



WHAT IS IN YOUR WATER?

I. Objectives

- a. Students will become familiar with the City Of Lubbock's Water Quality Report.
- b. Students will understand the concepts of solubility, dissolving, solutions, and mixtures.

II. Materials

- a. Water Quality Report (WQR): one for each student
- b. 3 different types of water: city water, well water, distilled water
- c. Small paper cups: four per student
- d. Worksheet: one for each student

III. Lesson

a. Before we get started today, I need to pass out some materials to you. Give each student the following:

1. 4 small paper cups
2. 1 WQR
3. 1 Worksheet

b. Ok, as we get started today we need to make something. What do you think all these cups are for? (Allow students to answer.) That's right; you put stuff in them, like liquids. Are all liquids drinkable? How do we know if liquids are safe to drink or not? Is our drinking water safe? How do you know? These are some of the things we are going to discuss today.

c. Now we need to make something to go into one of our cups. Hold up the Cool Aid packet. Make the Cool Aid. What materials did we use to make the Cool Aid? (Let students answer: water, sugar, and Cool Aid mix). We just created a mixture.

d. What is a mixture? A mixture is the physical combination of two or more substances. Does everyone know what the word substance means? (Explain to students)

e. There are all kinds of these mixtures all around the world. Can you give me some examples of more mixtures? (Allow students to answer.)

f. What about our water. When it comes out of our faucet it looks clean and clear. Are there things in the water we drink? Don't forget that our water is cleaned at the Water Treatment Plant. I hope you remember all the steps in the water treatment process. So, what's in our water?

g. There are actually many different types of substances in our water.

1. If you think about the cleaning process you should be able to identify at least two different types of chemicals used in the treatment process. Can you name them? (Chlorine and Ammonium sulfate) Can anyone tell me why these two chemicals are added to the treatment process?

- Chlorine – is added to disinfect the incoming water from Lake Meredith.

- Ammonium Sulfate – This is commonly known as alum. Alum was added during the treatment process to create floc. The large flocculated particles were removed from the water during sedimentation.

h. Now, I would like you to take a look at the Water Quality Report that I passed out earlier. The WQR is a detailed report containing everything that was found in our drinking water during the past year. Let's make a list of some of the things contained in this report and find out what they mean and what they measure.

1. Where our water comes from: Lake Meredith and the Ogallala Aquifer. (This information is covered in a previous lesson.)
2. Helpful Definitions: For each of these items the WQR can be used for obtaining the definition. Remember to explain the ones students are interested in.
 - i. MCL – Maximum Contaminant Level
 - ii. PPM – Parts Per Million
 - iii. PPB – Parts per Billion
- i. Are the substances in our water good or bad? Some of them are good and some are bad. Ask the students to identify some the items. Discuss the different levels allowed and actual levels detected. Why are there different levels allowed? Many of these substances are harmful. Some of them are more harmful than others at certain levels. So, scientists have tested and studied each of these different substances to find out exactly how much of the substance can be contained in our water before it becomes unsafe.
- j. Let's discuss a few of the items on the list of substances in our water.
 1. Arsenic – Has anyone ever heard of arsenic before, what is it? (Allow students to answer) Arsenic is commonly found in water. It can be naturally occurring in the soils around the water, come from industrial or agricultural sources. Arsenic is commonly used as rat poison. If humans ingest too much arsenic it could affect your circulatory system, cause skin damage, or even increase your risk of getting cancer.
 2. Copper – Copper is a metal. You could receive increased copper levels from corroded pipes at your home. Long term exposure to increased copper levels could cause liver or kidney damage.
 3. For additional explanations on the items monitored at the treatment plant use the chart from the EPA Ground Water and Drinking Water page.

IV. Activity

- a. Ok, you probably know about the three types of water on earth already. What are they? (Salt, Fresh and Frozen) If those are the only types of water, then why does water from different places taste so different? This is what we will be experimenting with today. You already have 4 small cups in front of you and you know we are going to put some type of liquid in them. Before we do that, I need you to label your cups 1 through 4. It is important to keep track of which sample we are using. Now, let's fill them up.
- b. Fill each small cup with the following: (Do not drink the liquids until I tell you to!!!!)
-Do not tell the students what kind of water is in each cup!!!
 1. Cool Aid
 2. Well Water
 3. City Water
 4. Distilled Water
- c. I want you to try and figure out what kind of water is in these cups. (Cool Aid is the easy one.) Now that your cups are filled, we need to make a few observations. As we make our observations, please write down what you observed. Keep in mind, that observations and recording data are important aspects of the scientific method. Pass out the worksheet.
 1. Describe how each cup of water smells. Is there one that really stands out? Keep this question in the back of your mind as we proceed, "Why does water from different places taste different?"
 2. Is there any difference in the appearance of the cups with water? Make sure you write down your observations. Use good descriptive words and really describe what you see and smell.
 3. Ok, now we are going to taste the water. Remember you are comparing these different liquids with each other. Take a small sip of one, and then describe the taste. Do this for each of the cups with water. Once you have sampled each one you may resample one or all of them. Compare the taste. Which one or ones did you like. How were they different? Are they similar

in taste?

d. Can anyone tell me what kind of water we just tasted? (Allow students to answer.) Ok, here are the answers, write this down on your worksheet.

1. Cool Aid
2. Distilled Water
3. Well Water
4. City of Lubbock Water

e. Clean up. Give the students instructions.

V. Conclusion

a. We still haven't answered the question of why different types of water taste different. Would anyone like to answer the question? Don't forget everything we have talked about today. It is a clue!

b. Water can taste different because of the different substances found in our water.

1. The City of Lubbock happens to have a fair amount of salt in our water.
2. Some places have hard or soft water. That has to do with the amount and types of minerals that are deposited into the water.
3. Is all bottled water the same? No, you need to read the label to find out where it comes from. That may give you some clues about what is in it. Sometimes bottled water is really just treated water from a city like Lubbock.

c. Not all water is safe to drink. We drank groundwater today. There are places right here in Lubbock where the groundwater is contaminated. We have discussed several different types of items that could be in our water, and how that is or could be harmful to humans if we consumed it!!!!



Substance	What is it and where does it come from?	What happens if there is too much?	MCL
Arsenic	Semi-metal element Enters water through natural deposits in the earth or from agricultural and industrial practices	Thickening and discoloration of skin, stomach pain, nausea, vomiting, diarrhea, numbness in the hands and feet, partial paralysis and blindness, cancer of the bladder, lungs, skin, kidney, nasal passages, liver and prostate	10 ppb
Barium	Lustrous machinable metal contained in ore. Used in making a wide variety of electronic components, in metal alloys, bleaches, dyes, fireworks, ceramics and glass. Used in well drilling operations where it is directly released into the ground	Gastrointestinal disturbances and muscular weakness. Long Term - High blood pressure	2 ppm
Fluoride	Naturally occurring element some cities add - the City of Lubbock does not	In excess of 4mgL over many years can cause bone disease Dental Florosis in excess of 2mgL	4mgL
Nitrate	Nitrogen - Oxygen chemical compound which combine with organic and inorganic compounds Fertilizers	Serous illnesses, hemorrhaging of the spleen. In children interferes with the oxygen carrying capacity of blood.	10 ppm

Selenium	Metal found in natural deposits as ores. Used in electronic and photocopier components, also widely used in glass pigments, rubber, metal alloys, textiles petroleum, medical therapeutic agents and photographic emulsions	Is an essential nutrient at low levels. Short Term – Hair and fingernail loss; damage to peripheral nervous system fatigue and irritability	50 ppb
Organic Carbon			
Chloramines	Disinfectant	Irritating effects to eyes and nose, stomach discomfort and anemia	
Alpha Emitters	Certain minerals are radioactive and may emit a form of radiation	Over many years levels above EPA standards can cause increased risk of cancer	
Beta Emitters	Certain minerals are radioactive and may emit a form of radiation	Over many years levels above EPA standards can cause increased risk of cancer	
Combined Radium	Alkali earth metal that is radioactive	Over many years levels above EPA standards can cause increased risk of cancer	
Trihalomethanes	Disinfection byproduct (chloroform, bromoform, bromdichloromethane and dibromchloromethane)	Could cause cancer and adverse reproductive affects	80ppm

Coliform	Not a health threat in itself; used to indicate whether potentially harmful bacterial is present. (Bacteria associated with human and animal waste		
Haloacetic Acids	Disinfection byproduct	Could cause cancer and adverse reproductive affects	
Lead	A metal. Source is pipes of solder in household plumbing	May cause a range of health effects including behavioral problems, physical and mental development. High Blood Pressure	
Copper	Metal commonly used in household plumbing materials	Essential element required by the body in small amounts. Short Term - Gastrointestinal disturbances. Long Term- liver and kidney damage	
Chloroform	Chemical compound CHCl_3 by product of chlorination	Carcinogenic, cardiac problems similar to trihalomethanes	
Bromodichloromethane	Component of Trihalomethanes		
Dibromochloromethane	Component of Trihalomethanes		
Bromoform	Component of Trihalomethanes		
Sulfate	Salt or sulfuric Acid Naturally occurring can affect the taste and odor of water	High levels may cause diarrhea.	

Aluminum	Metal found in bauxite ore	Neurotoxin that can alter the function of the blood/brain barrier. Some studies link to Alztimers and Breast Cancer	
Chloride	Cl- ion		
Ammonia	NH3 (nitrogen and hydrogen) used to make fertilizer and explosives	Added with chlorine to make chloramines, a disinfectant that does not combine with organic materials to form carcinogenic halomethanes such as chloroform. Human excrete ammonia in urine, however aquatic animals cannot causing bad stuff.	
Calcium	Alkaline earth metal found in soil	Essential in human diet	
Magnesium	Alkaline Earth metal found in over 60 minerals	Essential in human diet	
Sodium	Alkali metal found all over naturally	Essential however at high levels can lead to high blood pressure.	

Information provided by the EPA for Groundwater and Drinking Water.

What's In Your Water

Name: _____

Date: _____

Name the Material.	How does it smell? How do they vary?	Does it look different? How do they vary?	How does it taste? How do they vary?