

Chap 7 Mesure et calcul du pH de solutions aqueuses

1) a) pH neutre = 7 $[H_3O^+] = 10^{-pH} = 1 \cdot 10^{-7} M = [OH^-] \neq 0$ donc FAUX

b) pH = 3 : solution acide
 $[H_3O^+] = 10^{-pH} = 1 \cdot 10^{-3} M$
 $[OH^-] = \frac{K_w}{[H_3O^+]} = \frac{1 \cdot 10^{-14}}{1 \cdot 10^{-3}} = 1 \cdot 10^{-11} M$ $[H_3O^+] > [OH^-]$

c) acide nitrique HNO_3 : acide fort
 ionisation totale : maximum de H_3O^+
 acide nitreux HNO_2 : acide faible
 ionisation partielle : contient - de H_3O^+ que max
 $[H_3O^+]_{HNO_3} > [H_3O^+]_{HNO_2}$
 $pH_{HNO_3} < pH_{HNO_2}$ donc vrai

d) pH d'une solution identique dans tout le volume
 donc FAUX

e) $HCOOH$ en solution acide faible
 s'ionise très peu donc la concentration
 de $HCOO^-$ est bien + faible que celle de $HCOOH$
 ce n'est pas un mélange tampon. donc FAUX

2) $[H_3O^+] = \frac{K_w}{[OH^-]}$ $[OH^-] = \frac{K_w}{[H_3O^+]}$ pH solution

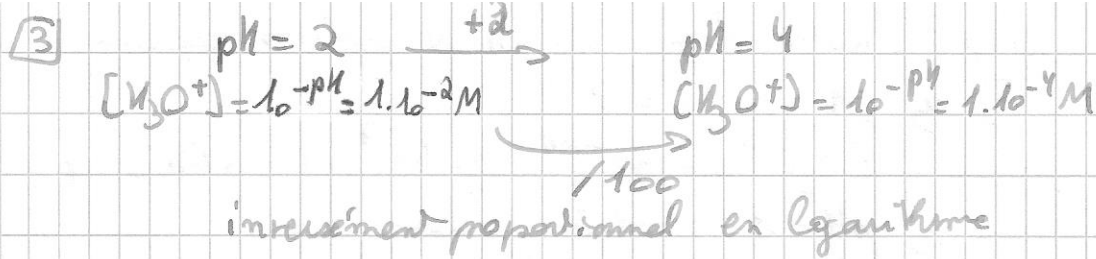
$\frac{10^{-7}}{1 \cdot 10^{-14}} = 1 \cdot 10^{-7} M$ $\log 10^{-7} = 7$ neutre
 $\frac{1 \cdot 10^{-14}}{0,25} = 4 \cdot 10^{-14}$ $0,25 M$ $-\log 4 \cdot 10^{-14} = 13,4$ basique

$10^{-pH} = 1 \cdot 10^{-5} M$ $\frac{1 \cdot 10^{-14}}{1 \cdot 10^{-5}} = 1 \cdot 10^{-9} M$ 5 acide

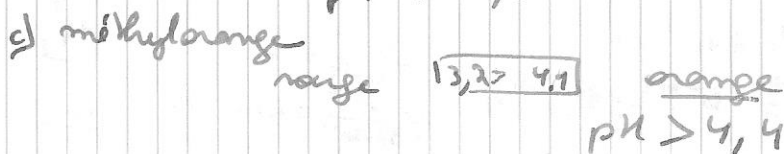
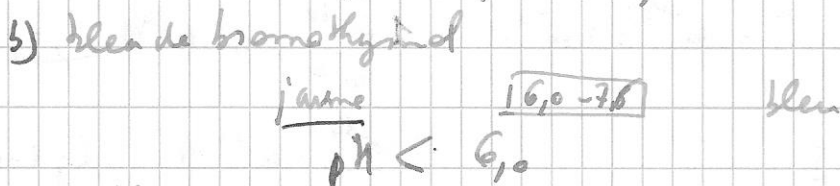
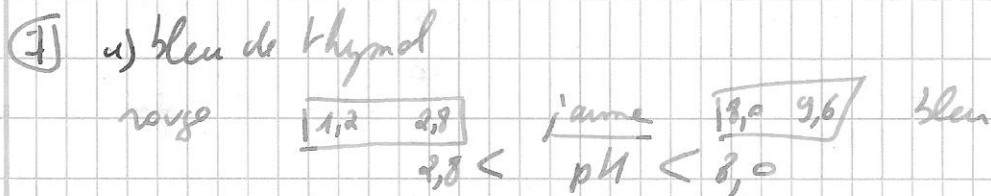
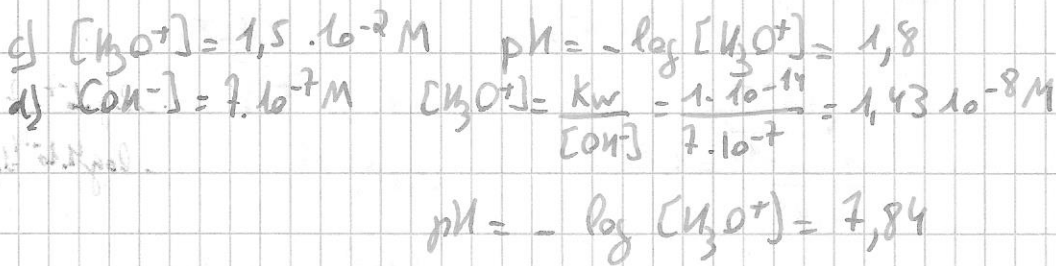
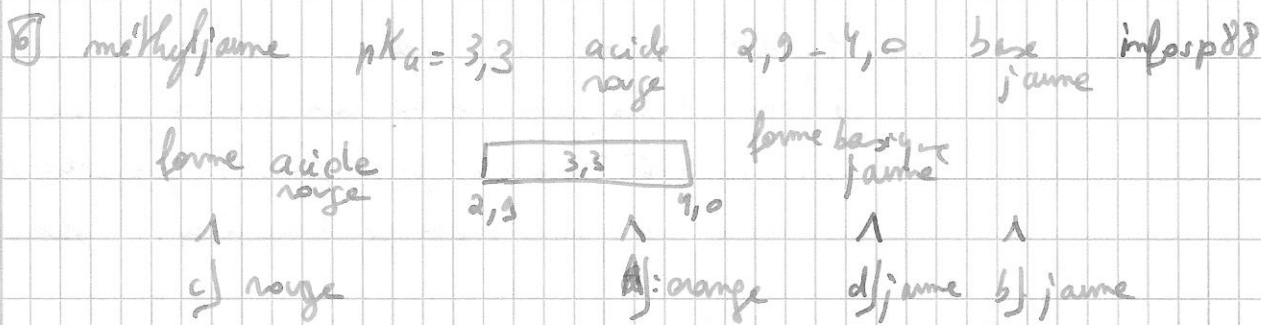
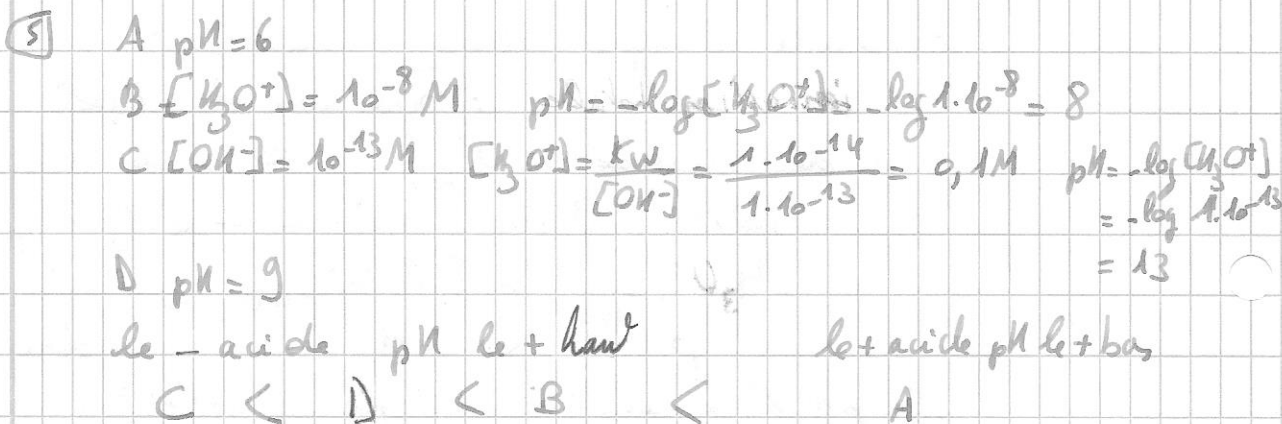
$\frac{10^{-3}}{1 \cdot 10^{-14}} = 1 \cdot 10^{-11} M$ $\log 10^{-3} = 3$ acide

$10^{-pH} = 10^{-2,4} = 4 \cdot 10^{-3} M$ $\frac{1 \cdot 10^{-14}}{4 \cdot 10^{-3}} = 2,5 \cdot 10^{-12} M$ $2,4$ acide

$\frac{1}{1 \cdot 10^{-14}} = 1 \cdot 10^{-14} M$ $-\log 1 = 0$ acide
 $10^{-pH} = 1 \cdot 10^{-14} M$ $\frac{1 \cdot 10^{-14}}{1} = 1$ 14 basique
 $10^{-pH} = 10^{-11} = 3,33 \cdot 10^{-11} M$ $\frac{1 \cdot 10^{-14}}{3,33 \cdot 10^{-11}} = 2,5 \cdot 10^{-4} M$ $10,4$ basique



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C=1M

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neutralisation mutuelle

réaction complète

$$\begin{array}{r} \sqrt{x} N_s = 1L \\ n = \frac{1 \text{ mol}}{1.1} \\ \hline 0 \end{array}$$

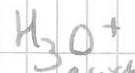
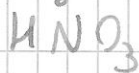
$$\begin{array}{r} \sqrt{x} N_s = 1L \\ n = \frac{1 \text{ mol}}{1.1} \\ \hline -1.1 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 0 \\ +1.1 \\ \hline 1 \end{array}$$

$$\begin{array}{r} 0 \\ +1.1 \\ \hline 1 \end{array}$$

sans excès ni d'acide ni de base

acide fort



acide fort

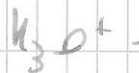
base de force nulle

Préchauffé KOH

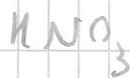


ni acide ni base

base forte



une molécule d'eau new jointe de support



rouge

rose

neutre

qq

incolore pH < 2

BBT

qq

BBT 6,0

jeune 7.6

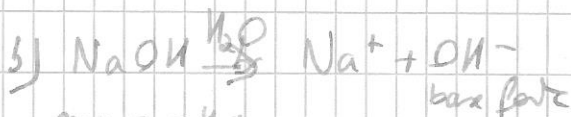
zone de virage bleu carban indistincte VERT

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a) HNO_3 acide fort $\text{pH} = -\log C_A$

$C_A = 0,02 \text{ M}$

$= -\log 0,02 = 1,7$



$m = 0,04 \text{ g}$

$\downarrow M = 40 \text{ g/mol}$

$n = 0,001 \text{ mol}$

$$\begin{array}{r} -1.0,201 \\ \hline 0 \end{array}$$

$$\begin{array}{r} +1.0,001 \\ \hline 1.0,001 \end{array}$$

$n = 0,001$

$\downarrow N_s = 0,1 \text{ L}$

$C = 0,01 \text{ M}$

$\text{pH} = 14 + \log C_B$

$= 14 + \log 0,01$

$= 12$

c) HNO_2 acide faible $\text{pH} = \frac{1}{2} (\text{p}K_a - \log C_A)$

$C_A = 0,1 \text{ M}$

$\text{p}K_a = 3,3$

$= \frac{1}{2} (3,3 - \log 0,1)$

$= 2,15$



$m = 25,2 \text{ g}$

$\downarrow M = 126 \text{ g/mol}$

$n = 0,2 \text{ mol}$

$$\begin{array}{r} -1.0,2 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 0 \\ +1.0,2 \\ \hline n = 0,2 \text{ mol} \\ \downarrow N_s = 1 \text{ L} \\ C = 0,2 \text{ M} \end{array}$$

$\text{pH} = 7 + \frac{1}{2} \text{p}K_a + \frac{1}{2} \log C_B$

$= 7 + \frac{1}{2} \cdot 7,2 + \frac{1}{2} \cdot \log 0,2$

$= 7 + 3,6 - 0,35$

$= 10,25$