

Calcola il pH delle seguenti soluzioni:

1) NH_3 0,58g parti in 350 mL ($K_b = 5.5 \cdot 10^{-10}$)

	$\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{OH}^-$			
INIZIO	c	/	0	0 (10^{-14})
FINE	c-x	/	x	x

$$K_b = \frac{[\text{NH}_4^+][\text{OH}^-]}{[\text{NH}_3]} \quad K_b = \frac{x^2}{c-x} \approx \frac{x^2}{c}$$

$$x = \sqrt{K_b c} \quad \text{OH}^- = \sqrt{K_b \cdot c}$$

$$K_b = \frac{K_w}{K_a} = \frac{10^{-14}}{5.5 \cdot 10^{-10}} = 0,182 \cdot 10^{-4} \quad \text{PM}(\text{NH}_3) = 14+3 = 17 \text{ g/mol} \quad M^o = \frac{g}{\text{PM}}$$

$$M^o = \frac{0,58 \text{ g}}{17 \text{ g/mol}} = 3,41 \cdot 10^{-2} \text{ mol} \quad c = \frac{M^o}{V} = \frac{3,41 \cdot 10^{-2} \text{ mol}}{0,350 \text{ L}} = 9,74 \cdot 10^{-2} \text{ mol/L}$$

$$\text{OH}^- = \sqrt{0,182 \cdot 10^{-4} \cdot 9,74 \cdot 10^{-2}} = \sqrt{1,77 \cdot 10^{-6}} = 1,33 \cdot 10^{-3} \quad \text{pOH} = -\log \text{OH}^-$$

$$\text{pOH} = 2,88 \quad \text{pH} = 14 - \text{pOH} \quad \boxed{\text{pH} = 11,12}$$

2) $\text{Mg}(\text{OH})_2$ 0,65 g 700 mL

	$\text{Mg}(\text{OH})_2 \rightarrow \text{Mg}^{2+} + 2 \text{OH}^-$		
INIZIO	c	0	0
FINE	0	c	2c

$$\text{OH}^- = 2c$$

$$\text{PM} = 24 + 32 + 2 = 58 \text{ g/mol}$$

$$M^o = \frac{0,65 \text{ g}}{58 \text{ g/mol}} = 1,12 \cdot 10^{-2} \text{ mol}$$

$$c = \frac{1,12 \cdot 10^{-2} \text{ mol}}{0,7 \text{ L}} = 1,60 \cdot 10^{-2} \text{ mol/L}$$

$$\text{OH}^- = 2c = 3,2 \cdot 10^{-2} \text{ mol/L}$$

$$\text{pOH} = 1,49 \quad \boxed{\text{pH} = 12,51}$$

3) H_2SO_4 0,15 g 400 mL

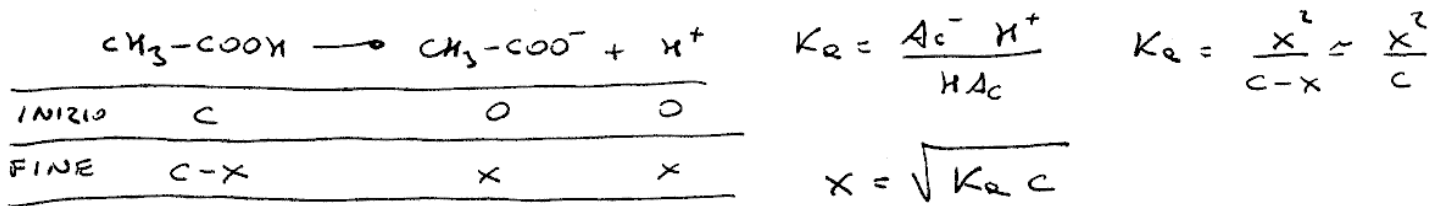
	$\text{H}_2\text{SO}_4 \rightarrow \text{HSO}_4^- + \text{H}^+$		
	c	0	0
	0	c	c
			INIZIO
			FINE

PM = 32
64
2
PM
g/mol

$$\text{H}^+ = c \quad M^o = \frac{g}{\text{PM}} = \frac{0,15 \text{ g}}{98 \text{ g/mol}} = 1,53 \cdot 10^{-3} \text{ mol} \quad c = \frac{M^o}{V} = \frac{1,53 \cdot 10^{-3} \text{ mol}}{0,4 \text{ L}}$$

$$c = 3,83 \cdot 10^{-3} \text{ mol/L} \quad \text{H}^+ = 3,83 \cdot 10^{-3} \text{ mol/L} \quad \boxed{\text{pH} = -\log 3,83 \cdot 10^{-3} = 2,42}$$

$$4) \boxed{\text{CH}_3\text{COOH } 0,90 \text{ g } 250 \text{ mL } K_a = 1,8 \cdot 10^{-5}}$$



$$\text{PM} = \begin{array}{r} 16 \\ 16 \\ 24 \\ 4 \\ \hline 60 \end{array} \text{ g/mol} \quad n^0 = \frac{g}{\text{PM}} = \frac{0,9 \text{ g}}{60 \text{ g/mol}} = 1,5 \cdot 10^{-2} \text{ mol} \quad c = \frac{\text{mol}}{L} = \frac{1,5 \cdot 10^{-2} \text{ mol}}{0,25 \text{ L}}$$

$$c = 6,0 \cdot 10^{-2} \text{ mol/L} \quad \text{H}^+ = \sqrt{K_a c} = \sqrt{1,8 \cdot 10^{-5} \cdot 6,0 \cdot 10^{-2}}$$

$$\text{H}^+ = 1,04 \cdot 10^{-4} \quad \text{H}^+ = 1,04 \cdot 10^{-3} \quad \text{pH} = -\log \text{H}^+ \quad \boxed{\text{pH} = 2,98}$$

$$c-x = 6,0 \cdot 10^{-2} - 0,104 \cdot 10^{-2} = 5,896 \cdot 10^{-2} \approx 6,0 \cdot 10^{-2} \quad \left[\begin{array}{l} \text{APPROSSIMAZIONE} \\ \text{CORRETTA } c-x \approx c \end{array} \right]$$