

A. References

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B. Soil Respiration (Alternative Method)

This alternative method uses a kit produced by Woods End¹ known as the Solvita Soil Life Kit¹. Instead of the Draeger tube apparatus, this procedure uses "paddles" inserted into a plastic container with the soil sample (See procedure on page 32). The use of this method eliminates the need for the Draeger tube (carbon dioxide adsorption tube), needle, and syringe. With the Solvita kits, results are given in 24 hours instead of 30 minutes with the Draeger method. The color change of the paddles may also be easier to distinguish than reading the color change off the Draeger tubes. The Solvita kit also requires the soil to be disturbed and will falsely stimulate microbial activity similar to the action of tillage. However, when used to compare sites, both soils are disturbed and the relative differences are noted. This procedure also reduces the effects of root respiration. Picking out as many roots from the sample as possible will further eliminate their CO₂ contribution. The Solvita kit may be preferred if immediate results are not necessary and the microbial activity differences without the influence of plant roots are desired.

The Solvita kit comes with well written and user friendly instructions and interpretations. There is also a trouble shooting guide to help the user. The kit consists of four parts: the sample jar to hold the correct volume of soil for the test (**Figure 1b**); a foil-pack containing a special color gel paddle (**Figure 2b**); instruction manual; and a color key for reading results (**Figure 2b**).

Solvita Soil Life kits can be obtained from Woods End Research, Mt. Vernon, ME; solvita@woodsand.org.



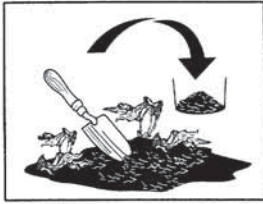
Figure 1b



Figure 2b

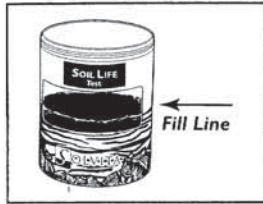
¹Trade names are used solely to provide specific information. Mention of a trade name does not constitute a guarantee of the product by the U.S. Department of Agriculture nor does it imply endorsement by the Department or the Natural Resources Conservation Service over comparable products that are not named.

The following is part of the instructions from the SOLVITA SOIL LIFE KIT¹:

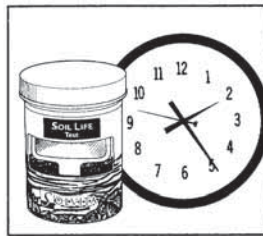


RUNNING THE SOLVITA™ TEST

1. **SOIL SAMPLING:** Soil should be sampled from any garden or field in a fresh, moist condition just before the test is performed. Take many smaller samples from various locations and mix just well enough to be homogenous while removing large stones and organic debris.



2. **IDEAL SOIL MOISTURE:** The soil should be at the ideal growing condition moisture before it is sampled. If the sample is very dry or very wet, it is best to wait until favorable conditions return. This may mean watering a dry soil and waiting 1-2 days again before sampling. If too wet, make a small pile to drain, or spread out to dry to a moderate moisture level. The idea is to disturb the natural state as little as possible.



3. **PUT SAMPLE INTO JAR:** Put the loose mix of soil into the jar just to the fill line. As you fill, tap the bottom of the jar sharply on a counter; this helps assure the correct density. Fill only to the indicated line. Record the time on the lid.



4. **START THE TEST:** When you are ready to start the test, open the foil-pack by tearing it along the top strip and carefully remove the paddle. *Do not touch the gel surface, and don't allow soil to touch it.* At the start of the test the paddle will be color #0 (bright blue). Once the foil pack is opened, the test should be started within about 30 minutes.

5. **INSERT THE PADDLE:** Push the paddle-stick point into the soil in the jar so that the gel-side can be seen through the back viewing side. Be careful not to jostle or tip the jar. Screw the lid on very tightly, and keep the jar at room temperature (68—77°F) *out of sunlight* for 24 hours.



6. **FIND THE GEL COLOR:** After 20 - 28 hours compare the color of the paddle to the Color Key provided. For this, the paddle should either be left in the jar with the lid on, or removed and laid face-up onto a white surface.

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C. EC and pH Meter Maintenance and Calibration

EC meter maintenance:

- Do not immerse the EC meter above the immersion level (**Figure 1c**). Under no circumstances should the meter be immersed above the display level.
- When not in use, switch off the meter and replace the protective cap.
- To improve performance, clean the stainless steel electrodes periodically by rinsing them in alcohol for a few minutes.
- Replace all four batteries if the display becomes faint or disappears or if the readings are unstable or constant.
- To change batteries for DiST WP¹ models, unscrew the top with a coin and replace the batteries (**Figure 2c**).

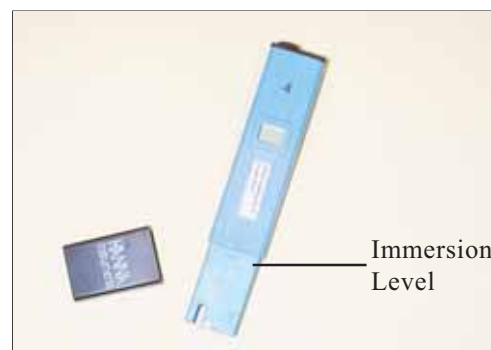


Figure 1c.

EC meter calibration:

- Immerse the meter into the calibration solution (1.41 dS/m).
- Allow the reading to stabilize. Using a small screwdriver, turn the Calibration Trimmer to match the solution value, 1.41 dS/m (normally at 25 C).

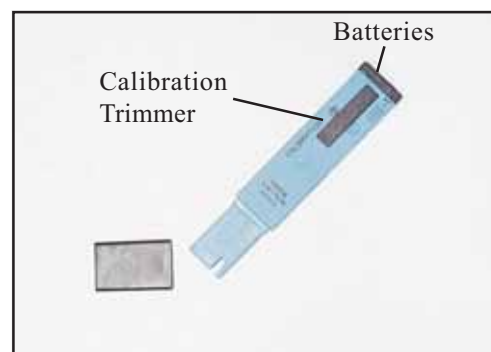


Figure 2c.

pH meter maintenance:

- Crystals may appear around the cap (**Figure 3c**). This condition is normal. The crystals will dissolve when rinsed with water.
- After use, rinse the electrode with water to minimize contamination.
- Store the electrode with a few drops of storage solution (HI 70300L) or pH 7 solution in the protective cap. **DO NOT STORE IN DISTILLED OR DEIONIZED WATER.**
- Always replace the protective cap after use.

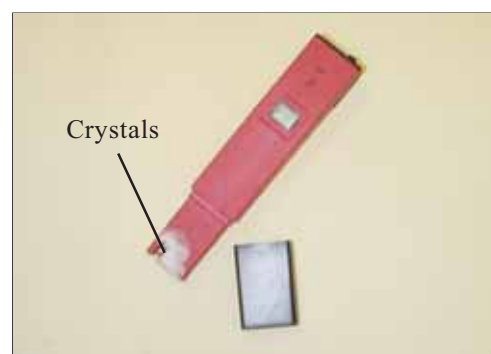


Figure 3c.

- Large differences in pH readings (± 0.5 pH) could be due to lack of calibration, dry electrode, or rundown batteries.
- If the pH meter cannot be switched on or if the display fades, unscrew the battery compartment and replace all four batteries, paying attention to their polarity (**Figure 4c**).

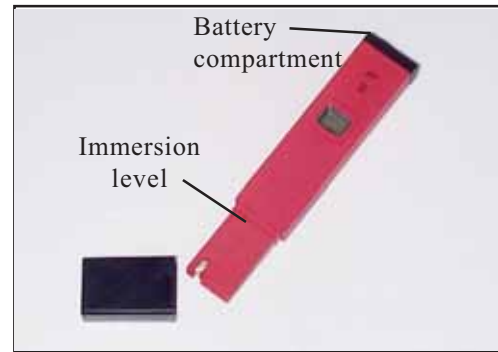


Figure 4c.

pH meter calibration (pHep 3¹):

- Prepare buffer solutions. Only 2 buffers are needed, pH 7 and 4 or 10, depending on the pH range of your soils (see **Figure 5c**).
- Switch the unit on by pressing the ON/OFF button.
- With the meter on, press and hold the ON/OFF button for about three seconds. The display will start blinking "7.0o" to confirm that you have entered the calibration mode.
- Immerse the pH meter in the pH 7 buffer solution. Stir gently and wait approximately 20 seconds.
- If "Ec" appears on the display, the pH 7 solution is not fresh, or the electrode is not conditioned.
- The pHep 3¹ meter automatically confirms the pH 7 calibration after the meter is adjusted. The display will blink "4.0o". After a few seconds, it will display "Ec" to prompt you to use a second buffer solution.
- Rinse the electrode with water and immerse in pH 4 for acidic samples or pH 10 for alkaline samples. Allow approximately 20 seconds for the meter to auto-confirm the reading. Once the display stops blinking, the meter is calibrated and ready to use. ALWAYS USE FRESH BUFFERS FOR CALIBRATION.



Figure 5c.

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