

11-15 (odd), 29, 33-37 odd

$$ii) M = \frac{\text{mol solute}}{\text{L solution}} = \frac{585g C_3H_7OH \times \frac{1 \text{ mole } C_3H_7OH}{60.09g C_3H_7OH}}{1.00L} = 9.74M$$

$$i) \text{ mole} = L \times M \\ = (1.00L) \left( \frac{0.040 \text{ mole HCl}}{1L} \right) = 0.040 \text{ mole HCl}$$

$$0.040 \text{ mole HCl} \frac{1L}{0.25 \text{ mole HCl}} = 0.16L \text{ or } 160 \text{ mL}$$

$$ii) \text{ mole } Na_2CO_3 = 0.0700L \frac{3.0 \text{ mol } Na_2CO_3}{1L} = 0.21 \text{ mole } Na_2CO_3$$



$$\text{mole } Na^+ = 2(0.21) = 0.42 \text{ mole } Na^+$$

$$\text{mole } NaHCO_3 = 0.0300L \frac{1.0 \text{ mole } NaHCO_3}{1L} = 0.030 \text{ mole } NaHCO_3$$



$$\text{mole } Na^+ = 0.030 \text{ mole}$$

$$M_{Na^+} = \frac{\text{total mole } Na^+}{\text{total volume}} = \frac{0.42 + 0.030}{0.0700 + 0.030} = \frac{0.45 \text{ mol}}{0.1000L} = 4.5M_{Na^+}$$

$$2a) \rho_{\text{H}_2\text{O}} = 1.00 \text{ g/ml} \quad 100.0 \text{ ml} = 100.0 \text{ g}$$

$$\rho = \frac{m}{V} = \frac{10.0 \text{ g H}_3\text{PO}_4 + 100.0 \text{ g H}_2\text{O}}{104 \text{ ml}} = 1.06 \text{ g/ml}$$

$$\text{mole H}_3\text{PO}_4 = 10.0 \text{ g} \frac{1 \text{ mole}}{97.99 \text{ g}} = 0.102 \text{ mole H}_3\text{PO}_4$$

$$\text{mole H}_2\text{O} = 100.0 \text{ g} \frac{1 \text{ mole}}{18.02 \text{ g}} = 5.55 \text{ mole H}_2\text{O}$$

$$\chi_{\text{H}_3\text{PO}_4} = \frac{0.102 \text{ mole H}_3\text{PO}_4}{(0.102 + 5.55)} = 0.0180$$

$$\chi_{\text{H}_2\text{O}} = \frac{5.55 \text{ mole H}_2\text{O}}{(0.102 + 5.55)} = 0.9820$$

$$M = \frac{\text{mole solute}}{\text{L solution}} = \frac{0.102 \text{ mole H}_3\text{PO}_4}{0.104 \text{ L}} = 0.981 \text{ M}$$

$$m = \frac{\text{mole solute}}{\text{kg solvent}} = \frac{0.102 \text{ mole H}_3\text{PO}_4}{0.100 \text{ kg H}_2\text{O}} = 1.02 \text{ m}$$

$$33) \quad 25 \text{ ml } C_5H_{12} \quad \frac{0.63 \text{ g}}{1 \text{ ml}} = 16 \text{ g } C_5H_{12} \quad \frac{1 \text{ mole } C_5H_{12}}{72.15 \text{ g } C_5H_{12}} = 0.22 \text{ mole } C_5H_{12}$$

$$45 \text{ ml } C_6H_{14} \quad \frac{0.66 \text{ g}}{1 \text{ ml}} = 30 \text{ g } C_6H_{14} \quad \frac{1 \text{ mole } C_6H_{14}}{86.17 \text{ g}} = 0.34 \text{ mole } C_6H_{14}$$

$$\text{mass } \% \text{ pentane} = \frac{\text{mass pentane}}{\text{total mass}} \times 100 = \frac{16 \text{ g}}{16 + 30.8} \times 100 = 34 \%$$

$$\chi_{\text{pentane}} = \frac{\text{mole pentane}}{\text{total moles}} = \frac{0.22 \text{ mol}}{0.22 + 0.34 \text{ mol}} = 0.39$$

$$m = \frac{\text{mole pentane}}{\text{kg hexane}} = \frac{0.22 \text{ mol}}{0.030 \text{ kg}} = 7.3 \text{ m}$$

$$M = \frac{\text{mole pentane}}{\text{L solution}} = \frac{0.22 \text{ mole}}{25 + 45 \text{ ml}} \frac{1000 \text{ ml}}{1 \text{ L}} = 3.1 \text{ M}$$

35) assume 1000 ml wine

$$12.5 \text{ ml } \text{C}_2\text{H}_5\text{OH} \frac{0.789 \text{ g}}{1 \text{ ml}} = 9.86 \text{ g } \text{C}_2\text{H}_5\text{OH}$$

$$87.5 \text{ ml } \text{H}_2\text{O} \frac{1.00 \text{ g}}{1.00 \text{ ml}} = 87.5 \text{ g } \text{H}_2\text{O}$$

$$\text{mass } \% \text{ C}_2\text{H}_5\text{OH} = \frac{9.86 \text{ g}}{9.86 + 87.5 \text{ g}} \times 100 = 10.1 \% \text{ by mass}$$

$$m = \frac{\text{mole } \text{C}_2\text{H}_5\text{OH}}{\text{kg } \text{H}_2\text{O}} = \frac{0.214 \text{ mole } \text{C}_2\text{H}_5\text{OH}}{0.0875 \text{ kg } \text{H}_2\text{O}} = 2.45 \text{ m}$$

$$9.86 \text{ g } \text{C}_2\text{H}_5\text{OH} \frac{1 \text{ mole}}{46.07 \text{ g}} = 0.214 \text{ mole}$$

37) assume 1.00 L solution

$$1.37 \text{ mole CA} \frac{192.12 \text{ g}}{1 \text{ mole}} = 263 \text{ g CA}$$

$$100 \times 10^3 \text{ ml solution} \frac{1.10 \text{ g}}{1.00 \text{ ml}} = 1.10 \times 10^3 \text{ g solution}$$

$$\text{mass } \% \text{ CA} = \frac{263 \text{ g}}{1.10 \times 10^3 \text{ g}} \times 100 = 23.9 \%$$

$$1.10 \times 10^3 \text{ g solution} - 263 \text{ g CA} = 840 \text{ g } \text{H}_2\text{O}$$

$$m = \frac{\text{mole solute}}{\text{kg solvent}} = \frac{1.37 \text{ mole CA}}{0.84 \text{ kg } \text{H}_2\text{O}} = 1.6 \text{ m}$$

$$840 \text{ g } \text{H}_2\text{O} \frac{1 \text{ mole}}{18.02 \text{ g}} = 47 \text{ mole } \text{H}_2\text{O} \quad \chi_{\text{CA}} = \frac{1.37}{1.37 + 47} = 0.028$$