

Taylor's Test Method Choices

INTRODUCTION

Analysts have a choice between time-tested visual methods that depend on one's ability to discern a change in color or a color match, and sophisticated electronic instruments that take the reading for you. Initial investment, cost per test, degree of accuracy achievable, degree of accuracy needed to translate test results to treatment, time necessary to perform each procedure, operator training required, potential for operator error, ruggedness of the system and portability for field use, maintenance requirements, and anticipated useful life are all factors to consider when choosing water-testing supplies for your applications. Taylor's customer service representatives are trained to assist you in making these decisions. It is likely your testing arsenal will include several different methods (Example A).

VISUAL METHODS

Drop-Count Titration

Taylor is best known for its drop tests, which have earned a reputation for giving **consistent results** over time. These drop-count titrations require minimal technique; they can be done in a minute or two even by inexperienced analysts; they offer a degree of accuracy sufficient for most applications (± 1 drop in 10, as a result of the quality control exercised in the manufacture of our dropper bottle tips); and they are very economical. They're favored for **field use** because there are few components (none easily breakable), no calibration is required before use, and the upkeep on a kit is negligible.

Most drop tests are performed by dispensing a standardized reagent from a dropper bottle into a measured volume of treated sample water until a permanent color change in the sample indicates the endpoint of the chemical reaction (Example B). The



▲ Example B



◀ Example A

number of drops required to reach the endpoint is then multiplied by a conversion factor (given in the instructions) to determine the concentration of the analyte. Testers who have difficulty matching colors, particularly shades of pink, should be able to see the distinct color change with no problem.

Molded fill marks on the sample containers—not silk-screened, which have the potential to be inconsistently applied—help ensure proper test volumes; waterproof instructions also resist fading and tearing; and durable plastic cases provide safe storage for kit components (Example C).

▶ Example C



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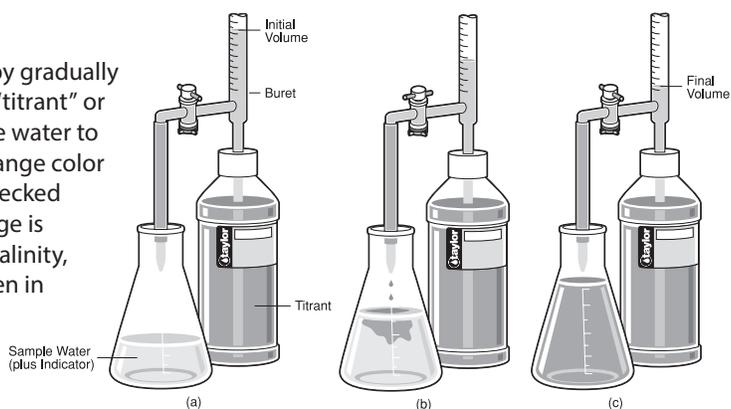
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Buret Titration

As pictured in Example D, buret titrations are performed by gradually dispensing a solution of known concentration, called the “titrant” or “titrating solution,” from a buret into a flask containing the water to be tested and (generally) an indicator reagent that will change color at the endpoint of the reaction. The flask is swirled and checked with each addition of titrant until a permanent color change is observed. The concentration of the analyte of interest (alkalinity, hardness, etc.) can then be calculated using a formula given in the test instruction.

Dispensing the titrant with a buret instead of a dropper bottle offers a **twofold advantage**: tighter control over the amount of titrant added to the sample, and calibration marks on the glassware to measure the volume dispensed more precisely. For this reason, buret titrations can achieve an accuracy of $\pm 2\%$ or better. While it's true buret titrations are most commonly performed in laboratories because the glassware employed is more fragile than the plastic components in drop-test kits, Taylor does offer a **portable titration setup** (Example E) for analysts seeking laboratory accuracy in the field, as well as a **wall-mount titration cabinet** for installation at the test site.

When ordering burets, ask about your **volume and flow-control options** (pinchcock alone or with Teflon™ stopcock). The reagents and instructions necessary to perform buret titrations are purchased separately from labware, in **reagent packs** (Example F).



▲ Example D



◀ Example E
(poly bottles must be purchased separately; see Example F)

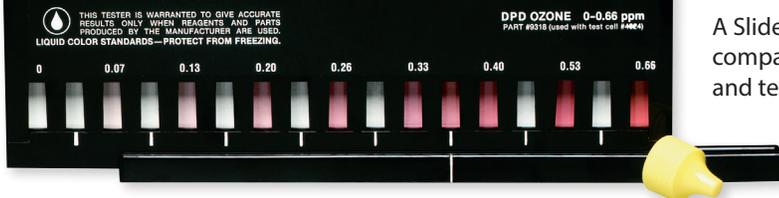
▲ Example F

Comparison to Liquid-Color Standards

Comparing the color of a treated sample to a liquid-color standard assures greater accuracy in the match than any liquid-to-nonliquid comparison can. The colors of our liquid standards—and there are hundreds of hues—are made from proprietary formulations; each is associated with a certain concentration of analyte in the treated water sample. The standards are **guaranteed never to fade** over the lifetime of the comparator or the defective ampules will be replaced free of charge. These instruments are extremely easy to use, portable, and available in the ranges most commonly encountered in field testing. Exercise reasonable care (do not drop, leave out in the sun, or let freeze) and you will enjoy **many years of service** from your modest investment.

When ordering, first determine the likelihood of color or turbidity in the water sample. Two comparator styles are designed to compensate for this interference. Then select the instrument whose midpoint value is closest to your target concentration. Your choices are:

Slide™ comparator—This system has three components: the molded-plastic Slide comparator itself, which contains nine liquid-color standards; a molded-plastic base to hold the Slide and the vials of sample water; and either three rectangular plastic test cells or three round glass test tubes. The overall system (Example G) is approximately 10" w x 2.25" d x 4" h. The unique **three-vial design compensates for color and/or turbidity** in the sample that would otherwise interfere with a proper color match.



▼ Example G

A Slide test kit for one parameter consists of the three-part comparator, all necessary reagents, waterproof and fade- and tear-resistant instructions, and a durable polypropylene carrying case with handle. Certain combination test kits contain more than one Slide comparator. Replacement reagents and parts are readily available for all Slide kits.

Long Viewpath™ (LVP) comparator—This system is identical to the Slide system except in the LVP a longer test cell, mirrored at one end, **increases test sensitivity.** LVP comparators (Example H) are also useful for determining the pH of unbuffered samples, such as steam condensate.



Midget™ comparator—Taylor's Midget comparators are the perfect choice for field testing when **color and turbidity are not present** in the sample, or have been filtered out before the test begins (a **syringe filtration system** is available for this purpose; order filter disks separately).

Approximately 3.5" w x 1.75" d x 3.75" h, each Midget comparator contains eight liquid-color standards cushioned in a molded-plastic block. Because interference from color and/or turbidity is not a problem, only one test cell is needed.

Like their Slide kit cousins, Midget kits (Example I) come complete with comparator, reagents, plasticized instructions, and a rugged carrying case. Certain combination test kits contain more than one Midget comparator. Replacement reagents and parts are readily available for all Midget kits.



▲ Example I

2-Standard™ comparator—When a chemical treatment only needs to be controlled between an **established maximum and minimum concentration**, use of the 2-Standard comparator is appropriate. Two glass ampules containing colorfast solutions are mounted on either side of a cavity in the molded-plastic block that holds a test tube containing the reacted sample. The developed color is checked to ascertain whether it falls in the range between the two color standards (Example J).

A representative kit contains the comparator block, one test tube, all necessary reagents and apparatus, waterproof instructions, and an 11.5" w x 5.25" d x 2" h polypropylene case.



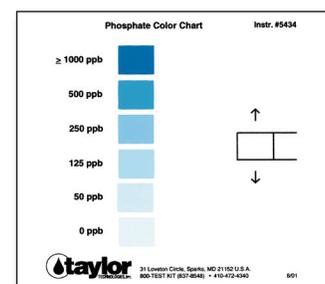
▲ Example J

Comparison to Printed-Color Standards

Printed-color standards, by definition, cannot mimic the characteristics of an aqueous sample. Nevertheless, **certain manufacturers' printed standards are superior to others'.** Important distinctions include how close the printing comes to the target color, whether colors can be achieved consistently from press run to press run, and how the standards hold up under constant use in wet environments. Taylor's printed-color standards (Example K) excel in all three regards.

Some companies' printed-color standards are made using 4-color process printing. Only four ink colors—yellow, magenta, cyan, and black—are used to approximate the target color. Look through a loupe at a "built color" and you will see dots of the four process colors that give the illusion of full color. With this type of printing it can be difficult to hold the same color throughout a press run, making it possible to buy two of the same test kit and find their color standards are different—which comparator would you trust? Plus, if the dots aren't aligned correctly (in register), the built colors will be noticeably off-target at their edges.

Spot printing is more expensive than 4-color process printing because each ink is premixed to an exact shade (the PMS system is widely used) and then laid down as a continuous solid color. Look through a loupe at spot printing and you won't see dots, only a **uniform field of color** from edge to edge. When the beginning and end of a print run are compared, they are also consistent.



▲ Example K

