

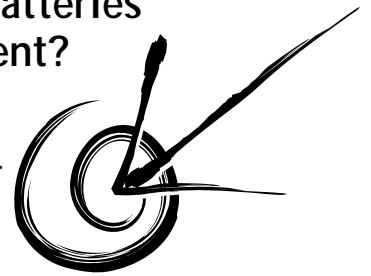


# Why are Batteries Harmful to the Environment?

## Lesson aims

**What are the different types of batteries? What are batteries made from and why are they harmful to the environment?**

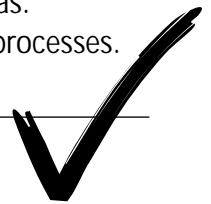
Students will learn about the different types of batteries, the amount of batteries and ways to reduce the damage batteries have on our environment.



## Learning outcomes

As outlined in the National Statements of Learning:

<b>Studies of Society and the Environment</b>	Place and Space	Features of places. Care of places. People and places.
	Resources	Use of resources. Management and enterprise.
	Active Citizenship	Students act in equitable ways to ensure the present and future quality of life.
<b>The Arts</b>	Creating, Making and Presenting	Exploring and developing ideas. Using skills, techniques and processes. Presenting.
<b>Science</b>	Natural and Processed Materials	Materials and their uses, structure and properties.
<b>Mathematics</b>	Chance and Data Collecting Data	Displaying and summarising data. Interpreting data.



## Why are Batteries Harmful to the Environment?



### Background information

We use batteries in many different things including cars, computers, laptops, radios, MP3 players, mobile phones, watches and clocks. Latest statistics show that Australia imported a staggering 267 million disposable batteries and 50 million rechargeable batteries in 2004 (ABS, 2005). However, the greatest environmental concern surrounding batteries is the impact they have at the end of their lives. Australia hasn't embraced battery recycling – it is estimated that around 94 per cent of dead batteries end up in landfill - and this is where the most serious problems start.

### Types of batteries

#### 1. Primary batteries:

are the most common household battery. These batteries automatically convert chemical energy into electrical energy. This kind of battery cannot be recharged and are thrown away straight after use. They are commonly known as alkaline batteries, contain zinc and manganese chemistry, and are often used in torches, toys, smoke detectors, watches, calculators, hearing aids, radios and remote controls.



#### 2. Secondary

**batteries:** are rechargeable and can be used

repeatedly. These batteries are usually nickel cadmium, nickel metal hydride or lithium ion. Secondary batteries are commonly found in cordless phones, cordless drills, mobile phones, laptops and computers, shavers, digital cameras, video cameras and house alarms. Although rechargeable, secondary batteries may need to be recycled when they no longer hold a charge.



### Environmental problems

Batteries are identified as a problem material in the waste stream. Batteries are made from a variety of chemicals to power their reactions. Some of these chemicals, such as nickel and cadmium, are extremely toxic and can cause damage to humans and the environment.

In particular, they can cause soil and water pollution and endanger wildlife. For example, cadmium can cause damage to soil micro-organisms and affect the breakdown of organic matter. It can also bio-accumulate in fish, which reduces their numbers and makes them unfit for human consumption.

### Disposal

Landfill is generally where batteries end up. Regulations governing battery disposal differ in each state and territory in Australia.

In Western Australia, both disposable and rechargeable batteries are classed as hazardous waste; they are placed in steel drums encased in concrete within secure landfills so that air and water can't corrode the battery casings. In Queensland, by comparison, people throw batteries in the bin with impunity.

The only batteries currently recycled in Australia are the lead-acid batteries that power our cars and trucks; more than 90 per cent of which are recycled. The good news is that moves are underway to establish household battery recycling.

In Melbourne, a trial of a free recycling service for household batteries began in mid 2007. The service is a joint initiative between the Government and industry to provide places where people can drop off their dead batteries.

## Why are Batteries Harmful to the Environment?

### Can you reduce batteries?

The most effective way to avoid battery waste is to reduce the amount you use. There are many items that do not require batteries such as non – battery operated watches, wind up radios and wind up torches.

### Can you re-use batteries?

Yes you can! There are many types of batteries that you can purchase that are rechargeable which means you can use the battery over and over again saving you money and reducing your impact on the environment.

Sanyo Eneloop rechargeable batteries can be used up to 1000 times. The Sanyo Eneloop rechargeable battery uses the latest technology and does not have any cadmium contained in it and therefore it is safer for the environment.



### Are batteries recyclable?

Unfortunately, there is no national recycling scheme for primary batteries in Australia. However, there are some companies that collect batteries and ship them overseas to be recycled. The Australian Battery Recycling Initiative (ABRI) is a relatively new organisation that consists of various battery industry organisations, recycling and collection companies plus environmental and government organisations that are working together at developing a sustainable viable national recycling program in Australia.

Batteries contain a range of metals, which can be reused as a secondary raw material. There are methods for recycling most batteries containing lead, nickel-cadmium, nickel hydride and mercury.



## Sources & further information

### Taking Charge of Battery Waste G Magazine on line

[www.gmagazine.com.au](http://www.gmagazine.com.au)

### Wastenet

Municipal Waste Advisory Council  
Battery Avoidance Strategies

[www.wastenet.net.au](http://www.wastenet.net.au)

### Recycling Near You

[www.recyclingnearyou.com.au](http://www.recyclingnearyou.com.au)

### NSW Department of Environment & Climate

[www.environment.nsw.gov.au/](http://www.environment.nsw.gov.au/)

### Sanyo Eneloop Rechargeable Batteries

[www.eneloop.info/](http://www.eneloop.info/)

### Waste Watch

[www.wasteonline.org.uk](http://www.wasteonline.org.uk)

## Why are Batteries Harmful to the Environment?



### Classroom Activity

### Lifecycle of Batteries

**Lesson Plan:** the aim of the lesson is to educate students about batteries and their impact on the environment.

1. Provide students with a number of different batteries to look at.  
  
Ask students if they know the difference between the batteries and what they are used for.  
Ask students to write a list or create a pictorial display of all the things in the classroom that contain a battery.
2. Explain to students that there are two different types of batteries
  - a. Primary batteries or non-rechargeable, and
  - b. Secondary batteries or rechargeable.
3. Ask students what they or their family do with batteries when they are no longer working or 'dead'.
4. Examine what happens to batteries if they are not disposed of properly and the effect on the environment.
5. Complete the *Worksheet: Taking Action – True or False?* and discuss what actions they can take to reduce the impact of batteries on the environment.

## Why are Batteries Harmful to the Environment?

# Worksheet: Taking Action - True or False?

There are some simple rules about how to safely handle batteries. Which one of the following statements will help you do this? Write *True* or *False* in the answers box.

Action	TRUE or FALSE
1 Use rechargeable batteries as they can be re-used several hundreds of times	
2 Choose primary batteries that are made from highly toxic materials like mercury and cadmium	
3 Purchase equipment that uses a winding mechanism and does not require batteries to operate e.g radios & torches.	
4 Recycle your rechargeable batteries when they can no longer hold a charge	
5 Recycle your non-rechargeable batteries	
6 Mix batteries with other objects, such as keys and coins, that can cause the battery to short circuit	
7 Remove batteries from equipment not being used as batteries may leak, corrode and damage the equipment which creates more waste	
8 Take apart or tamper with the case of the battery	
9 Purchase batteries when you need them, as they have a limited shelf life	
10 Remove batteries from battery-operated equipment before disposing the equipment	
11 Make batteries last longer by following recharging instructions on their packaging	
12 Throw away equipment with the batteries still inside	
13 Reverse the positive and negative terminals of the batteries when installing them in equipment or charger	
14 Recharge batteries when they are near to fully discharged	
15 Dispose of a battery in a fire or water	
16 Opt for appliances that can use power derived from the sun via solar panels.	

Answers:  
True: 1,3,4,5,7,9,10,11,14,16. False: 2,6,8,12,13,15

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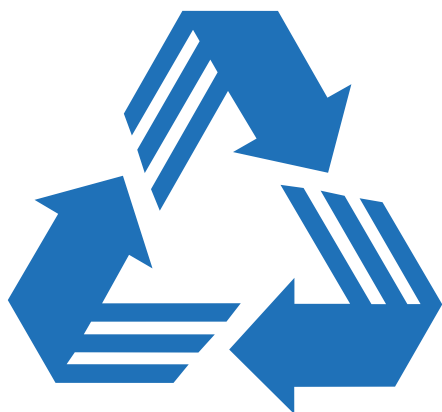
### Classroom Activity Battery Recycling Program



**Lesson Plan:** the aim of the lesson is to show primary school children how to correctly dispose of household batteries, whilst providing an environmentally responsible means of disposal.

1. As a class discuss why it is important to recycle batteries.
2. Currently there is no national battery recycling scheme for primary batteries in Australia.

As a class, find out what local facilities or services your school could access to run a battery recycling program for your school community. You could start the research by visiting your school or local library, contacting your local council or finding out more information from one of the programs listed on the right (if they operate in your area).



**Cleanaway's Battery Recycling Programme:** This program collects rechargeable batteries such as nickel cadmium, nickel metal hydride or lithium ion. These are most commonly found in cordless phones, cordless drills, mobile phones, laptops and PCs, shavers, digital cameras and video cameras. To find out more, call (07) 3367 7800 or visit [cleanaway.com.au/batteries](http://cleanaway.com.au/batteries)

**Battery World:** Participating Battery World stores will collect secondary/rechargeable batteries. To find out if Battery World near you is collecting batteries, call 13 17 60 or visit [www.batteryworld.com.au](http://www.batteryworld.com.au)

**IKEA:** offers customers a used light bulb, compact fluorescent and household battery take back service. Customers can take used batteries back to IKEA and deposit them in the take-back containers, located just after the checkouts. Visit [www.ikea.com.au](http://www.ikea.com.au)

**Batteryback:** Victorian residents can take advantage of a free battery recycling program for rechargeable batteries and household single-use batteries. For further information call 1800 353 233.

**Clean Up Australia:** Recycling your mobile phone and battery is easy, request a free satchel from Clean Up Australia by registering on-line <http://mobile.cleanup.org.au/register.html> and then follow the instructions on the satchel and send via freepost through Australia Post to Clean Up Australia's partner Australian Recycling.

**Local Council:** Contact your local council or community recycling facility to see if they have any household battery recycling options.

## Why are Batteries Harmful to the Environment?

3. Ask your battery recycler or local council representative to give a brief talk to your school about battery recycling and its benefits to the environment. Students and teachers will learn more about what happens to their recycled batteries.
4. As a class complete the *Worksheet: Battery Recycling Program* and discuss what ideas students have developed.
5. Prioritise what actions the class will take to develop the battery recycling program and include a suggested timeline for implementation
6. Ask small groups to discuss and agree on some rules for managing each action of the program.
7. If the whole school is going to participate in the program nominate one teacher and class to act as 'Leaders of the Program'. They will be in charge of collecting the batteries from each classroom to monitor progress. Each year the 'Leaders of the Program' can change.
8. Each class can be responsible for monitoring and promoting the program within the school and at home to parents. Each class can develop a tracking poster to display the number and weight of batteries they have collected.
9. Ask students to observe and record the battery recycling program using a method of their choice including drawing, story, picture, and photos. Students can be encouraged to participate through the use of competitions between classes.
10. Encourage students to reflect and include their thoughts on how the class and wider school community is helping the environment by living more sustainably.



### Extension Activity

Brainstorm with the class ideas on how to implement a national battery recycling program and facility in Australia. The following questions may be asked.

Who will be involved?

How will the batteries be collected?

How will the batteries get from the collection point to the recycling facility?

Where will the recycling plant be located?

Where does the recycled material go?

*Why are Batteries Harmful to the Environment?*

# Worksheet: Battery Recycling Program

Your plan on setting up a battery recycling program.

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1. What is the goal of the program?

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2. What ideas do we have to set up the program?

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3. What tasks need to be completed?

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4. What teams should we set up to complete each task?

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5. Who will be in each team?

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6. How will we tell other students about the program?

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7. How will we measure the success of the program?

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## Why are Batteries Harmful to the Environment?



### Classroom Activity

#### Non-rechargeable versus Rechargeable Batteries

Lesson Plan: the aim of the lesson is to learn about the benefits of rechargeable batteries and encourage students and parents to change to rechargeable batteries.

1. Discuss with students the types of things in the classroom and at home that use batteries to operate. For example clocks, mobiles phones, radios, ipods, game boys, cameras, laptops and cars.
2. As a homework activity ask students to complete the Worksheet: Household Survey.
3. Ask students to display the number of non-rechargeable versus rechargeable batteries they found in their home using a bar graph.
4. Total the whole classes' numbers of batteries found and calculate the percentage of non-rechargeable and rechargeable batteries being used. Draw a bar graph to represent the results. Discuss the results.
5. Develop a list of reasons why we should switch to rechargeable batteries
6. As a whole class activity or in small groups ask students to develop an advertising message and depending on student abilities, advertising material (for example posters, advertisements, storyboards, video or digital productions) to get people to switch to using rechargeable batteries.
7. Invite groups to share their ideas and present their advertising message to the classroom. Appropriate final products can also be displayed in the classroom, school office or local community facilities.

8. As a class discuss the importance of communicating information about rechargeable batteries.
  - a. What did you find interesting about the topic?
  - b. Did the number of non-rechargeable batteries being used surprise you?
  - c. Do you think the advertising messages would influence people?
  - d. What are the environmental ramifications of switching to rechargeable batteries?

### Extension Activities

Ask students to research the alternatives to rechargeable batteries that currently exist or are under development. For example, for portable radios and torches rechargeable batteries are being replaced by clockwork mechanisms or dynamos, which are cranked by the user to provide power.

Students can undertake an experiment to compare the overall life expectancy and cost of non-rechargeable versus rechargeable batteries.

You will need to purchase two same-volt non-rechargeable and rechargeable batteries. Place the batteries in two identical products like a torch. Make sure you write down the cost of each battery so that you can compare the costs. Turn the torches on and record the time the torches are on – students may need to take the torches home to record the time.

The experiment will need to be conducted a number of times so that you can determine the average life span for a non-rechargeable and rechargeable battery.

## *Why are Batteries Harmful to the Environment?*

# Worksheet: Household Survey

Ask students to survey their home of all the things that operate on batteries and complete the following sheet. Ask students to fill out the entire sheet except for adding up the totals.

Object	How many batteries in the object?	Rechargeable or not? (Y/N)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
	Total No =	Rechargeable = Not Rechargeable =