

Overview of Activities

1. Introduction
2. Chemical Testing Demonstration and Practice
3. Calibration
4. Discussion and Troubleshooting
5. Review

Learning Outcomes

At the end of this session participants will be able to:

1. Demonstrate chemical testing procedures
2. Explain the importance of equipment calibration

Materials & Preparation

- Activity: Chemical Testing Demonstration and Practice
- Test samples collected by participants
- Water sample with a drop of chlorine added for comparator demonstration
- Handout: Data Recording Form, see Appendix 3 (1 page, print a few copies)
- Colour comparators, discs and reagent tablets for testing: fluoride, nitrate, iron, manganese and chlorine
- Colour comparator square cuvettes, (20-25)
- Crusher paddles for reagent tablets, (two per station, approximately 10)
- Pipettes, disposable, non-sterile, (two per station)
- Digital turbidity, pH and/or conductivity meters (optional)
- pH buffer solutions (pH 4, 7 and 10) and/or conductivity standard (optional)
- Beaker or sample cup for pH meter rinsing and storage (optional)
- Wash bottles with distilled water for rinsing (one per table)
- Test strips, e.g., chlorine, pH, and/or multi-parameter
- Wet and dry disposal buckets with lids (one set per table)
- Arsenic test kit (optional)
- Preparation: Print test procedures for each station, see Appendix 4
- Set up test stations. See end of lesson for example layout
- Calibration standards for digital meter demonstration (optional)

Recommended Reading

- Technical Brief: Chemical Aspects in Drinking Water

5 minutes



Introduction

1. Ask: "What chemical aspects are you most interested in testing in your samples and why?"
2. Divide participants into small groups of two or three people. Allow groups a few minutes to discuss.
3. Ask participants to share their ideas with the large group.
4. Remind participants that it is very difficult and expensive to test for all chemicals and that it is best to focus on priority chemicals identified by the WHO.
5. Present the learning outcomes or an overview of the lesson.

90 minutes



Chemical Testing Demonstration and Practice

1. Explain: "You will be conducting chemical tests using a colour comparator and other testing equipment (optional). You will work in your small groups of two or three people and will work your way around the testing stations set up for different chemical parameters."
2. Invite participants to gather around the testing area for a demonstration of the colour comparator procedure.
3. Explain: "The purpose of a sample blank is to compensate for existing colour in the test sample." *Trainer tip: if there are enough cuvettes, each person should carry around their own sample blank cuvette. It will be the same one used for every test.*
4. Demonstrate the colour comparator procedure to the large group using the prepared chlorine sample.
5. Hand out test samples collected and supplied by participants.
6. Instruct groups to find a station, read the posted instructions and start testing. Participants should finish the procedures at each station before moving to the next test.
7. Demonstrate the pH meter or other testing equipment with individual small groups at those stations (optional). Suggest participants try to follow instructions on their own for test strips and digital meters. Provide guidance if needed.
8. Remind participants to record their results on their data recording sheets (the same sheets used for the microbiological testing practice).

Key Points

- Sample blank tubes go into the left side of the comparator (depends on comparator) or in the blank position.
- Each colour disc has the units displayed on the side and should be checked before recording results.
- Face a good light source, rotate the disk until the colours match and record results from the lower right hand window.
- If test readings are at the top of the colour disc scale the results exceed the instrument range and the sample must be diluted and retested.

Calibration



1. Discuss why test equipment needs to be calibrated.
 - Ensures consistent and valid results
 - Ensures proper functioning of equipment
 - Digital/electronic instruments usually need calibration
2. Ask: "What equipment needs to be calibrated in water quality testing?"
 - Digital meters including pH, TDS, EC, turbidity, photometer etc.
 - Incubators (some have internal calibrations, check specifications)
3. If time allows, demonstrate how to calibrate a pH meter or turbidity meter as per manufacturer's specifications and instructions (optional).

Discussion and Troubleshooting



1. Invite participants to return to the classroom area. *Trainer tip: people will be finishing the chemical testing at different times, do this activity after a break as an option.*
2. Ask: "Which test results did not meet the WHO guidelines stated on the data recording forms?" Record any results that did not meet the guidelines (or national standards) on a flip chart for discussion.
3. Lead a discussion about results that did not meet guidelines or with unusual findings. Allow a few minutes to explore ideas.
4. Ask: "What other reasons could there be for these results?"
 - Used the wrong reagents or discs
 - Didn't follow procedures
 - Didn't use a blank sample
 - Used the wrong units (some colour discs like manganese have units that are in ppb not ppm therefore results may appear to exceed guidelines)
 - Difficulty with visual comparison
5. Remind participants that this is a single point in time and further testing would be required to verify any test results.

5 minutes



Review

1. Play the Name This Item game.
2. Gather several items from the Chemical Testing Practice activity, e.g., colour comparator, cuvette, pipette, reagent tablets, crusher paddle, pH meter, test strips, beaker, colour disc, pH buffer solutions, wash bottles
3. Hold up each item one at a time.
4. Ask: "What is this item called? What is this item used for?" *Trainer tip: have a bag of sweets on hand to give out as prizes for correct answers to encourage participation.*

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Chemical Testing Stations

Handout

Example Testing Station Layout

