NaCl $36_g/100_g$ @ 25°C m.m. = 58.44 g mol^{-1} d = 2.165 g cm^{-3}

Assume 136 g soln

1. $m_{solute} = 36g$

2. $m_{solvent} = 100g$

3. $m_{solution} = 36g + 100g = 136g$

4. $\omega_{solute} = \frac{m_{solute}}{m_{soln}} = \frac{36g}{136g} = 0.26471$

5. mass % = $\omega_{solute} \times 100\% = 0.26471 \times 100\% = 26.471\%$

6. d_{soln} (at 26.5% and 25°C) is 1.1944 g mL^{-1}

7. $V_{soln} = \frac{m_{soln}}{d_{soln}} = \frac{136.0g}{1.1944\ g\ mL^{-1}}\left(\frac{1L}{10^3 mL}\right) = 0.113865L$

8. $\rho = \frac{g\ solute}{L\ soln} = \frac{36.0g}{0.113865L} = 316.16\ g\ L^{-1}$

9. $M = \frac{mol\ solute}{L\ soln} = \frac{(36.0g)\left(\frac{mol}{58.44g}\right)}{0.113865L} = 5.41\ M$

$n = 0.616$ mol NaCl

10. $m = \frac{mol\ solute}{kg\ solvent} = \frac{0.616\ mol}{100g\left(\frac{1kg}{10^3 g}\right)} = 6.16\ m$

$n_{H_2O} = 100g\ H_2O\left(\frac{mol}{18.02g}\right) = 5.549\ mol\ H_2O$

11. $\chi = \frac{mol\ solute}{mol\ soln} = \frac{0.616\ mol}{0.616\ mol + 5.549\ mol} = 0.09992$

12. mol % = $\chi \times 100\% = 0.09992 \times 100\% = 9.99\%$

13. m/v % = $\frac{g\ solute}{mL\ soln} \times 100\% = \frac{36g}{113.865mL} \times 100\% = 31.62\%$

14. ppm (by mass) = $\frac{m_{solute}}{m_{soln}} \times 10^6 = \frac{36g}{136g} \times 10^6 = 2.65 \times 10^5$ ppm

15. ppm (by volume) = $\frac{V_{solute}}{V_{soln}} \times 10^6 = \frac{\frac{36.0g\ NaCl}{2.165\ g\ mL^{-1}}}{113.865mL} \times 10^6 = 1.46 \times 10^5$ ppm

A saturated NaCl(aq) soln is <u>ALL</u> of these concentrations!

NaCl 36g/100g @ 25°C $mm = 58.44\ g\ mol^{-1}$ $d = 2.165\ g\ mL^{-1}$

Assume 10g soln.

Since 36g solute in 136g soln, then $\frac{36\ g\ solute}{136\ g\ soln}\left(\frac{10\ g\ soln}{}\right) = 2.64706\ g$ solute in 10g soln.

1. $m_{solute} = 2.64706\ g$
2. $m_{solvent} = m_{soln} - m_{solute} = 10.0\ g - 2.64706\ g = 7.35294\ g$
3. $m_{soln} = 10\ g$
4. $w_{solute} = \frac{m_{solu}}{m_{soln}} = \frac{2.64706\ g}{10\ g} = 0.264706$
5. mass % = $w \times 100\% = 0.264706 \times 100\% = 26.4706\%$
6. d (soln) at 25°C and 26.4706% is $1.1944\ g\ mL^{-1}$

7 → 15 identical

Assume mass ↕ w

Assume 355 g soln.

$\frac{36\ g\ solute}{136\ g\ soln}\left(\frac{355\ g\ soln}{}\right) = 93.9706\ g$ solute in 355g soln.

$w_{solute} = \frac{m_{solu}}{m_{soln}} = \frac{93.9706\ g}{355\ g} = 0.264706$

Assume 0.152 g soln.

$\frac{36\ g\ solute}{136\ g\ soln}\left(\frac{0.152\ g\ soln}{}\right) = 0.040235\ g$ solute

$w_{solute} = \frac{0.040235\ g\ solute}{0.152\ g\ soln} = 0.264706$

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mass % is 26.47% → Determine concentrations

Assume any mass of solution to get mass of solute!

mass % = $\frac{m_{solu}}{m_{soln}} \times 100\%$ → $m_{solute} = \frac{\text{mass \%}}{100\%} \times m_{soln}$

Then get $m_{solvent}$!

Use density to get V