

## ADJUSTING WATER WITH SALTS

It is important to note that calcium chloride is very hygroscopic (it absorbs water) and must be kept in a well-sealed container. You will note that there are two types of calcium chloride listed: anhydrous (no water) and dihydrate (two molecules of water per molecule of  $\text{CaCl}_2$ ). If you leave the anhydrous type out exposed to air, it will absorb water and quickly become the dihydrate. The dihydrate will absorb even more water (eventually, it will turn into a white soup!) and the data in the table below will no longer be valid. Therefore, you have to be very careful with all forms of calcium chloride and store them in screw-top containers that has a good seal in the lid.

The number of grams of each of these salts in a teaspoon can vary significantly depending on how finely they are ground. For the most accurate water adjustments, weigh out your additions rather than relying on a teaspoon for measurement.

### Calcium Sulfate (Gypsum)

$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$	ppm $\text{Ca}^{++}$	ppm $\text{SO}_4^-$
1g/liter	232.88	557.77
1g/gallon	61.53	147.36
1g/5 gallons	12.31	29.47
1tsp/liter	1117.82	2677.30
1tsp/gallon	295.33	707.34
1tsp/5 gallons	59.07	141.47

### Magnesium Sulfate (Epsom Salts)

$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	ppm $\text{Mg}^{++}$	ppm $\text{SO}_4^-$
1g/liter	98.64	389.58
1g/gallon	26.06	102.93
1g/5 gallons	5.21	20.59
1tsp/liter	335.38	1324.57
1tsp/gallon	88.61	349.95
1tsp/5 gallons	17.72	69.99

### Calcium Carbonate (Chalk)

$\text{CaCO}_3$	ppm $\text{Ca}^{++}$	ppm $\text{CO}_3^-$
1g/liter	400.44	599.55
1g/gallon	105.80	158.40
1g/5 gallons	21.16	31.68
1tsp/liter	720.79	1079.19
1tsp/gallon	190.43	285.12
1tsp/5 gallons	38.09	57.02

### Sodium Chloride (Table Salt)

$\text{NaCl}$	ppm $\text{Na}^+$	ppm $\text{Cl}^-$
1g/liter	393.37	606.62
1g/gallon	103.93	160.27
1g/5 gallons	20.79	32.05
1tsp/liter	2084.86	3215.09
1tsp/gallon	550.82	849.43
1tsp/5 gallons	110.16	169.89

### Calcium Chloride (anhydrous)

$\text{CaCl}_2$	ppm $\text{Ca}^{++}$	ppm $\text{Cl}^-$
1g/liter	361.13	638.87
1g/gallon	95.41	168.79
1g/5 gallons	19.08	33.76
1tsp/liter	3791.87	6708.14
1tsp/gallon	1001.81	1772.29
1tsp/5 gallons	200.36	354.46

### Calcium Chloride (dihydrate)

$\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$	ppm $\text{Ca}^{++}$	ppm $\text{Cl}^-$
1g/liter	272.62	482.3
1g/gallon	72.03	127.42
1g/5 gallons	14.41	25.48
1tsp/liter	1150.46	2035.31
1tsp/gallon	303.95	537.73
1tsp/5 gallons	60.79	107.55

## Further Reading

DeClerck, J., *A Textbook of Brewing*, Vol. 1 (Chapman and Hall, London, 1957). Hough, J. S., *The Biotechnology of Malting and Brewing*, (Cambridge University Press, Cambridge, 1985).

deLange, A. J., a series of posts on Classic Brewing Waters, Homebrew Digests #1761 to #1813.

Fix, G. J., *Principles of Brewing Science* (Brewers Publications, Boulder, 1989).

Hough, J. S., D. E. Briggs, R. Stevens, and T.W. Young, *Malting and Brewing Science*, Vol. 1 and 2 (Chapman and Hall, London, 1982).