

# Water Cycle Lesson Plan

## Aim

To learn about the water cycle and the various treatment processes water undergoes to make it safe to use.

## Time requirements

Approximately 120 mins

## Resources

- Interactive water resource
- Whiteboard or projector
- Computers and internet

## Activity 1

- Water from various sources
- Litmus paper and/or a pH meter

## Activity 2

- Muddy water
- 3 plastic bottles (perhaps some additional for aerating)
- Cotton wool/coffee filter with rubber band/small stones
- Gravel
- Fine sand
- Alum

## Learning objectives

To investigate the water cycle through discussion and the use of the water resource and to examine the water treatment process through various experiments. To further develop students understanding of the water cycle, the benefits of treated water and the impacts of untreated water on the environment and human health.

## Curriculum Strands

- **Geography**  
Junior Cycle – Section A, The Human Habitat – Processes and Change  
Senior Cycle - Patterns and Processes in the Physical Environment  
The Geographical Investigation and Skills
- **Home Economics**  
Junior Cycle – Resource Management and Home Studies  
Senior Cycle – Elective 1, Home Design and Management  
Optional Unit 9: The Atmosphere - Ocean Environment
- **Science**  
Junior Cycle- Biology - Section 1C, Animals, Plants and Micro-organism  
Physics - Section 3A: Force and Energy and Section 3B: Heat, Light and Sound  
Senior Cycle – Biology – Unit One, the Study of Life

## Skills

Questioning, observing, recording, discussing, cooperating, investigating, counting, analysing and interrupting data

## Links to Green-Schools

**Step 2 Environmental Review** – Investigating the life cycle of water

**Step 3 Action Plan** – Experiments to help understand the water and waste water treatment processes

## Vocabulary

Litmus paper, pH, basic, acidic, buffer solution, electrode, sedimentation, filtration, alum

## Running the activity:

- Ask the students to name some of the processes involved in the water cycle and if they know how their drinking water and waste water are treated. Write down their answers and then go through Section 1 of the water resource. You could repeat the above questions at the end of the review of Section 1 and compare the student's initial answers to assess their levels of awareness.
- Carry out the below experiments in pairs or small groups.

### 1) Ph testing:

- Measure the pH of various samples of water e.g. tap water, bottled water, rainwater, distilled water, water with a drop of ammonia, water with a drop of vinegar etc. using Litmus paper and/or a pH meter.
- A pH meter is more precise than Litmus paper, to show this scientifically you could use both methods and compare the results.
- Immerse one end of the Litmus paper in the water, remove immediately and compare the colour with the scale of colours printed on the pack. Blue indicates basic and red indicates acidic.
- Before using a pH meter check and possibly adjust the meter e.g. the electrode of the meter is immersed in suitable buffer solutions with known pH. Then place in the water and read.
- Record all the results and discuss.

### 2) Water treatment:

- Sedimentation – pour some muddy water into a plastic bottle with the top cut off and allow to settle, observing the water at intervals.
- Filtration – cut a 2 litre plastic bottle in two, plug the neck of the bottle with cotton wool or tie a coffee filter to the outside of the neck of the bottle with a rubber band or plug with small stones. Sit the top half of the bottle into the bottom half. Add a layer of gravel and then one of fine sand. Pour some muddy water into the top half of the bottle, letting it collect in the bottom half.
- Chemical – add a few alum crystals to aerated muddy water (shake a bottle with muddy water in it and move the water back and forth between bottles) in a plastic bottle with the top cut off, slowly stir for a few minutes and leave to settle; observe the water at intervals. Pour the top two thirds of the settled treated water through a filter.
- Compare the water e.g. has treatment changed the appearance and smell of water. Test the water's pH. You could also draw the sedimentation pattern and calculate the total dissolved solids of the water samples.

**Don't drink any of the treated water!**

See Section 1 of the Water Resource

## Questions

- Is there a difference in the pH of the water samples? If so, why and what impact, if any, will this have on human health, the school and outside environment?
- Which water treatment process do you think is most effective and why?
- What was the sedimentation pattern?
- Is the pH of the treated water different? If so, why?

## Go further

- Investigate the lifecycle of water in the school. Ask the students to find out where their water is sourced and where their drinking water and waste water are treated. Students could work in groups to research the school's water cycle or work individually. Posters could then be created to highlight the school's water cycle.
- Research the effect of extremes in pH on the environment.
- Visit a waste water treatment facility.