

# How cold is 0°C to 5°C? Experiment

## Materials

- Ice (i.e. bags of ice, chunks made from freezing ice in mixing bowls, snow from snow banks)
- Water
- Large containers (Rubbermaid bins or basins work well, something deep enough so that children can immerse their hands and part of their arms)
- Tarps or garbage bags to catch any spills
- Towels or paper towel to dry hands.

## Preparation

- Lay out tarps or garbage bags under containers to catch any water spills.
- At least 20 to 30 minutes before the experiment, fill the containers with cold water and ice/snow. Allowing the water to chill will provide a more realistic situation for the students.

## Experiment

1. Discuss with students that water in the spring is very cold as it is formed from melted ice and snow. Water in lakes, ponds, ditches, creeks, rivers, streams, etc. is approximately 0°C to 5°C. This is about as cold as the inside of your refrigerator.
2. Explain to the students that they are going to be provided with the opportunity to experience how cold this actually is. In this experiment, they will be putting one hand into a bucket of cold water for 30 to 45 seconds (this will depend on the age of the students) and seeing what the effects are. To measure the

effects, they will be performing a series of tests on their hands before the experiment and then repeating these same tests after the experiment to see how the results may or may not have changes. Following are the tests:

- Colour test — look at the front and back of your hands and observe the colour (the usual observation is a normal flesh colour with a slight pink colour).
  - Temperature test — put your hands on your cheeks to see what the skin temperature is.
  - Finger tip test — touch your thumb to your index finger, then your middle finger, ring finger and pinky finger seeing how quickly this can be repeated.
  - Snap test — see how quickly you can snap your fingers (it doesn't matter if you can make the sound!).
3. Have the students perform the tests and observe their initial results. Remind them that they will perform these same tests as soon as their hands come out of the water.
  4. Students will find their places around a bucket and get ready with one of their hands. When you say go, they can put their hand, fingers open, to the bottom of the bucket and hold it there until you tell them to take it out. Be forewarned, this is usually a very noisy process!
  5. Once the students are told to remove their hands, they should perform their four tests and observe the results.

## Discussion

- Colour test
- What colour is your hand? *Usually pink or red.*
  - Why do you think your hand turned red?
  - What is in your body that is red? All the blood is rushing up to the surface of your skin to try to keep your hand warm. Keep in mind that your body only has so much warm blood and at some point will need to focus this warm blood on the parts of your body that you need to stay alive (lungs, brain, heart, etc.). Therefore, your hands, feet, arms, and legs will be getting less blood and less oxygen making it difficult for your muscles to do the things they normally can do (swim, grab onto things, walk, stand up, etc.).
- Temperature test
  - What was the temperature of your experimental hand? *Very cold! It doesn't take very long for the cold water to have an effect on your body temperature.*
- Finger tip and snap tests (this is where you will get the most variation in results and it is important to remind the students that you are looking for average results)
  - What was it like to snap or move your fingers after the experiment? *Many students will feel numbness, pain, and decreased mobility in their fingers due their muscles already being affected by the cold.*
- If that is how one hand can be affected after 30 seconds, imagine what it would like have your whole body in water that cold.
- Discuss Hypothermia
  - Takes 5 to 10 minutes in water between 0 and 5 degrees Celsius
  - Cannot think clearly, motor skills are lacking, unconsciousness eventually occurs (the MUMBLIES, the STUMBLIES, and the GRUMBLIES)
  - Hypothermia is life threatening
- To avoid all of these horrible consequences, always remember to STAY AWAY from cold fast moving water in the spring.