Water Testing Lab

Purpose: To perform qualitative tests to determine the presence of several ions in various samples of water.

Introduction: In this lab, you will perform some confirming tests. In each confirming test, you will look for a change in solution color or for the presence of an insoluble material called a precipitate. When there is a change, this is a positive test. A negative test (no color or precipitate) does not necessarily mean that the ion in question is absent, but maybe just in so small an amount that no change is observed.

You will perform each confirming test on several different water samples. The first solution will be the reference solution, one that contains the ion of interest. The second will be a control, a sample known not to contain the ion. The control in this activity is distilled water. The other solutions will be tap water and some natural water samples. These solutions may or may not contain the ion.

Procedure:

Calcium Ion Test (Ca^{+2}) $Ca^{+2}(aq) + CO_3^{-2}(aq) \text{ ---> } CaCO_3(s)$

Follow these steps for each sample (Ca^{+2} reference, control, tap water and natural water samples):
1) Place 40 drops into a test tube.
2) Add six drops of sodium carbonate (Na_2CO_3) to the test tube.
3) Record your observations, including the color and whether a precipitate formed.
4) Determine whether the ion is present and record your results.
5) Repeat for the remaining solutions.
6) Discard the contents of the test tubes as directed by your teacher. Clean out all test tubes.

Iron (III) Ion Test (Fe^{+3}) $Fe^{+3}(aq) + SCN^{-1}(aq) \text{ ---> } [FeSCN]^{+2}(aq)$

Follow these steps for each sample (Fe^{+3} reference, control, tap water and natural water samples):
1) Place 40 drops into a test tube.
2) Add three drops of potassium thiocyanate (KSCN) to the test tube.
3) Record your observations, including the color and whether a precipitate formed.
4) Determine whether the ion is present and record your results.
5) Repeat for the remaining solutions.
6) Discard the contents of the test tubes as directed by your teacher. Clean out all test tubes.

Chloride Ion Test (Cl^{-1}) $Cl^{-1}(aq) + Ag^{+1}(aq) \text{ ---> } AgCl(s)$

Follow these steps for each sample (Cl^{+2} reference, control, tap water and natural water samples):
1) Place 40 drops into a test tube.
2) Add six drops of silver nitrate ($AgNO_3$) to the test tube.
3) Record your observations, including the color and whether a precipitate formed.
4) Determine whether the ion is present and record your results.
5) Repeat for the remaining solutions.
6) Discard the contents of the test tubes as directed by your teacher. Clean out all test tubes.

Sulfate Ion Test (SO_4^{-2}) $SO_4^{-2}(aq) + Ba^{+2}(aq) \text{ ---> } BaSO_4(s)$

Follow these steps for each sample (SO_4^{-2} reference, control, tap water and natural water samples):

1) Place 40 drops into a test tube.
2) Add six drops of barium chloride ($BaCl_2$) to the test tube.
3) Record your observations, including the color and whether a precipitate formed.
4) Determine whether the ion is present and record your results.
5) Repeat for the remaining solutions.
6) Discard the contents of the test tubes as directed by your teacher. Clean out all test tubes.

Data Table:

_____ion test

Solution	Observations (Color, Precipitate, etc.)	Result (Is ion present?)
Reference		
Control		
Tap Water		
Natural Source from _____		
Natural Source from _____		

You will need to copy the data table above into your lab book 4 times, once for each of the four ions being tested.

Questions:

1a) Why was a control used in each test?

b) Why was distilled water chosen as the control?

2) Describe some difficulties associated with the use of qualitative tests like these.

3) These tests cannot absolutely confirm the absence of an ion. Why?

4) How might your observations have changed if you had not cleaned your test tubes or stirring rod thoroughly between each test?

Conclusion: