EX1

$$Mg(OH)_2{}_{(s)} \longrightarrow Mg^{++}{}_{(aq)} + 2OH^-{}_{(aq)} \qquad pH = 10.35$$
$$pOH = 3.65$$

s   s   2s

$$2s = [OH^-] = 10^{-3.65} = 2.23 \cdot 10^{-4} \, M$$

$$\boxed{K_{ps}} = [Mg^{++}][OH^-]^2 = 4s^3 = 4 \cdot \left(\frac{2.23 \cdot 10^{-4}}{2}\right)^3 = \boxed{5.55 \cdot 10^{-12}}$$

$$MgSO_4{}_{(s)} \longrightarrow Mg^{++}{}_{(aq)} + SO_4^={}_{(aq)}$$

                                 0.2

                              0.2 + s   2s
                                 ↑   ↑

$$Mg(OH)_2{}_{(s)} \longrightarrow Mg^{++}{}_{(aq)} + 2OH^-{}_{(aq)}$$
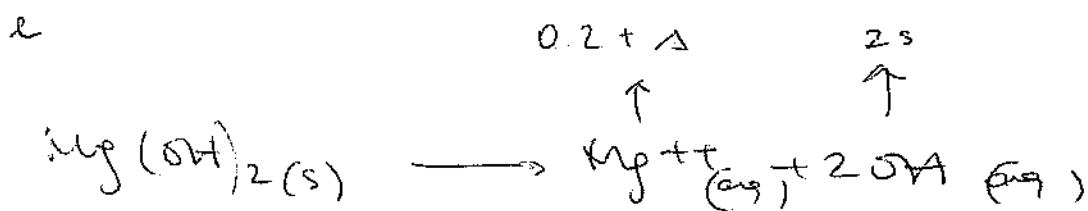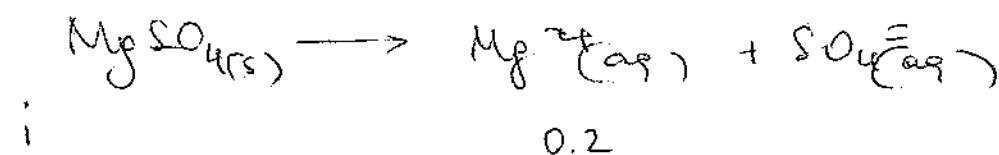
$$K_{ps} = 5.55 \cdot 10^{-12} = (0.2 + \cancel{x})(2s)^2$$

$$5.55 \cdot 10^{-12} = 0.2 \cdot 4s^2 \implies \boxed{s} = \sqrt{\frac{5.55 \cdot 10^{-12}}{0.2 \cdot 4}} = 2.63 \cdot 10^{-6} \, M$$

EX2

$$8 HNO_3 + 3 Zn \rightarrow 3 Zn(NO_3)_2 + 2NO + 4H_2O$$

$$2 \begin{vmatrix} \overset{+5}{NO_3^-} + 3e^- + 4H^+ \rightarrow \overset{+2}{NO} + 2H_2O \\ \\ 3 \quad Zn \rightarrow Zn^{2+} + 2e^- \end{vmatrix}$$

$$\overline{}$$

$$3 Zn + 2NO_3^- + 8H^+ \rightarrow 3Zn^{2+} + 2NO + 4H_2O$$
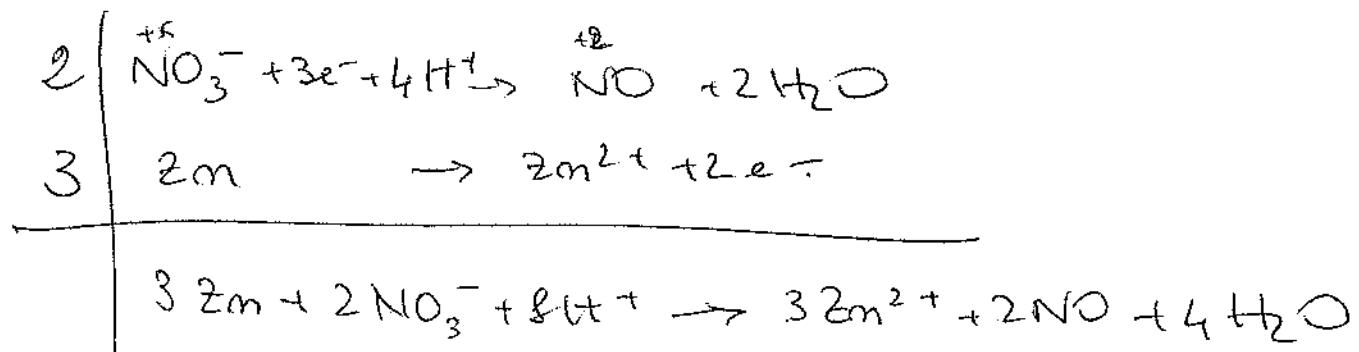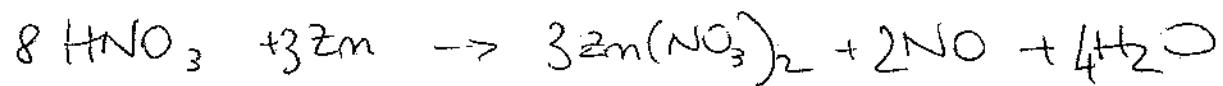
$$pV = \overset{?}{\textcircled{n}}RT$$

$$mol \; HNO_3 = 0.107 \, L \cdot 1.50 \, \frac{mol}{L} = 0.160 \, mol$$

$$mol \; Zn = \frac{2.75g \cdot 0.90}{65.38 \, g/mol} = 0.037 \, mol \qquad LIMITANTE$$

$$3 : 2 = 0.037 \, mol \; : \; x \, mol \; NO$$

$$mol \, NO_{teoriche} = 0.024 \, mol \cdot 0.98 = 0.023 \, mol \; effettive$$

$$T (28 + 273) K = 301 K$$

$$P = \frac{750}{760} \, atm = 0.98 \, atm$$

$$\boxed{V = \frac{nRT}{P}}$$

$$V_{NO} = \frac{0.023 \, mol \cdot 0.0821 \, \frac{atm \, L}{mol \, K} \cdot 301 \, K}{0.98 \, atm}$$

$$V_{NO} = 0.579 L = 579 \, mL$$

$$\overline{O} = \overset{\bullet}{N} - \overline{O} |$$

prepara sp^2

$$AX_2E \quad \underline{}$$

②

EX3

$8.1 \, g \, CaCl_2 \rightarrow Ca^{++} + 2Cl^- \qquad i = 3$
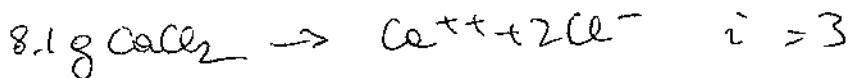
$750 \, g \, H_2O \qquad\qquad \Delta T = N_{cr} \cdot m$

$$mol \, CaCl_2 = \frac{8.1 \, g}{75.53 \, g/mol} = 0.107 \, mol$$

$$m_{soluto} = \frac{0.107 \, mol}{0.750 \, kg} = \boxed{0.142 \, m}$$

$$\Delta T = T_{sol} - T_{solvente \, puro} = N_{cr} \cdot m \cdot i$$

$$\Delta T = T_{sol} - 0.00°C = 1.86 °C \, kg/mol \cdot 0.142 \frac{mol}{kg} \cdot 3$$

$$T_{sol} = 0.792°C$$

EX4

$$C = \frac{24}{12} = 2$$

$$Cl = \frac{71}{35.5} = 2$$

$$H = \frac{4.05}{1.01} = 4$$

$$\frac{MM \, reale}{MM \, minima} = 2$$

CH_2Cl formula minima

$MM_{min} = 49.48 \, g/mol$

$MM_{reale} = 98.96 \, g/mol$

$C_2H_4Cl_2$ FORMULA MOLECOLARE

EX5

$pH = 9.5 \Rightarrow pOH = 4.5$

$[OH^-] = 10^{-4.5} = X$

$$NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^- \qquad K_b = 1.8 \cdot 10^{-5}$$

i C_b

e $C_b - x \qquad\qquad\qquad x \qquad x$
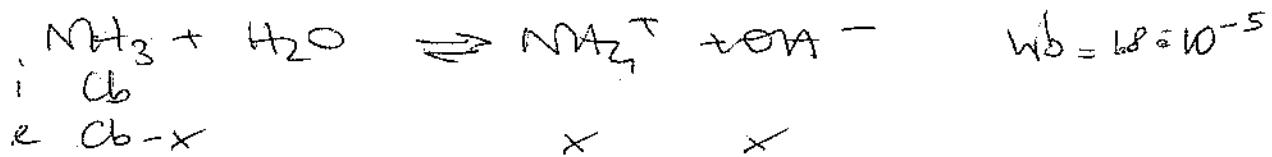
$K_b = 1.8 \cdot 10^{-5} = \dfrac{x^2}{C_b - x}$

$1.8 \cdot 10^{-5} = \dfrac{(10^{-4.5})^2}{C_b - 10^{-4.5}} \Rightarrow C_b = 8.70 \cdot 10^{-5}$ ✓

$[NH_3] = 8.70 \cdot 10^{-5} M \Rightarrow 8.70 \cdot 10^{-5} \, mol$ in $1L$

$\dfrac{8.70 \cdot 10^{-5} \, mol \cdot 17.01 \, g/mol}{0.28} = 5.28 \cdot 10^{-3} \, g \ NH_3 \ sol$

$V_{mL} = \dfrac{m}{d} = \dfrac{5.28 \cdot 10^{-3} \, g}{1.1 \, g/mL} = 4.80 \cdot 10^{-3} \, mL$

$[OH^-] = K_b \cdot \dfrac{n_b}{n_s} = 1.8 \cdot 10^{-5} \cdot \dfrac{0.07 \, mol}{0.280 \, mol} = 4.5 \cdot 10^{-6} M$

$n_b = 0.1 \dfrac{mol}{L} \cdot 0.700 \, L = 0.07 \, mol$

$n_s = \dfrac{15g}{53.5 \, g/mol} = 0.280 \, mol$

$pOH = 5.34$

$\boxed{pH = 8.66}$ ④

$$H_2 + CO_2 \rightleftharpoons H_2O + CO$$

i 0.5   0.5

e 0.5-x   0.5-x   x   x
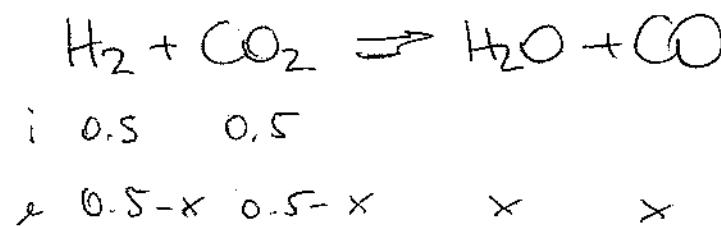
$K_c = 1.6 = K_p$ $\underline{\Delta n = 0}$

$$K_c = 1.6 = \frac{x^2}{(0.5-x)^2}$$

$$\sqrt{1.6} = \frac{x}{0.5-x} = 1.264$$

$$x = 1.264 (0.5-x)$$

$$x = 0.632 - 1.264\, x$$

$$x + 1.264\, x = 0.632 \implies \boxed{x = 0.279\ mol}$$

$$[H_2] = [CO_2] = \frac{(0.5-0.279)\,mol}{10\,L} = 0.0.221\ M$$

$$[H_2O] = [CO] = \frac{0.279}{10\,L} = 0.0279\ M$$

$$Rese = \frac{0.279\ mol}{0.5\ mol} \ast 100 = 55.8\%$$

⑤