10

Special Program in Technical Vocational Livelihood

Quarter 1 - Module 1
Service Automotive Battery
(Operating & handling different types of batteries)

AUTOMOTIVE SERVICING NC II

ALTERNATIVE DELIVERY MODE

10

Special Program in Technical Vocational Livelihood

Quarter 1 - Module 1
Service Automotive Battery
(Operating & Handling Different Types of Batteries)

AUTOMOTIVE SERVICING NC II

DepED
DEPARTMENT OF EDUCATION

IA-Automotive Servicing – Grade 10
Alternative Delivery Mode
Quarter 1 – Module 1: Operate & Handle Different Types of Batteries

Published by the Department of Education
Secretary: Leonor Magtolis Briones
Undersecretary: Diosdado M. San Antonio

Development Team of the Module

Writer: Pablo B. Mariacos & Danny Depaynos
Editors:
Reviewer: Jonalyn C. Ambrona
Mary Jane N. Malihod
Illustrator:
Layout Artist:
Management Team: Estela Leon-Cariño
Carmel F. Meris
Rosita C. Agnasi
Federico P. Martin
Christopher C. Benigno
Juliet C. Sannad
Mary Jane N. Malihod
Armi Victoria Fiangaan
Brenda M. Cariño

Printed in the Philippines by:

Department of Education – Cordillera Administrative Region

Office Address: Wangal, La Trinidad, Benguet
Telefax: (074) -422 -4074
E-mail Address: car@deped.gov.ph

Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLMS is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and test. And read the instructions carefully before performing each task.

If you have questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

Notes to the Teacher

This contains helpful tips or strategies that will help you in guiding the learner.

For the facilitator:

Hi, as a facilitator you are expected to orient the learners on how to use this module. You also need to keep track of the learners' progress while allowing them to manage their own learning. Kindly, advise the learner's parents or guardians of the same procedure since they will be the primary supporters in the learners' progress. Please, do not forget to remind the learner to use separate sheets in answering all of the activities found in the learning module

For the learner:

Hello learner, Welcome to the **Automotive Servicing NC II** Alternative Delivery Mode (ADM) **Module on operating and handling different types of batteries**. I hope you are ready to progress in your **SPTVE 10 in Automotive Servicing NC II** with this learning module. This is designed to provide you with interactive tasks to further develop the desired learning competencies prescribed in our curriculum. With this, you are expected to appreciate staking through the information and activity given.

This module has the following parts and corresponding icons:

ICON	LABEL	DETAIL
	What I Need to Know	This contains the learning objectives which you need to accomplish.
	What I know	This evaluates what you know about the lesson you are to learn.
	What's In	This connects the current lesson with a topic necessary in your understanding.
	What's New	This introduces the lesson through an activity.
	What Is It	This contains a brief discussion of the learning module lesson.
	What's More	These are activities to check your understanding of the lesson.
	What I Have Learned	This summarizes the important ideas presented in the lesson.
	What I Can Do	This is a real-life application of what you have learned.
	Assessment	This is a post assessment of what you have learned.
	Additional Activity	This is an activity that will strengthen your knowledge about the lesson.

At the end of this module you will also find:

References — This is a list of all sources used in developing this module.

TABLE OF CONTENTS

LESSON 1 Operating & Handling Different Types of Batteries

The following are some reminders in using this module:

1. Use the module with care. Do not put unnecessary mark/s on any part of the module. Use a separate sheet of paper in answering the exercises.
2. Don't forget to answer *What I Know* before moving on to the other activities included in the module.
3. Read the instruction carefully before doing each task.
4. Observe honesty and integrity in doing the tasks and checking your answers.
5. Finish the task at hand before proceeding to the next.
6. Return this module to your teacher/facilitator once you are through with it.

If you encounter any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator. Always bear in mind that you are not alone.

We hope that through this material, you will experience meaningful learning and gain deep understanding of the relevant competencies. You can do it!

What I Need to Know

This module was designed and written to guide you to acquire the learning competencies and develop your skills in operating & handling different types of batteries in IA-Automotive Servicing. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. However, the order in which you read the module can be changed to correspond with the textbook you are now using.

Quarter/Week	Q1/W1-2
Learning Competency Code	TLE_ICTTD9-12CA-Ia-b-1
Learning Competency	**LO 1. Operate & Safe Handle Different Type of Batteries**

Learning Objectives:

a. Identify the main components of batteries.
b. Classify types of batteries.
c. Observe proper safe handling of batteries.
d. Identify hazards associated with batteries.
e. Identify proper and safe disposal of discarded battery materials like solutions and components.

What I Know

Pre-Assessment

Multiple Choice

Direction: Choose the LETTER of the best answer. Write your answer in the **answer sheet**.

1. It is a corrosive and poisonous liquid which will cause painful burns, irritation and scarring to the skin and eyes and could severely damage to clothing.
   a. Sulphuric Acid
   b. Flammable Gases
   c. Weight of the Battery
   d. Electrical Shock and Burns

2. Hydrogen and oxygen are produced as a part of the operation of the battery. These gases produce an explosive mixture within the battery and escape through the vents.
   a. Sulphuric Acid
   b. Flammable Gases
   c. Weight of the Battery
   d. Electrical Shock and Burns

3. An accidental short circuit of battery terminals by a conductive object, such as a metal tool or item of jewelry etc. may generate sufficient heat to cause severe burns, create arcing or cause any metal to melt and splash.
   a. Sulphuric Acid
   b. Flammable Gases
   c. Weight of the Battery
   d. Electrical Shock and Burns

4. In servicing battery, protect yourself by wearing the following personal protective equipment except.
   a. Goggles
   b. Face shield
   c. Metal necklace
   d. rubber gloves

5. With nonsealed batteries, water should be the only portion of the electrolyte lost due to evaporation during hot weather and gassing during charging.
   a. Corrosion
   b. Temperature
   c. Undercharge /Sulfation
   d. Improper Electrolyte Level

6. The sulfuric acid from the electrolyte corrodes, attacks, and can destroy not only connectors and terminals but hold-down straps and the battery tray as well.
   a. Corrosion
   b. Temperature
   c. Undercharge /Sulfation
   d. Improper Electrolyte Level

7. A battery in this condition will become sulfated when the sulfate normally formed on the plates becomes <u>dense, hard, and chemically irreversible</u>. This happens because the sulfate has been allowed to remain in the plates for a long period.
   a. Temperature
   b. Corrosion
   c. Improper Electrolyte Level
   d. Undercharge /Sulfation

8. Loose hold-down straps allow the battery to vibrate or bounce during vehicle operation. This vibration can shake the active materials off the grid plates, severely shortening battery life.
   a. Cycling
   c. Poor Mounting

b. Corrosion d. Improper Electrolyte Level

9. Heavy and repeated cycling can cause the positive plate material to break away from its grids and fall into the sediment chambers at the base of the case. This problem reduces battery capacity and can lead to short circuiting between the plates.

a. Cycling c. Poor Mounting
b. Corrosion d. Improper Electrolyte Level

10. This hold securely the battery in the vehicle to prevent the possibility of shorting across the terminals if they move or fall.

a. Battery clamp c. Battery terminal
b. Heat shield d. Battery hold down

11. It is made of plastic or another material to protect the battery from high underhood temperatures.

a. Battery clamp c. Battery terminal
b. Heat shield d. Battery hold down

12. These are used to join the cells of a battery in series.

a. Cell cover c. Vent holes
b. Cell connectors d. Vent caps

13. It is encased on the top of the battery. The cover may be a one-piece design or the cell might have their own individual covers.

a. Cell cover c. Vent holes
b. Cell connectors d. Vent caps

14. This is to permit the escape of hydrogen and oxygen gases. Battery vents can be permanently fixed to the cover or be removable, depending on battery design.

a. Cell cover c. Vent caps
b. Cell connectors d. Vent holes

15. These are used on some batteries to close the openings in the cell cover and to allow for topping off the cells with water.

a. Cell cover c. Vent holes
b. Cell connectors d. Vent caps

What's In

Review of the past lesson.

Direction: Answer the following questions in the **answer sheet** provided.

A. Enumerate at least four (4) kinds of battery that you know.

1. _____ 3. _____
2. _____ 4. _____

B. Enumerate 3 locations of battery in the car.

1

2

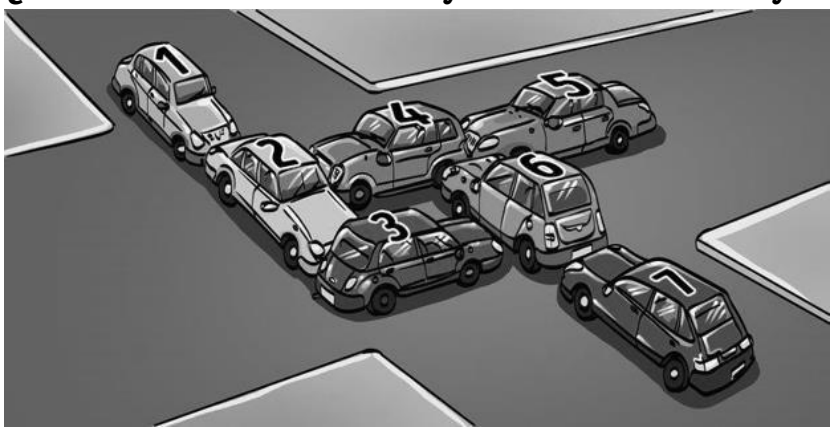
3

What's New

The Analyzer!
Direction: Analyze the illustrations below and answer the question. Put your answer in the **answer sheet**.

➢ Seven (7) cars have met in an intersection and a traffic jam has been created due to a failure of car battery of one vehicle. If one car was removed from the image, the rest of them would be free to move their way.

Question? Which car would you remove first? Why?



What Is It

BATTERY NOMENCLATURE

An automotive battery is a type of rechargeable battery that supplies electric energy to an automobile. Usually this refers to an SLI battery (*starting, lighting, ignition*) to power the starter motor, the lights, and the ignition system of a vehicle's engine. It is an **electrochemica**l device that stores and provides electrical energy.

TYPES OF BATTERY

The following are two types of automotive batteries. The battery on left has removable caps so the battery state of charge can be checked; adding water if needed. The battery is a "Maintenance Free" battery (lead acid or alkaline) which is sealed and does not require adding with distilled water because the electrolyte level does not change because they do not produce much gas. The charge indicator in the top shows the state of change.

Two Types of Automotive Battery:

1. Ordinary Wet Battery

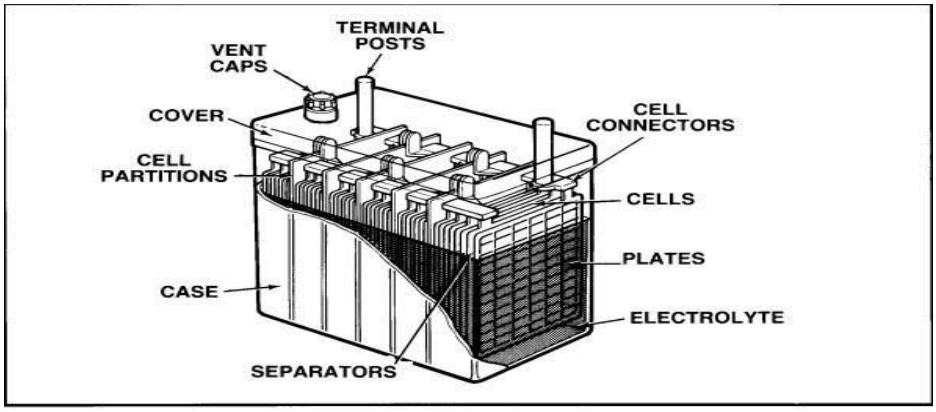
2. Maintenance Free Battery

BATTERY CONSTRUCTION

A storage battery consists of grids, positive plates, negative plates, separators, elements, electrolyte, a container, cell covers, vent plugs, and cell containers. The **grids** form the basic framework of the battery **plates**. Grids are the lead alloy framework that supports the active material of a plate and conducts current. Plates are typically flat, rectangular components that are either positive or negative, depending on the active material they hold.

A positive plate consists of a grid filled with **lead peroxide** as it active material. Lead peroxide (PbO_2) is a dark brown, crystalline material. Its high degree of porosity allows the liquid electrolyte to penetrate freely.

Components of a Typical Conventional Storage Battery



ELEMENT AND CELLS

Element is a group of positive and negative plates. The plates are formed into a plate group, which holds a number of plates of the same polarity.

Plate strap is where the like-charged plates are welded.

Separators are porous plastic sheets that allow the transfer of ions between plates but prevent physical contact between them, which would cause the plates to lose their stored energy.

When the element is placed inside the battery case and immersed in **electrolyte**, it becomes a cell.

The lead peroxide and sponge lead that made up the elements plates cannot become active until they are immersed in electrolyte. A 12-volt battery has six(6) cells that are connected in series with each other. Each cell has an open circuit voltage of approximately 2.1 volts; a 12-volt storage battery has an actual open circuit voltage of 12.6 volts.

Electrolyte is a solution of sulfuric acid and water.

Sulfuric acid which chemically reacts with both the lead and lead peroxide to release electrical energy. In addition, the sulfuric acid is the carrier for the electrons inside the battery between the positive and negative plates.

An unsealed battery gradually loses water due to its conversion into hydrogen and oxygen. These gases escape into the atmosphere through the **vent caps**. If the lost water is not replaced, the level of the electrolyte falls below the tops of the plates.

Parts of Casing Design

Container or shell a one-piece, molded assembly of polypropylene, hard rubber, or plastic.
The case has a number of individual cell compartments.
Cell connectors are used to join the cells of a battery in series.

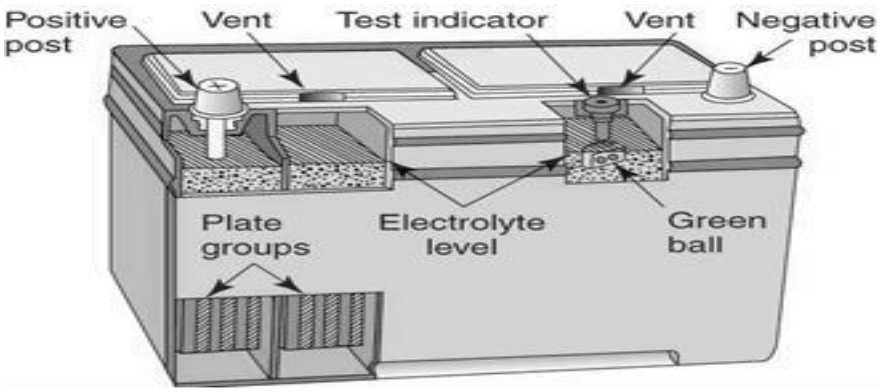
A battery with removable cell caps.

Cell cover is encased on the top of the battery. The cover may be a one-piece design or the cell might have their own individual covers.

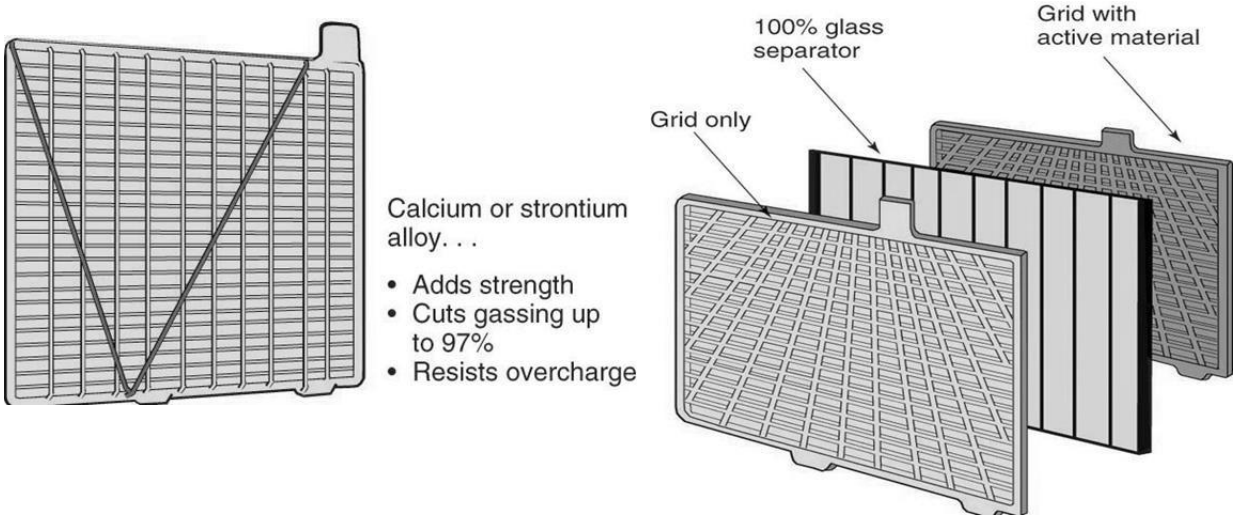
Vent holes to permit the escape of hydrogen and oxygen gases. Battery vents can be permanently fixed to the cover or be removable, depending on battery design.

Vent caps are used on some batteries to close the openings in the cell cover and to allow for topping off the cells with water.

C A U T I O N !	*When lifting a battery, excessive pressure on the end walls could cause acid to spew through the vent caps, resulting in personal injury. Lift with a battery carrier or with your hands on opposite corners.*



Construction of A Maintenance-Free Battery Showing the Location of the Gas Vents



Maintenance-free battery grids with support bars give increased strength and faster electrical delivery.

Maintenance-free batteries are equipped with a small gas vents that prevents gas pressure build-up in the case. Water is never added to maintenance free batteries.

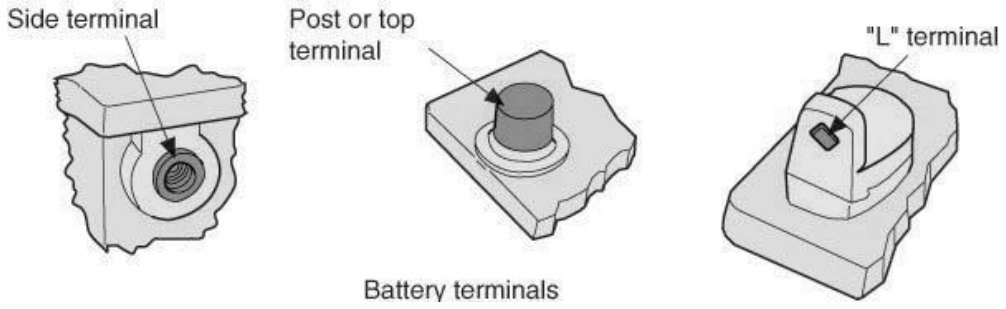
Low-maintenance batteries are still equipped with vent holes and caps, which allow water to be added to the cells. A low-maintenance battery requires additional water substantially less often than a conventional battery.

A hybrid battery can withstand six deep cycles and still retain 100% of its original reverse capacity.

The separators used are constructed of glass covered with a resin or fiberglass. The separators offer low electrical resistance with high resistance to chemical contamination.

Terminals

The battery has two external terminals: a positive (+) and a negative (-). These terminals are either two tapered posts, L terminals, threaded studs on top of the case, or two internally threaded connectors on the side. The terminals have either a positive (+) or a negative (-) marking, depending on which end of the series they present.



The Most Common Types of Automotive Battery Terminals.

Tapered terminals have a given dimension in accordance with standards agreed upon by the **Battery Council International (BCI)** and the Society of Automotive Engineers (SAE). This ensures that all positive and negative cable clamps would fit any corresponding battery terminal, regardless of the battery's manufacturer. The positive terminal is slightly larger, usually around 11/16 inch in diameter at the top, while the negative terminal usually has a 5/8-inch diameter. This design minimizes the danger of installing the battery cables in reverse polarity.

Recombination Batteries

A recombination battery is a completely sealed maintenance-free battery that uses an electrolyte in a gel form. In a gel-cell battery, gassing is minimized and vents are not needed.

Absorbed Glass Mat Batteries

The electrolyte in **absorbed glass mat (AGM)** batteries is held in moistened fiberglass matting instead of existing as a liquid or gel. The matting is sandwiched between the battery's lead plates, where it also serves as a vibration dampener.

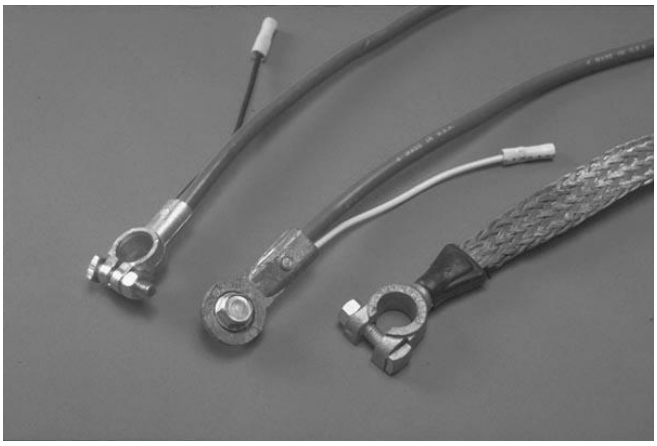
The construction of an AGM battery.

BATTERY HARDWARE

In order to connect the battery to the vehicle's electrical system, battery cables are used. Battery hold-downs are used to prevent damage to the battery, and heat shields are sometimes used to keep battery temperatures low.

Battery Cables

Battery cables must be of sufficient capacity to carry the current required to meet all demands. The normal 12-volt cable size is 4 or 6 gauge. Various forms of clamps are used to ensure a good electrical connection at each end of the cable. Connections must be clean and tight to prevent arcing between the terminal and clamp, corrosion, and high-voltage drops.



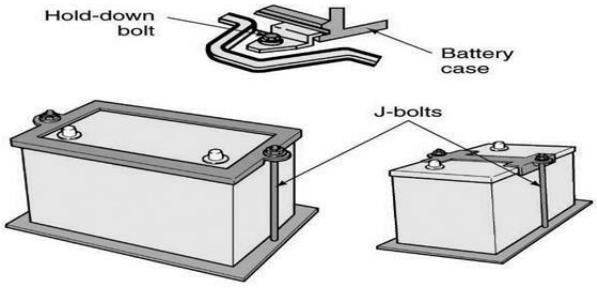
The battery cable is designed to carry the high current required to start the engine and supply the vehicle's electrical systems.

The positive cable is normally red and the negative cable is black. The positive cable fastens to the battery and the starter solenoid or relay. The negative cable fastens to the ground on the engine block or chassis.

Battery Hold-downs

This hold securely the battery in the vehicle to prevent the possibility of shorting across the terminals if they move or fall.

Normal vibrations cause the plates to shed their active materials. Hold-down reduce the amount of vibration and help increase the life of the battery. Battery hold-down are made of metal or plastic.



Gilles 30.18

Heat Shields

It is made of plastic or another material to protect the battery from high underhood temperatures. While heat shields do not need to be removed for most

testing and inspection procedures, they must be removed and then correctly installed during battery replacement.

Vehicle equipped for cold climates may have a battery blanket or heater to keep the battery warm during extremely cold weather.

BATTERY SIZE SELECTION

The battery should fit the battery holding fixture and the hold-down must be able to be installed. It is important that the height of the battery not allow the terminals to short across the vehicle's hood when it is closed.

BCI group numbers are normally given on the battery **and** are used to indicate the physical size and other features of the battery. The size of the battery does not always indicate the current capacity of a battery.

BCI Group Number	Maximum Overall Dimensions						Assembly Figure No.	PERFORMANCE RANGES	
	Millimeters			Inches				Cold Cranking Performance Amps. @ 0°F (−18°C)	Reserve Capacity Minutes @ 80°F (27°C)
	L	W	H	L	W	H			
PASSENGER CAR AND LIGHT COMMERCIAL BATTERIES 12-VOLT (6 CELLS)									
21	208	173	222	8 3/16	6 13/16	8 3/4	10	310-400	50-70
21R	208	173	222	8 3/16	6 13/16	8 3/4	11	310-500	50-70
22F	241	175	211	9 1/2	6 7/8	8 5/16	11F	220-425	45-90
22HF	241	175	229	9 1/2	6 7/8	9	11F	400	69
22NF	240	140	227	9 7/16	5 1/2	8 15/16	11F	210-325	50-60
22R	229	175	211	9	6 7/8	8 5/16	11	290-350	45-90
24	260	173	225	10 1/4	6 13/16	8 7/8	10	165-625	50-95
24F	273	173	229	10 3/4	6 13/16	9	11F	250-585	50-95
24H	260	173	238	10 1/4	6 13/16	9 3/8	10	305-365	70-95
24R	260	173	229	10 1/4	6 13/16	9	11	440-475	70-95
24T	260	173	248	10 1/4	6 13/16	9 3/4	10	370-385	110
25	230	175	225	9 1/16	6	8 7/8	10	310-[illegible]0	[illegible]0

https://raybuck.com/automotive-battery-dimensions/

BCI battery group numbers indicate the size and features of the battery.

FACTOR AFFECTING BATTERY LIFE

All storage batteries have a limited service life, but many conditions can decrease service life.

Improper Electrolyte Levels

With non-sealed batteries, water should be the only portion of the electrolyte lost due to evaporation during hot weather and gassing during charging.

Temperature

Batteries do not work when they are cold. At 0^{O}F battery is only capable of working at 40% of its capacity.

Corrosion

Battery corrosion is commonly caused by spilled electrolyte or electrolyte condensation from gassing. In either case, the sulfuric acid from the electrolyte corrodes, attacks, and can destroy not only connectors and terminals but hold-down straps and the battery tray as well.

Overcharging

Batteries can be overcharged by either the vehicle's charging system. or a battery charger.

Undercharge /Sulfation

A battery in this condition will become sulfated when the sulfate normally formed on the plates becomes dense, hard, and chemically irreversible. This happens because the sulfate has been allowed to remain in the plates for a long period.

Poor Mounting

Loose hold-down straps allow the battery to vibrate or bounce during vehicle operation. This vibration can shake the active materials off the grid plates, severely shortening battery life.

Cycling

Heavy and repeated cycling can cause the positive plate material to break away from its grids and fall into the sediment chambers at the base of the case. This problem reduces battery capacity and can lead to short circuiting between the plates.

Proper Safe Handling of Batteries

All types of batteries should be handled with care:

1. Avoid bringing metal into contact with batteries. This includes metal tools and hoist chain as well as personal items such as jewelry, watches and belts.
2. Never allow both terminals to make contact with an item (particularly yourself) simultaneously.
3. Do not hand-guide batteries during lifting/moving process. This puts you in danger if the battery were to drop or shift.

4. Practice safe and appropriate lifting procedures. Do not bring unprotected hands into contact with the battery throughout the moving process.
5. Wear protective equipment when handling batteries including gloves, eyewear and hardhat.
6. Batteries can be dangerous when mishandled. Not only are these batteries large and heavy objects that can cause severe injury and damage if dropped, battery acid is extremely corrosive and can cause severe burns to the skin or corrode equipment that it comes into contact with.
7. Likewise, touching batteries without proper equipment and preparation can result in high-voltage electric shocks.
8. Never short the terminals of a battery.
9. No smoking, electric sparks, or open flames should be permitted near charging batteries.
10. Care should be taken to prevent spilling of the electrolyte.
11. Get to know the procedures to be followed when you attempt to charge or test a battery or jump start a vehicle.
12. Always handle batteries with care and never overfill with acid.
13. Never allow children access to a battery.
14. Batteries should always be installed by a qualified professional.
15. The manufacturer's instructions must be followed when any equipment such as a charger or tester is used.
16. Follow the manufacturer's instructions for testing, jumping, installing, discharging, charging, equalizing and maintaining batteries.
17. Always remove metal objects from hands, wrists & neck e.g. rings, bracelets, watches & necklaces.
18. Never place tools or metal objects near to or on top of a battery.
19. Avoid dropping tools across the terminals and use insulated spanners.
20. Ensure that the charger cable clamps or 'jump start' leads are in good order and the connections are good. A poor connection can cause an electrical arc which can ignite the hydrogen gas and cause an explosion.
21. Recharging should be done only in a location specifically designed for that purpose – should have proper ventilation, be a "non-smoking" area with fire protection and necessary emergency equipment.
22. Do not attempt to jump start or recharge a frozen battery. Remove the battery from the vehicle, bring it into a warm room and let it thaw before charging or testing.

PERSONAL PROTECTIVE EQUIPMENT

1. When working with batteries, prevent exposure by wearing personal protective equipment (PPE).

2. Attempt to handle car batteries with bare hands. Always use sufficient protective clothing and accessories such as gloves and safety glasses when checking or changing batteries.
3. Batteries are being charged, explosive gases are produced. Heat and sparks can ignite these gases causing a fire or explosion.
4. All smoking, open flames, and spark producing items such as grinders, welders, or other electrical equipment, should be kept well clear of batteries.
5. Personal protective equipment could include Goggles, a face shield, rubber gloves and a rubber Metallic objects should not be placed on top of the battery.

Note:

In the event electrolyte is splashed or spilled on a surface, such as the floor or table, it should be diluted with large quantities of water and cleaned up immediately.

HAZARDS ASSOCIATED WITH BATTERIES

Batteries have many hazards including acid, fire or explosion, electrical shock, and heavy weight.

1. Battery Acid

Batteries contain sulphuric acid. The electrolyte in a battery is corrosive and extreme care should be taken to avoid spillage or splashing.

2. Sulphuric Acid

It is a corrosive and poisonous liquid which will cause painful burns, irritation and scarring to the skin and eyes and could severely damage to clothing.

3. Flammable Gases

Hydrogen and oxygen are produced as a part of the operation of the battery. These gases produce an explosive mixture within the battery and escape through the vents. Hydrogen & oxygen gases are both evolved during battery recharging.

4. Electrical Shock and Burns

An accidental short circuit of battery terminals by a conductive object, such as a metal tool or item of jewelry etc. may generate sufficient heat to cause severe burns, create arcing or cause any metal to melt and splash.

5. Physical Injury from Weight of the Battery

Lifting batteries incorrectly may cause strains to the human body and injury to the spine. Batteries, like those used in forklifts, are heavy and require proper material handling equipment to lift them safely.

PROPER AND SAFE DISPOSAL OF DISCARDED BATTERY MATERIALS LIKE SOLUTIONS AND COMPONENTS

Improper or careless handling of waste batteries can result in release of corrosive liquids and dissolved metals that are toxic to plants and animals.

Improper disposal of batteries in landfill sites can result in the release of toxic substances into groundwater and the environment. These chemicals are extremely toxic – to us and the environment.

Air Pollution: Batteries undergo a photochemical reaction as they decompose in landfills. This causes emissions of greenhouse gases. The danger lies in the fact that these batteries contain toxic chemicals that are absorbed by the soil.

Dispose of car batteries at an auto parts retailer or hazardous waste collection site. Since car batteries contain lead acid, they can't be disposed of in the trash or tossed in with your recycling.

Many retailers, like buy and sell of dead batteries or Auto Zone, will accept dead or used car batteries. You can also drop them off at recycling or waste disposal facilities that specialize in hazardous materials.

Keep your batteries in a cool, dry place. If your batteries become corroded or overheated, they could leak or rupture. It is also important to avoid storing your batteries near any flammable materials, as this could present a fire hazard

- Find out about local restrictions and guidelines about chemical waste disposal.
- If spills occur, do not dispose of battery residue by dumping it in the soil or water since this will cause contamination. Spills can also be neutralized using alkali-based chemicals and powders such as soda ash.
- All spent batteries and waste arising from spillages and fires must be disposed of in conformance with the Environmental Protection Laws, Special Waste Regulations and Environmental Protection Regulations.

What's More

Assessment 1

Direction: Answer the following question in the **answer sheet**.

1. Where should you dispose your old battery?
2. What happen if you will just spill the battery liquids in the soil?
3. How do you dispose your old battery without causing damages to property and injury to individuals?

Assessment 2.

Direction: Recall the battery nomenclature and answer the following questions in the answer sheet. Choose the letter of your answer on the options below.

1. These are the lead alloy framework that supports the active material of a plate and conducts current.
2. These are typically flat, rectangular components that are either positive or negative, depending on the active material they hold.
3. A group of positive and negative plates.
4. Refers to the solution of sulfuric acid and water.
5. It permits the escape of hydrogen and oxygen gases. Battery vents can be permanently fixed to the cover or be removable, depending on battery design.

OPTIONS

A. Plates	B. Vent holes	C. Electrolyte
D. Grids	E. Elements	

Assessment 3

TRUE OR FALSE

Direction: Write TRUE if the statement is correct while FALSE if it is wrong. Write your answer in the **answer sheet provided**

1. The hazard of batteries is battery acid that can burn skin or eyes and eat holes in clothing.
2. Proper PPE includes goggles, a face shield, rubber gloves, and a rubber apron.
3. Battery cells are immersed in a solution of sulfuric acid and water.
4. When the battery is used (discharged), the acid level becomes weaker until the battery cannot produce an electrical current.

5. Charging restores the acidity of the electrolyte so the battery can again produce an electrical current
6. You can safely recharge a battery anywhere.
7. Shut off the charger when connecting or disconnecting the battery.
8. Allowing the battery to cool down after charging prolongs battery life.
9. Baking soda is commonly used to neutralize electrolyte spills.
10. For electrolyte contact with a worker's skin or eyes, rinse immediately for at least 10 minutes and then seek medical attention.

What I Have Learned

Direction: Write specific learning in the different sub-topics you have read. Write your answer in the answer sheet provided.

1. I learned the that the main components of batteries are: a. _____, b. _____ c. _____, d. _____, _____

2. I learned the that the hazards associated with batteries: a. _____, b. _____ c. _____, d. _____, _____

What I Can Do

Direction: Provide a comprehensive answer for the question given below. Write your answer in the answer sheet provided.

In case your battery is already old, how will you dispose it properly?

_____
_____
_____
_____

Post-Assessment

Multiple Choice

Direction: Choose the LETTER of the best answer. Write your answer in the answer sheet provided.

1. It is a corrosive and poisonous liquid which will cause painful burns, irritation and scarring to the skin and eyes and could severely damage to clothing.
   a. Sulphuric Acid
   b. Flammable Gases
   c. Weight of the Battery
   d. Electrical Shock and Burns

2. Hydrogen and oxygen are produced as a part of the operation of the battery. These gases produce an explosive mixture within the battery and escape through the vents.
   a. Sulphuric Acid
   b. Flammable Gases
   c. Weight of the Battery
   d. Electrical Shock and Burns

3. An accidental short circuit of battery terminals by a conductive object, such as a metal tool or item of jewelry etc. may generate sufficient heat to cause severe burns, create arcing or cause any metal to melt and splash.
   a. Sulphuric Acid
   b. Flammable Gases
   c. Weight of the Battery
   d. Electrical Shock and Burns

4. In servicing battery, protect yourself by wearing the following personal protective equipment except.
   a. Goggles
   b. Face shield
   c. Metal necklace
   d. rubber gloves

5. With non-sealed batteries, water should be the only portion of the electrolyte lost due to evaporation during hot weather and gassing during charging.
   a. Corrosion
   b. Temperature
   c. Improper Electrolyte Level
   d. Undercharge /Sulfation

6. The sulfuric acid from the electrolyte corrodes, attacks, and can destroy not only connectors and terminals but hold-down straps and the battery tray as well.
   a. Temperature
   b. Corrosion
   c. Improper Electrolyte Level
   d. Undercharge /Sulfation

7. A battery in this condition will become sulfated when the sulfate normally formed on the plates becomes <u>dense, hard, and chemically irreversible</u>. This happens because the sulfate has been allowed to remain in the plates for a long period.
   a. Temperature
   b. Corrosion
   c. Improper Electrolyte Level
   d. Undercharge /Sulfation

8. Loose hold-down straps allow the battery to vibrate or bounce during vehicle operation. This vibration can shake the active materials off the grid plates, severely shortening battery life.
   a. Cycling
   b. Poor Mounting
   c. Corrosion
   d. Improper Electrolyte Level

9. Heavy and repeated cycling can cause the positive plate material to break away from its grids and fall into the sediment chambers at the base of the case. This problem reduces battery capacity and can lead to short circuiting between the plates.

a. Cycling
b. Corrosion
c. Poor Mounting
d. Improper Electrolyte Level

10. This hold securely the battery in the vehicle to prevent the possibility of shorting across the terminals if they move or fall.

a. Heat shield
b. Battery clamp
c. Battery terminal
d. Battery hold down

11. It is made of plastic or another material to protect the battery from high underhood temperatures.

a. Heat shield
b. Battery clamp
c. Battery terminal
d. Battery hold down

12. These are used to join the cells of a battery in series.

a. Cell cover
b. Vent caps
c. Vent holes
d. Cell connectors

13. It is encased on the top of the battery. The cover may be a one-piece design or the cell might have their own individual covers.

a. Cell cover
b. Vent caps
c. Vent holes
d. Cell connectors

14. This is to permit the escape of hydrogen and oxygen gases. Battery vents can be permanently fixed to the cover or be removable, depending on battery design.

a. Cell cover
b. Vent caps
c. Vent holes
d. Cell connectors

15. These are used on some batteries to close the openings in the cell cover and to allow for topping off the cells with water.

a. Cell cover
b. Vent caps
c. Vent holes
d. Cell connectors

Additional Activity

Direction: Answer what is being asked. Put your answer in the answer sheet provided.

What are the parts of maintenance free-battery?

_____ , _____
_____ , _____

Answer Key

What I Know

1. a
2. b
3. d
4. c
5. d
6. a
7. d
8. c
9. a
10. d
11. b
12. b
13. a
14. d
15. d

What's In

A. Answers vary

B. 1. Inside the hood.
2. Under the driver set
3. Trunk side of the car

What's New

3rd Car

What's More

Assessment 1

1. Auto parts retailer of hazardous collection site.
2. Cause contamination on the soil since battery contain toxic chemicals.
3. At recycling or waste disposal facilities.

Assessment 2

1. D
2. E
3. A
4. C
5. B

Assessment 3

1. True
2. True
3. True
4. True
5. True
6. False
7. True
8. True
9. True
10. True

What I Have Learned

Component of battery

1. Battery terminals
2. Grids
3. Plates
4. Separators

Hazards associated with batteries

a. Battery acid
b. Sulfuric acid
c. Flammable gas
d. Electrical shocks & burns

Post-Assessment

1. a
2. b
3. d
4. c
5. c
6. b
7. d
8. b
9. a
10. d
11. a
12. d
13. a
14. c
15. b

What I Can Do

Answers vary

Additional Activity

Positive & negative post
Vent
Test indicator
Green ball plate group

References

Automotive Servicing NC II. Curriculum Guide. Published on 2019 May 10th.

Automotive/SLI Batteries - Batteries by Fisher". Batteries by Fisher. Accessed February 15, 2016.

Larry Johnson. "Battery Tutorial". chargingchargers.com. Charging Chargers. Accessed February 15, 2016.

History of the car battery". www.racshop.co.uk. Retrieved 2016-02-17

Herron, David. "Why is there a 12volt lead-acid battery, and how is it charged in an electric car?". greentransportation.info. Retrieved 24 May 2020

Ruetschi, Paul (March 10, 2004), "Aging mechanisms and service life of lead–acid batteries", Journal of Power Sources, 127 (1–2): 33–44,

Bibcode:2004JPS...127...33R, doi:10.1016/j.jpowsour.2003.09.052
Training Regulations of TESDA in Automotive Servicing NC II "What is a lead battery?".

https://www.canva.com/photos/search/car-batteru-repair/

https://brightside.me/wonder-quizzes/9-puzzles-that-can-give-your-brain- a-workout- 675260

https://www.concordia.ca/content/dam/concordia/services/safety/docs/E HS-DOC-146_LeadAcidBatteries.pdf

https://www.google.com/search?q=Construction%20of%20a%20maintenancefree%20battery%20showing%20the%20location%20of%20the%20gas%20vents

http://autosystempro.com/wp-content/uploads/2013/06/Hybrid-grid-and- separatorconstruction.jpg

https://slideplayer.com/slide/5903556/19/images/16/Battery+Holddowns+Batter y+must+be+held+i n+its+tray.jpg

https://www.google.com/search?q=car+battery+cables&rlz=1C1PRFC_enPH893PH893&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjgl5Oik6zrAhVPzIsBHblZDvMQ_AUoAXoECA0QAw&biw=1366&bih=608#imgrc=DSZxfSQAd3wuJM

https://raybuck.com/automotive-battery-dimensions/

http://www.autoshop101.com/forms/h6.pf

For inquiries or feedback, please write or call:

Department of Education - Bureau of Learning Resources (DepEd-BLR)
Ground Floor, Bonifacio Bldg., DepEd Complex
Meralco Avenue, Pasig City, Philippines 1600
Telefax: (632) 8634-1072; 8634-1054; 8631-4985
Email Address: blr.lrqad@deped.gov.ph * blr.lrpd@deped.gov.ph
Telefax: (632) 8634-1072; 8634-1054; 8631-4985