

HOW TO BE A BATTERY HERO!

An introduction to battery recycling.



STUDENT WORKBOOK



RECYCLE YOUR
BATTERIES
CANADA!
powered by call2recycle

TABLE OF CONTENTS

03 Meet Smarty & Boxer

Meet Smarty and Boxer, our battery recycling mascots, willing to help you in this battery recycling learning journey.

04 What is a battery?

Definitions and fun resources to get familiar with the battery universe.

05 A little battery history

When and how were batteries invented? Discover their history!

06 The different types of batteries

Get familiar with the battery universe, learning more about different types of batteries.

**HI, I'M SMARTY THE
SMART BATTERY
CONTAINER! I'M SO
HAPPY TO JOIN YOU ON
THIS ADVENTURE!**



07 How do batteries work?

Become a battery expert! Learn about the parts of a battery and how it generates electricity.

10 Why is it important to recycle batteries?

Recycling batteries helps protect the planet. Find out how.

11 Collect, Protect, Drop Off

Learn about the three steps to safely recycle batteries in your community.

13 How are batteries recycled?

Learn the battery recycling journey.

14 What can old batteries become?

Battery components can be used in new products. Find out how.

15 Fun games and activities

Have fun with our battery recycling games and activities!

MEET SMARTY & BOXER

Meet Smarty, the Smart Battery Recycling Container, and his sidekick, Boxer!

You can find Smarty and Boxer at thousands of retail stores, libraries, and municipal depots across Canada, making it convenient for people to drop off their used batteries for recycling.

Smarty has special **sensors** and a **communication device** that he can use to tell the nice people at **Recycle Your Batteries, Canada!** when he is nearly full of used batteries.

They can then send a delivery person to empty Smarty so he can begin collecting used batteries all over again.

Boxer, the battery recycling box, is Smarty's reliable friend. He is small, fast, and agile so he can get into places Smarty can't go. Boxer has a big appetite for used batteries, so feed him often! When he's full, he catches a ride with a friendly delivery person back home to **Recycle Your Batteries, Canada!**

Find Smarty and Boxer in your community by visiting [RecycleYourBatteries.ca](https://www.RecycleYourBatteries.ca).



WHAT IS A BATTERY ?

DEFINITION:

A **battery** is a device that stores electricity. It can be used to help operate portable items like toys, remote controls and tools, without them needing to be plugged in.

There are many different types of batteries, but most of them can be recycled.



ACTIVITY:

Find **batteries around you**. List products that use batteries. Write them below:

Item 1:

Item 4:

Item 2:

Item 5:

Item 3:

Item 6

A LITTLE **BATTERY** HISTORY

**OVER 2000
YEARS AGO**

BAGHDAD BATTERIES

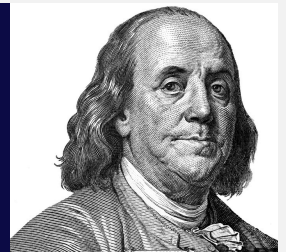
Archeologists have discovered artifacts dating back to between 250 BC and 224 AD that could be considered early batteries. These terracotta pots had copper sheets and iron rods inside and may have been used to electroplate jewelry.



1748

FIRST USE OF THE WORD BATTERY

Fun fact: the word “battery” was first used by Benjamin Franklin to describe an electric device. He chose the word because it reminded him of a group of cannons fired together, also called a “battery”.



1791

DISCOVERY OF ANIMAL ELECTRICITY

In 1791, Luigi Galvani discovered something amazing: when he touched a dead frog's leg with two different metals, it twitched like it was alive! He had just found out that electricity could make muscles move.



**AROUND
1800**

FIRST BATTERY INVENTED

In 1800, Italian scientist Alessandro Volta invented the first battery: the voltaic pile. He stacked copper and zinc discs with salty paper in between — and it created electricity!



1800'S

EARLY BATTERIES WERE JARS FILLED WITH LIQUID CHEMICALS

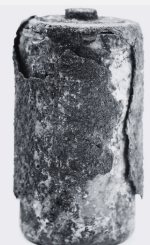
They worked, but could spill easily. Later in the 1800's, scientists invented dry batteries that didn't leak. These made batteries safer and portable — just like the ones we use today!



**END OF 19TH
CENTURY**

INVENTION OF DRY CELL BATTERIES

These batteries replaced the liquid electrolyte with a thick paste. This made portable electrical devices possible.





WHAT ARE THE DIFFERENT TYPES OF BATTERIES?

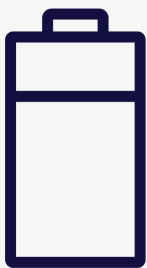


Single-Use Batteries: Also called primary batteries, or dry-cell single-use batteries, these are common household batteries that can't be recharged and must be replaced once they run out of power.



Rechargeable Batteries: Also called secondary batteries, or storage batteries, these can be recharged many times. But over time, they lose power and, like single-use batteries, will eventually need to be replaced.

Batteries can come in many shapes and sizes. Here are just a few:



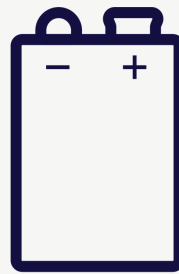
C, D



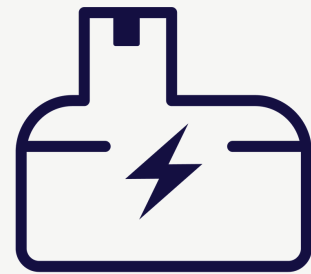
AA, AAA



Button

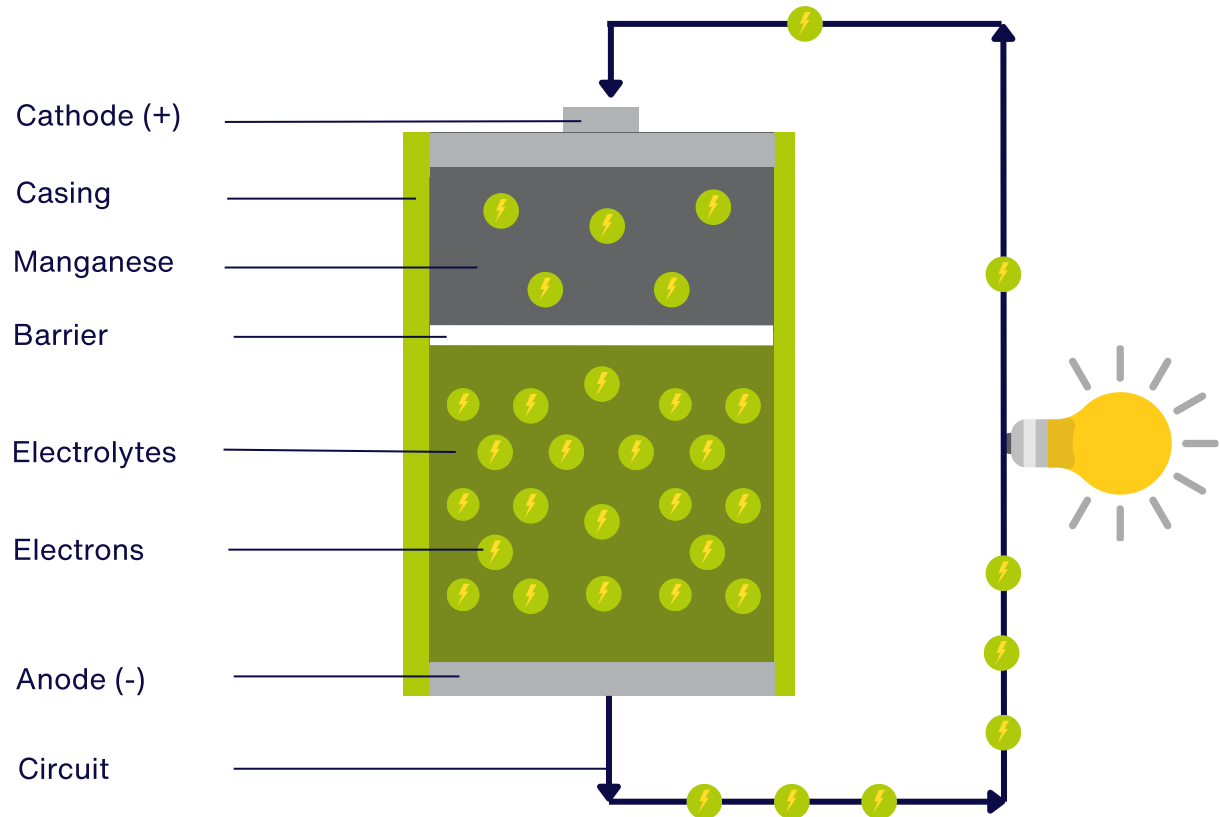


9V



Large Rechargeable

HOW DO BATTERIES WORK?



Think of the food that you eat. If you don't eat enough, you may feel tired. When you eat, your body converts the food into energy that lets you run and jump. In a similar way, batteries store electrical energy, in the form of **electrons**, housed in special chemicals.

Let's take a look at the simplified diagram above to see how a battery works. On the outside, there is a hard case, usually made of plastic. The ends, called **terminals** are made of metal and, can carry electricity. One terminal, called the **anode** has a negative sign (-). The other terminal, called a **cathode** has a positive sign (+).

The anode is filled with a chemical called **electrolytes**, which is filled with lots and lots of electrons. This acts as the fuel tank for the battery. The cathode is connected to a chemical such as manganese, that is **hungry** for electrons. It's ready to absorb electrons.

The anode and cathode are separated by a barrier, otherwise the battery would short-circuit. The only way for the electrons to escape is through the terminals.

When we connect the battery to a device like a flashlight and turn it on, we create a circle called a **circuit**. This allows the electrons to travel from the anode to the cathode. Along the way, they travel through the flashlight's wires, pass through the bulb, and electrons are used to light it up. That's how the bulb lights up!

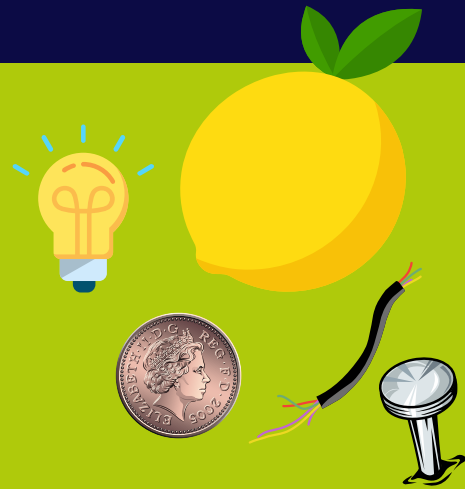
Over time, the chemicals in the battery get used up. Once that happens, the battery can't produce electricity anymore. That's when the battery must be recharged or recycled safely.

LET'S MAKE A LEMON BATTERY!

A FUN SCIENCE RECIPE, JUST FOR YOU!

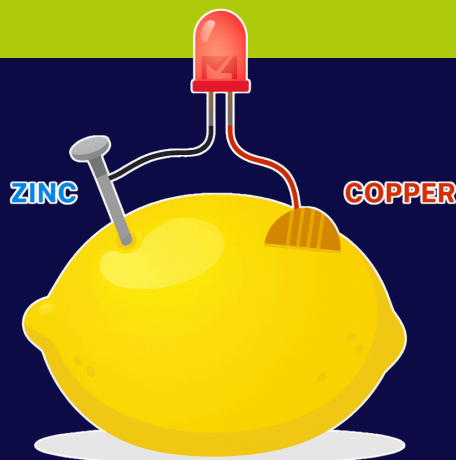
INGREDIENTS:

- 1 juicy lemon
- 1 shiny copper penny (or copper wire)
- 1 zinc nail (or galvanized nail)
- 2 short pieces of wire
- 1 small LED bulb or digital clock (optional!)



INSTRUCTIONS

1. Roll your lemon gently on the table to get the juice flowing inside (but don't break the skin!).
2. Wrap one wire around the copper penny, and another wire around the zinc nail.
3. Push the penny and the nail into the lemon, one on each side.
4. ⚠️ Make sure they don't touch inside the lemon!
5. Now, connect the free ends of the wires to your small bulb or digital clock.
6. 💡 Watch it light up — you've made electricity from a lemon!



WHAT'S HAPPENING?

The lemon juice acts as the battery's electrolyte, meaning it allows the flow of the electrical charge between the two metals. The penny acts as the cathode, or positive end, which attracts electrons. The nail acts as the anode, or negative end, which releases electrons. In this setup, electrons flow from the nail to the penny, just like in a real battery, creating an electric current.



SAFETY TIPS:

- Don't taste the lemon after the experiment!
- Ask an adult to help you with the wires and bulb.
- Never open real batteries — they contain dangerous chemicals



**TRY THE SAME EXPERIMENT
WITH A POTATO — WHICH
ONE IS STRONGER?**



WHY IS IT IMPORTANT TO RECYCLE BATTERIES?

PROTECT THE ENVIRONMENT



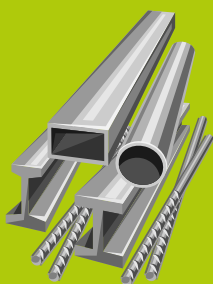
Batteries contain materials like lead, mercury, cadmium, and lithium. These can be very harmful to nature. If batteries go in the trash, they can leak into the ground or water and damage the planet. That's why we recycle them — to stop these toxic substances from causing harm.

PREVENT FIRES AND KEEP COMMUNITIES SAFE



If batteries are thrown in the trash, they can come into contact with metal objects and cause a spark, or even catch fire. Lithium-ion batteries can also catch fire if they are crushed in garbage trucks. It's much safer for everyone when we recycle them the right way!

REDUCE WASTE AND RECOVER NATURAL RESOURCES



Batteries contain valuable metals like nickel and steel. If they end up in landfill, they're lost forever. However, when batteries are recycled, these metals can be recovered and reused again and again!

Recycling also helps us reduce the need to mine new metals and saves a lot of energy.



FOLLOW THE RULES AND HELP YOUR COMMUNITY!

In many places in Canada, it's the law to recycle batteries. Programs like ***Recycle Your Batteries, Canada!*** have already collected millions of kilograms of batteries across the country! Your school or town may even have a battery bin — go check and become a Battery Hero where you live!

COLLECT, PROTECT, DROP OFF.®

Follow these steps to safely recycle your batteries and become a battery hero.



1. COLLECT

Collect used batteries in a non-metal container like an old tomato sauce jar or peanut butter jar.

2. PROTECT

Place electrical tape over the terminals of lithium and rechargeable batteries, and alkaline batteries over 9V to prevent sparks. Keep them away from heat and sun until they are ready to go.

3. DROP OFF

Drop off your batteries every three months to avoid corrosion. Find a drop-off location, by visiting RecycleYourBatteries.ca.

FIND SMARTY AND BOXER

Smarty and Boxer are hiding in this picture. Can you find them?



FIND SMARTY AND BOXER IN YOUR COMMUNITY

- Use a computer to visit RecycleYourBatteries.ca.
- Enter your postal code to find the closest drop-off location.
- Write it below and tell your parents.
- Go visit Smarty and Boxer and drop off your used batteries!

My closest drop off location is:



HOW ARE **BATTERIES** RECYCLED?



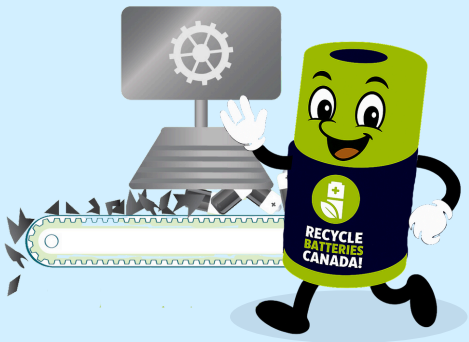
STEP 1 : COLLECTION

Drop your used batteries in a special box. It's the first step to becoming a Battery Hero! It all starts with YOU!



STEP 2: TRANSPORTATION & SORTING

The batteries are taken by truck to a big recycling centre. There, they are sorted into different groups.



STEP 3: PROCESSING

At the recycling plant, the batteries are safely taken apart. Useful materials are separated and saved for reuse.



STEP 4: NEW PRODUCTS CREATED

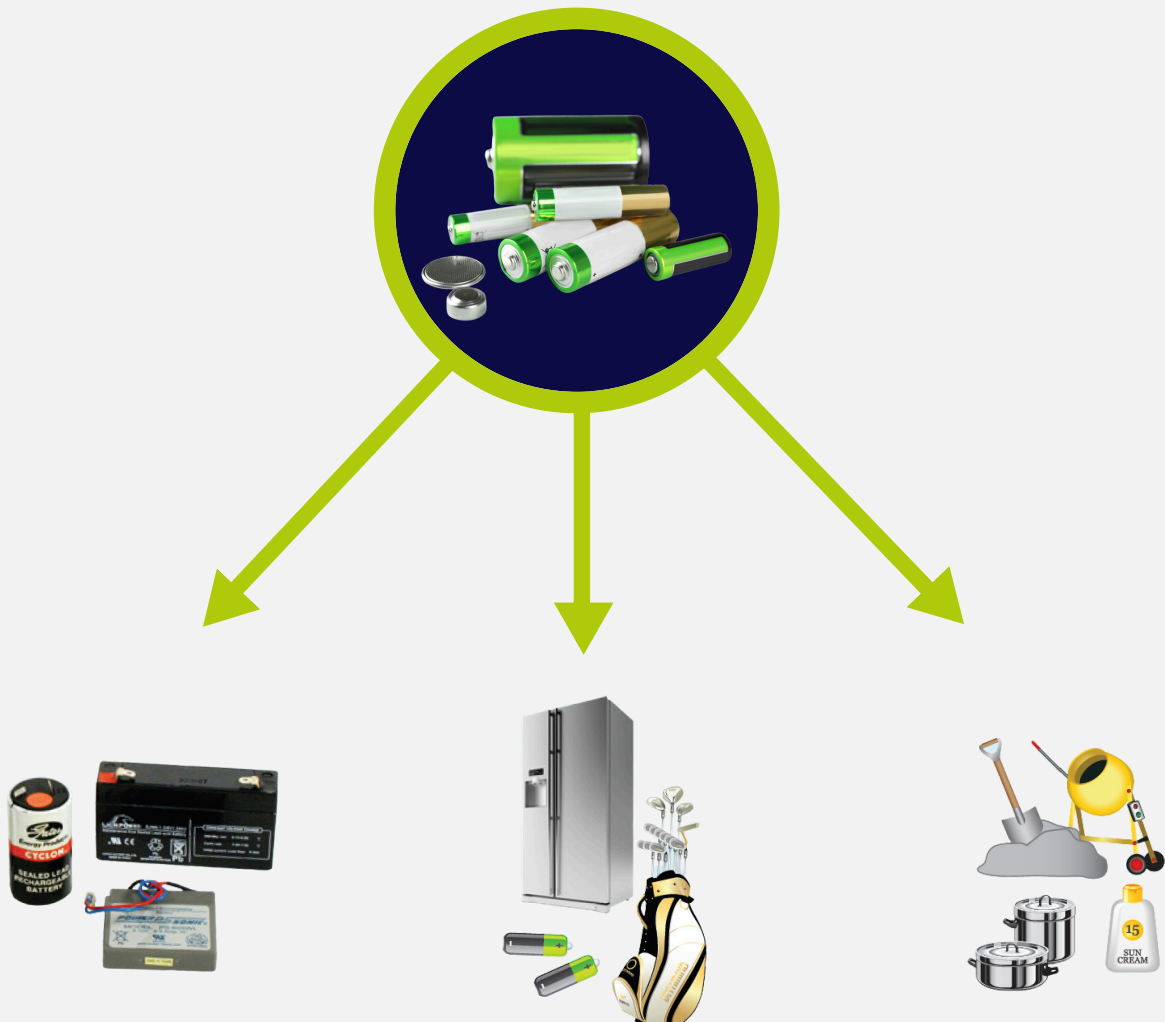
Metals are melted down into blocks called ingots and shipped to factories where they can be re-used in new products — like bikes, pots, or even new batteries!



WHAT CAN OLD BATTERIES BECOME?

Batteries collected by **Recycle Your Batteries, Canada!** are transported to a facility where they are sorted according to type, size, shape and chemistry. Sorted batteries are then sent to processors where they are broken apart through a mechanical separation process.

The battery components are separated, and materials are reclaimed for use in the manufacturing of new products. Metals recovered are melted down and can become nearly anything! The possibilities are endless!



Used lead-based batteries can be recycled into new ones.

Used Lithium-Ion rechargeable batteries can be recycled into stainless steel which can be used to make silverware, golf clubs and even new batteries.






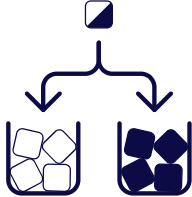
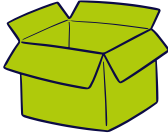




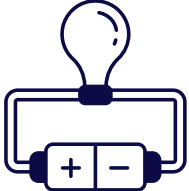
Used alkaline batteries can be recycled into steel and new products such as sunscreen, fertilizer and concrete.



BATTERY WORDS YOU SHOULD KNOW AS A BATTERY HERO!

Write the letter of the matching definition.

___ recycle	___ collection bin	___ hazardous	___ current
___ terminals	___ circular economy	___ to process	___ recharge
___ electricity	___ environment	___ to sort	___ pollution

 <p>A. The small metal parts on a battery that let power flow in and out.</p>	 <p>B. To take something old and turn it into something new.</p>	 <p>C. Using materials over and over instead of throwing them away.</p>	 <p>D. When you give energy back to a battery, so it can work again.</p>
 <p>E. Something that can be dangerous for people and the planet.</p>	 <p>F. To put things into groups based on what they are.</p>	 <p>G. A special box where used batteries are dropped off safely.</p>	 <p>H. When people make the air, water, or land dirty, which can hurt people, animals and nature.</p>
 <p>I. The world around us — like nature, animals and land — that we should protect.</p>	 <p>J. The power we need to make things move or work — like turning on a light or using a toy.</p>	 <p>K. To take something through steps to change or fix it.</p>	 <p>L. The flow of tiny electric particles, called electrons, that move to make things work.</p>

WHY IS IT IMPORTANT TO RECYCLE BATTERIES?

What are bad things that can happen when a battery is thrown in the garbage?

1. _____
2. _____
3. _____

What are the possible benefits of recycling batteries properly?

1. _____
2. _____
3. _____

What kind of products can be made from recycled batteries?

1. _____
2. _____
3. _____

Battery Recycling Quiz

Name: _____ Class: _____

Circle or underline the correct answer for each question. Good luck!

Who invented the first modern battery in 1800?

- a) Benjamin Franklin.
- b) Alessandro Volta.
- c) Thomas Edison.
- d) Albert Einstein.

Which of these is NOT a good reason to recycle batteries?

- a) Batteries contain harmful chemicals that can pollute the environment.
- b) Materials from batteries can be reused to make new products.
- c) Recycling batteries saves energy and resources.
- d) Batteries will last forever if you recycle them.

What should you do with a used battery?

- a) Throw it in the trash can.
- b) Take it to a battery recycling drop-off box.
- c) Flush it down the toilet.
- d) Put it in the regular recycling bin.

True or False: Nearly all parts of an alkaline battery can be recovered and reused.

True / False

Which of these can old battery materials turn into after recycling? (Choose all correct answers.)

- a) New batteries.
- b) Metal items like golf clubs or pans.
- c) Poisonous waste that nobody can use.
- d) Ingredients for products like fertilizer or paint.

Bonus (optional): Write one thing you find interesting from the battery lessons:

_____.



ACTIVITY: ACT IT OUT!

As a group or as a class, improvise a short scene that includes the following characters:

- Someone with a dead battery.
- A talking drop-off box.
- Sorting workers.
- Noisy recycling machines.
- Happy students receiving new products.



BATTERY HUNT MISSION

Name: _____ Date: _____

“Battery Hunt” – Find the Batteries in Your Life!

We use batteries in so many things. In this activity, your mission is to find devices that use batteries at home (or in class) and list them below. Ask an adult to help you if needed. We'll talk about your discoveries in class!

Find at least 5 things that use batteries, like toys, gadgets or tools. If you're not sure, ask an adult or check carefully. Example: TV remote, uses 2 AA batteries.

What type of battery does it use? If you know, write it down (AA, AAA, phone battery, watch battery, etc.). If not sure, you can leave it blank or guess (big or small?).

Have you ever changed that battery? Circle Yes or No. (If not, maybe it hasn't died yet or someone else changed it.)

What does your family do with the old battery? (Don't know? Ask! Some answers might be: throw it away, keep it, or recycle it!)

After your hunt: Which device had the most batteries in it at one time? _____. Which battery was the biggest? _____ (for example, a flashlight's D battery) and the smallest? _____ (for example, a watch battery).

GOOD LUCK DETECTIVES!

Bring this sheet back to class. Be ready to share one surprise or thing you learned about batteries in your home!





CREATE A POSTER

Let your creativity shine! Imagine you are an advertising expert assigned to create a poster to encourage people to recycle their used batteries. What message would you share? What would your poster look like? Draw it below!



FUNNY TRUE OR FALSE QUIZ

Test your knowledge! Read each sentence and check the right box: True or False.

You should store your used batteries in a metal bowl right next to the toaster.

☐

True

☐

False

Batteries love to take long naps in the trash can.

☐

True

☐

False

Taping battery terminals helps prevent sparks.

☐

True

☐

False

When you recycle your batteries, they might come back as a golf club or part of a bicycle!

☐

True

☐

False

**Rechargeable batteries never need to be disposed of.
They can be recharged over and over forever.**

☐

True

☐

False



MY BATTERY HERO PROMISE

Now that you know how important battery recycling is, it's your turn to take action! Are you ready to become a Battery Hero? Make your pledge below.

Fill out your Pledge Form:

My name is: _____

I promise to:

- ☐ Never throw batteries in the garbage.
- ☐ Help my family collect used batteries.
- ☐ Bring used batteries to a recycling box.
- ☐ Teach others what I've learned.
- ☐ Be a Battery Hero — every day!

Signature: _____

Date: _____



CONGRATULATIONS!

You did it! Thanks for helping protect the planet and learning so much! To celebrate your amazing work, here is your Battery Hero Certificate!

BATTERY HERO CERTIFICATE OF APPRECIATION



This certificate is presented to

[Signature]

For outstanding environmental achievement, by
filling out this booklet and contributing to a better
future.

[Signature]
Joe Zenobio

President
Call2Recycle Canada

