Automotive Technology

Module 1: Introduction to Automotive Technology

Student Workbook

Produced by the Instructional Materials Laboratory
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### INTRODUCTION TO AUTOMOTIVE TECHNOLOGY

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</table>
Directions — Answer the following questions by writing all responses on this sheet.

1. In which three types of businesses are the majority of automotive technicians employed?
   A. 
   B. 
   C. 

2. Name six career opportunities directly related to the automotive technology field.
   A. 
   B. 
   C. 
   D. 
   E. 
   F. 

3. What kind of training is required for most jobs in the automotive technology field?
4. Answer the following questions about ASE.
   
   A. What does ASE stand for and what is the organization’s purpose?

   B. What are the eight automotive areas that an automotive technician can be certified in by ASE?
      
      •
      •
      •
      •
      •
      •
      •
      •

5. What is the government’s prediction for the number of job opportunities in automotive technology in the years through 2014?
INTRODUCTION TO AUTOMOTIVE TECHNOLOGY

AS1-L1-UII

WORK SAFETY IN THE SHOP

Directions — Answer the following questions by writing all responses on this sheet.

1. Name the two federal agencies that issue safety guidelines for the workplace and describe the focus of each agency.

   A. 

   B. 

2. Write the reason for each safety rule below.

   A. Do not wear jewelry in the shop.

   B. Do not run a vehicle engine inside a closed garage unless hooked up to exhaust ventilation equipment.

   C. Wear a particle mask when doing cleaning work on brakes or clutch parts.

   D. Discard, repair, or replace worn tools.

   E. Do not use an electrode holder that has damaged insulation.

   F. Handle acetylene and oxygen cylinders with care.
3. Match the personal protective equipment (PPE) on the right that is most appropriate for the description on the left. All the PPE choices will not be used.

   ____ A. Loud noise created by grinder
   ____ B. Handling of caustic chemicals
   ____ C. Street clothes could get soiled
   ____ D. Potential for breathing dust
   ____ E. Wear every day in the shop
   ____ F. Potential for chemicals splashing in eyes
   ____ G. Working around toxic fumes
   ____ H. Flying objects could injure the face

   1. Air-supplied respirator
   2. Apron
   3. Ear muffs
   4. Face shield
   5. Leather gloves
   6. Protective eyewear
   7. Respiratory mask
   8. Rubber gloves
   9. Shop coat
   10. Splash-resistant goggles
   11. Tinted goggles

4. Why must the SRS be disabled before working on or around the air bags?

5. What can happen if an ABS component that is supposed to be replaced as an assembly is disassembled?
IDENTIFY VEHICLES EQUIPPED WITH A SUPPLEMENTAL RESTRAINT SYSTEM (SRS) AND ANTILOCK BRAKE SYSTEM (ABS)

Equipment:

Personal protective equipment (PPE)

Procedure:

1. Wear PPE while performing the procedures on this job sheet.

2. Research applicable vehicle service information such as vehicle service history, VIN, certification labels, and calibration decals. Record the necessary information in the following space.

3. In the space below, record the digits in the VIN that indicate if the vehicle is equipped with an SRS and ABS.

4. In the space below, record any other indicators such as symbols on the vehicle or warning schematics that indicate if the vehicle is equipped with an SRS and ABS.

NOTE: An oversized steering wheel hub is not sufficient evidence that the vehicle is equipped with an SRS.

Average of the above evaluations
SAFETY FEATURES AND EMERGENCY PROCEDURES IN THE SHOP

Directions — Answer the following questions by writing all responses on this sheet.

1. An automotive technician should know the location of certain areas or safety-related items in a shop. Name eight of these.
   
   A.  
   B.  
   C.  
   D.  
   E.  
   F.  
   G.  
   H.  

2. Should a fire blanket be used on a burning person wearing synthetic clothing? Explain why or why not.

3. List the type of fire for the following classes of fires.
   
   A. Class A  
   B. Class B  
   C. Class C
D. Class D

4. Which type of fire extinguisher should be used for the following classes of fires?
   A. Class A
   B. Class B
   C. Class C
   D. Class D

5. What should be done when someone receives an immobilizing electrical shock?
**INTRODUCTION TO AUTOMOTIVE TECHNOLOGY**

**AS2-L2-UII**

**SHOP SAFETY INSPECTION CHECKLIST**

**Directions** — Perform a safety inspection of the school shop or another shop specified by the instructor. Use the checklist below to guide the inspection and record the findings.

<table>
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<tr>
<th>Shop Layout and Emergency Procedures</th>
<th>YES</th>
<th>NO</th>
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<tr>
<td>Exits are clearly identified and visible?</td>
<td></td>
<td></td>
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<tr>
<td>Exits are clear of obstructions?</td>
<td></td>
<td></td>
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<tr>
<td>Specific work areas (e.g., welding, grinding, painting) are clearly marked?</td>
<td></td>
<td></td>
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<tr>
<td>Instructor and students know emergency evacuation routes and procedure?</td>
<td></td>
<td></td>
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<tr>
<td>Emergency phone and numbers are readily available?</td>
<td></td>
<td></td>
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<tr>
<td>Notes:</td>
<td></td>
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<table>
<thead>
<tr>
<th>Shop Cleanliness and Order</th>
<th>YES</th>
<th>NO</th>
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<tr>
<td>Pathways, especially to exits, are clear?</td>
<td></td>
<td></td>
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<tr>
<td>Floor, walls, and other surfaces are free of paint spills, grease, and oil?</td>
<td></td>
<td></td>
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<tr>
<td>Work areas are free of trash and debris?</td>
<td></td>
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<tr>
<td>Oily rags are disposed of in the proper container?</td>
<td></td>
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<td>Notes:</td>
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<tr>
<th>Fire Protection</th>
<th>YES</th>
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<td>Fire blanket is readily available?</td>
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<td></td>
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<tr>
<td>An adequate number of fire extinguishers are available?</td>
<td></td>
<td></td>
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<tr>
<td>The correct types of fire extinguishers are available?</td>
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<td>Fire extinguishers are properly marked and not blocked by obstructions?</td>
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<td></td>
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<tr>
<td>Fire extinguishers are fully charged?</td>
<td></td>
<td></td>
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<tr>
<td>Instructor and students are trained in using fire extinguishers?</td>
<td></td>
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<tr>
<td>Fire alarms are clearly marked and readily accessible?</td>
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<td>Notes:</td>
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<tr>
<td><strong>Hazardous Wastes and Materials</strong></td>
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<tr>
<td>Storage containers for hazardous wastes are clearly marked?</td>
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<td>An MSDS is on file and readily available for every hazardous material in the shop?</td>
<td></td>
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<tr>
<td>Eye wash station is available and operational?</td>
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<th><strong>Tools and Equipment</strong></th>
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<td>Tools and equipment are properly stored when not in use?</td>
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<td></td>
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<tr>
<td>Tools and equipment are properly maintained?</td>
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<tr>
<td>Safety shields/guards are present and in the proper position?</td>
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<tr>
<td>Cords, hoses, and power connections are in good condition?</td>
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<td></td>
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<td>Electrical equipment is properly grounded?</td>
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<th><strong>First Aid</strong></th>
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<td>First aid station is clearly marked and readily accessible?</td>
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<td>First aid kit is fully stocked?</td>
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<td>Instructor and students are aware of supplies available and know how to use them?</td>
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LIFTING AND SUPPORTING VEHICLES

Directions — Answer the following questions by writing all responses on this sheet.

1. Define the following lift or support devices.
   A. Jack
   B. Lift
   C. Safety stand

2. List three safety rules for raising a vehicle with a lift.
   A.
   B.
   C.
3. List five safety rules for raising a vehicle with a hydraulic floor jack.

A.

B.

C.

D.

E.

4. What are torque box areas?

5. Choose a vehicle make and model and a piece of lifting equipment for raising the vehicle. Refer to service information for the vehicle and equipment specifications for the lifting equipment to complete the information below. Please be specific.

Make and model: ______________________

Device(s) used to raise the vehicle:

Proper lift points on the vehicle for the lift device:

Support device(s) used and proper locations:
INTRODUCTION TO AUTOMOTIVE TECHNOLOGY

JS1-L3-Ull

LIFT A VEHICLE

Equipment:

Personal protective equipment (PPE)
Vehicle lifting equipment

Procedure:

CAUTION: When lifting a vehicle, always use proper lifting equipment and observe all safety precautions.

CAUTION: Identification of proper lifting points is extremely important. Damage caused by improper lifting can be severe. Common sense, along with an understanding of vehicle construction and vehicle supporting techniques, must be used in each repair instance.

CAUTION: Never crawl under a vehicle held up only by a jack, either hydraulic or pneumatic. Always use safety stands to support the vehicle.

1. Wear PPE while performing the procedures on this job sheet.

2. Using service information, locate a procedure for lifting a vehicle. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the box to approve the procedure.

   Be certain that the instructor approves the procedure and checks this box.

Using the procedure, lift the vehicle.

Average of the above evaluations
HAZARDOUS MATERIAL REGULATIONS

Directions — Answer the following questions by writing all responses on this sheet.

1. Define the following terms.
   
   A. Hazardous material —
   
   B. Toxic —
   
   C. Flammable —
   
   D. Corrosive —
   
   E. Reactive —

2. List three things employees must know when working in a shop with hazardous materials.

   A.
   
   B.
   
   C.
3. Describe the purpose of MSDSs and where they can be found.

4. Name the three categories of hazardous waste generators.
   A. 
   B. 
   C. 

5. Which category of hazardous waste generators does the typical shop fit in?
SOLVENTS AND SOAPS

Directions — Answer the following questions by writing all responses on this sheet.

1. List the five general rules for using chemicals.
   A. 
   B. 
   C. 
   D. 
   E. 

2. Name two ways that aqueous-based parts washer is less hazardous than petroleum-based parts washer.
   A. 
   B. 

3. On what type of parts is it safe to use digestive-type carburetor cleaner and why?
4. List two reasons why gasoline should never be used as a solvent.
   
   A.
   
   B.

5. What type of towel should be used with glass cleaner or windshield washer fluid? Why?
LUBRICANTS AND SPECIALTY CHEMICALS

Directions — Answer the following questions by writing all responses on this sheet.

1. List three reasons why oil is a hazardous chemical.
   A. 
   B. 
   C. 

2. What are light oils used for and what is their advantage?

3. How does the viscosity of gear lube compare to motor oil? What vehicle components are lubricated with gear lube?

4. In what situations is grease used to lubricate automotive parts instead of oil?
5. What is the difference between an aerobic and anaerobic sealer?
GASES, DUST, AND ACID

Directions — Answer the following questions by writing all responses on this sheet.

1. What are three harmful gases present in gasoline engines?
   A. 
   B. 
   C. 

2. What type of container must gasoline be stored in?

3. A. What is Freon?
   B. What is R-134a?

4. What material contained in brake and clutch linings can cause lung cancer?

5. Why is battery acid hazardous?
WRENCHES

Directions — Answer the following questions by writing all responses on this sheet.

1. Match the tool with its name by placing the appropriate number in the blank. All the illustrations will not be used.

   ____ A. Box wrench 1. 2.
   ____ B. Breaker bar
   ____ C. Pipe wrench
   ____ D. Ratchet
   ____ E. Swivel socket
   ____ F. Torque wrench
   ____ G. Tubing wrench

   3. 4.

   5. 6.

   7. 8.

   9.
2. What is the unit of measurement for the jaw opening in a metric wrench and a USCS wrench?

3. Answer the following questions about common wrenches.
   A. Which type of common, nonadjustable wrench grips bolts on all sides?
   B. Which wrench is used for loosening or tightening steel line fittings?

4. Answer the following questions about socket wrenches and torque wrenches.
   A. What are the two basic parts of a socket wrench?
   B. What two advantages do socket wrenches have over common wrenches?
   C. Which type of socket handle provides maximum leverage to loosen a bolt?
   D. When are torque wrenches necessary in automotive tasks?
   E. What can happen if too much or too little torque is applied?

5. Name a disadvantage of an adjustable wrench.
SCREWDRIVERS AND PLIERS

Directions — Answer the following questions by writing all responses on this sheet.

1. Match the tool with its name by placing the appropriate number in the blank. All the illustrations will not be used.

___ A. Adjustable-joint pliers
___ B. Locking pliers
___ C. Long-nose pliers
___ D. Nut driver
___ E. Phillips screwdriver
___ F. Slip-joint pliers
___ G. Snap-ring pliers
___ H. Standard Screwdriver
2. What are two things to check when evaluating if a screwdriver is right for a job?

   A.

   B.

3. What safety feature should screwdrivers or pliers have when using them near electrical equipment?

4. Which type of pliers has a long slot with many adjustment positions?

5. Which type of pliers is best for gripping tiny pins and parts?
HAMMERS, PUNCHES, AND CHISELS

Directions — Answer the following questions by writing all responses on this sheet.

1. Match the tool with its name by placing the appropriate number in the blank. All the illustrations will not be used.

   ____ A. Ball peen hammer
   ____ B. Diamond-point chisel
   ____ C. Plastic-tip hammer
   ____ D. Rubber mallet
   ____ E. Sledge-hammer
   ____ F. Standard chisel
   ____ G. Starting punch

   1. 
   2. 
   3. 
   4. 
   5. 
   6. 
   7. 
   8. 
   9.
2. Which hammer is used most for driving chisels and punches?

3. Which hammer is commonly used for installing wheel covers?

4. Which punch is used for marking the position of holes before drilling?

5. Provide two reasons why it is unsafe to use a punch or chisel with a mushroomed head?
   A. 
   B. 

SPECIALTY TOOL USES

Directions — Answer the following questions by writing all responses on this sheet.

1. List the function of the following special cutting tools.
   A. Hacksaw
   B. Tubing cutter
   C. Hand reamer
   D. File

2. List the use of each electrical system tool below.
   A. DMM
   B. Scan tool
   C. Oscilloscope
   D. Continuity light
   E. Timing light
   F. Remote starter switch
3. List the function of the following tools for battery work.
   
   A. Cable puller
   
   B. Terminal and post cleaner
   
   C. Battery lifting tool and carrying strap

4. Describe the use of each lubrication tool listed below.
   
   A. Transmission funnel
   
   B. Oil filter removing tool
   
   C. Grease gun

5. List the function of the following specialty tools below.
   
   A. Blowgun
   
   B. C-clamp
   
   C. Puller set
   
   D. Pressure gauges
   
   E. Vacuum gauges
INTRODUCTION TO AUTOMOTIVE TECHNOLOGY

AS1-L2-UV

COMMON VEHICLE FASTENERS

Directions — Answer the following questions by writing all responses on this sheet.

1. Match the fastener with its name by placing the appropriate number in the blank. All the illustrations will not be used.

   ___ A.  External snap ring
   ___ B.  Machine screw
   ___ C.  Metric bolt
   ___ D.  Plain Flat Washer
   ___ E.  Rivet
   ___ F.  Self-tapping screw
   ___ G.  Stud

   1.   2.   3.   4.   5.   6.   7.   8.   9.   10.
2. Answer the following questions about USCS and metric bolts.

A. How is the thread size determined for USCS and metric bolts?

B. How is bolt strength indicated for USCS and metric bolts?

3. Match the description at the right with the fastener on the left. All the descriptions will not be used.

___ A. Adhesive 1. Makes its own threads when driven into a surface
___ B. Internal snap ring 2. Prevents nut from damaging the part surface
___ C. Self-tapping screw 3. Bonds two surfaces together
___ D. Stud 4. Useful for achieving accurate alignment of parts
___ E. Washer 5. Fits in a groove inside an opening

6. Fits in a groove outside of a part
7. During installation, headless end is hammered until rounded

4. What is the function of a tap?

5. What is the function of a die?
**Introduction To Automotive Technology**

**AS1-L3-UV**

**USE AND CARE OF MEASURING TOOLS**

**Directions** — Answer the following questions by writing all responses on this sheet.

1. Match the use at the right with the measuring tool at the left. All the uses will not be used.

<p>| | | | |</p>
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<tbody>
<tr>
<td>1.</td>
<td>Used for precise outside measurement of parts</td>
<td>A. Dial indicator</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Used for inside, outside, and depth measurements</td>
<td>B. Feeler gauge</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Measures part movement</td>
<td>C. Inside micrometer</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Measures how deep a hole or cavity is</td>
<td>D. Outside micrometer</td>
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<td>5.</td>
<td>Measures air gaps and clearance between moving parts</td>
<td>E. Depth micrometer</td>
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<tr>
<td>6.</td>
<td>Measures diameter of a hole</td>
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2. List the basic steps in using a dial indicator.
3. Give the correct micrometer reading for each example below. The micrometer shown measures from 0 in to 1 in.

A. Reading _______

B. Reading _______

4. When using precision measuring tools, how should they be handled?

5. How should precision measuring tools be stored?
Introduction To Automotive Technology

AS1-L1-UVI

POWER TOOLS AND THEIR USES

Directions — Answer the following questions by writing all responses on this sheet.

1. Match the power tool with its name by placing the appropriate number in the blank. All the illustrations will not be used.

   ___ A. Air chisel
   ___ B. Air ratchet
   ___ C. Electric drill
   ___ D. Heat gun
   ___ E. Impact wrench
   ___ F. Tire burnishing tool

   1.  
   2.  
   3.  
   4.  
   5.  
   6.  
   7.  
   8.  

   W 35
2. Explain how electric, pneumatic, cordless, and hydraulic tools are powered?

3. Name two advantages that pneumatic tools have over electric tools.
   A.
   B.

4. Match the power tools to their uses. All the uses will not be used.
   ____ A. Air chisel  1. Drills holes or removes rust
   ____ B. Blowgun  2. Used with impact sockets to loosen or tighten nuts and bolts
   ____ C. Heat gun  3. Uses standard sockets to loosen and tighten nuts and bolts
   ____ D. Impact wrench  4. Breaks welds loose, cuts rivets, and punches holes
   ____ E. Mini die grinder  5. Softens, loosens, or thaws vehicle components
   ____ F. Power drill  6. Prepares rubber for patching
   ____ G. Tire burnishing tool  7. Cleans dust from shop equipment
   8. Cuts metal and removes gasket material

5. What should the operator do if an electric or pneumatic drill jams?
INTRODUCTION TO AUTOMOTIVE TECHNOLOGY

AS1-L2-UVI

SHOP EQUIPMENT USE

Directions — Answer the following questions by writing all responses on this sheet.

1. Match the use with the shop equipment by placing the appropriate number in the blank. All the uses will not be used.

   ___ A. Bench grinder
   ___ B. Drill press
   ___ C. Floor jack
   ___ D. Hoist
   ___ E. Hydraulic press
   ___ F. Lift
   ___ G. Tire machine
   ___ H. Wheel balancer

   1. Distributes weight equally around the wheel
   2. Maintains tools that have become dull
   3. Drills holes in metal parts
   4. Supplies compressed air for pneumatic tools
   5. Removes tires from wheels
   6. Raises the front, rear, or side of a vehicle
   7. Raises the entire vehicle
   8. Raises heavy vehicle parts
   9. Forces parts onto and off of shafts

2. To avoid electric shock, an operator of electrical shop equipment should not stand on ________________________________

3. The front of each wheel of a bench grinder should be equipped with what three parts?

   A.
   B.
   C.
4. How does a drill press operator keep the parts being drilled from spinning out of control and cutting the hands?

5. Which piece of equipment needs the additional support of safety stands before a technician can work under the vehicle?
VEHICLE INFORMATION AND IDENTIFICATION

Directions — Answer the following questions by writing all responses on this sheet.

1. Which source is the most comprehensive and the best source of information for a specific vehicle?

2. What are technical service bulletins (TSBs)?

3. List three guidelines for using service information.
   A.
   B.
   C.

4. Name two vehicle codes.
   A.
   B.

5. List two common places that a VIN is found on a vehicle.
   A.
   B.
INTRODUCTION TO AUTOMOTIVE TECHNOLOGY

AS1-L1-UVIII

CUSTOMER SERVICE, WORK ORDERS, AND VEHICLE PREPARATION

Directions — Answer the following questions by writing all responses on this sheet.

1. Why does a shop require automotive technicians to treat customers in a friendly, courteous manner?

2. How should an automotive technician refer to a customer when addressing him or her?

3. Explain what is typically involved in the procedures below.
   A. Preparing the vehicle for service
   B. Preparing the vehicle to return it to the customer

4. List three functions of a work order.
   A.
   B.
   C.
5. Explain what the three Cs mean in diagnosing a vehicle problem.
COMPLETE A WORK ORDER WITH CONCERN, CAUSE, AND CORRECTION

Directions:

1. The instructor will list a repair. Complete the work order on the following page for the repair.

   To receive credit, all sections of the work order must be complete.

Credit received for completing work order
### Smith's Automotive Repair

Customer’s Name: ___________________________ Date: ________ Invoice #: ________

Address: ___________________________ Phone: ________

Year/Make: __________ Model: _______ VIN: __________ Mileage: ________

Service Writer: ___________________________ Technician: __________

Customer Authorization Signature: ___________________________

Customer Concern:

________________________________________________________________________

Vehicle Service History Information:

________________________________________________________________________

Related Technical Service Bulletins:

________________________________________________________________________

Diagnostic Procedures Performed:

________________________________________________________________________

Cause: ___________________________

Correction: ___________________________

________________________________________________________________________

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<th>Actual</th>
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<td>Sales Tax</td>
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<td>GRAND TOTAL</td>
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PERFORM A GENERAL DIAGNOSIS

Equipment:

Service information source
Pen
Notebook
Personal protective equipment (PPE)

Procedure:

1. Wear PPE while performing all procedures on this job sheet.

2. Identify the concern. If possible, ask the owner/driver the following questions.
   a. Under what conditions does the problem occur?
   b. Are there unusual sounds?
   c. How long has the problem existed? Is it getting worse?

3. Prepare the vehicle for service (fender covers, floor protectors, etc.) according to the instructor’s directions.

4. Obtain the instructor’s permission to perform a road test. Have the instructor check the box to approve the road test.

   Be certain that the instructor approves the procedure and checks this box.

5. Test drive the vehicle under the conditions that the problem has been observed.

   CAUTION: Always obtain instructor’s approval before conducting a road test. Conduct the road test in an area with little or no traffic. Never exceed the legal speed limit during the road test. Always wear safety belts. An assistant should record all observations made during the road test. Do not attempt to drive and record results at the same time.
6. Isolate the cause of the problem.
   a. Locate and interpret vehicle and major component identification numbers.
      • VIN
      • Vehicle certification labels
      • Calibration decals
   b. Research applicable vehicle and service information.
      • Applicable components and their operation
      • Vehicle service history
      • Service precautions
      • Technical service bulletins
   c. Perform a visual inspection of the applicable system.
      • Look for damaged or broken components.
      • Look for worn or misaligned components.
      • Check fluid levels.
      • Inspect related electrical sensors, corrector, controls, and wiring.
   d. Test the systems and components that could cause the problem.
      Eliminate good components until the cause is found.

7. Determine the necessary action. Describe the appropriate actions below.

8. Prepare the vehicle to return it to the customer (remove protective covers and any dirt or grease, etc.) according to the instructor’s directions.

Average of the above evaluations