

Automotive Service Technician Level 1

Automotive Service Technician

Unit: A1 Learning About Work

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

One sign that an apprentice has become competent in a task or technique is to be asked to share this knowledge. Jobsite skills-exchange has long been fundamental to trade-learning. Even trade veterans rely on peers to refine their knowledge and skill. The opportunity to benefit from this process, however, is shaped by complex factors that include jobsite 'politics' and industrial/construction deadlines. As adult trade-learners, apprentices at all levels of training must use their observational, listening and interpersonal skills to benefit from the JP's knowledge and experience. This requires understanding the trade's dynamics, as well as the roles and responsibilities which order workplace/jobsite work-life.

This unit profiles the trade's structure and scope as determined by the Apprenticeship and Certification Act, regulations, Provincial Advisory Committees and the Red Seal Occupational Standard from which the training standards are derived (core tasks and skill requirements), as well as its job-ladders and long-term career options and social competencies. This includes information about major areas of working knowledge, activities and interactions at work, and expansive and restrictive workplaces, stressing their application to apprenticeship on-the-job training.

A sound grasp of the roles, workplace relationships, and possibilities introduced in this unit are part of 'learning to learn' in Manitoba's apprenticeship system. Senior apprentices are later offered information about learning to *teach* in this system – a central and time-honored foundation of Trades journeywork.

Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. Instead, a 'Pass/Fail' grade will be recorded for the unit in its entirety.

Objectives and Content:	Percent of Unit Mark (%)
1. Describe structure and scope of the Automotive Service Technician trade.	n/a
a. The Apprenticeship and Certification Act	
• Apprenticeship and Certification Board and Provincial Advisory Committees	
• General and specific trade regulation	
• Policies regarding attendance, evaluation procedures, conduct and progression requirements (Apprenticeship Manitoba, Training provider)	
b. Uses of the (Red Seal Occupational Standard (RSOS))	
• Technical training in-school curriculum	
• On-the-job record book of hours (Manitoba blue book)	
• Examinations (level placement tests, final certification examinations)	
c. Opportunities and future career options	

- Generalists and specialists. The move toward specialization is well known to modern tradespeople. Some prefer to specialize and others want to do it all. Supervisory positions require a broad scope.
- Lead hands and other immediate supervisors. Apprentices need to know how to become a lead-hand as much as they need to know the benefits and pit-falls of leadership between management and shop floor workers.
- Geographic mobility. What does it mean to a construction/industrial worker to have to travel to find work? Are there more opportunities if they do? What are they? What are the drawbacks to being away from home for several weeks at a time?
- Job hierarchies and innovations. What trade specific special training opportunities are available in your trade? Is there travel involved? Is there an opportunity to move up the ladder on a work crew as opposed to staying in the shop?

2. Describe two levels of workplace competency.

n/a

- a. Job competencies related to workplace culture
 - Knowledge of workplace equipment and materials
 - Skills and techniques
- b. Social competencies related to workplace culture
 - Frame of reference for evaluation workplace events
 - Language of work
 - Workplace belief systems
 - Rules and meanings
 - Multiculturalism and equity in the workplace

3. Describe accommodation for apprentices with disabilities.

n/a

- a. Technical training
 - Requirements
 - Roles and responsibilities
 - Services and information required by persons with disabilities
- b. On-the-job
 - Requirements
 - Roles and responsibilities
 - Services and information required by persons with disabilities

Automotive Service Technician

Unit: A2 Trade Safety Awareness

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

Safe working procedures and conditions, injury prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers, and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to incidents or injury. It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe, and accident-free working environment. It is imperative to apply and be familiar with the Workplace Safety and Health Act and Regulations. As well, it's essential to determine workplace hazards and take measures to protect oneself, co-workers, the public, and the environment. Safety education is an integral part of Insulator apprenticeship training both in school and on-the-job. Unit content is supplemented throughout Technical Training by trade-specific information about Insulator safety hazards and precautions presented in the appropriate contexts of discussion and study. **Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. Instead, a 'Pass/Fail' grade will be recorded for the unit in its entirety.**

Objectives and Content:

**Percent of
Unit Mark (%)**

1. Identify safety and health requirements.

n/a

- a. Overview of The Workplace Safety and Health Act
 - Rights and responsibilities of employees under the Act
 - Rights and responsibilities of employers under the Act
 - Rights and responsibilities of supervisors under the Act
- b. Fourteen (14) regulations
- c. Codes of practice
- d. Guidelines
- e. Right to refuse
 - Explanation of right to refuse process
 - Rights and responsibilities of employees
 - Rights and responsibilities of employers
 - Rights and responsibilities of supervisors under the Act

2. Identify personal protective equipment (PPE) and procedures.

n/a

- a. Employer and employee responsibilities as related to personal protective equipment.
- b. Standards: ANSI (U.S.A. standards), etc.
- c. Work protective clothing and danger if it fits poorly.

- d. Gloves – Importance of proper glove selection (when handling chemicals, cold items, slivers, etc.)
 - e. Headwear – appropriate protective headwear when required and the approved type of headwear.
 - f. Eye protection – comparison and distinction of everyday eyeglasses, industrial safety glasses and safety goggles
 - g. Foot protection – when required according to safety standards
 - h. Hearing protection
 - Hazards of various noise levels (hearing protection must be worn)
 - Laws
 - Types of hearing protection
 - i. Respiratory protection – types, overview of proper selection
 - j. Fall protection – Manitoba requirements standards guidelines
 - ANSI (U.S.A. standards), etc.
 - k. Ladders and scaffolding
 - l. Safety principles for working with or around industrial trucks site-specific (forklifts, pallet trucks, etc.)
- 3. Identify electrical safety.** **n/a**
- a. Effects of electric current on the human body
 - b. Three factors that affect the severity of an electric shock
 - c. The effects of ARC and blast on the human body and equipment
 - d. Work with energized equipment
- 4. Identify fire safety.** **n/a**
- a. Types of fires
 - b. Types of fire fighting equipment
 - c. Classifications of fire extinguishers (A, B and C)
 - d. Location of fire extinguishers and fire exits
 - e. Fire alarms and drills
- 5. Identify ergonomics.** **n/a**
- a. Definition of ergonomics and conditions that may affect the body
 - Working postures
 - Repetition
 - Force
 - Lifting
 - Tools
 - Identify tool and safety equipment
 - Causes of hand tool accidents
 - Equipment
- 6. Hazard recognition and control.** **n/a**
- a. Safe work practices
 - b. Basic risk assessment
 - c. Injury prevention and control measures
 - d. Identification of hazards involved in pneumatic tool use and explanation of how to guard against them
- 7. Hazard of confined space entry:** **n/a**
- a. Identification of a confined space
 - b. Hazards of a confined space
 - Physical

- Biological
- c. Working in a confined space
- d. Emergency response plan
- e. Self contained breathing apparatus (SCBA)

8. Identify First Aid/CPR: n/a

- a. Overview of First Aid Regulation
- b. Obligations of employers regarding First Aid
 - Who is certified to provide First Aid?
 - What to do while waiting for help?
 - Where is First Aid kit?
- c. Describe basic First Aid requirements and techniques
 - Scope and limits of First Aid intervention
 - Specific interventions (cuts, burns, abrasions, fractures, suffocation, shock, electrical shock, etc.)
 - What is it?
 - Interface with other services and agencies (eg. Workers Compensation claims)
- d. Describe basic CPR requirements and techniques
 - How do you get certified?
 - Scope and limits of CPR intervention (include varieties of CPR certification)

9. Identify the safety requirements as they apply to WHMIS with emphasis on: n/a

- a. WHMIS is a system
- b. Provincial Regulation under the Safety and Health Act
 - Each province has a WHMIS regulation
- c. Federal Hazardous Products Act
- d. WHMIS generic training:
 - WHMIS defined and the format used to convey information about hazardous materials in the workplace
 - Information found on supplier and workplace labeling using WHMIS
 - Hazardous materials in accordance with WHMIS
 - Compliance with government safety standards and regulations
- e. Description of WHMIS (include varieties of WHMIS Certification)
 - Typology of WHMIS labels, symbols, and classifications
 - Scope and use of Materials Safety Data Sheets (MSDS)

10. Identifying and controlling hazards: n/a

- a. Basic control measures (injury prevention)
- b. Safe work procedures
- c. Explanation on the importance of industrial housekeeping
- d. Employer responsibilities
- e. How and where to store materials
- f. Safety measures related to walkways, stairs and floor openings
- g. Explanation of how to protect the worker and others when working in traffic paths

Automotive Service Technician

Unit: A3 Tools, Equipment, Materials and Documentation

Level: One

Duration: 28 hours

Theory: 14 hours

Practical: 14 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about the various tools and equipment when working with today's automotive vehicles and light trucks. Beginning with safe work practices when using tools and equipment, the unit covers the types of hand and power tools, measuring tools, and scan/measuring tools; the unit also covers procedures and other considerations when operating, using and storing tools and equipment.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify hazards and describe safe work practices pertaining to the use of tools and equipment.	5%
2. Describe hand tools, power tools, and specialized test equipment, and procedures for their use.	15%
a. Types and applications, including: <ul style="list-style-type: none">• Electric, Pneumatic, and Hydraulic• Scan tools and digital voltage ohmmeters (DVOM)	
b. Inspection, maintenance and storage procedures	
3. Describe and demonstrate measuring tools and procedures for their use.	15%
a. Types and applications, including: <ul style="list-style-type: none">• Micrometers• Vernier calipers	
b. Inspection, maintenance and storage procedures	
4. Describe shop equipment and procedures for their use.	10%
a. Types and applications	
b. Inspection, maintenance and storage procedures	
5. Describe welding, cutting and heating equipment, and procedures for their use.	10%
a. Types and applications: <ul style="list-style-type: none">• oxy-acetylene heating and cutting• gas metal arc welding (GMAW) metal inert gas welding (MIG)• shielded metal arc welding (SMAW)	
b. Inspection, maintenance and storage procedures	

- 6. Identify types of fasteners, fittings, tubing and hoses, and describe their applications and procedures for use. 5%**

- 7. Describe and demonstrate the procedures used when operating, inspecting, maintaining and storing hoisting and lifting equipment. 15%**
 - a. Terminology associated with hoisting and lifting and types of equipment
 - b. Hazards and safe work practices
 - c. Service information from drawings and specifications

- 8. Identify and interpret identification codes found on the vehicle and vehicle components. 5%**
 - a. Vehicle identification number (VIN)

- 9. Identify types of trade related documents and describe their applications. 10%**
 - a. Work and repair orders
 - b. Schematics, service information and manufacturers' specifications
 - c. Technical service bulletins (TSB)
 - d. Preventative maintenance schedules
 - e. Industry standard labour guides

- 10. Describe the procedures used to prepare and/or complete trade related documents. 10%**
 - a. Work and repair orders
 - b. Pre-delivery inspection
 - c. Preventative maintenance
 - d. Estimates

Automotive Service Technician

Unit: A4 Trade Related Communications

Level: One

Duration: 14 hours

Theory: 14 hours

Practical: 0 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about the communication skills that are beneficial for effective communication when working with today's automotive vehicles and light trucks. The unit covers both communication techniques and communication devices.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify audiences and describe techniques for effective verbal and non-verbal communication.	25%
a. Apprentices	
b. Other tradespersons	
c. Colleagues	
d. Supervisors	
e. Clients	
2. Identify types of communication devices and describe their purpose and operation.	25%
a. Portable and stationary radios	
b. Cellular phones and mobility devices	
c. Computers	
d. Digital camera	
3. Describe the importance of communicating job requirements.	25%
4. Identify types of trade related documents and describe their applications.	25%
a. Codes and standards	
b. Company policies	

Automotive Service Technician

Unit: A5 Trade Related Mathematics

Level: One

Duration: 14 hours

Theory: 14 hours

Practical: 0 hours

Overview:

This unit is designed to provide the apprentice with the knowledge and ability to use mathematics with precision, resourcefulness and confidence. This unit is intended to help make the world of numbers and ratios work for, rather than against, the Automotive Service Technician apprentice. Beginning with an overview of the importance of math to the trade, the unit covers strategies to address math anxiety, a review of general mathematical concepts including the use of calculators, and an overview of trade-related mathematics.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the practical importance of math disciplines to the Automotive Service Technician trade.	10%
a. Definition and scope of relevant math disciplines	
b. Time-sheets, wages, and personal budgeting	
c. Engineering of tools and equipment	
d. Manufacture and packaging of Automotive Service materials and products	
e. Trade documents, including manufacturers' specifications	
f. Computer technology/applications	
g. Design/technical drawing	
h. Work order preparation	
i. Machinery and equipment set-up	
j. Measurement and related test readings	
• Temperatures	
• Pressures	
• Other measured quantities	
k. Customer relations/perceptions (e.g. schedules, timetables, etc.)	
l. Business management	
2. Describe "math anxiety" and its remedies.	10%
a. Definition	
b. Recognition	
c. Options, resources, and techniques for overcoming math anxiety	
d. Other common problems	
• Importance of adult learner's recognition of existing math strengths and weaknesses	
• Importance of early resolution during term of apprenticeship	

- Options/resources for remedial math instruction and other assistance

3. Review general math concepts and use of electronic calculators. 60%

- a. Basic operations
 - Addition
 - Subtraction
 - Multiplication
 - Division
 - Order of operations
 - Fractions and decimals
- b. Ratio and proportion
- c. Percentage calculations
- d. Constructing/solving simple equations
- e. Units of measure
 - Imperial
 - Metric (SI)
 - Conversion factors

4. Demonstrate trade-related calculations as specified by instructor. 20%

- a. Linear measurement
- b. Area and volume
- c. Ratio/proportion
 - Ratios
 - Percentages
 - Rates
- d. SI/Metric Units (including Conversions)

Automotive Service Technician

Unit: A6 Engine Fundamentals

Level: One

Duration: 28 hours

Theory: 21 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about engine principles when working with today's automotive vehicles and light trucks. Beginning with terminology and internal combustion principles, the unit covers types of engine classifications and configurations, types of valve train configurations; the unit also covers calculations related to engine displacement, compression ratios, horsepower, area and volume.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with engines.	5%
2. Explain internal combustion principles.	15%
3. Identify types of engine classifications.	5%
a. Fuel	
• Diesel	
• Gasoline	
• Alternate fuels	
b. Stroke	
4. Identify types of engine configurations and describe their construction.	5%
a. Inline	
b. Rotary	
c. Opposed	
d. V	
5. Identify types of valve train configurations and describe their construction.	30%
a. Push rod	
b. Overhead cam	
c. Multi-valve	
d. Solenoid operated valve	
6. Identify engine components and describe their design, purpose and operation.	30%
a. Block assembly	
b. Cylinder head assembly	
c. Timing	

- Gears
 - Belts
 - Chains
 - Variable
- d. Mounts

7. **Identify types of fasteners, gaskets, seals and sealants and describe their applications and procedures for use.** **5%**
8. **Calculate engine displacement, compression ratios, horsepower, area and volume.** **5%**

Automotive Service Technician

Unit: A7 Electrical Systems I: Fundamentals

Level: One

Duration: 56 hours

Theory: 42 hours

Practical: 14 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about electrical and electronic principles when working with today's automotive vehicles and light trucks. Beginning with terminology and safe work practices, the unit covers basic electrical theory, battery related testing, electrical and electronic components and their purpose and operation; the unit also covers procedures used to diagnose, repair and replace circuits and components.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with electrical, electronic and magnetic principles.	5%
2. Identify hazards and describe safe work practices pertaining to electrical and electronic components. a. Personal b. Vehicle	5%
3. Interpret information pertaining to electrical and electronic components found on drawings and specifications. a. Diagnostic flowcharts b. Schematics	10%
4. Explain basic electrical theory. a. Conventional theory b. Electron theory	10%
5. Explain Ohm's law and its applications to electrical circuits. a. Series circuit b. Parallel circuit c. Series-parallel circuits	10%
6. Identify types of tools and equipment used to test and charge batteries and describe/demonstrate their applications and procedures for use.	10%
7. Describe batteries and their characteristics. a. Function b. Service ratings c. Construction	10%

- d. Charging and boosting
 - e. Servicing and diagnosing
- 8. Identify types of wire and describe their characteristics, composition and applications. 10%**
- 9. Identify types of electrical components and describe their purpose and operation. 10%**
- a. Circuit protection
 - b. Control devices
 - c. Load devices
- 10. Identify tools and equipment used to test circuits and components and describe/ demonstrate their applications and procedures for use. 10%**
- a. Scan tools
 - b. DVOM
- 11. Identify methods of wire repair and describe/demonstrate their associated procedures. 10%**
- a. Splicing
 - b. Terminal replacement
 - c. Soldering
 - d. Crimping

Automotive Service Technician

Unit: A8 Steering and Suspension Systems I

Level: One

Duration: 21 hours

Theory: 14 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about steering systems when working with today's automotive vehicles and light trucks. Beginning with terminology and safe work practices, the unit covers types of steering systems, steering gears, assist systems, and their components; the unit also covers the procedures used to adjust, diagnose, repair and replace steering systems and their components.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with steering and suspension systems.	10%
2. Identify hazards and describe safe work practices pertaining to steering and suspension systems.	10%
3. Identify tools and equipment relating to steering and suspension systems and describe their applications and procedures for use.	10%
4. Identify types of suspension systems and describe their components and operation.	20%
a. Independent	
b. Solid axle	
5. Identify types of frames and body construction.	5%
6. Identify types of steering and suspension systems and describe their components and operation.	30%
a. Steering	
• Linkage	
• Rack-and-pinion	
• Recirculating ball	
b. Suspension	
• Coil springs	
• Leaf springs	
• Torsion bar springs	
• Air springs	
• Struts	
• Shocks	

- 7. Identify types of steering assist systems and describe their components. 10%**
- a. Electric
 - b. Hydraulic
 - c. Variable
- 8. Identify types of fluids and lubricants, fasteners, tubing, hoses, gaskets and seals and describe their applications. 5%**

Automotive Service Technician

Unit: A9 Drive Shafts and Axles

Level: One

Duration: 21 hours

Theory: 14 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about drive shafts and axles when working with today's automotive vehicles and light trucks. Beginning with terminology and safe work practices, the unit covers types of drive shafts, drive shaft components, axles and their components; the unit also covers the procedures used to adjust, diagnose, repair and replace drive shafts and axles, and their components.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with drive shafts and axles.	10%
2. Identify hazards and describe safe work practices pertaining to drive shafts and axles.	5%
3. Identify tools and equipment relating to drive shafts and axles and describe their applications and procedures for use.	10%
a. Dial indicators	
b. Inclinator	
4. Identify types of drive shafts and describe their composition.	10%
a. Front-wheel drive (CV shafts)	
b. Rear-wheel drive	
5. Identify types of drive shaft components and describe their purpose and operation.	15%
a. Slip yokes and flanges	
b. Flex joints	
c. Single cardan joints	
d. Double cardan joints	
e. Support bearing	
f. Viscous coupling	
6. Identify types of axles and describe their components and operation.	15%
a. Half shafts (independent suspension)	
b. Floating	
c. Semi-floating	

7. **Describe and demonstrate the importance of multiple piece drive shaft phasing and indexing.** 5%
8. **Identify types of lubricants, fasteners, gaskets, seals and sealants and describe their applications.** 5%
9. **Describe and demonstrate the procedures used to diagnose and repair drive shafts and axles systems.** 25%

Automotive Service Technician

Unit: A10 Braking Systems I (Non-ABS)

Level: One

Duration: 42 hours

Theory: 28 hours

Practical: 14 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about non-ABS braking systems when working with today's automotive vehicles and light trucks. Beginning with terminology and safe work practices, the unit covers hydraulic principles and types of braking systems including their components and operation; the unit also covers procedures used to adjust, diagnose, repair and replace braking systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with braking systems.	10%
2. Identify hazards and describe safe work practices pertaining to braking systems.	5%
a. Hydraulic pressure	
3. Explain hydraulic principles related to braking systems.	5%
a. Pascal's law	
4. Identify types of tools and equipment relating to braking systems and describe their applications and procedures for use.	10%
5. Identify types of braking systems and describe their components and operation.	25%
a. Disc	
b. Drum	
c. Parking	
6. Identify types of power assists and describe their components and operation.	15%
a. Vacuum	
b. Hydraulic	
c. Electric	
7. Identify types of fluids and describe their applications and procedures for use.	5%
8. Identify types of fittings, flaring, tubing and hoses and describe their applications and procedures for use.	10%

- 9. Describe and demonstrate the procedures used to diagnose and repair braking systems. 15%**
- a. Flush and bleed hydraulic brakes
 - b. Measure and machine components
 - c. Adjust, inspect, repair and/or replace braking system components

Automotive Service Technician

Unit: A11 Tires, Wheels and Hubs

Level: One

Duration: 28 hours

Theory: 14 hours

Practical: 14 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about tires, wheels and hubs when working with today's automotive vehicles and light trucks. Beginning with terminology and safe work practices, the unit covers tire codes and sidewall markings, tools and equipment related to tires, wheels and hubs; the unit also covers procedures used to diagnose, repair or replace tires and wheel assemblies.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with tires, wheels and hubs.	5%
2. Identify hazards and describe safe work practices pertaining to tires and wheels.	10%
3. Identify types of tires and describe their construction.	10%
a. Codes and sidewall markings	
b. Inflation	
c. Sizing	
4. Identify types of tools and equipment relating to tires, wheels and hubs and describe their applications and procedures for use.	10%
5. Identify types of wheels and describe their construction.	10%
a. Construction	
b. Sizing	
c. Offset and backspace	
6. Identify types of hubs and bearing assemblies and describe their components and operation.	10%
7. Identify types of tire pressure monitoring systems (TPMS).	10%
a. Types (direct, indirect)	
b. Reset procedures	
c. Servicing and diagnosing	

8. Describe and demonstrate the procedures used to diagnose, adjust, repair and/or replace tires, wheels and hubs. 35%

- a. Tires
 - Index and balance
 - Rotation and maintenance
 - Radial and lateral runout
 - Causes of abnormal tire wear
- b. Wheels
 - Parts and purpose of wheel sections
 - Radial and lateral runout
- c. Hubs
 - Application
 - Original equipment manufacturer (OEM) procedures
 - Servicing and inspection of bearing assembly parts

Automotive Service Technician

Unit: A12 Body Components and Trim

Level: One

Duration: 7 hours

Theory: 5 hours

Practical: 2 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about body components and trim when working with today's automotive vehicles and light trucks. Beginning with terminology and safe work practices, the unit covers body components and accessories, types of electrical/electronic systems, and types and sources of noise, vibration and harshness; the unit also covers the procedures used to adjust, diagnose, repair and replace body components and trim.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with body components and trim.	5%
2. Identify hazards and describe safe work practices pertaining to body components and trim.	5%
a. Restraint systems	
3. Identify tools and equipment relating to body components and trim and describe their applications and procedures for use.	5%
4. Explain the principles of basic aerodynamics related to body design.	5%
5. Identify body components and accessories and describe their purpose and operation.	5%
a. Interior	
b. Exterior	
6. Identify types of electrical/electronic systems and describe their components and operation.	10%
a. Locks	
b. Latches	
c. Windows	
7. Identify types and sources of noise, vibration and harshness (NVH).	15%
a. Chuckles	
b. Rattles	
c. Knocks and whines	
d. Offensive noises	

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|---|------------|
| 8. Identify materials used to dampen or interrupt vibration. | 5% |
| a. Tapes | |
| b. Adhesives | |
| c. Insulators | |
| 9. Identify types and sources of wind and water leaks. | 10% |
| 10. Identify types of seals, adhesives, cleaners and sealing materials and describe their applications and procedures for use. | 5% |
| 11. Describe and demonstrate the procedures used to diagnose body components and trim. | 10% |
| 12. Describe and demonstrate the procedures used to adjust, repair and/or replace body components and trim. | 20% |

Automotive Service Technician

Unit: A13 Hybrid and Electric Vehicle Systems I

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to provide the Automotive Service Technician apprentice with an introduction to the knowledge about current-generation hybrid and electric vehicle systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the fundamentals of hybrid technology.	20%
a. Differences compared to traditional non-hybrid technologies	
• Advantages	
• Disadvantages	
b. Types of hybrid powertrain designs	
• Series	
• Parallel	
• Series-parallel	
c. Levels of hybrid vehicles	
• Mild hybrid	
• Medium hybrid	
• Full hybrid	
2. Describe hybrid vehicle safety hazards.	50%
a. Properly tag out the vehicle	
b. Fire hazards	
c. Electrocutation hazards	
d. Electrolyte hazards	
e. Use of hybrid identification markers	
f. Working environment	
• Dry floor	
• With a partner	
3. Describe tools for hybrid vehicle safety.	10%
a. Personal protective equipment	
• High voltage gloves	
• Testing high voltage gloves	
• Safety glasses	

- Insulated steel-toed boots
- b. High voltage multimeters and leads (Cat III)
- c. Warning pylons
- d. Insulated tools
- e. Engine crane for battery removal
- f. Hook or gaff for electrocution

4. Describe differences with high voltage batteries.

20%

- a. Safety precautions for working on high voltage battery
 - Personal protective equipment
 - One hand rule
- b. Different types of hybrid batteries
 - Lead-acid batteries in series
 - Nickel-metal hydride
 - Lithium-ion
- c. Safety procedures
 - Different disconnect procedures
 - Verify voltage
