

ME 485 - Her Sol.

SS Di Julio

$$2.16 \quad [\text{OH}^-] = 3 \times 10^{-4} \frac{\text{mg}}{\text{L}} \times \frac{\text{g}}{1000 \text{ mg}} \times \frac{\text{mol}}{17 \text{ g}} = 1.7 \times 10^{-8} \text{ mol/L}$$

$$[\text{H}^+] = \frac{10^{-14}}{1.7 \times 10^{-8}} = 5.66 \times 10^{-7} \text{ mol/L}$$

$$\text{pH} = -\log [\text{H}^+] = -\log [5.66 \times 10^{-7}] = 6.25$$

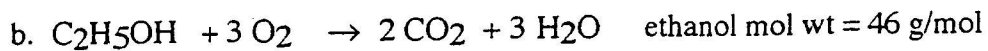
$$2.17 \quad \text{pH} = -\log [\text{H}^+] = 8.5 \quad \therefore [\text{H}^+] = 3.16 \times 10^{-9} \text{ mol/L}$$

$$[\text{OH}^-] = \frac{10^{-14}}{[\text{H}^+]} = \frac{10^{-14}}{3.16 \times 10^{-9}} = 3.16 \text{ mol/L}$$

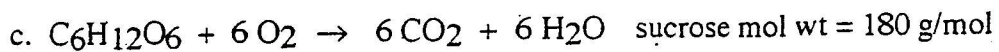


Acetic acid mol wt = $2 \times 12 + 4 \times 1 + 2 \times 16 = 60 \text{ g/mol}$

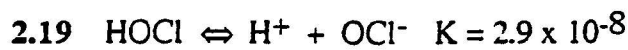
$$\text{ThOD} = 200 \frac{\text{mg AA}}{\text{L}} \times \frac{\text{g}}{1000 \text{ mg}} \times \frac{\text{mol AA}}{60 \text{ g}} \times \frac{2 \text{ mol O}_2}{\text{mol AA}} \times \frac{32 \text{ g O}_2}{\text{mol O}_2} \times \frac{1000 \text{ mg}}{\text{g}} = 213 \text{ mg/L}$$



$$\text{ThOD} = 30 \frac{\text{mg eth}}{\text{L}} \times \frac{\text{g}}{1000 \text{ mg}} \times \frac{\text{mol}}{46 \text{ g eth}} \times \frac{3 \text{ mol O}_2}{\text{mol eth}} \times \frac{32 \text{ g O}_2}{\text{mol O}_2} \times \frac{1000 \text{ mg}}{\text{g}} = 62.6 \text{ mg/L}$$



$$\text{ThOD} = 50 \frac{\text{mg suc}}{\text{L}} \times \frac{\text{g}}{1000 \text{ mg}} \times \frac{\text{mol suc}}{180 \text{ g suc}} \times \frac{6 \text{ mol O}_2}{\text{mol suc}} \times \frac{32 \text{ g O}_2}{\text{mol O}_2} \times \frac{1000 \text{ mg}}{\text{g}} = 53.3 \text{ mg/L}$$



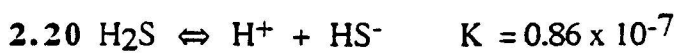
$$\frac{[\text{H}^+][\text{OCl}^-]}{[\text{HOCl}]} = 2.9 \times 10^{-8}$$

$$f = \frac{[\text{HOCl}]}{[\text{HOCl}] + [\text{OCl}^-]} = \frac{1}{1 + \frac{[\text{OCl}^-]}{[\text{HOCl}]}} = \frac{1}{1 + \frac{2.9 \times 10^{-8}}{[\text{H}^+]}} = \frac{1}{1 + \frac{2.9 \times 10^{-8}}{10^{-\text{pH}}}}$$

$$\text{pH} = 6: \quad f = \frac{1}{1 + \frac{2.9 \times 10^{-8}}{10^{-6}}} = 0.97$$

$$\text{pH} = 8: \quad f = \frac{1}{1 + \frac{2.9 \times 10^{-8}}{10^{-8}}} = 0.256$$

$$\text{pH} = 10: \quad f = \frac{1}{1 + \frac{2.9 \times 10^{-8}}{10^{-10}}} = 0.0034$$

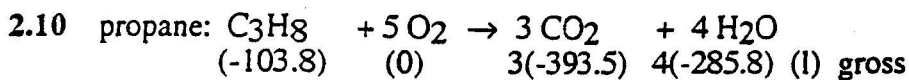


$$\frac{[\text{H}^+][\text{HS}^-]}{[\text{H}_2\text{S}]} = 0.86 \times 10^{-7}$$

$$f = \frac{[\text{H}_2\text{S}]}{[\text{H}_2\text{S}] + [\text{HS}^-]} = \frac{1}{1 + \frac{[\text{HS}^-]}{[\text{H}_2\text{S}]}} = \frac{1}{1 + \frac{0.86 \times 10^{-7}}{[\text{H}^+]}} = \frac{1}{1 + \frac{0.86 \times 10^{-7}}{10^{-\text{pH}}}}$$

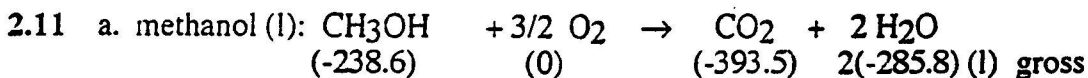
$$\text{pH} = 6: \quad f = \frac{1}{1 + \frac{0.86 \times 10^{-7}}{10^{-6}}} = 0.92$$

$$\text{pH} = 8: \quad f = \frac{1}{1 + \frac{0.86 \times 10^{-7}}{10^{-8}}} = 0.104$$



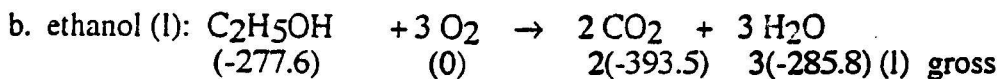
$$\text{gross: } \Delta H^\circ = 4x(-285.8) + 3(-393.5) - (-103.8) = -2219.9 \text{ kJ/mol}$$

$$2219.9 \frac{\text{kJ}}{\text{mol}} \times \frac{\text{mol}}{44 \text{ g}} \times 1000 \text{ g} = 50,452 \text{ kJ}$$



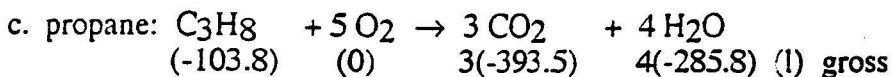
$$\text{gross: } \Delta H^\circ = 2x(-285.8) + (-393.5) - (-238.6) = -726.5 \text{ kJ/mol}$$

$$\text{HHV} = 726.5 \frac{\text{kJ}}{\text{mol}} \times \frac{\text{mol}}{32 \text{ g}} \times \frac{1000 \text{ g}}{2.2 \text{ lb}} \times 6.7 \frac{\text{lb}}{\text{gal}} \times \frac{\text{Btu}}{1.055 \text{ kJ}} = 65,537 \text{ Btu/gal}$$



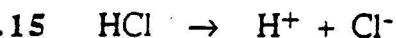
$$\text{gross: } \Delta H^\circ = 3x(-285.8) + 2(-393.5) - (-277.6) = -1366.8 \text{ kJ/mol}$$

$$\text{HHV} = 1366.8 \frac{\text{kJ}}{\text{mol}} \times \frac{\text{mol}}{46 \text{ g}} \times \frac{1000 \text{ g}}{2.2 \text{ lb}} \times 6.6 \frac{\text{lb}}{\text{gal}} \times \frac{\text{Btu}}{1.055 \text{ kJ}} = 84,492 \text{ Btu/gal}$$



$$\text{gross: } \Delta H^\circ = 4x(-285.8) + 3(-393.5) - (-103.8) = -2219.9 \text{ kJ/mol}$$

$$\text{HHV} = 2219.9 \frac{\text{kJ}}{\text{mol}} \times \frac{\text{mol}}{44 \text{ g}} \times \frac{1000 \text{ g}}{2.2 \text{ lb}} \times 4.1 \frac{\text{lb}}{\text{gal}} \times \frac{\text{Btu}}{1.055 \text{ kJ}} = 89,123 \text{ Btu/gal}$$



$$25 \frac{\text{mg}}{\text{L}} \times \frac{1 \text{ g}}{1000 \text{ mg}} \times \frac{\text{mol}}{36.45 \text{ g HCl}} = 6.8587 \times 10^{-4} \text{ mol/L} = [\text{H}^+]$$

$$\text{pH} = -\log [\text{H}^+] = -\log [6.8587 \times 10^{-4}] = 3.16$$