

Appello 17/07/2023

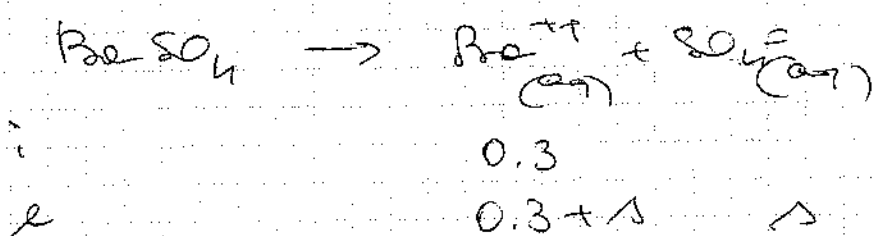
① 40 mL $\text{Ba}(\text{NO}_3)_2$ $4.5 \cdot 10^{-4} \text{ M}$ $[\text{Ba}^{++}] = ?$

50 mL Na_2SO_4 $5 \cdot 10^{-5} \text{ M}$ $[\text{SO}_4^{2-}] = ?$

$$\frac{4.5 \cdot 10^{-4} \frac{\text{mol}}{\text{L}} \cdot 0.040 \text{ L}}{0.090 \text{ L}} = [\text{Ba}^{++}] = 2 \cdot 10^{-4} \text{ M}$$

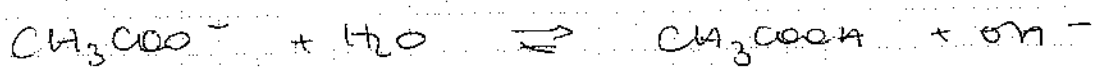
$$\frac{5 \cdot 10^{-5} \frac{\text{mol}}{\text{L}} \cdot 0.050 \text{ L}}{0.090 \text{ L}} = [\text{SO}_4^{2-}] = 2.78 \cdot 10^{-5} \text{ M}$$

$$[\text{Ba}^{++}][\text{SO}_4^{2-}] = Q_{\text{ps}} = 5.56 \cdot 10^{-9} > K_{\text{ps}} \quad \text{precipita}$$



$$K_{\text{ps}} = (0.3+x)(x) = 1.2 \cdot 10^{-10}$$

$$x = \frac{1.2 \cdot 10^{-10}}{0.3} = 4 \cdot 10^{-10}$$



0.3

0.3 - x

x

x

29

5

$$\frac{10^{-14}}{1.8 \cdot 10^{-5}} = \frac{x^2}{0.3-x}$$

$$x = [\text{OH}^-] = \sqrt{\frac{K_{\text{a}} \cdot 0.3}{K_{\text{a}}}} =$$

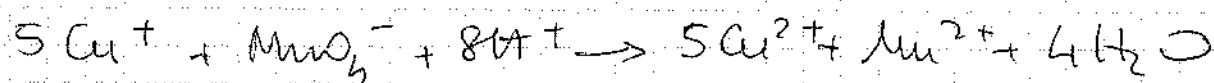
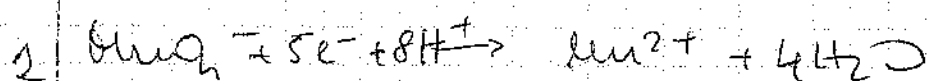
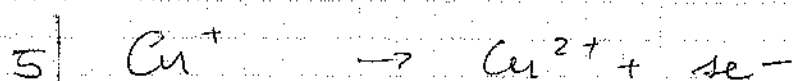
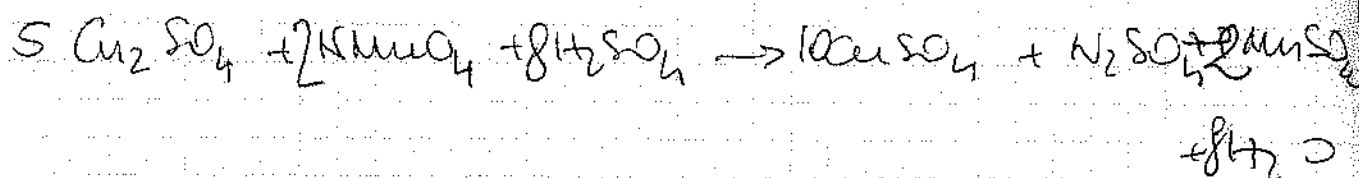
$$[\text{OH}^-] = 1.29 \cdot 10^{-5} \text{ M}$$

$$\text{pOH} = 4.89$$

$$\boxed{\text{pH} = 9.11}$$

①

Q2



3.80 g KMnO_4 97%

$$\frac{3.80 \text{ g}}{158.0 \text{ g/mol}} = 2.41 \cdot 10^{-2} \text{ mol} \cdot 0.97 = 2.33 \cdot 10^{-2} \text{ mol}$$

$$2:5 = 2.33 \cdot 10^{-2} \text{ mol} : x \text{ mol Cu}_2\text{SO}_4$$

$$\text{mol Cu}_2\text{SO}_4 = 5.83 \cdot 10^{-2} \text{ mol}$$

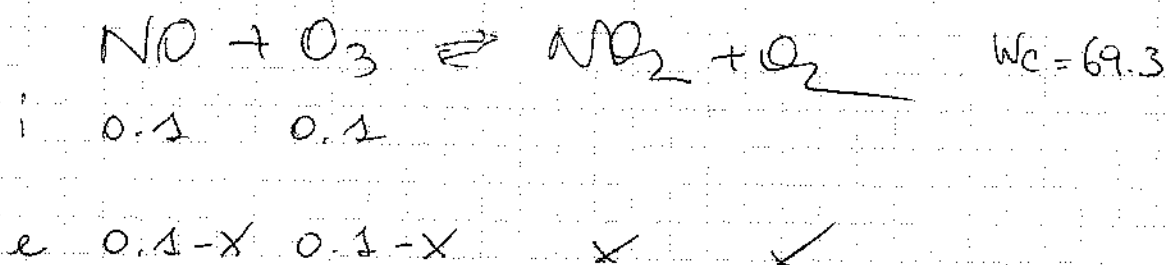
$$m \text{ Cu}_2\text{SO}_4 = 5.83 \cdot 10^{-2} \text{ mol} \cdot 223.15 \text{ g/mol} = 13.01 \text{ g}$$

$$m \text{ Cu}_2\text{SO}_4 \text{ 40\%} = \frac{13.01 \text{ g}}{0.40} = \boxed{32.54 \text{ g}}$$

$$V = \frac{32.54 \text{ g}}{1.38 \text{ g/ml}} = 23.58 \text{ ml}$$

2

Ex 3



$$K_c = \sqrt{69.3} = \frac{x^2}{(0.1-x)^2} = 8.32$$

$$\frac{x}{0.1-x} = 8.32 \quad x = 8.32(0.1-x)$$

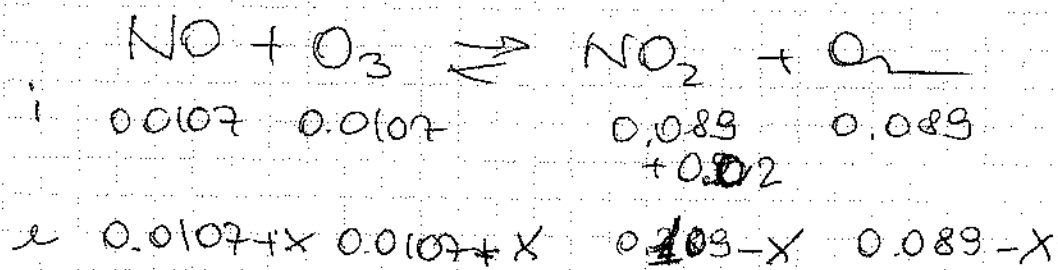
$$x = -8.32x + 0.832$$

$$9.32x = 0.832$$

$$\boxed{x = 0.089}$$

$$[\text{NO}] = [\text{O}_3] = (0.1 - 0.089) \text{ M} = 0.0107 \text{ M}$$

$$[\text{NO}_2] = [\text{O}_2] = 0.089 \text{ M}$$



$$69.3 = \frac{(0.0107-x)(0.089-x)}{(0.0107+x)^2}$$

29
25

$$[\text{NO}] = [\text{O}_3] = 0.0107 + 0.011 = \underline{0.0217 \text{ M}}$$

$$[\text{NO}_2] = \cancel{0.109} - 0.011 = \underline{0.098 \text{ M}}$$

$$[\text{O}_2] = 0.088 - 0.011 = \underline{0.077 \text{ M}}$$

EX4

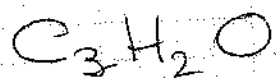
$$\frac{13.20 \text{ g CO}_2}{44 \text{ g/mol}} = \frac{0.3 \text{ mol C} \cdot 12}{3.6 \text{ g C}}$$

$$\frac{1.80 \text{ g}}{18 \text{ g/mol}} = 0.1 \text{ mol} \cdot 2 = \underline{0.2 \text{ mol H}}$$

$$0.2 \text{ mol} \cdot 1.01 \text{ g/mol} = 0.0404 \text{ g}$$

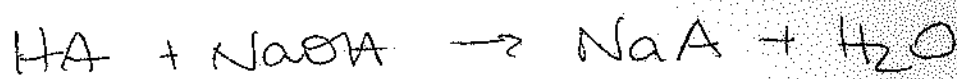
$$(5.40 - 3.6 - 0.0404) \text{ g} = 1.76 \text{ g O}$$

$$\frac{1.76 \text{ g}}{16.0 \text{ g/mol}} = \underline{0.11 \text{ mol O}}$$



(4)

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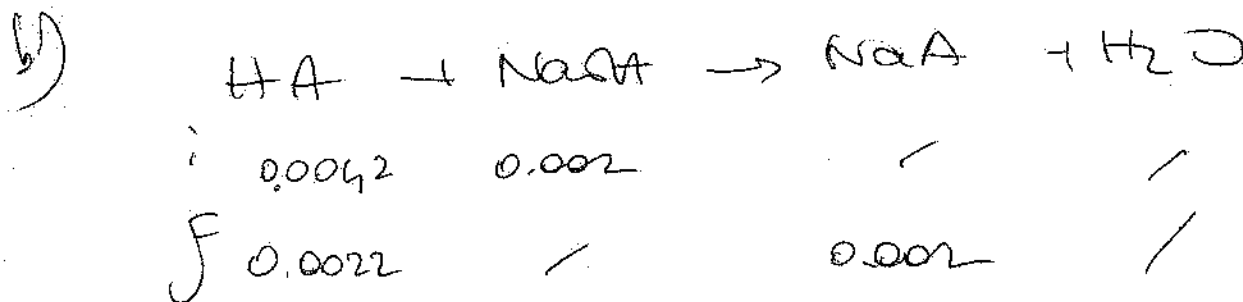
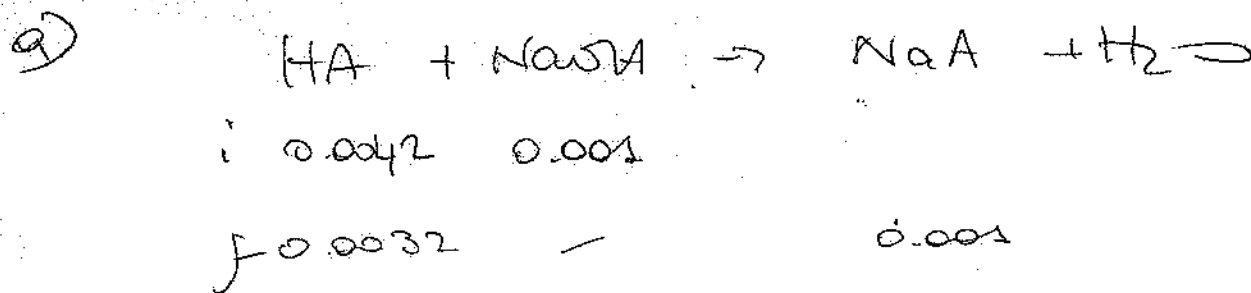
$$42 \text{ mL NaOH} \quad | \quad 0.042 \text{ L} \cdot 0.1 \frac{\text{mol}}{\text{L}} = 0.0042 \text{ mol}$$

$$0.10 \text{ M}$$



$$[\text{OH}^-] = \sqrt{\frac{K_w}{K_a} \cdot c_s} = \sqrt{\frac{10^{-14}}{1.6 \cdot 10^{-5}} \cdot \frac{0.0042}{0.042}}$$

$$[\text{OH}^-] = 7.45 \cdot 10^{-6} \text{ M} \Rightarrow \begin{cases} \text{pOH} = 5.13 \\ \text{pH} = 8.87 \end{cases}$$



a)

$$[\text{H}^+] = 1.6 \cdot 10^{-5} \cdot \frac{0.0032}{0.001} = 5.12 \cdot 10^{-5} \text{ M} \Rightarrow \text{pH} = 4.29$$

b)

$$[\text{H}^+] = 1.6 \cdot 10^{-5} \cdot \frac{0.0022}{0.002} = 1.76 \cdot 10^{-5} \text{ M} \Rightarrow \text{pH} = 4.75$$

(5)