Electrochemical Cells
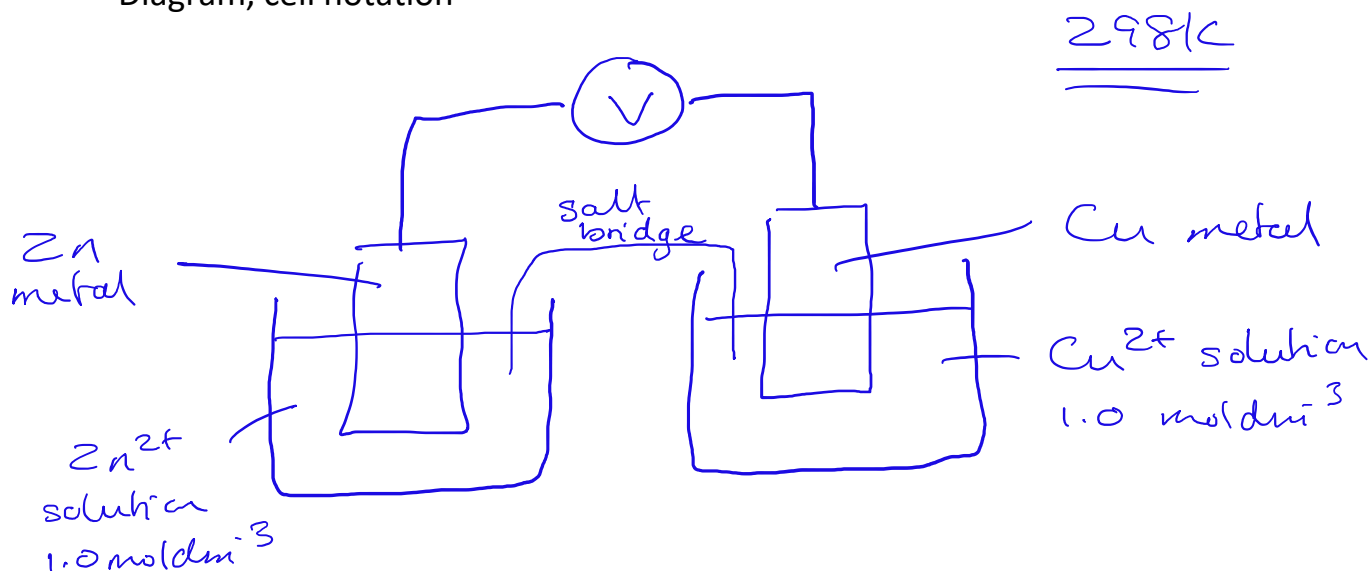
When we combine 2 half cells we can calculate the standard cell potential. E.g. zinc and copper.

The more negative half cell is drawn on the left

Diagram, cell notation

$$\underline{\underline{298K}}$$

Zn metal

salt bridge

Cu metal

Cu^{2+} solution
1.0 mol/dm^3

Zn^{2+} solution
1.0 mol/dm^3

$$Zn_{(s)} \mid Zn^{2+}_{(aq)} \mid\mid Cu^{2+}_{(aq)} \mid Cu_{(s)}$$

Calculation

We calculate the standard cell potential using the equation

Right hand side (+) – left hand side (−)

E.g. for zinc and copper

$$Zn^{2+} + 2e^- \rightleftharpoons Zn \qquad -0.76V \qquad LHS$$

$$Cu^{2+} + 2e^- \rightleftharpoons Cu \qquad +0.34V \qquad RHS$$

$$+0.34 - -0.76 = \boxed{+1.10V}$$

$$Cu^{2+} + Zn \rightarrow Cu + Zn^{2+}$$

(Feasible reaction)

E.g. silver and zinc

$$Ag^+ + e^- \rightleftharpoons Ag \qquad + 0.80V \quad RHS$$

$$Zn^{2+} + 2e^- \rightleftharpoons Zn \qquad - 0.76V \quad LHS$$

$$+0.80 - -0.76 = + 1.56V \text{ (feasible)}$$

$$2Ag^+ + Zn \rightarrow 2Ag + Zn^{2+}$$