

Balancing redox reactions and O.C.s

1 Half equation method

STEPS

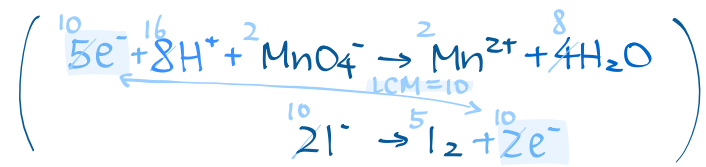
- Half equ. = O.A., R.A. 各自的 rx, 有电子
- Full equ. = 两个 half equ. 结合在一起, 没电子
- 四部曲
 - 1 欠O加水
 - 2 欠H加H⁺
 - 3 加电子平衡电荷
 - 4 左右两边的 LCM 加在一起

HALF EQU.

FULL EQU.

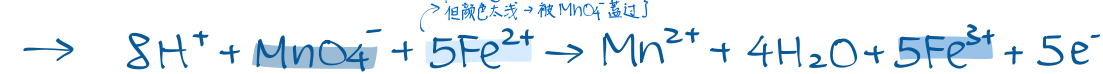
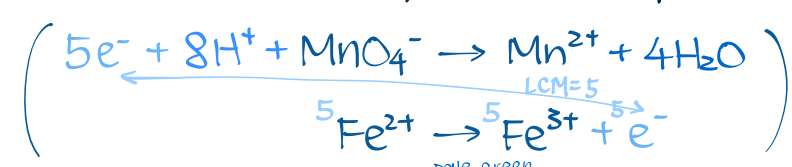
EXAMPLES

1. $\text{MnO}_4^- + \text{I}^-$



\rightarrow solⁿ changes from purple to brown

2. (acidified) $\text{MnO}_4^- \text{ aq} + \text{FeSO}_4 \text{ aq}$



\rightarrow solⁿ changes from purple to pale yellowish brown

Common mistakes

1. $\text{MnO}_4^- \rightarrow \text{Mn}^{2+}$
2. 写了 SO_4^{2-} 作 R.A. (可是不在表上 \Rightarrow 很弱, Fe^{2+} 更强)
3. 写错 half equ.
 $\text{KMnO}_4 \rightarrow \text{Mn}^{2+}$ 这是 (aq), 要排 spectator ion
 $\text{FeSO}_4 \rightarrow \text{Fe}^{3+}$ 如果是 (s) / (cr), 则靠四部曲平衡
 \rightarrow eg. $\text{Zn} + \text{CuO} \rightarrow \text{ZnO} + \text{Cu}$
 $\text{Cu}^{2+} \rightarrow \text{Cu}$
 $- 2e^- + 2H^+ + \text{CuO} \rightarrow \text{Cu} + \text{H}_2\text{O}$

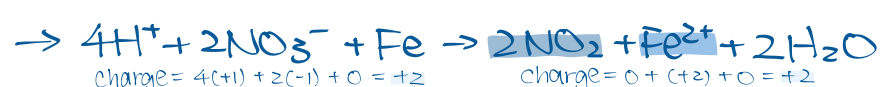
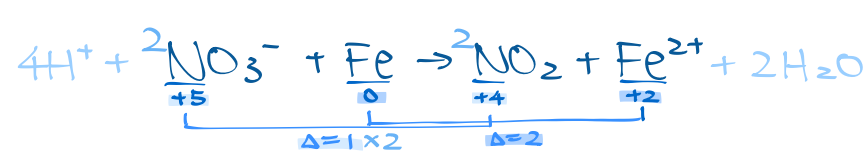
2 Change in O.N. method

STEPS

- 四部曲
 - 1 写 O.N. (for 氧化态变了 atoms)
 - 2 写每个 element O.N. 变了多少
 - 3 R.A., O.A. 式各至乘至 Δ O.N. 的 LCM
 - 4 欠O加水, 欠H加H⁺ (不用平衡电荷)

EXAMPLES

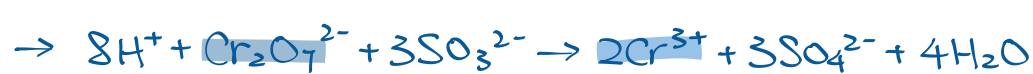
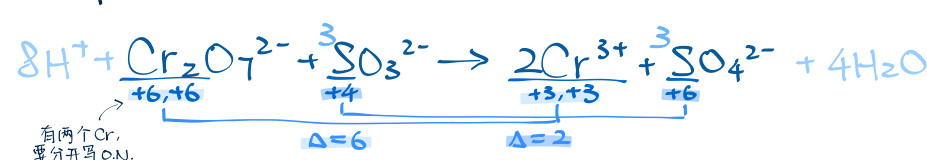
1. conc. nitric acid + Fe



\rightarrow brown fumes evolve

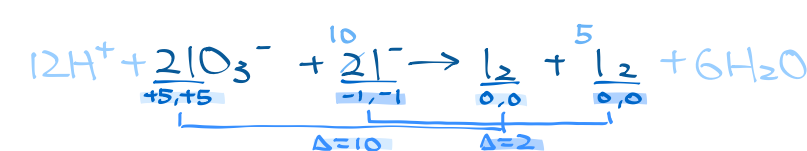
solⁿ changes from colourless to green

2. $\text{Cr}_2\text{O}_7^{2-} + \text{SO}_3^{2-}$



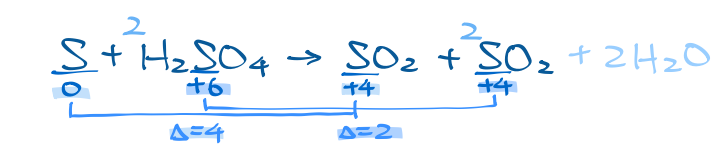
\rightarrow solⁿ changes from orange to green

3a. Potassium iodate (KIO_3) is mixed w/ potassium iodide to give I_2 .



\rightarrow solⁿ changes from colourless to brown

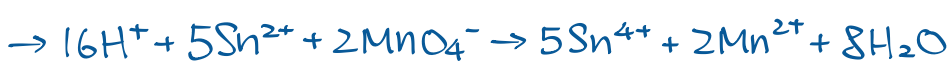
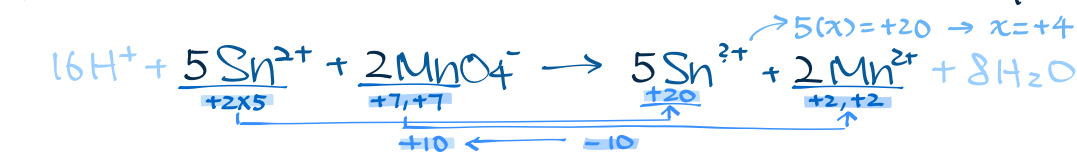
3b. Sulphur is added to conc. H_2SO_4 (cr) to give SO_2 .



\rightarrow Sulphur dissolves
choking smell

4a. 100cm^3 0.1M Sn^{2+} reacts w/ 40cm^3 0.1M MnO_4^- completely.

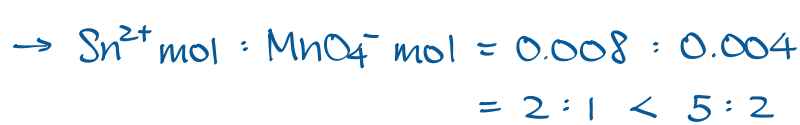
If MnO_4^- is reduced to Mn^{2+} , write balanced equ. + O.C.



\rightarrow solⁿ changes from purple to colourless.

If only 80cm^3 0.1M Sn^{2+} is added, state & explain 1 O.C.

\rightarrow purple colour intensity \downarrow / purple colour becomes paler.



$$= 2 : 1 < 5 : 2$$

$\therefore \text{MnO}_4^-$ is in excess, remaining MnO_4^- provides purple colour.

\therefore Since $[\text{MnO}_4^- \text{ aq}]$ decreases, colour intensity decreases.

4b. 200cm^3 0.05M SO_2 reacts w/ 20cm^3 0.2M MnO_4^- completely.

If SO_2 oxidizes to become SO_x^{2-} , MnO_4^- reduces to become Mn^{2+} , write balanced equ.

