheels and Tires
Task 8

Process/Skill Questions

• Why is it necessary to reset the monitoring system after rotating tires?
• What year did TPMS systems become mandatory? Why did they become mandatory?
• What are the two types of TPMS systems? Which type uses wheel-speed sensors?

BRAKES

General

Task Number 124

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

Research should include manufacturer recalls and use of electronic service information and time-labor guides pertaining to the condition.

**ASE Education Foundation**
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
A. General
Task 1

**Process/Skill Questions**

- Why are time-labor guides important?
- Why does a technician need vehicle service history?
- What vehicle information is the most crucial? Why?

---

**Task Number 125**

**Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).**

**Definition**

Description should include

- confirming that the vehicle performs the ABS self-test before beginning the test drive
- confirming that the brake pedal has the proper amount of resistance when pressed
- putting the vehicle through a variety of braking scenarios during the test drive to check for even and smooth braking
- confirming that there is no engagement of the ABS system under normal braking conditions.

**ASE Education Foundation**
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
A. General
Task 2

**Process/Skill Questions**
• What would cause a spongy, weak, or no-brake pedal?
• What might cause a very hard brake pedal with very little effort applied to the brakes?
• What do brakes feel like when the ABS system engages?

Hydraulic System

Task Number 126

Describe proper brake pedal height, travel, and feel.

Definition

Procedures should include using proper tools to measure and indicate free travel and play.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
B. Hydraulic System
Task 1

Process/Skill Questions

• What are brake pedal height, travel, and free play?
• How are brake pedal height, travel, and free play measured?
• How are brake pedal height, travel, and free play adjusted?

Task Number 127

Check master cylinder for external leaks and proper operation.

Definition

Procedures should include visually inspecting master cylinder for external leaks and testing pedal for internal leaks.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
B. Hydraulic System
Task 2

Process/Skill Questions

• How does one check a master cylinder for internal and external leaks?
• What is pedal fade?
• What are causes of pedal fade?

Task Number 128

Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports.

Definition

Procedures should include visually inspecting the components for damage or wear.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
B. Hydraulic System
Task 3

Process/Skill Questions

• Where are the flexible hoses on a vehicle?
• What are the typical failures of brake hoses?
• Why is it important to route brake lines properly?

Task Number 129

Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.

Definition
Procedures should include demonstrating proper methods of storing and handling brake fluid.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
B. Hydraulic System
Task 4

Process/Skill Questions

- What is hygroscopic fluid?
- Why is it important to put the lid on the brake fluid after use?
- What agency establishes the standards/laws for the handling and storage of brake fluid?

---

Task Number 130

Identify components of hydraulic brake warning light system.

Definition

Identification should include using digital multimeter (DMM) or a test light to indicate relevant components that may fail.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
B. Hydraulic System
Task 5

Process/Skill Questions

- What is the purpose of the brake warning light?
- How is a brake warning light tested?
- What will activate the brake warning light?

---

Task Number 131

Bleed and/or flush brake system.
Definition

Procedures should include bleeding brakes and adding fluid as necessary.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
B. Hydraulic System
Task 6

Process/Skill Questions

• Why should the brake system be flushed?
• When does the technician need to bleed the brake system?
• What is the procedure for bleeding the brake system?

Task Number 132

Test brake fluid for contamination.

Definition

Test should include removing a sample amount of brake fluid and inspecting it for degradation.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
B. Hydraulic System
Task 7

Process/Skill Questions

• What kind of contamination could be in brake fluid?
• What should be done if the brake fluid is contaminated with a petroleum product?
• What is the acceptable acidity level in brake fluid?

Drum Brakes

Task Number 133
Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.

Definition

Procedures should include using proper tools to remove brake drums and diagnose repair procedures.

Task Number 134

Refinish brake drum and measure final drum diameter; compare with specification.

Definition

Procedures should include renewing the brake drum, according to manufacturer guidelines.

Process/Skill Questions

• What are refinishing procedures?
• Why might the drum need to be refinished?
• When should the drum be discarded?
Task Number 135

Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.

Definition

Procedures should include

- removing drum
- inspecting all brake hardware
- adjusting per manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
C. Drum Brakes
Task 3

Process/Skill Questions

- What are the procedures to remove brake shoes?
- What are two types of brake drum systems?
- What are some possible problems concerning brake hardware?

Task Number 136

Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.

Definition

Inspection and installation should include

- checking wheel cylinder for leaking, binding, and freezing
- replacing as needed.
ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
C. Drum Brakes
Task 4

Process/Skill Questions

- How should a wheel cylinder be checked for leaks?
- What are some possible failures of the wheel cylinder?
- What are the consequences of wheel cylinder problems or failures?

Task Number 137

Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments.

Definition

Procedures should include using brake adjusting tool and installing brake drums or drum/hub assemblies and wheel bearings to proper clearance.

Task Number 138

Install wheel and torque lug nuts.
Definition

Installation should include using torque sticks or torque wrench to tighten lugs to proper specifications.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
A. General
Task 3

Process/Skill Questions

• Where are wheel torque specifications found?
• What is the function of a torque stick?
• What is a tightening sequence?

Disc Brakes

Task Number 139

Remove and clean caliper assembly; inspect for leaks and damage/wear; determine necessary action.

Definition

Procedures should include

• removing caliper assembly
• inspecting caliper housing
• repairing or replacing as necessary, according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
D. Disc Brakes
Task 1

Process/Skill Questions

• What are the procedures to remove a caliper assembly?
• What would constitute a replacement of a caliper?
• What is the proper way to remove a piston from a caliper?
Task Number 140

Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.

Definition

Procedures should include

- visually inspecting for binding components
- identifying the problem(s) in caliper operation.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
D. Disc Brakes
Task 2

Process/Skill Questions

- What lubricant is used for floating calipers?
- What indicates abnormal wear of brake pads?
- How is caliper clearance checked?

Task Number 141

Remove, inspect, and/or replace brake pads and retaining hardware; determine necessary action.

Definition

Procedures should include

- removing caliper assembly
- replacing pads if necessary, according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
D. Disc Brakes

Task 3

Process/Skill Questions

- What are the procedures to remove pads?
- How often should the pads be checked and replaced?
- How is pad composition determined? Why is this information important?

Task Number 142

Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads and inspect for leaks.

Definition

Procedures should include reinstalling caliper and pads, according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
D. Disc Brakes
Task 4

Process/Skill Questions

- What lubricant is used to assemble the caliper?
- In what order should the brake hose be installed?
- What is the purpose of the anti-rattle clips?

Task Number 143

Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine necessary action.

Definition
Procedures include using proper measuring tools to determine the condition of the rotor.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
D. Disc Brakes
Task 5

Process/Skill Questions

- What tool is used to check lateral runout and thickness variation?
- What evidence should require a technician to discard rather than try to repair the rotor?
- At how many points does a technician measure rotor for thickness variation?

Task Number 144

Remove and reinstall/replace rotor.

Definition

Procedure should include using proper methods to remove, to clean, and to reinstall the rotor, according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
D. Disc Brakes
Task 6

Process/Skill Questions

- What are the proper methods to remove a rotor?
- How would a technician remove a rotor that is seized to the hub?
- What is the definition of stacking?

Task Number 145

Refinish rotor on vehicle; measure final rotor thickness and compare with specification.
Definition

Procedure should include using on-car brake lathe machine rotor, according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
D. Disc Brakes
Task 7

Process/Skill Questions

- What are the procedures for on-the-car rotor machining?
- How should the rotor be cleaned after machining?
- What tool is used to measure final rotor thickness?

Task Number 146

Refinish rotor off vehicle; measure final rotor thickness and compare with specification.

Definition

Procedure should include using off-car brake lathe machine rotor, according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
D. Disc Brakes
Task 8

Process/Skill Questions

- What are the procedures for off-the-car rotor machining?
- How should the rotor be cleaned after machining?
- What tool is used to measure final rotor thickness?

Task Number 147
Retract and readjust caliper piston on an integrated parking brake system.

Definition

Retraction and readjustment should include using proper tools to retract caliper piston.

Task Number 148

Check brake pad wear indicator; determine necessary action.

Definition

Procedure should include using manufacturer guidelines to determine necessary action.

Process/Skill Questions

• What is a pad wear indicator system?
• At what thickness does the indicator alert the driver of low brake lining?
• What is the procedure to reset the brake warning indicator light?
Task Number 149

Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer’s recommendations.

Definition

Description should include that burnishing the brake pads and rotors

- seats the pads and shoes into the rotor and drums
- deposits the necessary friction transfer to the rotors and drums for optimum brake performance.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
D. Disc Brakes
Task 11

Process/Skill Questions

- What are the effects if the pads are not burnished correctly?
- How does burnishing affect brake pad life?
- Why should the technician not rely on the customer to burnish his/her own brake pads and rotors?

Power-Assist Units

Task Number 150

Check brake pedal travel with and without engine running to verify proper power booster operation.

Definition

Check should include testing all brake applications and assisting components, according to manufacturer guidelines.
Task Number 151

Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.

Definition

Procedure should include

- removing the vacuum supply hose to booster and checking with a gauge
- testing brake pedal by depleting the reserve
- restarting the engine.

Process/Skill Questions

- How should brake pedal free travel be checked?
- How should power assist operation be checked?
- What are the different power assist components?

Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)
Task Number 152

Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.

Definition

Procedures should include

- removing hub and bearing assembly
- cleaning, inspecting, and repacking wheel bearings
- replacing with new seals
- installing and tightening bearings, according to manufacturer guidelines.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
F. Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)
Task 1

Process/Skill Questions

- What are the procedures to remove a hub and bearing assembly?
- What lubricant is used when replacing hub?
- What are the proper procedures to adjust wheel bearings?

Task Number 153

Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.

Definition

Procedures should include visually inspecting cable operation and replacing or adjusting as needed.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
F. Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)

Task 2

Process/Skill Questions

- What are some possible failures of a parking brake system?
- How should cables be lubricated?
- What lubricant is used on the cables?

Task Number 154

Check parking brake operation and parking brake indicator light system operation; determine necessary action.

Definition

Check should include using digital multimeter (DMM), test light, and proper tools to assess operation and repair procedures.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
F. Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)
Task 3

Process/Skill Questions

- What are some possible causes for brake light failure?
- What diagnostic trouble codes (DTCs) are associated with the electronic parking brake system?
- What module controls the electronic parking brake system?

Task Number 155

Check operation of brake stop light system.

Definition

Procedure should include checking and adjusting related brake stop light components.
ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
F. Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)
Task 4

Process/Skill Questions

- Why is proper adjustment critical to the brake stop light switch?
- What other systems could an improperly adjusted brake stop light switch affect?
- What year was the high mount stop lamp (HMSL) required in Virginia?

Task Number 156

Replace wheel bearing and race.

Definition

Replacement should include

- removing the wheel and hub
- removing the wheel bearing
- inspecting
- replacing as necessary.

ASE Education Foundation
2017 Maintenance and Light Repair (MLR) Level
V. Brakes
F. Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)
Task 5

Process/Skill Questions

- What are the procedures to remove a wheel and hub?
- Why would a technician need to replace a wheel bearing?
- What are the tools needed for replacing wheel bearings?

SOL Correlation by Task
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>Identify general lab/shop safety rules and procedures.</td>
<td>Science: CH.1</td>
</tr>
<tr>
<td>40</td>
<td>Utilize safe procedures for handling tools and equipment.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>41</td>
<td>Identify and use proper placement of floor jacks and jack stands.</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Identify and use proper procedures for safe lift operation.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>43</td>
<td>Use proper ventilation procedures for working in the lab/shop area.</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Identify marked safety areas.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<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>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>46</td>
<td>Identify the location and use of eye wash stations.</td>
<td>Science: CH.1</td>
</tr>
<tr>
<td>47</td>
<td>Identify the location of posted evacuation routes.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>48</td>
<td>Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.</td>
<td>Science: CH.1</td>
</tr>
<tr>
<td>49</td>
<td>Identify and wear appropriate clothing for lab/shop activities.</td>
<td>History and Social Science: VUS.1</td>
</tr>
<tr>
<td>50</td>
<td>Secure hair and jewelry for lab/shop activities.</td>
<td>Science: CH.1</td>
</tr>
<tr>
<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>
<td></td>
</tr>
<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>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>53</td>
<td>Locate and demonstrate knowledge of safety data sheets (SDS).</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>54</td>
<td>Identify tools and their usage in automotive applications.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>55</td>
<td>Identify standard and metric measurement designations.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>Demonstrate safe handling and use of appropriate tools.</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>Demonstrate cleaning, storage, and maintenance of tools and equipment.</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Demonstrate use of precision measuring tools (i.e., micrometer, dial-indicator, dial-caliper).</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Identify information needed and the service requested on a repair order.</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Identify purpose and demonstrate proper use of fender covers and mats.</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>Demonstrate use of the three Cs (i.e., concern, cause, and correction).</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Review vehicle service history.</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Verify operation of the instrument panel engine warning indicators.</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs; determine needed action.</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Remove, inspect, and replace thermostat and gasket/seal.</td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Inspect and test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.</td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required.</td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>75</td>
<td>Check fluid level in a transmission or a transaxle equipped with a dipstick.</td>
<td>History and Social Science: VUS.1</td>
</tr>
<tr>
<td>76</td>
<td>Check fluid level in a transmission or a transaxle not equipped with a dipstick.</td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>Check transmission fluid condition; check for leaks.</td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>Identify drive-train components and configuration.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>79</td>
<td>Inspect for leakage at external seals, gaskets, and bushings.</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.</td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.</td>
<td>English: 10.5, 10.8, 11.5, 11.8 History and Social Science: VUS.1</td>
</tr>
<tr>
<td>82</td>
<td>Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification.</td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>Check fluid condition; check for leaks.</td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>Check and adjust clutch master cylinder fluid level; use proper fluid type per manufacturer specifications.</td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>Check for hydraulic system leaks.</td>
<td></td>
</tr>
<tr>
<td>86</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>
<td></td>
</tr>
<tr>
<td>87</td>
<td>Check and adjust differential case fluid level; use proper fluid type per manufacturer specification.</td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>Drain and refill differential housing.</td>
<td></td>
</tr>
<tr>
<td>89</td>
<td>Inspect and replace drive axle wheel studs.</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.</td>
<td>English: 10.5, 10.8, 11.5, 11.8</td>
</tr>
<tr>
<td>91</td>
<td>Inspect rack-and-pinion steering gear inner tie-rod ends (sockets) and bellows boots.</td>
<td></td>
</tr>
<tr>
<td>92</td>
<td>Inspect power steering fluid level and condition.</td>
<td></td>
</tr>
<tr>
<td>93</td>
<td>Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.</td>
<td></td>
</tr>
<tr>
<td>94</td>
<td>Inspect for power steering fluid leakage.</td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>Remove, inspect, replace, and/or adjust power steering pump drive belt.</td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>Inspect and replace power steering hoses and fittings.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>Inspect pitman arm, relay (center link/intermediate) rod, idler arm,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mountings, and steering linkage damper.</td>
<td></td>
</tr>
<tr>
<td>98</td>
<td>Inspect tie rod ends (sockets), tie rod sleeves, and clamps.</td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>Inspect upper and lower control arms, bushings, and shafts.</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>Inspect and replace rebound and/or jounce bumpers.</td>
<td></td>
</tr>
<tr>
<td>101</td>
<td>Inspect track bar, strut rods/radius arms, and related mounts and bushings.</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>Inspect upper and lower ball joints (with or without wear indicators).</td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>Inspect suspension system coil springs and spring insulators (silencers).</td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>Inspect suspension system torsion bars and mounts.</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>Inspect and/or replace front/rear stabilizer bar (sway bar) bushings,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>brackets, and links.</td>
<td></td>
</tr>
<tr>
<td>106</td>
<td>Inspect, remove, and/or replace strut cartridge or assembly; inspect mounts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and bushings.</td>
<td></td>
</tr>
<tr>
<td>107</td>
<td>Inspect front strut bearing and mount.</td>
<td></td>
</tr>
<tr>
<td>108</td>
<td>Inspect rear suspension system lateral links/arms (track bars) and control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(trailing) arms.</td>
<td></td>
</tr>
<tr>
<td>109</td>
<td>Inspect rear suspension system leaf spring(s), spring insulators (silencers),</td>
<td></td>
</tr>
<tr>
<td></td>
<td>shackles, brackets, bushings, center pins/bolts, and mounts.</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>Inspect, remove, and/or replace shock absorbers; inspect mounts and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bushings.</td>
<td></td>
</tr>
<tr>
<td>111</td>
<td>Inspect electric power steering assist system.</td>
<td></td>
</tr>
<tr>
<td>112</td>
<td>Identify hybrid vehicle power steering system electrical circuits and safety</td>
<td></td>
</tr>
<tr>
<td></td>
<td>precautions.</td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>Describe the function of suspension and steering control systems and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>components (i.e., active suspension and stability control).</td>
<td></td>
</tr>
<tr>
<td>114</td>
<td>Perform prealignment inspection; measure vehicle ride height.</td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>Describe alignment angles (camber, caster, and toe).</td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>Inspect tire condition; identify tire wear patterns; check for correct tire</td>
<td></td>
</tr>
<tr>
<td></td>
<td>size, application (load and speed ratings), and air pressure as listed on the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tire information placard/label.</td>
<td></td>
</tr>
<tr>
<td>117</td>
<td>Rotate tires according to manufacturer’s recommendations including</td>
<td></td>
</tr>
<tr>
<td></td>
<td>vehicles equipped with tire pressure monitoring systems (TPMS).</td>
<td></td>
</tr>
<tr>
<td>118</td>
<td>Dismount, inspect, and remount tire on wheel; balance wheel and tire</td>
<td></td>
</tr>
<tr>
<td></td>
<td>assembly.</td>
<td></td>
</tr>
<tr>
<td>119</td>
<td>Dismount, inspect, and remount tire on wheel equipped with TPMS sensor.</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>Inspect tire and wheel assembly for air loss; determine necessary action.</td>
<td></td>
</tr>
<tr>
<td>121</td>
<td>Repair tire following vehicle manufacturer approved procedure.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Task Description</td>
<td>Language(s)</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>122</td>
<td>Identify tire pressure monitoring systems (indirect and direct); calibrate system; verify operation of instrument panel lamps.</td>
<td></td>
</tr>
<tr>
<td>123</td>
<td>Demonstrate knowledge of steps required to remove and replace sensors in a TPMS including relearn procedure.</td>
<td></td>
</tr>
<tr>
<td>124</td>
<td>Research vehicle service information, including fuel type, vehicle service history, service precautions, and technical service bulletins.</td>
<td>10.5, 10.8, 11.5, 11.8</td>
</tr>
<tr>
<td>125</td>
<td>Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).</td>
<td>10.5, 11.5</td>
</tr>
<tr>
<td>126</td>
<td>Describe proper brake pedal height, travel, and feel.</td>
<td>10.5, 11.5</td>
</tr>
<tr>
<td>127</td>
<td>Check master cylinder for external leaks and proper operation.</td>
<td></td>
</tr>
<tr>
<td>128</td>
<td>Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports.</td>
<td></td>
</tr>
<tr>
<td>129</td>
<td>Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.</td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>Identify components of hydraulic brake warning light system.</td>
<td>10.5, 11.5</td>
</tr>
<tr>
<td>131</td>
<td>Bleed and/or flush brake system.</td>
<td></td>
</tr>
<tr>
<td>132</td>
<td>Test brake fluid for contamination.</td>
<td></td>
</tr>
<tr>
<td>133</td>
<td>Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.</td>
<td></td>
</tr>
<tr>
<td>134</td>
<td>Refinish brake drum and measure final drum diameter; compare with specification.</td>
<td></td>
</tr>
<tr>
<td>135</td>
<td>Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.</td>
<td></td>
</tr>
<tr>
<td>136</td>
<td>Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.</td>
<td></td>
</tr>
<tr>
<td>137</td>
<td>Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments.</td>
<td></td>
</tr>
<tr>
<td>138</td>
<td>Install wheel and torque lug nuts.</td>
<td></td>
</tr>
<tr>
<td>139</td>
<td>Remove and clean caliper assembly; inspect for leaks and damage/wear; determine necessary action.</td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.</td>
<td></td>
</tr>
<tr>
<td>141</td>
<td>Remove, inspect, and/or replace brake pads and retaining hardware; determine necessary action.</td>
<td></td>
</tr>
<tr>
<td>142</td>
<td>Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads and inspect for leaks.</td>
<td></td>
</tr>
<tr>
<td>143</td>
<td>Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine necessary action.</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>144</td>
<td>Remove and reinstall/replace rotor.</td>
<td></td>
</tr>
<tr>
<td>145</td>
<td>Refinish rotor on vehicle; measure final rotor thickness and compare with specification.</td>
<td></td>
</tr>
<tr>
<td>146</td>
<td>Refinish rotor off vehicle; measure final rotor thickness and compare with specification.</td>
<td></td>
</tr>
<tr>
<td>147</td>
<td>Retract and readjust caliper piston on an integrated parking brake system.</td>
<td></td>
</tr>
<tr>
<td>148</td>
<td>Check brake pad wear indicator; determine necessary action.</td>
<td></td>
</tr>
<tr>
<td>149</td>
<td>Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer’s recommendations.</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>Check brake pedal travel with and without engine running to verify proper power booster operation.</td>
<td></td>
</tr>
<tr>
<td>151</td>
<td>Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.</td>
<td></td>
</tr>
<tr>
<td>152</td>
<td>Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.</td>
<td></td>
</tr>
<tr>
<td>153</td>
<td>Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.</td>
<td></td>
</tr>
<tr>
<td>154</td>
<td>Check parking brake operation and parking brake indicator light system operation; determine necessary action.</td>
<td></td>
</tr>
<tr>
<td>155</td>
<td>Check operation of brake stop light system.</td>
<td></td>
</tr>
<tr>
<td>156</td>
<td>Replace wheel bearing and race.</td>
<td></td>
</tr>
</tbody>
</table>

**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 II (8507/36 weeks, 280 hours)

Career Cluster: Transportation, Distribution and Logistics

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
</thead>
<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>
</tr>
<tr>
<td></td>
<td>Automotive Service Technician, Mechanic</td>
</tr>
<tr>
<td></td>
<td>Diesel Service Technician</td>
</tr>
<tr>
<td></td>
<td>Electrical and Electronic Installer</td>
</tr>
<tr>
<td></td>
<td>Electrical and Electronic Repairer</td>
</tr>
<tr>
<td></td>
<td>Marine Watercraft Repair and Maintenance Worker</td>
</tr>
<tr>
<td></td>
<td>Motorboat Mechanic</td>
</tr>
<tr>
<td></td>
<td>Service Technician</td>
</tr>
<tr>
<td></td>
<td>Small Engine Mechanic</td>
</tr>
<tr>
<td>Sales and Service</td>
<td>Parts Salesperson</td>
</tr>
<tr>
<td>Transportation Operations</td>
<td>Aircraft Mechanic and Service Technician</td>
</tr>
</tbody>
</table>