HOW DOES THE OCEAN CIRCULATE?

The water in our oceans is constantly moving and today we will look at one of those processes called Thermohaline Circulation. **Thermo** means heat and **haline** means salt. As oceanographers we use the term salinity to describe how much salt is in water. Our oceans have different temperatures and salinity and these differences help to move our ocean water.

You can watch this NASA video of the thermohaline circulation to see a good video of this circulation around the world. Have a look at what happens just above Ireland on the video – the water sinks and goes into the deep ocean!

COUPLE OF INTERESTING FACTS:

- It takes about 1000 years for a parcel of water to travel all the way around our oceans
- Our oceans cover 70% of our planet

AIM

TODAY WE ARE GOING TO LOOK AT THE THERMO OR HEAT PART OF THERMOHALINE CIRCULATION!

STEP 1

Gather the following:

- Large glass or plastic bowl but you must be able to see through it
- Food dye-green works really well and you can get it in the baking isle in the supermarket
- Metal Egg cup or small container that can hold around 2.5 tablespoons-do a check first with cold water!
- Warm and Cold water from the tap
- String
- White sheet
- Ruler or measuring tape
- Scissors
- Selotape or tape

Equipment needed

Remember experiments sometimes have to be repeated before they work so keep trying until it works!

STEP 2

To allow the small cup to be lowered easily into the large bowl of water cut 2 pieces of string 40cm long using the ruler and the scissors.

Put one piece of the string around the top of the small cup. As you will see there is a lip on container I have used – try and find something similar at home but remember it must be small!

Adding the string to the cup

STEP 3

Add the second string and tie it on the opposite side of the cup. Using a bit of sellotape or tape secure the knots onto the cup (left image). It very important that when you hold the strings the cup is level as you will be putting hot water into this (right image).

Secure the knots onto the side of the cup

Knots secured and easy to lift evenly

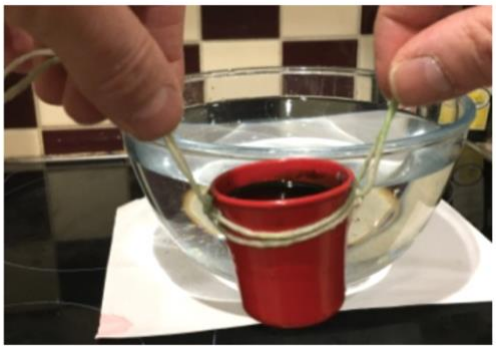
STEP 4

Fill the glass bowl with cold water from the tap and place it onto the white sheet.

STEP 5

Put a few drops of green dye into your cup and fill to the top with warm water from the tap, be careful in case the water is very hot from the tap!

STEP 6



How to hold the cup with the warm water and dye

Pick up the container using the strings.

It is best to hold the strings close to the knots as it's less likely to swing and spill.

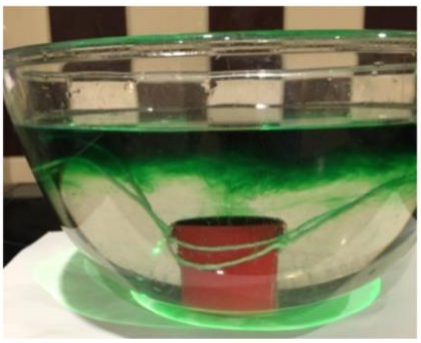
STEP 7

Start to lower the cup of warm green water slowly into the bowl of cold water.

It is important **to lower it slowly and gently to the bottom**.

As it goes in see how the green warm water comes out of the cup and sits on top of the cold water.

You will be able to observe this for a few minutes!



Warm green water sitting over the cold water

WHAT IF IT DOESN'T WORK FIRST TIME?

The best things to check if it doesn't seem to work on the first attempt

- Make sure you lower the small cup slowly and carefully into the bowl
- Ensure that there is a good temperature difference between your warm water and cold water, but be careful don't burn yourself!

WHY DOES THIS HAPPEN?

This is how our oceans behave with temperature differences. The hot water is **less dense** so it rises to the surface above the **more dense** cold water which stays underneath the warm water. You can also try the opposite. Fill the large glass bowl with warm water from the tap and put cold water and dye into your small cup. Lower the cup with the cold water into the warm water and see what happens!! Ask yourself first, what would you expect? Remember is cold water more or less dense than warm water?

Ocean circulation isn't just down to how warm or cold the water is in our oceans. How much salt or the salinity of the water plays an important part in our thermohaline circulation too. This will be our next experiment!

CREDITS

This experiment is brought to you by Sheena Fennell, an oceanographer in Earth and Ocean Sciences at NUI Galway.

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