Solved problems in general introduction

[1] $M = \frac{n_{solute}}{V_{soln(L)}}$, $n = \frac{mass_{(solute)}}{Molar\ mass}$

molar mass of $C_2H_5OH = 2\times12 + 6\times1 + 1\times16 = 46$ g/mole

$n_{C_2H_5OH} = \frac{its\ mass}{molar\ mass} = \frac{90}{46} = 1.96$ mole

$\therefore M = \frac{n}{V_{(L)}} = \frac{1.96}{0.75} = 2.61$ mol/L

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[2] molar mass of $NaCl = 23 + 35.5 = 58.5$ g/mol

$M = \frac{n}{V_{soln}} \Rightarrow 0.364 = \frac{n}{152/1000}$

$\therefore n = 0.056 = \frac{mass}{molar\ mass} = \frac{mass}{58.5}$

$\therefore mass = 3.24$ g

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[3] 1 dL $\longrightarrow$ 0.206 g

10 dL (1 L) $\longrightarrow$ x $\Rightarrow$ 2.06 g/L

1 mg $= \frac{1}{1000}$ g

1 L = 10 dL

$M = n/L \Rightarrow \frac{2.06}{molar\ mass}/L = \frac{2.06/386.64}{1\ L} = 0.005$ mol

4 molar mass of $C_6H_{12}O_6 = 6\times12+12\times1+6\times16 = 180$ g/mol

$$n = \frac{\text{mass}}{\text{molar mass}} = \frac{15}{180} = 0.083 \text{ mol}$$

$$m = \frac{n_{solute}}{kg\,(solvent)} = \frac{0.083}{200/1000} = 0.42 \text{ mol/kg}_{solvent}$$

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5 $$N = \frac{\text{no. g. eq}}{V_{soln}} = 0.500$$ (1)

$$\text{no. g. eq} = \frac{\text{mass}}{\text{eq. wt}} = \frac{98}{\text{eq. wt}}$$ (2)

$$\text{eq. wt} = \frac{\text{molar mass}}{\text{valance}} = \frac{2\times1+32+4\times16}{2} = \frac{98}{2} = 49$$

apply in (2) $\text{no. g. eq} = \frac{98}{49} = 2$

apply in (1) $0.5 = \frac{2}{V_{(soln)}} \Rightarrow$ **V = 4 L**

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6 molar mass of $HNO_3 = 1+14+3\times16 = 63$ g/mol

(solvent) كتلة المذيب (solution) كتلة المحلول mass of solvent = 0.997 kg

$$m = \frac{n}{kg\,(solv)} = 0.5 = \frac{n}{0.997} \Rightarrow n = 0.4985 \text{ mol}$$

$$n = \frac{\text{mass}}{\text{molar mass}} \Rightarrow 0.4985 = \frac{\text{mass}}{63} \Rightarrow \text{mass} = 31.4 \text{ g}$$

حاول حل المسألة من غير تصحيح كلمة solvent و solution
سوف يحتاج الحل لبعض المهارات الرياضية

(7) $M = \frac{n_{solute}}{V_{(soln)}}$, $N =$ valance $\times M$

molar mass of $Na_2CO_3 = 2\times23 + 12 + 3\times16 = 106$ g/mol

$n = \frac{\text{mass}}{\text{molar mass}} = \frac{53}{106} = 0.5$ mol

$M = \frac{0.5}{215/1000} = 2.33$ mol/L

$\therefore N =$ valance $\times M = 2\times2.33 = 4.66$ g.eq/L

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[8] provided that d of soln = 1 g/mL

$\therefore$ its mass = its volume

5% = each 100 mL soln there is 5 g $Cu(NO_3)_2$

$\therefore$ in 50 mL there is 2.5 g $Cu(NO_3)_2$.

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[9] provided that density of antifreze is 1 kg/L

$\therefore$ its mass = 4.5 kg = 4500 mL , mass ethyleneglycol = 27.5 g

$\therefore$ mass water = $4500 - 27.5 = 4472.5$ g

its molar mass $2\times12+6\times1+2\times16 = 62$ g/mol

$n_{\text{ethyleneglycol}} = n_1 = \frac{\text{mass}}{\text{its molar mass}} = 27.5/62 = 0.44$ mol

molar mass of water = $H_2O = 2\times1+16 = 18 \Rightarrow n_2 = \frac{4472.5}{18} = 248.5$

$X_1 = \frac{n_1}{n_1+n_2} = \frac{0.44}{0.44+248.5} = 0.002$.

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[10] 7.5% means each 100 g soln there is 7.5 g KCl and the rest is water

$\therefore$ mass of water required = $100 - 7.5 = 92.5$ g