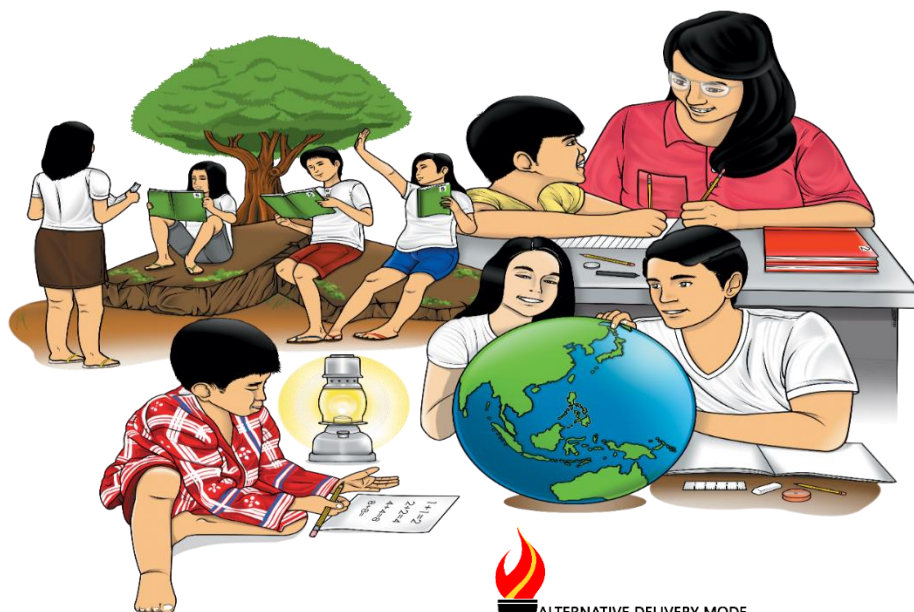


Special Program in Technical Vocational Education

Quarter 1 - Module 3 Service Automotive Battery (Removing and replacing batteries)

Automotive Servicing NC II



10

Special Program in Technical Vocational Education

Quarter 1 - Module 3 **Servicing Automotive Battery** (Removing and replacing batteries)

Automotive Servicing NC II

IA-Automotive Servicing – Grade 10
Alternative Delivery Mode
Quarter 1 – Module 3: Servicing Automotive Battery
(Demonstrate the Procedure in Removing and Replacing Batteries)

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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:





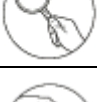
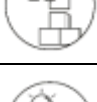

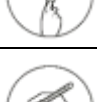
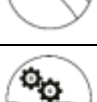
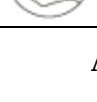
Hi, as a facilitator you are expected to orient the learners on how to use this module. You also need to keep track of the learners' progress while allowing them to manage their own learning. Kindly, advise the learner's parents or guardians of the same procedure since they will be the primary supporters 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 Servicing Automotive Battery (Removing and Replacing

Batteries). I hope you are ready to progress in your Grade 10 SPTVE in Automotive 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.

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LESSON

3

Removing and Replacing 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 Removing and Replacing Battery 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

Learning Competency Code

Learning Competency

Q1/W3

SPTVE_IAAUS9-12SAB-Ie-f-3

**LO 3. Demonstrate the Procedure
in Removing and Replacing
Batteries**

Learning Objectives:

After going through this module, you are expected to:

1. familiarize the different steps/procedures in removing and replacing a battery;
2. demonstrate the ability to safely remove, properly clean, and replace a battery; and,
3. develop traits such as resourcefulness and conscientiousness.



What I Know

Identification.

Directions 1: Read each question carefully and write the LETTER that corresponds to the **BEST** answer in your answer sheet. Choose your answer in the box given below.

1. A device that is used to maintain the battery in place to prevent battery vibration?
2. A tool that is used to clean the battery terminals and clamps?
3. A part of the vehicle where a battery is installed?
4. A solution that is use to neutralize the acid produce by the battery making it safe to handle?
5. In installing a battery, which cable must be connected first?
6. After installing the battery, the way to test it is to?
7. In removing a battery, which cable must be disconnected first??
8. A tool that is used to lift the battery in the battery tray?
9. It is used as a guide before removing a battery?
10. It is used as a protection on a cars fender before conducting an under hood repair in a vehicle like cleaning a battery??

- | | |
|--------------------------|-------------------------------|
| a. baking soda and water | f. grounded cable |
| b. battery hold-down | g. positive cable |
| c. battery lifter | h. service manual |
| d. battery tray | i. start the engine |
| e. fender cover | j. terminal and cable cleaner |

Directions 2: Arrange the following steps or procedures given in order in removing a battery. Assuming that the vehicle is an old vehicle. Used letters from A-E, A as the first step or procedure.

- _____ 11. Place a fender cover.
- _____ 12. Lift the battery using a battery lifter
- _____ 13. Disconnect the positive cable of the battery.
- _____ 14. Remove the battery hold-down.
- _____ 15. Disconnect the grounded cable of the battery.



What's In

Directions: Complete the paragraph. Choose your answer in the box provided just below the paragraph. Put your answer in your answer sheet.

Previously I have learned that _____1_____ is an important part of electrical system service for it will help me determine if my car's battery is nearing the end of its usefulness and whether I need to replace it and is determined in several ways like specific gravity test, _____2_____, _____3_____, _____4_____, _____5_____, _____6_____, _____7_____. I have learned also that different _____8_____ instrument is used in the different test and with proper _____9_____ to avoid any disease/health problem that may be caused by battery's harmful chemicals.

- a. Battery drain test
- b. Battery leakage test
- c. Battery Testing
- d. Capacitance test
- e. Capacity test
- f. Measuring/test
- g. Open circuit voltage tests
- h. Personal protective equipment
- i. Visual inspection of batteries with a built-in hydrometer



What's New

Direction: Look for someone who owns an automobile (parents, siblings or neighbors) whom you are about to interview. If it happens that your resource person is your neighbor, introduce yourself and tell them that what you are doing is a part of your module in Automotive. Interview at least two different persons. Write their answers in the answer sheet you have provided.

Here are the questions that you will ask during the interview.

1. Ask them politely to show to you the location of their cars battery.
2. Ask them how often they have been cleaning their car's battery?
Follow-up question: Why is it that we need to clean the battery?
3. Ask them if they had ever replaced their cars battery? If so, when and for what reason?

Sample format of your activity

Interviewee no.1: Name is optional

1. Ask them how often they have been cleaning their car's battery?
Follow-up question: Ask them the steps on how they clean their battery.

Response: _____

2. Ask them if they had ever replaced their cars battery? If so, when and for what reason?

Response: _____

Same with interviewee number 2.

Their answers just give you an idea on the content of this module. Finished this module and you will be able to remove, clean install or replace a cars battery.



What Is It

Removing and Replacing Batteries



Just like a bread, medicine or any product that has an expiration date, a car battery has also what we called lifespan where it will just fail when reached. A car's battery gradually deteriorates every time it's charged up by the vehicle's engine. After three years, it's normally time to install a replacement. Old car batteries can present a number of safety and reliability issues.

In a good battery, it should be removed and cleaned once per year, or whenever corrosion and acid buildup are noticed.

Before planning to remove your cars battery, make sure you have prepared the following for easier job and having a complete set of tools and materials before starting a job would save us a lot of time.

Tools and Materials Needed in Removing, Cleaning and Replacing a Battery

- | | |
|--------------------------------|---------------------------------------|
| 1. Baking soda and water | 6. Conventional wire brush and rags |
| 2. Battery clamp puller | 7. Fender covers |
| 3. Battery cleaning wire brush | 8. Masking tape or bright felt marker |
| 4. Battery strap or carrier | 9. Corrosion preventive spray |
| 5. Service manual | 10. Box wrench or cable-clamp pliers |

Protective Clothing

Rubber gloves

Rubber apron

Safety goggles or glasses with side shields

Steel-toed shoes

Note: The baking soda will react by bubbling up quite ferociously for a couple seconds. The reaction between the baking soda and water mixture and the acidic corrosion on the battery terminals will neutralize the acid, making it safe to handle

I. Procedures/Steps in Removing a Battery

Note: Make sure that the vehicle is parked properly and the wheels were chocked.

1. Place a fender cover around the work area.



Using a car fender covers ensures there is an extra layer of protection between the car and the chemicals that may spill out from a battery. It also protects the car in the event that an oil or coolant spill occurs and repel harmful liquids like brake fluid that can possibly damage a car's paint.

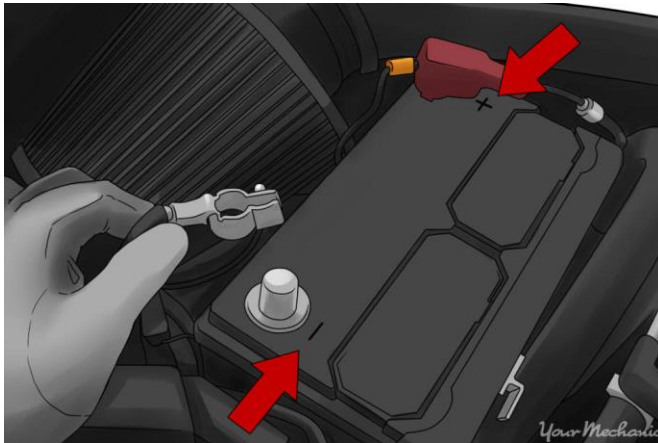
Fender covers are designed to be draped over your car's fender while you're working under the hood.

2. Consult the appropriate service manual for precautions computer controls.



In the latest model of cars which were pure electronically operated, referring to service manual of the vehicle is important to prevent possible damaged in the electronic parts.

3. *Locate and remove first the negative (-) battery terminal.*

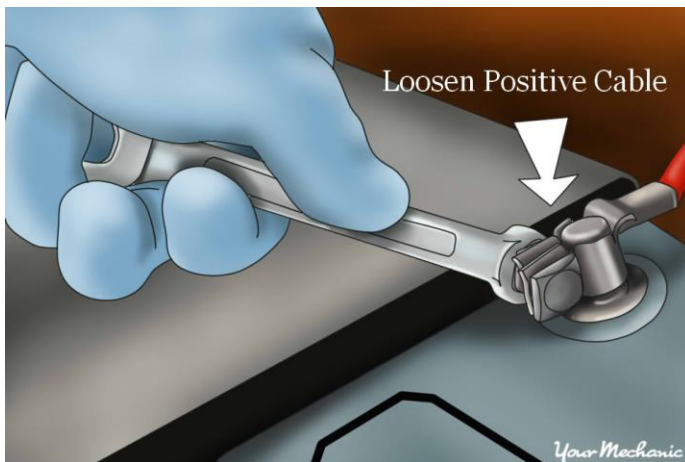


Always disconnect the grounded terminal from the vehicle first. Otherwise, a wrench or other tool can connect positive to negative, causing a direct short and sparks. Sparks can produce battery explosions.

Position the grounded cable well away from the battery.

Note: For connectors tightened with nuts and bolts, loosen the nut with a box wrench or cable-clamp pliers. Using ordinary pliers or an open-end wrench can cause problems. Always grip the cable while loosening the nut to prevent unnecessary pressure on the terminal post that could break it or loosen its mounting in the battery. If the connector does not lift easily off the terminal when loosened, use a clam puller to free it. Prying with a screw-driver or bar strains the terminal post.

4. *Locate and remove the positive (+) battery cable from the battery.*



Removing the positive battery cable of the battery after removing the negative battery cable is safe because the wrench or any other tool won't be having a reaction even though the tools may reach the body or any ground part of the vehicle.

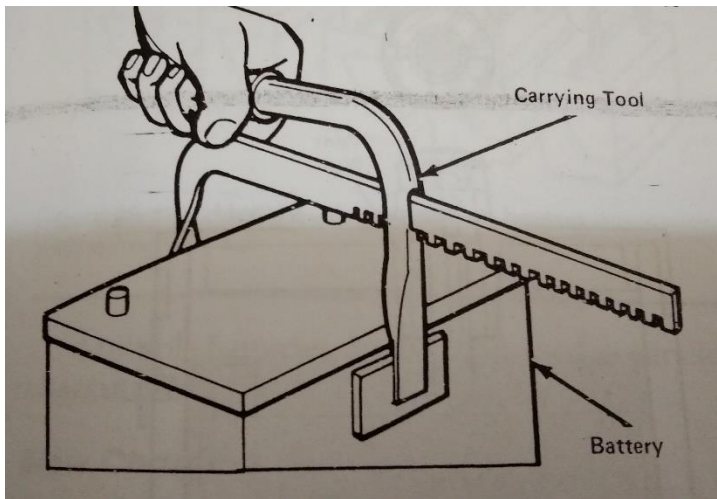
Note: If both battery cables are the same color, it is wise to mark the positive cable so that you will connect it to the correct terminal later. All that is needed to mark the cable is masking or similar kind of tape. Although differences in terminal size are designed to prevent reversing the polarity of the battery, marking the positive cable is an extra safeguard.

5. *Loosen and remove the battery hold-down straps, cover, and heat shield*



A battery doesn't like excessive vibration, which can shorten its life. And it doesn't like to fall out of its support tray against the motor and possibly into the fan. This can shorten its life, too. That's why the battery hold-down is there, to keep the battery in place.

6. *Lift the battery from the battery tray using a battery strap or carrier.*

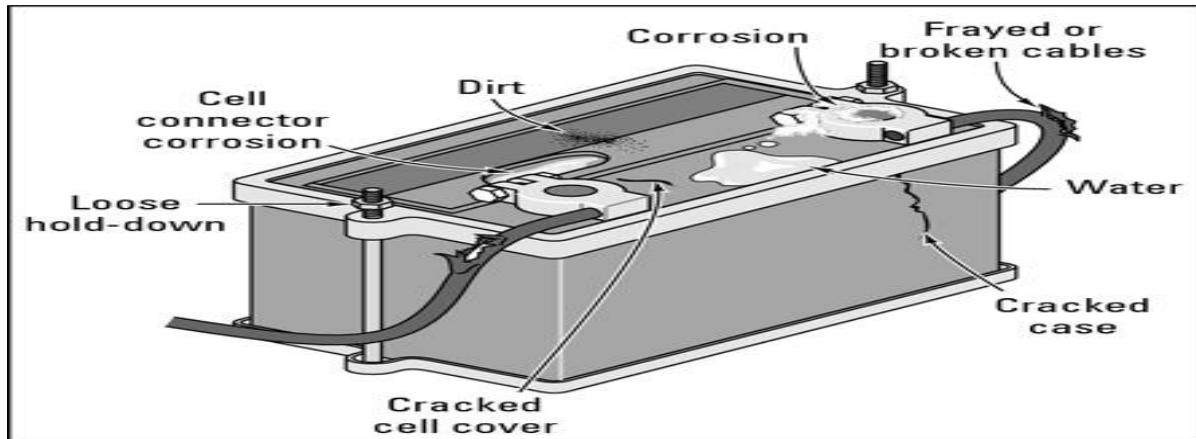


A car battery lifter or carrier is a simple accessory that is designed in such a way that it can help any user to carry the battery from one place to another with ease.

II. Cleaning of the Battery

A substance, called corrosion, will form on the battery terminals over time due to the chemical structure of the battery. While a little likely won't do any harm, a lot can block the electric current causing a vehicle not to start and other electrical accessories not to function and of course causing headaches for drivers.

Here is a picture that you may have observed in a battery.



A. Procedures in Cleaning a Battery

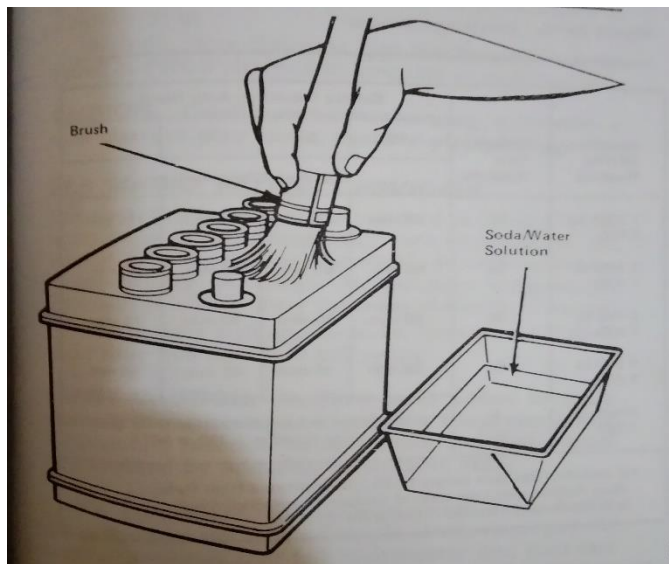
If you notice that the battery case is leaking, swollen, or bloated, skip the cleaning and head straight to the nearest auto supply and buy a new one but if it's just covered with dirt and corrosion then cleaning is applied.

1. *Mix baking soda and water*



The recipe is simple. Mix one tablespoon of baking soda into one cup of water, and stir it together until it's thoroughly mixed.

2. *Brush the baking soda solution over the battery top cover and terminals*



With an old toothbrush or a paint brush, dip the brush into this solution and scrub at the top surface of the battery and to the terminals when corroded. Clean the terminals thoroughly, until all of the buildup has been removed.

Note: Don't allow the solution to enter the cells of the battery

3. *Flush the baking soda off with water.*



After you've removed all of the corrosion and dirt from the terminals, give the battery a quick rinse. Fill up a spray bottle with a bit of water and spray down the terminals. If you don't have a spray bottle, you can also wipe everything down with a damp rag. Then, use another rag to dry the terminals completely.

B. Inspecting and cleaning battery cables, tray and hold down.

When the battery gets hot enough, or while it gets charged as being drive, gas from the acid escapes through the vents or through joints or cracks in the case. The gas reacts with the metals that the battery post, hold down, cables and tray are made out of, causing each to corrode.

1. *Brush the baking soda solution over the hold-down*



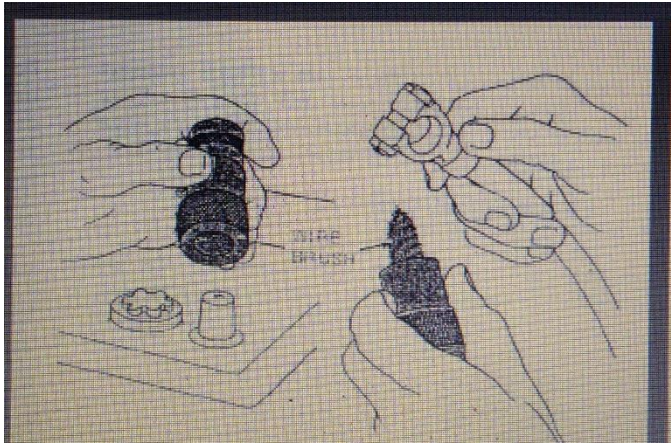
Brushing or dipping the hold-down into the solution will neutralize the formed rust/corrosion.

2. *Use a scraper and wire brush corrosion from the hold-down*



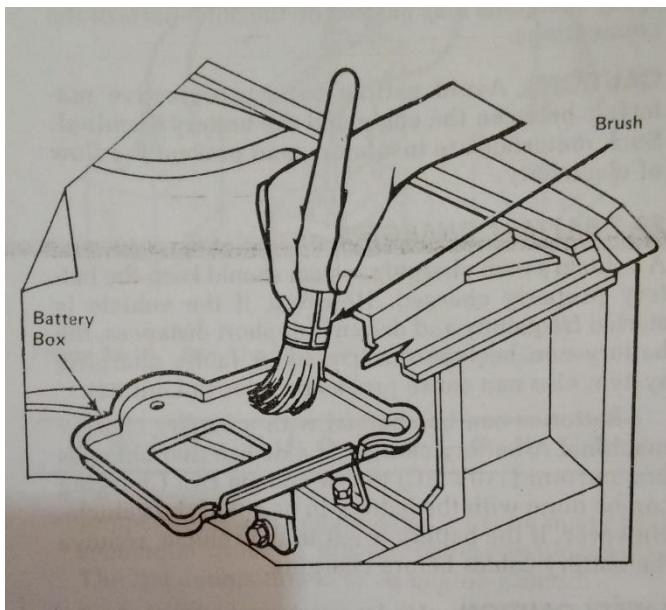
Apply steel brush on the hold-down till the rust is removed then wipe it with clean rags.

3. *Use a terminal cleaner brush to clean the battery cables.*



The vehicle may experience difficulty starting, slow cranking, or rapid clicking when the key is turned when the battery terminal and cable is corroded or rusted.

4. *Clean and inspect the battery tray.*



Place a drop of the solution onto the corroded or rusted area, then wait a minute or two for the neutralizing effect to take place, scrub the tray and apply clean rags in drying it.

Procedures in Installing a New Battery/Cleaned Battery

1. Reinstall, beginning with the positive cable, both terminal connectors. Do not overtighten because this could damage the post or connectors. Spray the top of the battery posts and cable connectors with a corrosion preventive spray.
2. Test the installation by starting the engine.



What's More

Activity 1

Directions: List at least 10 of the tools, materials and protective clothing that is needed in removing, cleaning and installing or replacing a battery. Write your answer in your answer sheet.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Activity 2

Directions: Write the word **True** if the statement is correct otherwise **False** if it is incorrect. Write your answers in your answer sheet.

1. In cleaning a battery, prepare all the tools needed before doing the job.
2. Mixture of salt and water would help in neutralizing the acid produced by the battery, making it safe to handle.
3. If paint brush is not available to scrub the top surface and terminals of the battery, old toothbrush may be used as a substitute.
4. Using a car fender covers ensures there is an extra layer of protection between the car and the chemicals that may spill out from a battery
5. Using hand gloves is NOT necessary when cleaning a battery.



What I Have Learned

Direction: Explain briefly what is being asked in the following question. Write your answer in your answer sheet.

1. As a car owner or a future car owner to be, what do you think is the importance of learning today's topic about removing, cleaning and replacing a battery? Write your answers in the answer sheet. 5 points each.

2. Why is it necessary to maintain a car's battery?



What I Can Do

Direction: Look for a car in your place then apply the steps or procedures in removing, cleaning and installing the battery. In every step/procedure you make, have someone take a photo of you, label or insert caption in what you are doing then send it to your teacher via email, messenger or printed output.

Sample format of the activity

A. Procedures in Removing a Battery

Picture 1 with caption and so on

B. Procedures in Cleaning the Battery

Picture 1 with caption and so on



Post-Assessment

Identification.

Directions 1: Read each question carefully and write the letter that corresponds to the **BEST** answer in the answer sheet. Choose your answer in the box given below.

1. It is used as a protection on a cars fender before conducting an under hood repair in a vehicle like cleaning a battery?
2. A solution that is use to neutralize the acid produce by the battery making it safe to handle?
3. After installing the battery, the way to test it is to?
4. A part of the vehicle where a battery is installed?
5. In removing a battery, which cable must be disconnected first?
6. In installing a battery, which cable must be connected first?
7. A device that is used to maintain the battery in place to prevent battery vibration?
8. A tool that is used to lift the battery in the battery tray?
9. A tool that is used to clean the battery terminals and clamps?
10. It is used as a guide before removing a battery?

- | | |
|--------------------------|-------------------------------|
| a. baking soda and water | f. grounded cable |
| b. battery hold-down | g. positive cable |
| c. battery lifter | h. service manual |
| d. battery tray | i. start the engine |
| e. fender cover | j. terminal and cable cleaner |

Directions 2: Arrange the following steps or procedures given in order in removing a battery. Assuming that the vehicle is an old vehicle. Used letters from A-E, E as the first step or procedure.

- _____ 11. Disconnect the positive cable of the battery.
- _____ 12. Disconnect the grounded cable of the battery.
- _____ 13. Place a fender cover.
- _____ 14. Lift the battery using a battery lifter
- _____ 15. Remove the battery hold-down.



Additional Activity

Direction: Answer the following in the answer sheet.

- a. Enumerate the protective clothing that you will use in removing, cleaning and installing the battery.

The Protective Clothing's are:

- 1.
- 2.
- 3.
- 4.



Answer Key

What I Know

1. B
2. J
3. D
4. A
5. G
6. I
7. F
8. C
9. H
10. E
11. A
12. D
13. C
14. E
15. B

What's in

1. A
 2. B
 3. C
 4. D
 5. E
 6. G
 7. I
 8. F
 9. H
- answers 2-
7 may
interchange

What's New

Answers may
vary

What's More

1. TRUE
 2. FALSE
 3. TRUE
 4. TRUE
 5. FALSE
- Assessment 1
1. Baking soda and water
 2. Battery clamp puller
 3. Battery cleaning wire brush
 4. Battery strap or carrier
 5. Service manual
 6. Conventional wire brush
 - and rags
 7. Fender covers
 8. Masking tape or bright felt
 - marker
 9. Corrosion preventive spray
 10. Box wrench or cable-clamp pliers

What I Have Learned

Answers may
vary

What I Can Do

Answers
may vary

Post Assessment

1. E
2. A
3. I
4. D
5. F
6. G
7. B
8. C
9. G
10. H
11. C
12. B
13. A
14. E
15. D

Additional Activity

1. Rubber gloves
2. Rubber apron
3. Safety goggles or glasses with side shields
4. Steel-toed shoes

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