MEC1020

Vehicle Service & Care

Student Workbook

This workbook is to be completed using the resources indicated. However, individuals who have experience with vehicle operation and maintenance may be able to complete many of the questions and perform the practical components with minimal resource support.

There is the opportunity for practical application of some of the processes and practices outlined in the theory. Your instructor will be making arrangements for students to observe a mechanic performing some of the more demanding tasks. There is also the opportunity for students to perform some of the processes at home and record with a digital recorder (still or moving), and use it for module marks.

Safety is always a concern when working with any type of machinery, and vehicle maintenance is no exception. Due to the lack of appropriate facilities and certified instruction, students will not be undertaking any major mechanical processes, but will instead be exposed to the theory and demonstration by a professional. If a situation arises where a student may perform a basic evaluation on a vehicle within the allowable guidance of the instructor, this will be allowed and encouraged.

# Chapter 1: Introduction and How Cars Work

## Read Chapter 1 and answer the following questions in the space provided.

1. What was the earliest self-powered road vehicle?
2. Who was credited with the world’s first motorcar?
3. How are vehicles classified?

1. What is the difference between a manufacturer and make?

1. What does the acronym VIN represent?
2. What is the difference between a gasoline and diesel engine?

1. Why is it a good idea to know the size of your vehicle’s engine?

## Define the following terms:

Diesel Engines

Henry Ford

Internal Combustion Engine

Ferdinand Porsche

Four-Stroke Engine

Gasoline Engines

Vehicle Identification Number

## Practical Component

Consult with your teacher about accessing a vehicle to locate the VIN. Record the VIN as it is shown on the left side of the dash and as it is shown on the inside of the driver’s door jamb. Write down all the information presented on the door jamb sticker as well as any distinguishing labels on the car as to make, model, manufacturer, engine size, grade, etc. Open the hood of the vehicle and see if there are any stickers on the forward frame support which give information about engine size, timing, etc. Copy all of this information down as well. Take the information you gathered from the vehicle and run the VIN on the VIN Decoder website (<http://www.decodethis.com/>). Print off the information and compare it to what you were able to find yourself. Note the information that you were unable to obtain from one source or the other and explain to your instructor why you think this happened.

VIN Decoder Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Chapter 4: Repair Facilities

## Read Chapter 4 and answer the following questions in the space provided.

1. What does it mean when a technician is ASE certified?
2. What are AMA Approved Auto Repair facility characteristics?
3. What are examples of an ASE technician’s Code of Ethics?

1. What is the purpose of the Better Business Bureau?
2. What is the difference between an estimate and a repair invoice?
3. What types of warranties are available on new vehicles?
4. Why might a chain warranty be better than an independent repair facility warranty?
5. What does it mean when a warranty is pro-rated?

## Define the following terms:

American Automobile Association (AMA)

Automotive Service Excellence (ASE)

Better Business Bureau

Bumper-to-Bumper Warranty

Corrosion Perforation Warranty

National Institute for Automotive Service Excellence

## Practical Component

Go to the Alberta Motor Association website (<http://www.ama.ab.ca/>) and find the nearest approved AMA approved repair center.

Approved Service Location Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Chapter 5: Safety Around the Automobile

## Read Chapter 5 and answer the following questions in the space provided.

1. Why is it important to “think safety” while working on an automobile?
2. What things should you know the location of in a garage, shop, or laboratory facility?

1. What safety equipment is required when working on vehicles?

1. Why do you need to be extremely cautious around electric fans?
2. What is the procedure for jacking up a vehicle?

1. How are fire extinguishers classified? What type of fire extinguisher should you have in an automotive shop?

## Define the following terms:

Airbag Safety

Decibel Ratings

Ear Muffs

Ear Plugs

Fire Extinguishers

Hydraulic Jacks

Jack Stands

Safety Glasses

## Practical Component

Find out what rating the nearest fire extinguisher is.

# Chapter 6: Basic Tools

## Read Chapter 6 and answer the following questions in the space provided.

1. What is the difference between an open-end and a box-end wrench? Use a drawing to illustrate the difference.
2. If a 6-point wrench is less likely to strip a fastener, when would there be a need for 12-point wrench?
3. What is the most common ratchet size?
4. What specialty tool can be used to test voltage, resistance, and amperage in a circuit?
5. What are the two types of measurement systems commonly used?
6. What is the function of a tire pressure gauge?
7. What are two common types of screwdrivers? How do you know what type of screwdriver tip to use?
8. If you only had one wrench in your toolbox, what type would it be?
9. Why is it important to use the correct tool?

## Define the following terms:

Chilton Repair Manuals

Dial and Vernier Calipers

Haynes Repair Manuals

Jack Stands

Multimeters

Pliers

Socket and Ratchet Sets

Torque Wrenches

## Practical Component

Ask your teacher for the Auto Care and Maintenance tool box. Identify all of the tools and check them off against the tool inventory sheet.

Tool Inventory Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Chapter 7: Auto Care and Cleaning

## Read Chapter 7 and answer the following questions in the space provided.

1. What are two types of automotive paint finishes? What is the difference?

1. What types of weather, climatic, or road conditions affect vehicle finishes?
2. What is a chamois?
3. Why shouldn’t you use dish detergent when washing your vehicle?
4. What is the purpose of waxing a vehicle?
5. Why is it important to vacuum the inside of a vehicle?
6. Why should you wash a vehicle before waxing it?
7. Why should you dry a vehicle after washing?

## Define the following terms:

Armor All

Automotive Detailing

Carnauba

Nu Finish

Simoniz Wax

Synthetic Automobile Waxes

## Practical Component

If you have access to an automobile, perform as many of the Care and Cleaning processes that you can. Your instructor may allow it to happen at school, but you are also able to do it at home and record your activity with before and after pictures, as well as pictures during your cleaning job. This is a great activity to perform on a vehicle which doesn’t often receive Care and Cleaning, like a bale truck or grain truck. Print your pictures, label them and show them to your teacher.

Care and Cleaning Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Chapter 8: Fluid Level Check

## Read Chapter 8 and answer the following questions in the space provided.

1. What functions do various fluids provide to vehicle components? List them and their purpose.

1. What is the process to check engine oil?
2. What is the color of clean oil? What is the color of dirty oil?
3. What is the process to check automatic transmission fluid?

1. What is the color of clean automatic transmission fluid?
2. What is the process to check antifreeze (coolant) level?
3. What is a common color for windshield washer fluid?
4. What are some safety precautions when handling brake fluid?
5. What is the process to check power steering fluid?

## Define the following terms:

American Petroleum Institute

Automatic Transmission Fluid

Battery Electrolyte

Ethylene Glycol

Power Steering Fluid

Society of Automotive Engineers

## Practical Component

If your instructor has not organized a visit by a mechanic, or trip to a garage to have a mechanic demonstrate the proper procedure for checking all the fluid levels in a vehicle, this practical component may be put off until that has been done. Once you have been given the go-ahead by your instructor, check the main fluids in a vehicle.

Fluid Check Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Chapter 9: Electrical System

## Read Chapter 9 and answer the following questions in the space provided.

1. What is the purpose of the battery?

1. What does a starter do?
2. How does an automotive battery get recharged?

1. How is the cold-cranking rating different from a cranking-rating?

1. Why shouldn’t you bypass a fuse?

1. What could cause a fuse to blow?

## Define the following terms:

Automotive Fuses

Cold-Cranking Amps

Composite Light bulbs

Cranking Amps

Jump-Starting a Vehicle

Replacing a Headlamp

Replacing Fuses

Sealed Beam Headlamps

Serpentine Belts

V-belts

## Practical Component

Locate the fuse block in a vehicle. Take a picture of the block and of the legend. Not all of the fuse holes will have fuses in them. Determine which ones don’t and why they are empty. Explain to your teacher why you think they are empty.

Fuse Block Check Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Chapter 10: Lubrication System

## Read Chapter 10 and answer the following questions in the space provided.

1. What does oil do within an engine?

1. How does engine oil get dirty?

1. What does API stand for and what does it rate?
2. What does SAE stand for and what does it rate?
3. Why is it not recommended to overfill the engine with oil?
4. What is one advantage and one disadvantage of synthetic oils?
5. How often should the oil and filter be changed?
6. What does an oil filter do?

1. Which oil is more viscous, 5W30 or 20W50?

## Define the following terms:

American Petroleum Institute

How to Change Oil on an Automobile

International Lubrication Standardization Approval Committee

Oil Viscosity

Society of Automotive Engineers

## Practical Component

List the steps involved in changing oil in a vehicle. Make sure you include all safety measures, including blocking tires and using jack stands. If you are involved in work experience or the RAP program and you work at a business where changing oil is part of your duties, inform your instructor and they will be able to verify this through work logs and you won’t have to write out the steps, you can simply describe the process to your instructor.

Oil Change Procedure Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Chapter 11: Fuel System

## Read Chapter 11 and answer the following questions in the space provided.

1. What is the purpose of the fuel system?

1. What does the fuel pump do and where might it be found on an automobile?

1. What does the acronym PCV represent?
2. What does the acronym CCV represent?
3. How often should air filters be changed?
4. What are common octane ratings of gasoline sold at the pump?
5. What is ultra-low sulfur diesel?
6. How can you improve the fuel economy of your automobile?

## Define the following terms:

Cetane Ratings

How to Change a Fuel Filter

Increasing Fuel Economy

Octane Ratings

Positive Crankcase Ventilation

Unleaded Fuel

## Practical Component

Select a vehicle and determine what types of fuel filters it uses and how often they should be changed.

# Chapter 12: Cooling System

## Read Chapter 12 and answer the following questions in the space provided.

1. What does the cooling system do within an engine?

1. What is the purpose of the radiator?
2. What is the purpose of the thermostat?
3. Why do automobiles have coolant recovery tanks?
4. Why should you mix a 50/50 blend of water and antifreeze?
5. How do you get heat in your automobile when it is cold outside?
6. How are drive belts part of the cooling system?
7. How often should antifreeze be serviced?

## Define the following terms:

Antifreeze/Water Mixture

Ethylene Glycol Antifreeze

Extended Life Antifreezes

Evaporator Drain Tube

How Air Conditioning Works

How to Change an Automobile’s Thermostat

Reconditioned Radiators

Remanufactured Water Pumps

## Practical Component

Obtain several different fluids and test them using an antifreeze tester. Suggested liquids would be water, pop, juice, antifreeze, sugar water, salt water. Record your results in a table and discuss it with your instructor.

Antifreeze Test Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Chapter 13: Ignition System

## Read Chapter 13 and answer the following questions in the space provided.

1. What is the purpose of the ignition system?

1. What is the purpose of an ignition coil?

1. What do spark plugs do?

1. How is the battery part of the ignition system?
2. What is an advantage of having an electronic (distributorless) ignition system?
3. How often should spark plugs be changed?
4. Why do some engines use crankshaft and camshaft sensors?

## Define the following terms:

Camshaft Position Sensor

Conventional Ignition Systems

Crankshaft Position Sensor

Electronic Ignition Systems

Distributor Ignition Systems

Ignition Control Modules

Spark Plugs

Splitfire Spark Plugs

Standard Ignition Products

# Chapter 14: Suspension and Steering System

## Read Chapter 14 and answer the following questions in the space provided.

1. What is the purpose of the suspension system?
2. What do shocks do?
3. How are shocks different than struts?
4. What is used to reduce the effort to steer an automobile?
5. Why is it important to torque lug nuts?
6. How often should tires be rotated?
7. Why is it not recommended to fix a tire’s sidewall?
8. What can cause a tire to wear excessively?

## Define the following terms:

How to Rotate Tires

Parallelogram Steering System

Passenger and Light Truck Tires

Rack and Pinion Steering System

Run Flat Tires

Tire Load Ranges

Tire Plugs and Patches

Tread wear, Traction, Temperature Ratings

Uniform Tire Quality Grading Ratings

## Practical Component

Go to a parking lot and find four vehicles which have different sized tires. Write down basic information about the vehicle (two wheel drive truck, compact car, extended cab dually four wheel drive truck, etc.) and the information about the tire. Using the manufacturer’s tire size information, determine if they are the correct size for the vehicle. Share your results with your instructor.

Tire Check Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Chapter 15: Braking System

## Read Chapter 15 and answer the following questions in the space provided.

1. What is the purpose of the braking system?
2. How is a disc brake system different than a drum brake system?
3. What does brake fluid do?
4. What does the acronym ABS represent?
5. What are benefits of antilock brakes?
6. Why does the parking brake use a mechanical linkage instead of a fluid linkage?
7. If you hear a high pitch squeal that goes away every time you apply your brakes, what might this indicate?
8. What is electronic stability control?

## Define the following terms:

Antilock Brake Systems

Brake Drums

Brake Fluid

Brake Rotors

Disc Brake Systems

Drum Brake Systems

Electronic Stability Control

## Practical Component

Go into a parking lot and examine as many vehicles as you can. Record the brake arrangement of the vehicles in the following table. Discuss your findings with your instructor.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Disc front/disc rear | Disc front/drum rear | Drum front/drum rear |
| Truck |  |  |  |
| Car |  |  |  |

Brake Survey Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Chapter 16: Drivetrains

## Read Chapter 16 and answer the following questions in the space provided.

1. What is the purpose of the drivetrain system?
2. What does a drive shaft do?
3. What does a clutch do in a manual transmission?
4. What are four drivetrain systems (configurations)?
5. What would be a symptom of a worn CV joint?
6. How is an all-wheel drive vehicle different from a four-wheel drive vehicle?
7. What causes a front-wheel drive vehicle to have better traction than a rear-wheel drive vehicle?
8. What color is automatic transmission fluid?

## Define the following terms:

Constant Velocity Shafts

Continuously Variable Transmission

CV Boots

Pressure Plate

Throw Out Bearing

U-Joints

## Practical Component

Go into a parking lot and count how many vehicles are front wheel drive, rear wheel drive and four/all wheel drive.

|  |  |  |
| --- | --- | --- |
| Front Wheel Drive | Rear Wheel Drive | All Wheel/Four Wheel Drive |
|  |  |  |

Discuss your findings with your instructor. Why do you think the count is the way it is?

Drivetrain Survey Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Chapter 17: Exhaust and Emissions

## Read Chapter 17 and answer the following questions in the space provided.

1. What is the purpose of the exhaust system?
2. What is the purpose of the emission system?

1. What do the exhaust manifolds do?
2. What is the purpose of the muffler?

1. What does the acronym EGR represent and what does the EGR do?

1. What does an oxygen sensor do?

1. What may be the problem if your vehicle is excessively loud?

## Define the following terms:

Exhaust Gas Recirculation

Positive Crankcase Ventilation

Smog

## Practical Component

Find out what the fine is for having an excessively loud exhaust. How is it measured? Discuss with your instructor.

Noise Ticket Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Chapter 19: Automotive Accessories

## Read Chapter 19 and answer the following questions in the space provided.

1. What is the benefit of using floor mats?
2. When are engine heaters necessary?
3. When are wheel lock lug nuts commonly used?
4. Why are towing mirrors sometimes necessary?
5. What is a trailer brake controller?
6. How are trailer hitches classified?
7. Why is it important to use trailer safety chains?

## Define the following terms:

Automotive Gauges

Car Entertainment Systems

Custom Wheels

GPS

Trailer Brake Controller

Trailer Hitch Classifications

## Practical Component

There are specific regulations in Alberta regarding window tint, hand held devices and driving lights. Research these specific laws and present your findings to your instructor.

Accessories Regulations Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Chapter 20: Common Problems and Roadside Emergencies

## Read Chapter 20 and answer the following questions in the space provided.

1. What is OBD and how can it be helpful?
2. What does it mean if your car’s check engine light comes on?
3. What does white smoke from the tailpipe usually indicate?
4. What might be the problem if you smell a rotten egg/sulfur odor?
5. How can you find a leak in a tire?
6. What should you do if you get in a car accident?
7. What is the proper procedure to hook up jumper cables?
8. Why shouldn’t you drive your vehicle if the engine’s drive belt breaks?
9. What types of items are handy to have in an emergency roadside kit?
10. What items should be in an Automotive Winter Survival Kit?

## Define the following terms:

Check Engine Light

How to Jump-Start a Battery

Replacing a Headlight

Replacing a Serpentine Belt

Replacing Wiper Blades

## Practical Component

Consult with your instructor and arrange to observe a tire being changed, or change a tire under experienced supervision.

Tire Change Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Initial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Occupational Connection Worksheet***

Complete an Occupational Connection Sheet for this module. The purpose of the worksheet is to develop an understanding of how the activities undertaken in this module may be connected to an occupation. Your research may come from several sources. A speaker may come to your class to talk about mechanics or car care in their occupation. You may chose to research the Alberta Learning Information Service ([www.alis.alberta.ca](http://www.alis.alberta.ca)) or any other Canadian information service. The role auto care and maintenance takes in the occupation may be direct and obvious, or it may be indirect or just a small component of. When you finish your Occupational Connection Worksheet, go over it with your instructor and have them initial your activity sheet.