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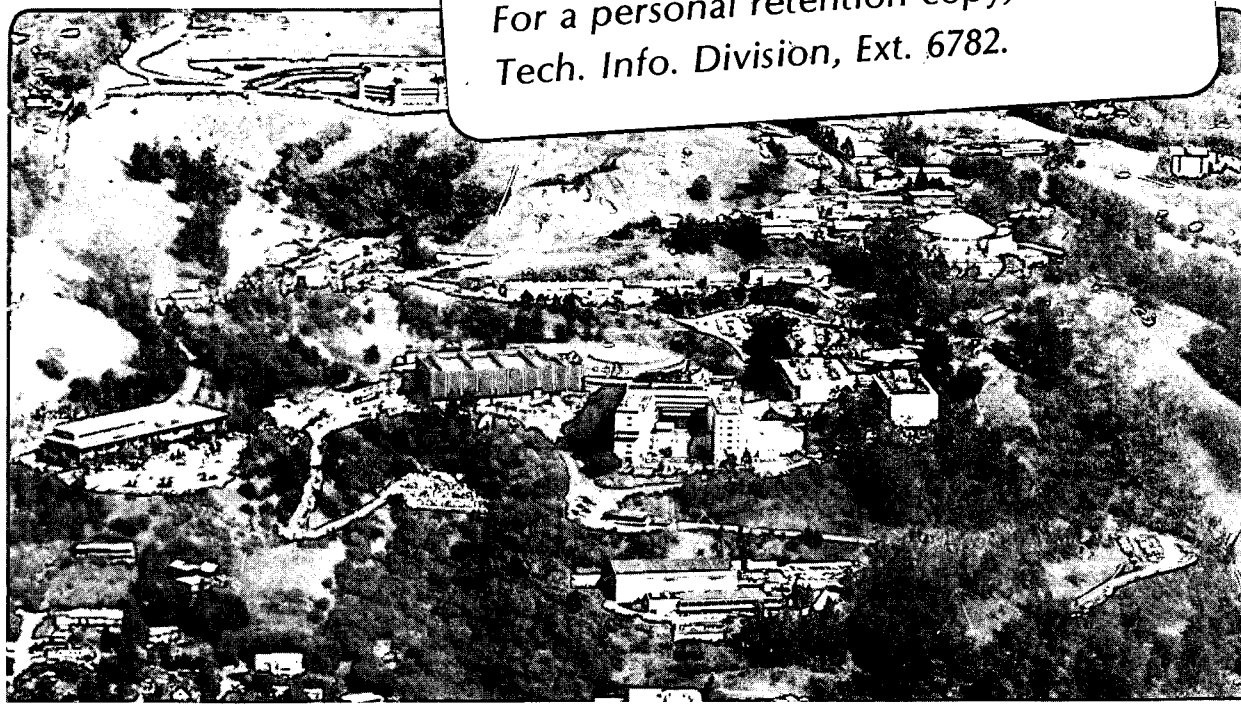
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August 28-31, 1983

DENSITY OF SODIUM CHLORIDE SOLUTIONS AT HIGH
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S.L. Phillips, H. Ozbek, and L.F. Silvester

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DENSITY OF SODIUM CHLORIDE SOLUTIONS AT HIGH TEMPERATURES AND PRESSURES*

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A correlation equation is given which reproduces the density of sodium chloride solutions to $\pm 4\%$ over the ranges 0-5 molal, 0-350° C and 1-1000 bars. Data generated from the equation are compared with selected experimental and smoothed values at typical temperatures, pressures and concentrations. Data are included for the density of sea water concentrates up to 150° C and 150 g/kg salinity at saturation vapor pressures based on a fit to a Chebyshev polynomial.

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Introduction

The development of new energy resources and advanced chemical processes requires sound thermophysical data on aqueous solutions to high temperatures. The combined need is for modern data in a quickly useful form. This paper gives a correlating equation used to generate tables of data on the density of sodium chloride solutions up to 350° C, 1-1000 bars and 0-5 molal concentrations. Such data are used to predict characteristics of brines for geothermal energy (1-3), sea water desalination (4), and for the origin of subsurface brines (5). The equations were developed by fitting critically evaluated experimental data (1).

The critical evaluation and selection of experimental data was based on the following criteria: details given on the experimental procedure; purity of materials; uncertainty assigned by the investigator; number of replicate measurements; temperature, pressure and concentration range covered; publication in refereed journals; and, prior publications by the researcher. Interpolated values from these correlating equations were then compared to both experimental and calculated data.

This work reports correlation equations and tables of data on the density of water, sodium chloride solutions and sea water concentrates. The larger aqueous solutions database consists of other thermophysical properties such as viscosity; and, thermochemical data, e.g., equilibrium constants (1).

Density of Sodium Chloride Solutions

Experimental data on the density of sodium chloride solutions were selected and fit earlier (1) to the following empirical equation:

$$d = A + Bx + Cx^2 + Dx^3 \quad (1)$$

where

$$x = c_1 \exp(a_1 m) + c_2 \exp(a_2 T) + c_3 \exp(a_3 P) \quad (2)$$

d = density, g/cm³; m = molality; T = °C; P = bars

A = -3.033405; B = 10.128163;

C = -8.750567; D = 2.663107

c_1 = -9.9559; c_2 = 7.0845; c_3 = 3.9093

$$a_1 = -4.539 \text{ E } -003; \quad a_2 = -1.638 \text{ E } -004; \quad a_3 = 2.551 \text{ E } -005$$

$$0 < T < 350^\circ \text{ C}; \quad 1 < P < 1000 \text{ bars}$$

$$0 < m < 5 \text{ molal}$$

Some features of eq 1 are the following: calculation of temperature and pressure derivatives is straightforward; the equation is easily programmed; and the equation reproduces experimental data with sufficient accuracy for many application. Equation 1 interpolates the density of water to $\pm 4\%$ deviation for $m=0$, 1-1000 bars, and 0-350° C. Figure 1 shows % deviation versus temperature between density calculated by eq 1, and 79 values selected from the recent publications by Rogers, Bradley and Pitzer (6), Out and Los (7), Nagashima (8), and from the Steam Tables (9). Comparison of data for the density of water from eq 1 when $m=0$ in eq 2 with values calculated from Rowe and Chou (10) for 0-100° C, and from Isdale and Morris (11) for 70-160° C were also $\pm 4\%$ difference. Figure 2 is a plot of % deviation for water density versus pressure, covering 1-1000 bars.

Similarly, the density of NaCl solutions is reproduced to $\pm 4\%$ by eq 1. Figure 3 plots 200 points selected from the following: Out and Los (7); Rogers, Bradley and Pitzer (6); Grant-Taylor (14); Zarembo and Fedorov (15); Gorbachev, Kondrat'ev, Androsov and Kolupaev (16); and Ellis (17). We do not include data from Zarembo et al. for 350° C at 24% (5.404m) concentration because of the comparatively larger error (-5.7% to -7.8%). Similarly, the last six values for 1.000 m solutions for Table 1 of Grant-Taylor are erroneous and, therefore, not included here. The density values published by Khaibullin and Novikov (18) for 100-417° C, 1-338 kg/cm², 1% and 5% of NaCl (0.1728 and 0.9006 m) gave the largest errors (up to 15%), and consequently are not included in these comparisons.

Figure 4 plots % deviation in density for 112 points over the pressure range 20-1000 bars using data from Rogers et al., Zarembo and Fedorov, Gorbachev et al., and Grant-Taylor. Beyond 500 bars, values interpolated by eq 1 are 0-3% higher than e.g., Zarembo and Fedorov. Figure 5 shows % deviation for 107 points for 0.1-4 m concentrations in comparing eq 1 with the recent publications by Out and Los (7), Rogers et al. (6) and Grant-Taylor (14). There is a noticeable trend of zero to about 3% lower results as the concentration increases from 2-4 m. A comparable plot of 117 points

of data from Ellis (17), Gorbachev et al. (16) and Zarembo and Fedorov (15) indicates a similar trend (Fig. 6).

Our values for NaCl solutions were compared with specific volumes calculated by the equation for volumetric properties published recently by Rogers and Pitzer covering temperatures to 300° C and pressures to 1000 bars (19). Figures 7, 8 and 9 plot density versus temperature for 1 molal NaCl solutions at pressures of 200, 600 and 1000 bars. Agreement is quite good generally, with the largest difference of about $\pm 1.5\%$ apparently at 1000 bars. Figures 10 and 11 compare the two sets of data as a function of concentration with the pressure fixed at 200 bars, and temperatures of 100° C and 300° C. At 100° C, the two sets begin to diverge near 1 molal NaCl to a maximum difference of 2.6% at 5 m. For 300° C, the two curves merge at about 2m NaCl, with maximum differences of 2.9% at 0.1 m, and 0.8% at 5 m. A comparison for 0-5 m, 1 bar and 100° C gives two curves with a difference of 0.5% at 0.1 m, which increases to 3% at 5 m (Fig. 12). The agreement is considered satisfactory, given the different databases used to develop the correlations.

Comparison of our data for NaCl solutions with selected densities from Rowe and Chou indicates at any constant pressure and molal concentration, % deviation is usually positive for temperatures from 0-150° C (Fig. 13).

Table 1 lists selected sources of experimental data on density of NaCl solutions; Table 2 gives density values generated from eq 1 and eq 2 for 0-350° C; 1-1000 bars; 0-5 molal.

Sea Water Density

As a companion study to developing eq 1, an interpolating equation for the density of sea water concentrates was developed as the difference in density of sea water and pure water, $d-d_w$. The limited range of temperature (0-150° C) simplifies obtaining an expression for water to predict density values to better than the $\pm 4\%$ obtained from eq 1, which covers much wider ranges of temperature and pressure.

More accurate interpolating equations for reproducing the density of water were developed at saturated vapor pressures for the temperature ranges 0-100° C, and for 0-150° C. Both were obtained by fitting published experimental and smoothed data from selected sources to a Chebyshev

polynomial. For purposes of interpolation, the Chebyshev polynomial has several advantages as discussed by Ambrose, Counsell and Davenport (22), and recently by Brewer (23). Isdale and Morris fit their density data for sea water concentrates to a Chebyshev polynomial in the form of a double summation (11).

A caution in fitting Chebyshev polynomials is not to include an excessive number of coefficients with the expectation of obtaining continually improved accuracy on interpolation (22). Instead, the reproducibility of data may actually worsen. For example, we fit data on the specific volume of water taken from the Steam Tables for 0-100° C to polynomials of order 2-8. A comparison of the order with the square of the sum of residuals gave the following results.

| | | | | | | | |
|--------------------------------|----------|----------|----------------------|----------|----------|----------|----------|
| <u>Order:</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>6</u> | <u>7</u> | <u>8</u> |
| $\Sigma(\text{Residuals})^2$: | 0.105 | 0.252 | 3.6×10^{-5} | 0.0001 | 0.029 | 5.75 | 31,258 |

Order 6 gives increasingly negative % deviations; orders 7 and 8 increasingly positive erroneous densities.

Data on the density of water to six and seven decimal places from Kell and Whalley (24) and Kell (25) at one bar for 0-100° C were fit to Chebyshev polynomials as $\log(\text{density, g/cm}^3)$ versus T/K. Coefficients of the resulting fits relate water density (d_w) to specific volume (V) by $\log d_w = -\log V$ (25). Fits were made for orders 4, 5 and 6; Table 3 compares the resulting correlations as % deviations with densities given in Kell and Whalley (24). From Table 3, order 5 is the best choice.

Our fitting was done using a program obtained from Hewlett-Packard and run on an HP-85 microcomputer. This program fits data to a polynomial which is the best polynomial approximation in the Chebyshev sense:

$$P = \sum A_i X^i, \quad \text{for } i = 0 \text{ to } n$$

The number of coefficients is not reduced by developing the polynomial with $T = ^\circ\text{C}$, where the first term is then $\log d_w$ at 0°C . For example, the % difference for order 4 and 5 when fitting to Chebyshev polynomials as $\log d_w$ versus $T/^\circ\text{C}$ gave the following results:

% Deviation with Data in Kell (25)

| <u>T (C)</u> | <u>Order 4</u> | <u>Order 5</u> |
|--------------|-------------------|-------------------|
| 0 | -0.00122 | -0.00022 |
| 10 | .00449 | .00153 |
| 20 | .00122 | .00022 |
| 30 | -.00133 | -.00022 |
| 40 | -.00122 | .00008 |
| 50 | .00024 | .00022 |
| 60 | .00122 | -.00003 |
| 80 | -.00122 | .00022 |
| 90 | -.00234 | .00095 |
| 100 | .00122 | -.00022 |
| | av. \pm 0.0015% | av. \pm 0.0004% |

From the above comparison, order 5 is the best choice; the data in Table 3 shows order 5 is also the best choice for T/K .

A more accurate correlation for the density of water at $0-100^\circ\text{C}$ and saturation vapor pressures other than eq 1 is the following Chebyshev polynomial:

$$\log d_w = A_0 + A_1T + A_2T^2 + A_3T^3 + A_4T^4 + A_5T^5 \quad (3)$$

$$T = 273.15 + ^\circ\text{C}$$

$$A_0 = -2.45724246 \quad E +000$$

$$A_1 = 3.44563271 \quad E -002$$

$$A_2 = -1.93976798 \quad E -004$$

$$A_3 = 5.50708349 \quad E -007$$

$$A_4 = -7.89829871 \quad E -010$$

$$A_5 = 4.54837241 \quad E -013$$

Table 4 lists d_w interpolated from eq 3. The following equation covers the range 0-150°C, and was developed by fitting data from the Steam Tables, and References 7, 9 and 24.

$$\begin{aligned}
 \log d_w &= A_0 + A_1T + A_2T^2 + A_3T^3 + A_4T^4 + A_5T^5 & (4) \\
 T &= 273.15 + ^\circ C \\
 A_0 &= -1.4001218E -001 \\
 A_1 &= -1.4671353E -004 \\
 A_2 &= 1.1845275E -005 \\
 A_3 &= -5.9008320E -008 \\
 A_4 &= 1.0998292E -010 \\
 A_5 &= -7.4573506E -014
 \end{aligned}$$

Figure 14 compares density values for water from eq 4 with the following: the elegant correlation developed by Rowe and Chou which is based on data published in 1935 (10); experimental data published by Out and Los (7); highly accurate densities from the correlation by Millero et al. (12, 13); values from Isdale and Morris and the Steam Tables (9); and, Kell and Whalley for 1 bar (24). Water densities are reproduced to an average of $\pm 0.03\%$ at saturated vapor pressures from 0-150° C.

For sea water density, we used eq 4 and data in Isdale and Morris (11) to fit the following Chebyshev polynomial.

$$(d_s - d_w) = A_0 + A_1T + A_2T^2 + A_3T^3, \text{ g/cm}^3 \quad (5)$$

for which

$$\begin{aligned}
 A_0 &= 1.6263604 E -003 + 7.912403 E -004S \\
 A_1 &= -1.311896 E -004 - 4.247298E -006 S + 2.506863 E -008 S^2 \\
 A_2 &= 1.670632 E -006 + 4.959969 E -008 S - 3.430183 E - 010S^2 \\
 A_3 &= -5.974604 E -009 - 1.407165 E -010S + 1.140085 E - 012 S^2 \\
 T &= ^\circ C; \quad d_s = \text{density of sea water, g/cm}^3 \\
 S &= \text{salinity, g/kg}
 \end{aligned}$$

The quantity ($d_s - d_w$) is the relative density; d_s is recovered by adding d_w . Equation 5 reproduces sea water data in both Isdale and Morris and Fabuss and Korosi (20, 21) to about $\pm 0.2\%$. Table 5 is the density of sea water concentrates from 5-150° C, 10-150 g/kg salinity and saturation vapor pressures.

Empirical equations such as eq 3 and eq 4 for water are intended for purposes of interpolation so that extrapolation outside the range where data were fit is risky. For example, Fig. 15 plots the highly accurate eq 3 to 150° C, representing extrapolation of 50° C beyond the region where data were fit (0-100° C). Comparison with data from Kell and Whalley shows a fit within $\pm 0.0005\%$ deviation from 0-100° C; however, extrapolated results predicted by eq 3 are consistently lower: from -0.006% at 100° C to -0.35% at 150° C. However, within the temperature, pressure and concentration domain covered, eq 1-4 are very useful in predicting density and specific volume. In addition, variation in density with other parameters are faithfully reproduced; for example, increase in density with pressure isotherms such as that for water and 5m NaCl solution at 350° C are shown in Figure 16.

Ion Product of Water

The ion product of water, $H_2O = H^+ + OH^-$, is reproduced by the following equation recently published by Marshall and Franck (26).

$$\log K_w = -4.098 - \frac{3245.2}{T} + \frac{2.2362 E+005}{T^2} - \frac{3.984 E+007}{T^3} + \left(13.957 - \frac{1262.3}{T} + \frac{8.5641 E+005}{T^2} \right) \log d_w \quad (6)$$

where $T = 273.15 + ^\circ C$

Note that in eq 6 the pressure dependence for $\log K_w$ is contained in the density term. We have calculated values of $\log K_w$ using eq 1 for water density, at representative pressures of 1, 500 and 1000 bars. Figure 17 shows agreement between the results from eq 1 and eq 6, with those tabulated by Marshall and Franck. The percentage deviation varies with temperature, and is within $\pm 3\%$. See Figure 18. Equation 1 for density is only valid up to 350°C , so that $\log K_w$ calculated with these equations is valid only up to 350°C and 1000 bars.

Units and Conversions

$$1 \text{ bar} = 1.019716 \text{ kg/cm}^2$$

$$1 \text{ atm} = 1.01325 \text{ bar} = 1.03323 \text{ kg/cm}^2$$

$$\% \text{ weight NaCl} = (100)(\text{molality})(58.44)/(1000 + (\text{molality})(58.44))$$

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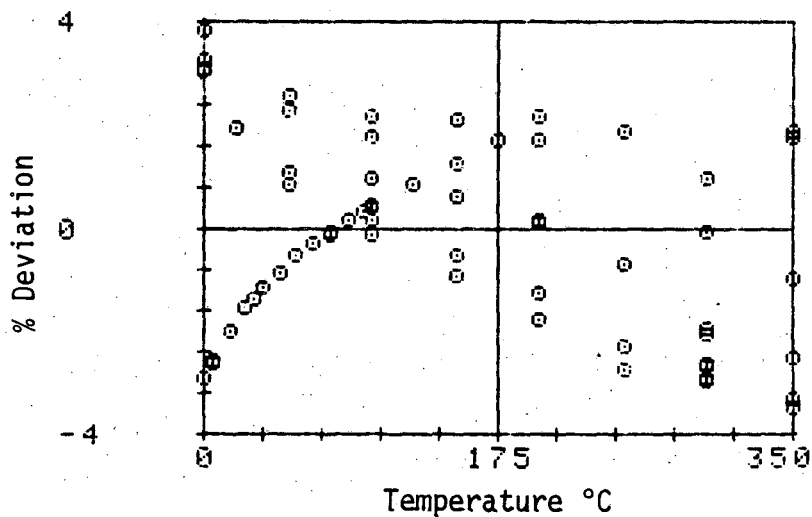


Figure 1. Density of water. Percentage difference in data from eq 1 and eq 2 with data from Out and Los;Rogers et al.; Nagashima;and, Steam Tables. Pressure is 1 - 1000 bar ; 79 data points.

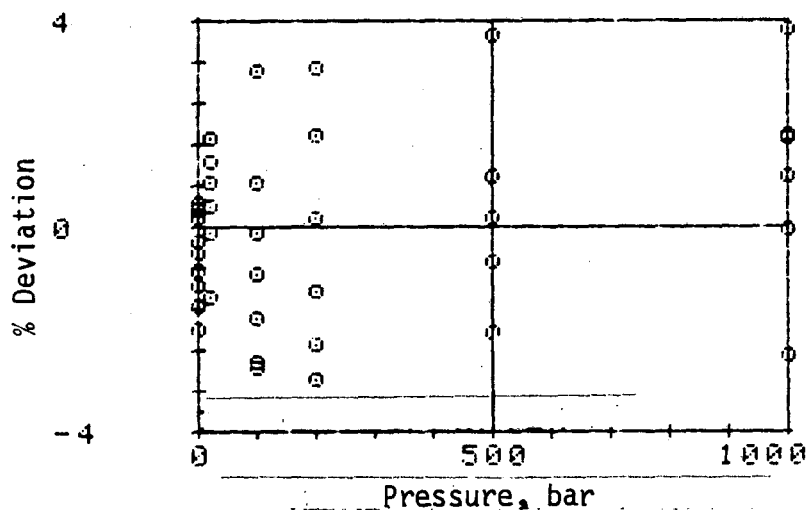


Figure 2. Density of water. Percentage difference in data from eq 1 and eq 2 with data from Out and Los;Rogers et al.; Nagashima;and, Steam Tables. Temperature is 0 - 350°C; 40 data points.

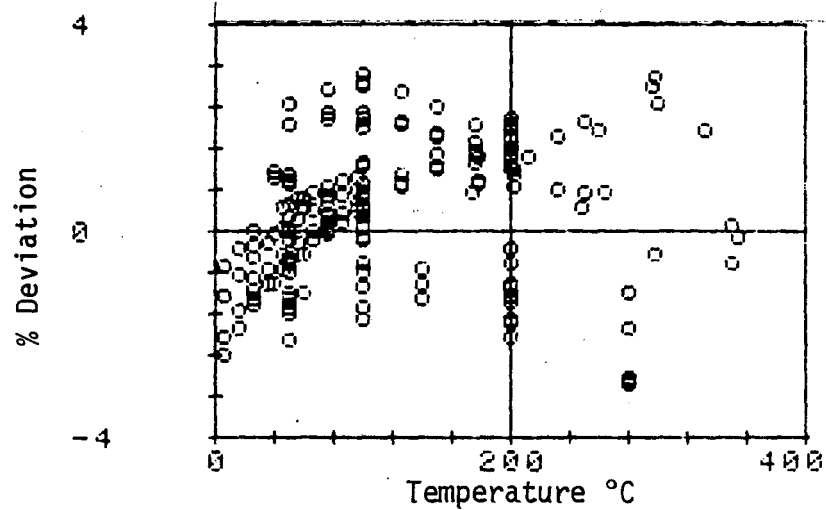


Figure 3. Density of sodium chloride solutions. Percentage difference in data from eq 1 and eq 1 with data from Out and Los; Zarembko and Fedorov; Gorbachev et al.; Rogers et al.; Grant-Taylor; and, Ellis. Pressure is 1 - 1000 bar; concentration is 0.001 - 5.4 m; 200 data points.

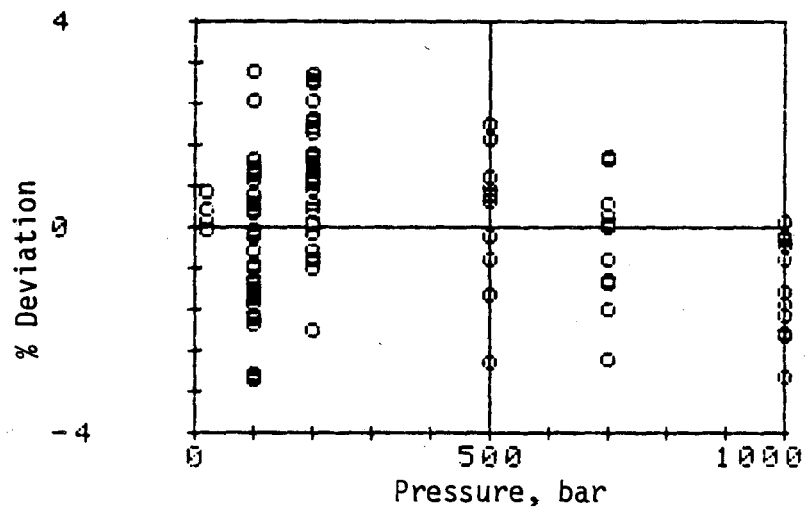


Figure 4. Density of sodium chloride solutions. Percentage difference in data from eq 1 and eq 2 with data from Grant-Taylor; Rogers et al.; Gorbachev et al.; and, Zarembko and Fedorov. Temperature is 20 - 350°C; concentration is 0.001 - 5.4m; 112 data points.

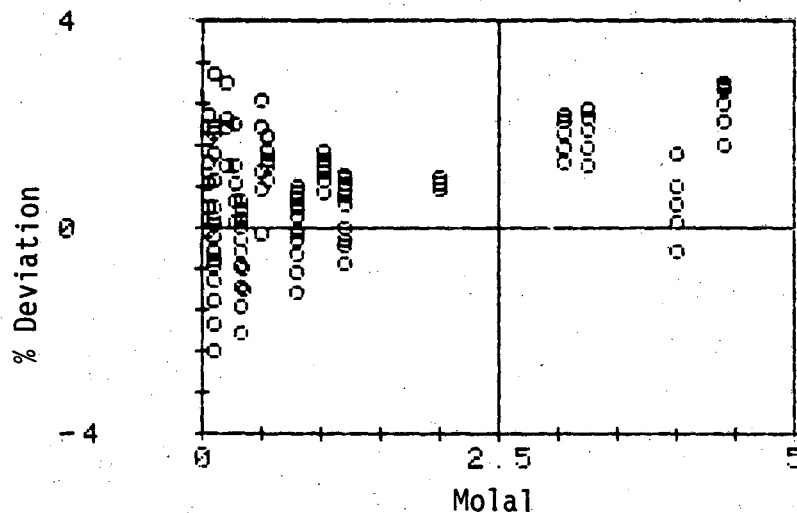


Figure 5. Density of NaCl solutions. Percentage difference in data from eq 1 and eq 2, and data from Out and Los; Rogers et al.; Grant-Taylor; and, Zarembo and Fedorov. Temperature 5 - 350°C; pressure 1 - 200 bar; 107 data points.

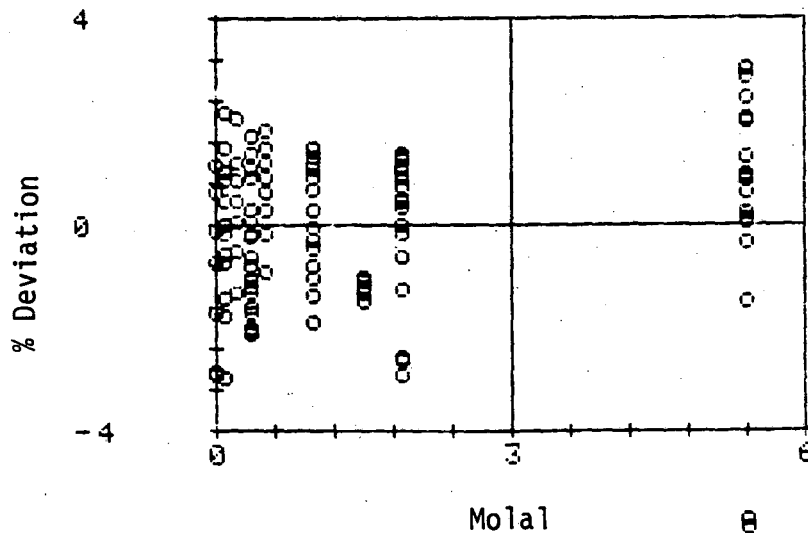


Figure 6. Density of NaCl solutions. Percentage difference in data from eq 1 and eq 2, and data from Ellis; Gorbachev et al.; and, Zarembo and Fedorov. Temperature 25 - 350°C; pressure 20-1000 bar; 117 data points.

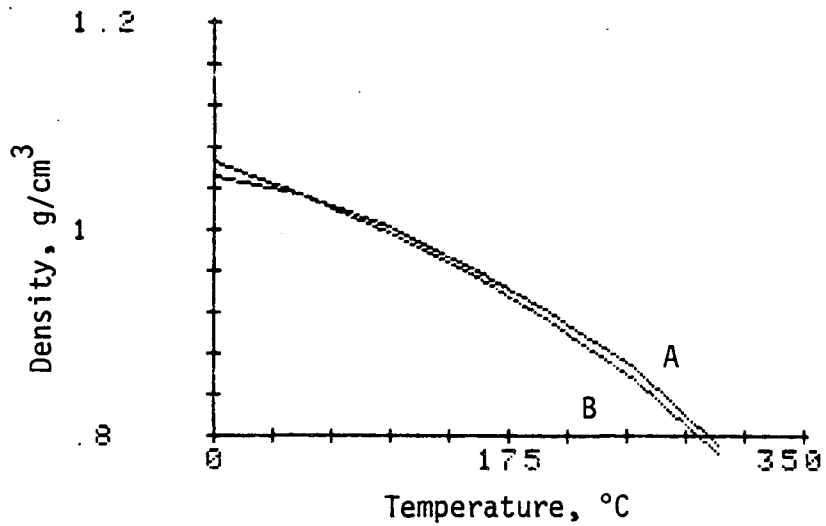


Figure 7. Comparison of density data (A) Rogers and Pitzer with (B) this work. Pressure is 200 bar ; concentration is 1m NaCl.

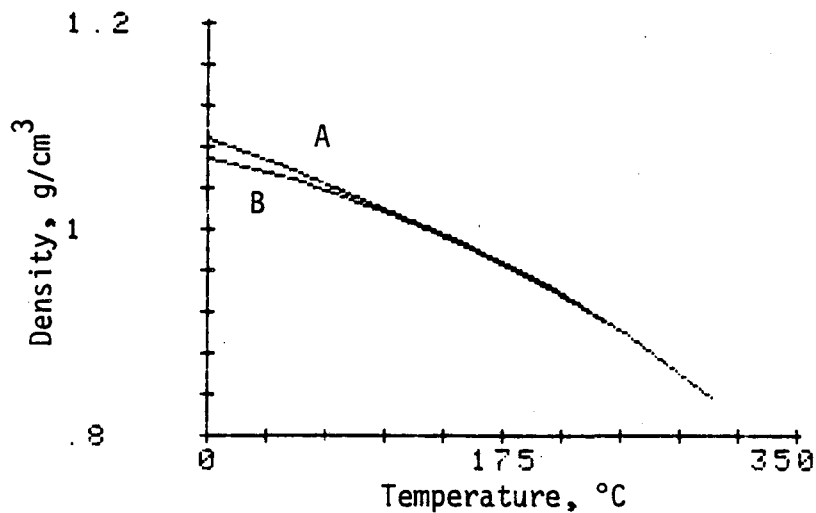


Figure 8. Comparison of density data (A) from this work with (B) Rogers and Pitzer. Pressure is 600 bar ; concentration is 1m NaCl.

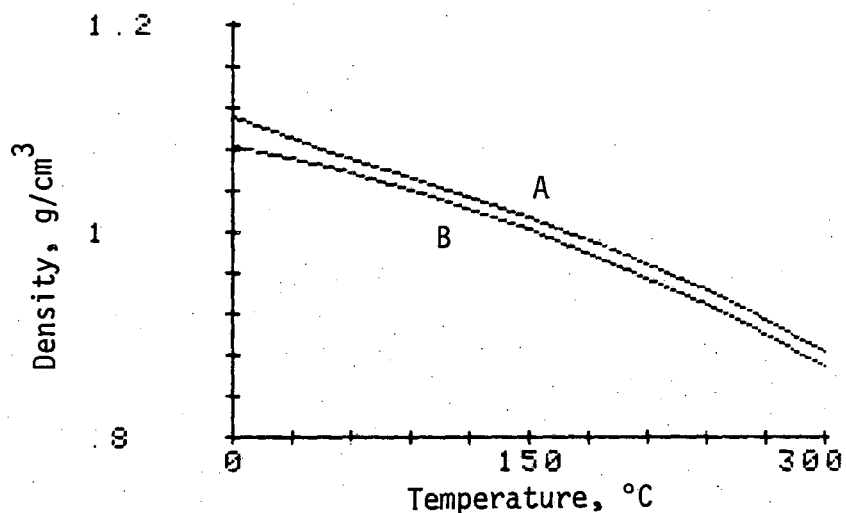


Figure 9. Comparison of density data from (A) Rogers and Pitzer with (B) this work. Pressure is 1000 bar ; concentration is 1m NaCl.

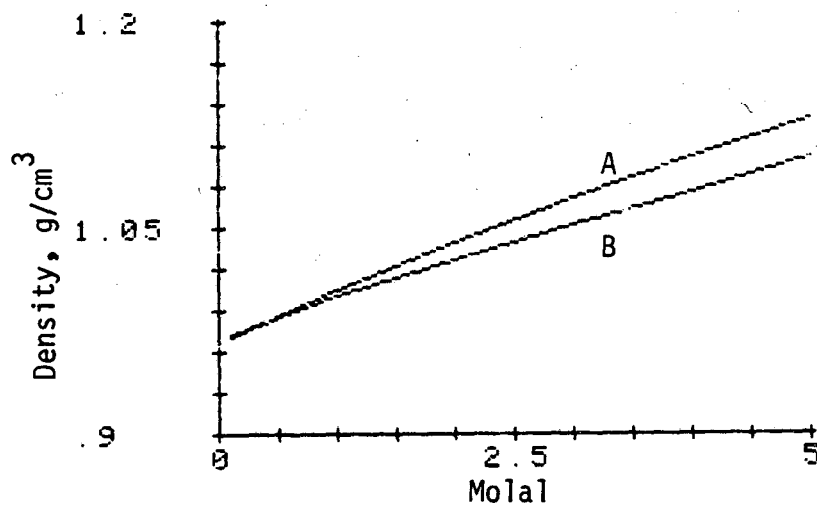


Figure 10. Comparison of density data from (A) Rogers and Pitzer with (B) this work. Temperature is 100°C; pressure is 200 bar .

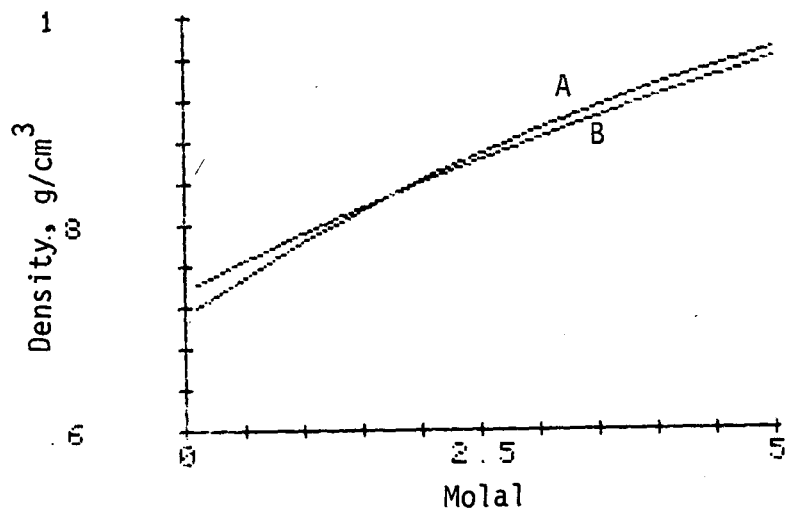


Figure 11. Comparison of density data from (A) this work with (B) Rogers and Pitzer. Temperature is 300°C; pressure is 200 bar.

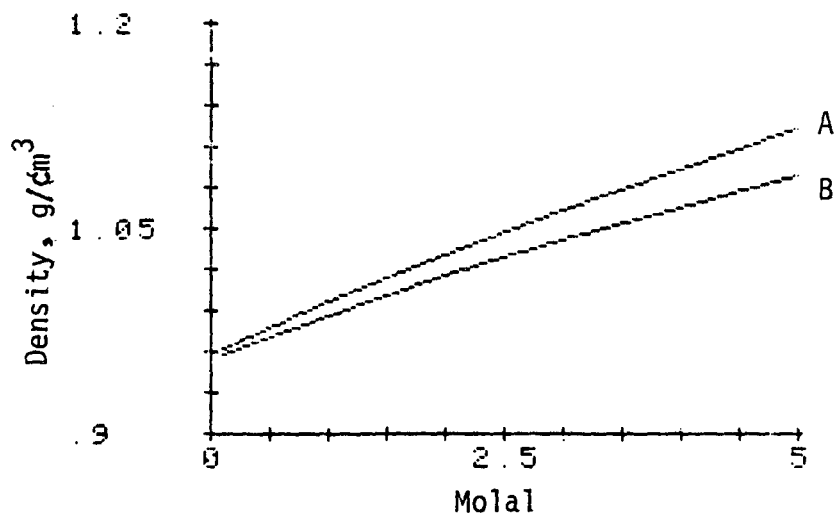


Figure 12. Comparison of density data from (A) Rogers and Pitzer with (B) this work. Temperature is 100°C; pressure is 1 bar.

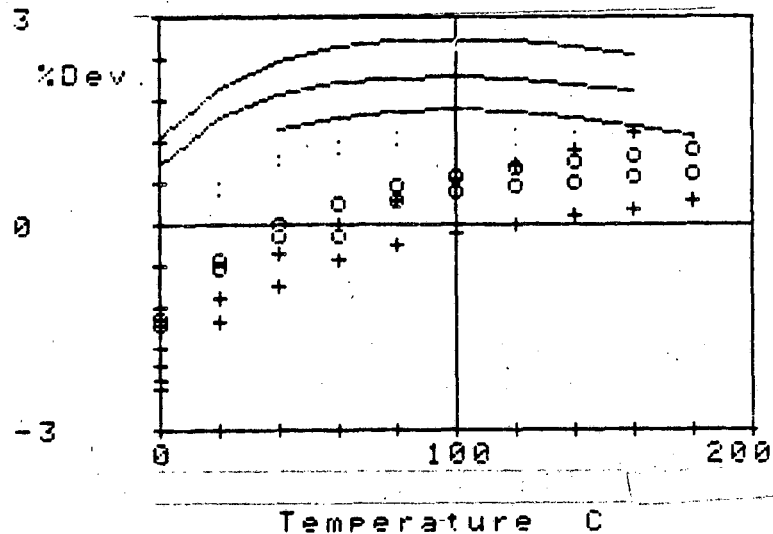


Figure 13. Comparison of densities of NaCl solutions predicted by eq 1, compared with Rowe and Chou correlation. Concentration and pressure: 0.5m (10 and 100 bar.): +++; 1m (100 and 200 bar.): ooo; 2m (100 and 200 bar.): ...; 3m (20 and 300 bar.): ___; 4m (10 bar.): ___ (uppermost curve).

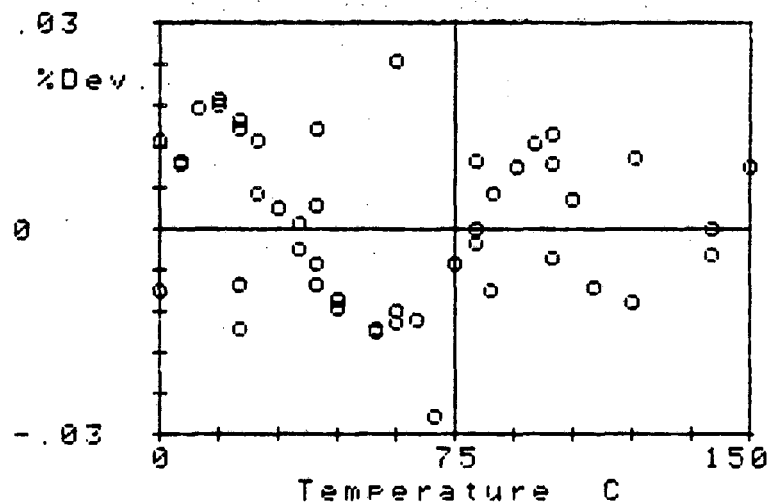


Figure 14. Percentage deviation in density of water using data from eq 4, with data from Kell and Whalley (0 - 100°C); Out and Los (5-95°C); Rowe and Chou (0 - 100°C); Isdale and Morris (70 - 160°C); Chen, Chen and Millero (0 - 55°C); Steam Tables (0 - 150°C). Saturated vapor pressures; 49 data points.

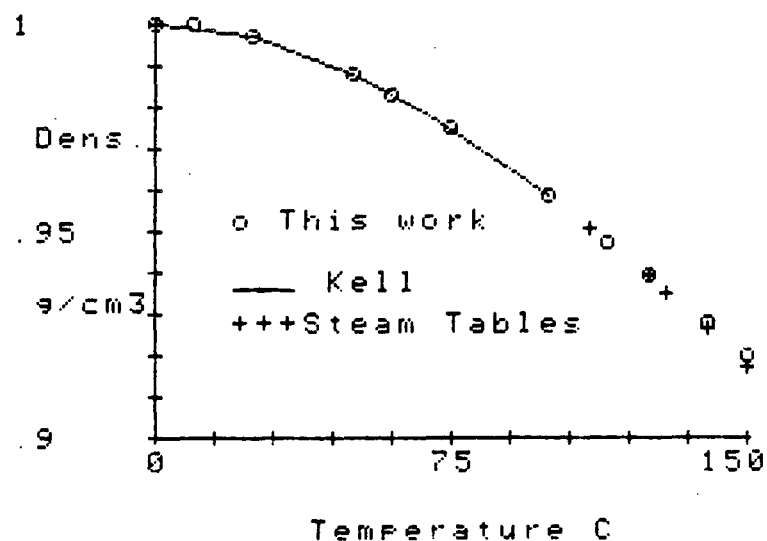


Figure 15. Plot of eq 3 showing extrapolation from 100 - 150°C.

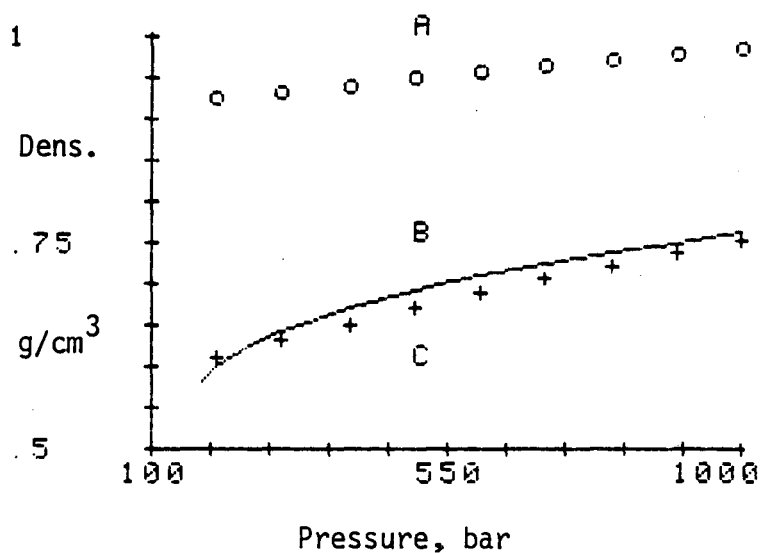


Figure 16. Plot of density of water versus pressure for 350°C. A. 5m NaCl. B. Water, data from Nagashima (—). C. Water, data from this work (+++).

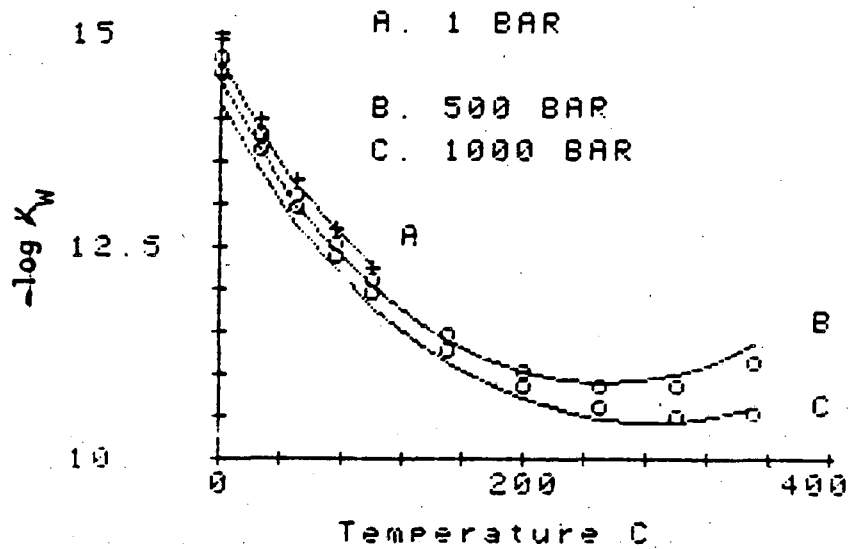


Figure 17. Ion product of water ($-\log K_w$) calculated from eq 6, using densities calculated by eq 1, eq 2 (solid lines). Values are compared with data from Marshall and Franck (26).

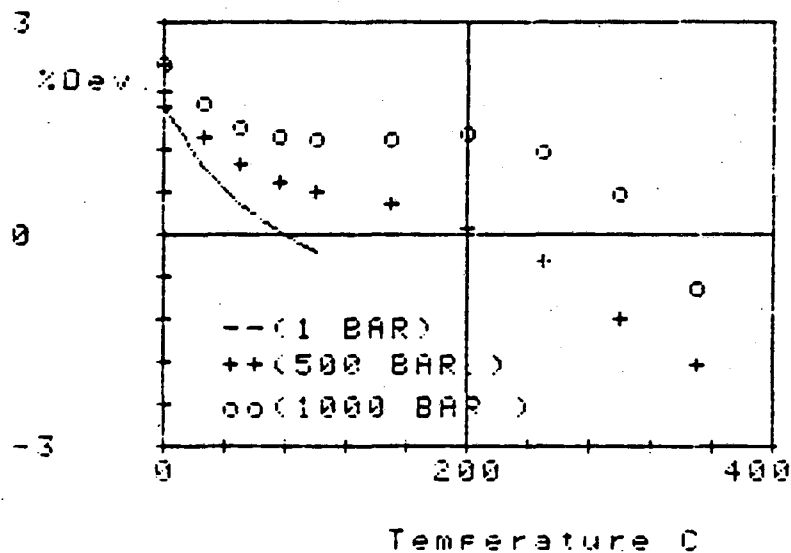


Figure 18. Percentage deviation between ion product of water calculated from eq 6, using densities calculated by eq 1, eq 2 and data from Marshall and Franck (26), at pressures indicated.

Table 1. Selected experimental data for density of water and sodium chloride solutions to high temperatures and pressures. Some data are published in the form of a correlation equation.

| <u>Ranges</u> | <u>Measurement</u> | <u>Reference</u> |
|-------------------------|---------------------------|--|
| 25-45;1;1-5 | Oscillating tube | Romankiw;Chou(1983) |
| 5-34;1;0.37802-5.99684 | Vibrating tube | LoSurdo;Alzola;Millero(1982) |
| 30-200;20.3;0-4.39 | Dilatometer | Rogers;Bradley;Pitzer(1982) |
| 173-354;200;0.100-4.000 | Mercury displacement | Grant-Taylor(1981) |
| 0-100;1;0 | Calculated | Kell(1981) |
| 5-95;1;0-1.2000 | Calculated | Out;Los(1980) |
| 0-35;1;0.00992-1.49986 | Vibrating flow densimeter | Chen;Chen;Millero(1980) |
| 25-50;1;0.00784-5.8267 | Pycnometer | Goncalves;Kestin(1977) |
| 25-350;0-980.7;0.35-5.4 | Hydrostatic weighing | Zarembo;Fedorov(1976) |
| 0-150;0-1000;0 | Calculated | Kell;Whalley(1975) |
| 40-280;100.1;0.001-1.5 | | Gorbachev;Kondrat'ev;Androsov;Kolupaev(1974) |
| 70-160;SVP;0 | Dilatometer | Isdale;Morris(1972) |
| 0-175;1-303;0-5.7 | Compressibility | Rowe;Chou(1972) |
| 25-200;20.3;0.1-1 | Mercury displacement | Ellis(1966) |
| 25-175;SVP;0.1-2.5 | Pycnometer;dilatometer | Fabuss;Korosi;Huq(1966) |
| 0-40;0-1000;0-1 | Equation of state | Chen;Millero(1981) |

Romankiw, L. A.; Chou, I-M; J. Chem. Eng. Data 1983, 28, 300.

Goncalves, F. A.; Kestin, J; Berich. Bunsege Physik.Chem. 1977, 81, 1156.

Chen, C.-T.; Millero, F. J.; J. Chem. Eng. Data 1981, 26, 270.

Table 2. Density of NaCl solutions g/cm³, at molal concentration shown

| TEMP (C) | PRES BAR | MOLAL CONCENTRATION | | | | | | |
|-------------|-------------|---------------------|---------|---------|---------|---------|---------|---------|
| | | 0 | .5 | 1 | 2 | 3 | 4 | 5 |
| 20 | 10 | 1.01681 | 1.02993 | 1.04256 | 1.06708 | 1.09182 | 1.11820 | 1.14757 |
| 20 | 100 | 1.02211 | 1.03502 | 1.04752 | 1.07199 | 1.09697 | 1.12386 | 1.15404 |
| 20 | 200 | 1.02789 | 1.04061 | 1.05300 | 1.07748 | | | |
| 20 | 500 | 1.04483 | 1.05717 | 1.06943 | 1.09439 | | | |
| 20 | 1000 | 1.07256 | 1.08503 | 1.09781 | 1.12506 | | | |
| 50 | 10 | .99537 | 1.00956 | 1.02297 | 1.04822 | 1.07258 | 1.09747 | 1.12429 |
| 50 | 100 | 1.00112 | 1.01499 | 1.02816 | 1.05314 | 1.07751 | 1.10271 | 1.13011 |
| 50 | 200 | 1.00737 | 1.02092 | 1.03385 | 1.05859 | 1.08305 | 1.10865 | 1.13677 |
| 50 | 500 | 1.02535 | 1.03815 | 1.05058 | 1.07505 | 1.10020 | 1.12745 | 1.15816 |
| 50 | 1000 | 1.05371 | 1.06599 | 1.07832 | 1.10381 | 1.13160 | 1.16309 | 1.19961 |
| 70 | 10 | .97996 | .99510 | 1.00927 | 1.03548 | 1.06006 | 1.08444 | 1.11003 |
| 70 | 100 | .98611 | 1.00086 | 1.01471 | 1.04050 | 1.06495 | 1.08949 | 1.11551 |
| 70 | 200 | .99277 | 1.00711 | 1.02064 | 1.04603 | 1.07040 | 1.09518 | 1.12176 |
| 70 | 500 | 1.01177 | 1.02511 | 1.03789 | 1.06251 | 1.08708 | 1.11301 | 1.14169 |
| 70 | 1000 | 1.04108 | 1.05349 | 1.06574 | 1.09054 | 1.11691 | 1.14626 | 1.17992 |
| 100 | 10 | .95473 | .97164 | .98730 | 1.01565 | 1.04125 | 1.06558 | 1.09003 |
| 100 | 100 | .96162 | .97803 | .99326 | 1.02096 | 1.04622 | 1.07048 | 1.09514 |
| 100 | 200 | .96905 | .98493 | .99971 | 1.02677 | 1.05170 | 1.07596 | 1.10093 |
| 100 | 500 | .99004 | 1.00454 | 1.01820 | 1.04375 | 1.06814 | 1.09281 | 1.11915 |
| 100 | 1000 | 1.02158 | 1.03451 | 1.04702 | 1.07149 | 1.09645 | 1.12329 | 1.15338 |
| 150 | 10 | .90555 | .92632 | .94538 | .97912 | 1.00828 | 1.03434 | 1.05874 |
| 150 | 100 | .91403 | .93412 | .95256 | .98530 | 1.01374 | 1.03938 | 1.06363 |
| 150 | 200 | .92315 | .94251 | .96030 | .99189 | 1.01970 | 1.04492 | 1.06908 |
| 150 | 500 | .94868 | .96605 | .98210 | 1.01103 | 1.03699 | 1.06141 | 1.08572 |
| 150 | 1000 | .98601 | 1.00076 | 1.01462 | 1.04041 | 1.06486 | 1.08940 | 1.11542 |
| 200 | 100 | .85565 | .88054 | .90332 | .94333 | .97722 | 1.00649 | 1.03258 |
| 200 | 200 | .86696 | .89091 | .91284 | .95139 | .98415 | 1.01260 | 1.03821 |
| 200 | 500 | .89854 | .91989 | .93946 | .97405 | 1.00383 | 1.03027 | 1.05482 |
| 200 | 1000 | .94419 | .96190 | .97825 | 1.00764 | 1.03387 | 1.05839 | 1.08262 |
| 250 | 100 | .78392 | .81470 | .84291 | .89240 | .93393 | .96903 | .99918 |
| 250 | 200 | .79790 | .82754 | .85470 | .90232 | .94232 | .97621 | 1.00547 |
| 250 | 500 | .83699 | .86343 | .88762 | .93007 | .96588 | .99656 | 1.02357 |
| 250 | 1000 | .89346 | .91522 | .93517 | .97038 | 1.00062 | 1.02736 | 1.05204 |
| 300 | 100 | .69641 | .73416 | .76886 | .82996 | .88127 | .92435 | .96071 |
| 300 | 200 | .71353 | .74994 | .78339 | .84223 | .89161 | .93309 | .96816 |
| 300 | 500 | .76157 | .79416 | .82405 | .87651 | .92051 | .95759 | .98923 |
| 300 | 1000 | .83127 | .85818 | .88280 | .92601 | .96242 | .99355 | 1.02087 |
| 350 | 200 | .61155 | .65576 | .69655 | .76869 | .82955 | .88072 | .92370 |
| 350 | 500 | .66992 | .70972 | .74635 | .81092 | .86522 | .91080 | .94918 |
| 350 | 1000 | .75522 | .78832 | .81868 | .87199 | .91670 | .95435 | .98643 |

Table 3. Comparison of Densities of Water from Chebyshev Polynomials, with Kell and Whalley Values.

| <u>Order</u> | <u>Σ (% Deviations)²</u> |
|--------------|---|
| 4 | 0.0104 |
| 5 | 0.0001 |
| 6 | 0.0047 |

Table 4. Density of water, eq 3 and eq 4, at saturated vapor pressures

| TEMPERATURE | DENSITY(g/cm ³) | |
|-------------|-----------------------------|---------|
| DEG C | eq 3 | eq 4 |
| 0 | 0.9998420 | 0.99993 |
| 5 | 0.9999478 | 0.99986 |
| 10 | 0.9996847 | 0.99952 |
| 15 | 0.9990914 | 0.99892 |
| 20 | 0.9982021 | 0.99806 |
| 25 | 0.9970462 | 0.99696 |
| 30 | 0.9956493 | 0.99562 |
| 35 | 0.9940330 | 0.99406 |
| 40 | 0.9922155 | 0.99230 |
| 45 | 0.9902119 | 0.99033 |
| 50 | 0.9880349 | 0.98817 |
| 55 | 0.9856946 | 0.98584 |
| 60 | 0.9831996 | 0.98333 |
| 65 | 0.9805566 | 0.98067 |
| 70 | 0.9777716 | 0.97786 |
| 75 | 0.9748497 | 0.97490 |
| 80 | 0.9717957 | 0.97182 |
| 85 | 0.9686146 | 0.96860 |
| 90 | 0.9653118 | 0.96527 |
| 95 | 0.9618934 | 0.96183 |
| 100 | 0.9583668 | 0.95827 |
| 105 | | 0.95461 |
| 110 | | 0.95085 |
| 115 | | 0.94699 |
| 120 | | 0.94303 |
| 125 | | 0.93897 |
| 130 | | 0.93481 |
| 135 | | 0.93054 |
| 140 | | 0.92617 |
| 145 | | 0.92169 |
| 150 | | 0.91709 |

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Table 5. Density of sea water, g/cm³; at salinity (g/kg) shown

| TEMP DEG C | SALINITY | | | | | | |
|---------------|----------|--------|--------|--------|--------|--------|--------|
| | 10 | 30 | 35 | 50 | 70 | 110 | 150 |
| 5 | 1.0086 | 1.0241 | 1.0280 | 1.0397 | 1.0554 | 1.0871 | 1.1192 |
| 10 | 1.0076 | 1.0228 | 1.0266 | 1.0382 | 1.0538 | 1.0855 | 1.1179 |
| 15 | 1.0063 | 1.0214 | 1.0251 | 1.0366 | 1.0521 | 1.0838 | 1.1165 |
| 20 | 1.0050 | 1.0198 | 1.0235 | 1.0349 | 1.0503 | 1.0819 | 1.1148 |
| 25 | 1.0034 | 1.0181 | 1.0218 | 1.0330 | 1.0483 | 1.0800 | 1.1130 |
| 30 | 1.0017 | 1.0162 | 1.0199 | 1.0311 | 1.0463 | 1.0779 | 1.1110 |
| 35 | .9999 | 1.0143 | 1.0179 | 1.0290 | 1.0442 | 1.0757 | 1.1089 |
| 40 | .9979 | 1.0122 | 1.0158 | 1.0269 | 1.0420 | 1.0734 | 1.1066 |
| 45 | .9958 | 1.0100 | 1.0136 | 1.0246 | 1.0397 | 1.0710 | 1.1041 |
| 50 | .9936 | 1.0077 | 1.0113 | 1.0223 | 1.0373 | 1.0686 | 1.1016 |
| 55 | .9912 | 1.0053 | 1.0089 | 1.0198 | 1.0348 | 1.0660 | 1.0989 |
| 60 | .9887 | 1.0028 | 1.0064 | 1.0173 | 1.0323 | 1.0634 | 1.0961 |
| 65 | .9861 | 1.0002 | 1.0038 | 1.0147 | 1.0296 | 1.0606 | 1.0932 |
| 70 | .9834 | .9975 | 1.0011 | 1.0120 | 1.0269 | 1.0578 | 1.0902 |
| 75 | .9805 | .9947 | .9983 | 1.0093 | 1.0241 | 1.0549 | 1.0871 |
| 80 | .9776 | .9918 | .9955 | 1.0064 | 1.0213 | 1.0520 | 1.0840 |
| 85 | .9745 | .9889 | .9925 | 1.0035 | 1.0184 | 1.0490 | 1.0807 |
| 90 | .9714 | .9858 | .9894 | 1.0004 | 1.0154 | 1.0459 | 1.0774 |
| 95 | .9681 | .9826 | .9863 | .9973 | 1.0123 | 1.0428 | 1.0741 |
| 100 | .9648 | .9794 | .9830 | .9941 | 1.0091 | 1.0395 | 1.0707 |
| 105 | .9613 | .9760 | .9797 | .9909 | 1.0058 | 1.0362 | 1.0672 |
| 110 | .9577 | .9725 | .9763 | .9875 | 1.0025 | 1.0329 | 1.0636 |
| 115 | .9540 | .9690 | .9727 | .9840 | .9991 | 1.0294 | 1.0601 |
| 120 | .9502 | .9653 | .9690 | .9804 | .9955 | 1.0259 | 1.0564 |
| 125 | .9462 | .9614 | .9652 | .9767 | .9919 | 1.0223 | 1.0527 |
| 130 | .9422 | .9575 | .9613 | .9728 | .9881 | 1.0186 | 1.0490 |
| 135 | .9380 | .9534 | .9573 | .9688 | .9842 | 1.0148 | 1.0451 |
| 140 | .9336 | .9492 | .9531 | .9647 | .9802 | 1.0108 | 1.0413 |
| 145 | .9291 | .9448 | .9487 | .9604 | .9760 | 1.0068 | 1.0373 |
| 150 | .9244 | .9402 | .9442 | .9560 | .9716 | 1.0026 | 1.0333 |

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Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

The appendix which follows consists of values for the density of NaCl solutions

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# Solutions #
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NaCl Solutions

Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | .1 | .2 | .3 | .4 | .5 |
| 0 | 1 | 1.02977 | 1.03233 | 1.03488 | 1.03741 | 1.03993 | 1.04243 |
| 5 | 1 | 1.02644 | 1.02903 | 1.03160 | 1.03416 | 1.03669 | 1.03921 |
| 10 | 1 | 1.02309 | 1.02571 | 1.02830 | 1.03088 | 1.03343 | 1.03597 |
| 15 | 1 | 1.01970 | 1.02235 | 1.02497 | 1.02757 | 1.03015 | 1.03271 |
| 20 | 1 | 1.01628 | 1.01896 | 1.02161 | 1.02424 | 1.02684 | 1.02942 |
| 25 | 1 | 1.01281 | 1.01553 | 1.01821 | 1.02087 | 1.02350 | 1.02611 |
| 30 | 1 | 1.00931 | 1.01205 | 1.01477 | 1.01746 | 1.02013 | 1.02276 |
| 35 | 1 | 1.00575 | 1.00854 | 1.01129 | 1.01402 | 1.01671 | 1.01938 |
| 40 | 1 | 1.00215 | 1.00498 | 1.00777 | 1.01053 | 1.01326 | 1.01597 |
| 45 | 1 | .99849 | 1.00137 | 1.00420 | 1.00700 | 1.00977 | 1.01251 |
| 50 | 1 | .99478 | .99770 | 1.00058 | 1.00342 | 1.00623 | 1.00901 |
| 55 | 1 | .99102 | .99398 | .99691 | .99979 | 1.00265 | 1.00546 |
| 60 | 1 | .98719 | .99020 | .99318 | .99611 | .99901 | 1.00187 |
| 65 | 1 | .98330 | .98636 | .98939 | .99237 | .99531 | .99822 |
| 70 | 1 | .97934 | .98246 | .98554 | .98857 | .99156 | .99452 |
| 75 | 1 | .97531 | .97849 | .98162 | .98471 | .98775 | .99076 |
| 80 | 1 | .97121 | .97445 | .97764 | .98078 | .98388 | .98694 |
| 85 | 1 | .96703 | .97034 | .97359 | .97679 | .97994 | .98305 |
| 90 | 1 | .96278 | .96615 | .96946 | .97272 | .97594 | .97910 |
| 95 | 1 | .95845 | .96188 | .96526 | .96859 | .97186 | .97508 |
| 100 | 1 | .95403 | .95753 | .96098 | .96437 | .96771 | .97099 |

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NaCl Solutions

Density of NaCl solutions,g/cm³,at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | .1 | .2 | .3 | .4 | .5 |
| 0 | 10 | 1.03028 | 1.03284 | 1.03538 | 1.03791 | 1.04043 | 1.04293 |
| 5 | 10 | 1.02696 | 1.02955 | 1.03211 | 1.03466 | 1.03719 | 1.03971 |
| 10 | 10 | 1.02361 | 1.02623 | 1.02882 | 1.03139 | 1.03394 | 1.03647 |
| 15 | 10 | 1.02023 | 1.02287 | 1.02549 | 1.02809 | 1.03066 | 1.03322 |
| 20 | 10 | 1.01681 | 1.01949 | 1.02213 | 1.02476 | 1.02736 | 1.02993 |
| 25 | 10 | 1.01336 | 1.01606 | 1.01874 | 1.02139 | 1.02402 | 1.02663 |
| 30 | 10 | 1.00985 | 1.01260 | 1.01531 | 1.01799 | 1.02065 | 1.02329 |
| 35 | 10 | 1.00631 | 1.00909 | 1.01184 | 1.01456 | 1.01725 | 1.01991 |
| 40 | 10 | 1.00271 | 1.00553 | 1.00832 | 1.01108 | 1.01380 | 1.01650 |
| 45 | 10 | .99907 | 1.00193 | 1.00476 | 1.00756 | 1.01032 | 1.01305 |
| 50 | 10 | .99537 | .99828 | 1.00115 | 1.00398 | 1.00679 | 1.00956 |
| 55 | 10 | .99161 | .99457 | .99748 | 1.00036 | 1.00321 | 1.00602 |
| 60 | 10 | .98779 | .99080 | .99376 | .99669 | .99958 | 1.00243 |
| 65 | 10 | .98391 | .98697 | .98998 | .99296 | .99590 | .99879 |
| 70 | 10 | .97996 | .98308 | .98614 | .98917 | .99216 | .99510 |
| 75 | 10 | .97595 | .97912 | .98224 | .98532 | .98836 | .99135 |
| 80 | 10 | .97186 | .97509 | .97827 | .98140 | .98449 | .98754 |
| 85 | 10 | .96769 | .97099 | .97423 | .97742 | .98057 | .98367 |
| 90 | 10 | .96346 | .96681 | .97011 | .97337 | .97657 | .97973 |
| 95 | 10 | .95914 | .96256 | .96593 | .96924 | .97251 | .97572 |
| 100 | 10 | .95473 | .95822 | .96166 | .96504 | .96837 | .97164 |
| 105 | 10 | .95024 | .95381 | .95731 | .96076 | .96415 | .96749 |
| 110 | 10 | .94567 | .94930 | .95288 | .95639 | .95985 | .96326 |
| 115 | 10 | .94100 | .94471 | .94836 | .95195 | .95548 | .95895 |
| 120 | 10 | .93624 | .94003 | .94375 | .94741 | .95101 | .95456 |
| 125 | 10 | .93138 | .93525 | .93905 | .94279 | .94646 | .95008 |
| 130 | 10 | .92642 | .93037 | .93426 | .93807 | .94182 | .94552 |
| 135 | 10 | .92136 | .92540 | .92936 | .93326 | .93709 | .94086 |
| 140 | 10 | .91620 | .92032 | .92437 | .92835 | .93226 | .93611 |
| 145 | 10 | .91093 | .91514 | .91928 | .92334 | .92734 | .93127 |
| 150 | 10 | .90555 | .90985 | .91408 | .91823 | .92231 | .92632 |
| 155 | 10 | .90005 | .90445 | .90877 | .91301 | .91718 | .92128 |
| 160 | 10 | .89444 | .89894 | .90335 | .90768 | .91194 | .91613 |
| 165 | 10 | .88872 | .89331 | .89782 | .90225 | .90660 | .91087 |
| 170 | 10 | .88287 | .88756 | .89217 | .89669 | .90114 | .90551 |
| 175 | 10 | .87690 | .88169 | .88640 | .89103 | .89557 | .90003 |

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NaCl Solutions

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Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | .1 | .2 | .3 | .4 | .5 |
| 0 | 20 | 1.03084 | 1.03340 | 1.03594 | 1.03847 | 1.04098 | 1.04348 |
| 5 | 20 | 1.02753 | 1.03012 | 1.03268 | 1.03522 | 1.03775 | 1.04026 |
| 10 | 20 | 1.02419 | 1.02680 | 1.02939 | 1.03195 | 1.03450 | 1.03703 |
| 15 | 20 | 1.02082 | 1.02345 | 1.02607 | 1.02866 | 1.03123 | 1.03378 |
| 20 | 20 | 1.01741 | 1.02007 | 1.02271 | 1.02533 | 1.02793 | 1.03050 |
| 25 | 20 | 1.01396 | 1.01666 | 1.01933 | 1.02198 | 1.02460 | 1.02720 |
| 30 | 20 | 1.01046 | 1.01320 | 1.01590 | 1.01858 | 1.02124 | 1.02386 |
| 35 | 20 | 1.00693 | 1.00970 | 1.01244 | 1.01515 | 1.01784 | 1.02050 |
| 40 | 20 | 1.00334 | 1.00615 | 1.00893 | 1.01168 | 1.01440 | 1.01709 |
| 45 | 20 | .99970 | 1.00256 | 1.00538 | 1.00817 | 1.01092 | 1.01365 |
| 50 | 20 | .99601 | .99891 | 1.00178 | 1.00461 | 1.00740 | 1.01017 |
| 55 | 20 | .99227 | .99521 | .99812 | 1.00100 | 1.00383 | 1.00664 |
| 60 | 20 | .98846 | .99146 | .99441 | .99733 | 1.00021 | 1.00306 |
| 65 | 20 | .98459 | .98764 | .99065 | .99361 | .99654 | .99943 |
| 70 | 20 | .98065 | .98376 | .98682 | .98983 | .99281 | .99575 |
| 75 | 20 | .97665 | .97981 | .98292 | .98599 | .98902 | .99201 |
| 80 | 20 | .97257 | .97579 | .97897 | .98209 | .98517 | .98821 |
| 85 | 20 | .96843 | .97171 | .97494 | .97812 | .98126 | .98435 |
| 90 | 20 | .96420 | .96755 | .97084 | .97408 | .97727 | .98042 |
| 95 | 20 | .95990 | .96331 | .96666 | .96997 | .97322 | .97642 |
| 100 | 20 | .95551 | .95899 | .96241 | .96578 | .96909 | .97236 |
| 105 | 20 | .95104 | .95458 | .95808 | .96151 | .96489 | .96822 |
| 110 | 20 | .94648 | .95010 | .95366 | .95716 | .96061 | .96400 |
| 115 | 20 | .94182 | .94552 | .94916 | .95273 | .95625 | .95971 |
| 120 | 20 | .93708 | .94085 | .94456 | .94821 | .95180 | .95533 |
| 125 | 20 | .93224 | .93609 | .93988 | .94361 | .94727 | .95087 |
| 130 | 20 | .92730 | .93124 | .93510 | .93891 | .94265 | .94632 |
| 135 | 20 | .92226 | .92628 | .93023 | .93411 | .93793 | .94168 |
| 140 | 20 | .91711 | .92122 | .92526 | .92922 | .93312 | .93695 |
| 145 | 20 | .91186 | .91606 | .92018 | .92423 | .92821 | .93213 |
| 150 | 20 | .90650 | .91079 | .91500 | .91914 | .92320 | .92720 |
| 155 | 20 | .90103 | .90541 | .90971 | .91394 | .91809 | .92217 |
| 160 | 20 | .89544 | .89992 | .90431 | .90863 | .91287 | .91705 |
| 165 | 20 | .88974 | .89431 | .89880 | .90321 | .90755 | .91181 |
| 170 | 20 | .88391 | .88859 | .89317 | .89768 | .90211 | .90647 |
| 175 | 20 | .87797 | .88274 | .88743 | .89204 | .89656 | .90101 |
| 180 | 20 | .87190 | .87677 | .88157 | .88627 | .89090 | .89544 |
| 185 | 20 | .86570 | .87068 | .87558 | .88039 | .88511 | .88975 |
| 190 | 20 | .85937 | .86446 | .86946 | .87438 | .87921 | .88395 |
| 195 | 20 | .85291 | .85811 | .86322 | .86824 | .87318 | .87802 |
| 200 | 20 | .84631 | .85163 | .85685 | .86198 | .86702 | .87197 |

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#####
# Aqueous      #
# Solutions    #
# Database     #
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April 1983
NaCl Solutions

Appendix.Density of NaCl solutions,g/cm3,at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | .1 | .2 | .3 | .4 | .5 |
| 0 | 100 | 1.03536 | 1.03789 | 1.04040 | 1.04291 | 1.04540 | 1.04788 |
| 10 | 100 | 1.02879 | 1.03136 | 1.03392 | 1.03645 | 1.03898 | 1.04148 |
| 20 | 100 | 1.02211 | 1.02473 | 1.02733 | 1.02992 | 1.03248 | 1.03502 |
| 30 | 100 | 1.01528 | 1.01797 | 1.02063 | 1.02327 | 1.02588 | 1.02847 |
| 40 | 100 | 1.00829 | 1.01105 | 1.01378 | 1.01648 | 1.01915 | 1.02180 |
| 50 | 100 | 1.00112 | 1.00396 | 1.00676 | 1.00954 | 1.01228 | 1.01499 |
| 60 | 100 | .99373 | .99666 | .99955 | 1.00241 | 1.00523 | 1.00802 |
| 70 | 100 | .98611 | .98914 | .99213 | .99508 | .99799 | 1.00086 |
| 80 | 100 | .97824 | .98138 | .98447 | .98752 | .99052 | .99349 |
| 90 | 100 | .97008 | .97334 | .97654 | .97970 | .98282 | .98589 |
| 100 | 100 | .96162 | .96501 | .96834 | .97162 | .97485 | .97803 |
| 110 | 100 | .95284 | .95636 | .95983 | .96323 | .96659 | .96989 |
| 120 | 100 | .94371 | .94738 | .95098 | .95453 | .95802 | .96145 |
| 130 | 100 | .93422 | .93804 | .94179 | .94549 | .94912 | .95269 |
| 140 | 100 | .92433 | .92831 | .93223 | .93608 | .93987 | .94359 |
| 150 | 100 | .91403 | .91819 | .92228 | .92629 | .93024 | .93412 |
| 160 | 100 | .90330 | .90764 | .91191 | .91610 | .92022 | .92426 |
| 170 | 100 | .89212 | .89665 | .90110 | .90548 | .90977 | .91400 |
| 180 | 100 | .88047 | .88520 | .88984 | .89441 | .89889 | .90330 |
| 190 | 100 | .86832 | .87325 | .87811 | .88287 | .88756 | .89216 |
| 200 | 100 | .85565 | .86081 | .86587 | .87085 | .87574 | .88054 |
| 210 | 100 | .84245 | .84783 | .85312 | .85832 | .86342 | .86843 |
| 220 | 100 | .82870 | .83432 | .83983 | .84526 | .85058 | .85582 |
| 230 | 100 | .81437 | .82023 | .82599 | .83165 | .83721 | .84267 |
| 240 | 100 | .79945 | .80556 | .81157 | .81747 | .82327 | .82897 |
| 250 | 100 | .78392 | .79029 | .79655 | .80271 | .80876 | .81470 |
| 260 | 100 | .76775 | .77440 | .78092 | .78734 | .79365 | .79985 |
| 270 | 100 | .75094 | .75786 | .76466 | .77135 | .77792 | .78438 |
| 280 | 100 | .73345 | .74066 | .74775 | .75471 | .76156 | .76829 |
| 290 | 100 | .71528 | .72278 | .73016 | .73741 | .74454 | .75156 |
| 300 | 100 | .69641 | .70421 | .71188 | .71943 | .72686 | .73416 |
| 310 | 100 | .67681 | .68492 | .69290 | .70075 | .70848 | .71607 |


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#####
# Aqueous   #
# Solutions #
# Database  #
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April 1983
NaCl Solutions

Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | .1 | .2 | .3 | .4 | .5 |
| 0 | 200 | 1.04095 | 1.04345 | 1.04594 | 1.04842 | 1.05089 | 1.05335 |
| 10 | 200 | 1.03447 | 1.03700 | 1.03952 | 1.04203 | 1.04452 | 1.04701 |
| 20 | 200 | 1.02789 | 1.03047 | 1.03303 | 1.03558 | 1.03810 | 1.04061 |
| 30 | 200 | 1.02120 | 1.02384 | 1.02645 | 1.02903 | 1.03160 | 1.03415 |
| 40 | 200 | 1.01437 | 1.01706 | 1.01973 | 1.02238 | 1.02500 | 1.02759 |
| 50 | 200 | 1.00737 | 1.01014 | 1.01287 | 1.01558 | 1.01826 | 1.02092 |
| 60 | 200 | 1.00018 | 1.00303 | 1.00584 | 1.00862 | 1.01138 | 1.01410 |
| 70 | 200 | .99277 | .99571 | .99862 | 1.00148 | 1.00431 | 1.00711 |
| 80 | 200 | .98513 | .98817 | .99117 | .99413 | .99705 | .99994 |
| 90 | 200 | .97723 | .98038 | .98349 | .98655 | .98957 | .99255 |
| 100 | 200 | .96905 | .97232 | .97555 | .97872 | .98185 | .98493 |
| 110 | 200 | .96057 | .96397 | .96731 | .97061 | .97385 | .97705 |
| 120 | 200 | .95176 | .95529 | .95877 | .96220 | .96557 | .96889 |
| 130 | 200 | .94260 | .94628 | .94991 | .95347 | .95698 | .96042 |
| 140 | 200 | .93307 | .93691 | .94069 | .94440 | .94805 | .95164 |
| 150 | 200 | .92315 | .92716 | .93109 | .93496 | .93877 | .94251 |
| 160 | 200 | .91282 | .91700 | .92111 | .92514 | .92911 | .93301 |
| 170 | 200 | .90206 | .90642 | .91070 | .91491 | .91905 | .92312 |
| 180 | 200 | .89084 | .89539 | .89986 | .90426 | .90858 | .91282 |
| 190 | 200 | .87914 | .88390 | .88857 | .89315 | .89766 | .90209 |
| 200 | 200 | .86696 | .87192 | .87679 | .88158 | .88629 | .89091 |
| 210 | 200 | .85425 | .85943 | .86452 | .86952 | .87443 | .87926 |
| 220 | 200 | .84102 | .84642 | .85173 | .85695 | .86208 | .86712 |
| 230 | 200 | .82722 | .83287 | .83841 | .84386 | .84921 | .85446 |
| 240 | 200 | .81286 | .81874 | .82453 | .83021 | .83579 | .84128 |
| 250 | 200 | .79790 | .80403 | .81007 | .81600 | .82182 | .82754 |
| 260 | 200 | .78232 | .78872 | .79501 | .80119 | .80727 | .81324 |
| 270 | 200 | .76612 | .77279 | .77934 | .78579 | .79212 | .79834 |
| 280 | 200 | .74926 | .75621 | .76304 | .76975 | .77636 | .78284 |
| 290 | 200 | .73174 | .73897 | .74609 | .75308 | .75995 | .76671 |
| 300 | 200 | .71353 | .72106 | .72846 | .73574 | .74290 | .74994 |
| 310 | 200 | .69461 | .70244 | .71015 | .71772 | .72518 | .73250 |
| 320 | 200 | .67497 | .68312 | .69113 | .69901 | .70676 | .71438 |
| 330 | 200 | .65460 | .66306 | .67139 | .67958 | .68764 | .69557 |
| 340 | 200 | .63346 | .64225 | .65090 | .65941 | .66779 | .67603 |
| 350 | 200 | .61155 | .62067 | .62966 | .63850 | .64720 | .65576 |

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#####
# Aqueous      #
# Solutions   #
# Database    #
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April 1983
NaCl Solutions

Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | .1 | .2 | .3 | .4 | .5 |
| 0 | 300 | 1.04649 | 1.04897 | 1.05144 | 1.05391 | 1.05636 | 1.05882 |
| 10 | 300 | 1.04008 | 1.04259 | 1.04508 | 1.04756 | 1.05004 | 1.05250 |
| 20 | 300 | 1.03360 | 1.03614 | 1.03867 | 1.04118 | 1.04367 | 1.04616 |
| 30 | 300 | 1.02702 | 1.02961 | 1.03217 | 1.03472 | 1.03725 | 1.03977 |
| 40 | 300 | 1.02032 | 1.02296 | 1.02558 | 1.02817 | 1.03075 | 1.03330 |
| 50 | 300 | 1.01348 | 1.01618 | 1.01886 | 1.02151 | 1.02414 | 1.02674 |
| 60 | 300 | 1.00646 | 1.00924 | 1.01199 | 1.01471 | 1.01740 | 1.02006 |
| 70 | 300 | .99926 | 1.00212 | 1.00494 | 1.00774 | 1.01050 | 1.01323 |
| 80 | 300 | .99183 | .99479 | .99770 | 1.00058 | 1.00342 | 1.00623 |
| 90 | 300 | .98418 | .98723 | .99024 | .99322 | .99615 | .99904 |
| 100 | 300 | .97625 | .97942 | .98254 | .98562 | .98865 | .99164 |
| 110 | 300 | .96805 | .97134 | .97457 | .97776 | .98090 | .98400 |
| 120 | 300 | .95954 | .96296 | .96632 | .96963 | .97289 | .97610 |
| 130 | 300 | .95070 | .95426 | .95775 | .96119 | .96458 | .96791 |
| 140 | 300 | .94152 | .94522 | .94886 | .95244 | .95596 | .95943 |
| 150 | 300 | .93196 | .93582 | .93961 | .94334 | .94701 | .95061 |
| 160 | 300 | .92201 | .92603 | .92999 | .93387 | .93770 | .94145 |
| 170 | 300 | .91164 | .91584 | .91997 | .92402 | .92801 | .93192 |
| 180 | 300 | .90085 | .90523 | .90953 | .91376 | .91792 | .92201 |
| 190 | 300 | .88959 | .89417 | .89866 | .90308 | .90741 | .91168 |
| 200 | 300 | .87787 | .88264 | .88733 | .89194 | .89647 | .90092 |
| 210 | 300 | .86564 | .87063 | .87552 | .88033 | .88506 | .88970 |
| 220 | 300 | .85290 | .85811 | .86322 | .86824 | .87317 | .87802 |
| 230 | 300 | .83963 | .84506 | .85039 | .85563 | .86078 | .86584 |
| 240 | 300 | .82580 | .83146 | .83703 | .84250 | .84788 | .85316 |
| 250 | 300 | .81139 | .81730 | .82311 | .82882 | .83443 | .83994 |
| 260 | 300 | .79639 | .80256 | .80862 | .81457 | .82042 | .82617 |
| 270 | 300 | .78078 | .78721 | .79352 | .79973 | .80583 | .81183 |
| 280 | 300 | .76454 | .77124 | .77782 | .78429 | .79065 | .79690 |
| 290 | 300 | .74765 | .75462 | .76148 | .76822 | .77485 | .78136 |
| 300 | 300 | .73009 | .73735 | .74449 | .75151 | .75841 | .76519 |
| 310 | 300 | .71184 | .71940 | .72683 | .73414 | .74132 | .74839 |
| 320 | 300 | .69289 | .70075 | .70848 | .71608 | .72356 | .73091 |
| 330 | 300 | .67322 | .68139 | .68943 | .69733 | .70511 | .71276 |
| 340 | 300 | .65280 | .66129 | .66965 | .67787 | .68595 | .69391 |
| 350 | 300 | .63163 | .64045 | .64913 | .65767 | .66607 | .67434 |

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#####
# Aqueous      #
# Solutions    #
# Database     #
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April 1983
NaCl Solutions

Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | .1 | .2 | .3 | .4 | .5 |
| 0 | 400 | 1.05200 | 1.05447 | 1.05693 | 1.05938 | 1.06184 | 1.06429 |
| 10 | 400 | 1.04565 | 1.04813 | 1.05060 | 1.05307 | 1.05553 | 1.05798 |
| 20 | 400 | 1.03924 | 1.04175 | 1.04425 | 1.04673 | 1.04921 | 1.05167 |
| 30 | 400 | 1.03276 | 1.03530 | 1.03783 | 1.04035 | 1.04285 | 1.04534 |
| 40 | 400 | 1.02617 | 1.02877 | 1.03134 | 1.03389 | 1.03643 | 1.03895 |
| 50 | 400 | 1.01947 | 1.02211 | 1.02474 | 1.02734 | 1.02992 | 1.03248 |
| 60 | 400 | 1.01261 | 1.01532 | 1.01801 | 1.02067 | 1.02330 | 1.02591 |
| 70 | 400 | 1.00558 | 1.00837 | 1.01113 | 1.01385 | 1.01655 | 1.01922 |
| 80 | 400 | .99836 | 1.00123 | 1.00407 | 1.00687 | 1.00964 | 1.01238 |
| 90 | 400 | .99092 | .99389 | .99682 | .99970 | 1.00256 | 1.00537 |
| 100 | 400 | .98324 | .98631 | .98934 | .99232 | .99527 | .99817 |
| 110 | 400 | .97530 | .97848 | .98162 | .98470 | .98775 | .99075 |
| 120 | 400 | .96708 | .97038 | .97363 | .97683 | .97998 | .98309 |
| 130 | 400 | .95854 | .96197 | .96535 | .96867 | .97195 | .97517 |
| 140 | 400 | .94968 | .95325 | .95676 | .96022 | .96362 | .96697 |
| 150 | 400 | .94046 | .94418 | .94784 | .95144 | .95497 | .95845 |
| 160 | 400 | .93088 | .93475 | .93856 | .94231 | .94599 | .94962 |
| 170 | 400 | .92090 | .92494 | .92891 | .93282 | .93666 | .94043 |
| 180 | 400 | .91050 | .91472 | .91887 | .92294 | .92694 | .93088 |
| 190 | 400 | .89967 | .90408 | .90840 | .91265 | .91683 | .92093 |
| 200 | 400 | .88839 | .89298 | .89750 | .90193 | .90629 | .91057 |
| 210 | 400 | .87663 | .88142 | .88613 | .89076 | .89531 | .89978 |
| 220 | 400 | .86437 | .86938 | .87429 | .87913 | .88387 | .88854 |
| 230 | 400 | .85160 | .85682 | .86195 | .86700 | .87195 | .87682 |
| 240 | 400 | .83829 | .84374 | .84910 | .85436 | .85953 | .86461 |
| 250 | 400 | .82442 | .83011 | .83570 | .84119 | .84659 | .85189 |
| 260 | 400 | .80998 | .81592 | .82175 | .82748 | .83311 | .83864 |
| 270 | 400 | .79495 | .80114 | .80722 | .81319 | .81907 | .82484 |
| 280 | 400 | .77930 | .78575 | .79209 | .79832 | .80445 | .81046 |
| 290 | 400 | .76302 | .76975 | .77635 | .78285 | .78923 | .79550 |
| 300 | 400 | .74610 | .75310 | .75998 | .76674 | .77339 | .77993 |
| 310 | 400 | .72850 | .73579 | .74295 | .75000 | .75693 | .76373 |
| 320 | 400 | .71022 | .71780 | .72526 | .73259 | .73980 | .74689 |
| 330 | 400 | .69124 | .69912 | .70688 | .71451 | .72201 | .72939 |
| 340 | 400 | .67153 | .67973 | .68779 | .69573 | .70353 | .71121 |
| 350 | 400 | .65109 | .65960 | .66798 | .67623 | .68434 | .69232 |

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#####
# Aqueous      #
# Solutions    #
# Database     #
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April 1983
NaCl Solutions

Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | .1 | .2 | .3 | .4 | .5 |
| 0 | 500 | 1.05750 | 1.05996 | 1.06242 | 1.06487 | 1.06733 | 1.06979 |
| 10 | 500 | 1.05118 | 1.05365 | 1.05611 | 1.05856 | 1.06102 | 1.06347 |
| 20 | 500 | 1.04483 | 1.04731 | 1.04979 | 1.05226 | 1.05472 | 1.05717 |
| 30 | 500 | 1.03842 | 1.04093 | 1.04343 | 1.04592 | 1.04840 | 1.05087 |
| 40 | 500 | 1.03194 | 1.03449 | 1.03702 | 1.03954 | 1.04205 | 1.04454 |
| 50 | 500 | 1.02535 | 1.02795 | 1.03052 | 1.03308 | 1.03562 | 1.03815 |
| 60 | 500 | 1.01863 | 1.02129 | 1.02392 | 1.02653 | 1.02911 | 1.03168 |
| 70 | 500 | 1.01177 | 1.01449 | 1.01718 | 1.01985 | 1.02249 | 1.02511 |
| 80 | 500 | 1.00473 | 1.00753 | 1.01029 | 1.01303 | 1.01573 | 1.01841 |
| 90 | 500 | .99749 | 1.00038 | 1.00322 | 1.00604 | 1.00881 | 1.01156 |
| 100 | 500 | .99004 | .99302 | .99595 | .99885 | 1.00171 | 1.00454 |
| 110 | 500 | .98234 | .98542 | .98846 | .99145 | .99441 | .99732 |
| 120 | 500 | .97438 | .97757 | .98072 | .98382 | .98688 | .98989 |
| 130 | 500 | .96613 | .96945 | .97271 | .97592 | .97909 | .98221 |
| 140 | 500 | .95757 | .96102 | .96441 | .96775 | .97104 | .97427 |
| 150 | 500 | .94868 | .95227 | .95580 | .95927 | .96269 | .96605 |
| 160 | 500 | .93944 | .94318 | .94685 | .95047 | .95402 | .95751 |
| 170 | 500 | .92983 | .93372 | .93755 | .94131 | .94501 | .94865 |
| 180 | 500 | .91982 | .92388 | .92787 | .93180 | .93565 | .93944 |
| 190 | 500 | .90940 | .91364 | .91780 | .92189 | .92591 | .92986 |
| 200 | 500 | .89854 | .90296 | .90730 | .91157 | .91577 | .91989 |
| 210 | 500 | .88722 | .89184 | .89637 | .90083 | .90520 | .90950 |
| 220 | 500 | .87543 | .88025 | .88498 | .88963 | .89420 | .89868 |
| 230 | 500 | .86314 | .86817 | .87311 | .87796 | .88273 | .88741 |
| 240 | 500 | .85033 | .85558 | .86074 | .86580 | .87078 | .87566 |
| 250 | 500 | .83699 | .84247 | .84785 | .85313 | .85833 | .86343 |
| 260 | 500 | .82309 | .82881 | .83442 | .83993 | .84535 | .85068 |
| 270 | 500 | .80862 | .81458 | .82043 | .82619 | .83184 | .83739 |
| 280 | 500 | .79356 | .79977 | .80587 | .81187 | .81777 | .82356 |
| 290 | 500 | .77788 | .78435 | .79071 | .79697 | .80311 | .80915 |
| 300 | 500 | .76157 | .76831 | .77494 | .78146 | .78787 | .79416 |
| 310 | 500 | .74461 | .75163 | .75854 | .76533 | .77200 | .77856 |
| 320 | 500 | .72698 | .73429 | .74148 | .74855 | .75550 | .76233 |
| 330 | 500 | .70867 | .71628 | .72376 | .73112 | .73835 | .74546 |
| 340 | 500 | .68966 | .69757 | .70535 | .71300 | .72053 | .72793 |
| 350 | 500 | .66992 | .67814 | .68623 | .69419 | .70202 | .70972 |

* Aqueous *
* Solutions *
* Database *

Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | .1 | .2 | .3 | .4 | .5 |
| 0 | 600 | 1.06300 | 1.06546 | 1.06792 | 1.07038 | 1.07285 | 1.07532 |
| 10 | 600 | 1.05670 | 1.05915 | 1.06161 | 1.06406 | 1.06652 | 1.06898 |
| 20 | 600 | 1.05038 | 1.05285 | 1.05531 | 1.05777 | 1.06022 | 1.06268 |
| 30 | 600 | 1.04403 | 1.04652 | 1.04900 | 1.05147 | 1.05393 | 1.05639 |
| 40 | 600 | 1.03763 | 1.04014 | 1.04265 | 1.04514 | 1.04762 | 1.05009 |
| 50 | 600 | 1.03114 | 1.03369 | 1.03623 | 1.03876 | 1.04127 | 1.04376 |
| 60 | 600 | 1.02455 | 1.02715 | 1.02973 | 1.03230 | 1.03484 | 1.03737 |
| 70 | 600 | 1.01782 | 1.02049 | 1.02312 | 1.02574 | 1.02833 | 1.03090 |
| 80 | 600 | 1.01095 | 1.01368 | 1.01638 | 1.01906 | 1.02170 | 1.02433 |
| 90 | 600 | 1.00390 | 1.00671 | 1.00948 | 1.01222 | 1.01494 | 1.01762 |
| 100 | 600 | .99665 | .99954 | 1.00240 | 1.00522 | 1.00801 | 1.01077 |
| 110 | 600 | .98918 | .99217 | .99512 | .99803 | 1.00090 | 1.00373 |
| 120 | 600 | .98146 | .98456 | .98761 | .99061 | .99358 | .99650 |
| 130 | 600 | .97348 | .97669 | .97985 | .98296 | .98603 | .98905 |
| 140 | 600 | .96521 | .96854 | .97182 | .97505 | .97823 | .98136 |
| 150 | 600 | .95663 | .96010 | .96350 | .96685 | .97015 | .97340 |
| 160 | 600 | .94772 | .95132 | .95487 | .95835 | .96178 | .96516 |
| 170 | 600 | .93846 | .94221 | .94590 | .94953 | .95309 | .95660 |
| 180 | 600 | .92882 | .93273 | .93657 | .94035 | .94407 | .94772 |
| 190 | 600 | .91878 | .92286 | .92687 | .93081 | .93468 | .93849 |
| 200 | 600 | .90833 | .91259 | .91677 | .92087 | .92491 | .92888 |
| 210 | 600 | .89744 | .90188 | .90625 | .91053 | .91474 | .91888 |
| 220 | 600 | .88610 | .89073 | .89528 | .89976 | .90415 | .90847 |
| 230 | 600 | .87428 | .87911 | .88386 | .88853 | .89312 | .89762 |
| 240 | 600 | .86196 | .86700 | .87196 | .87684 | .88162 | .88632 |
| 250 | 600 | .84912 | .85439 | .85956 | .86465 | .86964 | .87455 |
| 260 | 600 | .83575 | .84124 | .84665 | .85195 | .85716 | .86228 |
| 270 | 600 | .82182 | .82755 | .83319 | .83872 | .84416 | .84951 |
| 280 | 600 | .80732 | .81330 | .81917 | .82495 | .83062 | .83619 |
| 290 | 600 | .79222 | .79845 | .80458 | .81060 | .81652 | .82233 |
| 300 | 600 | .77651 | .78301 | .78939 | .79567 | .80184 | .80790 |
| 310 | 600 | .76017 | .76694 | .77359 | .78013 | .78656 | .79288 |
| 320 | 600 | .74318 | .75023 | .75716 | .76397 | .77067 | .77725 |
| 330 | 600 | .72553 | .73286 | .74008 | .74717 | .75414 | .76100 |
| 340 | 600 | .70719 | .71482 | .72233 | .72971 | .73696 | .74410 |
| 350 | 600 | .68815 | .69608 | .70389 | .71156 | .71911 | .72654 |

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#####
# Aqueous      #
# Solutions    #
# Database     #
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April 1983
NaCl Solutions

Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | .1 | .2 | .3 | .4 | .5 |
| 0 | 700 | 1.06852 | 1.07099 | 1.07346 | 1.07593 | 1.07842 | 1.08091 |
| 10 | 700 | 1.06221 | 1.06467 | 1.06713 | 1.06959 | 1.07205 | 1.07452 |
| 20 | 700 | 1.05591 | 1.05837 | 1.06083 | 1.06328 | 1.06574 | 1.06819 |
| 30 | 700 | 1.04960 | 1.05207 | 1.05454 | 1.05700 | 1.05945 | 1.06190 |
| 40 | 700 | 1.04326 | 1.04575 | 1.04823 | 1.05070 | 1.05317 | 1.05563 |
| 50 | 700 | 1.03685 | 1.03938 | 1.04188 | 1.04438 | 1.04686 | 1.04934 |
| 60 | 700 | 1.03036 | 1.03293 | 1.03547 | 1.03800 | 1.04051 | 1.04301 |
| 70 | 700 | 1.02377 | 1.02638 | 1.02897 | 1.03154 | 1.03409 | 1.03662 |
| 80 | 700 | 1.01704 | 1.01971 | 1.02235 | 1.02497 | 1.02757 | 1.03015 |
| 90 | 700 | 1.01015 | 1.01289 | 1.01560 | 1.01829 | 1.02094 | 1.02357 |
| 100 | 700 | 1.00309 | 1.00591 | 1.00869 | 1.01145 | 1.01417 | 1.01686 |
| 110 | 700 | .99583 | .99873 | 1.00160 | 1.00443 | 1.00723 | 1.00999 |
| 120 | 700 | .98835 | .99135 | .99430 | .99722 | 1.00011 | 1.00295 |
| 130 | 700 | .98061 | .98372 | .98678 | .98980 | .99277 | .99571 |
| 140 | 700 | .97262 | .97583 | .97901 | .98213 | .98521 | .98825 |
| 150 | 700 | .96433 | .96767 | .97096 | .97420 | .97739 | .98054 |
| 160 | 700 | .95573 | .95920 | .96262 | .96599 | .96930 | .97256 |
| 170 | 700 | .94679 | .95041 | .95397 | .95747 | .96091 | .96430 |
| 180 | 700 | .93750 | .94127 | .94497 | .94862 | .95220 | .95572 |
| 190 | 700 | .92784 | .93177 | .93563 | .93942 | .94315 | .94682 |
| 200 | 700 | .91778 | .92187 | .92590 | .92985 | .93374 | .93756 |
| 210 | 700 | .90730 | .91157 | .91577 | .91990 | .92395 | .92793 |
| 220 | 700 | .89639 | .90084 | .90522 | .90953 | .91376 | .91791 |
| 230 | 700 | .88501 | .88967 | .89424 | .89873 | .90314 | .90748 |
| 240 | 700 | .87316 | .87802 | .88279 | .88748 | .89208 | .89660 |
| 250 | 700 | .86082 | .86589 | .87086 | .87575 | .88056 | .88528 |
| 260 | 700 | .84795 | .85324 | .85844 | .86354 | .86855 | .87348 |
| 270 | 700 | .83455 | .84007 | .84549 | .85082 | .85605 | .86119 |
| 280 | 700 | .82060 | .82635 | .83201 | .83756 | .84302 | .84838 |
| 290 | 700 | .80607 | .81207 | .81796 | .82376 | .82945 | .83505 |
| 300 | 700 | .79094 | .79720 | .80334 | .80939 | .81532 | .82116 |
| 310 | 700 | .77521 | .78172 | .78813 | .79443 | .80062 | .80670 |
| 320 | 700 | .75884 | .76563 | .77230 | .77886 | .78531 | .79165 |
| 330 | 700 | .74182 | .74889 | .75584 | .76268 | .76940 | .77600 |
| 340 | 700 | .72414 | .73150 | .73874 | .74585 | .75284 | .75972 |
| 350 | 700 | .70578 | .71343 | .72096 | .72836 | .73564 | .74280 |

 Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | .1 | .2 | .3 | .4 | .5 |
| 0 | 800 | 1.07408 | 1.07656 | 1.07905 | 1.08154 | 1.08405 | 1.08657 |
| 10 | 800 | 1.06774 | 1.07021 | 1.07268 | 1.07515 | 1.07763 | 1.08012 |
| 20 | 800 | 1.06144 | 1.06390 | 1.06636 | 1.06882 | 1.07128 | 1.07375 |
| 30 | 800 | 1.05515 | 1.05761 | 1.06007 | 1.06253 | 1.06498 | 1.06744 |
| 40 | 800 | 1.04885 | 1.05132 | 1.05379 | 1.05625 | 1.05870 | 1.06116 |
| 50 | 800 | 1.04251 | 1.04500 | 1.04749 | 1.04996 | 1.05243 | 1.05489 |
| 60 | 800 | 1.03611 | 1.03863 | 1.04114 | 1.04364 | 1.04613 | 1.04860 |
| 70 | 800 | 1.02961 | 1.03218 | 1.03473 | 1.03726 | 1.03978 | 1.04228 |
| 80 | 800 | 1.02301 | 1.02563 | 1.02823 | 1.03080 | 1.03336 | 1.03590 |
| 90 | 800 | 1.01628 | 1.01896 | 1.02161 | 1.02423 | 1.02684 | 1.02942 |
| 100 | 800 | 1.00939 | 1.01213 | 1.01485 | 1.01754 | 1.02020 | 1.02284 |
| 110 | 800 | 1.00231 | 1.00514 | 1.00793 | 1.01069 | 1.01342 | 1.01612 |
| 120 | 800 | .99504 | .99795 | 1.00083 | 1.00367 | 1.00647 | 1.00925 |
| 130 | 800 | .98754 | .99055 | .99352 | .99645 | .99934 | 1.00220 |
| 140 | 800 | .97979 | .98291 | .98598 | .98901 | .99200 | .99494 |
| 150 | 800 | .97178 | .97501 | .97819 | .98133 | .98442 | .98746 |
| 160 | 800 | .96347 | .96682 | .97013 | .97338 | .97658 | .97974 |
| 170 | 800 | .95485 | .95834 | .96177 | .96515 | .96847 | .97175 |
| 180 | 800 | .94589 | .94952 | .95310 | .95661 | .96007 | .96347 |
| 190 | 800 | .93658 | .94037 | .94408 | .94774 | .95134 | .95488 |
| 200 | 800 | .92690 | .93084 | .93471 | .93852 | .94227 | .94595 |
| 210 | 800 | .91681 | .92092 | .92496 | .92893 | .93284 | .93667 |
| 220 | 800 | .90631 | .91060 | .91481 | .91895 | .92302 | .92702 |
| 230 | 800 | .89537 | .89985 | .90424 | .90856 | .91281 | .91698 |
| 240 | 800 | .88397 | .88864 | .89323 | .89774 | .90217 | .90652 |
| 250 | 800 | .87210 | .87697 | .88176 | .88646 | .89109 | .89563 |
| 260 | 800 | .85972 | .86481 | .86981 | .87472 | .87954 | .88428 |
| 270 | 800 | .84683 | .85214 | .85736 | .86248 | .86751 | .87245 |
| 280 | 800 | .83341 | .83894 | .84438 | .84973 | .85498 | .86014 |
| 290 | 800 | .81942 | .82520 | .83087 | .83645 | .84193 | .84731 |
| 300 | 800 | .80487 | .81089 | .81681 | .82262 | .82833 | .83395 |
| 310 | 800 | .78972 | .79600 | .80216 | .80822 | .81418 | .82003 |
| 320 | 800 | .77396 | .78050 | .78693 | .79324 | .79945 | .80555 |
| 330 | 800 | .75757 | .76438 | .77107 | .77766 | .78412 | .79048 |
| 340 | 800 | .74053 | .74762 | .75459 | .76145 | .76818 | .77481 |
| 350 | 800 | .72283 | .73020 | .73746 | .74459 | .75161 | .75851 |

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#####
# Aqueous      #
# Solutions    #
# Database     #
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April 1983
NaCl Solutions

Appendix.Density of NaCl solutions,g/cm3,at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | .1 | .2 | .3 | .4 | .5 |
| 0 | 900 | 1.07969 | 1.08219 | 1.08470 | 1.08723 | 1.08977 | 1.09233 |
| 10 | 900 | 1.07331 | 1.07579 | 1.07827 | 1.08077 | 1.08327 | 1.08579 |
| 20 | 900 | 1.06699 | 1.06945 | 1.07192 | 1.07439 | 1.07687 | 1.07935 |
| 30 | 900 | 1.06070 | 1.06316 | 1.06561 | 1.06807 | 1.07053 | 1.07300 |
| 40 | 900 | 1.05442 | 1.05688 | 1.05934 | 1.06179 | 1.06425 | 1.06670 |
| 50 | 900 | 1.04812 | 1.05060 | 1.05307 | 1.05553 | 1.05798 | 1.06044 |
| 60 | 900 | 1.04178 | 1.04428 | 1.04677 | 1.04925 | 1.05171 | 1.05418 |
| 70 | 900 | 1.03538 | 1.03791 | 1.04043 | 1.04293 | 1.04542 | 1.04790 |
| 80 | 900 | 1.02889 | 1.03146 | 1.03401 | 1.03655 | 1.03907 | 1.04158 |
| 90 | 900 | 1.02228 | 1.02491 | 1.02751 | 1.03009 | 1.03265 | 1.03519 |
| 100 | 900 | 1.01554 | 1.01823 | 1.02089 | 1.02352 | 1.02613 | 1.02872 |
| 110 | 900 | 1.00864 | 1.01140 | 1.01412 | 1.01682 | 1.01949 | 1.02213 |
| 120 | 900 | 1.00156 | 1.00439 | 1.00719 | 1.00996 | 1.01270 | 1.01541 |
| 130 | 900 | .99427 | .99720 | 1.00008 | 1.00293 | 1.00575 | 1.00853 |
| 140 | 900 | .98676 | .98978 | .99276 | .99570 | .99860 | 1.00147 |
| 150 | 900 | .97900 | .98213 | .98521 | .98825 | .99124 | .99420 |
| 160 | 900 | .97097 | .97421 | .97740 | .98055 | .98365 | .98671 |
| 170 | 900 | .96264 | .96601 | .96933 | .97259 | .97580 | .97897 |
| 180 | 900 | .95400 | .95750 | .96095 | .96434 | .96768 | .97096 |
| 190 | 900 | .94503 | .94867 | .95226 | .95578 | .95925 | .96267 |
| 200 | 900 | .93570 | .93949 | .94323 | .94690 | .95051 | .95406 |
| 210 | 900 | .92599 | .92995 | .93384 | .93766 | .94142 | .94512 |
| 220 | 900 | .91588 | .92001 | .92406 | .92805 | .93197 | .93582 |
| 230 | 900 | .90536 | .90966 | .91389 | .91805 | .92213 | .92615 |
| 240 | 900 | .89439 | .89889 | .90330 | .90764 | .91190 | .91608 |
| 250 | 900 | .88297 | .88766 | .89227 | .89679 | .90124 | .90560 |
| 260 | 900 | .87107 | .87597 | .88077 | .88549 | .89013 | .89469 |
| 270 | 900 | .85868 | .86378 | .86880 | .87372 | .87856 | .88332 |
| 280 | 900 | .84576 | .85109 | .85632 | .86146 | .86651 | .87147 |
| 290 | 900 | .83231 | .83787 | .84333 | .84869 | .85396 | .85913 |
| 300 | 900 | .81831 | .82410 | .82979 | .83539 | .84088 | .84628 |
| 310 | 900 | .80373 | .80977 | .81570 | .82154 | .82727 | .83290 |
| 320 | 900 | .78856 | .79485 | .80104 | .80712 | .81309 | .81897 |
| 330 | 900 | .77277 | .77933 | .78578 | .79211 | .79834 | .80446 |
| 340 | 900 | .75636 | .76319 | .76991 | .77651 | .78299 | .78937 |
| 350 | 900 | .73930 | .74641 | .75340 | .76028 | .76703 | .77368 |


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#####
# Aqueous   #
# Solutions #
# Database  #
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Appendix.Density of NaCl solutions,g/cm³,at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | .1 | .2 | .3 | .4 | .5 |
| 0 | 1000 | 1.08536 | 1.08790 | 1.09044 | 1.09301 | 1.09559 | 1.09819 |
| 10 | 1000 | 1.07892 | 1.08142 | 1.08393 | 1.08646 | 1.08899 | 1.09154 |
| 20 | 1000 | 1.07256 | 1.07504 | 1.07752 | 1.08001 | 1.08252 | 1.08503 |
| 30 | 1000 | 1.06626 | 1.06872 | 1.07119 | 1.07365 | 1.07613 | 1.07861 |
| 40 | 1000 | 1.05998 | 1.06244 | 1.06490 | 1.06735 | 1.06981 | 1.07228 |
| 50 | 1000 | 1.05371 | 1.05617 | 1.05863 | 1.06109 | 1.06354 | 1.06599 |
| 60 | 1000 | 1.04742 | 1.04990 | 1.05236 | 1.05483 | 1.05728 | 1.05974 |
| 70 | 1000 | 1.04108 | 1.04358 | 1.04607 | 1.04855 | 1.05102 | 1.05349 |
| 80 | 1000 | 1.03468 | 1.03722 | 1.03973 | 1.04224 | 1.04473 | 1.04721 |
| 90 | 1000 | 1.02819 | 1.03076 | 1.03332 | 1.03586 | 1.03839 | 1.04090 |
| 100 | 1000 | 1.02158 | 1.02421 | 1.02681 | 1.02940 | 1.03197 | 1.03451 |
| 110 | 1000 | 1.01483 | 1.01752 | 1.02019 | 1.02283 | 1.02544 | 1.02804 |
| 120 | 1000 | 1.00792 | 1.01069 | 1.01342 | 1.01612 | 1.01880 | 1.02145 |
| 130 | 1000 | 1.00083 | 1.00367 | 1.00648 | 1.00926 | 1.01200 | 1.01472 |
| 140 | 1000 | .99353 | .99647 | .99936 | 1.00222 | 1.00504 | 1.00783 |
| 150 | 1000 | .98601 | .98904 | .99203 | .99498 | .99789 | 1.00076 |
| 160 | 1000 | .97823 | .98137 | .98446 | .98751 | .99052 | .99349 |
| 170 | 1000 | .97019 | .97344 | .97665 | .97980 | .98292 | .98598 |
| 180 | 1000 | .96184 | .96522 | .96855 | .97183 | .97505 | .97823 |
| 190 | 1000 | .95319 | .95670 | .96016 | .96356 | .96691 | .97021 |
| 200 | 1000 | .94419 | .94785 | .95145 | .95499 | .95847 | .96190 |
| 210 | 1000 | .93484 | .93865 | .94240 | .94609 | .94971 | .95327 |
| 220 | 1000 | .92512 | .92909 | .93299 | .93683 | .94060 | .94431 |
| 230 | 1000 | .91499 | .91913 | .92320 | .92720 | .93113 | .93500 |
| 240 | 1000 | .90444 | .90876 | .91301 | .91718 | .92128 | .92531 |
| 250 | 1000 | .89346 | .89797 | .90240 | .90675 | .91102 | .91522 |
| 260 | 1000 | .88202 | .88672 | .89134 | .89588 | .90034 | .90473 |
| 270 | 1000 | .87010 | .87500 | .87983 | .88456 | .88922 | .89379 |
| 280 | 1000 | .85768 | .86280 | .86783 | .87277 | .87763 | .88240 |
| 290 | 1000 | .84474 | .85008 | .85533 | .86049 | .86556 | .87054 |
| 300 | 1000 | .83127 | .83684 | .84232 | .84770 | .85298 | .85818 |
| 310 | 1000 | .81724 | .82305 | .82877 | .83438 | .83989 | .84531 |
| 320 | 1000 | .80264 | .80870 | .81465 | .82051 | .82625 | .83190 |
| 330 | 1000 | .78745 | .79376 | .79997 | .80607 | .81206 | .81795 |
| 340 | 1000 | .77165 | .77822 | .78469 | .79104 | .79729 | .80343 |
| 350 | 1000 | .75522 | .76207 | .76880 | .77542 | .78192 | .78832 |

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#####
# Aqueous   #
# Solutions #
# Database  #
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April 1983
NaCl Solutions

Density of NaCl solutions,g/cm 3,at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 1 | 1.02977 | 1.05478 | 1.07929 | 1.10473 | 1.13250 | 1.16397 |
| 5 | 1 | 1.02644 | 1.05162 | 1.07609 | 1.10131 | 1.12869 | 1.15958 |
| 10 | 1 | 1.02309 | 1.04844 | 1.07291 | 1.09794 | 1.12494 | 1.15528 |
| 15 | 1 | 1.01970 | 1.04526 | 1.06975 | 1.09461 | 1.12126 | 1.15107 |
| 20 | 1 | 1.01628 | 1.04207 | 1.06660 | 1.09132 | 1.11764 | 1.14694 |
| 25 | 1 | 1.01281 | 1.03886 | 1.06345 | 1.08805 | 1.11407 | 1.14289 |
| 30 | 1 | 1.00931 | 1.03563 | 1.06031 | 1.08481 | 1.11055 | 1.13891 |
| 35 | 1 | 1.00575 | 1.03237 | 1.05717 | 1.08160 | 1.10709 | 1.13501 |
| 40 | 1 | 1.00215 | 1.02909 | 1.05403 | 1.07841 | 1.10367 | 1.13119 |
| 45 | 1 | .99849 | 1.02579 | 1.05088 | 1.07524 | 1.10029 | 1.12742 |
| 50 | 1 | .99478 | 1.02245 | 1.04773 | 1.07209 | 1.09696 | 1.12372 |
| 55 | 1 | .99102 | 1.01908 | 1.04456 | 1.06895 | 1.09365 | 1.12008 |
| 60 | 1 | .98719 | 1.01567 | 1.04139 | 1.06581 | 1.09039 | 1.11650 |
| 65 | 1 | .98330 | 1.01222 | 1.03819 | 1.06269 | 1.08715 | 1.11297 |
| 70 | 1 | .97934 | 1.00872 | 1.03498 | 1.05957 | 1.08394 | 1.10949 |
| 75 | 1 | .97531 | 1.00519 | 1.03174 | 1.05645 | 1.08076 | 1.10606 |
| 80 | 1 | .97121 | 1.00160 | 1.02848 | 1.05333 | 1.07759 | 1.10268 |
| 85 | 1 | .96703 | .99796 | 1.02518 | 1.05020 | 1.07445 | 1.09933 |
| 90 | 1 | .96278 | .99426 | 1.02186 | 1.04706 | 1.07132 | 1.09603 |
| 95 | 1 | .95845 | .99051 | 1.01851 | 1.04392 | 1.06820 | 1.09276 |
| 100 | 1 | .95403 | .98670 | 1.01511 | 1.04076 | 1.06509 | 1.08952 |

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#####
# Aqueous #
# Solutions #
# Database #
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April 1983
NaCl Solutions

Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 10 | 1.03028 | 1.05527 | 1.07978 | 1.10526 | 1.13309 | 1.16465 |
| 5 | 10 | 1.02696 | 1.05211 | 1.07659 | 1.10184 | 1.12927 | 1.16025 |
| 10 | 10 | 1.02361 | 1.04894 | 1.07341 | 1.09846 | 1.12552 | 1.15594 |
| 15 | 10 | 1.02023 | 1.04576 | 1.07024 | 1.09513 | 1.12183 | 1.15171 |
| 20 | 10 | 1.01681 | 1.04256 | 1.06708 | 1.09182 | 1.11820 | 1.14757 |
| 25 | 10 | 1.01336 | 1.03936 | 1.06394 | 1.08855 | 1.11462 | 1.14351 |
| 30 | 10 | 1.00985 | 1.03613 | 1.06080 | 1.08531 | 1.11110 | 1.13953 |
| 35 | 10 | 1.00631 | 1.03288 | 1.05766 | 1.08210 | 1.10762 | 1.13562 |
| 40 | 10 | 1.00271 | 1.02961 | 1.05452 | 1.07891 | 1.10420 | 1.13177 |
| 45 | 10 | .99907 | 1.02630 | 1.05137 | 1.07573 | 1.10082 | 1.12800 |
| 50 | 10 | .99537 | 1.02297 | 1.04822 | 1.07258 | 1.09747 | 1.12429 |
| 55 | 10 | .99161 | 1.01961 | 1.04506 | 1.06944 | 1.09417 | 1.12064 |
| 60 | 10 | .98779 | 1.01620 | 1.04188 | 1.06630 | 1.09090 | 1.11705 |
| 65 | 10 | .98391 | 1.01276 | 1.03869 | 1.06318 | 1.08766 | 1.11352 |
| 70 | 10 | .97996 | 1.00927 | 1.03548 | 1.06006 | 1.08444 | 1.11003 |
| 75 | 10 | .97595 | 1.00574 | 1.03225 | 1.05694 | 1.08125 | 1.10660 |
| 80 | 10 | .97186 | 1.00216 | 1.02899 | 1.05382 | 1.07809 | 1.10320 |
| 85 | 10 | .96769 | .99853 | 1.02570 | 1.05069 | 1.07494 | 1.09985 |
| 90 | 10 | .96346 | .99485 | 1.02239 | 1.04756 | 1.07181 | 1.09654 |
| 95 | 10 | .95914 | .99111 | 1.01903 | 1.04441 | 1.06869 | 1.09327 |
| 100 | 10 | .95473 | .98730 | 1.01565 | 1.04125 | 1.06558 | 1.09003 |
| 105 | 10 | .95024 | .98344 | 1.01222 | 1.03808 | 1.06247 | 1.08681 |
| 110 | 10 | .94567 | .97951 | 1.00875 | 1.03489 | 1.05937 | 1.08363 |
| 115 | 10 | .94100 | .97551 | 1.00523 | 1.03167 | 1.05627 | 1.08046 |
| 120 | 10 | .93624 | .97144 | 1.00167 | 1.02843 | 1.05317 | 1.07732 |
| 125 | 10 | .93138 | .96730 | .99806 | 1.02516 | 1.05006 | 1.07420 |
| 130 | 10 | .92642 | .96308 | .99439 | 1.02186 | 1.04695 | 1.07109 |
| 135 | 10 | .92136 | .95878 | .99066 | 1.01852 | 1.04382 | 1.06799 |
| 140 | 10 | .91620 | .95440 | .98688 | 1.01515 | 1.04068 | 1.06490 |
| 145 | 10 | .91093 | .94993 | .98303 | 1.01174 | 1.03752 | 1.06182 |
| 150 | 10 | .90555 | .94538 | .97912 | 1.00828 | 1.03434 | 1.05874 |
| 155 | 10 | .90005 | .94074 | .97514 | 1.00479 | 1.03114 | 1.05566 |
| 160 | 10 | .89444 | .93600 | .97109 | 1.00124 | 1.02792 | 1.05258 |
| 165 | 10 | .88872 | .93117 | .96697 | .99764 | 1.02466 | 1.04949 |
| 170 | 10 | .88287 | .92624 | .96277 | .99399 | 1.02138 | 1.04639 |
| 175 | 10 | .87690 | .92121 | .95850 | .99028 | 1.01806 | 1.04328 |

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#####
# Aqueous      #
# Solutions    #
# Database     #
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April 1983
NaCl Solutions

.Density of NaCl solutions,g/cm 3,at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 20 | 1.03084 | 1.05581 | 1.08033 | 1.10585 | 1.13376 | 1.16542 |
| 5 | 20 | 1.02753 | 1.05265 | 1.07713 | 1.10242 | 1.12993 | 1.16100 |
| 10 | 20 | 1.02419 | 1.04948 | 1.07395 | 1.09904 | 1.12616 | 1.15668 |
| 15 | 20 | 1.02082 | 1.04631 | 1.07078 | 1.09570 | 1.12246 | 1.15244 |
| 20 | 20 | 1.01741 | 1.04312 | 1.06763 | 1.09239 | 1.11882 | 1.14828 |
| 25 | 20 | 1.01396 | 1.03991 | 1.06448 | 1.08912 | 1.11523 | 1.14421 |
| 30 | 20 | 1.01046 | 1.03669 | 1.06134 | 1.08587 | 1.11170 | 1.14021 |
| 35 | 20 | 1.00693 | 1.03344 | 1.05820 | 1.08265 | 1.10822 | 1.13629 |
| 40 | 20 | 1.00334 | 1.03017 | 1.05506 | 1.07946 | 1.10479 | 1.13243 |
| 45 | 20 | .99970 | 1.02688 | 1.05192 | 1.07628 | 1.10140 | 1.12865 |
| 50 | 20 | .99601 | 1.02355 | 1.04877 | 1.07312 | 1.09805 | 1.12493 |
| 55 | 20 | .99227 | 1.02019 | 1.04561 | 1.06998 | 1.09474 | 1.12127 |
| 60 | 20 | .98846 | 1.01680 | 1.04243 | 1.06685 | 1.09146 | 1.11767 |
| 65 | 20 | .98459 | 1.01336 | 1.03925 | 1.06372 | 1.08822 | 1.11413 |
| 70 | 20 | .98065 | 1.00988 | 1.03604 | 1.06060 | 1.08500 | 1.11063 |
| 75 | 20 | .97665 | 1.00636 | 1.03281 | 1.05748 | 1.08181 | 1.10719 |
| 80 | 20 | .97257 | 1.00279 | 1.02956 | 1.05436 | 1.07864 | 1.10379 |
| 85 | 20 | .96843 | .99917 | 1.02628 | 1.05124 | 1.07549 | 1.10044 |
| 90 | 20 | .96420 | .99549 | 1.02297 | 1.04810 | 1.07235 | 1.09712 |
| 95 | 20 | .95990 | .99176 | 1.01962 | 1.04496 | 1.06923 | 1.09384 |
| 100 | 20 | .95551 | .98797 | 1.01624 | 1.04181 | 1.06612 | 1.09059 |
| 105 | 20 | .95104 | .98412 | 1.01282 | 1.03864 | 1.06301 | 1.08737 |
| 110 | 20 | .94648 | .98020 | 1.00936 | 1.03545 | 1.05991 | 1.08418 |
| 115 | 20 | .94182 | .97622 | 1.00585 | 1.03223 | 1.05682 | 1.08102 |
| 120 | 20 | .93708 | .97216 | 1.00230 | 1.02900 | 1.05371 | 1.07787 |
| 125 | 20 | .93224 | .96803 | .99870 | 1.02573 | 1.05061 | 1.07475 |
| 130 | 20 | .92730 | .96383 | .99504 | 1.02244 | 1.04749 | 1.07163 |
| 135 | 20 | .92226 | .95954 | .99132 | 1.01911 | 1.04437 | 1.06854 |
| 140 | 20 | .91711 | .95518 | .98755 | 1.01574 | 1.04123 | 1.06545 |
| 145 | 20 | .91186 | .95073 | .98372 | 1.01234 | 1.03808 | 1.06236 |
| 150 | 20 | .90650 | .94619 | .97982 | 1.00890 | 1.03491 | 1.05928 |
| 155 | 20 | .90103 | .94156 | .97585 | 1.00541 | 1.03171 | 1.05620 |
| 160 | 20 | .89544 | .93685 | .97181 | 1.00187 | 1.02849 | 1.05312 |
| 165 | 20 | .88974 | .93203 | .96771 | .99828 | 1.02524 | 1.05003 |
| 170 | 20 | .88391 | .92712 | .96352 | .99464 | 1.02196 | 1.04694 |
| 175 | 20 | .87797 | .92211 | .95926 | .99094 | 1.01865 | 1.04383 |

 Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 100 | 1.03536 | 1.06016 | 1.08478 | 1.11064 | 1.13914 | 1.17165 |
| 10 | 100 | 1.02879 | 1.05385 | 1.07834 | 1.10372 | 1.13137 | 1.16266 |
| 20 | 100 | 1.02211 | 1.04752 | 1.07199 | 1.09697 | 1.12386 | 1.15404 |
| 30 | 100 | 1.01528 | 1.04114 | 1.06569 | 1.09037 | 1.11660 | 1.14576 |
| 40 | 100 | 1.00829 | 1.03470 | 1.05941 | 1.08389 | 1.10956 | 1.13779 |
| 50 | 100 | 1.00112 | 1.02816 | 1.05314 | 1.07751 | 1.10271 | 1.13011 |
| 60 | 100 | .99373 | 1.02151 | 1.04684 | 1.07120 | 1.09603 | 1.12269 |
| 70 | 100 | .98611 | 1.01471 | 1.04050 | 1.06495 | 1.08949 | 1.11551 |
| 80 | 100 | .97824 | 1.00776 | 1.03409 | 1.05871 | 1.08306 | 1.10854 |
| 90 | 100 | .97008 | 1.00061 | 1.02758 | 1.05248 | 1.07673 | 1.10176 |
| 100 | 100 | .96162 | .99326 | 1.02096 | 1.04622 | 1.07048 | 1.09514 |
| 110 | 100 | .95284 | .98567 | 1.01420 | 1.03991 | 1.06426 | 1.08866 |
| 120 | 100 | .94371 | .97783 | 1.00728 | 1.03353 | 1.05807 | 1.08229 |
| 130 | 100 | .93422 | .96972 | 1.00016 | 1.02706 | 1.05187 | 1.07601 |
| 140 | 100 | .92433 | .96130 | .99285 | 1.02047 | 1.04565 | 1.06980 |
| 150 | 100 | .91403 | .95256 | .98530 | 1.01374 | 1.03938 | 1.06363 |
| 160 | 100 | .90330 | .94349 | .97750 | 1.00685 | 1.03303 | 1.05747 |
| 170 | 100 | .89212 | .93404 | .96942 | .99978 | 1.02659 | 1.05132 |
| 180 | 100 | .88047 | .92421 | .96105 | .99249 | 1.02004 | 1.04513 |
| 190 | 100 | .86832 | .91398 | .95236 | .98498 | 1.01334 | 1.03889 |
| 200 | 100 | .85565 | .90332 | .94333 | .97722 | 1.00649 | 1.03258 |
| 210 | 100 | .84245 | .89221 | .93395 | .96919 | .99945 | 1.02618 |
| 220 | 100 | .82870 | .88064 | .92418 | .96087 | .99220 | 1.01966 |
| 230 | 100 | .81437 | .86858 | .91401 | .95223 | .98473 | 1.01300 |
| 240 | 100 | .79945 | .85601 | .90343 | .94326 | .97701 | 1.00618 |
| 250 | 100 | .78392 | .84291 | .89240 | .93393 | .96903 | .99918 |
| 260 | 100 | .76775 | .82927 | .88091 | .92423 | .96075 | .99197 |
| 270 | 100 | .75094 | .81507 | .86894 | .91413 | .95217 | .98454 |
| 280 | 100 | .73345 | .80028 | .85647 | .90362 | .94325 | .97687 |
| 290 | 100 | .71528 | .78488 | .84348 | .89267 | .93399 | .96893 |
| 300 | 100 | .69641 | .76886 | .82996 | .88127 | .92435 | .96071 |
| 310 | 100 | .67681 | .75221 | .81587 | .86940 | .91433 | .95218 |

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# Aqueous      #
# Solutions    #
# Database     #
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April 1983
NaCl Solutions

Appendix.Density of NaCl solutions,g/cm3,at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 200 | 1.04095 | 1.06561 | 1.09040 | | | |
| 10 | 200 | 1.03447 | 1.05930 | 1.08389 | | | |
| 20 | 200 | 1.02789 | 1.05300 | 1.07748 | | | |
| 30 | 200 | 1.02120 | 1.04667 | 1.07114 | 1.09608 | 1.12288 | 1.15291 |
| 40 | 200 | 1.01437 | 1.04029 | 1.06485 | 1.08950 | 1.11566 | 1.14469 |
| 50 | 200 | 1.00737 | 1.03385 | 1.05859 | 1.08305 | 1.10865 | 1.13677 |
| 60 | 200 | 1.00018 | 1.02731 | 1.05232 | 1.07669 | 1.10183 | 1.12914 |
| 70 | 200 | .99277 | 1.02064 | 1.04603 | 1.07040 | 1.09518 | 1.12176 |
| 80 | 200 | .98513 | 1.01384 | 1.03969 | 1.06416 | 1.08867 | 1.11462 |
| 90 | 200 | .97723 | 1.00687 | 1.03328 | 1.05793 | 1.08227 | 1.10769 |
| 100 | 200 | .96905 | .99971 | 1.02677 | 1.05170 | 1.07596 | 1.10093 |
| 110 | 200 | .96057 | .99234 | 1.02014 | 1.04545 | 1.06971 | 1.09434 |
| 120 | 200 | .95176 | .98474 | 1.01337 | 1.03914 | 1.06351 | 1.08789 |
| 130 | 200 | .94260 | .97688 | 1.00644 | 1.03277 | 1.05733 | 1.08154 |
| 140 | 200 | .93307 | .96874 | .99931 | 1.02629 | 1.05114 | 1.07528 |
| 150 | 200 | .92315 | .96030 | .99198 | 1.01970 | 1.04492 | 1.06908 |
| 160 | 200 | .91282 | .95154 | .98441 | 1.01296 | 1.03865 | 1.06292 |
| 170 | 200 | .90206 | .94243 | .97659 | 1.00606 | 1.03231 | 1.05677 |
| 180 | 200 | .89084 | .93296 | .96850 | .99897 | 1.02586 | 1.05062 |
| 190 | 200 | .87914 | .92310 | .96010 | .99167 | 1.01930 | 1.04444 |
| 200 | 200 | .86696 | .91284 | .95139 | .98415 | 1.01260 | 1.03821 |
| 210 | 200 | .85425 | .90215 | .94234 | .97637 | 1.00574 | 1.03190 |
| 220 | 200 | .84102 | .89101 | .93293 | .96832 | .99869 | 1.02549 |
| 230 | 200 | .82722 | .87940 | .92313 | .95997 | .99143 | 1.01897 |
| 240 | 200 | .81286 | .86730 | .91294 | .95132 | .98395 | 1.01230 |
| 250 | 200 | .79790 | .85470 | .90232 | .94232 | .97621 | 1.00547 |
| 260 | 200 | .78232 | .84157 | .89126 | .93297 | .96821 | .99846 |
| 270 | 200 | .76612 | .82789 | .87975 | .92324 | .95992 | .99125 |
| 280 | 200 | .74926 | .81365 | .86775 | .91312 | .95131 | .98380 |
| 290 | 200 | .73174 | .79882 | .85525 | .90259 | .94238 | .97612 |
| 300 | 200 | .71353 | .78339 | .84223 | .89161 | .93309 | .96816 |
| 310 | 200 | .69461 | .76734 | .82867 | .88019 | .92344 | .95992 |
| 320 | 200 | .67497 | .75065 | .81456 | .86829 | .91339 | .95138 |
| 330 | 200 | .65460 | .73330 | .79987 | .85589 | .90293 | .94251 |
| 340 | 200 | .63346 | .71527 | .78458 | .84299 | .89205 | .93329 |
| 350 | 200 | .61155 | .69655 | .76869 | .82955 | .88072 | .92370 |

Aqueous #
Solutions #
Database #
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Appendix.Density of NaCl solutions,g/cm3,at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 300 | 1.04649 | 1.07108 | 1.09613 | | | |
| 10 | 300 | 1.04008 | 1.06476 | 1.08952 | | | |
| 20 | 300 | 1.03360 | 1.05846 | 1.08303 | | | |
| 30 | 300 | 1.02702 | 1.05217 | 1.07664 | 1.10190 | 1.12934 | 1.16033 |
| 40 | 300 | 1.02032 | 1.04584 | 1.07032 | 1.09522 | 1.12193 | 1.15183 |
| 50 | 300 | 1.01348 | 1.03947 | 1.06405 | 1.08867 | 1.11474 | 1.14365 |
| 60 | 300 | 1.00646 | 1.03302 | 1.05779 | 1.08224 | 1.10777 | 1.13578 |
| 70 | 300 | .99926 | 1.02647 | 1.05153 | 1.07590 | 1.10099 | 1.12819 |
| 80 | 300 | .99183 | 1.01981 | 1.04525 | 1.06962 | 1.09436 | 1.12086 |
| 90 | 300 | .98418 | 1.01299 | 1.03891 | 1.06339 | 1.08787 | 1.11376 |
| 100 | 300 | .97625 | 1.00601 | 1.03249 | 1.05718 | 1.08150 | 1.10686 |
| 110 | 300 | .96805 | .99884 | 1.02598 | 1.05096 | 1.07520 | 1.10014 |
| 120 | 300 | .95954 | .99146 | 1.01935 | 1.04470 | 1.06898 | 1.09357 |
| 130 | 300 | .95070 | .98383 | 1.01257 | 1.03840 | 1.06279 | 1.08714 |
| 140 | 300 | .94152 | .97595 | 1.00562 | 1.03202 | 1.05661 | 1.08081 |
| 150 | 300 | .93196 | .96779 | .99849 | 1.02554 | 1.05043 | 1.07457 |
| 160 | 300 | .92201 | .95933 | .99114 | 1.01894 | 1.04422 | 1.06838 |
| 170 | 300 | .91164 | .95054 | .98355 | 1.01220 | 1.03795 | 1.06223 |
| 180 | 300 | .90085 | .94141 | .97572 | 1.00529 | 1.03160 | 1.05610 |
| 190 | 300 | .88959 | .93191 | .96760 | .99819 | 1.02516 | 1.04995 |
| 200 | 300 | .87787 | .92202 | .95919 | .99088 | 1.01859 | 1.04378 |
| 210 | 300 | .86564 | .91173 | .95045 | .98334 | 1.01189 | 1.03755 |
| 220 | 300 | .85290 | .90101 | .94138 | .97555 | 1.00501 | 1.03124 |
| 230 | 300 | .83963 | .88984 | .93194 | .96748 | .99795 | 1.02483 |
| 240 | 300 | .82580 | .87820 | .92212 | .95911 | .99068 | 1.01830 |
| 250 | 300 | .81139 | .86607 | .91190 | .95043 | .98319 | 1.01163 |
| 260 | 300 | .79639 | .85343 | .90126 | .94142 | .97544 | 1.00479 |
| 270 | 300 | .78078 | .84027 | .89017 | .93205 | .96742 | .99777 |
| 280 | 300 | .76454 | .82656 | .87862 | .92230 | .95911 | .99055 |
| 290 | 300 | .74765 | .81229 | .86660 | .91215 | .95049 | .98310 |
| 300 | 300 | .73009 | .79743 | .85407 | .90159 | .94154 | .97540 |
| 310 | 300 | .71184 | .78196 | .84102 | .89059 | .93223 | .96743 |
| 320 | 300 | .69289 | .76588 | .82743 | .87914 | .92255 | .95917 |
| 330 | 300 | .67322 | .74915 | .81329 | .86722 | .91249 | .95061 |
| 340 | 300 | .65280 | .73177 | .79857 | .85480 | .90201 | .94172 |
| 350 | 300 | .63163 | .71371 | .78326 | .84187 | .89111 | .93249 |

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# Aqueous   #
# Solutions #
# Database  #
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NaCl Solutions

Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 400 | 1.05200 | 1.07659 | 1.10197 | | | |
| 10 | 400 | 1.04565 | 1.07024 | 1.09525 | | | |
| 20 | 400 | 1.03924 | 1.06394 | 1.08867 | | | |
| 30 | 400 | 1.03276 | 1.05765 | 1.08220 | 1.10786 | 1.13601 | 1.16803 |
| 40 | 400 | 1.02617 | 1.05136 | 1.07583 | 1.10104 | 1.12838 | 1.15922 |
| 50 | 400 | 1.01947 | 1.04504 | 1.06953 | 1.09438 | 1.12101 | 1.15077 |
| 60 | 400 | 1.01261 | 1.03867 | 1.06327 | 1.08786 | 1.11386 | 1.14265 |
| 70 | 400 | 1.00558 | 1.03222 | 1.05702 | 1.08145 | 1.10693 | 1.13483 |
| 80 | 400 | .99836 | 1.02567 | 1.05077 | 1.07513 | 1.10017 | 1.12729 |
| 90 | 400 | .99092 | 1.01899 | 1.04449 | 1.06887 | 1.09357 | 1.11999 |
| 100 | 400 | .98324 | 1.01217 | 1.03815 | 1.06265 | 1.08711 | 1.11292 |
| 110 | 400 | .97530 | 1.00518 | 1.03173 | 1.05644 | 1.08075 | 1.10606 |
| 120 | 400 | .96708 | .99799 | 1.02522 | 1.05023 | 1.07448 | 1.09936 |
| 130 | 400 | .95854 | .99059 | 1.01858 | 1.04398 | 1.06826 | 1.09283 |
| 140 | 400 | .94968 | .98295 | 1.01179 | 1.03768 | 1.06209 | 1.08641 |
| 150 | 400 | .94046 | .97505 | 1.00483 | 1.03130 | 1.05592 | 1.08011 |
| 160 | 400 | .93088 | .96687 | .99768 | 1.02482 | 1.04974 | 1.07388 |
| 170 | 400 | .92090 | .95839 | .99032 | 1.01822 | 1.04353 | 1.06771 |
| 180 | 400 | .91050 | .94957 | .98272 | 1.01146 | 1.03727 | 1.06157 |
| 190 | 400 | .89967 | .94042 | .97487 | 1.00454 | 1.03092 | 1.05545 |
| 200 | 400 | .88839 | .93089 | .96673 | .99743 | 1.02448 | 1.04931 |
| 210 | 400 | .87663 | .92098 | .95830 | .99011 | 1.01791 | 1.04314 |
| 220 | 400 | .86437 | .91066 | .94954 | .98256 | 1.01119 | 1.03691 |
| 230 | 400 | .85160 | .89991 | .94045 | .97475 | 1.00431 | 1.03060 |
| 240 | 400 | .83829 | .88871 | .93099 | .96666 | .99724 | 1.02419 |
| 250 | 400 | .82442 | .87704 | .92114 | .95828 | .98996 | 1.01766 |
| 260 | 400 | .80998 | .86488 | .91090 | .94959 | .98245 | 1.01098 |
| 270 | 400 | .79495 | .85222 | .90023 | .94055 | .97469 | 1.00414 |
| 280 | 400 | .77930 | .83902 | .88912 | .93116 | .96666 | .99711 |
| 290 | 400 | .76302 | .82528 | .87755 | .92139 | .95834 | .98988 |
| 300 | 400 | .74610 | .81097 | .86549 | .91122 | .94970 | .98241 |
| 310 | 400 | .72850 | .79608 | .85294 | .90064 | .94073 | .97470 |
| 320 | 400 | .71022 | .78059 | .83986 | .88962 | .93140 | .96672 |
| 330 | 400 | .69124 | .76447 | .82625 | .87814 | .92171 | .95846 |
| 340 | 400 | .67153 | .74772 | .81208 | .86619 | .91162 | .94988 |
| 350 | 400 | .65109 | .73031 | .79733 | .85375 | .90113 | .94098 |

Aqueous #
Solutions #
Database #
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Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 500 | 1.05750 | 1.08217 | 1.10794 | | | |
| 10 | 500 | 1.05118 | 1.07576 | 1.10108 | | | |
| 20 | 500 | 1.04483 | 1.06943 | 1.09439 | | | |
| 30 | 500 | 1.03842 | 1.06314 | 1.08784 | 1.11397 | 1.14291 | 1.17602 |
| 40 | 500 | 1.03194 | 1.05686 | 1.08140 | 1.10699 | 1.13504 | 1.16690 |
| 50 | 500 | 1.02535 | 1.05058 | 1.07505 | 1.10020 | 1.12745 | 1.15816 |
| 60 | 500 | 1.01863 | 1.04426 | 1.06876 | 1.09357 | 1.12012 | 1.14976 |
| 70 | 500 | 1.01177 | 1.03789 | 1.06251 | 1.08708 | 1.11301 | 1.14169 |
| 80 | 500 | 1.00473 | 1.03144 | 1.05627 | 1.08069 | 1.10611 | 1.13391 |
| 90 | 500 | .99749 | 1.02488 | 1.05003 | 1.07438 | 1.09938 | 1.12641 |
| 100 | 500 | .99004 | 1.01820 | 1.04375 | 1.06814 | 1.09281 | 1.11915 |
| 110 | 500 | .98234 | 1.01137 | 1.03741 | 1.06193 | 1.08637 | 1.11212 |
| 120 | 500 | .97438 | 1.00437 | 1.03100 | 1.05574 | 1.08003 | 1.10528 |
| 130 | 500 | .96613 | .99717 | 1.02448 | 1.04953 | 1.07377 | 1.09862 |
| 140 | 500 | .95757 | .98976 | 1.01783 | 1.04329 | 1.06758 | 1.09211 |
| 150 | 500 | .94868 | .98210 | 1.01103 | 1.03699 | 1.06141 | 1.08572 |
| 160 | 500 | .93944 | .97418 | 1.00407 | 1.03061 | 1.05525 | 1.07943 |
| 170 | 500 | .92983 | .96598 | .99691 | 1.02412 | 1.04908 | 1.07322 |
| 180 | 500 | .91982 | .95747 | .98953 | 1.01751 | 1.04288 | 1.06706 |
| 190 | 500 | .90940 | .94864 | .98192 | 1.01075 | 1.03661 | 1.06094 |
| 200 | 500 | .89854 | .93946 | .97405 | 1.00383 | 1.03027 | 1.05482 |
| 210 | 500 | .88722 | .92991 | .96590 | .99671 | 1.02382 | 1.04869 |
| 220 | 500 | .87543 | .91997 | .95744 | .98937 | 1.01725 | 1.04252 |
| 230 | 500 | .86314 | .90962 | .94867 | .98180 | 1.01053 | 1.03629 |
| 240 | 500 | .85033 | .89885 | .93955 | .97398 | 1.00364 | 1.02999 |
| 250 | 500 | .83699 | .88762 | .93007 | .96588 | .99656 | 1.02357 |
| 260 | 500 | .82309 | .87592 | .92020 | .95748 | .98927 | 1.01704 |
| 270 | 500 | .80862 | .86374 | .90993 | .94877 | .98175 | 1.01036 |
| 280 | 500 | .79356 | .85104 | .89924 | .93971 | .97398 | 1.00351 |
| 290 | 500 | .77788 | .83782 | .88811 | .93030 | .96593 | .99648 |
| 300 | 500 | .76157 | .82405 | .87651 | .92051 | .95759 | .98923 |
| 310 | 500 | .74461 | .80972 | .86443 | .91033 | .94894 | .98176 |
| 320 | 500 | .72698 | .79480 | .85185 | .89972 | .93995 | .97404 |
| 330 | 500 | .70867 | .77927 | .83875 | .88868 | .93061 | .96605 |
| 340 | 500 | .68966 | .76313 | .82511 | .87719 | .92090 | .95777 |
| 350 | 500 | .66992 | .74635 | .81092 | .86522 | .91080 | .94918 |

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#####
# Aqueous #
# Solutions #
# Database #
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NaCl Solutions

Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 600 | 1.06300 | 1.08782 | 1.11406 | | | |
| 10 | 600 | 1.05670 | 1.08134 | 1.10705 | | | |
| 20 | 600 | 1.05038 | 1.07496 | 1.10023 | | | |
| 30 | 600 | 1.04403 | 1.06864 | 1.09357 | 1.12024 | 1.15004 | 1.18434 |
| 40 | 600 | 1.03763 | 1.06236 | 1.08704 | 1.11309 | 1.14192 | 1.17488 |
| 50 | 600 | 1.03114 | 1.05609 | 1.08062 | 1.10616 | 1.13410 | 1.16582 |
| 60 | 600 | 1.02455 | 1.04982 | 1.07429 | 1.09940 | 1.12655 | 1.15713 |
| 70 | 600 | 1.01782 | 1.04351 | 1.06801 | 1.09279 | 1.11926 | 1.14878 |
| 80 | 600 | 1.01095 | 1.03714 | 1.06177 | 1.08632 | 1.11219 | 1.14076 |
| 90 | 600 | 1.00390 | 1.03068 | 1.05555 | 1.07995 | 1.10532 | 1.13303 |
| 100 | 600 | .99665 | 1.02412 | 1.04931 | 1.07367 | 1.09862 | 1.12556 |
| 110 | 600 | .98918 | 1.01744 | 1.04303 | 1.06744 | 1.09208 | 1.11835 |
| 120 | 600 | .98146 | 1.01060 | 1.03670 | 1.06124 | 1.08566 | 1.11135 |
| 130 | 600 | .97348 | 1.00359 | 1.03028 | 1.05505 | 1.07934 | 1.10454 |
| 140 | 600 | .96521 | .99637 | 1.02376 | 1.04885 | 1.07310 | 1.09790 |
| 150 | 600 | .95663 | .98894 | 1.01711 | 1.04261 | 1.06691 | 1.09141 |
| 160 | 600 | .94772 | .98127 | 1.01031 | 1.03631 | 1.06076 | 1.08505 |
| 170 | 600 | .93846 | .97334 | 1.00333 | 1.02993 | 1.05461 | 1.07878 |
| 180 | 600 | .92882 | .96512 | .99616 | 1.02345 | 1.04845 | 1.07258 |
| 190 | 600 | .91878 | .95659 | .98877 | 1.01683 | 1.04224 | 1.06644 |
| 200 | 600 | .90833 | .94774 | .98114 | 1.01007 | 1.03598 | 1.06032 |
| 210 | 600 | .89744 | .93853 | .97326 | 1.00313 | 1.02964 | 1.05422 |
| 220 | 600 | .88610 | .92896 | .96509 | .99600 | 1.02319 | 1.04809 |
| 230 | 600 | .87428 | .91900 | .95662 | .98866 | 1.01661 | 1.04193 |
| 240 | 600 | .86196 | .90863 | .94782 | .98108 | 1.00989 | 1.03570 |
| 250 | 600 | .84912 | .89783 | .93869 | .97324 | 1.00299 | 1.02940 |
| 260 | 600 | .83575 | .88657 | .92918 | .96513 | .99591 | 1.02298 |
| 270 | 600 | .82182 | .87485 | .91930 | .95671 | .98861 | 1.01645 |
| 280 | 600 | .80732 | .86264 | .90901 | .94798 | .98108 | 1.00976 |
| 290 | 600 | .79222 | .84992 | .89829 | .93891 | .97329 | 1.00291 |
| 300 | 600 | .77651 | .83667 | .88714 | .92948 | .96523 | .99587 |
| 310 | 600 | .76017 | .82287 | .87552 | .91968 | .95688 | .98861 |
| 320 | 600 | .74318 | .80851 | .86341 | .90947 | .94821 | .98113 |
| 330 | 600 | .72553 | .79356 | .85081 | .89885 | .93921 | .97340 |
| 340 | 600 | .70719 | .77802 | .83769 | .88779 | .92986 | .96540 |
| 350 | 600 | .68815 | .76185 | .82403 | .87627 | .92013 | .95711 |

Aqueous #
Solutions #
Database #
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Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 700 | 1.06852 | 1.09356 | 1.12036 | | | |
| 10 | 700 | 1.06221 | 1.08700 | 1.11317 | | | |
| 20 | 700 | 1.05591 | 1.08055 | 1.10620 | | | |
| 30 | 700 | 1.04960 | 1.07418 | 1.09941 | 1.12670 | 1.15744 | 1.19298 |
| 40 | 700 | 1.04326 | 1.06788 | 1.09277 | 1.11936 | 1.14904 | 1.18317 |
| 50 | 700 | 1.03685 | 1.06161 | 1.08627 | 1.11225 | 1.14097 | 1.17377 |
| 60 | 700 | 1.03036 | 1.05535 | 1.07987 | 1.10535 | 1.13319 | 1.16477 |
| 70 | 700 | 1.02377 | 1.04908 | 1.07355 | 1.09862 | 1.12569 | 1.15613 |
| 80 | 700 | 1.01704 | 1.04277 | 1.06729 | 1.09204 | 1.11843 | 1.14784 |
| 90 | 700 | 1.01015 | 1.03640 | 1.06106 | 1.08559 | 1.11140 | 1.13986 |
| 100 | 700 | 1.00309 | 1.02995 | 1.05485 | 1.07924 | 1.10456 | 1.13217 |
| 110 | 700 | .99583 | 1.02339 | 1.04861 | 1.07297 | 1.09789 | 1.12475 |
| 120 | 700 | .98835 | 1.01670 | 1.04234 | 1.06676 | 1.09137 | 1.11757 |
| 130 | 700 | .98061 | 1.00985 | 1.03601 | 1.06057 | 1.08497 | 1.11060 |
| 140 | 700 | .97262 | 1.00283 | 1.02959 | 1.05439 | 1.07867 | 1.10383 |
| 150 | 700 | .96433 | .99560 | 1.02307 | 1.04820 | 1.07244 | 1.09722 |
| 160 | 700 | .95573 | .98816 | 1.01641 | 1.04196 | 1.06627 | 1.09075 |
| 170 | 700 | .94679 | .98047 | 1.00960 | 1.03567 | 1.06013 | 1.08440 |
| 180 | 700 | .93750 | .97252 | 1.00262 | 1.02928 | 1.05399 | 1.07815 |
| 190 | 700 | .92784 | .96429 | .99544 | 1.02280 | 1.04783 | 1.07197 |
| 200 | 700 | .91778 | .95574 | .98804 | 1.01618 | 1.04164 | 1.06584 |
| 210 | 700 | .90730 | .94687 | .98040 | 1.00941 | 1.03538 | 1.05974 |
| 220 | 700 | .89639 | .93764 | .97249 | 1.00246 | 1.02903 | 1.05364 |
| 230 | 700 | .88501 | .92805 | .96431 | .99533 | 1.02258 | 1.04752 |
| 240 | 700 | .87316 | .91806 | .95582 | .98797 | 1.01600 | 1.04136 |
| 250 | 700 | .86082 | .90767 | .94701 | .98038 | 1.00927 | 1.03514 |
| 260 | 700 | .84795 | .89684 | .93786 | .97253 | 1.00237 | 1.02883 |
| 270 | 700 | .83455 | .88557 | .92834 | .96440 | .99528 | 1.02242 |
| 280 | 700 | .82060 | .87382 | .91843 | .95598 | .98797 | 1.01588 |
| 290 | 700 | .80607 | .86158 | .90812 | .94723 | .98043 | 1.00919 |
| 300 | 700 | .79094 | .84884 | .89739 | .93814 | .97263 | 1.00233 |
| 310 | 700 | .77521 | .83556 | .88621 | .92870 | .96456 | .99528 |
| 320 | 700 | .75884 | .82174 | .87457 | .91887 | .95620 | .98803 |
| 330 | 700 | .74182 | .80736 | .86244 | .90865 | .94752 | .98054 |
| 340 | 700 | .72414 | .79239 | .84982 | .89801 | .93850 | .97280 |
| 350 | 700 | .70578 | .77682 | .83668 | .88694 | .92914 | .96479 |

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# Aqueous      #
# Solutions    #
# Database     #
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April 1983
NaCl Solutions

Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|--|
| | | 0 | 1 | 2 | 3 | 4 | 5 | |
| 0 | 800 | 1.07408 | 1.09941 | 1.12683 | | | | |
| 10 | 800 | 1.06774 | 1.09274 | 1.11946 | | | | |
| 20 | 800 | 1.06144 | 1.08621 | 1.11231 | | | | |
| 30 | 800 | 1.05515 | 1.07978 | 1.10537 | 1.13336 | 1.16511 | 1.20199 | |
| 40 | 800 | 1.04885 | 1.07343 | 1.09861 | 1.12581 | 1.15642 | 1.19179 | |
| 50 | 800 | 1.04251 | 1.06714 | 1.09200 | 1.11851 | 1.14808 | 1.18204 | |
| 60 | 800 | 1.03611 | 1.06089 | 1.08552 | 1.11144 | 1.14005 | 1.17271 | |
| 70 | 800 | 1.02961 | 1.05464 | 1.07914 | 1.10457 | 1.13232 | 1.16376 | |
| 80 | 800 | 1.02301 | 1.04837 | 1.07284 | 1.09787 | 1.12486 | 1.15518 | |
| 90 | 800 | 1.01628 | 1.04207 | 1.06659 | 1.09131 | 1.11764 | 1.14693 | |
| 100 | 800 | 1.00939 | 1.03570 | 1.06038 | 1.08489 | 1.11063 | 1.13900 | |
| 110 | 800 | 1.00231 | 1.02924 | 1.05417 | 1.07856 | 1.10382 | 1.13135 | |
| 120 | 800 | .99504 | 1.02268 | 1.04794 | 1.07230 | 1.09718 | 1.12397 | |
| 130 | 800 | .98754 | 1.01598 | 1.04168 | 1.06610 | 1.09068 | 1.11682 | |
| 140 | 800 | .97979 | 1.00912 | 1.03534 | 1.05993 | 1.08431 | 1.10989 | |
| 150 | 800 | .97178 | 1.00209 | 1.02893 | 1.05376 | 1.07803 | 1.10314 | |
| 160 | 800 | .96347 | .99486 | 1.02240 | 1.04757 | 1.07182 | 1.09655 | |
| 170 | 800 | .95485 | .98740 | 1.01574 | 1.04134 | 1.06566 | 1.09011 | |
| 180 | 800 | .94589 | .97970 | 1.00892 | 1.03504 | 1.05952 | 1.08378 | |
| 190 | 800 | .93658 | .97174 | 1.00193 | 1.02866 | 1.05339 | 1.07755 | |
| 200 | 800 | .92690 | .96348 | .99474 | 1.02217 | 1.04724 | 1.07138 | |
| 210 | 800 | .91681 | .95492 | .98733 | 1.01555 | 1.04105 | 1.06527 | |
| 220 | 800 | .90631 | .94603 | .97968 | 1.00877 | 1.03479 | 1.05917 | |
| 230 | 800 | .89537 | .93678 | .97176 | 1.00182 | 1.02845 | 1.05308 | |
| 240 | 800 | .88397 | .92717 | .96356 | .99468 | 1.02200 | 1.04697 | |
| 250 | 800 | .87210 | .91717 | .95506 | .98731 | 1.01541 | 1.04081 | |
| 260 | 800 | .85972 | .90675 | .94623 | .97971 | 1.00868 | 1.03459 | |
| 270 | 800 | .84683 | .89590 | .93706 | .97185 | 1.00177 | 1.02829 | |
| 280 | 800 | .83341 | .88460 | .92752 | .96371 | .99467 | 1.02188 | |
| 290 | 800 | .81942 | .87283 | .91760 | .95527 | .98736 | 1.01533 | |
| 300 | 800 | .80487 | .86058 | .90727 | .94651 | .97981 | 1.00864 | |
| 310 | 800 | .78972 | .84781 | .89652 | .93741 | .97201 | 1.00178 | |
| 320 | 800 | .77396 | .83451 | .88532 | .92795 | .96392 | .99473 | |
| 330 | 800 | .75757 | .82067 | .87366 | .91811 | .95555 | .98746 | |
| 340 | 800 | .74053 | .80626 | .86152 | .90787 | .94686 | .97997 | |
| 350 | 800 | .72283 | .79127 | .84888 | .89722 | .93783 | .97222 | |

 # Aqueous #
 # Solutions #
 # Database #
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April 1983
 NaCl Solutions

 Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 900 | 1.07969 | 1.10539 | 1.13352 | | | |
| 10 | 900 | 1.07331 | 1.09860 | 1.12593 | | | |
| 20 | 900 | 1.06699 | 1.09196 | 1.11859 | | | |
| 30 | 900 | 1.06070 | 1.08544 | 1.11148 | 1.14024 | 1.17308 | 1.21136 |
| 40 | 900 | 1.05442 | 1.07903 | 1.10458 | 1.13246 | 1.16408 | 1.20077 |
| 50 | 900 | 1.04812 | 1.07270 | 1.09784 | 1.12496 | 1.15544 | 1.19065 |
| 60 | 900 | 1.04178 | 1.06643 | 1.09126 | 1.11770 | 1.14715 | 1.18096 |
| 70 | 900 | 1.03538 | 1.06018 | 1.08480 | 1.11066 | 1.13917 | 1.17169 |
| 80 | 900 | 1.02889 | 1.05394 | 1.07844 | 1.10382 | 1.13148 | 1.16279 |
| 90 | 900 | 1.02228 | 1.04768 | 1.07215 | 1.09714 | 1.12406 | 1.15426 |
| 100 | 900 | 1.01554 | 1.04138 | 1.06592 | 1.09061 | 1.11687 | 1.14606 |
| 110 | 900 | 1.00864 | 1.03502 | 1.05972 | 1.08421 | 1.10990 | 1.13817 |
| 120 | 900 | 1.00156 | 1.02856 | 1.05352 | 1.07790 | 1.10312 | 1.13057 |
| 130 | 900 | .99427 | 1.02199 | 1.04730 | 1.07166 | 1.09650 | 1.12322 |
| 140 | 900 | .98676 | 1.01529 | 1.04103 | 1.06547 | 1.09003 | 1.11610 |
| 150 | 900 | .97900 | 1.00843 | 1.03470 | 1.05930 | 1.08367 | 1.10920 |
| 160 | 900 | .97097 | 1.00138 | 1.02828 | 1.05314 | 1.07741 | 1.10248 |
| 170 | 900 | .96264 | .99414 | 1.02175 | 1.04696 | 1.07121 | 1.09592 |
| 180 | 900 | .95400 | .98667 | 1.01509 | 1.04073 | 1.06507 | 1.08950 |
| 190 | 900 | .94503 | .97896 | 1.00827 | 1.03444 | 1.05894 | 1.08319 |
| 200 | 900 | .93570 | .97098 | 1.00127 | 1.02806 | 1.05282 | 1.07697 |
| 210 | 900 | .92599 | .96271 | .99407 | 1.02157 | 1.04668 | 1.07082 |
| 220 | 900 | .91588 | .95413 | .98665 | 1.01494 | 1.04049 | 1.06472 |
| 230 | 900 | .90536 | .94522 | .97898 | 1.00816 | 1.03423 | 1.05863 |
| 240 | 900 | .89439 | .93596 | .97106 | 1.00121 | 1.02789 | 1.05255 |
| 250 | 900 | .88297 | .92633 | .96285 | .99405 | 1.02144 | 1.04644 |
| 260 | 900 | .87107 | .91630 | .95433 | .98668 | 1.01485 | 1.04029 |
| 270 | 900 | .85868 | .90587 | .94549 | .97907 | 1.00812 | 1.03408 |
| 280 | 900 | .84576 | .89500 | .93630 | .97120 | 1.00120 | 1.02777 |
| 290 | 900 | .83231 | .88368 | .92675 | .96305 | .99410 | 1.02136 |
| 300 | 900 | .81831 | .87189 | .91681 | .95460 | .98678 | 1.01482 |
| 310 | 900 | .80373 | .85961 | .90646 | .94583 | .97922 | 1.00812 |
| 320 | 900 | .78856 | .84683 | .89569 | .93671 | .97141 | 1.00126 |
| 330 | 900 | .77277 | .83351 | .88448 | .92724 | .96332 | .99420 |
| 340 | 900 | .75636 | .81965 | .87280 | .91739 | .95493 | .98693 |
| 350 | 900 | .73930 | .80522 | .86064 | .90713 | .94623 | .97943 |

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# Aqueous      #
# Solutions    #
# Database     #
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April 1983
NaCl Solutions

Appendix. Density of NaCl solutions, g/cm³, at molal concentration shown

| TEMP DEG C | PRES BARS | MOLAL CONCENTRATION | | | | | |
|---------------|--------------|---------------------|---------|---------|---------|---------|---------|
| | | 0 | 1 | 2 | 3 | 4 | 5 |
| 0 | 1000 | 1.08536 | 1.11152 | 1.14042 | | | |
| 10 | 1000 | 1.07892 | 1.10458 | 1.13260 | | | |
| 20 | 1000 | 1.07256 | 1.09781 | 1.12506 | | | |
| 30 | 1000 | 1.06626 | 1.09120 | 1.11776 | 1.14736 | 1.18137 | 1.22113 |
| 40 | 1000 | 1.05998 | 1.08471 | 1.11068 | 1.13933 | 1.17204 | 1.21013 |
| 50 | 1000 | 1.05371 | 1.07832 | 1.10381 | 1.13160 | 1.16309 | 1.19961 |
| 60 | 1000 | 1.04742 | 1.07200 | 1.09710 | 1.12414 | 1.15450 | 1.18955 |
| 70 | 1000 | 1.04108 | 1.06574 | 1.09054 | 1.11691 | 1.14626 | 1.17992 |
| 80 | 1000 | 1.03468 | 1.05951 | 1.08410 | 1.10991 | 1.13832 | 1.17070 |
| 90 | 1000 | 1.02819 | 1.05327 | 1.07776 | 1.10309 | 1.13067 | 1.16186 |
| 100 | 1000 | 1.02158 | 1.04702 | 1.07149 | 1.09645 | 1.12329 | 1.15338 |
| 110 | 1000 | 1.01483 | 1.04072 | 1.06528 | 1.08994 | 1.11613 | 1.14523 |
| 120 | 1000 | 1.00792 | 1.03436 | 1.05908 | 1.08355 | 1.10919 | 1.13738 |
| 130 | 1000 | 1.00083 | 1.02790 | 1.05289 | 1.07726 | 1.10244 | 1.12981 |
| 140 | 1000 | .99353 | 1.02133 | 1.04667 | 1.07104 | 1.09585 | 1.12250 |
| 150 | 1000 | .98601 | 1.01462 | 1.04041 | 1.06486 | 1.08940 | 1.11542 |
| 160 | 1000 | .97823 | 1.00775 | 1.03409 | 1.05871 | 1.08306 | 1.10854 |
| 170 | 1000 | .97019 | 1.00070 | 1.02767 | 1.05256 | 1.07681 | 1.10185 |
| 180 | 1000 | .96184 | .99345 | 1.02113 | 1.04638 | 1.07063 | 1.09531 |
| 190 | 1000 | .95319 | .98597 | 1.01446 | 1.04016 | 1.06450 | 1.08891 |
| 200 | 1000 | .94419 | .97825 | 1.00764 | 1.03387 | 1.05839 | 1.08262 |
| 210 | 1000 | .93484 | .97025 | 1.00063 | 1.02748 | 1.05227 | 1.07642 |
| 220 | 1000 | .92512 | .96197 | .99343 | 1.02099 | 1.04613 | 1.07028 |
| 230 | 1000 | .91499 | .95337 | .98600 | 1.01436 | 1.03995 | 1.06419 |
| 240 | 1000 | .90444 | .94445 | .97832 | 1.00758 | 1.03370 | 1.05812 |
| 250 | 1000 | .89346 | .93517 | .97038 | 1.00062 | 1.02736 | 1.05204 |
| 260 | 1000 | .88202 | .92552 | .96216 | .99346 | 1.02090 | 1.04594 |
| 270 | 1000 | .87010 | .91548 | .95363 | .98608 | 1.01432 | 1.03979 |
| 280 | 1000 | .85768 | .90503 | .94478 | .97846 | 1.00758 | 1.03358 |
| 290 | 1000 | .84474 | .89414 | .93557 | .97058 | 1.00066 | 1.02728 |
| 300 | 1000 | .83127 | .88280 | .92601 | .96242 | .99355 | 1.02087 |
| 310 | 1000 | .81724 | .87100 | .91605 | .95396 | .98622 | 1.01432 |
| 320 | 1000 | .80264 | .85870 | .90569 | .94517 | .97866 | 1.00763 |
| 330 | 1000 | .78745 | .84589 | .89491 | .93605 | .97084 | 1.00076 |
| 340 | 1000 | .77165 | .83256 | .88368 | .92656 | .96274 | .99370 |
| 350 | 1000 | .75522 | .81868 | .87199 | .91670 | .95435 | .98643 |

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