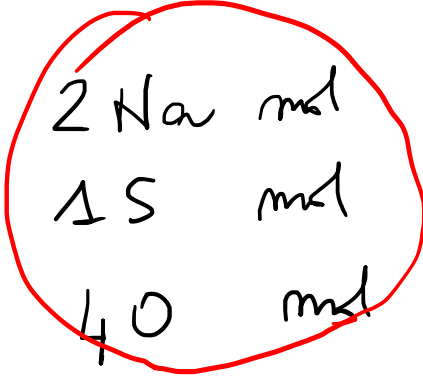
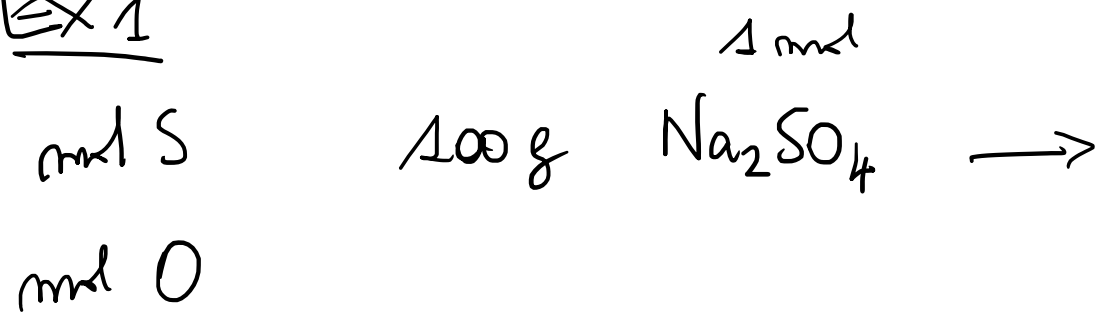


Lezione 2

EX 1



$$MM = 23 \text{ g/mol} \cdot 2 + 32 \text{ g/mol} + 16.0 \text{ g/mol} \cdot 4$$

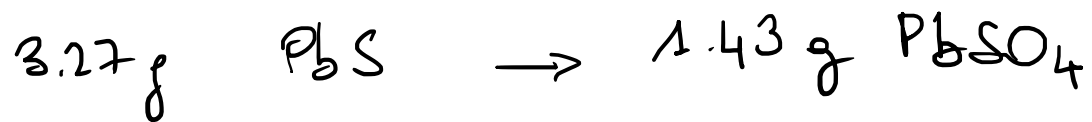
$$MM_{\text{Na}_2\text{SO}_4} = 142 \text{ g/mol}$$

$$\text{mol} = \frac{g}{MM} = \frac{100 \text{ g}}{142 \text{ g/mol}} = 0.704 \text{ Na}_2\text{SO}_4 \text{ mol}$$

mol S = 0.704 mol

mol O = 0.704 mol · 4 = 2.82 mol

EX2



$$\begin{aligned} \% \text{ PbS} &= ? \\ \% \text{ Pb} &= ? \end{aligned}$$

$$\underline{\text{mol}} = \frac{\text{g}}{\underline{\text{MM}}}$$

$$\text{MM}_{\text{PbSO}_4} = 303.2 \text{ g/mol}$$

$$\Rightarrow \text{mol PbSO}_4 = \text{mol Pb} = \frac{1.43 \text{ g}}{303.2 \text{ g/mol}} = 4.71 \cdot 10^{-3} \text{ mol} = \text{mol PbS}$$

$$m \text{ PbS} = 4.71 \cdot 10^{-3} \text{ mol} \cdot 239.2 \text{ g/mol} = 1.13 \text{ g PbS}$$

$$m \text{ Pb} = 4.71 \cdot 10^{-3} \text{ mol} \cdot 207.2 \text{ g/mol} = 0.976 \text{ g Pb}$$

$$\% \text{ PbS} = \frac{1.13 \text{ g}}{3.27 \text{ g}} \cdot 100 = 34.6\%$$

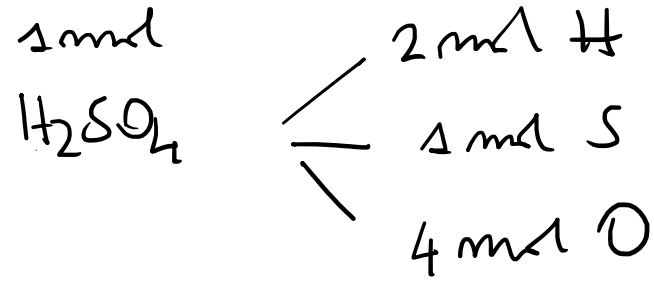
$$\% \text{ Pb} = \frac{0.976 \text{ g}}{3.27 \text{ g}} \cdot 100 = 29.8\%$$

②

EX 3

H_2SO_4 3.00 ml

- a) Masse H_2SO_4
- b) masse S
- c) m.atomi H, O, S



$$MM_{H_2SO_4} = 98 \text{ g/ml}$$

$$g/MM = \text{ml}$$

$$m = \text{ml} \cdot MM.$$

a) $m_{H_2SO_4} = 3.00 \text{ ml} \cdot 98 \text{ g/ml} = 294 \text{ g}$

b) $m_S = 3.00 \text{ ml} \cdot \text{g/ml} = 96.0 \text{ g}$

c) $1 \text{ ml} = N_A = 6.022 \cdot 10^{23}$

$$m_{\text{atomi S}} = 3.00 \text{ ml} \cdot 6.022 \cdot 10^{23} \frac{\text{atomi}}{\text{ml}} =$$

$$m_{\text{atomi O}} = 3.00 \text{ ml} \cdot \underline{\underline{4}} \cdot 6.022 \cdot 10^{23} \frac{\text{atomi}}{\text{ml}}$$

$$m_{\text{atomi H}} = 3.00 \text{ ml} \cdot \underline{\underline{2}} \cdot 6.022 \cdot 10^{23} \frac{\text{atomi}}{\text{ml}}$$

EX4

PbS
+
altro

→ Pb 22.5 % $\frac{m}{m}$ PbS è contenuto nel campione

$$MA_{Pb} = 207.2 \text{ g/mol}$$

22.5 g Pb

$$mol_{Pb} = \frac{22.5 \text{ g}}{207.2 \text{ g/mol}} = 0.1086 \text{ mol} = \text{mol PbS}$$

$$m_{PbS} = 0.1086 \text{ mol} \cdot 239.2 \text{ g/mol} = \boxed{25.98 \text{ g PbS}}$$

$$MM_{PbS} = (207.2 + 32) \text{ g/mol} = 239.2 \text{ g/mol}$$

4

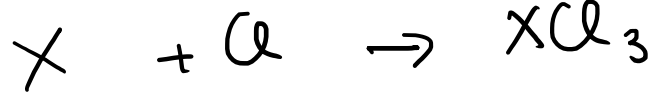
EX 5

$\frac{\% \text{ m}}{\text{m}}$ P_2O_5 in $\text{Ca}_3(\text{PO}_4)_2$

1 mol $\text{Ca}_3(\text{PO}_4)_2 \rightarrow 2 \text{ mol di P}$
1 mol $\text{P}_2\text{O}_5 \rightarrow 2 \text{ mol P}$

$$\% \text{ P}_2\text{O}_5 = \frac{\text{MM P}_2\text{O}_5}{\text{MM Ca}_3(\text{PO}_4)_2} = \frac{141.9 \text{ g/mol}}{310.2 \text{ g/mol}} \cdot 100 = 45.74 \%$$

EX 6



$\% \text{ Cl} = 79.76 \%$

$\text{MA X} = ?$

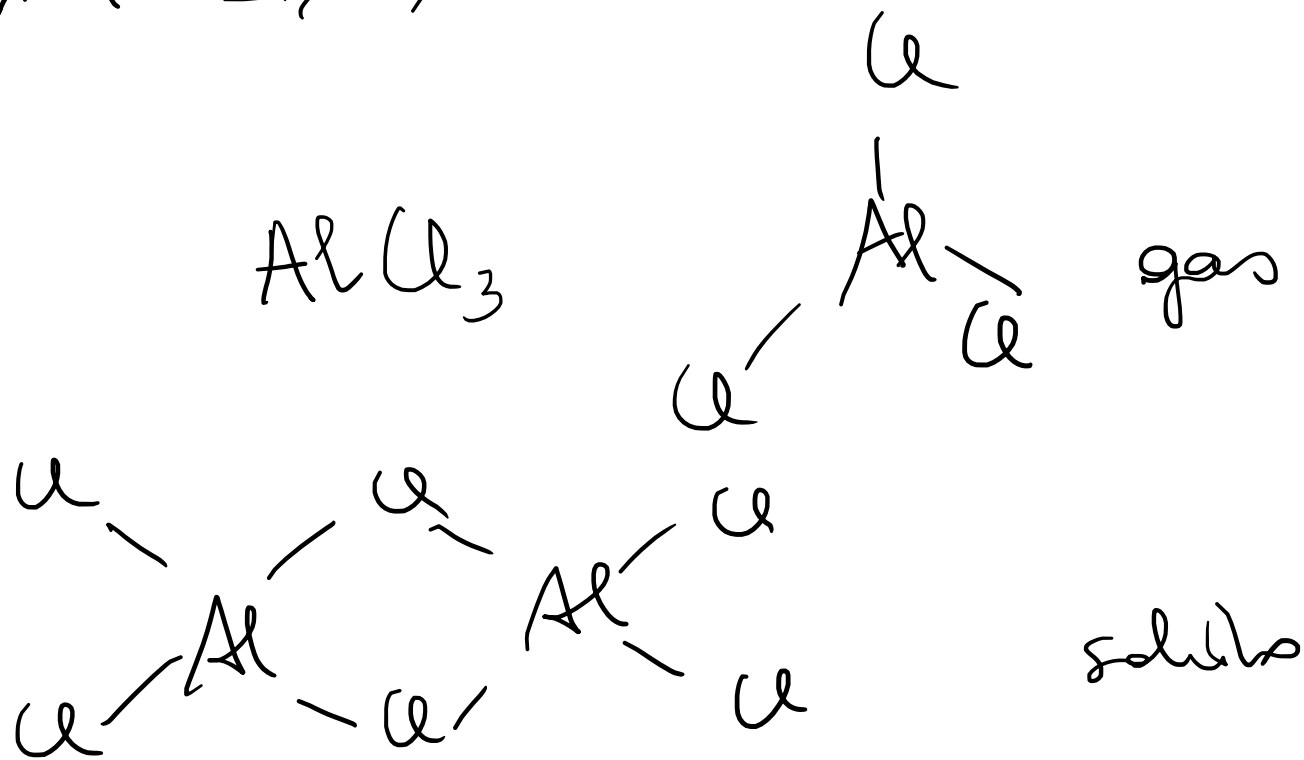
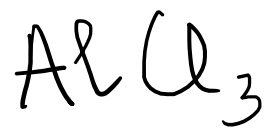
$\text{MA Cl} = 35.45 \text{ g/mol}$

$$\% = \frac{m_{\text{Cl}}}{m_{\text{XCl}_3}}$$

$$79.76 \% = \frac{3 \cdot 35.45 \text{ g/mol}}{(3 \cdot 35.45 \text{ g/mol}) + \text{MA X}} \cdot 100$$



$$M_{Ax} = 26.99 \text{ g/mol} \Rightarrow \text{Al}$$



EX #

$$\text{mol NO} = ? + 9.01 \cdot 10^{23} \text{ molecule di NO} \rightarrow 48.3 \text{ g NO}$$

$\rightarrow 1.50 \text{ mol}$

$$\text{MM NO} = (14 + 16) \approx 30 \text{ g/mol}$$

$$\frac{48.3 \text{ g}}{30.0 \text{ g/mol}} = \text{mol tot NO} = \underline{1.61 \text{ mol}}$$

$$1 \text{ mol} = 6.022 \cdot 10^{23} \text{ molecule NO}$$

$$\text{mol tot} = 1.61 \text{ mol}$$

$$\frac{9.01 \cdot 10^{23} \text{ molecule}}{6.022 \cdot 10^{23} \frac{\text{molecule}}{\text{mol}}} = 1.50 \text{ mol}$$

$$(1.61 - 1.50) \text{ mol} = \underline{0.11 \text{ mol NO}}$$

Ex 8



Formula
mínima = ?

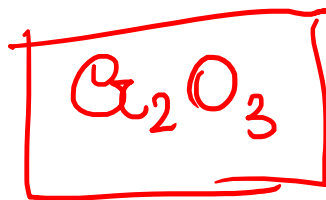
$$1.63 \text{ g} - \boxed{1.12 \text{ g Cr}} = \boxed{0.51 \text{ g O}}$$

$$MA_{\text{Cr}} = 52.0 \text{ g/mol}$$

$$MA_{\text{O}} = 16.0 \text{ g/mol}$$

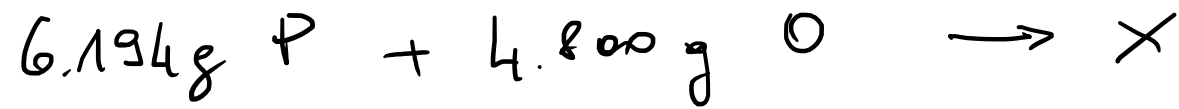
$$\text{mol Cr} = \frac{1.12 \text{ g}}{52.0 \text{ g/mol}} = 0.0215 \text{ mol Cr} \quad \leftarrow \quad \textcircled{1} \cdot 2 = \textcircled{2}$$

$$\text{mol O} = \frac{0.51 \text{ g}}{16.0 \text{ g/mol}} = 0.032 \text{ mol O} \quad \frac{0.032}{0.0215} \approx \textcircled{1.49} \cdot 2 = \textcircled{3}$$



$\textcircled{2}$

EX 9



Formula muiima
del compuesto

$$\text{mol P} = \frac{6.194 \text{ g}}{30.97 \text{ g/mol}} = 0.2000 \text{ mol P}$$

$$\sim \textcircled{1} \cdot 2$$



$$\text{mol O} = \frac{4.800 \text{ g}}{16.00 \text{ g/mol}} = 0.3000 \text{ mol O}$$

$$\sim \textcircled{1.5} \cdot 2$$

9

EX 10

Calcolare % NH₃ in (NH₄)₂SO₄
↓
2 NH₃

$$\% \text{NH}_3 = \frac{2 \cdot \text{MM NH}_3}{\text{MM (NH}_4)_2\text{SO}_4} = \frac{2 \cdot 17 \text{ g/mol}}{132 \text{ g/mol}} \cdot 100$$

$$\% \text{NH}_3 = 25.8 \%$$

EX. 11 Pyrex 15.5% B₂O₃ % B nel vetro B₂O₃ → 2 B

$$\text{mol B}_2\text{O}_3 = \frac{15.5 \text{ g}}{69.6 \text{ g/mol}} = 0.223 \text{ mol} \cdot 2 = 0.446 \text{ mol B}$$

MM B₂O₃ = 69.6 g/mol
MA_B = 10.8 g/mol

$$0.446 \text{ mol} \cdot 10.8 \text{ g/mol} = 4.82 \text{ g} \Rightarrow \% \text{ B} = 4.82 \%$$

EX 12

$$\% \text{ H} = 4.80\%$$

$$\% \text{ C} = 19.0\%$$

$$\% \text{ O} = 76.2\%$$

$$\% \text{ H}_2\text{O}_{\text{const}} = 28.6\%$$

Formula minima

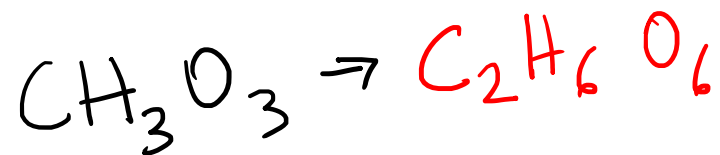
Formula molecolare

$$\text{MM}_{\text{reale}} = \underline{126.07 \text{ g/mol}}$$

$$\text{mol H} = \frac{4.80 \text{ g}}{1.01 \text{ g/mol}} = 4.76 \text{ mol} / 1.58 \text{ mol} \approx \textcircled{3}$$

$$\text{mol C} = \frac{19.0 \text{ g}}{12.0 \text{ g/mol}} = 1.58 \text{ mol} \approx \textcircled{1}$$

$$\text{mol O} = \frac{76.2 \text{ g}}{16.0 \text{ g/mol}} = 4.76 \text{ mol} / 1.58 \text{ mol} \approx \textcircled{3}$$



$$\text{MM}_{\text{min}} = 63.0 \text{ g/mol}$$

$$\frac{\text{MM}_{\text{reale}}}{\text{MM}_{\text{min}}} = \frac{126}{63.0} = 2$$

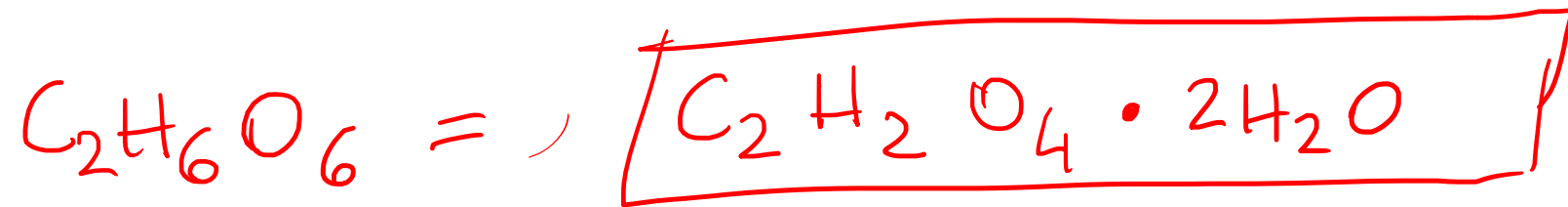
\textcircled{m}

$$MM_{H_2O} = 18.0 \text{ g/mol}$$

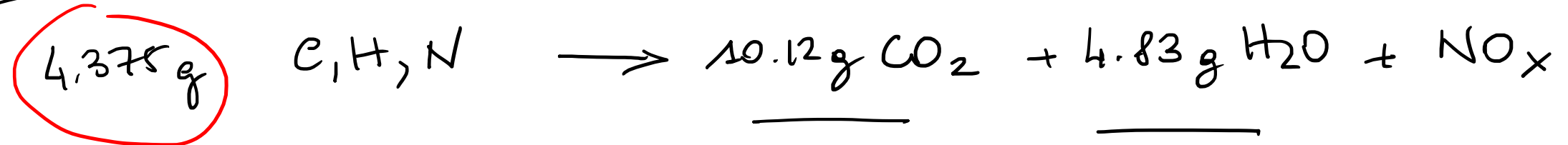
$$MM_{\text{Composto}} = 126 \text{ g/mol}$$

$$\% H_2O = \frac{18.0 \text{ g/mol}}{126.0 \text{ g/mol}} \cdot 100 = 14.37\%$$

nel composto 2 mol H_2O cristallizzazione



EX 13



formula unknown = ?

$\text{mol C} = \text{mol CO}_2 = \frac{10.12 \text{ g}}{44.0 \text{ g/mol}} = 2.30 \cdot 10^{-1} \text{ mol} \cdot 12.0 \text{ g/mol} = 2.76 \text{ g C}$

$\text{mol H} = 2 \cdot \text{mol H}_2\text{O} = \frac{4.83 \text{ g}}{18.0 \text{ g/mol}} \cdot 2 = 5.36 \cdot 10^{-1} \text{ mol H} \cdot 1.01 \text{ g/mol} = 0.541 \text{ g H}$

$(4.375 - 2.76 - 0.541) \text{ g} = 1.075 \text{ g N}$

$\text{mol N} = \frac{1.075 \text{ g}}{14.0 \text{ g/mol}} = 7.71 \cdot 10^{-3} \text{ mol N}$

$N = 1$

$\frac{H}{N} = \frac{5.36 \cdot 10^{-1} \text{ mol}}{7.71 \cdot 10^{-3} \text{ mol}} \sim 7$
 $\text{C}_3\text{H}_7\text{N}$

$\frac{C}{N} = \frac{2.30 \cdot 10^{-1}}{7.71 \cdot 10^{-3}} \sim 3$