# Balancing redox reactions and O.C.s

## Half equation method

#### STEPS -- Half equ. = O.A., R.A. 各至的 ra, 有电子 - Full equ. = 两个harf equ. 结合在一起, 沒电子 - 四部曲 1 尺〇加水 | HALF □ 尺升加升\* EQU. 3 加电子平衡电荷 在后两边的LCM加在一起} FULL EQU.

#### EXAMPLES

```
1. MnO4+1
       5e+8+++2Mn04 -> Mn2++4H20
                     21- -512+20
     -> 16H++2MnO4+101->2Mn2++8H20+512
     -> Soln changes from purple to brown
2. (acidified) MNO4 cag, + FeSO4 cag,
       5e^{-} + 8H^{+} + MnO_{4}^{-} \rightarrow Mn^{2+} + 4H_{2}O
5e^{-} + 8H^{+} + MnO_{4}^{-} \rightarrow Mn^{2+} + 4H_{2}O
5e^{-} + 8H^{+} + MnO_{4}^{-} \rightarrow Mn^{2+} + 4H_{2}O
     \rightarrow SH^{+}+MnO4^{-}+5Fe^{2t}\rightarrow Mn^{2t}+4H_2O+5Fe^{3t}+5e^{-}
     -> Soln changes from purple to pale yellowish brown
```

## Common mistakes 1. Mn04-> Mn2+ 2. 写了SO42-作 R.A. (可是不在表上⇒很弱, Fe2t更强) 3. 写错 half equ. KMhO4→Mn²+→ 这是(aq),要抓 Spectator fon FeSO4→ Fe3+ 如果是(s)((e), 则靠回部曲平衡

## 2 Change in O.N. method

#### STEPS

- 四部曲
  - □ 写O.N. (for 氧化素变了的 attoms)
  - □ 写每个element O.N.变了多少
  - 3 R.A., O.A. 式各至乘至 △o.N.的 LCM
  - ▼ 欠○カット,欠日か日\*(不用平衡电荷)

### EXAMPLES -

YAMPLES

与conc. HNOs coop react
$$\overline{p}$$
 react
 $\overline{p}$  rea

- $\rightarrow$  4H++2NO3+Fe  $\rightarrow$  2NO2+Fe<sup>2+</sup>+H<sub>2</sub>O Charge= 4(+1)+2(-1)+0=+2 Charge= 0+(+2)+0=+2 -> brown fumes evolve Sol h changes from colourless to green
- 2. Cr2072-+ SO32-

- $\rightarrow$   $8H^{+} + Cr_{2}O_{7}^{2} + 3SO_{3}^{2} \rightarrow 2Cr^{3} + 3SO_{4}^{2} + 4H_{2}O_{3}^{2}$
- -> soln changes from orange to green
- 3a. Potassium iodiate (KIO3) is mixed w/ potassium iodide to give 12.

$$\frac{12H^{+} + 2103^{-} + 21^{-} \rightarrow 12}{45,45} + \frac{10}{12} + \frac{1}{2} + \frac{1}{2}$$

- > 12H++2103+101->612+6H≥0
- 4 6H++105+51 → 312+3H≥0 -> Soln changes from colourless to brown
- 36. Sulphur is added to conc. H\_SO4(1) to give SO2.

$$S + H_2SO_4 \rightarrow SO_2 + SO_2 + 2H_2O_4$$

- $\rightarrow$  S+2HzSO<sub>4</sub>  $\rightarrow$  3SO<sub>2</sub> + 2H<sub>2</sub>O
- → Sulphur dissolves choking smell

0.01mol: 0.004 mol = 5:2

40.100cm³0.1M Sn²t reacts w/ 40cm³0.1M MnO4 completely. If MnO4 is reduced to Mn2+, write balanced equ. + O.C.

$$16H^{+} + 5Sn^{2+} + 2MnO4 \longrightarrow 5Sn^{2+} + 2Mn^{2+} + 8H_{2}O$$

- $\rightarrow 16H^{+} + 5Sn^{2+} + 2MnO_{4}^{-} \rightarrow 5Sn^{4+} + 2Mn^{2+} + 8H_{2}O$
- -> soln changes from purple to colourless.

If only 80 cm3 0.1M Sn2+ is added, state & explain 1 o.C.

- -> purple colour intensity +/ purple colour becomes paler.
- $\rightarrow$  Sn<sup>2+</sup>mol : MnO<sub>4</sub> mol = 0.008 : 0.004 = 2:1 < 5:2
  - : MnO4 is in excess, remaining MnO4 provides purple colour.
  - :. Since [MnO4 cagi] decreases, colour intensity decreases.

0.1 mol: 0.04 mol = 5:2

46.200 cm3 0.05 M SO2 reacts W/ 20 cm3 0.2 M MnO4 completely. If SO2 oxidizes to become SOx2-, MnO4- reduces to become Mn2+, write balanced equ.

$$2H_{2}O + 5 \underbrace{SO_{2} + 2MnO_{4}}_{+1x2} \rightarrow 5\underbrace{SO_{x}^{2}}_{+2x2} + 2\underbrace{Mn^{2}}_{+2x2} + 4H^{+}$$

 $\rightarrow$  2HzO+5SO<sub>2</sub> + 2MnO<sub>4</sub>  $\rightarrow$  5SO<sub>4</sub><sup>2</sup> + 2Mn<sup>2+</sup> + 4H<sup>+</sup>