

* لَاب أُكْسِيَات الكِيمَاء الْعَامَّة 108

* الْحَالِب : يَزْنِي رِيَا حَنِ الْخَطِيب
هَذِهِ مَدِينَةُ سَنَةِ ثَانِيَةِ

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① Exp2 Empirical formula of a compound

* الجانب الحسابي (كيفية 107)

* الجانب النظري (فهم + حفظ)

* Empirical formula: Simplest whole number ratio between atoms in cpd.



* Purpose of exp.: Determine the ratio of $x:y$ $\frac{x}{y}$

* The ratio should be :

- 1) Smallest .
- 2) whole number.

② ex How many grams of Magnesium combine with 1.5 g of chloride ions in $MgCl_2$? * mass of Mg

sol * mass Cl = 1.5 g

✓ * moles of Cl = $\frac{\text{mass}}{\text{M.M}} = \frac{1.5}{35.45} = \underline{\underline{0.0423 \text{ mol}}}$



$\Rightarrow \frac{2X}{2} = \frac{0.0423}{2} \Rightarrow \underline{\underline{X = 0.02115 \text{ mol of Mg}}}$

* mol of Mg = $\frac{\text{mass}}{\text{M.M}} \Rightarrow \text{mass Mg} = \underline{\underline{0.514 \text{ g}}}$

③ ex If 11.8 g of iron reacts with 5.06 g of Oxygen
Determine the empirical formula of the resulting Oxide?

sol $\text{Fe} \times \text{O}_y$

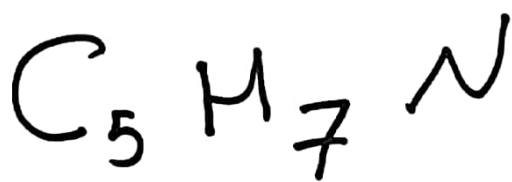
$$\frac{11.8}{55.85} = \frac{0.21128}{0.21128} \text{ mol}$$
$$= 1 \times 2$$
$$= \underline{\underline{2}}$$
$$\frac{5.06}{16} = \frac{0.3162}{0.21128} \text{ mol}$$
$$= 1.5 \times 2$$
$$= \underline{\underline{3}}$$



ex 24 Nicotine is a cpd containing C, H & N. A 2.5 g sample of the cpd is burned & produces 6.78 g of CO₂, 1.94 g of H₂O, 0.43 g of N₂. what's the E.F of nic.?

sol

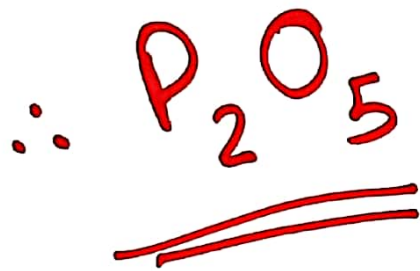
$$\begin{array}{ccc}
 \text{C} & : & \text{H} & : & \text{N} \\
 \frac{6.78}{44} \times \frac{1}{1} = \frac{0.154}{0.031} & \bigg| & \frac{1.94}{18} \times 2 = \frac{0.216}{0.031} & \bigg| & \frac{0.43}{28} \times 2 = \frac{0.031}{0.031} \\
 = 5 & & = 7 & & = 1
 \end{array}$$



⑤ ex when 0.288 g of P is burned, 0.66 g of white Phosphorus oxide is obtained, determine the E.F. of the oxide?

<u>sol</u> P $\frac{0.288}{31}$ $= \frac{0.0093}{0.0093}$ $= \frac{1 \times 2}{2}$	O $\frac{0.372}{16}$ $= \frac{0.0233}{0.0093}$ $= \frac{2.5 \times 2}{5}$
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$$\begin{aligned} \text{mass O} &= \text{m. oxide} - \text{m. P} \\ &= 0.66 - 0.288 \\ &= \underline{\underline{0.372 \text{ g}}} \end{aligned}$$



⑥ ex A 2.00 g sample of a bromide oxide is converted to 2.936 g of AgBr, calculate the E.F. of the oxide.

sol $Br_x O_y$

$\frac{1.25}{80}$	$\frac{0.75}{16}$
$= \frac{0.0156}{0.0156}$	$= \frac{0.0468}{0.0156}$
$= 1$	$= 3$

$Br O_3$

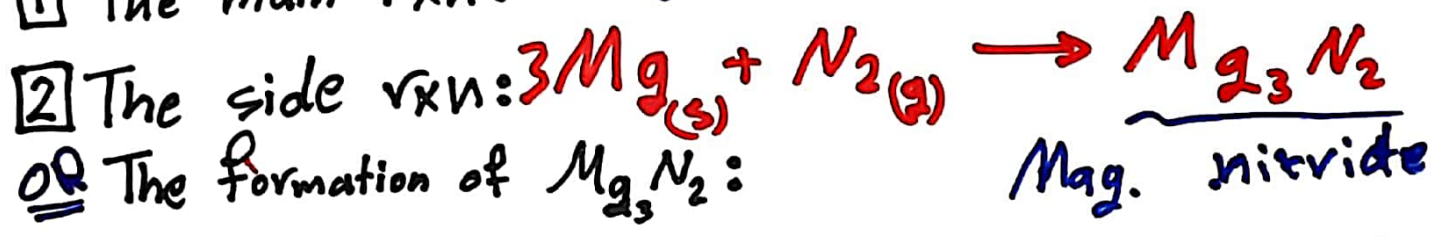
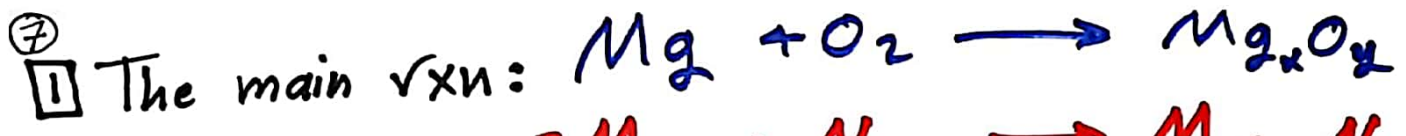
mass O = 2 - ~~1.25~~
 mass O = 0.75 g

$\frac{2.936}{187.78} = 0.156$ mole AgBr

1 mole AgBr $\rightarrow$ 0.156 mol
 1 mole Br $\rightarrow$ x

$0.156 = \frac{\text{mass Br}}{80}$
mass Br = 1.25 g

$x = 0.156$ mole
mass Br mole



⑧ * Some questions about exp. ^-^ : why ?!

① Heating before starting? To remove the moisture
الرطوبة

② Don't weight the crucible when it's hot?
It gives wrong accurate

③ Don't Cover the crucible widely?
It burns Mg brightly

④ Adding a few water drops?
To decompose Mg_3N_2

9) *| What's the effect of $Mg:O$ mole ratio if:

1. Balance reads 0.20g lower/higher than the true value $\rightarrow$ **No effect**

2. Rapid Oxidation of Magnesium $\rightarrow$ **increase**

3. The formation of side product Mg_3N_2 not decomposed completely $\rightarrow$ **increase**

4. Mg_3N_2 decomposed completely $\rightarrow$ **no ef.**

5. Carbon deposited on the crucible surface $\rightarrow$ dec.
6. Carbon not deposited on the crucible surface $\rightarrow$ no ef.
7. Magnesium oxide ash is not dried completely $\rightarrow$ dec.
8. Magnesium Oxide ash is dried completely $\rightarrow$ no ef.
9. Air is not ^{کافی} sufficient to react with all Mg $\rightarrow$ inc.
10. Air is sufficient to react with all Mg $\rightarrow$ no ef.

11. Nonvolatile & unreactive impurities in the crucible during Oxidation $\rightarrow$ dec.

* مواد غير متطايرة أثناء التأكسد (dec). بالتالي

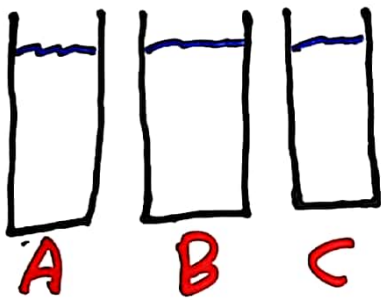
* no ef قبل التأكسد

12. Nonvolatile & unreactive impurities in the crucible from the beging $\rightarrow$ no ef.

* وجود مواد متطايرة قبل أو أثناء التأكسد (no ef)

* مهم جدًا : Mg : نغرس

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$$d = \frac{m}{V}$$

الكتلة $\rightarrow$ m
الحجم $\rightarrow$ V
الكثافة $\rightarrow$ d

$$\uparrow d \propto m \uparrow$$

$$m_A > m_C > m_B$$

$$d_A > d_C > d_B$$

⑬ $\text{Ratio} = \frac{\cancel{Mg}}{0}$ $\text{Ratio} \propto \frac{1}{0}$

$0 \uparrow \Rightarrow \text{Ratio} \downarrow$

$\text{Ratio} = \frac{0}{\cancel{Mg}}$ $\text{Ratio} \propto 0$

$0 \uparrow \Rightarrow \text{Ratio} \uparrow$

Q1] When a metal (M) with atomic mass 56 g/mol was oxidized to a metal oxide that contains 36.4% by mass O, The E.F of the metal oxide is:

1) MO_2 2) MO_3 3) M_2O_3 4) M_3O_4 5) M_2O_5

sol * Mass = 100 g { mass M = $m_{\text{oxide}} - m_O$
 $= \frac{100}{100} - 36.4$

M	O
$\frac{63.3}{56}$	$\frac{36.4}{16} = \frac{2.275}{1.13 \text{ mol}}$

Mass M = 63.3 g

$= \frac{1.13}{1.13} \text{ mol}$

= 2

= 1



Q2] In The E.F. experiment which statemnt below is incorrect:

- 1) (Mg to O) mole ratio will not affect, if the balance is always read $0.05g$ higher than the actual value.
- 2) The side product that formed is Mg_3N_2 .
- 3) If the Mg . Oxide isn't dried completely the reported value of (Mg to O) Mole ratio will decrease.
- 4) (Mg to O) mole ratio will increase if air isn't sufficient to react with all the Mg .
- 5) (Mg to O) mole ratio will decrease if a rapid Oxidation is Occur & some of the Mg . is Lost .

Q3] A compd iridium (Ir) & (O) was produced in a lab by heating (Ir) in a Crucible, The data was collected:

- Mass of crucible 38.26 g
- Mass of crucible & (Ir) 39.63 g
- Mass of crucible & Ir Oxide 39.74 g

What's The E.F. of the compd?!

- 1) IrO_2 ~~2) IrO~~ 3) Ir_2O_3 4) Ir_3O_4

$$\begin{aligned} * 39.63 - 38.26 &= 1.37 \text{ g Ir} \\ * 39.74 - 39.63 &= 0.11 \text{ g O} \end{aligned}$$

$$\begin{aligned} \frac{1.37}{192.2} &= 7.12 \times 10^{-3} \\ \frac{0.11}{16} &= 6.87 \times 10^{-3} \end{aligned}$$

