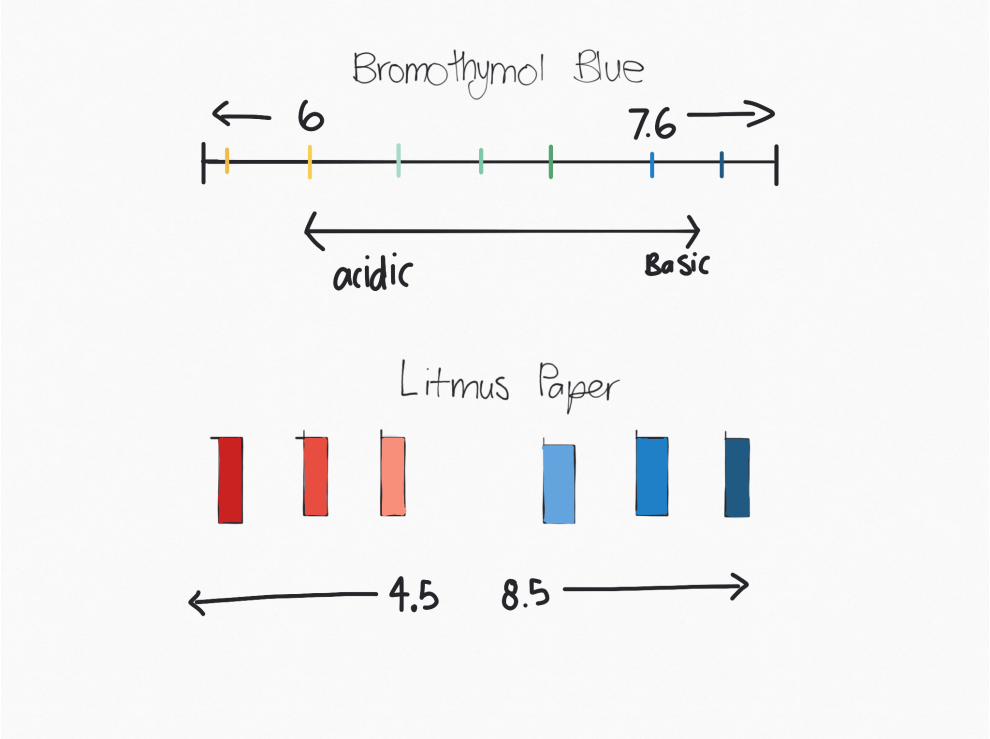
Question: How does the acidity of each water source differ? How can we test their acidity?

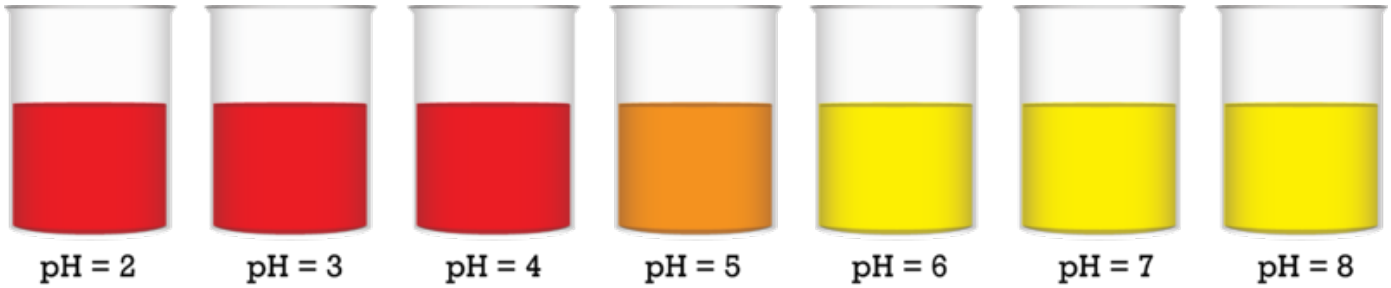
Hypothesis:

If we add the bromothymol blue to each source of water we think that the salt water will turn a yellow ish green colour meaning it is the most acidic because of the pollution in the ocean. Then following we believe will be the rain water, then tap water, and fresh water being the most basic (this will be the most blue).

Procedure:

1) Take your four different water sources (sea water, rain water, tap water, fresh water) and pour 100 ml (*this is our controlled variable*) of each type into three sets of separate containers.
2) Add 3 drops of methyl orange to the first set of containers. Observe + record the reaction. (See visuals below of what each reaction means).
3) Add three drops of bromothymol blue to the second set of containers. Observe + record the reaction. (See visuals below of what each reaction means).
4) Take red litmus paper and dip one single strip into each container of water. Observe + record the reaction. (See visuals below of what reaction means).





Observations:
Overall the bromothymol blue had the strongest reaction, it ended up turning the rain completely yellow, the tap water a little bluer, the ocean water a light blue and the fresh water blue. All of the containers reacted right away, unlike the methyl orange and litmus paper. The methyl orange had a slight change of colour in each container. It turned the rain water a dark orange, the tap water a lighter orange, the ocean water slightly yellow and the fresh water yellow. As for the litmus paper, the scale of what the red litmus paper can detect wasn't large enough so their was no reaction in the end.

Conclusions:

We have come to the conclusion that that the rain water is the most acidic then following is tap water, ocean water and fresh water. Throughout the experiment the rain water turned yellow with the bromothymol blue, this means that it was acidic and there was large amounts of carbon dioxide found in it. After doing research we realized that the rain could potentially be acid rain. Acid rain is formed when the carbon dioxide dissolves into the precipitation creating carbonic acid. Carbonic acid is a weak acid because it ionises (removes electrons) to forms hydrogen ions. As for the fresh water, it was the most blue because of its extensive amounts of minerals that are known to be found in fresh water.

acid rain vs. normal rain

acidic rain

$CO_2 + H_2O = H_2CO_3$

normal rain

H_2O

Acid rain reacting with bromothymol blue

Bromothymol Blue

$C_{27}H_{28}Br_2O_5S$ +

acid rain

H_2CO_3 $= C_{28}H_{30}Br_2O_8S$