

CHIMIE ( 9 points )  
Exercice 1 (5 points)

BAREME

COMMENTAIRE

## Partie I

1 - La valeur du pH d'une base forte est donnée par l'expression :  
 $\text{pH} = \text{pK}_e + \log C_0$ . Seul le pH de la solution ( $S_3$ ) vérifie cette relation. Par conséquent  $B_1$  et  $B_2$  sont des bases faibles et  $B_3$  est une base forte.

0,25x2

2) a -  $\tau_{1f} = \frac{[\text{OH}^-]}{C_0} = \frac{K_e}{C_0 \cdot 10^{-\text{pH}_{S1}}}$  (0,25)

$$\tau_{1f} = 10^{-3,6} = 2,5 \cdot 10^{-2}$$

0,25x2

$\tau_{1f} < 5 \cdot 10^{-2}$  donc  $B_1$  est faiblement ionisée dans l'eau. (0,25)

b - Dans le domaine des concentrations [ $10^{-2} \text{ mol.L}^{-1}$ ,  $10^{-1} \text{ mol.L}^{-1}$ ], la base  $B_1$  est faiblement dissociée dans l'eau donc  $[B_1] \approx C$ .

En négligeant les molarités des ions  $\text{H}_3\text{O}^+$  et  $\text{OH}^-$  provenant de la dissociation propre de l'eau on peut écrire :  $[B_1\text{H}^+] = [\text{OH}^-]$

0,25x4

La constante d'acidité du couple  $B_1\text{H}^+/B_1$  s'écrit :  $K_{a1} = \frac{[\text{H}_3\text{O}^+] \cdot [B_1]}{[B_1\text{H}^+]}$  (0,25)

$$K_{a1} = \frac{[\text{H}_3\text{O}^+] \cdot C}{[\text{OH}^-]} = \frac{[\text{H}_3\text{O}^+]^2 \cdot C}{K_e} = \frac{10^{-2\text{pH}} \cdot C}{K_e}$$

D'où :  $\text{pH} = \frac{1}{2} (\text{pK}_{a1} + \text{pK}_e + \log C)$ , qui peut se mettre sous la forme (0,25)

$$\text{pH} = b + a \log C \text{ avec } b = \frac{1}{2} (\text{pK}_{a1} + \text{pK}_e); \quad a = 1/2 \quad (0,25)$$

c - D'après la courbe  $\mathcal{E}_1$ , or  $b = \frac{1}{2} (\text{pK}_{a1} + \text{pK}_e)$ ; d'où (0,25)

$$\text{pK}_{a1} = \text{pK}_e$$

Soit :  $\text{pK}_{a1} = 7,8$  (0,25)

0,25x2

## Partie II

1) a - Le pH initial de la solution ( $S_3$ ) est égal à 13. La courbe  $\mathcal{E}_3$  correspond au dosage de la solution ( $S_3$ ).

0,25

b - l'équivalence acido-basique est l'état du mélange correspondant à un mélange de quantités de matière d'acide et de base dans les proportions stoechiométriques. (0,25)

0,25x2

A l'équivalence  $C_A \cdot V_{AE} = C_0 \cdot V_{B3} \Rightarrow C_A = \frac{C_0 \cdot V_{B3}}{V_{AE}} \quad C_A = 5 \cdot 10^{-2} \text{ mol.L}^{-1}$  (0,25)

# Paper1physical Science 2014

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