C.I.EAU
Centre d'interprétation de l'eau

CYCLE 3 ELEMENTARY

Fantastik'eau

J'aime l'eau, j'en prends soin !

THE FANTASTIK'EAU EDUCATIONAL PACKAGE (2ND EDITION)
COMPLETE GUIDE: CYCLE 3

Québec

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Fantastik'eau I love water. I take care of it!
The Fantastik'eau educational package: Complete Guide, 2nd edition

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CREDITS
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The full list of people who contributed to the project (employees, volunteers, contract workers) is displayed on the C.I.EAU's website.

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CURRENT SITUATION*

In 2018, the water distributed in Québec amounted to 1 345 million cubic metres per year, which is the equivalent of 358 667 Olympic swimming pools! Quebeckers are among the people who consume the most drinking water in the world, even though their way of life is similar to that of many other countries, particularly in Europe, where water is used sparingly.

Water may seem overabundant on our planet, but treating it is more complicated than it seems. The vast majority of the Earth's water (the oceans, for instance) is salty, making it very difficult and costly to use as drinking water.

The Québec Ministry of Municipal Affairs and Housing estimates that, in 2018, the average distribution of drinking water in a city of Québec amounted to 536 litres of water per capita per day. Half of this water is dedicated to commercial, industrial and institutional uses or is lost to leaks in the water supply system. Citizens, however, can have a significant impact on half the volume of this colossal consumption of water.

Currently, over 40% of Québec's water distribution network suffers from a high or very high level of leaks while the levels of moderate and low leakage account for 26% and 31% respectively. In general, Québec's leakage level is high, which significantly increases its distribution of drinkable water.

Bottled water represents another major problem. Not only does bottled water cost consumers 1 000 times more money, but 25% of the bottled water on the market is regular tap water. Producing a bottle of water requires even more water than it carries. Therefore, drinking bottled water is not a viable long-term solution.

The quality of Québec's drinking water is excellent. Several of the province's drinking water treatment plant exceed government standards in terms of water quality. Without a doubt, this resource is the blue gold of Québec.

The Québec government's goals for 2019–2025: reduce the amount of water distributed per capita by at least 20% compared to 2015, and reach moderate or low leakage levels throughout the province.

For more information on water and the issues affecting it, visit C.I.EAU's website at **www.cieau.org**.

*To learn more about the sources of this documentation, please refer to the Bibliography and Webography at the end of this document.

FOREWORD

The Centre d'interprétation de l'eau (C.I.EAU) is pleased to present this second edition of the Fantastik'eau activity package. The materials and the slogan "I love water. I take care of it!" aim to raise awareness about a very valuable resource: water.

Fantastik'eau is an educational package that includes eight scientific missions. These missions describe fun and instructional learning situations for elementary students in all three cycles. The package was designed to offer connections with the curriculum of the Québec Education Program (QEP).

Two of the missions were designed to be done in a classroom environment. The six other missions are intended for families at home or to deepen students' learning at school. Each of these eight missions includes a short video featuring Jérémie Larouche, a comedian, host, and scientific popularizer.

This package is intended to provoke questions and a sense of wonder about the omnipresence of water in our daily lives. Its ultimate goal is to instill a desire to protect it and manage it more effectively.

From a young age, children today have a strong awareness of environmental issues, along with a willingness to play an active role in society. Therefore, it is important to provide these future agents of change with opportunities to develop their burgeoning sense of civic responsibility.

Schools provide an ideal environment to raise or strengthen awareness about the wasting of our most precious resource.

Together, we can make a difference!

FANTASTIK'EAU ACTIVITIES

MINI-ACTIVITY A

Cycle 1

AQUA-RESPONSIBLE BEHAVIOURS

This activity invites students to think about different habits they can adopt regarding water. What are the impacts of these habits? Which ones are ideal, and why?

MINI-ACTIVITY B

Cycle 1

THE WATER EXPERTS' INVESTIGATION

Your class will embark on an investigative adventure to find out where drinking water is used at school. Students will offer suggestions to improve water consumption by completing the "Water experts' report."

MISSION 01

Cycle 2 Cycle 3

WHERE DOES DRINKING WATER COME FROM?

This first mission explains where drinking water comes from. Students learn about the source from which a drinking water treatment plant draws its water and how it is treated. A problem arises at the drinking water treatment plant, and students must therefore make their own "water filter" and calculate the proportions of water they can filter using it.

MISSION 02

Cycle 2 Cycle 3

SAVING DRINKING WATER

During this second and main mission, your students will dive into the action by learning how a water-saving device works (scientific method). All the materials you need are easy to find at home! This mission offers fun ways to approach problem-solving, to calculate surface areas, and to determine drinking water savings in percentage values.

EXTRA MISSIONS

Cycle 1 Cycle 2 Cycle 3

WATER'S PATH, WHAT A MAZE!

THE WATER TOWER

ALERT! THERE'S A LEAK!

THE SONOSCOPE IS LISTENING!

IN HOT WATER

QUIZ: HOW WATER-CONSCIOUS ARE YOU?

Your students are thirsty for more? No problem! We have a list of short missions that can be done in the classroom or at home to deepen their learning in mathematics and in science and technology. From experiments to games and quizzes, there's something for everyone!

THE FANTASTIK'EAU WEBSITE

To view and download all of the Fantastik'eau content, visit the C.I.EAU's website at **www.cieau.org/fantastikeau**

THE FANTASTIK'EAU VIDEO SERIES

Our extra missions are all accompanied by a video featuring Jérémie Larouche, who invites students to experiment with him. Check them out on our website or YouTube channel!

EDUCATIONAL OBJECTIVES

LEARNING OBJECTIVES

Each activity is put into a fun and practical context with inspiring characters, all while focusing on learning.

Through these activities, your students will learn:

1. How to use certain objects and simple scientific principles to save drinking water on a daily basis.
2. How to calculate water savings achieved by adopting environmentally responsible behaviours.
3. Where the water that goes through the urban water cycle comes from.

CONNECTIONS WITH THE CURRICULUM OF THE QUÉBEC EDUCATION PROGRAM (QEP)

• **Ethics and Religious Culture** (Cycle 1): Give examples of actions that can foster the well-being of living beings; Give examples of actions that are harmful to living beings.

• **Mathematics** (Cycles 2 and 3): Measurement units; Decimals; Perimeter; Estimating surface areas; Proportions; Percentages.

• **Science and technology** (Cycles 2 and 3): Technological design; Scientific method; Impact of the quality of water on living beings; Water cycle.

At the end of this adventure, everything will be crystal clear... like a glass of fresh water!

INTERACTIVE WHITEBOARD

To facilitate classroom activities, some assignments are available in **IWB** formats.

Mini-Activity A: Aqua-Responsible Behaviours
Mini-Activity B: The Water Expert's Report
Mission 01: Crystal Clear
Mission 02: Saving Drinking Water
Extra Mission 03: Water's Path, What a Maze!
Extra Mission 08: Quiz: How Water-Conscious Are You?

Find and download the **IWB** formats for these activities on our website at **www.cieau.org/fantastikeau**

MEET THE FANTASTIK'EAU CREW!

Join **Wasteful Wally** and **Conscious Charlie** in their misadventures, while experiencing science and technology. These two characters do their best to protect our precious blue gold … but despite their best intentions, they always seem to be treading water! You and your students must come up with inventive solutions to help them out.

The Fantastik'eau crew will help you succeed in this mission.

Young, curious and meticulous, **Aqua-Mary** is eager to know how everything works. She's also a swimming athlete. Her discipline is … unwavering, which is especially helpful in mathematics and in science and technology!

Walter was born in Québec, but his parents are from India, a country struggling with a drinking water crisis. Potable water is becoming increasingly difficult to source in his parents' home country. He understands that it is a very precious resource indeed, and he has a ton of clever ideas to conserve it.

Jérémie, Aqua-Mary and **Walter** are joined by **Crystal Clearwater**, a water treatment expert who helps them deepen their knowledge of water.

Wasteful Wally

Conscious Charlie

Jérémie

Aqua-Mary

Walter

Crystal Clearwater

JÉRÉMIE LAROUCHE:
A comedian who has won several awards, Jérémie also runs a YouTube channel with his daughters, hosts a podcast, and collaborates on a number of television shows. Among other projects, he is the host of several programs for young viewers. Jérémie dived into the Fantastik'eau experience by tackling the extra missions.

MISSION 01

Fantastik'eau

I love water. I take care of it!

CRYSTAL CLEAR

CYCLE 3

C.I.EAU Centre d'interprétation de l'eau

Québec

MISSION
01

Fantastik'eau

I love water. I take care of it!

CRYSTAL CLEAR

IWB
ACTIVITY ALSO AVAILABLE IN INTERACTIVE WHITEBOARD FORMAT!
cieau.org/fantastikeau

TEACHER'S GUIDE
CYCLE 3

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Québec

MISSION 01: CRYSTAL CLEAR

GOAL OF THE ACTIVITY

Build a water filter to "fix" a section of the drinking water treatment plant.

DURATION

45 MINUTES

CONNECTIONS WITH THE CURRICULUM OF THE QEP

MATHEMATICS:

- Fractions, percentages

SCIENCE AND TECHNOLOGY:

- Technological design
- Using simple measuring instruments
- Measuring quantities

CRYSTAL CLEARWATER: There are 995 municipal drinking water treatment facilities in Québec, which get their water from surface or groundwater sources, and 7 000 certified water treatment operators—people like me!

JÉRÉMIE: The plate will be used to support the plastic glass. The size of the hole in the plate must be slightly smaller than the opening of the glass in order for the rim of the glass to be able to rest on the plate.

WALTER : Check out the filter I made! You can show it to your students if they need some inspiration.

I used a coffee filter, some cat litter, gravel, cotton balls, and a strainer. I lose a lot of water when filtering … your students can surely do better!

MATERIALS FOR EACH TEAM OF 2–3 STUDENTS

- 1 large nail, 1 pushpin or a sharp screwdriver (!)
- 2 glasses made of clear, flexible plastic that each hold 250 millilitres of liquid
- 1 paper or aluminum plate with a six centimetres diameter hole in the middle (diameter of the base of the 250 millilitres glass)
- Earth and leaves to cloud the water that will be filtered by the water filter. The water must be brown, but not muddy, in order for the students to see a difference.
  - e.g. 1 cup (250 millilitres) of water + 1 tablespoon of earth, leaves, branches or debris, as desired.
- Students' choice of the following to filter (B) :
  - A paper coffee filter
  - Sifted sand
  - Gravel or aquarium gravel
  - Funnels or strainers
  - Cotton balls
  - Sponges
  - Cat litter (non-clumping)
  - Cardboard, paper
  - Whatever you find in the recycling bin, whether or not it works!
- 1 measuring cup (A)
- Scissors and a pencil
- Water and a bin or tray to hold the water
- A time measuring device (clock, watch, stopwatch)

WARNING

It is recommended to have an adult use a drill, a hole puncher or another tool to pierce a hole.

BACKGROUND

Still half asleep, Conscious Charlie trudges towards the shower, with a towel around his neck. Wasteful Wally dashes past him and slams the shower door shut.

He opens the faucet of the shower ... but hardly any water comes out! Outraged, Wasteful Wally is eventually joined by Conscious Charlie. Together, they open the faucet, look inside the showerhead, and listen for the sound of water in the wall. It's no use: the water still won't run!

Our two companions head to the source of the problem: the drinking water treatment plant. They are welcomed by Crystal Clearwater, who tells them the problem is caused by the filters. Normally, they are changed one by one, every 25 to 30 years. Exceptionally, they must now be changed all at the same time! That explains why Mini-Town's water flow has been significantly reduced. If only a team of people could build new filters, the water flow could be restored much sooner!

THIS IS A JOB FOR
THE FANTASTIK'EAU CREW!

BUILDING A BASIC WATER FILTER

INSTRUCTIONS FOR CYCLE 3 ELEMENTARY STUDENTS

1. YOUR TASK

Build a filter that clarifies water and also allows it to flow well.

2. INVESTIGATING AND IDENTIFYING POSSIBLE SOLUTIONS

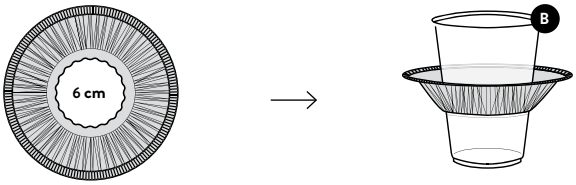
Guide your students' hypotheses towards absorbent materials AND mention that sand and gravel are often used in filters. Ask your students to advance hypotheses. Let them illustrate the plans for their filters, then tell them to get to work! Each team must create a prototype (step 3). The results are then shared to determine which ones work best. Lastly, the students calculate the gains they have achieved (step 4).

CRYSTAL CLEARWATER:
If your students have difficulty building a filter, a standard model can be made by putting a paper filter in the bottom of the glass, then adding sand and gravel. But first, invite them to explore the materials, to choose the medium (or media) they intend to use to filter the water, and to explain their choices.

3. DESIGNING THE PROTOTYPE

- Your students will use a 250 millilitres B glass in which they will punch six holes using a pushpin or a sharp screwdriver. !
- Next, your students will enlarge the holes using a large nail. You can also make the holes in advance if you prefer, or use a funnel. !
- Lastly, your students will choose the medium (or media) they will use to filter the water.

Note: the chosen medium (or media) must all fit into the glass!



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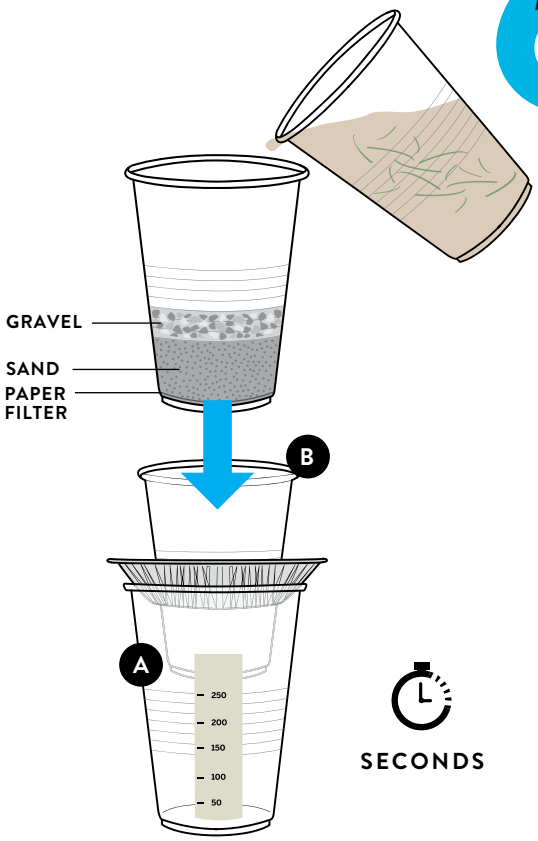


JÉRÉMIE:
A similar design will be used in Mission 02! You can use a clear plastic glass to allow your students to see how the filtering media are superimposed in the glass.

4. OBSERVATIONS : CALCULATING THE VOLUME OF WATER LOST

Up until now, everything could be done without getting wet! At this stage, we add the use of water. You can do the filtration tests in a plastic bin or tray, or ask the teams to proceed one at a time in the sink to avoid spills.

Alternatively, you can make a hole with a six centimetres diameter (or with the same diameter as the glass) in a thick paper plate, insert your glass with the filter, and place everything on a measuring cup A. Afterwards, all you need to do is stir and pour the cloudy water over the filter. Your students can also simply hold the glass over a measuring cup.

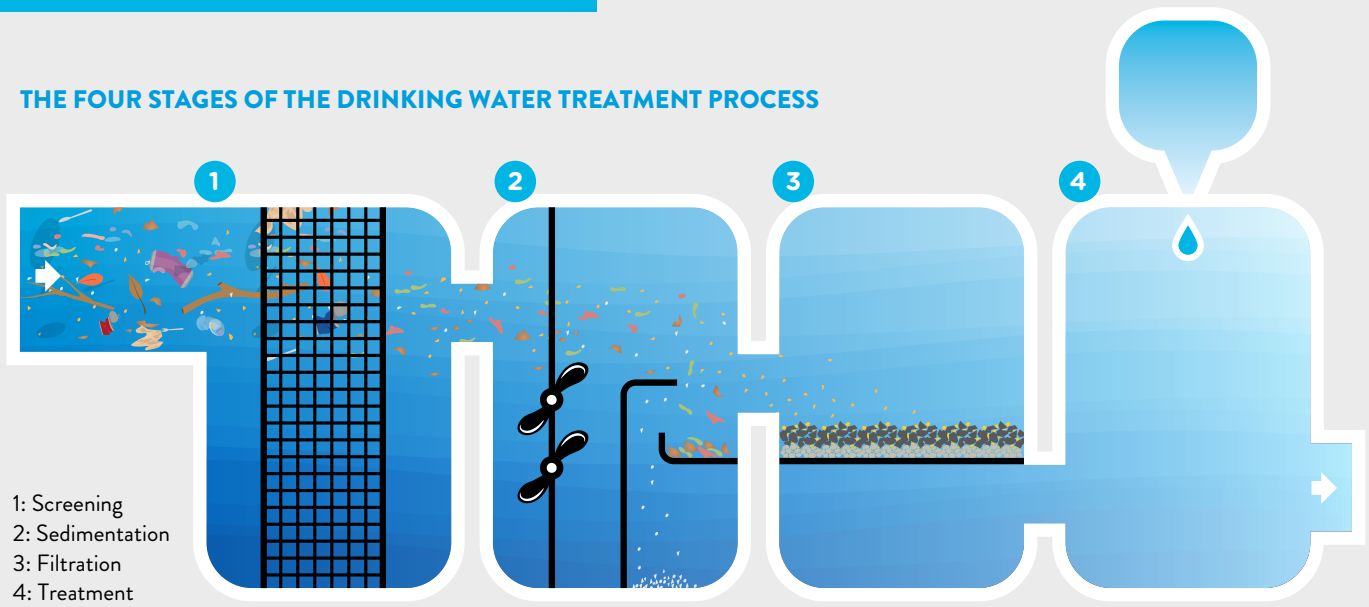
Ask your students to calculate the volume of water lost during the filtration (see the student workbook).

CONCLUSIONS

How did it go? What could your students do to improve their prototypes?

THE FANTASTIK'EAU CREW'S EXPLANATIONS

THE FOUR STAGES OF THE DRINKING WATER TREATMENT PROCESS



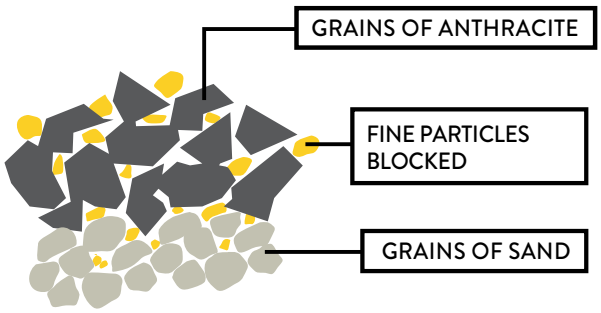
1: Screening
2: Sedimentation
3: Filtration
4: Treatment

WHAT IS HAPPENING AND WHY IS IT IMPORTANT?

Great job! Thanks to you, water is now flowing freely once again. The way your filter works is very similar to some of the stages that take place at the drinking water treatment plant. First, to clarify the water coming in from the source, the largest solids are removed from it. This stage is called screening (1). If these larger solids were not removed, they could damage or block the filter used at a later stage in the process. In your own mission, this step could be done using a strainer, for instance.

Once the water is in the treatment plant, it is left to stand until the largest particles of suspended matter fall to the bottom. This stage is called sedimentation (2). Notice how the water on top gradually becomes clearer.

Lastly, the smallest particles remaining in the water are filtered (3), which can be done using sand, like in your experiment! Several water treatment plants have an additional layer in their filters, which is made of larger grains of anthracite (a sedimentary rock which is part of the coal family). Anthracite holds in the larger particles and prevents the sand from clogging too quickly. In drinking water treatment plants, the bottoms of the filters retain the grains of sand from the filter medium while letting the water flow. This is the equivalent of the coffee filter in your project!



CRYSTAL CLEARWATER:
Important: your students cannot drink this water! At a water treatment plant, there is a fourth stage, which consists of treating the water using chemicals like ozone—yes, that same gas found high up in the sky's ozone layer. When the water leaves the treatment plant, a small amount of chlorine is also added to it. That's right, the same disinfectant found in swimming pools! Don't worry: once the water reaches your home, it hardly contains any more chlorine. It is totally fit for consumption.

DIVING DEEPER: THE WATER CYCLE

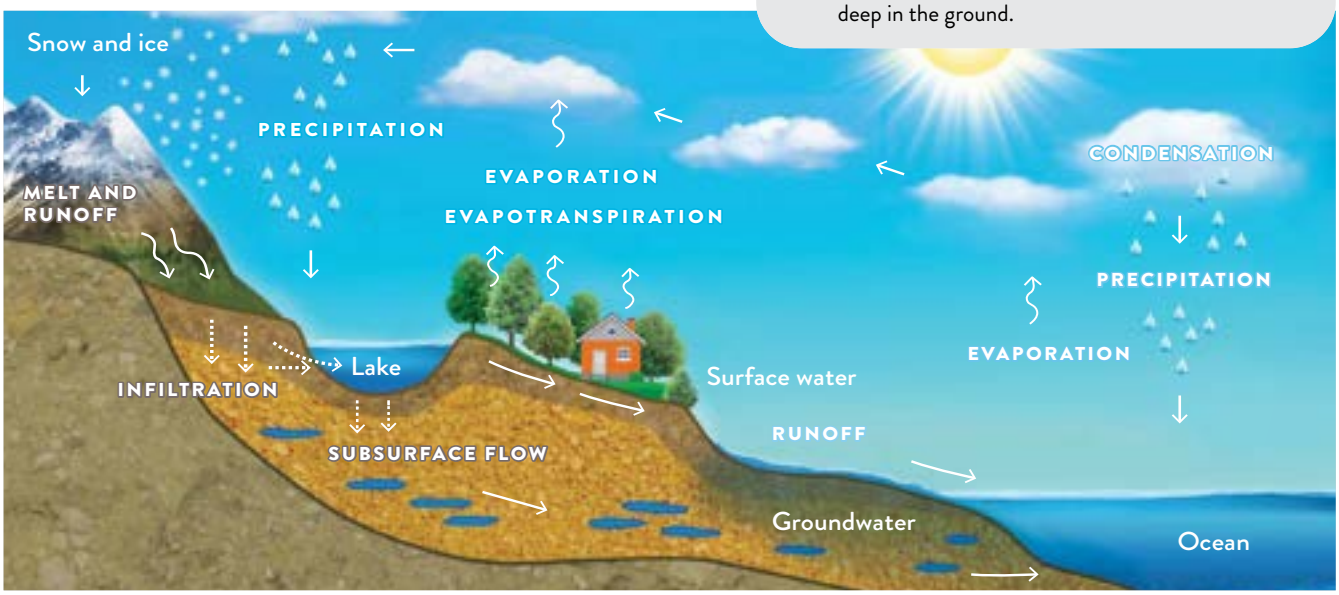
JÉRÉMIE:
While Wasteful Wally and Conscious Charlie go back home to finally take their showers, explore how water makes its way to their homes—and yours—by doing The Water Tower activity (mission 04) !

AQUA-MARY:
Water is purified by humans—and also by nature!

CRYSTAL CLEARWATER: Yes, like the filters in a drinking water treatment plant, the soil filters part of the rainwater until it reaches the water tables, which contain valuable drinking water reserves that are deep in the ground.

During the **EVAPORATION** stage, the water from streams, lakes and oceans is exposed to the sun, which makes it evaporate. Transpiration refers to all the water that is rejected by plants, as well as animals and humans (through sweat, for instance). Both processes are combined in the word evapotranspiration!

CONDENSATION, is when fine droplets of water vapour found in the air (in the form of clouds, for example) agglomerate to form drops of water.



PRECIPITATION is how water appears after condensation. This is what creates rain, snow, and hail.

RUNOFF is simply when water flows on the ground. For example, water may flow from the top of a mountain down to a plain, then reach the streams, rivers, lakes, and oceans. Along the way, the water will come into contact with certain substances (e.g. salt), which it will dissolve and carry with it.

INFILTRATION is when the water penetrates the soil, either by travelling through the soil or through natural cracks in rocks. This is how the water reaches the water tables, which are underground water reserves. Surface water (e.g. the water from a lake) and glacier water are also water reserves.

The **WATER TABLE** is the underground area where water that infiltrates the soil moves more slowly than on the surface. Water leaves the water table when a passage, such as a well, allows it to come outside.

The water **FLOWS** towards the ocean, through the rivers and lakes, or through the soil. And then the cycle starts all over again...

MISSION
01

Fantastik'eau

I love water. I take care of it!

CRYSTAL CLEAR

STUDENT WORKBOOK
CYCLE 3

C.I.E.A.U
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Québec

MISSION
01

BACKGROUND

Still half asleep, Conscious Charlie trudges towards the shower, with a towel around his neck. Wasteful Wally dashes past him and slams the shower door shut.

He opens the faucet of the shower … but nothing comes out! Outraged, Wasteful Wally is eventually joined by Conscious Charlie. Together, they open the faucet, look inside the shower head, and listen for the sound of water in the wall. It's no use: the water just won't run!

Our two companions head to the source of the problem: the drinking water treatment plant. They are welcomed by Crystal Clearwater, who tells them the problem is caused by the filters. Normally, they are changed one by one, every 25 to 30 years. Exceptionally, they must now be changed all at the same time! That explains why Mini-Town's water flow has been significantly reduced. If only a team of people could build new filters, the water flow could be restored much sooner!

THIS IS A JOB FOR **THE FANTASTIK'EAU CREW!**

DO THIS ACTIVITY WITH JÉRÉMIE

Watch the short video featuring Jérémie, and do the activity with him! All of the Fantastik'eau content and videos are available on the C.I.EAU's website at:

www.cieau.org/fantastikeau

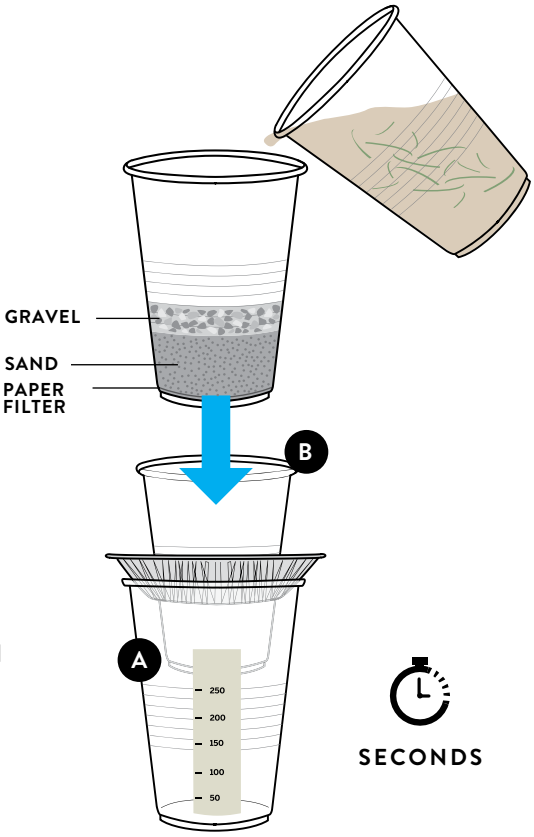
MISSION 01

YOUR TASK

Build a filter that clarifies water and also allows it to flow well.

CHOOSING THE MATERIALS, FILTERING MEDIA AND SOLUTION

Which materials and filtering media seem useful to filter water? Why?



Important: After going through the filter, the water will be clearer than when it is poured, but **it will not be drinkable.** At a water treatment plant, the water goes through additional stages to become drinkable!

DESIGNING AND TESTING THE PROTOTYPE
BUILDING A FILTER FOR THE CLOUDY WATER

- Pierce six holes under the 250 millilitres glass using a pushpin. !
- Enlarge the holes using a large nail. !
- Use the materials at your disposal to build the best filter possible.
  Important: all of your materials and filtering media must fit into your glass. The goal is to have a filter that gives you the clearest water possible, while also filtering as much water as possible.
- When you are ready, pour some murky water over your filter, and use the measuring cup to determine how much water went through your filter. Don't forget to measure the time as the water is passing through the filter.

DIAGRAM OF YOUR FILTER

WARNING

It is recommended to have an adult use a drill, a hole puncher or another tool to pierce a hole.

OBSERVATIONS: CALCULATING THE PERCENTAGE OF WATER FILTERED

What percentage of water did you filter with your device? To find the answer, **use the following equation**:

% of water filtered = volume of water filtered ÷ 150 ml of cloudy water X 100 =

_____

CONCLUSIONS

Does your prototype work well? How could you improve your filter? _____

_____

TEST YOUR SKILLS!

At what speed (flow rate) is water filtered using your device?

Use the following equation: Flow rate of your filter (ml/second) = volume of water / time = _____

How much time would it take you to filter 5 L of water? _____

STUDENT EVALUATION GRID—MISSION 1: COMPETENCY 1 IN SCIENCE AND TECHNOLOGY

Name : _____ Group : _____ Date : _____

	Exceeds expectations (4-5)	Meets expectations (3)	Does not meet expectations (0-2)
Diagram of the filter			
Building the prototype and following the directions of the task.			
Reporting the results			
Calculating the proportion of water filtered			
Conclusions			

MISSION 02

Fantastik'eau

I love water. I take care of it!

SAVING DRINKING WATER

CYCLE 3

CIEAU Centre d'interprétation de l'eau

Québec

MISSION 02

Fantastik'eau

I love water. I take care of it!

SAVING DRINKING WATER

IWB
ACTIVITY ALSO AVAILABLE IN INTERACTIVE WHITEBOARD FORMAT!
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TEACHER'S GUIDE
CYCLE 3

C.I.E.A.U. Centre d'interprétation de l'eau

Québec

MISSION 02 : SAVING DRINKING WATER

GOAL OF THE ACTIVITY

Test the operation of a water-saving device for a showerhead.

DURATION

45 MINUTES

CONNECTIONS WITH THE CURRICULUM OF THE QEP

MATHEMATICS:
- Estimating a surface area
- Fractions
- Percentages

SCIENCE AND TECHNOLOGY:
- Scientific method
- Using simple measuring instruments
- Measuring quantities

MATERIALS FOR EACH TEAM OF 2–3 STUDENTS

- 1 pushpin !
- 1 small nail !
- 1 large nail !
- 2 measuring cups A
- 2 glasses made of clear, flexible plastic that each hold 250 millilitres of liquid B et C .
- 1 paper or aluminum plate with a hole having a six centimetres diameter. This plate will be used to support one of the glasses.
- Pencils and scissors
- Whatever you can find in the recycling bin to hold the bottle upside down!
- Water
- A bin to hold the water
- A time measuring device (clock, watch, stopwatch)

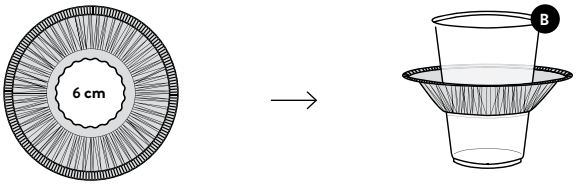
WARNINGS

It is recommended to have an adult use a drill, a hole puncher or another tool to make holes.

Make sure an adult is there to make holes in the glasses and manipulate the aluminum plate.

AQUA-MARY: If your chosen tool allows it, you can punch holes in several glasses at once by sliding one inside the other, to speed up the process.
Choose glasses made of clear and flexible plastic, since they allow students to see and better understand the final setup.

NOTE: The plate will be used to support the plastic glass. The size of the hole in the plate must be slightly smaller than the opening of the glass in order for the rim of the glass to be able to rest on the plate.



WALTER: Here is a real aerator to reduce the flow of a tap or showerhead. Aerators usually have a small opening and a screen that reduces the flow of water.
You could bring one from home to observe it!

BACKGROUND

Back at home, Wasteful Wally pretends to be an opera singer under the shower, while Conscious Charlie is left waiting for his turn to wash on the other side of the door. When he finally finishes, Wasteful Wally opens the door, and the bathroom is filled with water! Conscious Charlie is aggravated by all this wasted water, but Wasteful Wally tells him it isn't his fault: the showerhead is uncontrollable! Conscious Charlie is discouraged and unsure what to do...

THIS IS A JOB FOR
THE FANTASTIK'EAU CREW!

TEST THE WATER-SAVING DEVICE TO SEE IF IT WORKS

SCIENTIFIC METHOD: CALCULATING THE FLOW OF WATER

Hypothesis:

Encourage your students to directly formulate hypotheses.

CRYSTAL CLEARWATER:
Ideally, the hypotheses should come from the students. Here is some guidance you can give them if they have difficulty coming up with solutions:

1 -It is better to make big holes (with the big nail) than small holes.

2 -X holes can reduce the flow while still allowing people to wash themselves properly.

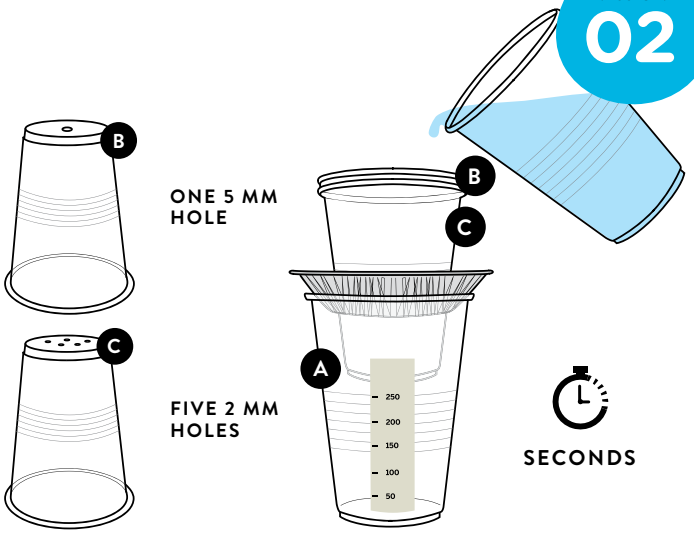
MATERIALS AND METHOD: MAKING THE WATER-SAVING DEVICE

Punch holes in glasses B and C. Start by taking the pushpin to make the holes, then use the nail to enlarge them. Afterwards, ask the students to think about how they are going to measure the water saved.

AQUA-MARY:
Ideally, you should give two glasses to each team. This way, the teams can test their hypotheses by changing the number of holes OR the size of the holes between glasses B and C.

EXTRA: ESTIMATE THE TOTAL AREA OF THE HOLES

The students can draw and estimate the surface area of their holes to find out what works best. They can draw the holes side by side to scale in the student workbook. You can help them add the areas and play with the units of measurement (see student workbook).



MANIPULATIONS

Up until now, everything could be done without getting wet! At this stage, we add the use of water. You can test the water-saving devices in a plastic bin or tray, or ask the teams to proceed one at a time in a sink to avoid spills.

Alternatively, you can make a hole with a six centimetres diameter (or with the same diameter as the glass) in a thick paper plate, insert your glass with the hole in it, and place everything on a measuring cup. Afterwards, all you need to do is pour the water into the water-saving device. Your students can also simply hold the glass over a measuring cup A.

The students calculate the volume of water lost in the filter and must note the time and the volume of water that fall into measuring cup A to calculate the flow of water (see student workbook).

JÉRÉMIE :
If your students are having difficulty doing the activity on their own, you can follow these steps.

1. Slowly pour water from a glass or a tap, as if it were coming from a showerhead without a water-saving device.
2. Calculate the volume of water poured in 20 seconds.
3. Repeat the same steps using the water-saving device they built.
   - Make sure the glass is full of water before beginning the test.
4. Note the volume of water saved in 20 seconds using the second measuring cup.

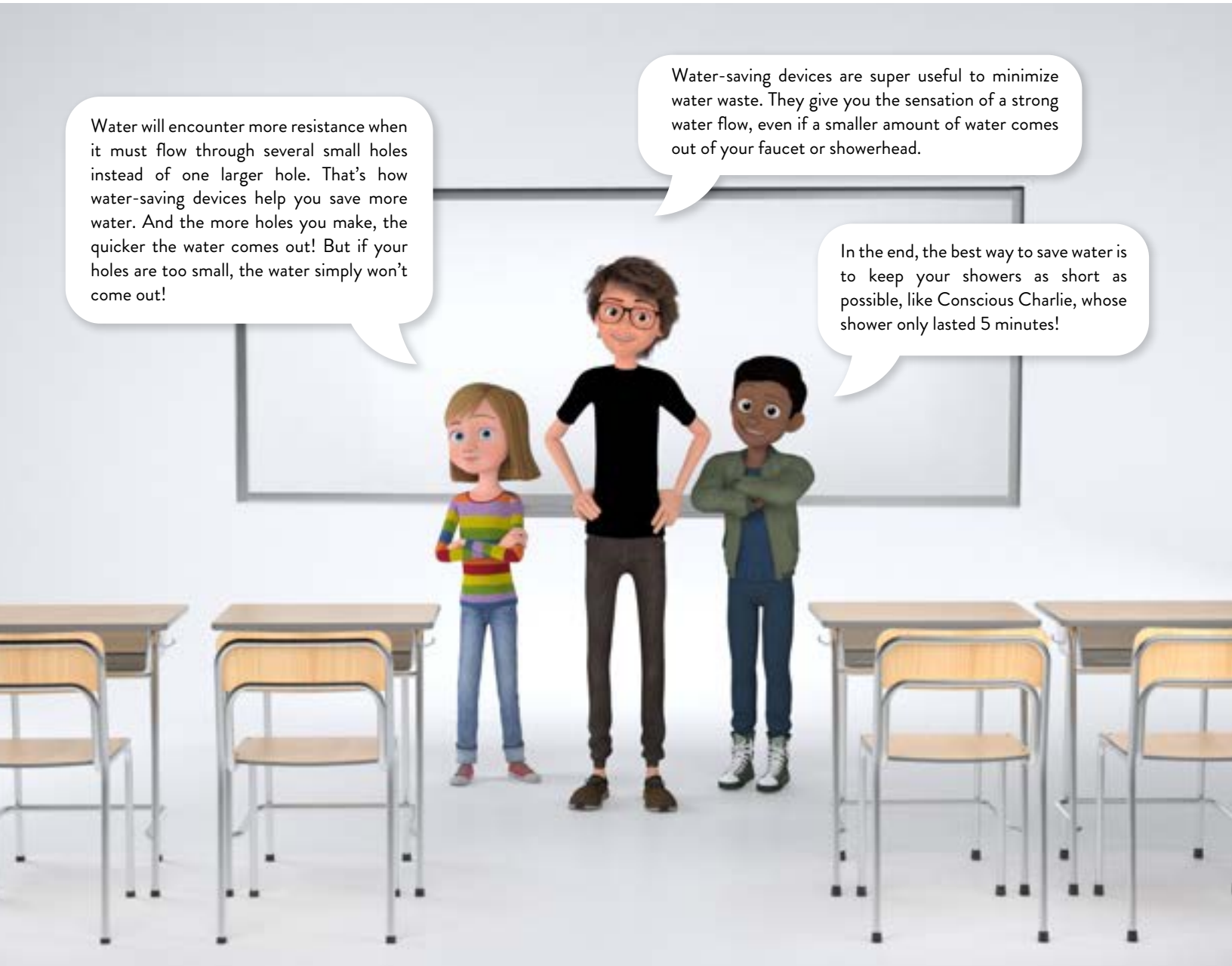
The more the glass is full, the greater the water pressure will be. Therefore, it's important for the glass to be as full as possible during the test in order to maintain pressure at the level of the holes. For more details on this subject, you can also do The Water Tower mission at p.115.

CONCLUSIONS

RESULTS AND CALCULATIONS

See student workbook.

ANALYSIS: KEY POINTS TO REMEMBER, AND WHY WATER-SAVING DEVICES ARE IMPORTANT



DIVING DEEPER

CRYSTAL CLEARWATER:
Where, in your home, could you easily install a water-saving device like the one you just made?

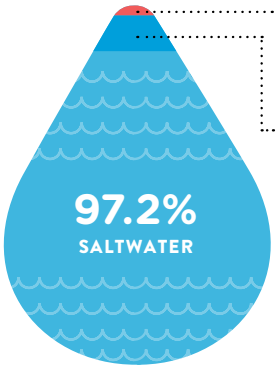
Kitchen faucet (sink), bathroom faucets (sink and shower), basement faucet (laundry sink), outdoor hose.

You can also try using a spray bottle whose water output you can control. What's more, you might find that you need a very small amount of water to wash your hands.

AQUA-MARY:
To save water, we can install water-saving devices, such as faucet aerators and low-flow showerheads. How do these devices give the sensation of a strong water flow?

These devices introduce air in the water, which offers the sensation of a strong water flow even if a smaller quantity of water comes out of the faucet. This principle makes it possible to save a greater amount of water. The water-saving devices that are available on the market perform better than the one you made with your class!

CRYSTAL CLEARWATER:
Using what you have learned, try to make a water-saving device that's even more effective!



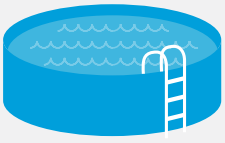
0.028%
FRESHWATER THAT IS ACCESSIBLE ON EARTH

2.8%
FRESHWATER THAT IS INACCESSIBLE

0.028%

Only a very small amount of the Earth's water can be used for human consumption. Whether we drink it or use it to put out fires, to have fun or to keep our industries running, all this water is extremely precious!

In comparison:



If all of the Earth's water were equal to one swimming pool ...

Here would be the equivalent amount of water from our ...

Snow and glaciers

Groundwater

Lakes and rivers

Atmosphere

MISSION
02

Fantastik'eau

I love water. I take care of it!

SAVING DRINKING WATER

STUDENT WORKBOOK
CYCLE 3

CIEAU
Centre d'interprétation de l'eau

Québec

MISSION
02

BACKGROUND

Back at home, Wasteful Wally pretends to be an opera singer under the shower, while Conscious Charlie is left waiting for his turn to wash on the other side of the door. When he finally finishes, Wasteful Wally opens the door, and the bathroom is filled with water! Conscious Charlie is angered by all this wasted water, but Wasteful Wally tells him it isn't his fault: the shower head is uncontrollable! Conscious Charlie is discouraged and unsure what to do ...

THIS IS A JOB FOR **THE FANTASTIK'EAU CREW!**

DO THIS ACTIVITY WITH JÉRÉMIE

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www.cieau.org/fantastikeau

MISSION
02

ANSWER ONE OF THE FOLLOWING TWO QUESTIONS TO FORMULATE YOUR HYPOTHESIS

To reduce the water flow rate using your water-saving device, is it preferable to:

1. Make large holes using the large nail or make small holes using the pushpin? _____

Or

2. Make five holes or a single hole? _____

What combination of holes should you use for your water-saving device? _____

FOLLOW THESE STEPS:

- Measure, cut out, and remove the bottom of the plate. You will use this holed plate to support the 250 millilitres glass on the rim of the measuring cup.
- Pierce one 5 mm hole in a 250 millilitres glass B and five 2 mm holes in a 250 millilitres glass C. !
- Place the glasses over a measuring cup, using the holed plate to support them.
- Gently pour water in the measuring cup A, as if it were flowing out of a shower head.
- Calculate the flow rate, i.e. the volume of water over a certain period of time.
- Write down the time required to collect a certain volume of water in the measuring cup.
- Try different combinations of glasses and holes to find the most effective water-saving device !

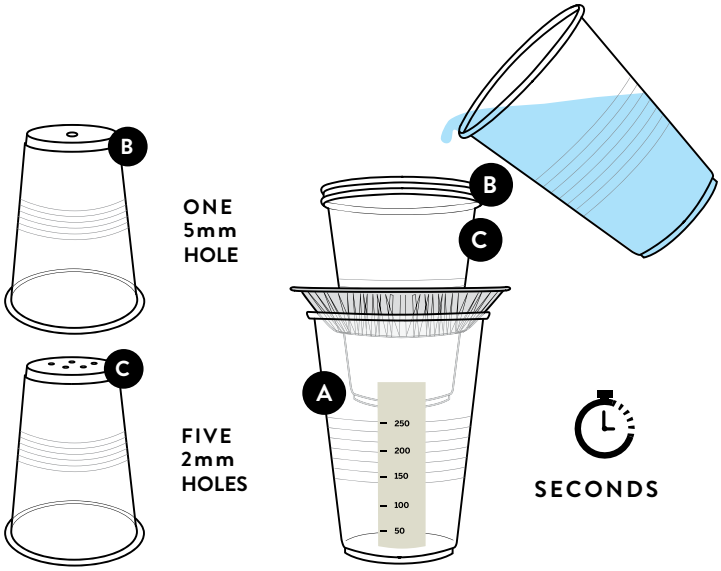


DIAGRAM OF YOUR WATER-SAVING DEVICE

Draw the size of the holes in your water-saving device to scale.

CRYSTAL CLEARWATER :
An actual shower with a low-flow shower head can save more than eight litres of water per minute—that's a 60% saving in potable water! And that's not counting the energy saved thanks to the unused hot water !

WARNING

It is recommended to have an adult use a drill, a hole puncher or another tool to pierce a hole.

RESULTS

Without a water-saving device

a) Flow rate = _____ ml ÷ _____ seconds = _____ ml/sec

With a water-saving device (holed glass)

b) Flow rate = _____ ml ÷ _____ seconds = _____ ml/sec

c) Compare the results: _____

ANALYSIS

Does the water flow faster with more holes? _____

Does the water flow faster with bigger holes? _____

CONCLUSION

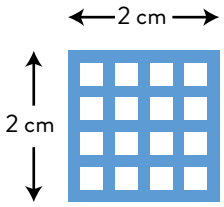
Explain how a water-saving device should be designed to be as effective as possible: _____

_____

_____

TEST YOUR SKILLS

Here is a diagram of the screen in a water-saving device. The size of each little white square is 3 mm X 3 mm.



Measure the outer perimeter of the screen: _____

What is the total area of the large square without the screen? _____

What is the area that is subtracted because of the screen? _____

STUDENT EVALUATION GRID—MISSION 2

Name : _____ Group : _____ Date : _____

	Exceeds expectations (4-5)	Meets expectations (3)	Does not meet expectations (0-2)
Hypotheses			
Materials, filtering media and protocol			
Process for measuring the results			
Reporting the results			
Flow rate calculations			
Analysis			

EXTRA MISSION 04

Fantastik'eau

I love water. I take care of it!

THE WATER TOWER

CYCLE 3

C.I.EAU Centre d'interprétation de l'eau

Québec

EXTRA MISSION 04

Fantastik'eau

I love water. I take care of it!

THE WATER TOWER

STUDENT WORKBOOK
CYCLE 3

C.I.EAU Centre d'interprétation de l'eau

Québec

EXTRA MISSION 04

BACKGROUND

While taking a walk through their town, Conscious Charlie and Wasteful Wally discover a huge, towering construction. Crystal Clearwater happens to be standing next to it. She explains to them that it is a water tower. The water that comes out of the drinking water treatment plant is pumped and stored high up in the water tower. Right now, the water tower is empty, which is why Conscious Charlie and Wasteful Wally don't have any water pressure at home ... but that's about to change!

THIS IS A JOB FOR **THE FANTASTIK'EAU CREW!**

DO THIS ACTIVITY WITH JÉRÉMIE

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EXTRA MISSION 04

YOUR MISSION

Build a miniature water tower. This construction will allow drinking water to travel to Wasteful Wally and Conscious Charlie's home.

DURATION

45 minutes

SUGGESTED MATERIALS, WITH ADULT SUPERVISION

- 1 nail to make 5 mm holes
- Small hammer
- 1 pushpin to make 2 mm holes
- 1 measuring cup
- A 500 millilitres plastic bottle and its cap
- A 4 litres clear plastic bottle
- A stopwatch
- Adhesive putty
- 1 paper plate with a hole cut in the middle; the diameter of the hole should be about 6 centimetres
- Whatever you can find in the recycling bin to hold the bottle upside down!
- Adhesive tape
- Scissors
- A marker
- Water
- A bin to hold the water

CRYSTAL CLEARWATER : The water tower maintains a constant water pressure in the system. It also improves the quality of water by letting it settle, while offering additional contact between the water and the products used to ensure its quality.

INVESTIGATING AND IDENTIFYING POSSIBLE SOLUTIONS

Use the materials listed above or whatever you find at home to get inspired!

JÉRÉMIE : Does the water come out faster when the bottle is full? And how about if you squeeze it? Or place it higher? Find out for yourself!

WARNINGS

Ideally, you should do this experiment in a sink or bathtub! If the water won't flow, it might be because of an air bubble; to solve this, gently shake the construction.

It is recommended to have an adult use a drill, a hole puncher or another tool to make holes.

EXTRA MISSION 04

DESIGNING THE PROTOTYPE OF A WATER TOWER—EXAMPLE

Here are the instructions to design the prototype of a water tower. If you want, you can also use your imagination and create your own version!

- Ask an adult to make a hole in the cap of your 500 millilitres bottle using a pushpin. Afterwards, you can use a nail to enlarge this hole. This bottle will become your miniature water tower.
- Plug the hole in the cap using adhesive putty.
- Make a hole in the bottom of this bottle using a pushpin. This will let in air and help the water come out through the hole in the cap.
- Using your marker, trace the base of your 500 millilitres bottle in your paper plate. This should give you a circle. Cut out this circle and insert the top of your bottle in the hole. Use adhesive tape to secure the plate and bottle together.
- Ask an adult to help you cut the 4 litres bottle over the neck, or use another container you have at home. You will use this as a support to hold your water tower in place.
- Turn your water tower (i.e. your bottle) over your container and remove the adhesive putty. You should see the water coming out of your bottle.

EXERCISE

- What would happen if you changed the quantity of liquid coming out of your water bottle? Would it flow faster or slower? _____
- For each volume of liquid used, measure the liquid that flows in 20 seconds to calculate the speed at which it comes out (flow rate), like you did with the shower head in mission 2. You can redo the exercise using different volumes of liquid and write down your calculations below.

CALCULATIONS

WARNING

It is recommended to have an adult use a drill, a hole puncher or another tool to pierce a hole.

FOR INSPIRATION

WALTER : You can very well make your own water tower. You can use whatever you find in your recycling bin that inspires you. You can even continue your work **outside** by building a pipe system that will distribute water to miniature houses! Feel free to use your imagination!

AQUA-MARY : You can also graduate your bottle to see the effect of the volume of water on the pressure when the water comes out of the bottle, instead of using a measuring cup. If you want to go even further, you can create a table with your class or family to write down everyone's results and compare them.

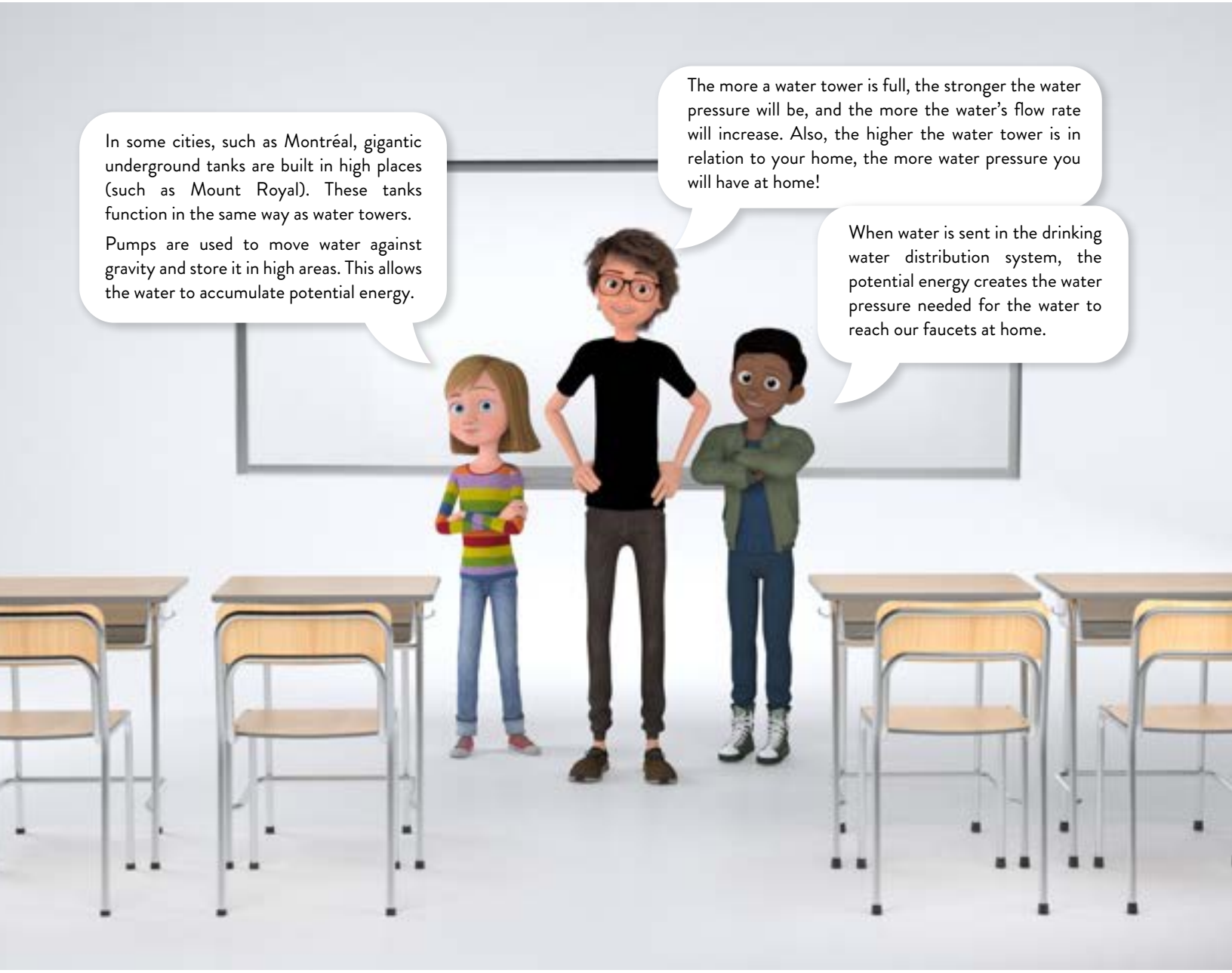
EXTRA MISSION 04

CONCLUSIONS

What observations can you make with your version of a water tower? _____

What helped you improve the water pressure? _____

USEFUL TO KNOW



EXTRA MISSION 05

Fantastik'eau

I love water. I take care of it!

ALERT! THERE'S A LEAK!

CYCLE 3

CIEAU Centre d'interprétation de l'eau

Québec

EXTRA MISSION 05

Fantastik'eau

I love water. I take care of it!

ALERT! THERE'S A LEAK!

STUDENT WORKBOOK
CYCLE 3

C.I.EAU Centre d'interprétation de l'eau

Québec

EXTRA MISSION 05

BACKGROUND

Conscious Charlie and Wasteful Wally are late for a visit at the aquarium! Wasteful Wally leaves the house in a hurry, carrying Conscious Charlie on his back. He locks the door and rushes out. Walter, who happened to be passing by, notices the two companions forgot to fully turn off the tap of the kitchen sink, and it's slightly dripping! Conscious Charlie and Wasteful Wally are lucky that Walter happened to be there! Since he regularly waters their plants, Walter knew where they kept their spare key. He was able to get inside and close the tap. But what would have happened if no one had been there to turn the water off?

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DO THIS ACTIVITY WITH JÉRÉMIE

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EXTRA MISSION
05

YOUR MISSION

Simulate a water leak and measure the amount of water wasted.

AQUA-MARY : Did you know that leaks can waste a lot of water? That's why it's important to detect and fix them as soon as possible.

DIRECTIONS

If a leaking faucet lets out one drop of water per second for an entire day (24 hours), how much water is wasted?

WALTER : 1 000 litres = 1 cubic metre. That's the volume occupied by a regular-sized fridge.

SUGGESTED MATERIALS, WITH ADULT SUPERVISION

- One 1 000 millilitres (1 litre) measuring cup
- One 250 millilitres glass made of clear and flexible plastic
- Scissors
- 1 cookie of your choice

METHOD

Do you have a leaky faucet at home? If so, it would give you the perfect opportunity to do this activity!

You can also simulate a leak by turning on the faucet of your sink very slightly, until only one drop per second comes out.

Place a measuring cup under the leak, and observe how much time it takes to fill it with 200 millilitres of water.

Before you get started, try to guess how much time it will take to reach 200 millilitres of water. It might be a lot quicker than you think!

WHAT'S THE COOKIE FOR?

If you want to make this activity even funnier, you can make a bet with a friend or family member. Place the cookie on a little stand you can make by cutting a plastic glass. Make sure this stand is the same height as the 200 millilitres line of your measuring cup.

Make two slits on the sides of your stand. This will allow the water to circulate and prevent the stand from tipping over.

The person whose estimation of how much time it takes the water to reach 200 millilitres is the furthest from the actual result must drink the glass of water containing a wet cookie!

EXTRA MISSION 05

You surely noticed that the time it takes to reach 200 millilitres of water, in the measuring cup with the cookie, can vary greatly from one experiment to another. The time it takes depends on the speed at which each drop of water falls.

CALCULATIONS

How do you calculate the amount of water wasted by a single leak?

Let's use the experiment you just did to calculate the amount of water wasted by an imaginary leak (but one that could be real!). Let's say we lose one drop of water per second and the water reaches the 200 millilitres line in 10 minutes:

How much water would be wasted in 1 minute (litres)? _____

How much water would be wasted in 1 hour (litres)? _____

How much water would be wasted in 1 day (litres)? _____

How much water would be wasted in 1 year (litres)? _____

Use the hints below to make your calculations.

HINT TO CALCULATE THE VOLUMES
1 000 ml = 1 L

HINTS TO CALCULATE THE TIME	
1 minute = 60 seconds	1 day = 24 hours
1 hour = 60 minutes	1 year = 365 days

YOUR CALCULATIONS

Use this space to show how you made your calculations.

EXTRA MISSION 05

DIVING DEEPER

Calculate the amount of water wasted in a town of 10 000 inhabitants, where 10% of the people have a similar leak that would go unfixed for a period of 1 year. _____

How much would this loss cost the city in total, if it costs the city in total $1.50 to produce 1 000 L of drinking water (and to treat this water after it is used)? _____

If an Olympic swimming pool can contain up to 3 500 000 L of water, how many Olympic swimming pools can we fill with this wasted water in 1 year? _____

If a standard above-ground swimming pool that stands 21 feet tall can contain up to 40 000 L of water, how many above-ground swimming pools can we fill with wasted water in 1 year? _____

YOUR CALCULATIONS

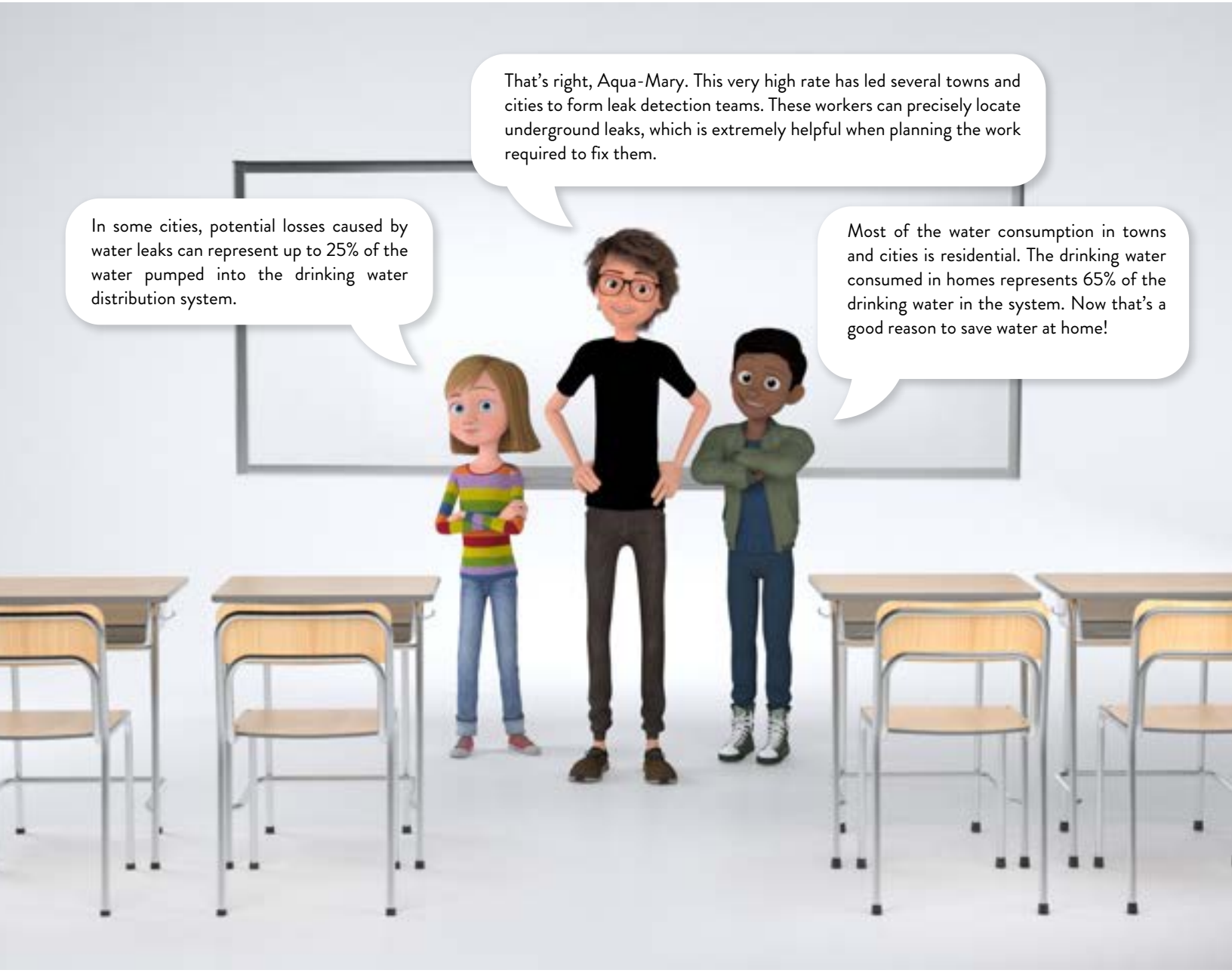
Use this space to show how you made your calculations.

EXTRA MISSION 05

CONCLUSION

At home, you won't always have someone to check that the faucets are properly turned off. Make sure you do it after using them!

USEFUL TO KNOW



EXTRA MISSION 05

Fantastik'eau

I love water. I take care of it!

ALERT! THERE'S A LEAK!

ANSWER KEY
CYCLE 3

C.I.EAU Centre d'interprétation de l'eau

Québec

EXTRA MISSION 05

ANSWER KEY

Your students probably noticed that the time it takes to reach 200 millilitres of water, in a measuring cup with a cookie, can vary from one experiment to another. Depending on the speed at which each drop of water falls, the time required may vary!

CALCULATIONS

How do you calculate the amount of water wasted by a single leak?

Let's use the experiment you just did to calculate the amount of water wasted by an imaginary leak (but one that could be real!). Let's say we lose one drop of water per second and the water reaches the 200 millilitres line in 10 minutes:

To simplify calculations, we start by finding the quantity of water wasted per minute, then convert it into litres. We also calculate the time using decimal values. Once this is done, we must always go back to the answer of the previous question to make the following calculation:

Amount of water wasted in one minute (litres)

Calculations:

1. Find the volume of water wasted in millilitres:
   200 ml of water ÷ 10 minutes = 20 ml of water per minute.
2. Calculate the volume in litres:
   [20 ml of water ÷ 1 000 ml x 1 L] = 0.02 L in 1 minute.

ANSWERS

Quantity of water wasted in 1 hour (litres)

[Quantity of water wasted in 1 minute] X 60 minutes

Answer: 0.02 L x 60 minutes = 1.2 L per hour

Quantity of water wasted in 1 day (litres)

[Quantity of water wasted in 1 hour] X 24 hours

Answer: 1.2 L x 24 hours = 28.8 L of water per day

Quantity of water wasted in 1 year (litres)

[Quantity of water wasted in 1 day] X 365 days

Answer: 28.8 L x 365 days = 10 512 L of water per year

EXTRA MISSION 05

DIVING DEEPER

If your Cycle 3 students are receptive and advanced in calculations, here are some additional questions we have included in the student workbook.

Calculate the amount of water wasted in a town of 10 000 inhabitants, where 10% of the people have a similar leak that would go unfixed for a period of 1 year.

[Amount of water wasted in 1 year] X 10 000 X 10 ÷ 100

Answer: 10 512 L x 10 000 x 10 ÷ 100 = 10 512 000 L

How much would this loss cost the city in total, if it costs the city $1.50 to produce 1 000 L of drinking water (and to treat this water after it is used)?

[Amount of water wasted in 1 year by the town] ÷ 1 000 L X $1.50

Answer: 10 512 000 L ÷ 1 000 L x $1.50 = $15 768

If an Olympic swimming pool can contain up to 3 500 000 L of water, how many Olympic swimming pools can we fill with this wasted water in 1 year?

[Amount of water wasted in 1 year by the town] ÷ 3 500 000 L

Answer: 10 512 000 L ÷ 3 500 000 L = +/- 3 Olympic swimming pools

If a standard above-ground swimming pool that stands 21 feet tall can contain up to 40 000 L of water, how many above-ground swimming pools can we fill with wasted water in 1 year?

[Amount of water wasted in 1 year by the town] ÷ 40 000 L

Answer: 10 512 000 L ÷ 40 000 L = +/- 263 above-ground swimming pools

EXTRA MISSION 06

Fantastik'eau

I love water. I take care of it!

THE SONOSCOPE IS LISTENING

CYCLE 3

C.I.EAU Centre d'interprétation de l'eau

Québec

EXTRA MISSION 06

Fantastik'eau

I love water. I take care of it!

THE SONOSCOPE IS LISTENING

STUDENT WORKBOOK
CYCLE 3

C.I.EAU Centre d'interprétation de l'eau

Québec

EXTRA MISSION 06

BACKGROUND

Conscious Charlie is worried about the tap that has been leaking because of Wasteful Wally's careless behaviour. He suspects that there are other leaks in the house. But how to discover them? Aqua-Mary has an idea, but she needs your help to make it happen!

THIS IS A JOB FOR **THE FANTASTIK'EAU CREW!**

DO THIS ACTIVITY WITH JÉRÉMIE

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www.cieau.org/fantastikeau

EXTRA MISSION 06

YOUR MISSION

Make a sonoscope to listen to the water flowing through the pipes and detect any leaks.

DURATION

45 minutes

SUGGESTED MATERIALS, WITH ADULT SUPERVISION

- 1 pushpin to pierce holes and 1 nail to enlarge them
- 2 glasses made of clear, flexible plastic that each hold 250 millilitres of liquid
- 1 nail that is 10 centimetres long
- 1 aluminum plate whose bottom has a diameter of about 6 centimetres
- Hot glue gun (or adhesive putty)
- Adhesive tape

GOALS OF THE ACTIVITY

- Recognize the distinctive sound that water makes when a leak is present.
- Learn how certain devices, such as the sonoscope, amplify sound and therefore help to detect water leaks.

WARNING

It is recommended to have an adult use a drill, a hole puncher or another tool to pierce a hole.

Make sure an adult is present when piercing holes in the glasses, handling the aluminum plate, and/or using the hot glue gun. The edges of the aluminum plate can become sharp.

If the sonoscope must be brought home, take some adhesive tape and wrap it around the edge of the nail several times.

To minimize the risk of injuries, you can slightly blunt the end of the nail using a file.

OPTIONS AND TIPS

Make holes in several glasses at once by sliding them one inside the other (if the chosen tool allows it) to speed things up.

Choose glasses made of flexible and clear plastic because they will allow you to see and better understand the final setup.

Make sure the nail tip touching the tube is very thin to help the sound spread as effectively as possible.

CRYSTAL CLEARWATER : Sound is in fact a vibration that can travel wherever there is matter. For instance, it travels through the air by making air molecules vibrate from the source of the sound to your ears. Sound can also travel through solid objects, such as a nail, by causing the particles that form this object to vibrate. With this sonoscope, the sound will be louder if it travels through a solid object then through a gas such as air. The sound will travel through the nail and then be amplified in the empty glass.

EXTRA MISSION 06

DESIGNING THE PROTOTYPE OF THE SONOSCOPE

- In one of the glasses, pierce a hole using the pushpin in order to help insert a nail in it. (1) !
- In the bottom of the other glass, pierce 8 to 12 holes using the pushpin. (2) !
- In the bottom of the plate, cut out a circle with a 6 centimetres diameter. (3)
- Using a few drops of hot glue (we strongly recommend you ask an adult for help with the glue gun) or adhesive putty, stick the nail head in the centre of the circle you just cut out. (4)
- Insert the nail in the bottom of the glass (you should see about 1 to 2 centimetres of it sticking out from under the glass), and stick it into place (the aluminum plate must not touch the edges of the glass). (5)
- Using adhesive tape, stick the other glass to your device. It will be used as a resonator. (6)
- Place the tip of the nail on a water pipe. The pipe doesn't have to be close to a tap.
- Place your ear at the other end of the device, as if you were listening to a telephone.

FIGURES

FIG. 1

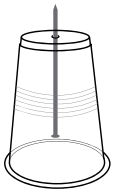


FIG. 2

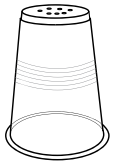


FIG. 3

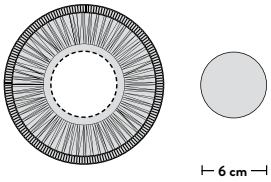
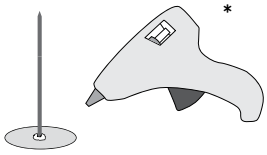


FIG. 4



*Adhesive putty is a bit less effective.

FIG. 5

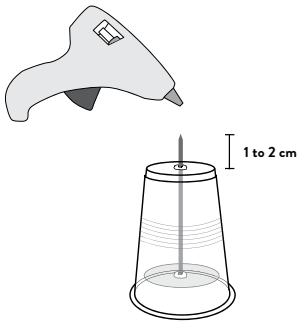


FIG. 6

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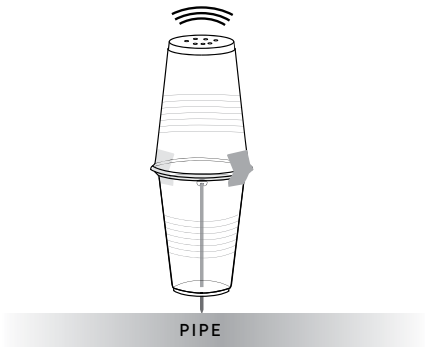


WARNING

It is recommended to have an adult use a drill, a hole puncher or another tool to pierce a hole.

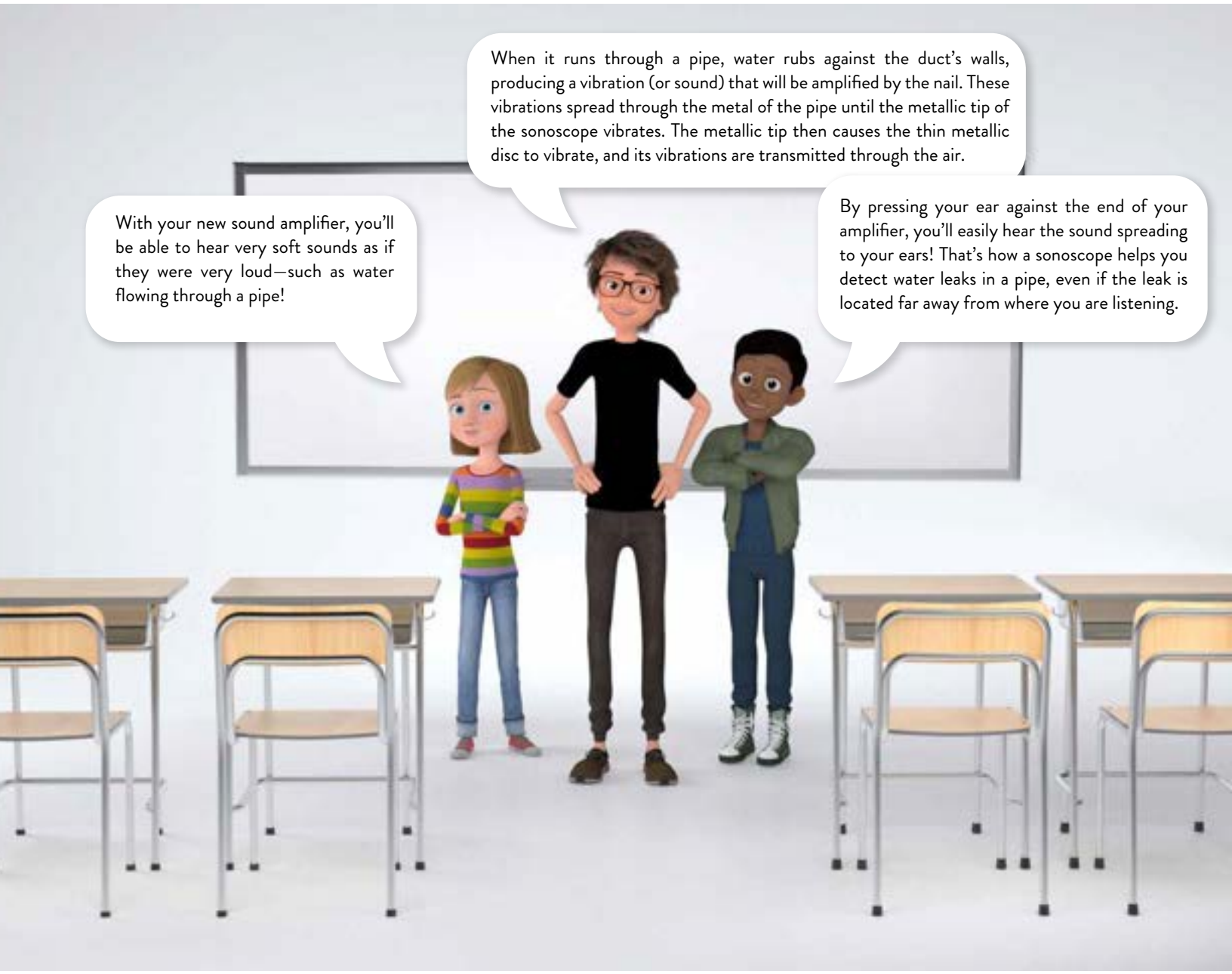
EXTRA MISSION 06

CONCLUSION

Why use a metal nail instead of a plastic or wooden tip?

Why do cities try to detect water leaks in pipes?

USEFUL TO KNOW



EXTRA MISSION 06

Fantastik'eau

I love water. I take care of it!

THE SONOSCOPE IS LISTENING

ANSWER KEY
CYCLE 3

C.I.E.A.U. Centre d'interprétation de l'eau

Québec

EXTRA MISSION 06

ANSWER KEY

Why use a metal nail instead of a plastic or wooden tip?

Metal vibrates better than plastic or wood, which allows the sound to travel better.

Why do cities try to detect water leaks in pipes?

Because leaks in distribution systems are invisible, but they contribute in a major way to the water waste generated by drinking water treatment plants.

EXTRA MISSION 07

Fantastik'eau

I love water. I take care of it!

IN HOT WATER

CYCLE 3

C.I.EAU Centre d'interprétation de l'eau

Québec

EXTRA MISSION 07

Fantastik'eau

I love water. I take care of it!

IN HOT WATER

STUDENT WORKBOOK
CYCLE 3

CIEAU Centre d'interprétation de l'eau

Québec

EXTRA MISSION 07

BACKGROUND

Wasteful Wally steps under the shower and turns on the tap. Woah! The water is much too cold! He moves away and waits for the water to heat up. Conscious Charlie wonders how much water is wasted each time we want hot water. Do you know how to calculate it? Aqua-Mary might have an idea ...

THIS IS A JOB FOR **THE FANTASTIK'EAU CREW!**

DO THIS ACTIVITY WITH JÉRÉMIE

Watch the short video featuring Jérémie, and do the activity with him! All of the Fantastik'eau content and videos are available on the C.I.EAU's website at:

www.cieau.org/fantastikeau

EXTRA MISSION 07

YOUR MISSION

Let's calculate how much water we waste every time we leave it running until it becomes hot.

WARNING

Hot tap water can cause burns. The risk of burns depends on the water temperature, the settings of the hot water tank, the duration of the exposure, and the skin's resistance to heat.

CRYSTAL CLEARWATER : To calculate the water's temperature from one room to another, use a thermometer. To better compare your data, make sure you reach the same temperature each time.

You can set a limit at 37 °C (98 °F), which is equal to the average temperature of the human body.

Be careful with the heat of the water!

INSTRUCTIONS

Take a large bucket. Put it under a tap in your home, for instance, in the kitchen. Turn on the hot water, and collect all the water that falls into the bucket until the water is hot. You can test this in different rooms of your home or at school.

OBSERVATIONS

What volume of water did you collect with the different taps you tested?

ROOM	VOLUME OF WATER WASTED

Kitchen

Shower

Bathroom

Bathtub

Half bathroom

Garage

EXTRA MISSION 07

CONCLUSION

In what room of the house do you waste the most water before it becomes hot? Why is that, in your opinion?

USEFUL TO KNOW

EXTRA MISSION 07

DIVING DEEPER

We just calculated how much water is lost each time we leave it running until it gets hot. Now, the Fantastik'eau Crew invites you to launch an investigation into your family's general water consumption. Fill out the Water Expert's Report and make recommendations! Can you and your family follow them for an entire year?

DIRECTIONS

Fill out the Water Expert's Report using the "Average Amount of Water Consumed Based on Uses" table, which is found on page 146. You will find a list of the various actions that require the use of drinking water on a daily basis.

Before calculating your family's actual water consumption, form an hypothesis. How many liters of water do you assume your family consumes everyday ?

DAY 1 : Calculate your family's actual daily water consumption.

To do so, find the activity in the "Average Amount of Water Consumed Based on Uses" table.

Determine whether the water use was regular or economical during the activity.

Write down the number of litres per use for this activity in the "average consumption (L)" column of your Water Expert's Report.

In the "frequency" column, indicate how many times the activity takes place during the day.

Afterwards, multiply the "average consumption (L)" required to do the activity by the "frequency." Enter this value in the "Partial Total" column.

Add the partial totals; this global total is your family's actual daily water consumption.

JÉRÉMIE : If you identify an action that is not found in the "Average Amount of Water Consumed Based on Uses" table, you can estimate the amount of water consumed based on other similar actions.

DAY 2 : Recalculate your family's water consumption after behaviours have been changed according to your recommendations.

WATER SAVINGS ACHIEVED : To calculate the water saved, subtract the total water consumption of Day 2 from the total water consumption of Day 1.

CRYSTAL CLEARWATER : Every person only needs two litres of water a day to properly hydrate his or her body. However, we need much more water to meet what we consider to be our daily needs.

WALTER : Our drinking water is so easily accessible that we rarely pay attention to the amount we consume. That's why we waste so much of it! Elsewhere in the world, many people only have a few litres of water a day to meet their needs.

CRYSTAL CLEARWATER : In Québec, the average residential consumption of water is 268 litres per person per day. That's huge! It's even more than the Canadian average, which is estimated at 235 litres per person per day.

AQUA-MARY : Did you know that some Europeans consume a lot less water than here in Québec? And yet, their quality of life is similar to ours. They waste less water because they must pay for their water based on the quantity they consume. Water meters also have their disadvantages, but they do avoid waste!

EXTRA MISSION 07

WATER EXPERT'S REPORT

My consumption of drinking water

Changes made to my consumption

ACTION		DAY 1 frequency	DAY 1 average consumption (L)	DAY 1 PARTIAL TOTAL (L)	DAY 2 frequency	DAY 2 average consumption (L)	DAY 2 PARTIAL TOTAL (L)	WATER SAVED (L) – TOTAL DAY 1 / TOTAL DAY 2 = SAVINGS
BATHROOM								
Washing	Bath							
	15-minute shower							
	5-minute shower							
Brushing teeth	Tap on while brushing							
	Tap off while brushing							
Washing hands	Tap on							
	Tap off while lathering							
Using the toilet	Flushing							
KITCHEN								
Drinking cold water from the tap	Letting water run until it's cold							
	From a pitcher in the fridge							
Preparing meals	Washing vegetables							
Washing dishes	Dishwasher half-full							
	Dishwasher full							
	Handwashing							
ELSEWHERE IN THE HOUSE								
Washing clothes	Half-full load	2x	87 L	174 L				174 - 87 = 87 L
	Very full load				1x	87 L	87 L	
Leak	Toilet leak found							
	Tap leak found							
OUTDOORS								
Washing car	With a hose	2x	375 L	750 L				750 - 48 = 702 L
	With a bucket and sponges				2x	24 L	48 L	
Watering grass	Automatic watering system							
	Hose with gun							
	Watering done by hand							
OTHER INDOOR USES								
OTHER OUTDOOR USES								
			TOTAL			TOTAL		

EXTRA MISSION 07

AVERAGE AMOUNT OF WATER CONSUMED BASED ON USES

		REGULAR USE		ECONOMICAL USE	
ACTION	Means	Description	Number of LITRES (L) per use	Description	Number of LITRES (L) per use
BATHROOM					
Washing	Bath	Tub quite full	150	Tub 1/3 full	50
	15-minute shower	Regular shower head	210	Low-flow shower head	85
	5-minute shower	Regular shower head	70	Low-flow shower head	30
Brushing teeth	Tap on while brushing	Without faucet aerator	17	With faucet aerator	9
	Tap off while brushing	Without faucet aerator	4	With faucet aerator	2
Washing hands	Tap on	Without faucet aerator	8	With faucet aerator	4
	Tap off while lathering	Without faucet aerator	5	With faucet aerator	3
Using the toilet	Flushing	Traditional toilet	13	Recent toilet	6 or 4,8
KITCHEN					
Drinking cold water	From the tap	Letting water run until cold	4	Pitcher in fridge	1
Preparing meals	Washing vegetables	Under running water	5	In a bowl of water	2
Washing dishes	Dishwasher	Regular cycle	38	Eco cycle	16
	Handwashing	Under running water	45	In a bin	30
ELSEWHERE IN THE HOUSE					
Washing clothes	Washer (washing machine)	Traditional washing machine	87	Front load (or water efficient) washer	57
Leak	Toilet leak	Active leak, one day	550	Leak repaired	0
	Tap leak	Active leak, one day	50	Leak repaired	0
OUTDOORS					
Washing car	With a hose	Traditional hose	375	Pressure washer	120
	With a bucket and wash mitts	Rinsing with hose	70	Rinsing with bucket	24
Watering grass	Automatic watering system	For one hour	500	For 15 minutes	125
	Hose with gun	For 30 minutes	250	Only on flowers/fruits/ vegetables	100
	Manually, with watering can	Ten loads (5 L)	50	From a barrel of rainwater	0

Note : *These consumption values are approximate. They will vary greatly based on the hypotheses advanced or the methods used. Some values were also rounded to simplify your calculations.*

EXTRA MISSION 08

Fantastik'eau

I love water. I take care of it!

QUIZ: HOW WATER-CONSCIOUS ARE YOU?

IWB
ACTIVITY ALSO AVAILABLE IN INTERACTIVE WHITEBOARD FORMAT!
cieau.org/fantastikeau

CYCLE 3

CIEAU Centre d'interprétation de l'eau

Québec

EXTRA MISSION 08

Fantastik'eau

I love water. I take care of it!

QUIZ: HOW WATER-CONSCIOUS ARE YOU?

STUDENT WORKBOOK
CYCLE 3

C.I.EAU Centre d'interprétation de l'eau

Québec

EXTRA MISSION 08

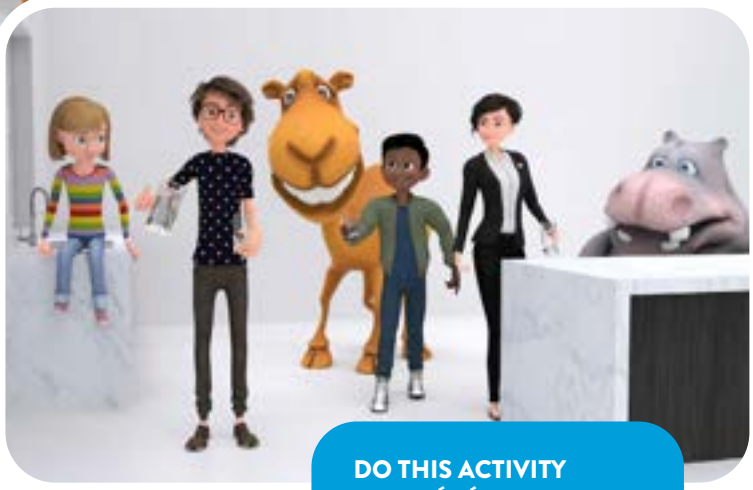
BACKGROUND

Walter : Alright, the low-flow shower head is almost installed!

Wasteful Wally : Thanks a lot, Walter!

Aqua-Mary : The watering hose is now protected because it's properly stored!

Jérémie : Friends, I think you're ready for our "water-rific" quiz! Show me your stuff!



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EXTRA MISSION
08

QUESTION 1

What's the best way to obtain hot water for grandma's tea?

A Only put the amount of water needed in a kettle.

B Fill a large pot of water and boil it on the stovetop.

C Let the hot water run in the shower and collect it in a cup.

QUESTION 2

What's the best way to get cold drinking water?

A Fill a pitcher or water bottle and keep it in the fridge.

B Let the tap water run until it gets nice and cold.

C Buy bottled water and keep it in the fridge.

QUESTION 3

You wash the dishes in the sink. Which of the following methods will you use to consume the smallest amount of water possible?

A Fill a bin with soapy water and rinse the dishes beside the bin.

B Pour a bit of soapy water in the bottom of a bin and rinse the dishes over it.

C Put some soap on a sponge and wash all the dishes under running water.

QUESTION 4

You have a dishwasher. How do you avoid wasting water as much as possible when using it?

A Fill the dishwasher to full capacity before starting it.

B Start the dishwasher after every meal.

C Fill the dishwasher with just the dishes, then start it. Afterwards, fill it with just the utensils and start it again.

EXTRA MISSION 08

QUESTION 5

What happens when paper tissues get thrown into the toilet instead of the garbage?

A No negative or positive effect. It changes absolutely nothing.

B Positive effect. Paper tissues help to clean out the pipes of the house.

C Negative effect. Paper tissues must absolutely be thrown in the garbage, otherwise it's simply a waste of water.

QUESTION 6

What should you do with hair that has just been cut?

A Throw it in the toilet.

B Throw it in the garbage.

C Compost it.

QUESTION 7

Which of the following is preferable when brushing your teeth?

A Letting the water run and singing very loudly so that nobody hears it.

B Only using water to rinse your toothbrush and your mouth.

C Brushing your teeth without using water, wiping them carefully with a paper towel, and throwing the paper towel in the toilet.

QUESTION 8

Which of the following is preferable when washing clothes?

A Accumulating dirty laundry to make large loads.

B Only putting a small amount of laundry in the washer to make several small loads.

C Adding clean clothes to your dirty laundry to make the loads bigger.

EXTRA MISSION 08

QUESTION 9

What's the best way to thaw out food?

A Place the food package in a bowl of boiling water.

B Run warm water over it.

C Put the frozen foods in the fridge.

QUESTION 10

What should you do if the toilet isn't completely cleaned after you've flushed?

A Flush the toilet several times until all the residue is cleared from the toilet bowl.

B Put a small amount of water in a glass and pour it gently over the residue.

C Scrub the bowl using a toilet brush.

QUESTION 11

What's the best way to detect a toilet leak, at home?

A Check if the water level rises in the toilet bowl.

B Pour a few drops of food colouring in the toilet tank and observe the water in the toilet bowl.

C Place a bar of soap in the toilet tank and smell the water in the toilet bowl.

QUESTION 12

What should you do when a tap is leaking?

A Take a picture of it, post it on the Internet, and wait for advice.

B Fix the leak as soon as possible.

C Collect the leaking water in a container made of recyclable plastic.

EXTRA MISSION 08

QUESTION 13

Which of the following usually requires the least amount of water?

A A bath.

B A shower that lasts five minutes or less.

C A shower that lasts ten to fifteen minutes.

QUESTION 14

What's the best way to wash the car at home?

A Spray the car with a hose until all the dirt is gone, without using soap.

B Wet the car using a hose with no gun, use a car wash mitt to lather it with soap, then rinse it using the hose.

C Lather up the car using a bucket of water and a car wash mitt, then rinse it using a hose with a gun.

QUESTION 15

What's the best way to remove dust and dirt from the driveway of a home?

A Use a broom made for sweeping outdoors and your muscle strength.

B Fill a bucket with water and pour it forcefully on the dust. Repeat a few times.

C Spray the driveway using a hose with a strong jet.

EXTRA MISSION 08

Fantastik'eau

I love water. I take care of it!

QUIZ: HOW WATER-CONSCIOUS ARE YOU?

ANSWER KEY
CYCLE 3

C.I.EAU Centre d'interprétation de l'eau

Québec

EXTRA MISSION 08

ANSWER KEY

Question 1: A. Explanation: Using a kettle saves a lot of water (and electricity) because you only use the amount needed to prepare a hot drink each time. The pot on the stove can also be a good option, as long as you only pour the amount of water you need in it.

Question 2: A. Explanation: It's wise to keep a pitcher of water in the refrigerator at all times. That way, you'll always have cold water on hand. Letting the tap water run wastes several litres of water. As for bottled water, the company who produced it needed several litres of water just to manufacture and ship the empty plastic bottle, so even just buying bottled water is wasteful!

Question 3: B. Explanation: You can wash the dishes using a small amount of soapy water in the bottom of a bin or sink. And if you rinse your dishes and utensils over the bin, it will slowly be filled with your rinsing water. This way, all of the running water is used. At some point, the water may start to look dirty, but your soap will continue to do its work, so all of your dishes can be washed in this water.

Question 4: A. Explanation: Dishwashers are designed to work efficiently when they're full. Therefore, it's useless to start the dishwasher if there is still room for some dishes. By loading the dishwasher to full capacity, you save about 7% of the water used for this task because the machine works at full capacity—and is used less frequently! Newer washing machines are even more efficient: some use as little as 16 litres of water—that's less than half the water consumed by older models, which typically use 38 litres! Remind your parents of this when it's time to replace that old dishwasher!

Question 5: C. Explanation: Paper tissues, cotton swabs, paper towels, wet wipes—none of these should be thrown in the toilet! Doing so wastes water and can even clog the toilet! Do you really need to waste 3 to 20 litres of water (depending on the toilet) just to get rid of one tissue?

Only toilet paper can be thrown in the toilet. It's designed specifically for this use and it decomposes easily. Also, make sure you only use the necessary amount—no need to go through half a roll each time!

Question 6: B or C. Explanation: Throw it in the garbage … or compost it! Yes, believe it or not, hair is compostable! Throwing hair in the toilet or sink is a bad idea because it will damage the equipment used in wastewater treatment plants and clog pipes. You can also put your hair outside so that birds can use it to make their nests.

Question 7: B. Explanation: Brushing your teeth should be as simple as a smile: brush, rinse, brush again, rinse again and you're done! Turning off the tap while brushing is a simple gesture that saves about eight litres of water each time you brush—that's 16 litres of water that can easily be saved each day! Why would you let that water run, anyway? To create the soothing sounds of a babbling brook? It's really not a good idea.

As for the paper towel option: 1) it could clog the toilet, and 2) it would waste even more water!

Question 8: A. Explanation: By doing large loads of laundry, you'll save a lot of water and use less soap than if you do several small loads. Front-loading washers use half the amount of water that top-loading washers consume. That's worth keeping in mind when it's time to replace your old washing machine! When you decide to do your laundry, ask the other members of your family if they have clothes to wash—dirty clothes, of course! Washing clothes that are already clean is obviously a waste of water. Also be mindful of microplastics; synthetic fiber clothing should be avoided.

Question 9: C. Explanation: Frozen foods will be fully thawed in the refrigerator within one or two days. It's just a matter of remembering to take them out of the freezer a day or two before cooking them. Using tap water to thaw out food wastes time and a lot of water! Placing wrapped foods in boiling water is obviously not recommended, since some packages can't withstand the heat. Besides, this water will have to be thrown out afterwards.

EXTRA MISSION 08

ANSWER KEY

Question 10: B. Explanation: Pouring water from a glass over any remaining residue requires very little water, and it's really effective, even if the residue is underneath the water in the bowl. Your toilet brush is useful, but you have to wash it afterwards if anything stays stuck to it, for hygiene reasons. As for flushing several times, this option carelessly wastes dozens of litres of water! A pro tip to save even more water: add a container in your toilet tank to reduce its water consumption, or choose a water-efficient model for your next purchase.

Question 11: B. Explanation: Colouring the water in the tank is the way to go. If there's a leak, the water in the bowl will be coloured, even without flushing. The leak will be trapped! Afterwards, it's a matter of finding out if the leak comes from the flapper or the tank's refill mechanism. It's often easy to fix a toilet leak, and it saves so much water!

You can also detect a leak by listening for the sound of water flowing: simply press your ear against the tank. Lastly, if you see water constantly "quivering" in the toilet bowl, that's also a sign you have a leak.

Question 12: B. Explanation: It is very important to fix the tap as soon as possible. A single leaking faucet can waste several hundred litres of water each day! Found a leak in your house? Fixing a tap with your parents can be a fun task—as long as you don't forget to turn off the water supply before unscrewing the tap!

Question 13: B. Explanation: Taking a shower instead of a bath can save up to 100 litres of water each time. That's on the condition you keep it short, of course! A long shower (ten minutes and more) can sometimes require more water than a full bathtub. The best way to save water is to close the tap when soaping yourself. Installing a low-flow shower head is also a great idea—and it's so easy to do!

Question 14: C. Explanation: A water hose isn't an effective tool to remove dirt from the car without first soaping it: you have to water the car for a very long time, which wastes an enormous amount of water. The best—and most fun—way to wash a car is to fill a bucket with soapy water and scrub the vehicle using a car wash mitt (or a sponge). With this method, the water from the hose is only used to rinse the car, which can be done quickly and easily. Using a gun allows you to stop watering when the hose is placed on the ground, which avoids unnecessary waste. Only a few litres of water are needed for a sparkling clean car and a quality moment with your family!

Question 15: A. Explanation: There's nothing like getting some exercise! Using a broom is the fastest and most water-conscious way to clean an asphalt driveway—and it's also great to stay in shape! As for the water hose, ideally you should only use it to make flowers and vegetables grow. Does anyone really believe that asphalt can grow?

The following is a list of books, websites, pages, and publications dealing directly with the subjects covered in the Fantastik'eau educational package.

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Fantastik'eau

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SPECIAL THANKS

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