

Strength of O.A.s and R.A.s

1 Feasibility of an reaction

- 比较 full equ. 两边的 O.A. / R.A., 看是强 \rightarrow 弱 / 弱 \rightarrow 强.

- eg. Explain why Cu cannot react w/ H_2SO_4 (aq) while Fe can.

草稿 - $\text{Cu} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2$ \rightarrow 尽量选有 element 的一方比较
(: 不知道什么时候能排成 ion)

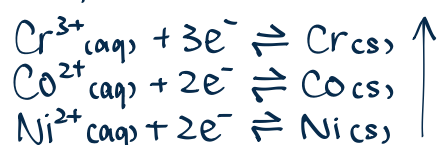
$\text{Fe} + \text{H}_2\text{SO}_4 \rightarrow \text{FeSO}_4 + \text{H}_2$

作答 - \therefore strength of reducing agent: $\text{Cu} < \text{H}_2$ \therefore No reaction

\therefore strength of reducing agent: $\text{Fe} > \text{H}_2$ \therefore \checkmark reaction

- eg2. There are 2 green solutions, containing Cr^{3+} (aq) / Ni^{2+} (aq) respectively.

The following is a part of the electrochemical series.



Briefly describe and explain how the solutions can be distinguished.

作答 - Add identical $\text{Co}(\text{s})$ to both solutions respectively.

Cr^{3+} (aq): strength of reducing agent: $\text{Cr} > \text{Co}$ $\rightarrow 2\text{Cr}^{3+} + 3\text{Co}(\text{s}) \rightarrow 2\text{Cr}(\text{s}) + 3\text{Co}^{2+}$ (弱出强)
Solution remains green

Ni^{2+} (aq): strength of reducing agent: $\text{Co} > \text{Ni}$ $\rightarrow \text{Ni}^{2+} + \text{Co}(\text{s}) \rightarrow \text{Ni}(\text{s}) + \text{Co}^{2+}$ (强出弱)
Solution turns from green to pink

2 Acidifying reactants

- acid: similar to catalysts

	MnO_4^- (aq)	$\text{Cr}_2\text{O}_7^{2-}$ (aq)
conc./dilute HCl (aq)	\times ($\text{MnO}_4^- + 2\text{Cl}^- \rightarrow \text{Mn}^{2+} + \text{Cl}_2$, Cl $^-$ 把 MnO_4^- 变成了 Mn^{2+} , 不能与 RA react)	\checkmark ($\text{Cr}_2\text{O}_7^{2-} + \text{Cl}^- \rightarrow \text{Cr}^{3+} + \text{Cl}_2$, but RA strength: $\text{Cr}_2\text{O}_7^{2-} < \text{Cl}_2 \rightarrow$ no rx)
dilute H_2SO_4 (aq)	\checkmark	
conc. H_2SO_4 (l)	\times	
conc./dilute HNO_3 (aq)	\times (H_2SO_4 (l) / NO_3^- 也是很强的 O.A., 会把 RA 搞走) \rightarrow 不知道最后真正与 RA react 的是 MnO_4^- 还是 acid)	

3 Proving the strengths of O.A. / R.A.

- eg. Prove O.A. strength: $\text{Cl}_2 > \text{Br}_2 > \text{I}_2$

a. Theoretically

> \therefore no# of e^- shell \uparrow down Grp VII

\therefore nucleus attraction to incoming $\text{e}^- \downarrow$

\therefore strength of O.A. decreases down Grp VII

$\therefore \text{Cl}_2 > \text{Br}_2 > \text{I}_2$ \rightarrow oxidating power

b. Experimentally

> exp. 1 - prove O.A. strength: $\text{Cl}_2 > \text{Br}_2$

- Add KBr (aq) into Cl_2 (aq)

- $\text{Cl}_2 + 2\text{Br}^- \rightarrow 2\text{Cl}^- + \text{Br}_2$

- Solⁿ turns from pale yellowish green to brown.

- \therefore strength of O.A.: $\text{Cl}_2 > \text{Br}_2$

> exp. 2 - prove O.A. strength: $\text{Br}_2 > \text{I}_2$

- Add Br_2 (aq) into KI (aq) mixed w/ hexane w/ shaking. \rightarrow orl

- $\text{Br}_2 + 2\text{I}^- \rightarrow 2\text{Br}^- + \text{I}_2$

- Upper organic layer will be purple.

Lower aqueous layer will be brown.

- \therefore strength of O.A.: $\text{Br}_2 > \text{I}_2$

> \therefore strength of O.A.: $\text{Cl}_2 > \text{Br}_2 > \text{I}_2$

