

ACTIVITY 3: Water testing with pH meter

Activity Objective: Test a water sample against the ASTM standards for water use a pH meter as shown in Figure 1

Materials: Chapter 14, paper, computer, printer, Internet Access, pH meter

Definition: Food and agriculture are the largest consumers of water, requiring one hundred times more than we use for personal needs. Up to 70 % of the water we take from rivers and groundwater goes into irrigation, about 10% is used in domestic applications and 20% in industry. Agriculture is a major user of ground and surface water in the United States, accounting for approximately 80% percent of the water used.

- **Water Source-** U.S. Geological Survey water use estimates generally refer to withdrawals, or the quantity of water withdrawn from a water source such as a river, lake, or aquifer.
- **Applied Water-** USDA Farm & Ranch Irrigation Survey (FRIS) reports on farm applied water use, which refers to estimates of the quantity of water applied to the field by an irrigation system such as a gravity-flow system or a low-pressure center-pivot sprinkler system.
- **Consumptive Water-** Annual crop consumptive use estimates refer to the quantity of

Water actually consumed (taken up) by the crop plant over its various crop-growth stages for crop retention and evapotranspiration. Consumptive use estimates may or may not include system efficiency losses such as evaporation, deep percolation, and runoff.

Peak Water: Much of the world's water in underground aquifer and in lakes can be depleted and thus resembles a finite resource. The term peak water is similar to peak oil where the production or access to water will reach a peak and then drop. The amount of available freshwater supply in some regions is decreasing because of the following:

The Food Safety Modernization Act (FSMA) requires the Food and Drug Administration (FDA) to develop regulations aimed at improving the safety of produce. Water used in agricultural operations has been identified as a potential source of pathogens that may contaminate produce, and Congress required FDA to include standards for water when developing new regulations for produce safety.

The proposed standards require a farmer to inspect their agricultural water system at the beginning of a growing season. In that inspection, a farmer must identify conditions that may result in hazards contaminating produce through such as debris, trash, or domesticated animals. For farmers that have to test water, FDA is proposing the standards for testing:

1. No detectible E. coli present per 100 ml of water: This standard would apply to water used for an activity during and after harvest, water used to make agricultural teas, and water used in sprout irrigation.
2. A statistical threshold value of 410 colony forming units (CFUs) generic E. coli per 100 ml for a single water sample, and a geometric mean of no more than 126 CFU per 100 ml.



Figure 1 pH meter https://www.opensky.com/1smartdeal/product/digital-ph-meter-tester-pocket-portable-pool-water-aquarium-hydroponic-wine-new?max_discount=1&configurationId=56df426f4e3d6f035c8b4857&osky_campaign=platformconverters_advertisers&utm_source=bing&utm_medium=cpc&utm_campaign=platformconverters_advertiser&utm_term=1101119378223&utm_content=Ad%20Group%20%231&gclid=CNjXw8KxktECFQJNNwodG6UDkw&glsrc=ds

Drinking Water Standards: The American Society for Testing and Materials (ASTM) standards for water quality include:

- Chloride <40 ppm
- Sulfate <100 ppm
- Calcium <100 ppm
- Magnesium <100 ppm
- Total Hardness <170 ppm
- Iron <1 ppm
- Lead < 15 ppb
- pH Range: 5.5—9.0

REVIEW VIDEOS:

How to Test and adjust pH levels in your water:

<https://www.youtube.com/watch?v=HQIH6Z3rLYU>

Know what you're drinking? <https://www.youtube.com/watch?v=0MIOeATTW7A>

Procedure:

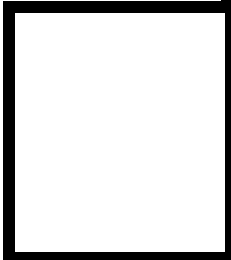
1. Work as partners or small teams.
2. Research and brainstorm water testing on the Internet and YouTube videos using both dye and a pH meter.

3. Locate and purchase a pH water testing meter:
https://www.opensky.com/1smartdeal/product/digital-ph-meter-tester-pocket-portable-pool-water-aquarium-hydroponic-wine-new?max_discount=1&configurationId=56df426f4e3d6f035c8b4857&osky_campaign=platopconverters_advertisers&utm_source=bing&utm_medium=cpc&utm_campaign=platopconverters_advertiser&utm_term=1101119378223&utm_content=Ad%20Group%20%231&gclid=CNjXw8KxktECFQJNNwodG6UDkw&gclid=ds
4. Test a water sample and write a report on how you tested the water.



RUBRIC

4 World-Class Learner	3 Proficient Learner	2 Developing Learner	1 Emergent Learner
Learner at this level has gone beyond mastery of knowledge, skills, & attitudes described in project. World-class learner consistently exhibits high-quality performance.	Learner at this level has had opportunities to apply knowledge, skills, & attitudes of component of project. Proficient learner has mastered essential attributes, thus proving mastery.	Learner at this level has been exposed to & had opportunity to apply knowledge, skills, & attitudes of project. Developing learner may have only a few essential attributes to master before mastery.	Learner at this level may or may not have been exposed to knowledge, skills, & attitudes required by academic standards of the project.



- 1= Emergent Learner
- 2 = Developing Learner
- 3 = Proficient Learner
- 4 = World-Class Learner