Electrolysis: more examples
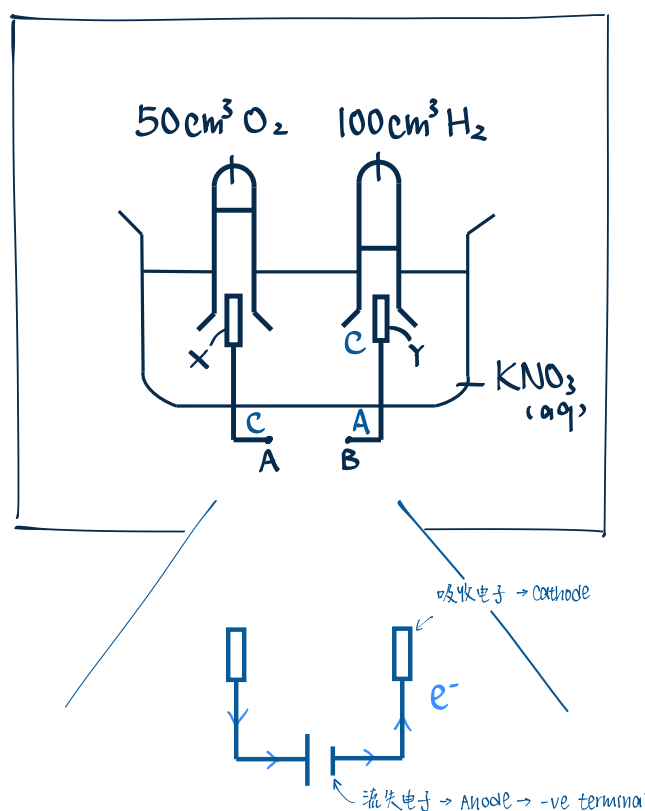
1 Electrolysis of weak O.A./R.A.


State & explain which terminal, A or B, is positive terminal.
- H_2 vol : O_2 vol = 100 : 50 = 2:1
- $2H_2O \rightarrow 2H_2 + O_2 \rightarrow$ vol. ratio
  - $2 : 1$
- ∴ electrolysis of water is performed
- H^+ is stronger O.A. than K^+, undergoes reduction and form H_2 at Y.
- electrode Y is cathode → B is anode
- ∴ A is +ve terminal

From the experiment, prove the chemical formula of water is H_2O.
- $H_2 : O_2 = 2 : 1$ (mol ratio)
  $H : O = 4 : 2$ (atom ratio)

→ empirical formula of water = H_2O
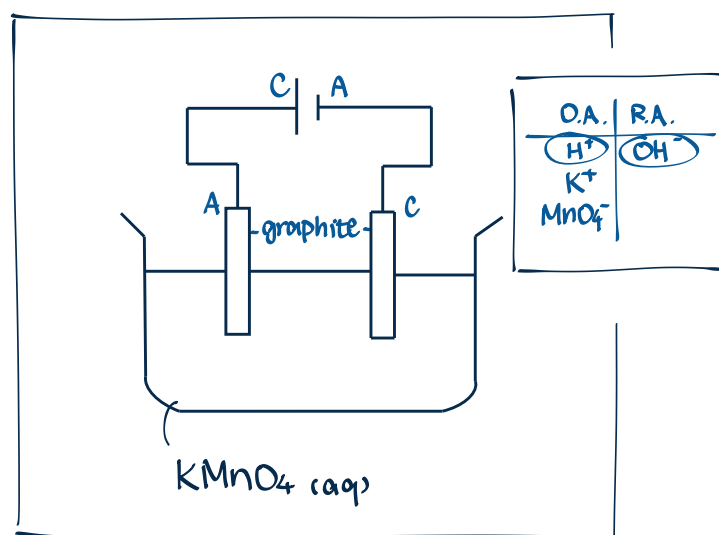
State & explain observable changes at both electrodes.

Cathode electrode
- colourless gas bubbles evolve
  - > MnO_4^- is strongest O.A.
  - > but MnO_4^- has −ve charge, X migrate to −ve cathode electrode to gain e^- for reduction
  - > H^+ is only positive O.A. stronger than K^+
  - > preferentially discharges
  - > undergoes reduction → H_2

Anode electrode
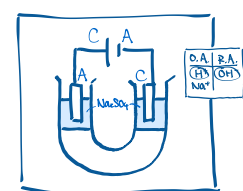- colourless gas bubbles evolve
  - > OH^- is the only R.A.
  - > preferentially discharges
  - > undergoes oxidation → O_2

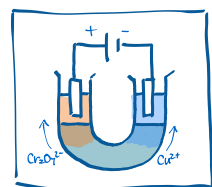## 2 Migration of ions + electrolysis
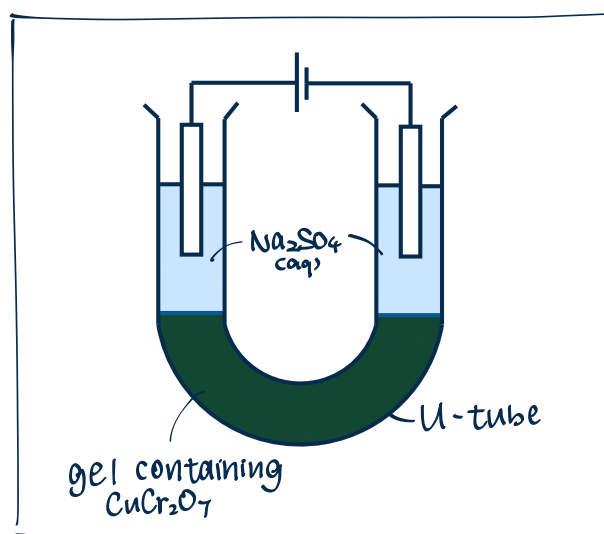
① Electrolysis of Na_2SO_4 (aq)

Na_2SO_4 = 废柴, 电解Na_2SO_4 = 电解水 ($2H_2O \rightarrow 2H_2 + O_2$)

Cathode: H^+ is stronger O.A. than Na^+
→ preferentially discharges to form H_2
→ colourless gas bubbles

Anode: OH^- is only R.A.
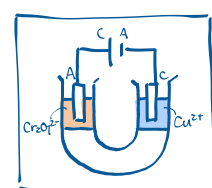→ preferentially discharges to form O_2
→ colourless gas bubbles

② After a while... migration of ions

+ve electrode: orange colour
→ $Cr_2O_7^{2-}$ is orange in colour, negatively charged
→ attracted to +ve electrode

−ve electrode: blue colour
→ Cu^{2+} is blue in colour, positively charged
→ attracted to −ve electrode

③ Redox reactions of migrated ions

Cathode: Cu^{2+} is stronger O.A. than H^+
→ preferentially discharge to form Cu
→ reddish brown solid deposits

Anode: OH^- continues to be only R.A.
→ 有 $Cr_2O_7^{2-}$ 但为 O.A.
→ anode 只进行 oxidation ⇒ $Cr_2O_7^{2-}$ X r.a
→ OH^- preferentially discharges to form O_2
→ colourless gas bubbles