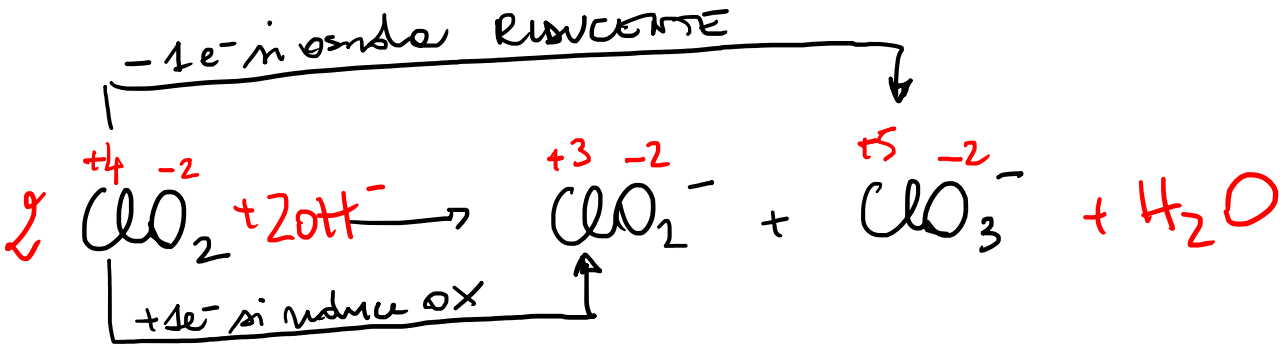
Lezione 8

Es 1



$$2\,ClO_2 + 2OH^- \longrightarrow ClO_2^- + ClO_3^- + H_2O$$

(ambiente basico OH^-)

1	$ClO_2 + 1e^- \rightarrow ClO_2^-$
1	$ClO_2 + 2OH^- \rightarrow ClO_3^- + 1e^- + H_2O$

$$2ClO_2 + \cancel{1e^-} + 2OH^- \rightarrow ClO_2^- + ClO_3^- + \cancel{1e^-} + H_2O$$

Bilanciata

ESX2

$-1e^- \times 2$ si riduce RID.

$$10H^+ + \overset{+5}{V_2}\overset{-2}{O_5} + \overset{-1}{4Cl^-} \longrightarrow \overset{+3}{2V^{3+}} + \overset{0}{2Cl_2} + 5H_2O \quad (\text{ambiente acido } H^+)$$

$+2e^-$ si riduce OSSIDANTE

$\times 2$

$$N_2O_5 + 4e^- + 10H^+ \longrightarrow 2V^{3+} + 5H_2O \quad \times 1$$

$$2Cl^- \longrightarrow Cl_2 + 2e^- \quad \times 2$$

$$2V_2O_5 + 4e^- + 10H^+ + 4Cl^- \longrightarrow 2V^{3+} + 5H_2O + 2Cl_2 + 4e^-$$

Es3

-8e⁻ si ossida RED.

$\overset{+2\ -2}{FeS} + 3\overset{+5\ -2}{NO_3^-} + 4H^+ \longrightarrow \overset{+6\ -2}{Fe^{3+} + SO_4^=} + 3\overset{+2\ -2}{NO} + 2\overset{+1\ -2}{H_2O}$

-1e⁻ si ossida RED.

+3e⁻ si riduce OSSIDANTE

$Fe^{2+} \longrightarrow Fe^{3+} + 1e^-$

$S^= + 4H_2O \longrightarrow SO_4^= + 8e^- + 8H^+$

} OSSIDAZIONE

$Fe^{2+} + S^= + 4H_2O \longrightarrow Fe^{3+} + SO_4^= + 9e^- + 8H^+$ || Processo globale di ossidazione

1 ×3

3 ×9

$NO_3^- + 3e^- + 4H^+ \longrightarrow NO + 2H_2O$ || Processo di riduzione

$Fe^{2+} + S^= + 4H_2O + 3NO_3^- + 9e^- + 12H^+ \longrightarrow Fe^{3+} + SO_4^= + 9e^- + 8H^+ + 3NO + 6H_2O$

(3)

Ex 4

+12e⁻ si riduce

$$\overset{+3\ -1}{2CrI_3} + \overset{+1\ +5\ -2}{21NaNO_3} + \overset{+1\ +4\ -2}{5Na_2CO_3} \longrightarrow \overset{+1\ +6\ -2}{2Na_2CrO_4} + \overset{+1\ +5\ -2}{6NaIO_3} + \overset{+1\ +3\ -2}{21NaNO_2} + \overset{+4\ -2}{5CO_2}$$

$-3e^-$ si ossida RIDUCENTE

$-6e^- \times 3$ si ossida RIDUCENTE

$$Cr^{3+} + 4H_2O \longrightarrow CrO_4^{2-} + 3e^- + 8H^+$$

$\times 3$ | $I^- + 3H_2O \longrightarrow IO_3^- + 6e^- + 6H^+$ } OX

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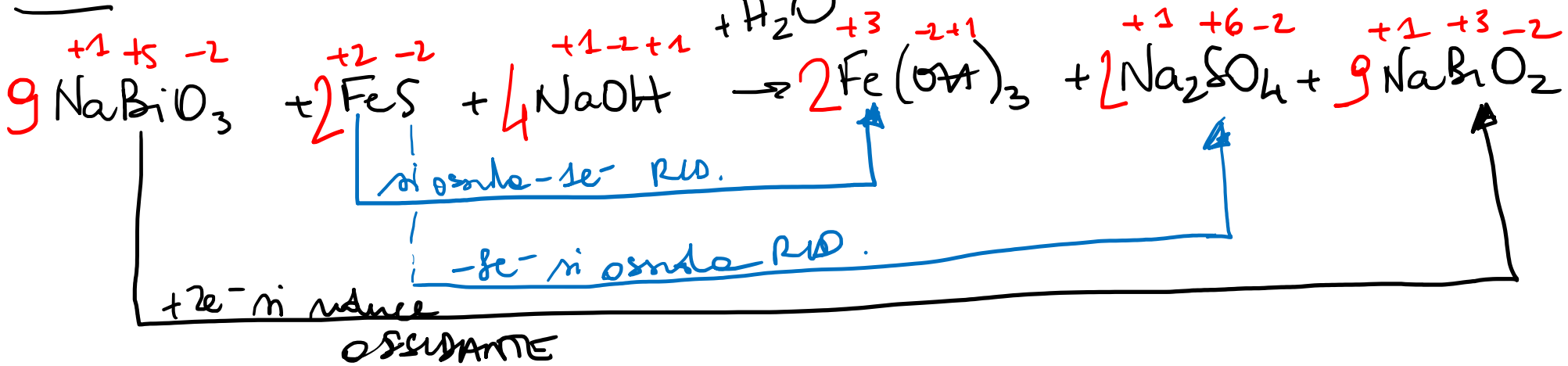
2 | $Cr^{3+} + 3I^- + 13H_2O \longrightarrow CrO_4^{2-} + 3IO_3^- + 21e^- + 26H^+$

21 | $NO_3^- + 2e^- + 2H^+ \longrightarrow NO_2^- + H_2O$

$$2Cr^{3+} + 6I^- + 26H_2O + 21NO_3^- + 42e^- + 42H^+ \longrightarrow 2CrO_4^{2-} + 6IO_3^- + 42e^-$$

$$+ 10H^+ + 21NO_2^- + 21H_2O$$

EXS



$Fe^{2+} \rightarrow Fe^{3+} + 1e^-$

$S^= + 8OH^- \rightarrow SO_4^= + 8e^- + 4H_2O$ } OSSIDAZIONE

2 | $Fe^{2+} + S^= + 8OH^- \rightarrow Fe^{3+} + SO_4^= + 9e^- + 4H_2O$

9 | $BiO_3^- + 2e^- + H_2O \rightarrow BiO_2^- + 2OH^-$ RIDUZIONE

$2Fe^{2+} + 2S^= + 16OH^- + 9BiO_3^- + 18e^- + 9H_2O \rightarrow 2Fe^{3+} + 2SO_4^= + 18e^- + 8H_2O + 9BiO_2^- + 18OH^-$

(5)

EX 6

$$3\,HgS + 6\,HCl + 2\,HNO_3 \rightarrow 3\,HgCl_2 + 3\,S + 2\,NO + 4\,H_2O$$

(+2 −2) (+1 −1) (+1 +5 −2) → (+2 −1) (0) (+2 −2) (+1 −2)

−2e⁻ si ossida RIDUCENTE

+3e⁻ si riduce OSSIDANTE

$g\ HgCl_2 = ?$

123 g HgS

92.1 %

$$m_{HgS\ puro} = 123\,g \cdot 0.921 = 113\,g\ HgS\ puro$$

$$mol_{HgS\ puro} = \frac{113\,g}{232.6\,g/mol} = 0.486\,mol = mol\ HgCl_2$$

3 : 3 / 1 : 1

$$m_{HgCl_2} = 0.486\,mol \cdot 271.5\,g/mol = \boxed{132.0\,g\ HgCl_2}$$

Es 7

$V_{HNO_3} = ?$

65% $\frac{m}{m}$ $d = 1.20\ g/mL$

65.2 g $SnCl_4$

Resa $SnCl_4 = 98.2\%$

$-2e^-$ si ossida RIDUCENTE

$+2 \quad -1 \qquad +1-1 \qquad +4\ -1 \qquad +1\ -2 \qquad +1\ -2$

$2\,HNO_3 + 4\,SnCl_2 + 8\,HCl \rightarrow 4\,SnCl_4 + N_2O + 5\,H_2O$

$+4e^-$ si riduce $\times 2$ OSSIDANTE

$1 \times 2 \quad 2NO_3^- + 8e^- + 10H^+ \rightarrow N_2O + 5H_2O$

$4 \times 8 \quad Sn^{2+} \rightarrow Sn^{4+} + 2e^-$

$2NO_3^- + 8e^- + 10H^+ + 4Sn^{2+} \rightarrow N_2O + 5H_2O + 4Sn^{4+} + 8e^-$

$mol\ eff\ SnCl_4 = \frac{65.2\ g}{260.7\ g/mol} = 0.250\ mol$ EFFETTIVE

$mol_{TEOR.} = \frac{0.250\ mol}{0.982} = 0.255\ mol$

$Resa = \frac{mol\ eff}{mol\ teor}$

$4 : 2 = 0.255\ mol : x\ mol\ HNO_3 \Rightarrow mol\ HNO_3\ PURO = 0.127\ mol$

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$mol\ HNO_3\ puro = 0.127\ mol$

$m\ HNO_3\ puro = 0.127\ mol \cdot 63.0\ g/mol = 8.00\ g\ HNO_3\ puro$

$m\ soluzione\ HNO_3\ 65\% = \frac{8.00\ g}{0.65} = 12.3\ g\ sol.\ HNO_3\ 65\%$

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

$V = \frac{m}{d} \Rightarrow V_{mL} = \frac{12.3\ g}{1.20\ g/mL} = 10.3\ mL\ sol.\ HNO_3\ 65\%\ m/m$