Automotive Painter
Level 1

Rev. December 2020

Apprenticeship Manitoba

Automotive Painter

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 National/Provincial Occupational Analysis 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 Auto Body and Collision 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) – Automotive Refinishing Technician
      - 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

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Apprenticeship Manitoba

Automotive Painter

Unit: A2 Trade Safety Awareness

Level: One

Duration: 7 hours

Theory: 6 Hours

Practical: 1 Hour

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 trade apprenticeship training both in school and on-the-job. Unit content is supplemented throughout Technical Training by trade-specific information about trade 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 ("the 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: Canadian Standards Association (CSA), American National Standards Institute (ANSI) and guidelines 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 (simple safety procedures and precautions related to material handling procedures on how to lift carry and put down a load)
   - 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 Cardiopulmonary Resuscitation (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 Workplace 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

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Apprenticeship Manitoba

Automotive Painter

Unit: A3 Tools and Equipment I

Level: One

Duration: 7 hours

Theory: 3 Hours

Practical: 4 Hours

Overview:

This unit is designed to provide the apprentice with the knowledge and skills for using and maintaining tools. Topics include: safely using and maintaining hand tools, measuring equipment, and specialized measuring equipment, testing equipment, using power tools, shop equipment, electric welding and gas cutting equipment, straightening equipment, and refinishing and detailing tools.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Identify tools and equipment, and describe their applications.	**20%**
a. Basic hand tools b. Power tools • Electric • Pneumatic • Hydraulic c. Shop d. Refinishing e. Detailing	
2. Describe and demonstrate care and maintenance procedures related to tools and equipment.	**40%**
a. Basic hand tools b. Power tools • Electric • Pneumatic • Hydraulic c. Shop d. Refinishing e. Detailing	
3. Demonstrate the use of various types of tools and equipment.	**40%**
a. Basic hand tools b. Power tools • Electric • Pneumatic • Hydraulic c. Shop	

d. Refinishing
e. Detailing

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Apprenticeship Manitoba

Automotive Painter

Unit: A4 Trade Related Documents

Level: One

Duration: 7 hours

Theory: 5 Hours

Practical: 2 Hours

Overview:

This unit is designed to provide the apprentice with an overview of trade related documents, including the use of vehicle identification numbers, paint codes, production dates, and other technical information.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Identify sources of related information.	**10%**
2. Identify and interpret information found on the vehicle. a. Vehicle Identification Number (VIN) b. Paint code c. Production date	**20%**
3. Identify types of documents and describe the procedures used to interpret them. a. Safety data sheets (SDS) b. Work orders c. Estimates d. Technical manuals and bulletins e. Incident reports and spill logs	**20%**
4. Describe the procedures used to prepare documentation. a. Work orders b. Estimates	**10%**
5. Describe procedures for ordering refinishing materials and related supplies.	**10%**
6. Describe procedures for organizing/storing refinishing materials and related supplies.	**10%**
7. Retrieve VIN and all other necessary information as specified by the instructor for a specific job.	**10%**
8. Retrieve trade related documents from the computer.	**10%**

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Apprenticeship Manitoba

Automotive Painter

Unit: A5 Communication

Level: One

Duration: 7 hours

Theory: 6 Hours

Practical: 1 Hour

Overview:

This unit is designed to provide the apprentice with the knowledge about the communication skills required when working in the industry. Beginning with communication practices, the unit also covers aspects of customer relations and resume writing.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe importance of effective communication practices. a. Customers b. Co-workers c. Appraisers d. Suppliers e. Journeypersons/apprentices	**20%**
2. Identify the types of communication equipment and describe their operating procedures.	**20%**
3. Role-play how to deal with challenging situations. Practice empathetic listening and response.	**10%**
4. Practice listening skills with customers.	**10%**
5. Perform resume writing, practice selling yourself.	**40%**

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Apprenticeship Manitoba

Automotive Painter

Unit: A6 Trim and Hardware

Level: One

Duration: 7 hours

Theory: 2 Hours

Practical: 5 Hours

Overview:

This unit is designed to provide the apprentice with the knowledge and skills for working with trim and hardware. Topics will include: types of trim, hardware, fasteners and adhesives; visual inspection of trim and hardware for collision related damage; removal and installation/application of fasteners and adhesives; and removal and installation of pin stripes and decals.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with trim and hardware.	**10%**
2. Identify hazards and describe safe work practices pertaining to trim, hardware, fasteners and adhesives. a. Personal b. Vehicle	**20%**
3. Identify and describe the types of trim, hardware, fasteners, and adhesives. a. Interior b. Exterior c. Mechanical fasteners d. Adhesives	**20%**
4. Describe and demonstrate the procedures used to visually inspect trim and hardware for collision related damage. a. Locate/detect b. Remove and install	**10%**
5. Describe and demonstrate the procedures used to remove and install/apply fasteners and adhesives. a. Type and location of mechanical fasteners b. Type and location of adhesives	**20%**
6. Describe and demonstrate the procedures used to remove and install pin stripes and decals.	**20%**

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Apprenticeship Manitoba

Automotive Painter

Unit: A7 Metal Panels and Components

Level: One

Duration: 21 hours

Theory: 7 hours

Practical: 14 hours

Overview:

This unit is designed to provide the apprentice with the knowledge and skills about metal panels and components. Topics include: describing types of sheet metal and types of damage, performing metal work on sheet metal, panels and repair procedures, paintless dent repair, detecting surface irregularities, and rough out and alignment of damaged mild sheet metal.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with vehicle construction, automotive sheet metal and components. a. Vehicle construction b. Structural c. Non-structural	**10%**
2. Identify hazards and describe safe work practices when working with automotive sheet metal and components.	**10%**
3. Identify and describe the types of vehicle construction, automotive sheet metal and their characteristics. a. Substrates • Steel • Aluminum • Composites (including plastics)	**15%**
4. Identify and describe types of damage to sheet metal. a. Direct b. Indirect	**5%**
5. Identify considerations when performing metal work on automotive sheet metal. a. Tool selection b. Repair sequence c. Protection of adjacent panels d. Panel preparation e. Corrosion protection	**10%**

6. Describe and demonstrate repair procedures on automotive sheet metal. 15%

a. Accessibility
   - Hammer and dolly
   - Shrinking (hot or cold)

b. Limited accessibility
   - Prybar
   - Pick
   - Dent puller
   - Uni-spotter

c. Paintless dent repair (PDR)

d. Rough out

e. Align and adjust

7. Describe and demonstrate methods used to detect surface irregularities on automotive sheet metal. 10%

8. Describe and demonstrate procedures used to prepare automotive sheet metal for application of fillers. 10%

9. Demonstrate and perform the following repair procedures on automotive sheet metal. 15%

a. Unlocking and reshaping

b. Dent removal

c. Shrinking and stress relieving

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Apprenticeship Manitoba

Automotive Painter

Unit: A8 Body Fillers and Abrasives

Level: One

Duration: 14 hours

Theory: 4 hours

Practical: 10 hours

Overview:

This unit is designed to provide the apprentice with the knowledge and skills for using body fillers and abrasives. Topics include: describing characteristics and applications of abrasives, techniques for using abrasives, types of abrasives and body fillers, safety considerations, applying body fillers and shaping and finishing body fillers.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with body filler and abrasives.	**10%**
2. Identify hazards and describe safe work practices when working with body fillers and abrasives.	**10%**
3. Describe the types of body fillers and their characteristics and applications.	**10%**
4. Describe and demonstrate the techniques and procedures for using body fillers and abrasives. a. Body filler application • Tool selection • Surface preparation • Mixing technique • Application techniques b. Shaping and finishing • Tool selection • Grit selection • Sanding techniques • Detect surface irregularities (high and low spots) • Visual inspection • Guide coat application • Tactile (touch) technique	**35%**
5. Demonstrate and perform body filler application, shaping and finishing techniques on automotive sheet metal.	**35%**

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Apprenticeship Manitoba

Automotive Painter

Unit: A9 Plastic and Composite Panels

Level: One

Duration: 7 hours

Theory: 3 hours

Practical: 4 hours

Overview:

This unit is designed to provide the apprentice with an overview of plastics and composite repairs. Topics include: describing the characteristics of plastics and composite repairs, products and materials used in plastics and composite repair, International Organization for Standardization codes, procedures for plastics and composite repairs.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with plastic and composite panels and components.	**10%**
2. Identify hazards and describe safe work practices when working with plastic and composite panels and components.	**10%**
3. Describe the types of plastic and composite panels and their characteristics and applications. a. International Organization for Standardization (ISO) codes b. Substrates	**25%**
4. Demonstrate and perform the techniques and procedures for removing and installing plastic and composite panels and their components.	**15%**
5. Demonstrate and perform adhesive repair procedures.	**40%**

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Apprenticeship Manitoba

Automotive Painter

Unit: A10 Surface Preparation

Level: One

Duration: 28 hours

Theory: 7 Hours

Practical: 21 Hours

Overview:

This unit is designed to provide the apprentice with the knowledge and skills for surface preparation and application of undercoats and topcoats (cleaning, stripping and masking). Topics include: describing working conditions for surface preparation, products, application and procedures for cleaning surfaces, evaluating types of substrate, evaluating and stripping topcoats and undercoats, stripping paint, using abrasives to prepare surfaces, and techniques for masking and removing masking.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with surface preparation.	**10%**
2. Identify hazards and describe safe work practices when performing surface preparation. a. Personal b. Shop/facility c. Equipment d. Environmental	**10%**
3. Describe and demonstrate products used to clean surfaces, their applications and procedures for use. a. Soapy water b. Pre-wash cleaner (wax and grease remover) • Water-based • Alcohol-based • Solvent-based c. Anti-static plastic cleaner	**10%**
4. Identify substrate types and describe the procedures and considerations for evaluating their condition. a. Metals (steel and alloys) b. Non-metals (plastics and composites)	**10%**
5. Describe and demonstrate types of masking materials, their applications and procedures for use. a. Duct tape b. Cardboard c. Tarps	**20%**

d. Masking paper (plastic)

6. Describe and demonstrate the types of surface preparation and their characteristics and applications. **20%**

a. Chemical stripping
b. Media blasting
c. Mechanical

7. Describe and demonstrate surface preparation of substrates. **20%**

a. Feather edging
b. Back sanding
c. Final sanding
d. Prepping for blend areas
e. Removal of decals, pin striping and emblems

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Apprenticeship Manitoba

Automotive Painter

Unit: A11 Repair Materials

Level: One
Duration: 35 hours
Theory: 7 hours
Practical: 28 hours

Overview:

This unit is designed to provide the apprentice with knowledge and skills for using and applying repair materials.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with repair materials.	**10%**
2. Identify hazards and describe safe work practices when using repair materials. a. Personal b. Shop/facility c. Equipment d. Environmental	**10%**
3. Describe and demonstrate the types of repair materials, their characteristics, applications, and procedures for use. a. Original equipment manufacturer (OEM) corrosion protection • Epoxy primer • Self-etching primer • Direct-to-metal primer • Metal conditioning • Primer surfacer • Rocker guard/gravel guard	**30%**
4. Identify substrate types and describe the procedures for use and selection of repair materials. a. Steel b. Aluminum c. Plastics d. Composites	**10%**
5. Perform application of repair materials on an automotive panels. a. Steel b. Aluminum c. Plastics d. Composites	**40%**

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Apprenticeship Manitoba

Automotive Painter

Unit: A12 Refinishing Equipment Preparation I

Level: One

Duration: 14 hours

Theory: 4 hours

Practical: 10 hours

Overview:

This unit is designed to provide the apprentice with the knowledge and skills for working with refinishing equipment preparation. Topics include: safe work practices; and procedures used to set-up, operate and maintain the spray booth and spray gun.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with refinishing equipment preparation.	**10%**
2. Identify hazards and describe safe work practices when preparing refinishing equipment. a. Personal b. Shop/facility c. Equipment d. Environmental	**10%**
3. Describe and demonstrate the procedures used to set-up, operate and maintain the spray booth. a. Setup and preparation • Position air movers • Adjust spray booth temperature and air pressure b. Operate c. Maintenance • Clean and drain air line system • Inspect and replace air filter d. Shutdown	**20%**
4. Describe and demonstrate the procedures used to set-up, operate and maintain the spray gun. a. Setup and preparation • Install recommended fluid tip needle and air cap • Attach cups and hose coupler • Adjust fluid delivery, air pressure, and fan width b. Operate c. Maintenance • Identify, troubleshoot and correct spray pattern problems	**30%**

- Cleaning
- Lubricating

5. Describe and demonstrate complete paint booth and spray gun setup and preparation procedures. **30%**

a. Paint booth setup and preparation procedures

b. Spray gun pattern problem identification and correction
   - Heavy on the top or bottom
   - Heavy in the middle
   - Hourglass
   - Crescent

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Apprenticeship Manitoba

Automotive Painter

Unit: A13 Refinishing Materials I

Level: One

Duration: 49 hours

Theory: 14 hours

Practical: 35 hours

Overview:

This unit is designed to provide the apprentice with the knowledge and skills for using and applying refinishing materials.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with refinishing materials. a. Surface preparation b. Application	**10%**
2. Identify hazards and describe safe work practices when using refinishing materials.	**10%**
3. Describe and demonstrate the types of refinishing materials, their characteristics, applications, and procedures for use. a. Characteristics • Waterborne • Solvent borne b. Types • Epoxy-based • Polyester • Urethane • Transparent • Tintable • Non-tintable c. Applications • Sealers • Topcoats (single-stage, two-stage, multi-stage) • Clearcoats d. Additives • Flattening agents • Blending agents • Accelerators • Retarders • Adhesion promoters • Flex agents	**40%**

- Solvents
- Hardeners

4. Describe and demonstrate application of refinishing materials on an automotive panels. **40%**

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Apprenticeship Manitoba

Automotive Painter

Unit: A14 Post-Refinishing Functions I

Level: One

Duration: 7 hours

Theory: 4 hours

Practical: 3 hours

Overview:

This unit is designed to provide the apprentice with the knowledge and skills for performing post-refinishing functions on vehicles. Topics include: safe work practices when performing post-refinishing functions; the post-refinishing functions for the exterior and interior of a vehicle; and the equipment and products used when performing post-refinishing functions.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with post-refinishing functions.	**10%**
2. Identify hazards and describe safe work practices when performing post-refinishing functions.	**10%**
3. Describe and demonstrate the post-refinishing functions for the exterior of the vehicle. a. Topcoat defects b. Overspray c. Masking d. Cleaning (washing)	**15%**
4. Describe and demonstrate the post-refinishing functions for the interior of the vehicle. a. Dust b. Stains c. Glass d. Foreign objects (example: gum) e. Odour f. Techniques for removing g. Vacuuming	**20%**
5. Describe and demonstrate equipment and products used in the post-refinishing of the vehicle. a. Exterior of the vehicle b. Interior of the vehicle	**20%**
6. Perform post-refinishing procedures on a vehicle. a. Exterior of the vehicle	**25%**

- Wash
- Polish
- Apply decals, pin stripings and emblems

b. Interior of the vehicle
   - Clean
   - Vacuuming

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Apprenticeship Manitoba

Automotive Painter

Unit: A15 Trade Related Science, Mathematics and Batteries

Level: One

Duration: 28 hours

Theory: 23 hours

Practical: 5 hours

Overview:

This unit is designed to provide the apprentice with the knowledge and skills about trade related sciences, mathematics and batteries.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define and explain terms associated with batteries. a. Conventional b. Hybrid	**10%**
2. Identify hazards and describe safe work practices when working with automotive batteries. a. Personal b. Vehicle c. Disposal and recycling	**10%**
3. Identify and describe types of batteries and their purpose, location, construction, operation and ratings. a. Conventional b. Hybrid	**10%**
4. Describe science concepts associated with batteries and refinishing materials (paint). a. Safety precautions for working on batteries and paint products • Personal protective equipment (PPE) • Different disconnect procedures • Ventilation b. Different types of batteries • Lead-acid batteries • Nickel-metal hydride • Lithium-ion c. Different types of paint products • Waterborne • Solvent-based	**30%**
5. Describe the procedures used when working with automotive batteries.	**15%**

a. Charge
   - Slow
   - Fast
b. Remove and replace
c. Maintaining memory
d. Disconnect and connect
e. Boosting

6. Perform basic arithmetic. 15%

a. Whole numbers
   - Operations and sequence
   - Addition
   - Subtraction
   - Division
b. Rules of brackets
c. Dimensioning and shop related applications
d. Fractions and decimals
   - Types of fractions
   - Terminology
     -Numerator/denominator
     -Lowest common denominator
     -Least common multiple
     -Reciprocal fractions
   - Decimals (Decimal fractions; mixed decimals)
   - Manipulation of common and decimal fractions
   - Fraction to decimal and decimal to fraction conversions
   - Dimensioning and shop related applications
e. Metric measurement
   - Units of metric measure
   - Shop related practical applications
f. Imperial measurement
   - Units of Imperial measure
   - Imperial and metric conversions
   - Shop-related practical applications: calculating and mixing by percentage and parts/volume
g. Percent: practical applications
   - Payroll calculations
   - Purchasing parts & paints
h. Ratio
   - Writing comparisons as ratios
   - Stating and interpreting ratios
   - Equality within ratios
i. Proportion
   - Direct proportions: gear ratios, tapers
   - Inverse proportions: gear and pulley systems
   - Solving trade-related proportion problems
j. Geometry concept applications: shapes and measurement
   - Perimeter, area, volume

7. Perform basic algebra. 10%

a. Signed numbers: comparison of signed numbers
b. Basic equations

- Algebraic operations: addition, subtraction, multiplication, division, powers, roots
- Solving equations using principles of equality and transportation
- Solving equations using combined operations
- Shop related applications

c. Formulas
- Formula manipulation
- Solve production time problems

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