

## WATER QUALITY TESTING

### Topics Covered

- Different Types of Test Kits
- Test Kit Accuracy and Range Requirements
  - Testing Frequency
  - Things to Remember
  - Caring for Test Kits
  - Performing the Tests

WA State DOH | 2

### Different Types of Test Kits

- Colorimetric
- Titrimetric
- Photometric
- Electronic
- Turbidimetric
- Test Strips

WA State DOH | 3

## Colorimetric

### Characteristics and Method

- Probably the most commonly used type
- Add a reagent(s) to water
- Color indicates the concentration of the chemical being measured
- Match the color to reference
- Available for disinfectant and pH

WA State DOH | 4

## Colorimetric

### Advantages and Disadvantages

- Advantages:
  - Relatively easy to perform
  - Relatively accurate
- Disadvantages:
  - Can be difficult to distinguish subtle color differences
  - Lighting affects your reading
  - Reagents have expiration date

WA State DOH | 5

## Titrimetric

### Characteristics and Method

- Probably the second most common type
- Add a reagent(s) to water, and color appears
- Add a different reagent until color disappears or changes to another color.
- Count drops and multiply by a factor
- Available for disinfectant, total alkalinity, and calcium hardness

WA State DOH | 6

## Titrimetric

### Advantages and Disadvantages

- Advantages:
  - Very accurate if done right
- Disadvantages:
  - Can be time-consuming
  - Reagents have expiration date

WA State DOH | 7

## Photometric

### Characteristics and Method

- Just like colorimetric test
- A machine shines light and detects the color
- Available for disinfectant, pH, Alkalinity, Hardness, Cyanuric acid

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## Photometric

### Advantages and Disadvantages

- Advantages:
  - Eliminates human error in color perception
  - Relatively easy to perform
  - Easy calibration with a blank sample
- Disadvantages:
  - May not meet the accuracy requirement

WA State DOH | 9

## Electronic

### Characteristics and Method

- Simple to complex types available
- Portable and hand-held
- Dip probe in the sample to test
- Available for pH and Total Dissolved Solids

WA State DOH | 10

## Electronic

### Advantages and Disadvantages

- Advantages:
  - Eliminates human error in color perception
  - Can be very accurate
  - Can be easy to use
- Disadvantages:
  - Needs calibration
  - Needs probe cleaning/protection
  - Reliable ones can be expensive

WA State DOH | 11

## Turbidimetric

### Characteristics and Method

- Measures cloudiness of water
- Types:
  - Cyanuric acid testing
  - Nephelometer
  - Secchi disk (Pronounced [sekkij])
  - Main drains visible

WA State DOH | 12

## Test Strips

### Characteristics and Method

- Dip test strip into the pool water
- Available for disinfectant, pH, cyanuric acid, alkalinity, hardness, and more.

## Test Strips

### Advantages and Disadvantages

- Advantages:
  - Very quick and easy
  - Can test multiple chemicals at the same time
- Disadvantages:
  - Much room for individual differences in color perception
  - Not very accurate or reliable
  - Do not meet the accuracy requirement
  - Test strips have expiration dates

## Test Kit Accuracy and Ranges

Required by WAC 246-260-999

CHEMICAL TEST	MINIMUM TEST KIT RANGE	MINIMUM REQUIRED INCREMENTS ON KITS	MINIMUM ACCURACY
Free and total available chlorine and total bromine	0.5 - 10.0 ppm*	These increments are required to be on the test kit: 0.5, 1.0, 1.5, 2.0, 3, 5, 6, 10 ppm	±50% of the difference of incremental readings
pH (hydrogen ion)	7.0 - 8.2	Maximum increments of 0.4, e.g., 7.0, 7.4, 7.8, 8.2. Preferred increments of 0.2, e.g., 7.0, 7.2... 8.0, 8.2	±50% of the difference of incremental readings
Cyanuric acid	20 - 100 ppm	20 ppm	±10
Alkalinity	0 - 300 ppm	20 ppm	±10
Temperature	60 - 110°F	Shall have increments of less than or equal to 2°F, e.g., 60, 62, 64... 108, 110	±2°F

\*Operators who demonstrate the ability to accurately perform test kit dilutions may be allowed to use test kits with a chlorine range of 1.5 - 5.0 ppm, thereby using dilutions to read up to 10 ppm.

## Frequency of Testing

- Daily (or as often as needed):
  - Disinfectant (Free and Combined)
  - pH
  - Temperature (if higher than 95°F)
- Weekly:
  - Alkalinity
  - Cyanuric acid

**Keep these records for at least 3 years**

WA State DOH | 16

## Things to Remember

- Bleaching effect (when too much chlorine)
- Out-of-range reading
- ORP vs actual disinfectant level
- Bromine measurement (Total Bromine = Free chlorine reading X 2.25)

WA State DOH | 17

## Things to Remember

- High level disinfectant (>25 ppm) interferes with Phenol Red for pH (false high pH reading)
- Potassium monopersulfate interferes with DPD#3
- Cyanuric acid interferes with alkalinity test (1/3 cyanuric acid should be subtracted from alkalinity)

WA State DOH | 18

## Test Kit Care

- Chemical reagents must be protected from
  - Air, heat, light, and other chemicals
- Put caps back on right away
- Store between 36°F and 85°F
- Use before expiration date
- Never mix reagents
- Wash vials after each use

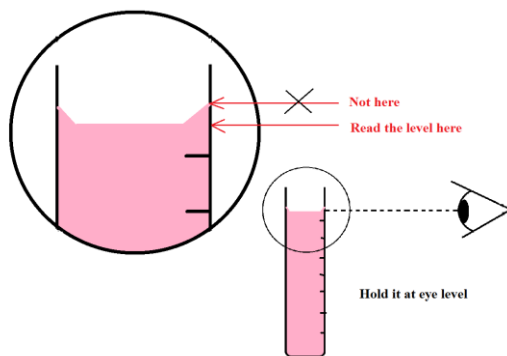
WA State DOH | 19

## Performing the Test

- Collect samples from at least 18 inches below water surface
- Pick a place away from any return inlet
- Insert a clean plastic bottle (bottom side up) to 18" depth.
- Turn the bottle right side up and remove the bottle from the water
- Fill the vial to the correct level (meniscus)
- Hold it at your eye level.

WA State DOH | 20

## Performing the Test



WA State DOH | 21

## Performing the Test

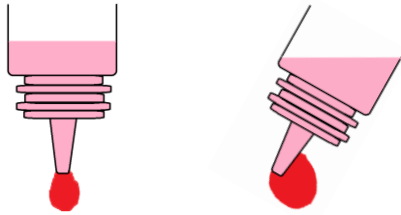
### Lighting

- Use sunlight whenever possible
- Fluorescent light is not good
- Hold the sample facing away from the light source
- Having a white background helps!

## Performing the Test

### Drop size

- Correct drop size is crucial for accurate measurement
- Hold the bottle straight up and down.



## Performing the Test

- If your test kit measures Free Chlorine and Combined Chlorine, then get the Total Chlorine by:
  - Total Chlorine = Free Chlorine + Combined Chlorine
- If your test kit measures Free Chlorine and Total Chlorine, then get the Combined Chlorine by:
  - Combined Chlorine = Total Chlorine – Free Chlorine



## Performing the Test

- Let's Practice!
  - Take sample water from the sample bucket
  - Dump used sample in the dump bucket
  - Rinse your vial in the rinse bucket
  - Record results in the Log Sheet for:
    - Free Chlorine
    - Combined Chlorine
    - pH
    - Alkalinity
    - Cyanuric Acid

WA State DOH | 25

## Performing the Test

**Let's compare results!**

WA State DOH | 26

## Questions?



WA State DOH | 27