

**Urea and Guanidine Hydrochloride Stock Solutions**

Property	Urea	GuHCl
Mol wt	60.056	95.533
Solubility, 25°C	10.49M	8.54M
$d/d_0^a$	$1 + 0.2658W + 0.0330W^2$	$1 + 0.2710W + 0.0330W^2$
Molarity <sup>b</sup>	$117.66(\Delta N) + 29.753(\Delta N)^2 + 185.56(\Delta N)^3$	$57.147(\Delta N) + 38.68(\Delta N)^2 - 91.60(\Delta N)^3$
Grams of denaturant/ gram of water to prepare		
6M	0.495	1.009
8M	0.755	1.816
10M	1.103	—

<sup>a</sup> $W$  is the weight fraction of denaturant in the solution,  $d$  is the density of the solution and  $d_0$  is the density of water (6).  
<sup>b</sup> $\Delta N$  is the difference in refractive index between the denaturant solution and water (or buffer) at the sodium D line. The equation for urea solutions is based on data from Warren and Gordon (7), and the equation for GuHCl solutions is from Nozaki (8).

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**Summary of Data on Density and Index of Refraction of Guanidine·HCl**

Weight fraction (W)	Molar concn.	Density ( $d/d_0$ )	$\bar{V}$ (G·HCl)	$n_D^{22.5}$
0.0	0.0	—	0.700	1.3327
0.09866	1.060	1.02690	0.731	1.3507
0.18661	2.055	1.05186	0.743	1.3672
0.25649	2.878	1.07184	0.749	1.3809
0.36223	4.177	1.10173	0.754	1.4020
0.44181	5.208	1.12617	0.758	1.4188
0.52271	6.296	1.15074	0.760	1.4362

$d/d_0 = 1 + 0.2720 W + 0.0315 W^2$   
 where  $d_0$  is the absolute density of water at 20.15°C.

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$d/d_0 = 1 + 0.2710 W + 0.0330 W^2$   
 where  $d_0$  is the absolute density of water at 25°C.  
 Using  $d_0$  for each appropriate temperature will give density to within 1 part per thousand for any temperature from 15 to 35°C.

From Kawahara and Tanford *J Biol Chem* 241, 3228 (1966). Permission of American Society of Biological Chemists, Inc.

**TABLE II. VISCOSITY OF AQUEOUS SOLUTIONS OF GUANIDINE HYDROCHLORIDE, AT 25°**

Weight %	Concentration		Relative viscosity, $\eta/\eta_0$	
	Moles/liter	Moles/kg H <sub>2</sub> O	Observed	Calculated, Equation 5
4.72	0.500			
5.693	0.603	0.632	1.022	1.022
10.299	1.105	1.202	1.043	1.043
20.052	2.209	2.625	1.110	1.107
23.767	2.645	3.263	1.139	1.139
29.377	3.318	4.354	1.199	1.199
34.688	3.975	5.559	1.270	1.271
38.197	4.418	6.469	1.329	1.329
42.70	4.940	7.656	1.408	1.409
46.741	5.531	9.186	1.517	1.518
50.040	5.973	10.484	1.613	1.617
52.791	6.348	11.704	1.716	1.713
54.759	6.619	12.669	1.794	1.793
54.847	6.632	12.714	1.798	1.797
57.528	7.005	14.177	1.922	1.922
60.340	7.399	15.925	2.083	2.078

$$\eta/\eta_0 = 1 + 5.0 \times 10^{-3} m^{1/2} + 1.80 \times 10^{-2} m + 1.213 \times 10^{-2} m^{3/2}$$

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$$[6dmCl] = 57.147 \cdot \Delta n_0 + 38.68 \Delta n_0^2 - 91.6 \Delta n_0^3$$