Rapid Estimation of Residual Sugar using *Clinitest* Method

Clinitest reagent tablets contain copper sulfate which reacts with reducing sugars in wine; thus, converting cupric sulfate to cupric oxide. The color of the byproducts of this reaction vary systematically with the amount of reducing sugars available in the sample. Hence, the color of the precipitate generated with the *Clinitest* method can be used to estimate the residual sugar level of wine. <u>WARNING</u>: The Clinitest reagent also reacts with phenolic compounds naturally found in red wines or resulting from barrel aging. The levels of these phenolics can contribute a 0.2-0.3% elevation in the results of the residual sugar test. As a result, residual sugar estimates of "dry red" wine tend to be slightly greater than those observed for "dry white" wine.

Procedure

10-Drop Method (expected Residual Sugar < 1%)
a. Add 10 drops (0.5 ml) of wine to test tube.
b. Drop 1 *Clinitest* tablet into test tube.
c. Observe foaming heat-producing reaction to see if color development "passes through" the ORANGE end-point of the Color Chart and turns "brownish". If such a "pass through" is noted, the residual sugar content exceeds 1% and the sample must be diluted (Goto <u>2-Drop Method</u>).
d. If no color pass through is noted during the boiling reaction, shake the tube gently and <u>match the color present 15-seconds after the reaction stops</u> to the Color Test Chart below.

Color Chart
(Scanned from Clinitest Glossy Instructions Sheet; see color reproduction notes on next page)
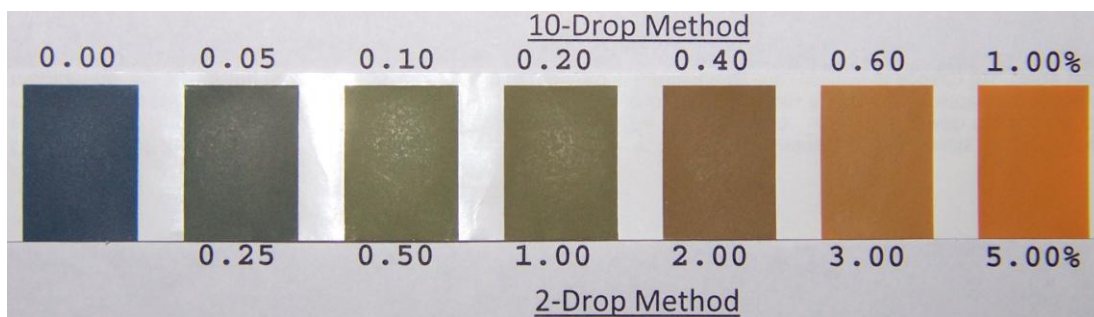
2-Drop Method (expected Residual Sugar between 1-5%)
a. Add 2 drops (0.1 ml) of wine to test tube.
b. Add 8 drops (0.4 ml) of distilled water to same test tube.
c. Drop 1 *Clinitest* tablet into test tube.
d. Observe reaction to see if color development "passes through" the ORANGE end-point of the Color Test Chart and turns "brownish" instead. If such a "pass through" occurs, the residual sugar level is greater than 5%.
e. If no color pass through occurs, shake the test tube gently and <u>match the color present 15-seconds after the reaction stops</u> to the Color Test Chart above.

Notes regarding reproduction of the Color Test Chart

The Color Test Chart used to interpret the Clinitest results is provided as part of the Instructions provided with each bottle of reagent tables (Copyright 1995 by Bayer Corp., Elkhart, IN USA). Due to wide variations in the color representation schemes used by various computer display and color printer technologies it is quite difficult to reliably reproduce the "true" colors of this chart using generic electronic media. Hence, one should use the color test chart provided by the manufacturer whenever possible. None the less, the following table attempts to provide a reliable definition of the colors used in the test chart by matching each level to samples provided in the *Munsell Book of Color*:

Munsell Color	Description	%Residual Sugar 10-drop	2-Drop
10B 3/2	Black/Green	0.0	null
10GY 4/4	Dark Olive	0.05	0.25
5GY 4/4	Olive	0.10	0.50
10Y 4/4	Light Olive	0.20	1.00
10YR 4/4	Mud Brown	0.40	2.00
10YR 5/8	Sand	0.60	3.00
7.5YR 6/10	Orange	1.00	5.00

Computer Scanned Reproduction of *Clinitest* "Directions for Testing"

Note: Color reproduction varies significantly from original artwork.

2-Drop Method

DIRECTIONS FOR TESTING:

1. Collect urine in clean container. With dropper in upright position, place **2 drops** of urine in test tube. Rinse dropper with water and add 10 drops of water to test tube.

2. Drop one tablet into test tube. Watch while complete boiling reaction takes place. Do not shake test tube during boiling, or for the following 15 seconds after boiling has stopped.

3. At the end of this 15-second waiting period, shake test tube gently to mix contents. Compare

color of liquid to Color Chart below. Ignore sediment that may form in the bottom of the test tube. Ignore changes after the 15-second waiting period.

4. Write down the percent (%) result which appears on the color block that most closely matches the color of the liquid.

NEGATIVE   TRACE   1/2%   1%   2%   3%   5% or more