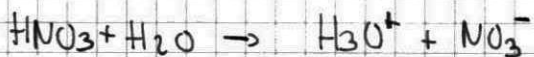


Exercices : acides et bases - corrigés (1)

Exercice 1

$M(\text{HNO}_3) = 63,0 \text{ g/mol}$ $0,0063 \text{ g} \Rightarrow n = \frac{0,0063}{63} = 1 \cdot 10^{-4} \text{ mol}$

$pK_a(\text{HNO}_3) = -3,00 \Rightarrow$ acide fort seul



$\text{pH} = -\log [\text{HNO}_3] = -\log 10^{-4} \Rightarrow \underline{\underline{\text{pH} = 4}}$

Exercice 2

$M(\text{HCl}) = 36,45 \text{ g/mol}$ $1 \text{ g} \Rightarrow n = \frac{1}{36,45} = 0,0274 \text{ mol HCl}$

$pK_a(\text{HCl}) = -7,40 \Rightarrow$ acide fort seul



$\text{pH} = -\log [\text{HCl}] = -\log 0,027 \Rightarrow \underline{\underline{\text{pH} = 1,57}}$

Exercice 3

HNO_3 acide fort seul $\Rightarrow \text{pH} = -\log [\text{HNO}_3] \Rightarrow [\text{HNO}_3] = 10^{-\text{pH}}$
 $[\text{HNO}_3] = \underline{\underline{10^{-2} \text{ mol/l}}}$

$0,01 \text{ mol HNO}_3 = ? \text{ g}$ $m = n \cdot M(\text{HNO}_3) = 0,01 \cdot 63,0 = 0,63 \text{ g HNO}_3$
 \Rightarrow dans la solution il ya $\underline{\underline{0,63 \text{ g HNO}_3/\text{l}}}$

Exercice 4

NaOH base forte $\Rightarrow \text{pH} = 14 + \log [\text{NaOH}]$
 $\text{pH} = 14 + \log (0,1) = 13 \Rightarrow \underline{\underline{\text{pH} = 13}}$

Exercice 5

$1 \text{ g NaOH} = ? \text{ mol}$ $M(\text{NaOH}) = 39,99 \text{ g/mol}$ $n = \frac{1}{39,99} = 0,025 \text{ mol}$
 $\text{pH} = 14 + \log [\text{NaOH}] \Rightarrow \text{pH} = 14 + \log 0,025 \Rightarrow \underline{\underline{\text{pH} = 12,39}}$

Exercice 6

NaOH base forte $\Rightarrow \text{pH} = 14 + \log [\text{NaOH}] \Rightarrow \log [\text{NaOH}] = \text{pH} - 14$
 $\Rightarrow \log [\text{NaOH}] = -0,5 \Rightarrow [\text{NaOH}] = 10^{-0,5} = \underline{\underline{0,316 \text{ mol/l}}}$

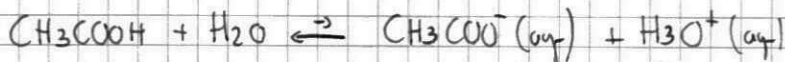
$$m(\text{NaOH}) = m \cdot M \Rightarrow m = 0,316 \cdot 39,99 = \underline{\underline{12,64 \text{ g/l}}}$$

Exercice 7

CH_3COOH acide faible con $pK_a(\text{CH}_3\text{COOH}) = 4,76$

$3 \text{ g CH}_3\text{COOH} = ? \text{ mol}$ $M(\text{CH}_3\text{COOH}) = 60 \text{ g/mol}$

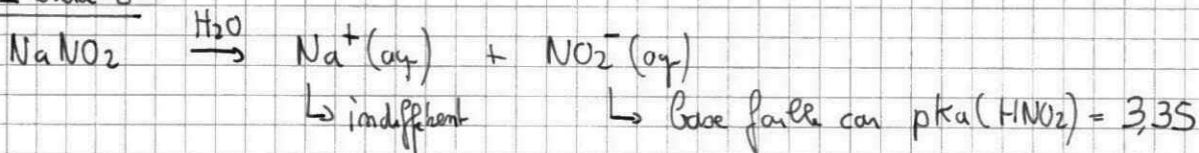
$$m = \frac{3}{60} = 0,05 \text{ mol CH}_3\text{COOH / l} \Rightarrow [\text{CH}_3\text{COOH}] = 0,05 \text{ mol/l}$$



$$\text{pH} = \frac{1}{2} pK_a(\text{CH}_3\text{COOH}) - \frac{1}{2} \log [\text{CH}_3\text{COOH}]$$

$$\text{pH} = 2,38 - \frac{1}{2} \log 0,05 = 3,03 \Rightarrow \underline{\underline{\text{pH} = 3,03}}$$

Exercice 8



$1,38 \text{ NaNO}_2 \Rightarrow ? \text{ mol}$ $M(\text{NaNO}_2) = 69,0 \text{ g/mol}$

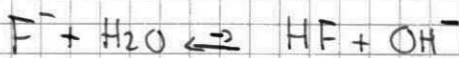
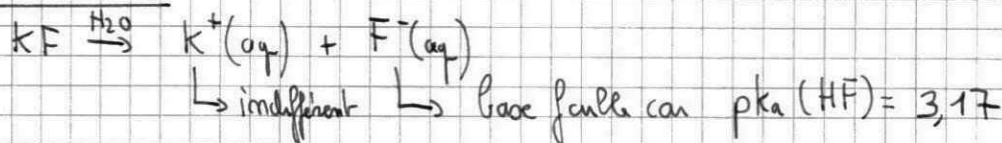
$$m = \frac{1,38}{69,0} = 0,02 \text{ mol NaNO}_2 \text{ dans } 1 \text{ l}$$

$$[\text{NaNO}_2] = [\text{Na}^+] = [\text{NO}_2^-] = 0,02 \text{ mol/l}$$

$$\text{pH} = 7 + \frac{1}{2} pK_a(\text{HNO}_2) + \frac{1}{2} \log [\text{NO}_2^-]$$

$$\text{pH} = 7 + 1,675 + \frac{1}{2} \log 0,02 = 7,83 \Rightarrow \underline{\underline{\text{pH} = 7,83}}$$

Exercice 9



$$\text{pH} = \underbrace{7}_8 + \underbrace{\frac{1}{2} pK_a(\text{HF})}_{1,675} + \frac{1}{2} \log [\text{F}^-] \Rightarrow \frac{1}{2} \log [\text{F}^-] = 8 - 7 - 1,675 = -0,675$$

$$\Rightarrow \log [\text{F}^-] = 2 \cdot (-0,675) \Rightarrow \log [\text{F}^-] = -1,35 \Rightarrow [\text{F}^-] = 10^{-1,35}$$

$$\Rightarrow [\text{F}^-] = 0,045 \text{ mol/l} \Rightarrow [\text{KF}] = [\text{F}^-] = \underline{\underline{0,045 \text{ mol/l}}}$$

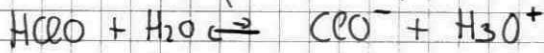
$m(\text{KF}) = m \cdot M$ et $M(\text{KF}) = 58,096 \text{ g/mol}$

$$m \text{ KF} = 0,045 \cdot 58,096 = \underline{\underline{2,614 \text{ g/l}}}$$

Exercices : acides et bases - corrigés (2)

Exercice 10

HCOO acide faible car $pK_a = 7,5$



$pH = \frac{1}{2} pK_a HCOO - \frac{1}{2} \log [HCOO]$
4,5 7,5

$\Rightarrow \frac{1}{2} \log [HCOO] = 3,75 - 4,5 = -0,75$

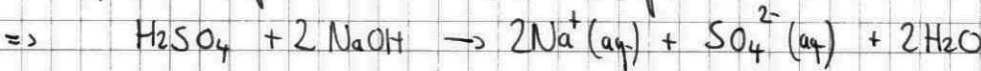
$\Rightarrow \log [HCOO] = -1,5 \Rightarrow [HCOO] = 10^{-1,5} = \underline{\underline{0,032 \text{ mol/l}}}$

$m = n \cdot M$ et $M(HCOO) = 52,45 \text{ g/mol}$

$m = 0,032 \cdot 52,45 = \underline{\underline{1,678 \text{ g HCOO/l}}}$

Exercice 11

H₂SO₄ diacide fort et NaOH base forte



Stoechiométrie

	1	2	2	1	2
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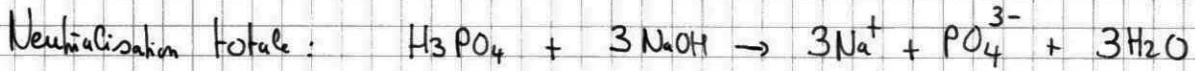
$[]_{(H)} \times 0,1$

$V [l] 0,02 \quad 0,0151$

$m [mmol] 7,55 \cdot 10^{-4} \quad 0,00151$

$[] \cdot V = m \Rightarrow [] = \frac{m}{V} \Rightarrow [] = \frac{7,55 \cdot 10^{-4}}{0,02} = \underline{\underline{0,0378 \text{ mol/l}}}$

Exercice 12



Stoechiométrie

	1	3	3	1	3
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$[] [mol/l] 0,5 \quad \times$

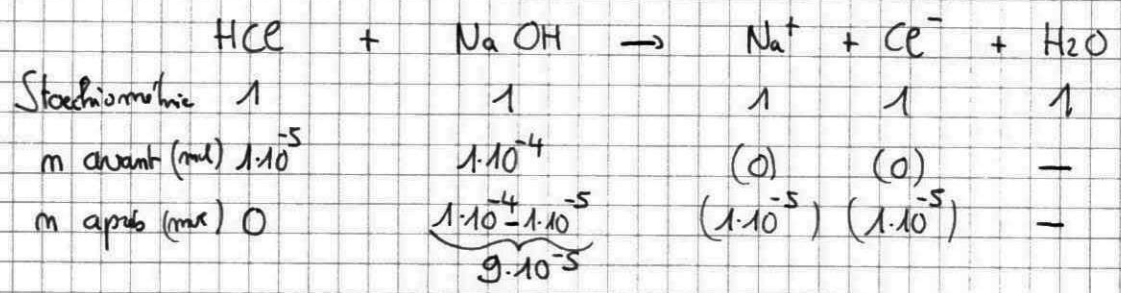
$V [l] 0,014 \quad 0,01$

$m [mmol] 5,7 \cdot 10^{-3} \quad 0,0171$

$m = [] \cdot V \Rightarrow [] = \frac{m}{V} \Rightarrow [] = \frac{0,0171}{0,01} = \underline{\underline{1,71 \text{ mol/l}}}$

Exercice 13

HCl acide fort et NaOH base forte \Rightarrow réaction ox!



• $[] = \frac{m}{V} \Rightarrow m = [] \cdot V \Rightarrow m(\text{NaOH}) = 0,01 \cdot 0,01 = 1 \cdot 10^{-4} \text{ ml}$

• HCl à pH = 3 $\Rightarrow \text{pH} = -\log [\text{HCl}] \Rightarrow [\text{HCl}] = 10^{-3} \text{ mol/l}$

$m(\text{HCl}) = [\text{HCl}] \cdot V_{\text{HCl}} = 10^{-3} \cdot 0,01 = 1 \cdot 10^{-5} \text{ mol}$

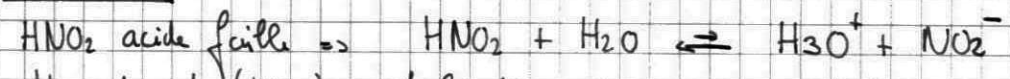
Après neutralisation il reste $9 \cdot 10^{-5} \text{ mol}$ NaOH en excès qui sont dilués dans un volume total de 20 ml

$\Rightarrow [\text{NaOH}] = \frac{m}{V} = \frac{9 \cdot 10^{-5}}{0,02} = 4,5 \cdot 10^{-3} \text{ mol/l}$

NaOH base forte $\Rightarrow \text{pH} = 14 + \log [\text{NaOH}] \Rightarrow \text{pH} = 14 + \log 4,5 \cdot 10^{-3}$

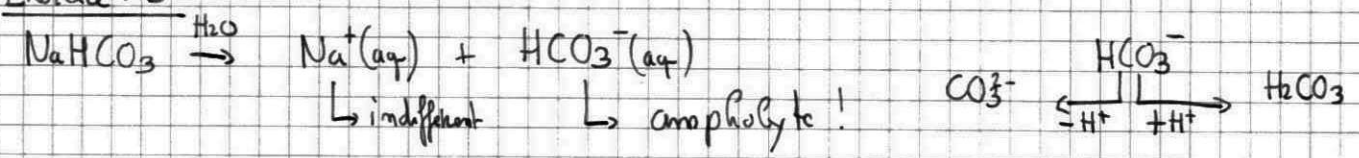
$\Rightarrow \text{pH} = 11,65$

Exercice 14



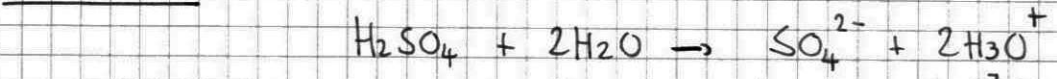
$\text{pH} = \frac{1}{2} \text{p}K_a(\text{HNO}_2) - \frac{1}{2} \log [\text{HNO}_2] = 1,65 - \frac{1}{2} \log 0,1 \Rightarrow \text{pH} = 2,15$

Exercice 15



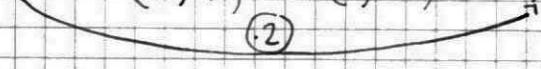
$\text{pH} = \frac{\text{p}K_a(\text{H}_2\text{CO}_3) + \text{p}K_a(\text{HCO}_3^-)}{2} = \frac{6,38 + 10,32}{2} = 8,35 > 7 \Rightarrow \text{Basique!}$

Exercice 16



[] Avant 0,1M (5,5M) (0) (10⁻⁷M)

[] Après 0 (5,5M) (0,1M) 0,2M



H_3O^+ acide fort $\Rightarrow \text{pH} = -\log [\text{H}_3\text{O}^+] \Rightarrow \text{pH} = -\log 0,2 \Rightarrow \text{pH} = 0,698$