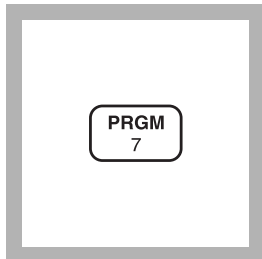


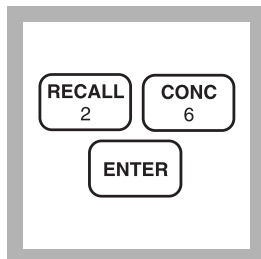
**SURFACTANTS, ANIONIC (0 to 0.300 mg/L)** For water, wastewater, and seawater**(Also called: Detergents) Crystal Violet Method\***

1. Enter the stored program number for Surfactants, anionic (LAS).

Press: **PRGM**

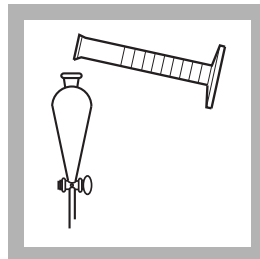
The display will show:

**PRGM ?**

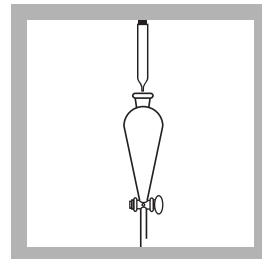


2. Press: **26 ENTER**

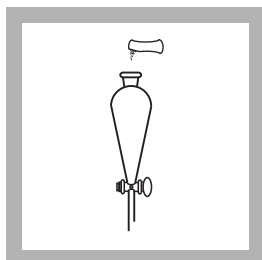
The display will show **mg/L, LAS** and the **ZERO** icon.



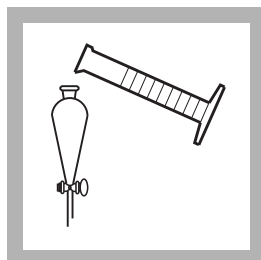
3. Fill a clean 500-mL graduated cylinder to the 300-mL mark with sample. Pour the sample into a clean 500-mL separatory funnel.



4. Add 10 mL of Sulfate Buffer Solution. Stopper the funnel. Shake the funnel for five seconds.



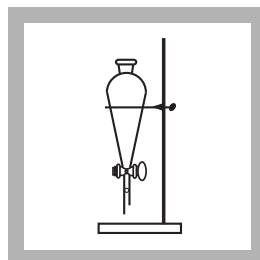
5. Add the contents of one Detergents Reagent Powder Pillow to the funnel. Stopper the funnel and shake to dissolve the powder.



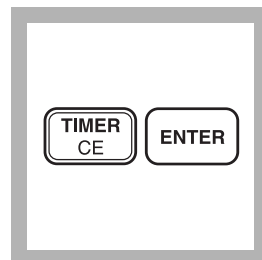
6. Add 30 mL of benzene to the funnel. Stopper the funnel and shake gently for one minute.

*Note: Spilled reagent will affect test accuracy and is hazardous to the skin and other materials.*

*Note: Use benzene only in a well-ventilated area.*



7. Place the separatory funnel in a support stand.



8. Press:

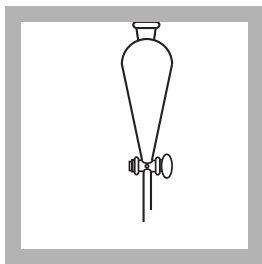
**TIMER ENTER**

A 30-minute reaction period will begin.

*Note: Excessive agitation may cause an emulsion, requiring a longer time for phase separation. If this occurs, remove most of the water layer, then gently agitate the funnel with a clean inert object in the funnel such as a Teflon-coated magnetic stirring bar.*

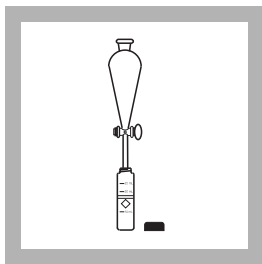
\* Analytical Chemistry, 38, 791(1966).

## SURFACTANTS, ANIONIC, continued



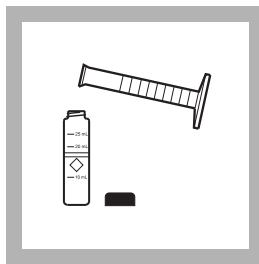
**9.** After the timer beeps, remove the stopper and drain the bottom water layer. Discard this layer.

*Note:* Benzene solutions are a regulated waste and cannot be poured down the drain. See Section 3 for proper disposal of these materials.

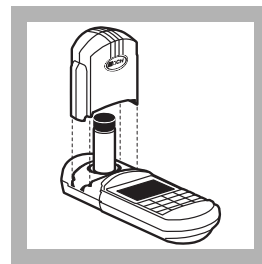


**10.** Drain the top benzene layer into a clean sample cell (the prepared sample).

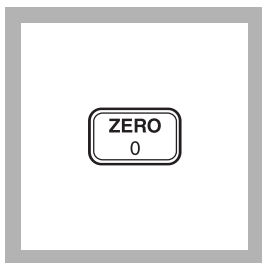
*Note:* The benzene layer cannot be filtered before color measurement. Filtration removes the blue color.



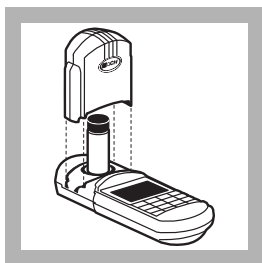
**11.** Fill another sample cell to the 25-mL mark with pure benzene (the blank).



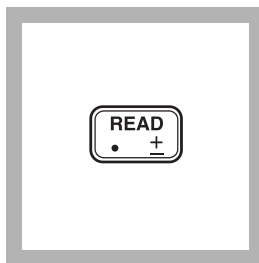
**12.** Place the blank in the cell holder. Tightly cover the sample cell with the instrument cap.



**13.** Press: **ZERO**  
The cursor will move to the right, then the display will show:  
**0.000 mg/L LAS**



**14.** Place the prepared sample into the cell holder. Tightly cover the sample cell with the instrument cap.



**15.** Press: **READ**  
The cursor will move to the right, then the result in mg/L anionic surfactants (LAS) will be displayed.

*Note:* Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).

*Note:* Acetone may be used to clean benzene from glassware.

## Sampling and Storage

Collect samples in clean plastic or glass bottles. Analyze samples as soon as possible, but they may be stored at least 24 hours by cooling to 4 °C (39 °F). Warm to room temperature before testing.

## Accuracy Check

### Standard Additions Method

- a) Snap the neck off a Detergent Voluette Ampule Standard Solution, 60 mg/L as LAS (The molecular weight of linear alkylate sulfonate used to make the standard is 342).
- b) Using the TenSette Pipet, add 0.1, 0.2, and 0.3 mL of standard to three 300-mL samples. Mix thoroughly.
- c) Analyze each as described above. The anionic surfactants reading should increase 0.02 mg/L for each 0.1 mL of standard added.
- d) If these increases do not occur, see *Standard Additions* (Section 1) for more information.

## Method Performance

### Precision

In a single laboratory, using a standard solution of 0.150 mg/L LAS, two lots of reagent, and the instrument, a single operator obtained a standard deviation of  $\pm 0.010$  mg/L LAS as anionic surfactant.

### Estimated Detection Limit

The estimated detection limit for program 26 is 0.020 mg/L LAS. For more information on the estimated detection limit, see *Section 1*.

## Interferences

Perchlorate and periodate ions will interfere. High amounts of chloride, such as those levels found in brines and seawater, will cause low results.

## Summary of Method

Detergents, ABS (alkyl benzene sulfonate) or LAS (linear alkylate sulfonate) are determined by association with crystal violet dye and extraction of the ion-pair complex into benzene.

# SURFACTANTS, ANIONIC, continued

## Pollution Prevention and Waste Management

Benzene (D018) solutions are regulated as hazardous waste by Federal RCRA. Do not pour these materials down the drain. Collect water saturated with benzene solutions for disposal with laboratory solvent wastes. See *Section 3* for more information on proper disposal of these materials.

## REQUIRED REAGENTS

Description	Quantity Required		Cat. No.
	Per Test	Unit	
Benzene, ACS.....	55 mL.....	500 mL.....	14440-49
Buffer Solution, sulfate type.....	10 mL.....	500 mL.....	452-49
Detergent Reagent Powder Pillow.....	1 pillow.....	25/pkg.....	1008-68

## REQUIRED APPARATUS

Clippers, for opening powder pillows.....	1.....	each.....	968-00
Cylinder, graduated, 25 mL.....	1.....	each.....	508-40
Cylinder, graduated, 50 mL.....	1.....	each.....	508-41
Cylinder, graduated, 500 mL.....	1.....	each.....	508-49
Funnel, separatory, 500 mL.....	1.....	each.....	520-49
Ring, support, 4 inch.....	1.....	each.....	580-01
Sample Cell, 10-20-25 mL, w/ cap.....	2.....	6/pkg.....	24019-06
Stand, support, 127 x 203 mm (5 x 8").....	1.....	each.....	563-00

## OPTIONAL REAGENTS

Acetone, ACS.....	500 mL.....	14429-49
Detergent Standard Solution, Voluette ampule, 60 mg/L as LAS, 10 mL.....	16/pkg.....	14271-10

## OPTIONAL APPARATUS

Ampule Breaker Kit.....	each.....	21968-00
Pipet, TenSette, 0.1 to 1.0 mL.....	each.....	19700-01
Pipet Tips, for 19700-01 Pipet.....	50/pkg.....	21856-96
Pipet Tips, for 19700-01 Pipet.....	1000/pkg.....	21856-28
Thermometer, -20 to 110 °C, Non-Mercury.....	each.....	26357-02

### *For Technical Assistance, Price and Ordering*

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.