

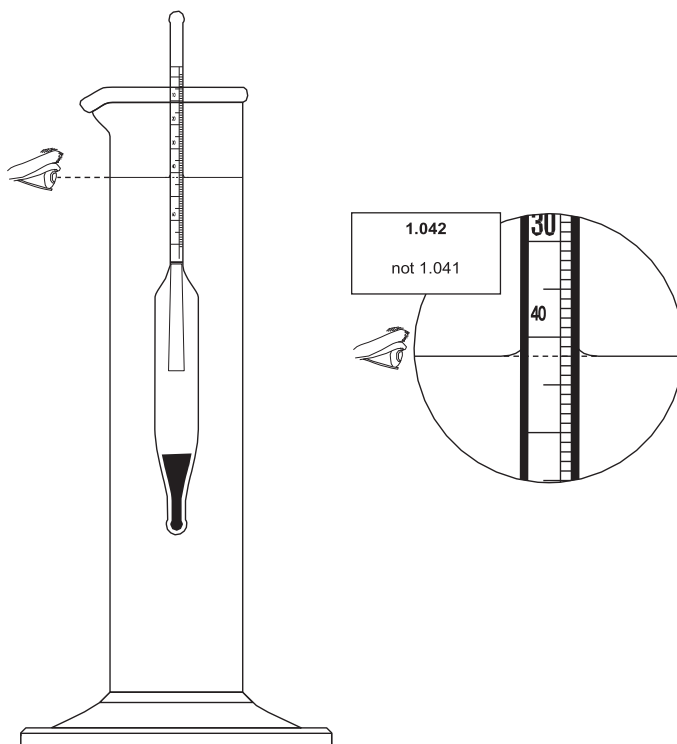
Freezing Point Determination

Ethylene Glycol and Propylene Glycol Solutions

PROCEDURE:

1. Rinse a clean hydrometer cylinder with sample to be tested. Carefully fill the hydrometer cylinder by pouring sample down the inside wall of the hydrometer cylinder avoiding the formation of air bubbles in the sample. Place cylinder on a level surface.
2. Determine the temperature of the sample.
3. Place the hydrometer in the sample and allow it to float.
4. Gently push the hydrometer down no more than 1/8". Release the hydrometer and allow it to rise and settle in the sample.
5. Read the hydrometer at eye level with the sample surface to determine the specific gravity of the sample. To do this, follow the procedure below:

- a. Begin with your eye below the level of the sample surface so that the surface appears as an ellipse. Slowly raise the line of sight until the sample surface becomes a straight line. (At this point your eye is level with the sample surface.)
- b. Read the hydrometer at the point where the line of the sample surface intersects the hydrometer stem.
- c. NOTE: The hydrometer and sample should be at the same temperature before a reading is taken.
- d. Do not take a reading until the hydrometer and sample are at rest and free of air bubbles.
- e. The point where the sample actually touches the stem is not the correct reading. The correct reading corresponds to the plane of intersection of the sample surface and the hydrometer stem.



6. Using the temperature correction chart on the next page, adjust the hydrometer reading to compensate for the temperature effect on the hydrometer as follows:
 - a. Match the specific gravity value in the table closest to the hydrometer reading with the sample temperature. Divide the value from the table by 1000 to get the correction factor. Add the correction factor to the hydrometer reading and record the result as the specific gravity of the sample.
 - b. For example, if the hydrometer reading is 1.100 and the sample temperature is 86°F, the correction factor calculates to be $3.0/1000$ or 0.003. The specific gravity of the sample is $1.100 + 0.003$ or 1.103.
NOTE: For more exact values, interpolation between values can be performed.
7. After factoring for temperature correction, use the appropriate Freeze Point chart on the next page to match the specific gravity of the sample to the freezing point of the water.

Temperature Corrections for Specific Gravity Hydrometers (15.5°C/60°F)

Solution Temperature		Specific Gravity				
°C	°F	1.000	1.100	1.200	1.300	1.400
15.5	60	0.0	0.0	0.0	0.0	0.0
20	68	0.7	0.8	0.8	0.9	1.0
25	77	1.8	1.9	2.0	2.3	2.5
30	86	2.9	3.0	3.2	3.7	4.0
35	95	4.0	4.1	4.4	5.1	5.5
40	104	5.1	5.2	5.6	6.5	7.0
45	113	6.2	6.3	6.8	7.9	8.5
50	122	7.3	7.4	8.0	9.3	10.0
55	131	8.4	8.5	9.2	10.7	11.5
60	140	9.5	9.6	10.4	12.1	13.0
65	149	10.6	10.7	11.6	13.5	14.5
70	158	11.7	11.8	12.8	14.9	16.0
75	167	12.8	12.9	14.0	16.3	17.5
80	176	13.9	14.0	15.2	17.7	19.0
85	185	15.0	15.1	16.4	19.1	20.5
90	194	16.1	16.1	17.6	20.5	22.0
95	203	17.2	17.1	18.8	21.9	23.5
100	212	18.3	18.1	20.0	23.0	25.0

Freezing Point of Ethylene Glycol Solutions

% Glycol		Specific Gravity	Freezing Point	
By Weight	By Volume	15.5°C (60°F)	°C	°F
10	9.2	1.013	-3.6	25.6
15	13.8	1.019	-5.6	22.0
20	18.3	1.026	-7.9	17.8
25	23.0	1.033	-10.7	12.8
30	28.0	1.040	-14.0	6.8
40	37.8	1.053	-22.3	-8.2
50	47.8	1.067	-33.8	-28.8
60	58.1	1.079	-49.3	-56.7

Freezing Point of Propylene Glycol Solutions

% Glycol		Specific Gravity	Freezing Point	
	By Volume	15.5°C (60°F)	°C	°F
	5	1.004	-1.1	30
	10	1.006	-2.2	28
	15	1.012	-3.9	25
	20	1.017	-6.7	20
	25	1.020	-8.9	16
	30	1.024	-12.8	9
	35	1.028	-16.1	3
	40	1.032	-20.6	-5
	45	1.037	-26.7	-16
	50	1.040	-33.3	-28