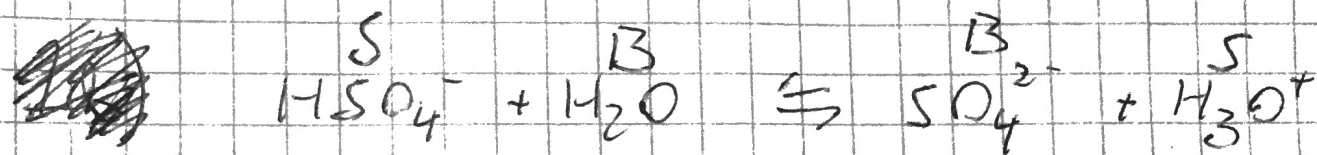
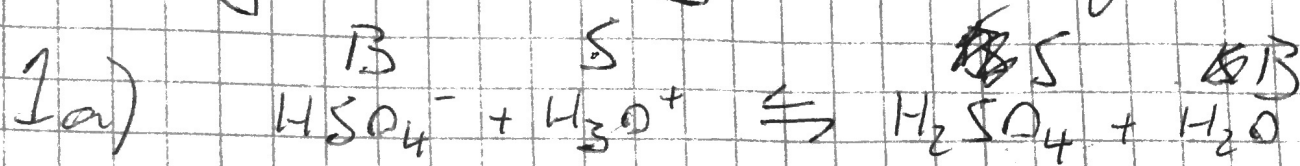


Øving 3 - Vegard G. Jervell

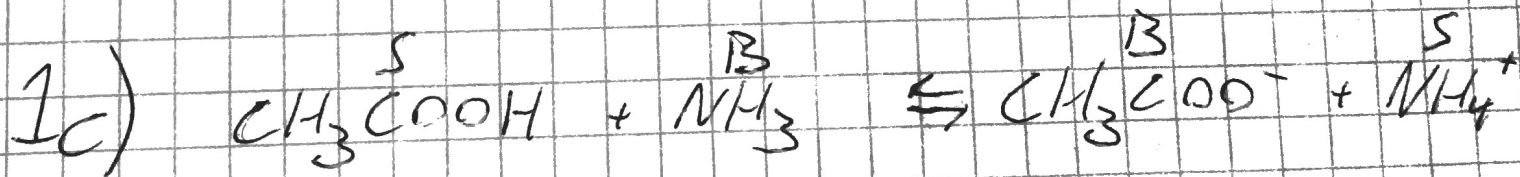


1b)

1) HNO_3 er en syre, NO_3^- er konj. base

2. HS^- er en base, H_2S er konj. syre

3. HF er en syre, F^- er konj. base



2a) $-\log(x) = 1,5 \rightarrow x = \underline{\underline{3,16 \cdot 10^{-2} = [\text{H}^+]}}$

2b) $-\log(0,01) = 4,6$ $\underline{\underline{\text{pH} = 4,6}}$

$$2b) -\log(0,01) = 4,6$$

$$\underline{\underline{pH = 4,6}}$$

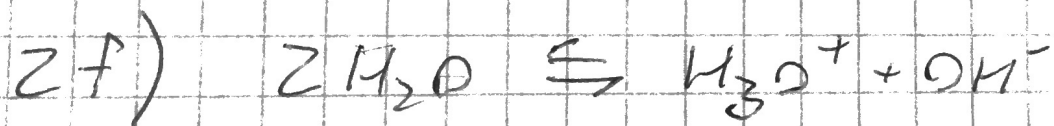
$$2c) -\log(0,01) = 4,6$$

$$\underline{\underline{pOH = 4,6}}$$

$$2d) pH + pOH = 14$$

$$\underline{\underline{pH = 14 - 4,6 = 9,4}}$$

2e) NaCl ger ~~det~~ påverkar inte protonbalansen i vatten, därför blir $[H^+] = [OH^-]_{\text{vatten}} = \frac{K_w}{[H^+]} \rightarrow$
 $\rightarrow \underline{\underline{[H^+] = 10^{-7}}}$

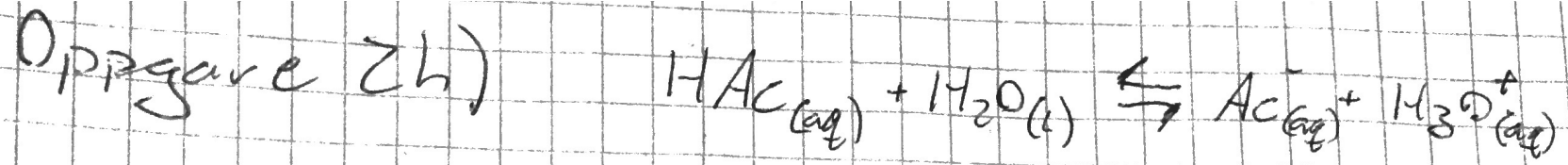


$$2g) [OH^-] = 3 \cdot 10^{-2} \text{ mol/l} \rightarrow pOH = -\log \frac{[OH^-]}{M} = 1,52$$

$$\underline{\underline{pH = 14 - 1,52 = 12,48}}$$

$$-\log \frac{[H_3O^+]}{M} = 12,48 \rightarrow [H_3O^+] = 3,8 \cdot 10^{-6} M$$

Oppgave 2h)



$$2i) \quad K_a = \frac{[\text{Ac}^-][\text{H}_3\text{O}^+]}{[\text{HAc}]}$$

$$2j) \quad K_a = 1,8 \cdot 10^{-5}$$

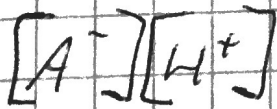
$$2k) \quad \text{p}K_a = 3 \rightarrow K_a = -\log(x) = 3 \rightarrow K_a = 10^{-3}$$
$$\text{p}K_a = -4 \rightarrow K_a = 10^4$$

$$2l) \quad [\text{HAc}] = [\text{Ac}^-] = 0,1 \text{ M}$$

Ka Bufferlikningen gjelder

$$\text{pH} = \text{p}K_a + \log\left(\frac{[\text{Base}]}{[\text{Syre}]}\right)$$

$$\text{pH} = \text{p}K_a = 4,76$$



$$pH = pK_a + \log\left(\frac{[Base]}{[Syre]}\right)$$

$$\underline{\underline{pH = pK_a = 4,76}}$$

$$2m) \quad K_a = \frac{[A^-][H^+]}{[HA]}$$

Brukes tabellmetode hvor $[HA] - x \approx [HA]$

$$1,8 \cdot 10^{-5} = \frac{x^2}{0,1} \rightarrow \underline{\underline{x = 1,34 \cdot 10^{-3}}}$$

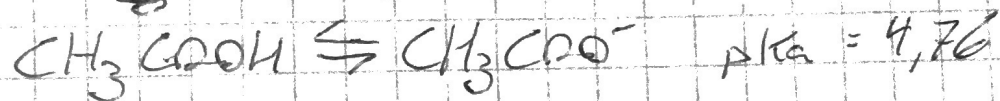
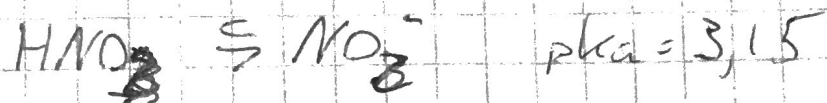
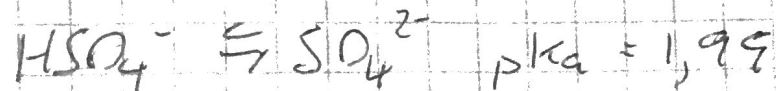
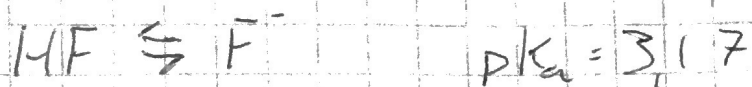
$$pH = -\log(x)$$

$$\underline{\underline{pH = 6,62}}$$

2n) K_w og K_a er konstanter, pH varierer etter $[H^+]$

Öving 3, Vegard G. Jøvell

Oppg 3)



→
stærke base

4a) $\text{p}K_a = 3,86$

$$K_a = 2,1068 \cdot 10^{-2}$$

$$K_a = \frac{[\text{A}^-][\text{H}^+]}{[\text{HA}]}$$

$$\rightarrow 2,1068 = \frac{x^2}{0,1-x} \rightarrow \underline{x = 3,66 \cdot 10^{-2}}$$

$$[\text{H}^+] = 3,66 \cdot 10^{-2} \rightarrow \text{pH} = 1,4$$

$$K_a = \frac{[H^+][A^-]}{[HA]}$$

$$\rightarrow 2,1068 = \frac{x}{0,1-x} \rightarrow x = \underline{\underline{3,66 \cdot 10^{-2}}}$$

$$[H^+] = 3,66 \cdot 10^{-2} \rightarrow \underline{\underline{pH = 1,4}}$$

4b) När $pH = pK_a$ är $[A^-] = [HA]$

Ved tabellmetoden blir då

$$[A^-] = [HA]_0 - [HA] \rightarrow [A^-] = [HA] = \frac{1}{2} [HA]_0$$

$$pH = pK_a - 0,5 \rightarrow \log \frac{[A^-]}{[HA]} = -0,5 \rightarrow \underline{\underline{\frac{[A^-]}{[HA]} = \sqrt{10^{-1}}}}$$

Ved tabellmetode är

$$[A^-] = [HA]_0 - [HA] \rightarrow [A^-] = \frac{[HA]_0}{1 + \sqrt{10}}$$

$$\rightarrow [HA] = \frac{[HA]_0}{1 + \frac{1}{\sqrt{10}}}$$

5a)

$$[H^+] = [OH^-]$$

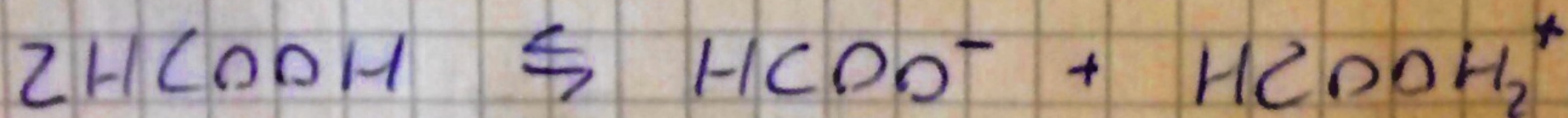
b) $[H^+] = [Cl^-] + [OH^-]$

c) $[H^+] = [HCOO^-] + [OH^-]$

d) $[H^+] = [OH^-] + [Ac^-] - [Na^+]$

e) $[H^+] = [OH^-] + [HSO_4^-] + 2 \cdot [SO_4^{2-}]$

6a)



$$[HC(=O)O^-] [H_2C(=O)OH_2^+]$$

$$a_{HC(=O)O^-} \cdot a_{H_2C(=O)OH_2^+}$$

5a)

$$[H^+] = [OH^-]$$

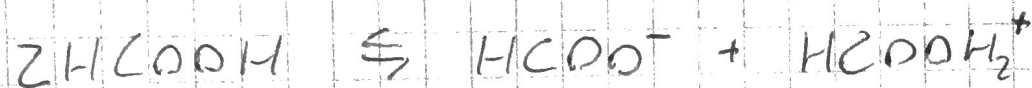
$$b) [H^+] = [Cl^-] + [OH^-]$$

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6a)



~~$$K_L = \frac{[HC(=O)O^-][HC(=O)OH_2^+]}{[ZHC(=O)OH]}$$~~

$$K_L = \frac{a_{HC(=O)O^-} \cdot a_{HC(=O)OH_2^+}}{(a_{ZHC(=O)OH})^2}$$

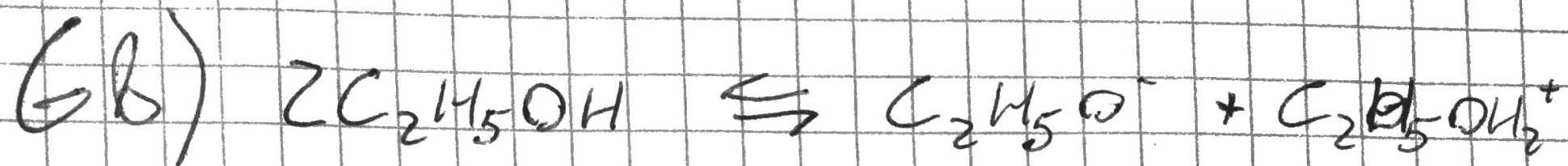
aktivitet til rent løsemiddel = 1

$$K_L = a_{HC(=O)O^-} \cdot a_{HC(=O)OH_2^+}$$

$$a_{HC(=O)OH_2^+} = \sqrt{K_L} = \sqrt{6,3 \cdot 10^{-7}}$$

$$pK_L = 6,2 \rightarrow K_L = 6,3 \cdot 10^{-7}$$

$$pH = -\log(a_{HC(=O)OH_2^+}) = 3,1$$



$$K_L = \frac{a_{C_2H_5O^-} \cdot a_{C_2H_5OH_2^+}}{a_{C_2H_5OH}^2}$$

aktivitet til ren $C_2H_5OH = 1$

$$K_L = (a_{C_2H_5OH_2^+})^2$$

$$K_L = (1,58 \cdot 10^{-10})^2$$

$$K_L = 2,51 \cdot 10^{-20}$$

$$pH = 9,8$$

$$-\log(a_{C_2H_5OH_2^+}) = 9,8$$

$$a_{C_2H_5OH_2^+} = 1,58 \cdot 10^{-10}$$