AUTOMOTIVE TECHNOLOGY SKILL STANDARDS

This document was prepared by:

Office of Career, Technical, and Adult Education
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NEVADA STATE BOARD OF EDUCATION/
STATE BOARD FOR CAREER AND TECHNICAL EDUCATION

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Acknowledgements:

The Department of Education must rely on teachers who have the technical expertise and teaching experience to develop standards and performance indicators that truly measure student attainment of technical and employability skills. The development of the revised State Skill Standards for Automotive Technology was a result of a collaborative effort involving the Department and a writing team of teachers with extensive experience in both education and business and industry.

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Introduction

The standards in this document are for Automotive Technology programs and are designed to clearly state what the student should know and be able to do upon completion of an advanced high-school automotive program. Minimally, the student will complete a three-year program to achieve all standards.

The Automotive Technology Standards Writing Team determined that any statewide skill standards for automotive programs must follow, as closely as possible, the nationally-recognized standards established by the National Automotive Technical Education Foundation (NATEF). The writing team reasoned that the NATEF standards, driven by industry and updated on a regular basis, provide the strong foundation by which to improve all automotive programs in the State of Nevada. This revision to the original standards is aligned with the NATEF General Service Technician Standards (GST).

Although these exit-level standards are designed for advanced programs, they are also intended to focus curriculum objectives for entry-level programs. Objectives for first- and second-year programs, for example, may include many of the performance indicators in the "approaches standard" section for each performance standard.

The standards are organized as follows:

Content Standards are general statements that identify major areas of knowledge, understanding and the skills students are expected to learn in key subject and career areas by the end of the program. The content standards for Automotive Technology are organized according to the eight technical areas defined by the NATEF standards.

Following each content standard are a number of **performance standards**. Performance standards identify the more specific components of each content standard and define the expected abilities of students within each content standard.

Each performance standard is supported by **performance indicators**. Performance indicators are very specific criteria statements for determining whether a student exceeds the standard, meets the standard, or whose performance approaches the standard. Performance indicators may also be used as learning outcomes which teachers can identify as they plan their program learning objectives.

All performance indicators are taken directly from the NATEF standards and are organized into three categories according to degree of difficulty: **Exceeds Standard; Meets Standard;** or **Approaches Standard**. Any student considered successful in the completion of a particular performance standard will have successfully demonstrated all performance indicators in the "Meets" and "Approaches" sections for the performance standard. Furthermore, any knowledge and/or performance assessments should be based on the indicators in those sections.

Although the safety competencies are listed under the first content standard, they must be integrated into all performance standards, especially where the student will be working with tools, machinery, and/or hazardous materials.

Content standard 12.0 addresses employability skills, where students must demonstrate proficiency in workplace readiness, career development, and lifelong learning. The competencies in this section are designed to be completed by the student over the course of his/her high school career. The

responsibility for a "delivery system" for the students' employability skill development is broad-based and not merely the responsibility of career and technical education teachers. Integration between the students' occupational coursework and existing programs for career development will be required to ensure the student achieves the standards in this area.

The final section of the document shows where the performance standards and performance indicators support the state academic standards for math, science, and English. Where correlation with an academic standard exists, students in the automotive program perform learning activities that support, either directly or indirectly, achievement of one or more academic standards.

Content and Performance Standards
Safety

Content Standard 1.0: **Students will demonstrate safe work practices while performing operations in the automotive technology lab.**

Performance Standard 1.1	The student will adhere to general lab safety rules including but not limited to those listed in the following performance indicators.
EXCEEDS STANDARD	♦ Design a lab safety-improvement plan.
MEETS STANDARD	1.1.1 Identify general lab safety rules and procedures. 1.1.2 Demonstrate safe procedures for handling of tools and equipment. 1.1.3 Demonstrate the proper placement and use of floor jacks and jack stands. 1.1.4 Demonstrate proper procedures for safe lift operation. 1.1.5 Demonstrate the proper use of ventilation procedures for working within the lab area. 1.1.6 Identify marked safety areas. 1.1.7 Describe the proper use of fire blankets. 1.1.8 Identify the location and the types of fire extinguishers; demonstrate knowledge of the procedures for using fire extinguishers. 1.1.9 Identify the location and use of eyewash stations. 1.1.10 Identify the location of the posted evacuation routes. 1.1.11 Comply with the required use of safety apparel including safety glasses, gloves and shoes during lab activities. 1.1.12 Wear appropriate clothing for lab activities. 1.1.13 Comply with appropriate hairstyles for lab activities. 1.1.14 Demonstrate knowledge of safety aspects of supplemental restraint systems (SRS) and antilock brake systems (ABS). 1.1.15 Demonstrate knowledge of material safety data sheets (MSDS).
APPROACHES STANDARD	♦ Identify potential general lab safety hazards.

Content and Performance Standards
General Lab Procedures

Content Standard 2.0: **The student will demonstrate proper use of tools and equipment, retrieval of service information, vehicle preparation and basic vehicle service.**

Performance Standard 2.1	The student will demonstrate proper use of tools and equipment common to the automotive lab.
EXCEEDS STANDARD	♦ Identify and explain specialty tools and equipment and their use. ♦ Develop a tool inventory system. ♦ Design a new specialty tool.
MEETS STANDARD	2.1.1 Identify tools and their usage in automotive applications. 2.1.2 Identify standard and metric designation for tools, fasteners and measurements, including conversions. 2.1.3 Demonstrate safe handling and proper use of appropriate tools. 2.1.4 Demonstrate proper cleaning, storage, and maintenance of tools and equipment. 2.1.5 Demonstrate proper use of measurement tools.
APPROACHES STANDARD	♦ List common tool names.

Nevada Academic Standards Correlation:
Math: 3.12.1, 3.12.3

Content and Performance Standards
General Lab Procedures

Content Standard 2.0: **The student will demonstrate proper use of tools and equipment, retrieval of service information, vehicle preparation and basic vehicle service.**

Performance Standard 2.2	The student will demonstrate how to retrieve and apply vehicle service information.
EXCEEDS STANDARD	♦ Research vehicle information and history using Internet sites, technical service bulletins (TSBs) and other resources.
MEETS STANDARD	2.2.1 Retrieve specified vehicle information using paper and electronic manuals. 2.2.2 Retrieve specified vehicle information technical service bulletins (TSBs). 2.2.3 Define the purpose and use of the vehicle identification number (VIN), engine numbers and date code. 2.2.4 Locate the vehicle identification number on a specified vehicle. 2.2.5 Use a vehicle identification number to apply service information.
APPROACHES STANDARD	♦ Retrieve vehicle information from the owner's manual. ♦ List common sources of service information.

Content and Performance Standards
General Lab Procedures

Content Standard 2.0: **The student will demonstrate proper use of tools and equipment, retrieval of service information, vehicle preparation and basic vehicle service.**

Performance Standard 2.3	The student will demonstrate how to prepare a vehicle for service and to return the vehicle to the customer.
EXCEEDS STANDARD	♦ Design a comprehensive work order form.
MEETS STANDARD	2.3.1 Explain the information needed and the service requested on a repair order. 2.3.2 Demonstrate the proper use of fender covers, mats and other protective materials when servicing a vehicle. 2.3.3 Demonstrate use of the three Cs (concern, cause, and correction). 2.3.4 Review the vehicle service history for a specified make and model. 2.3.5 Complete a work order to include customer information and signature, vehicle identification information, customer concerns, related service history, causes and corrections. 2.3.6 Ensure the vehicle is prepared to return to the customer per school/company policy (floor mats, steering wheel cover, etc.).
APPROACHES STANDARD	♦ Properly clean and detail a vehicle to return to the customer. ♦ Explain the purpose of a repair order.

Content and Performance Standards
General Lab Procedures

Content Standard 2:0 **The student will demonstrate proper use of tools and equipment, retrieval of service information, vehicle preparation and basic vehicle service.**

Performance Standard 2.4	**The student will demonstrate how to perform basic vehicle service.**
EXCEEDS STANDARD	♦ Develop a vehicle service checklist.
MEETS STANDARD	2.4.1 Check and adjust the engine oil level. 2.4.2 Check and adjust the engine coolant level. 2.4.3 Check and adjust the power steering fluid level. 2.4.4 Check and adjust the brake fluid level. 2.4.5 Check and adjust the windshield washer fluid level. 2.4.6 Inspect and replace wiper blades. 2.4.7 Check and adjust differential/transfer case fluid level. 2.4.8 Check and adjust transmission fluid level. 2.4.9 Inspect, replace and adjust drive belts, tensioners and pulleys; check pulley and belt alignment. 2.4.10 Inspect and replace the air filter. 2.4.11 Determine fluid type requirements and identify correct fluid.
APPROACHES STANDARD	♦ Identify fluid by color. ♦ List the essential tasks of a basic vehicle service.

Content and Performance Standards
Engine Repair

Content Standard 3.0: **The student will demonstrate how to perform general engine service and maintenance.**

Performance Standard 3.1	**The student shall perform general engine service and maintenance.**
EXCEEDS STANDARD	♦ Inspect, repair or replace the crankshaft vibration damper (harmonic balancer). ♦ Remove cylinder head(s); visually inspect cylinder head(s) for cracks; check gasket surface areas for warping and leakage; check passage condition. ♦ Adjust valves for mechanical or hydraulic lifters. ♦ Disassemble and identify components and reassemble an engine.
MEETS STANDARD	3.1.1 Inspect an engine assembly for fuel, oil, coolant and other leaks; determine necessary action. 3.1.2 Test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required. 3.1.3 Inspect and test cooling system components. 3.1.4 Perform oil and filter change; properly recycle used oil. 3.1.5 Remove and replace a radiator. 3.1.6 Inspect power train mounts; determine necessary action. 3.1.7 Inspect and replace timing belt(s), overhead cam drive sprockets and tensioners; check belt tension; adjust as necessary. 3.1.8 Inspect and measure internal and external threads; use charts and tables to determine drill size and restore as needed (including installation of thread inserts). 3.1.9 Calculate engine displacement in cubic inches, cubic centimeters and liters.
APPROACHES STANDARD	♦ Identify the engine make, configuration and displacement on a specified vehicle. ♦ Explain the difference between oil viscosities.

Nevada Academic Standards Correlation:
Math: 2.12.4, 3.12.1, 3.12.2, 3.12.3, 3.12.4, 3.12.5, 4.12.1
Science: E.12.C.4

Content and Performance Standards
Automatic Transmission

Content Standard 4.0: **The student will demonstrate how to perform general automatic transmission/transaxle service.**

Performance Standard 4.1	**The student will perform general automatic transmission/ transaxle service.**
EXCEEDS STANDARD	♦ Disassemble, inspect, measure and reassemble an automatic transmission. ♦ Diagnose electronic, mechanical and hydraulic vacuum control system concerns; determine necessary action. ♦ Inspect and replace external seals and gaskets. ♦ Remove and replace an automatic transmission/transaxle.
MEETS STANDARD	4.1.1 Service a transmission; perform visual inspection of the transmission; replace fluids and filters. 4.1.2 Retrieve and interpret diagnostic trouble codes. 4.1.3 Identify major transmission internal components. 4.1.4 Identify fluid types, levels and condition concerns; determine necessary action.
APPROACHES STANDARD	

Content and Performance Standards
Manual Drivetrain and Axles

Content Standard 5.0: **The student will demonstrate automotive service requirements for manual drivetrain and axles to include clutch, transmission and transaxle, drive shaft and half shaft, universal and constant-velocity (CV) joint and drive axles.**

Performance Standard 5.1	The student will perform service requirements for a manual drivetrain and axles.
EXCEEDS STANDARD	♦ Remove and replace a manual transmission/transaxle. ♦ Replace a front- or rear-wheel drive axle. ♦ Disassemble, inspect, measure and reassemble an axle assembly. ♦ Inspect and replace a clutch assembly and flywheel. ♦ Disassemble, clean, measure and reassemble transmission/ transaxle components. ♦ Replace a front wheel drive (FWD) front wheel bearing. ♦ Inspect, service and replace shaft center support bearings. ♦ Diagnose differential noise, vibration, slippage and chatter concerns; determine necessary action. ♦ Remove and reinstall a transfer case. ♦ Inspect and service four-wheel drive/all-wheel drive components. ♦ Diagnose universal joint noise and vibration concerns; perform necessary action.
MEETS STANDARD	5.1.1 Diagnose fluid loss, fluid level and fluid condition concerns; determine necessary action. 5.1.2 Drain and fill a transmission/transaxle and final drive unit; properly recycle fluids. 5.1.3 Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots and springs; determine necessary action. 5.1.4 Inspect hydraulic clutch slave and master cylinders, lines and hoses; determine necessary action. 5.1.5 Bleed a clutch hydraulic system. 5.1.6 Diagnose fluid leakage concerns; determine necessary action. 5.1.7 Inspect and replace drive axle shaft wheel studs. 5.1.8 Inspect constant-velocity (CV) joint boots. 5.1.9 Remove and replace rear wheel drive shaft.
APPROACHES STANDARD	♦ Identify and calculate gear ratios. ♦ Identify different transmission and axle lubricants. ♦ Identify transmission and axle components. ♦ Explain power flow.

Nevada Academic Standards Correlation:
Science: E.12.C.4

Content and Performance Standards
Suspension and Steering

Content Standard 6.0: **Students will demonstrate automotive service and repair requirements for suspension and steering systems and wheel and tire systems.**

Performance Standard 6.1	The student will perform general service for suspension and steering systems.
EXCEEDS STANDARD	♦ Adjust manual or power non-rack and pinion worm bearing preload and sector lash. ♦ Remove, inspect and replace a power steering pump. ♦ Remove and replace a manual or power rack and pinion steering gear; inspect mounting bushings and brackets. ♦ Adjust a manual or power rack and pinion steering gear. ♦ Diagnose, inspect, adjust, repair or replace components of electronically controlled suspension systems. ♦ Perform a wheel alignment.
MEETS STANDARD	6.1.1 Identify and interpret suspension and steering concerns; determine necessary action. 6.1.2 Determine proper power steering fluid types; inspect fluid levels and condition. 6.1.3 Flush, fill and bleed power steering system. 6.1.4 Diagnose power steering fluid leakage; determine necessary action. 6.1.5 Lubricate suspension and steering systems. 6.1.6 Inspect, remove and replace shock absorbers. 6.1.7 Remove, inspect and install stabilizer bar bushings, brackets and links. 6.1.8 Remove, inspect and install a strut cartridge or assembly, strut coil spring, insulators (silencers) and upper strut bearing mount. 6.1.9 Perform pre-alignment inspection; determine necessary action. 6.1.10 Measure vehicle riding height; determine necessary action. 6.1.11 Demonstrate knowledge of safety aspects of supplemental restraint systems (SRS). 6.1.12 Demonstrate how to inspect and replace a pitman arm, relay (center link/intermediate) rod, idler arm and mountings, and steering linkage damper. 6.1.13 Describe basic alignment geometry, including camber, caster and toe-in.
APPROACHES STANDARD	♦ Identify primary steering components. ♦ Identify primary suspension components.

Nevada Academic Standards Correlation:
Math: 3.12.2, 3.12.3, 4.12.6

Content and Performance Standards
Suspension and Steering

Content Standard 6.0: **Students will demonstrate automotive service and repair requirements for suspension and steering systems and wheel and tire systems.**

Performance Standard 6.2	The student will perform general service for wheels and tires.
EXCEEDS STANDARD	♦ Identify the components of an electronic tire pressure sensing system.
MEETS STANDARD	6.2.1 Diagnose tire wear patterns and measure tread depth; determine necessary action. 6.2.2 Inspect tires; check and adjust air pressure. 6.2.3 Diagnose wheel/tire vibration, shimmy and noise; determine necessary action. 6.2.4 Rotate tires according to the manufacturer's specifications. 6.2.5 Balance a wheel and tire assembly (static and dynamic). 6.2.6 Dismount, inspect and remount a tire on wheel. 6.2.7 Repair a tire using an internal patch. 6.2.8 Reinstall a wheel; torque lug nuts. 6.2.9 Remove, inspect and service or replace front and rear wheel taper bearings on non-drive axles.
APPROACHES STANDARD	♦ Explain tire specifications and capacities. ♦ Explain common tire construction and tread patterns. ♦ Identify torque methods and patterns. ♦ Identify different types of wheel construction and materials. ♦ Remove and replace valve stems and caps.

Nevada Academic Standards Correlation:
Math: 3.12.2, 3.12.3
Science: N.12.A.1

Content and Performance Standards
Brakes

Content Standard 7.0: **The student will demonstrate service requirements for brake systems, to include hydraulic systems, power assist units, disc brakes, drum brakes, antilock brakes and miscellaneous (wheel bearings, parking brakes, electrical, etc.) diagnosis and repair.**

Performance Standard 7.1	**The student will perform general service for hydraulic systems, power assist units, parking brakes and antilock braking systems (ABS).**
EXCEEDS STANDARD	♦ Inspect, test and replace components of a brake warning light system. ♦ Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action. ♦ Inspect and test a hydro-boost system and accumulator for leaks and proper operation; determine necessary action. ♦ Depressurize high-pressure components of the antilock brake system (ABS). ♦ Bleed the antilock brake system's (ABS) front and rear hydraulic circuits. ♦ Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment; determine necessary action. ♦ Remove, bench bleed and reinstall a master cylinder. ♦ Fabricate brake lines using double flare and ISO types.
MEETS STANDARD	7.1.1 Inspect brake lines, flexible hoses and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action. 7.1.2 Select, handle, store and fill brake fluids to the proper level. 7.1.3 Bleed (manual, pressure, vacuum, or surge) a brake system. 7.1.4 Flush a hydraulic system. 7.1.5 Check the vacuum supply (manifold or auxiliary pump) to a vacuum-type power booster. 7.1.6 Inspect the vacuum-type power booster unit for vacuum leaks; inspect the check valve for proper operation; determine necessary action. 7.1.7 Check parking brake cables and components for wear, rusting, binding and corrosion; clean, lubricate or replace as needed. 7.1.8 Check parking brake operation; determine necessary action. 7.1.9 Check the operation of a parking brake indicator light system. 7.1.10 Check the operation of a brake stop light system; determine necessary action. 7.1.11 Identify and inspect antilock brake system (ABS) components; determine necessary action. 7.1.12 Identify traction control/vehicle stability control system components. 7.1.13 Check a master cylinder for internal and external leaks and proper operation; determine necessary action.

APPROACHES STANDARD	♦ Identify the major components of a brake hydraulic system.

Nevada Academic Standards Correlation:
Math: 3.12.3

Content and Performance Standards
Brakes

Content Standard 7.0: **The student will demonstrate service requirements for brake systems, to include hydraulic systems, power assist units, disc brakes, drum brakes, antilock brakes and miscellaneous (wheel bearings, parking brakes, electrical, etc.) diagnosis and repair.**

Performance Standard 7.2	**The student will perform general service for disc brake systems.**
EXCEEDS STANDARD	♦ Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.
MEETS STANDARD	7.2.1 Remove the caliper assembly from mountings; clean and inspect for leaks and damage to the caliper housing; determine necessary action. 7.2.2 Clean and inspect the caliper mounting and slides for wear and damage; determine necessary action. 7.2.3 Remove, clean and inspect pads and retaining hardware; determine necessary action. 7.2.4 Reassemble, lubricate and reinstall caliper, pads and related hardware; seat pads and inspect for leaks. 7.2.5 Clean, inspect and measure rotor with a dial indicator and a micrometer; follow the manufacturer's recommendations in determining the need to machine or replace the rotor. 7.2.6 Remove and reinstall the rotor. 7.2.7 Refinish the rotor to specified tolerances on the vehicle. 7.2.8 Refinish the rotor to specified tolerances off the vehicle. 7.2.9 Install the wheel and torque the lug nuts; make final checks and adjustments. 7.2.10 Diagnose wheel bearing noises, wheel shimmy and vibration concerns; determine necessary action. 7.2.11 Remove, clean, inspect, repack and install wheel bearings and replace seals; install hub and adjust wheel bearings. 7.2.12 Employ appropriate measures to ensure respiratory safety when servicing disc brake systems.
APPROACHES STANDARD	♦ Compare and contrast disc and drum brake systems. ♦ Determine the minimum thickness of a rotor. ♦ Identify respiratory safety concerns when servicing disc brake systems.

Nevada Academic Standards Correlation:
Math: 3.12.1, 3.12.2, 3.12.3

Content and Performance Standards
Brakes

Content Standard 7.0: **The student will demonstrate service requirements for brake systems, to include hydraulic systems, power assist units, disc brakes, drum brakes, antilock brakes and miscellaneous (wheel bearings, parking brakes, electrical, etc.) diagnosis and repair.**

Performance Standard 7.3	The student will perform general service for drum brake systems.
EXCEEDS STANDARD	♦ Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.
MEETS STANDARD	7.3.1 Remove, clean (using proper safety procedures), inspect and measure brake drums; determine necessary action. 7.3.2 Refinish a brake drum to specified tolerances. 7.3.3 Remove, clean and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware and backing support plates; lubricate and reassemble. 7.3.4 Remove, inspect and install wheel cylinders. 7.3.5 Pre-adjust brake shoes and the parking brake before installing brake drums or drum/hub assemblies and wheel bearings. 7.3.6 Install the wheel and torque lug nuts; make final checks and adjustments. 7.3.7 Diagnose wheel bearing noises, wheel shimmy and vibration concerns; determine necessary action. 7.3.8 Remove, clean, inspect, repack and install wheel bearings and replace seals; install hub and adjust wheel bearings. 7.3.9 Employ appropriate measures to ensure respiratory safety when servicing drum brake systems.
APPROACHES STANDARD	♦ Compare and contrast disc and drum brake systems. ♦ Determine maximum diameter of a brake drum. ♦ Identify respiratory safety concerns when servicing drum brake systems.

Nevada Academic Standards Correlation:
Math: 3.12.1, 3.12.2, 3.12.3

Content and Performance Standards
Electrical/Electronic Systems

Content Standard 8.0: **The student will demonstrate service requirements for electrical/electronic systems to include general diagnosis and service for electrical systems, batteries and starting and charging systems.**

Performance Standard 8.1	The student will perform general service for electrical systems.
EXCEEDS STANDARD	♦ Inspect and diagnose incorrect turn signal or hazard light operations; perform necessary action. ♦ Inspect and test gauges and gauge sending units for cause of intermittent, high, low or no gauge readings; determine necessary action.
MEETS STANDARD	8.1.1 Diagnose the electrical/electronic integrity of series, parallel and series-parallel circuits using the Ohm's Law formula. 8.1.2 Use wiring diagrams and current-flow theory to diagnose electrical circuit problems. 8.1.3 Use of a digital multimeter (DMM) to diagnose electrical circuit problems. 8.1.4 Check electrical circuits with a test light; determine necessary action. 8.1.5 Measure source voltage and perform voltage drop tests in electrical/electronic circuits using a voltmeter; determine necessary action. 8.1.6 Measure current flow in electrical/electronic circuits and components using an ammeter; determine necessary action. 8.1.7 Check continuity and measure resistance in electrical/ electronic circuits and components using an ohmmeter; determine necessary action. 8.1.8 Check electrical circuits using fused jumper wires; determine necessary action. 8.1.9 Locate shorts, grounds, opens and resistance problems in electrical/electronic circuits; determine necessary action. 8.1.10 Measure and diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action. 8.1.11 Inspect and test fusible links, circuit breakers and fuses; determine necessary action. 8.1.12 Inspect and test switches, connectors, relays, solid-state devices and wires of electrical/electronic circuits; perform necessary action. 8.1.13 Repair connectors and terminal ends. 8.1.14 Repair a wiring harness (including CAN/BUS systems). 8.1.15 Perform solder repair of electrical wiring. 8.1.16 Diagnose the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action. 8.1.17 Inspect, replace and aim headlights and bulbs.
APPROACHES STANDARD	♦ Explain the principles of Ohm's Law. ♦ Explain conventional and electron theory.

Nevada Academic Standards Correlation:
Math: 2.12.1, 2.12.3, 3.12.3, 3.12.5
Science: P.12.C.6

Content and Performance Standards
Electrical/Electronic Systems

Content Standard 8.0: **The student will demonstrate service requirements for electrical/electronic systems to include general diagnosis and service for electrical systems, batteries and starting and charging systems.**

Performance Standard 8.2	The student will perform general service and testing for batteries.
EXCEEDS STANDARD	♦ Determine cold cranking amp requirements for inclement weather conditions. ♦ Explain the difference between spiral, deep cycle and gel cell batteries.
MEETS STANDARD	8.2.1 Perform a battery state-of-charge test; determine necessary action. 8.2.2 Perform a battery capacity test (or conductance test); confirm the proper battery capacity for a vehicle application; determine necessary action. 8.2.3 Maintain or restore electronic memory functions. 8.2.4 Inspect, clean, fill and replace a battery; ensure proper disposal of used batteries. 8.2.5 Perform a slow or fast battery charge using the state-of-charge formula. 8.2.6 Inspect and clean battery cables, connectors, clamps and hold-downs; repair or replace as needed. 8.2.7 Start a vehicle using jumper cables and a battery or auxiliary power supply. 8.2.8 Use a hydrometer to measure the specific gravity of a battery cell electrolyte; use charts to determine necessary action.
APPROACHES STANDARD	♦ Determine battery group size for a designated vehicle. ♦ Identify battery locations on different vehicles.

Nevada Academic Standards Correlation:
Math: 2.12.1, 3.12.3, 3.12.4
Science: P.12.A.5, P.12.A.6, P.12.A.7, P.12.C.6, E.12.C.4

Content and Performance Standards
Electrical/Electronic Systems

Content Standard 8.0: **The student will demonstrate service requirements for electrical/electronic systems to include general diagnosis and service for electrical systems, batteries and starting and charging systems.**

Performance Standard 8.3	The student will perform general service for starting and charging systems.
EXCEEDS STANDARD	♦ Disassemble, clean, inspect and test starter components; replace as needed. ♦ Disassemble a generator (alternator) and clean, inspect and test the components; determine necessary action.
MEETS STANDARD	8.3.1 Perform starter current draw tests; determine necessary action. 8.3.2 Perform starter circuit voltage drop tests; determine necessary action. 8.3.3 Inspect and test starter relays and solenoids; determine necessary action. 8.3.4 Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition. 8.3.5 Perform a charging system output test; determine necessary action. 8.3.6 Demonstrate how to remove and install a starter. 8.3.7 Demonstrate how to remove, inspect and install a generator (alternator).
APPROACHES STANDARD	♦ Perform starter bench tests; determine necessary action.

Nevada Academic Standards Correlation:
Math: 3.12.3
Science: P.12.C.6, P.12.B.2, P.12.B.3

Content and Performance Standards
Heating and Air Conditioning

Content Standard 9.0: **Student will understand general automotive service requirements for heating and air conditioning systems.**

Performance Standard 9.1	**The student will demonstrate knowledge of heating and air conditioning systems.**
EXCEEDS STANDARD	♦ Leak test an air conditioning system; determine necessary action. ♦ Select oil type; measure and add oil to the air conditioning system as needed. ♦ Diagnose unusual operating noises in the air conditioning system; determine necessary action. ♦ Diagnose air conditioning system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action. ♦ Remove, inspect, troubleshoot and replace heating and air conditioning components. ♦ Use an EPA certified recovery machine to evacuate and recharge an air conditioning system.
MEETS STANDARD	9.1.1 Identify and visually inspect air conditioning system components. 9.1.2 Locate refrigerant label and identify specified refrigerant type (i.e., R-12, R-134a). 9.1.3 Conduct a preliminary performance test of an air conditioning system using manifold gauges (i.e., verify compressor engagement, measure outlet duct temperature, sense temperature change across components); determine necessary action.
APPROACHES STANDARD	♦ Explain the refrigerant cycle. ♦ Explain the operation of a typical heating system.

Nevada Academic Standards Correlation:
Math: 3.12.2, 3.12.3, 3.12.4
Science: P.12.A.1, E.12.A.4

Content and Performance Standards
Engine Performance

Content Standard 10.0: **Student will demonstrate understanding of general engine diagnosis; computerized engine controls diagnosis and repair; ignition system diagnosis and repair; fuel, air induction and exhaust systems diagnosis and repair; emissions control systems diagnosis and repair; and engine-related service.**

Performance Standard 10.1	The student will demonstrate general engine performance diagnosis and repair.
EXCEEDS STANDARD	♦ Diagnose unusual exhaust colors, odors and sounds; determine necessary action. ♦ Diagnose unusual engine noise or vibration concerns; determine necessary action. ♦ Diagnose engine mechanical, electrical, electronic, fuel and ignition concerns with an oscilloscope and engine diagnostic equipment; determine necessary action. ♦ Diagnose driveability and emissions problems resulting from failures of interrelated systems; determine necessary action. ♦ Remove, inspect and test vacuum and electrical circuits, components and connections of a fuel system; perform necessary action. ♦ Test the operation of turbocharger/supercharger systems; determine necessary action. ♦ Diagnose and test emission control devices.
MEETS STANDARD	10.1.1 Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels and calibration decals). 10.1.2 Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action. 10.1.3 Perform a cylinder power balance test; determine necessary action. 10.1.4 Perform a cylinder cranking compression test; determine necessary action. 10.1.5 Perform a cylinder leakage test to measure percentage loss; determine necessary action. 10.1.6 Verify engine operating temperatures; determine necessary action. 10.1.7 Prepare a 4 or 5 gas analyzer; inspect and prepare vehicle for the test and obtain exhaust readings; determine necessary action. 10.1.8 Perform cooling system pressure tests; check coolant condition; inspect and test the radiator, pressure cap, coolant recovery tank and hoses; perform necessary action. 10.1.9 Retrieve and record stored OBD I (on board diagnostics) diagnostic trouble codes; clear codes. 10.1.10 Retrieve and record stored OBD II and CAN (controlled area network) diagnostic trouble codes; clear codes when applicable.

	10.1.11 Obtain and interpret scan tool data. 10.1.12 Remove and replace a thermostat and gasket. 10.1.13 Perform common fastener and thread repair to include removal of a broken bolt; restore internal and external threads and repair internal threads with a thread insert. 10.1.14 Practice recommended precautions when handling static sensitive devices.
APPROACHES STANDARD	♦ Describe the four-stroke cycle. ♦ Describe the operation of rotary engines.

Nevada Academic Standards Correlation:
Math: 3.12.2, 3.12.3, 3.12.4
Science: P.12.A.6, P.12.A.7

Content and Performance Standards
Engine Performance

Content Standard 10.0: **Student will demonstrate understanding of general engine diagnosis; computerized engine controls diagnosis and repair; ignition system diagnosis and repair; fuel, air induction and exhaust systems diagnosis and repair; emissions control systems diagnosis and repair; and engine-related service.**

Performance Standard 10.2	**The student will perform fuel and ignition system diagnosis and repair.**
EXCEEDS STANDARD	♦ Inspect, test and clean fuel injectors. ♦ Remove, inspect, gap and replace spark plugs. ♦ Diagnose and replace oxygen sensors.
MEETS STANDARD	10.2.1 Inspect and test ignition primary circuit wiring and components; perform necessary action. 10.2.2 Inspect, test and adjust ignition system secondary circuit wiring and components; perform necessary action. 10.2.3 Inspect and test mechanical and electrical fuel pumps and pump control systems; perform necessary action. 10.2.4 Inspect an exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s) and heat shield(s); perform necessary action. 10.2.5 Inspect fuel tank and fuel cap, fuel lines, fittings and hoses; perform necessary action. 10.2.6 Identify, describe and inspect emission control devices. 10.2.7 Replace fuel filters. 10.2.8 Identify fuel pressure safety concerns.
APPROACHES STANDARD	♦ List different firing orders for four-, six- and eight-cylinder engines. ♦ Identify different octane requirements for various engines.

Nevada Academic Standards Correlation:
Math: 3.12.3
Science: P.12.B.2, P.12.C.1, P.12.A.5, P.12.A.6

Content and Performance Standards
Alternative Fuels and Vehicles

Content Standard 11.0: **The student will demonstrate knowledge of alternative fuels and alternative fuel vehicles.**

Performance Standard 11.1	**The student will demonstrate knowledge of alternative fuels.**
EXCEEDS STANDARD	♦ Demonstrate knowledge of different types and construction of electrical vehicle batteries.
MEETS STANDARD	11.1.1 Describe different types of alternative fuels to include biodiesel, electricity, ethanol, hydrogen, methanol, natural gas and propane. 11.1.2 Describe safety precautions and procedures for alternative fuels. 11.1.3 Describe safety precautions and procedures for servicing alternative fuel vehicles. 11.1.4 Demonstrate knowledge of engine operation characteristics with the use of alternative fuels.
APPROACHES STANDARD	♦ List major manufactures of alternative fuel and hybrid vehicles. ♦ Research the Department of Energy Website for alternative fuels and alternative fuel vehicles.

Nevada Academic Standards Correlation:
Science: N.12.B.1, N.12.B.2, N.12.B.4, E.12.A.2, E.12.A.3, L.12.C.2, L.12.C.3, P.12.A.4, P.12.A.5, P.12.A.9

Content and Performance Standards
Alternative Fuels and Vehicles

Content Standard 11.0: **The student will demonstrate knowledge of alternative fuels and alternative fuel vehicles.**

Performance Standard 11.2	**The student will demonstrate knowledge of alternative fuel vehicles.**
EXCEEDS STANDARD	♦ Demonstrate knowledge of different types and construction of electrical vehicle batteries.
MEETS STANDARD	11.2.1 Describe the primary alternative fuel vehicles to include electric, flexible fuel, natural gas, propane, hybrid and fuel cell vehicles. 11.2.2 Describe safety precautions and procedures for servicing alternative fuel vehicles. 11.2.3 Demonstrate knowledge of engine operation characteristics with the use of alternative fuels. 11.2.4 Describe safety precautions and procedures when servicing hybrid vehicles. 11.2.5 Demonstrate knowledge of hybrid vehicle operation.
APPROACHES STANDARD	♦ List major manufacturers of alternative fuel and hybrid vehicles. ♦ Research the Department of Energy Website for alternative fuels and alternative fuel vehicles.

Nevada Academic Standards Correlation:
Science: N.12.B.1, N.12.B.2, N.12.B.4

Content and Performance Standards
Employability Skills

Content Standard 12.0: **Students will achieve competence in workplace readiness, career development, and lifelong learning.**

Performance Standard 12.1	The student will demonstrate problem-solving and critical-thinking skills.
EXCEEDS STANDARD	♦ Develop a flow chart to solve a problem.
MEETS STANDARD	12.1.1 Solve a work-related problem using the appropriate steps in the problem-solving process. 12.1.2 Demonstrate or explain brainstorming techniques. 12.1.3 Evaluate options to solving a work-related problem. 12.1.4 Use a flow chart to help solve a work-related problem. 12.1.5 Use the four-step plan to solve a problem: Interview the customer, verify the concern, repair the vehicle and verify the repair. 12.1.6 Prioritize and organize workloads. 12.1.7 Explain the difference between reliable and unreliable information.
APPROACHES STANDARD	♦ Identify the basic steps in the problem-solving process. ♦ Describe the four-step plan to solve a work-related problem. ♦ Identify the difference between opinions and statements of fact.

Nevada Academic Standards Correlation:
English: 7.12.2, 7.12.5, 8.12.1, 8.12.2, 8.12.4

Content and Performance Standards
Employability Skills

Content Standard 12.0: **Students will achieve competence in workplace readiness, career development, and lifelong learning.**

Performance Standard 12.2	The student will demonstrate the ability to speak, write and listen effectively.
EXCEEDS STANDARD	♦ Research, prepare and deliver an automotive-related presentation. ♦ Prepare technical documents, such as work orders. ♦ Compete in a SkillsUSA job skill demonstration and/or public speaking contest.
MEETS STANDARD	12.2.1 Follow written and oral directions. 12.2.2 Demonstrate proper telephone etiquette. 12.2.3 Prepare well-constructed written communications. 12.2.4 Effectively demonstrate job skills to others. 12.2.5 Identify common communication barriers and methods for improving communication.
APPROACHES STANDARD	♦ Explain the benefits of effective communication in the automotive industry. ♦ Explain how cultural and physical diversity affect communication. ♦ Identify applicable medium for conveying messages.

Nevada Academic Standards Correlation:
English: 5.12.5, 5.12.6, 5.12.7, 6.12.7, 6.12.8, 8.12.1, 8.12.3, 8.12.4

Content and Performance Standards
Employability Skills

Content Standard 12.0: **Students will achieve competence in workplace readiness, career development, and lifelong learning.**

Performance Standard 12.3	The student will demonstrate the ability to select, apply and maintain appropriate technology.
EXCEEDS STANDARD	♦ Critique the use, benefits and cost of technologically advanced equipment in the automotive industry. ♦ Analyze the impact of technological changes on one or more aspects of automotive industry by researching current literature. ♦ Compete in a regional or state SkillsUSA automotive contest. ♦ Compete in the Ford/AAA Student Auto Skills Contest.
MEETS STANDARD	12.3.1 Demonstrate ability to utilize basic keyboarding techniques. 12.3.2 Demonstrate basic knowledge of computing. 12.3.3 Recognize the impact of technological changes on tasks and people. 12.3.4 Demonstrate routine maintenance and repair of technological equipment.
APPROACHES STANDARD	♦ Use an Internet browser to locate specific Websites related to the automotive industry.

Content and Performance Standards
Employability Skills

Content Standard 12.0: **Students will achieve competence in workplace readiness, career development, and lifelong learning.**

Performance Standard 12.4	The student will demonstrate leadership and teamwork skills.
EXCEEDS STANDARD	♦ Analyze the stages of group development. ♦ Demonstrate leadership ability within a group or team. ♦ Compromise and/or build consensus within a group and summarize the decision of the group while maintaining respect for diverse viewpoints. ♦ Complete levels 1-3 of the SkillsUSA Professional Development Program. ♦ Campaign for a local SkillsUSA chapter office. ♦ Serve as a committee chair in a local SkillsUSA chapter.
MEETS STANDARD	12.4.1 Work cooperatively with others when given a group project. 12.4.2 Match team member's skills with a group activity. 12.4.3 Explain traits necessary to effectively lead and influence individuals and groups. 12.4.4 Demonstrate appropriate attitudes and behaviors for effective leadership. 12.4.5 Demonstrate respect for team members, team processes, and team goals. 12.4.6 Participate in the implementation of a group's decision and evaluate the results. 12.4.7 Demonstrate the qualities of an effective leader and team member. 12.4.8 Describe the importance of a proper dress code.
APPROACHES STANDARD	♦ Explain the importance of groups. ♦ Explain how to organize groups. ♦ Wear appropriate attire.

Content and Performance Standards
Employability Skills

Content Standard 12.0: **Students will achieve competence in workplace readiness, career development, and lifelong learning.**

Performance Standard 12.5	The student will demonstrate sound workplace ethics.
EXCEEDS STANDARD	♦ Demonstrate time-management skills and cost-effective practices.
MEETS STANDARD	12.5.1 Develop personal work ethics through work experience. 12.5.2 Describe the importance of ethics practiced in the workplace. 12.5.3 Demonstrate regular attendance, promptness and the willingness to follow instructions and complete assigned tasks. 12.5.4 Demonstrate appropriate personal and professional attitudes and behaviors. 12.5.5 Maintain a safe, clean and organized work area. 12.5.6 Demonstrate awareness of legal responsibilities related to individual performance, safety and customer satisfaction. 12.5.7 Demonstrate knowledge of various types of harassment. 12.5.8 Exhibit pride in workmanship, especially as it relates to customer satisfaction.
APPROACHES STANDARD	♦ List the important ethics in the workplace. ♦ Meet attendance standards. ♦ Describe an organized workplace. ♦ Identify appropriate responses to unethical actions.

Content and Performance Standards
Employability Skills

Content Standard 12.0: **Students will achieve competence in workplace readiness, career development, and lifelong learning.**

Performance Standard 12.6	The student will demonstrate the ability to effectively manage resources in high-performance workplaces.
EXCEEDS STANDARD	♦ Recognize the individual roles of team members, delegate tasks, and provide feedback on performance. ♦ Acknowledge and utilize the skills, abilities and input of all members of a team. ♦ Develop an action plan to accomplish tasks within a given timeframe.
MEETS STANDARD	12.6.1 Identify and organize the material resources and space requirements needed to complete a job assignment. 12.6.2 Effectively use technology to complete a job assignment. 12.6.3 Demonstrate cooperation and leadership as a team at school or in a workplace setting. 12.6.4 Demonstrate effective time management. 12.6.5 Recognize the need for management skills for employees in the workplace with regard to stress, anger management and substance abuse. 12.6.6 Use flat-rate schedules to allot time to complete repairs.
APPROACHES STANDARD	♦ List effective time management skills. ♦ Maintain a clean, organized and safe work area.

Content and Performance Standards
Employability Skills

Content Standard 12.0: **Students will achieve competence in workplace readiness, career development, and lifelong learning.**

Performance Standard 12.7	The student will demonstrate career planning and development skills.
EXCEEDS STANDARD	♦ Develop a community service or job shadowing project. ♦ Develop an education/training plan to fulfill long-term career goals. ♦ Define advantages and disadvantages of self-employment or working for various sizes and types of businesses. ♦ Critique results of a job interview. ♦ Develop a proposal for an organized community service project. ♦ Compete in a local or state level SkillsUSA job interview contest.
MEETS STANDARD	12.7.1 Prepare a job application. 12.7.2 Prepare a personal resume. 12.7.3 Complete a personal aptitude and interest inventory. 12.7.4 Participate in a mock job interview. 12.7.5 Establish short-term career goals. 12.7.6 Establish long-term career goals. 12.7.7 Use the Nevada Career Information System (NCIS) or a similar computer-based program to research careers in a chosen field. 12.7.8 Participate in an organized job-shadowing activity. 12.7.9 Participate in a community service project. 12.7.10 Construct a career portfolio.
APPROACHES STANDARD	♦ Locate employment opportunities. ♦ Identify job requirements for entry-level positions in the automotive industry. ♦ Identify general conditions for employment. ♦ Identify educational/training requirements for related automotive fields. ♦ Identify the elements of goal setting. ♦ Identify automotive related careers. ♦ Describe essential job interview skills. ♦ Identify the components of a career portfolio.

Nevada Academic Standards Correlation:
English: 5.12.5, 5.12.6, 5.12.7

Content and Performance Standards
Employability Skills

Content Standard 12.0: **Students will achieve competence in workplace readiness, career development, and lifelong learning.**

Performance Standard 12.8	The student will demonstrate job-retention and lifelong-learning skills.
EXCEEDS STANDARD	♦ Create a plan for lifelong learning. ♦ Create a presentation illustrating interpersonal skills needed for job retention. ♦ Adapt new knowledge and skills in changing situations. ♦ Analyze how work life is affected by families and how families are affected by work life.
MEETS STANDARD	12.8.1 Maintain an employment/career portfolio. 12.8.2 Explain strategies for balancing work and family roles. 12.8.3 Demonstrate understanding of the need for lifelong learning in a rapidly changing job market. 12.8.4 Develop long-term career planning strategies. 12.8.5 Describe various educational options needed for job retention. 12.8.6 Model sound workplace ethics, such as loyalty, punctuality and initiative. 12.8.7 Demonstrate interpersonal skills needed for job retention.
APPROACHES STANDARD	♦ Describe the importance of a portfolio. ♦ Identify options for lifelong learning. ♦ Identify interpersonal skills needed for job retention. ♦ Identify jobs with opportunity for advancement. ♦ Describe the importance of career planning.

Crosswalk of Automotive Standards and Academic Standards

The crosswalk of the Automotive Standards with the state standards for Math, Science and English Language Arts shows by performance indicator where the learning activities in the Automotive program supports academic learning. The performance indicators from the Automotive Standards are grouped according to the performance standard they support; each performance indicator supports one or more of the academic standards in each corresponding cell.

Content Standard 2.0: The student will demonstrate proper use of tools and equipment, retrieval of service information, vehicle preparation and basic vehicle service.

Performance Indicators	Academic Standards
2.1.2	**Math** 3.12.1 Estimate and convert between customary and metric systems.
2.1.5	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.

Content Standard 3.0: The student will demonstrate how to perform general engine service and maintenance.

Performance Indicators	Academic Standards
3.1.2, 3.1.4	**Science** E.12.C.4 Students know processes of obtaining, using and recycling of renewable and nonrenewable resources.
3.1.8	**Math** 3.12.1 Estimate and convert between customary and metric systems. 3.12.2 Justify, communicate, and differentiate between precision, error, and tolerance in practical problems. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. 3.12.4 Interpret and apply consumer data presented in charts, tables, and graphs to make informed financial decisions related to practical applications.
3.1.9	**Math** 2.12.4 Determine the domain and range of functions, including linear, quadratic, and absolute value, algebraically and graphically. Solve absolute value equations and inequalities both algebraically and graphically. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. 3.12.5 Determine the measure of unknown dimensions, angles, areas, and volumes using relationships and formulas to solve problems. 4.12.1 Identify and use the parts of a circle to solve mathematical and practical problems. Identify and apply properties of interior and exterior angles of polygons to solve mathematical and practical problems.

Content Standard 5.0: **The student will demonstrate automotive service requirements for manual drivetrain and axles to include clutch, transmission and transaxle, drive shaft and half shaft, universal and constant-velocity (CV) joint and drive axles.**

Performance Indicators	Academic Standards
5.1.2	**Science** E.12.C.4 Students know processes of obtaining, using and recycling of renewable and nonrenewable resources.

Content Standard 6.0: **Students will demonstrate automotive service and repair requirements for suspension and steering systems and wheel and tire systems.**

Performance Indicators	Academic Standards
6.1.10	**Math** 3.12.2 Justify, communicate, and differentiate between precision, error, and tolerance in practical problems. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.
6.1.13	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. 4.12.6 Solve problems using complementary and supplementary angles, congruent angles, vertical angles, angles formed when parallel lines are cut by a transversal and angles in polygons.
6.2.1	**Math** 3.12.2 Justify, communicate, and differentiate between precision, error, and tolerance in practical problems. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. **Science** N.12.A.1 Students know tables, charts, illustrations and graphs can be used in making arguments and claims in oral and written presentations.
6.2.2	**Math** 3.12.2 Justify, communicate, and differentiate between precision, error, and tolerance in practical problems. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.
6.2.5, 6.2.8	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.

Content Standard 7.0: **The student will demonstrate service requirements for brake systems, to include hydraulic systems, power assist units, disc brakes, drum brakes, antilock brakes and miscellaneous (wheel bearings, parking brakes, electrical, etc.) diagnosis and repair.**

Performance Indicators	Academic Standards
7.1.5, 7.1.6	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.
7.2.5, 7.2.7, 7.2.8	**Math**

	3.12.1 Estimate and convert between customary and metric systems. 3.12.2 Justify, communicate, and differentiate between precision, error, and tolerance in practical problems. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.
7.2.9	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.
7.3.1, 7.3.2	**Math** 3.12.1 Estimate and convert between customary and metric systems. 3.12.2 Justify, communicate, and differentiate between precision, error, and tolerance in practical problems. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.
7.3.6	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.

Content Standard 8.0: The student will demonstrate service requirements for electrical/electronic systems to include general diagnosis and service for electrical systems, batteries and starting and charging systems.

Performance Indicators	Academic Standards
8.1.1	**Math** 2.12.1 Use algebraic expressions to identify and describe the nth term of a sequence. 2.12.3 Add, subtract, multiply, and factor 1st and 2nd degree polynomials connecting the arithmetic and algebraic processes. Simplify algebraic expressions, including exponents and radicals. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. 3.12.5 Determine the measure of unknown dimensions, angles, areas, and volumes using relationships and formulas to solve problems.
8.1.2	**Science** P.12.C.6 Students know electricity is transferred from generating sources for consumption and practical uses.
8.1.3	**Math** 2.12.1 Use algebraic expressions to identify and describe the nth term of a sequence. 2.12.3 Add, subtract, multiply, and factor 1st and 2nd degree polynomials connecting the arithmetic and algebraic processes. Simplify algebraic expressions, including exponents and radicals. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. 3.12.5 Determine the measure of unknown dimensions, angles, areas, and volumes using relationships and formulas to solve problems.
8.1.4	**Science** P.12.C.6 Students know electricity is transferred from generating sources for consumption and practical uses.
8.1.5, 8.1.6, 8.1.7	**Math** 2.12.1 Use algebraic expressions to identify and describe the nth term of a sequence. 2.12.3 Add, subtract, multiply, and factor 1st and 2nd degree polynomials connecting the arithmetic and algebraic processes. Simplify algebraic expressions,

	including exponents and radicals. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. 3.12.5 Determine the measure of unknown dimensions, angles, areas, and volumes using relationships and formulas to solve problems. **Science** P.12.C.6 Students know electricity is transferred from generating sources for consumption and practical uses.
8.1.8	**Science** P.12.C.6 Students know electricity is transferred from generating sources for consumption and practical uses.
8.1.9, 8.1.10, 8.1.11, 8.1.12	**Math** 2.12.1 Use algebraic expressions to identify and describe the nth term of a sequence. 2.12.3 Add, subtract, multiply, and factor 1st and 2nd degree polynomials connecting the arithmetic and algebraic processes. Simplify algebraic expressions, including exponents and radicals. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. 3.12.5 Determine the measure of unknown dimensions, angles, areas, and volumes using relationships and formulas to solve problems. **Science** P.12.C.6 Students know electricity is transferred from generating sources for consumption and practical uses.
8.1.15, 8.1.16, 8.1.17	**Science** P.12.C.6 Students know electricity is transferred from generating sources for consumption and practical uses.
8.2.1	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. **Science** P.12.A.6 Students know chemical reactions either release or absorb energy. P.12.A.7 Students know that, in chemical reactions, elements combine in predictable ratios, and the numbers of atoms of each element do not change.
8.2.2	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. 3.12.4 Interpret and apply consumer data presented in charts, tables, and graphs to make informed financial decisions related to practical applications.
8.2.3	**Science** P.12.A.6 Students know chemical reactions either release or absorb energy.
8.2.4	**Science** E.12.C.4 Students know processes of obtaining, using and recycling of renewable and nonrenewable resources.
8.2.5	**Math** 2.12.1 Use algebraic expressions to identify and describe the nth term of a sequence. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. **Science** P.12.C.6 Students know electricity is transferred from generating sources for consumption and practical uses.
8.2.8	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.

	3.12.4 Interpret and apply consumer data presented in charts, tables, and graphs to make informed financial decisions related to practical applications. **Science** P.12.A.5 Students know chemical reactions can take place at different rates, depending on a variety of factors (i.e. temperature, concentration, surface area, and agitation). P.12.A.6 Students know chemical reactions either release or absorb energy.
8.3.1	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. **Science** P.12.B.2 Students know magnetic forces and electric forces can be thought of as different aspects of electromagnetic force. P.12.B.3 Students know the strength of the electric force between two objects increases with charge and decreases with distance. P.12.C.6 Students know electricity is transferred from generating sources for consumption and practical uses.
8.3.2, 8.3.3, 8.3.4	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.
8.3.5	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. **Science** P.12.B.2 Students know magnetic forces and electric forces can be thought of as different aspects of electromagnetic force. P.12.B.3 Students know the strength of the electric force between two objects increases with charge and decreases with distance. P.12.C.6 Students know electricity is transferred from generating sources for consumption and practical uses.
8.3.7	**Science** P.12.C.6 Students know electricity is transferred from generating sources for consumption and practical uses.

Content Standard 9.0: Student will understand general automotive service requirements for heating and air conditioning systems.

Performance Indicators	Academic Standards
9.1.3	**Math** 3.12.2 Justify, communicate, and differentiate between precision, error, and tolerance in practical problems. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. 3.12.4 Interpret and apply consumer data presented in charts, tables, and graphs to make informed financial decisions related to practical applications. **Science** P.12.A.1 Students know different molecular arrangements and motions account for the different physical properties of solids, liquids, and gasses. E.12.A.4 Students know convection and radiation play important roles in moving heat energy in the Earth system.

Content Standard 10.0: **Student will demonstrate understanding of general engine diagnosis; computerized engine controls diagnosis and repair; ignition system diagnosis and repair; fuel, air induction and exhaust systems diagnosis and repair; emissions control systems diagnosis and repair; and engine-related service.**

Performance Indicators	Academic Standards
10.1.2, 10.1.3, 10.1.4, 10.1.5, 10.1.6	**Math** 3.12.2 Justify, communicate, and differentiate between precision, error, and tolerance in practical problems. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. 3.12.4 Interpret and apply consumer data presented in charts, tables, and graphs to make informed financial decisions related to practical applications.
10.1.7	**Math** 3.12.2 Justify, communicate, and differentiate between precision, error, and tolerance in practical problems. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. 3.12.4 Interpret and apply consumer data presented in charts, tables, and graphs to make informed financial decisions related to practical applications. **Science** P.12.A.6 Students know chemical reactions either release or absorb energy. P.12.A.7 Students know that, in chemical reactions, elements combine in predictable ratios, and the numbers of atoms of each element do not change.
10.1.8	**Math** 3.12.2 Justify, communicate, and differentiate between precision, error, and tolerance in practical problems. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. 3.12.4 Interpret and apply consumer data presented in charts, tables, and graphs to make informed financial decisions related to practical applications.
10.1.13	**Math** 3.12.2 Justify, communicate, and differentiate between precision, error, and tolerance in practical problems. 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.
10.2.1	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. **Science** P.12.B.2 Students know magnetic forces and electric forces can be thought of as different aspects of electromagnetic force.
10.2.2	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. **Science** P.12.B.2 Students know magnetic forces and electric forces can be thought of as different aspects of electromagnetic force. P.12.C.1 Students know waves (i.e. sound, seismic, electromagnetic) have energy that can be transferred when the waves interact with matter.
10.2.3	**Math** 3.12.3 Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.
10.2.6	**Science** P.12.A.5 Students know chemical reactions can take place at different rates,

	depending on a variety of factors (i.e. temperature, concentration, surface area, and agitation). P.12.A.6 Students know chemical reactions either release or absorb energy.

Content Standard 11.0: The student will demonstrate knowledge of alternative fuels and alternative fuel vehicles.

Performance Indicators	Academic Standards
11.1.1	**Science** N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways. N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts. N.12.B.4 Students know scientific knowledge builds on previous information. E.12.A.2 Students know the composition of Earth's atmosphere has changed in the past and is changing today. E.12.A.3 Students understand the role of the atmosphere in Earth's greenhouse effect. L.12.C.2 Students know how changes in an ecosystem can affect biodiversity and biodiversity's contribution to an ecosystem's stability. L.12.C.3 Students know the amount of living matter an environment can support is limited by the availability of matter, energy, and the ability of the ecosystem to recycle materials.
11.1.4	**Science** P.12.A.4 Students know atoms bond with one another by transferring or sharing electrons. P.12.A.5 Students know chemical reactions can take place at different rates, depending on a variety of factors (i.e. temperature, concentration, surface area, and agitation). P.12.A.7 Students know that, in chemical reactions, elements combine in predictable ratios, and the numbers of atoms of each element do not change. P.12.A.9 Students know the number of electrons in an atom determines whether the atom is electrically neutral or an ion. N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways. N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts. N.12.B.4 Students know scientific knowledge builds on previous information. E.12.A.2 Students know the composition of Earth's atmosphere has changed in the past and is changing today.
11.2.5	**Science** N.12.B.1 Students know science, technology, and society influenced one another in both positive and negative ways. N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts. N.12.B.4 Students know scientific knowledge builds on previous information.

Content Standard 12.0: Students will achieve competence in workplace readiness, career development, and lifelong learning.

Performance Indicators	Academic Standards
12.1.5	**English** 7.12.2 Listen to and provide constructive feedback on oral communications. 7.12.5 Actively listen to oral communications. Listen to and participate in conversations. Listen to and evaluate constructive feedback. Provide constructive feedback. 8.12.1 Give directions to complete tasks or procedures with a focus on clarity, technical vocabulary. Ask questions to clarify. 8.12.4 Participate in conversations to solve problems by identifying, synthesizing, and evaluation data. Ask relevant questions to generate possible solutions to a problem.
12.1.7	**English** 8.12.2 Use precise language to describe and elicit feelings, experiences, observations, ideas. 8.12.4 Distinguish between relevant and irrelevant information.
12.2.2	**English** 5.12.5 Edit for correct use of nouns, verbs, pronouns, adjectives, subject/verb agreement, verb tenses, adverbs, clauses, phrases, pronoun/antecedent agreement, pronoun case. 5.12.6 Edit sentences for complete sentences; combining sentences; compound sentences; complex sentences; compound-complex sentences. Edit sentences for the elimination of fragments, run-ons. 5.12.7 Prepare a legible final draft to display or share. 8.12.1 Give directions to complete tasks or procedures with a focus on clarity, technical vocabulary. Ask questions to clarify. 8.12.4 Participate in conversations to solve problems by identifying, synthesizing, and evaluation data. Ask relevant questions to generate possible solutions to a problem.
12.2.3	**English** 6.12.7 Write a variety of communications in appropriate formats. 6.12.8 Write directions to complete tasks or procedures with attention to clarity, format, technical vocabulary, text features.
12.2.4	**English** 8.12.1 Give directions to complete tasks or procedures with a focus on clarity, technical vocabulary. Ask questions to clarify. 8.12.3 Communicate information by maintaining a clear focus; following a logical sequence; illustrating information with media aids.
12.7.1	**English** 5.12.5 Edit for correct use of nouns, verbs, pronouns, adjectives, subject/verb agreement, verb tenses, adverbs, clauses, phrases, pronoun/antecedent agreement, pronoun case. 5.12.6 Edit sentences for complete sentences; combining sentences; compound sentences; complex sentences; compound-complex sentences. Edit sentences for the elimination of fragments, run-ons. 5.12.7 Prepare a legible final draft to display or share.