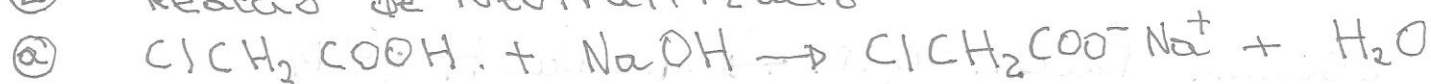


2012

①

② Reacció de Neutralització



P.E = els mols de l'àcid = els mols de la base

$$[\text{CH}_2\text{ClCOOH}] = \frac{5 \times 10^{-3}}{0,1} = \underline{0,05 \text{ M}}$$

Segons Bronsted-Lowry és un àcid perquè pot cedir protó, i aleshores es comporta com un àcid. La reacció d'hidròlisi amb aigua és:



Àcid₁: ClCH_2COOH

Base₁: $\text{ClCH}_2\text{COO}^-$

Base₂: H_2O

Àcid₂: H_3O^+

b) $K_a = \frac{[\text{ClCH}_2\text{COO}^-] \cdot [\text{H}_3\text{O}^+]}{[\text{ClCH}_2\text{COOH}]} = ?$

$$\text{pH} = 2,11 \Rightarrow [\text{H}_3\text{O}^+] = 10^{-2,11} = \underline{7,76 \times 10^{-3} \text{ M}}$$

$$[\text{H}_3\text{O}^+] = [\text{ClCH}_2\text{COO}^-]$$

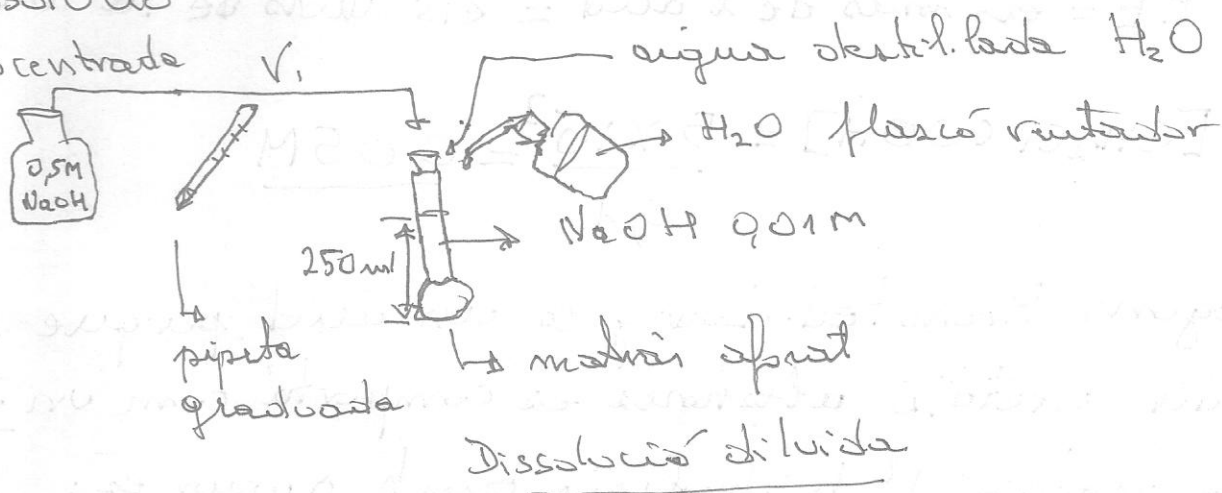
$$K_a = \frac{(7,76 \times 10^{-3})^2}{0,05 - 7,76 \times 10^{-3}} = \underline{1,42 \times 10^{-3} \text{ M}}$$

④ HCl 0,01M
NaOH 0,5M

② 250 ml NaOH 0,1M $\rightarrow$ V₁ NaOH 0,5M

Dissolució

Concentrada



Càlculs

$$250 \text{ ml} \times \frac{0,01 \text{ mol}}{1000 \text{ ml}} \times \frac{1000 \text{ ml}}{0,5 \text{ mol}} = \underline{5 \text{ ml}} \text{ NaOH}$$

Procediment

1°. Prendre 5 ml NaOH del 0,5M

2°. Transferir a un matràs aforat de 250 ml

3°. Enratar a 250 ml amb aigua destil·lada

4°. Remenar.

5°. Etiquetar: Data, concentració, data de preparació

Materials

- Matràs aforat 250 ml
- Pipeta graduada 5 ml.
- Flascó rentador
- Etiqueta
- Embut. de vidre.

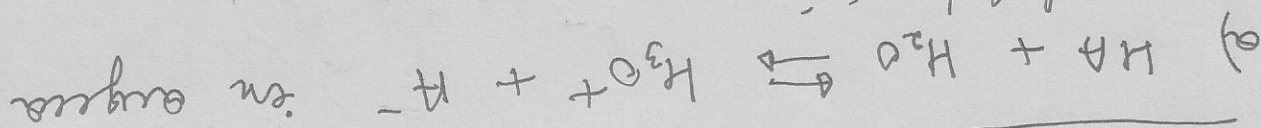
⑥ $25 \text{ ml} \times 0,01 \text{ mol HCl} \times \frac{1000 \text{ ml}}{0,01 \text{ mol}} = 25 \text{ ml NaOH}$

Si volum preparat 25 ml NaOH 0,01 M, neutralize

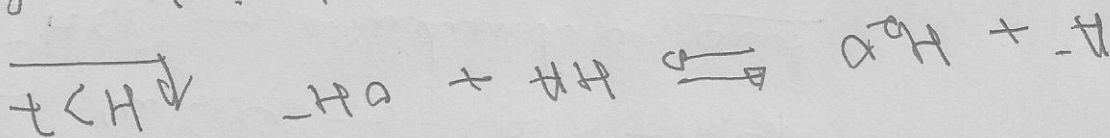
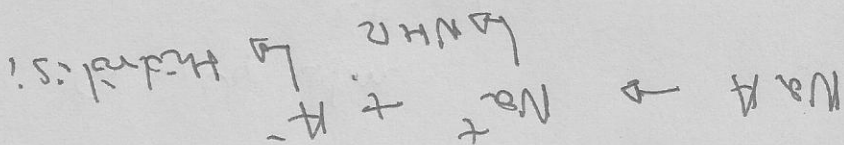
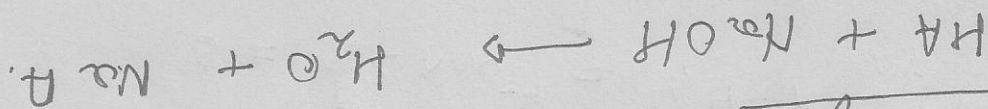
$$25 \text{ ml} \times \frac{0,01 \text{ mol}}{1000 \text{ ml}} \times \frac{1000 \text{ ml}}{0,01 \text{ mol}} = 0,5 \text{ ml}$$

Hem de prepara 0,5 ml de NaOH 0,5 M i diluir a 25 ml amb aigua destil·lada

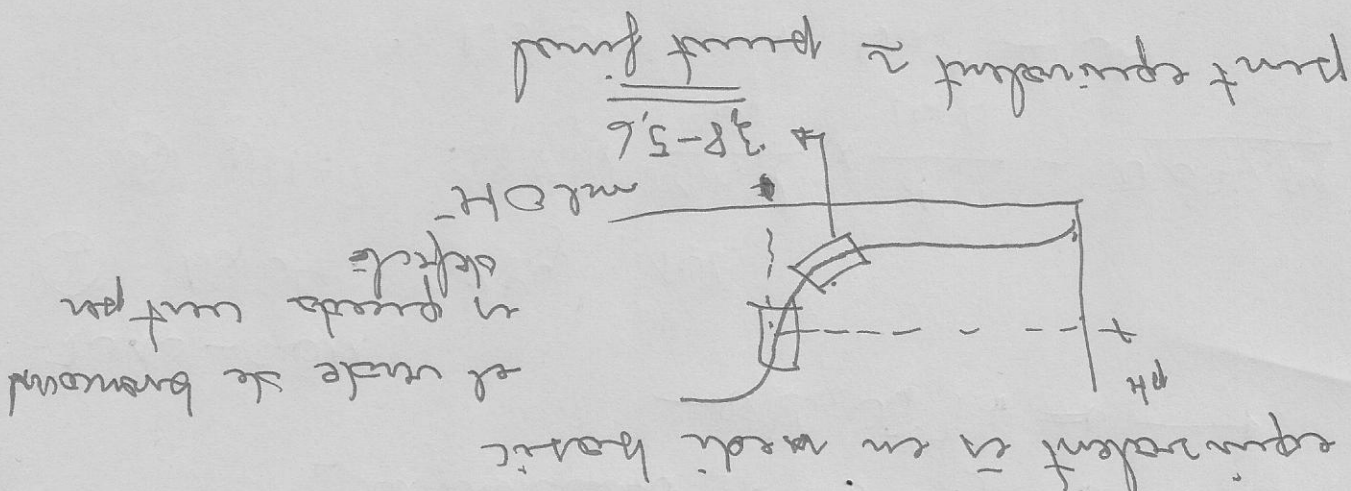
2011 - 2012



Neutralització



Se necessita un indicador amb interval de viratge per a medi bàsic - punt d'equivalència perquè el punt equivalent és en medi bàsic

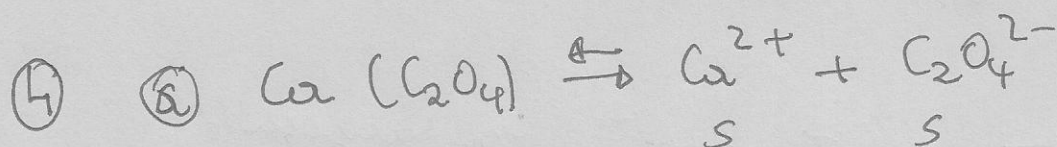


$$\textcircled{b} \quad 25 \text{ mL NaOH} \times \frac{0.1 \text{ mol}}{1000 \text{ mL}} \times \frac{1 \text{ mol HA}}{1 \text{ mol NaOH}} \times \frac{90 \text{ g}}{1 \text{ mol HA}} = 0.225 \text{ g} \quad \textcircled{4}$$

$$[\text{HA}] = \frac{0.225 \text{ g}}{2.0 \text{ L}} \times 1000 = 0.0765 \text{ M}$$

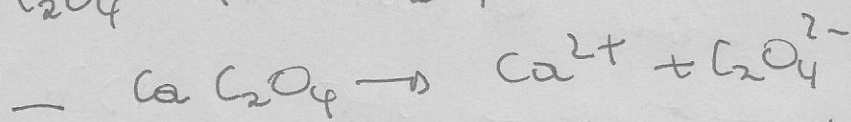
$$[\text{HA}] = 3.825 \text{ g/L} \quad \text{La llet no està precipitada perquè}$$

$$3.825 \frac{\text{g}}{\text{L}} < 5 \text{ g/L}$$



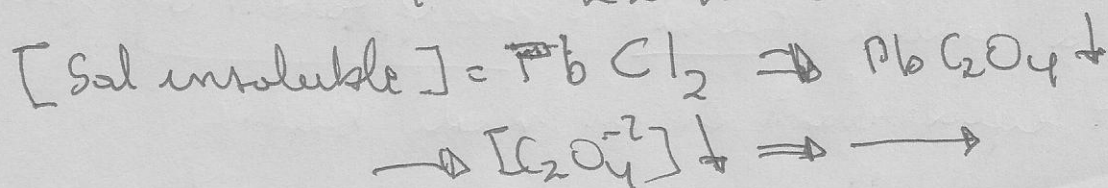
$$S^2 = 2 \times 10^{-9}$$

$$S = \sqrt{2 \times 10^{-9}} = 4.47 \times 10^{-5} \text{ M}$$



$[\text{HCl}] \rightarrow$ añadiendo un ácido

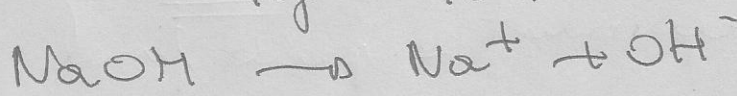
augmenta la $[\text{H}^+]$, reacciona amb $\text{C}_2\text{O}_4^{2-} \Rightarrow [\text{C}_2\text{O}_4^{2-}] \downarrow$ i $\rightarrow$



2010-2011



$$\textcircled{a} \quad \text{pH}=? \quad 28.8 \text{ g} \times \frac{1 \text{ mol}}{40 \text{ g}} \times \frac{1}{10 \text{ L}} = 0.072 \text{ M}$$

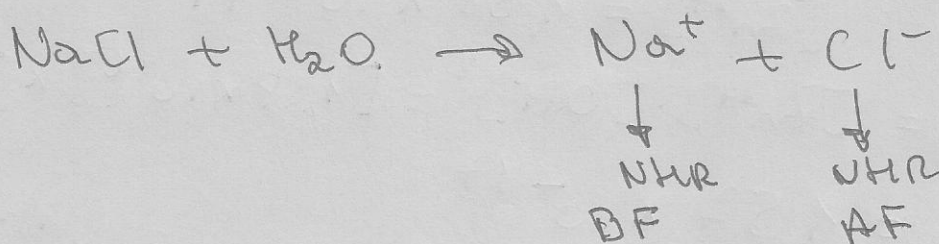
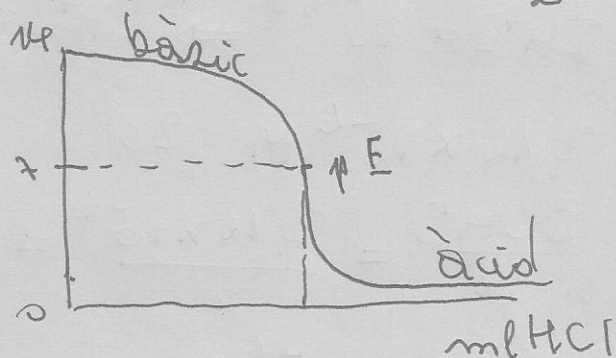
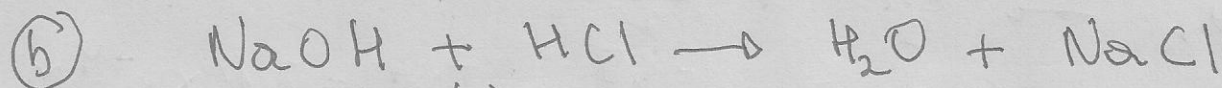


$$0.072 \text{ M}$$

$$0.072 \text{ M} \quad 0.072 \text{ M}$$

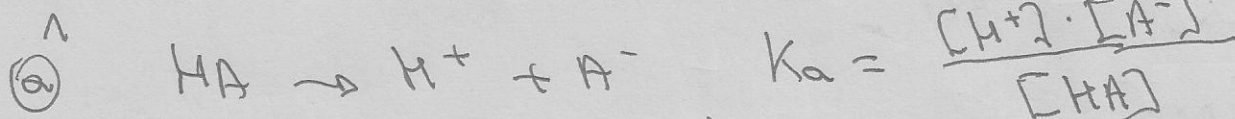
$$pOH = -\log 0,072 = 1,14 = \underline{\underline{12,8}}$$

⑤



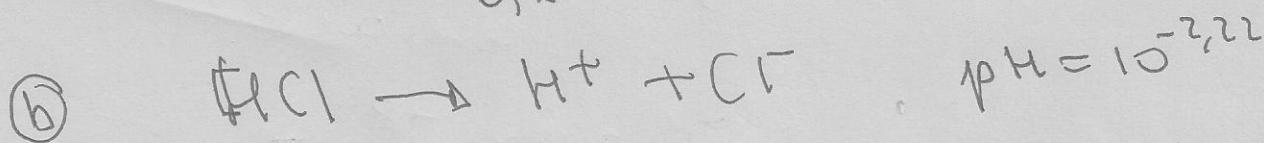
no hi ha hidròlisi.. pH = 7 corresponent a l'aigua

2009 - 2010



$$\frac{4,6g}{500ml} \cdot \frac{1mol}{46} \cdot \frac{1000ml}{1l} = 0,2M$$

$$K_a = \frac{(10^{-2,22})^2}{0,2 - 10^{-2,22}} = \underline{\underline{1,87 \times 10^{-4}}}$$



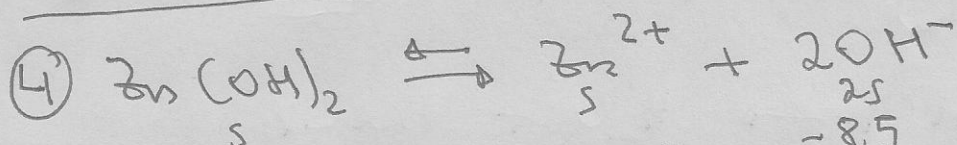
$$pH = -\log H^+$$

$$[H^+] = 6,02 \times 10^{-3}M$$

$[HCl]$ és un àcid fort $\Rightarrow [H^+] = [HCl] = \underline{\underline{6,02 \times 10^{-3}M}}$

2008 - 2009

⑥



$\text{pH} = 8,5 \rightarrow [\text{H}^+] = 10^{-8,5} \Rightarrow [\text{H}^+] = \underline{\underline{3,16 \times 10^{-9} \text{ M}}}$

$[\text{OH}^-] = 3,16 \times 10^{-6} \text{ M} = 2,5$

$[\text{Zn}^{2+}] = \frac{[\text{OH}^-]}{2} = \frac{3,16 \times 10^{-6}}{2} = 1,58$

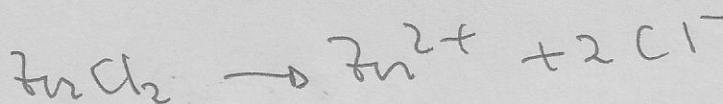
$[\text{Zn}^{2+}] = 1,58 \times 10^{-6} \text{ M} = 5$

④ $K_s = [\text{Zn}^{2+}] \cdot [\text{OH}^-]^2 = [1,58 \times 10^{-6}] \times [3,16 \times 10^{-6}]^2$

$K_s = 1,57 \times 10^{-17}$

$5 \text{ L} \times \frac{1,58 \times 10^{-6} \text{ mol}}{1 \text{ L}} \times \frac{99,4 \text{ g Zn(OH)}_2}{1 \text{ mol}} = 7,85 \times 10^{-4} \text{ g}$

⑤



$1,5 \times 10^{-2}$

$1,5 \times 10^{-2} \quad 1,5 \times 10^{-2}$

$[1,5 \times 10^{-2} + 1,58 \times 10^{-6}] \cdot [S]^2 = 1,57 \times 10^{-17}$

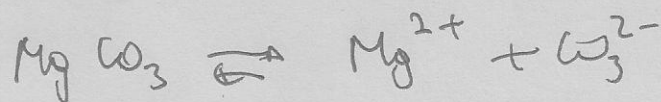
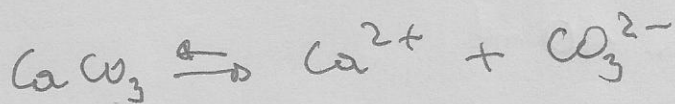
$S' = \sqrt{\frac{1,57 \times 10^{-17}}{901500178}}$

$S' = 3,23 \times 10^{-8}$

en redueix

2008 - 2009

⑦



⑥ $S(\text{CaCO}_3) = \sqrt{5 \times 10^{-9}} = 7,07 \times 10^{-5} \text{ M}$

$S(\text{MgCO}_3) = \sqrt{1 \times 10^{-5}} = 3,16 \times 10^{-3} \text{ M}$

és més soluble el MgCO₃.

$$3,16 \times 10^{-3} \frac{\text{mol}}{\text{L}} \times \frac{84,3 \text{ g}}{1 \text{ mol.}} \times \frac{1000 \text{ mg}}{1 \text{ g}} = \underline{266,6 \text{ ppm}}$$

⑦ 100 ml MgCl₂ 0,012 M

50 ml CaCO₃ 0,06 M.

} MgCO₃

100 ml $\times \frac{0,012 \text{ mol}}{1000 \text{ ml}} \text{ Mg}^{2+} = 1,2 \times 10^{-3} \text{ mol} \rightarrow [\text{Mg}^{2+}] = 8 \times 10^{-3} \text{ M}$

50 ml $\times \frac{0,06 \text{ mol}}{1000 \text{ ml}} \text{ CO}_3^{2-} = 3 \times 10^{-3} \text{ mol} \rightarrow [\text{CO}_3^{2-}] = 0,02 \text{ M}$

$Q = (8 \times 10^{-3}) \cdot (0,02) = 1,6 \times 10^{-4} > 1 \times 10^{-5}$
precipita

⑧ 100 mL MgCl₂ 0,012 M

sln MgCl₂ 0,12 M

$$100 \text{ mL} \times \frac{0,012 \text{ mol}}{1000 \text{ mL}} \times \frac{1000 \text{ mL}}{0,12 \text{ M}} = \underline{10 \text{ mL}}$$

- prenem 10 mL dln 0,12 M i diluïm a 100 mL amb aigua destil·lada.

Material

- Matră eforat 100 ml
- pipeta eforată ~~100~~ ml
- Taps plastic
- eticheta
- flacără murdară.

(8)

2008 - 2009

4.1) $6^\circ = 6\text{ g CH}_3\text{COOH} / 100\text{ g Vinegre}$
 $K_a = 1.75 \times 10^{-5}$
 $d = 1.05 \frac{\text{g}}{\text{cm}^3}$

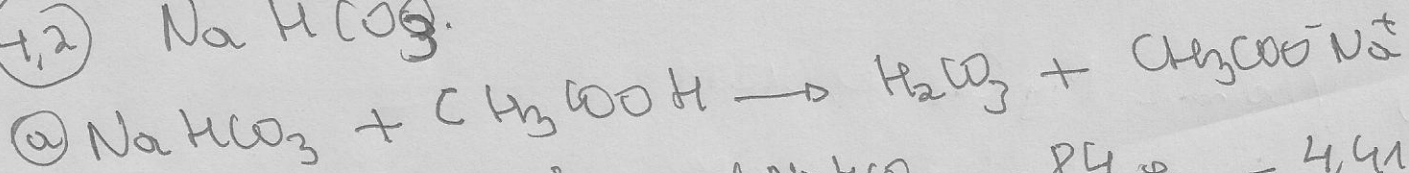
pH = ? $\rightarrow \text{CH}_3\text{COOH} \rightleftharpoons \text{CH}_3\text{COO}^- + \text{H}_3\text{O}^+$

$$K_a = \frac{[\text{CH}_3\text{COO}^-] \cdot [\text{H}_3\text{O}^+]}{[\text{CH}_3\text{COOH}]}$$

$$\frac{6\text{ g acid}}{100\text{ g}} \times \frac{1.05\text{ g}}{1\text{ cm}^3} \times \frac{1\text{ cm}^3}{1\text{ ml}} \times \frac{1000\text{ ml}}{1\text{ l}} \times \frac{1\text{ mol}}{60\text{ g}} = 1.05\text{ M}$$

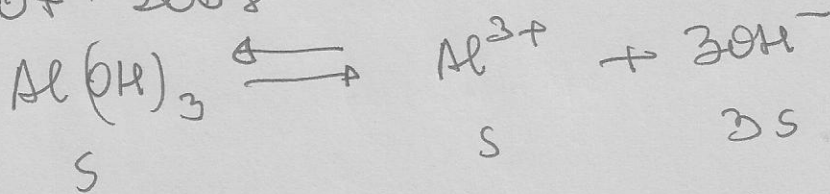
$$\frac{x^2}{1.05} = 1.75 \times 10^{-5} \rightarrow \boxed{\text{pH} = 2.37}$$

4.2) NaHCO_3 .



$$\text{b) } 50\text{ ml} \times \frac{1.05\text{ mol}}{1000\text{ ml}} \times \frac{1\text{ mol NaHCO}_3}{1\text{ mol HAc}} \times \frac{84\text{ g}}{1\text{ mol NaHCO}_3} = 4.41\text{ g}$$

4) 2007-2008



H.1

$$[3S]^3 \cdot [S] = 3,7 \times 10^{-15}$$

$$27 S^4 = 3,7 \times 10^{-15}$$

$$S = \sqrt[4]{\frac{3,7 \times 10^{-15}}{27}} = 1,08 \times 10^{-4} \text{ M}$$

$$[\text{OH}^-] = 3 \cdot 1,08 \times 10^{-4}$$

$$= 3,24 \times 10^{-4} \text{ M}$$

$$\text{pH} = 10,51$$

H.2

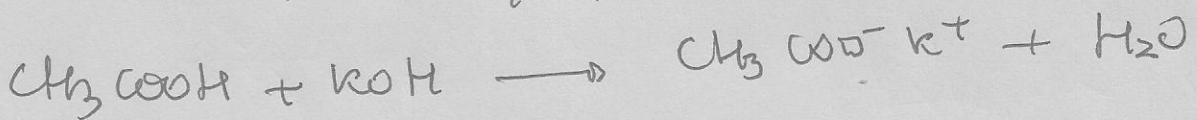
afugint un acid (HCl)

reacțiune cu $\text{OH}^- \Rightarrow [\text{OH}^-] \downarrow \Rightarrow [\text{Al}^{3+}] \uparrow$
 în echilibru $\longrightarrow$

2)

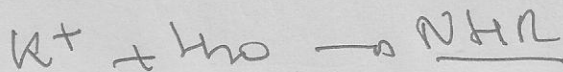
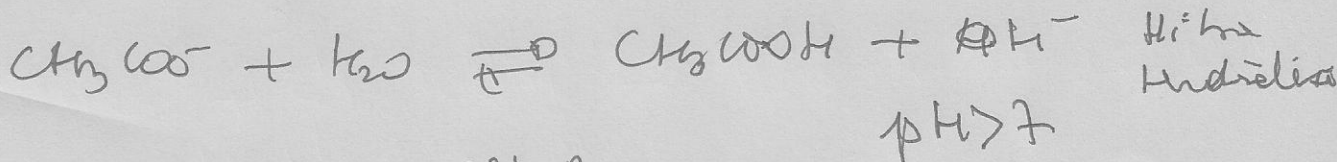
20 mL CH_3COOH 0,5 M
 KOH 1 M

2.1



$$20 \text{ mL} \times \frac{0,5 \text{ mols}}{1000 \text{ mL}} \times \frac{1 \text{ mol KOH}}{1 \text{ mol CH}_3\text{COOH}} \times \frac{1000 \text{ mL}}{0,5 \text{ mols KOH}} = \underline{\underline{10 \text{ mL}}}$$

2.2



pH > 7

2.3

$$20 \text{ mL} \times \frac{0,25 \text{ mL}}{1000 \text{ mL}} \times \frac{1000 \text{ mL}}{0,50 \text{ mL}} = \underline{\underline{25 \text{ mL}}}$$

explicare cum abans