

Redox Equilibria

① Find the emfs of the following cells:

- $\text{Al(s)} \mid \text{Al}^{3+}(\text{aq}) \parallel \text{Cd}^{2+}(\text{aq}) \mid \text{Cd(s)}$
- $\text{Ag(s)} \mid \text{Ag}^+(\text{aq}) \parallel \text{Cu}^{2+}(\text{aq}) \mid \text{Cu(s)}$
- $\text{Pt(s)} \mid \text{Fe}^{2+}(\text{aq}), \text{Fe}^{3+}(\text{aq}) \parallel \text{Cl}_2(\text{g}), 2\text{Cl}^-(\text{aq}) \mid \text{Pt(s)}$

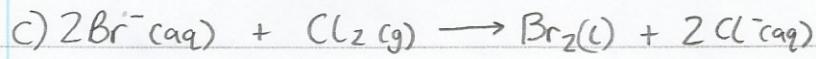
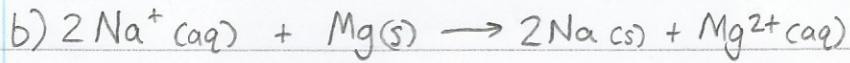
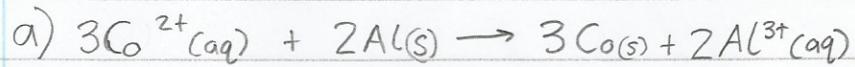
Values (E^\ominus)
$\text{Al}^{3+}/\text{Al} = -1.66 \text{ volts}$
$\text{Cd}^{2+}/\text{Cd} = -0.40 \text{ volts}$
$\text{Ag}^+/\text{Ag} = +0.80 \text{ volts}$
$\text{Cu}^{2+}/\text{Cu} = +0.34 \text{ volts}$
$\text{Fe}^{3+}/\text{Fe}^{2+} = +0.77 \text{ volts}$
$\text{Cl}_2/2\text{Cl}^- = +1.36 \text{ volts}$

② Calculate the unknown E^\ominus values from E^\ominus_{cell} and the E^\ominus given values below:

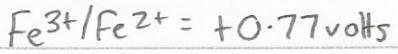
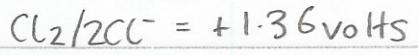
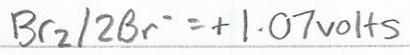
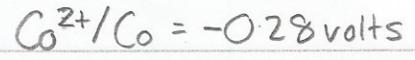
- Cr^{3+}/Cr if $E^\ominus_{\text{cell}} = -0.49 \text{ volts}$ for $\text{Ni(s)} \mid \text{Ni}^{2+}(\text{aq}) \parallel \text{Cr}^{3+}(\text{aq}) \mid \text{Cr(s)}$
- $\text{V}^{3+}/\text{V}^{2+}$ if $E^\ominus_{\text{cell}} = -2.11 \text{ volts}$ for $\text{Pt(s)} \mid \text{V}^{2+}(\text{aq}), \text{V}^{3+}(\text{aq}) \parallel \text{Mg}^{2+}(\text{aq}) \mid \text{Mg(s)}$
- Mn^{2+}/Mn if $E^\ominus_{\text{cell}} = +0.79 \text{ volts}$ for $\text{Mn(s)} \mid \text{Mn}^{2+}(\text{aq}) \parallel \text{Cd}^{2+}(\text{aq}) \mid \text{Cd(s)}$

Values (E^\ominus)
$\text{Ni}^{2+}/\text{Ni} = -0.25 \text{ volts}$
$\text{Mg}^{2+}/\text{Mg} = -2.37 \text{ volts}$
$\text{Cd}^{2+}/\text{Cd} = -0.40 \text{ volts}$

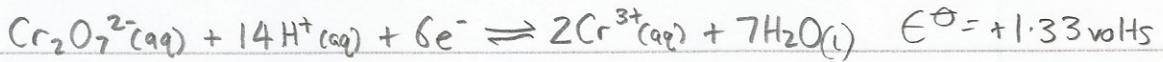
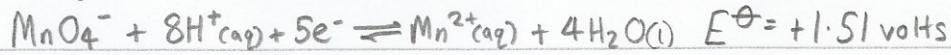
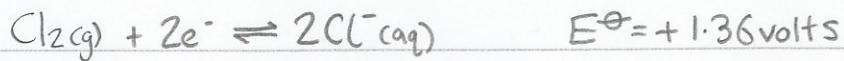
③ Which of the following reactions are feasible?



Values (E^\ominus)



④ Potassium Manganate(VII) solution acidified with dilute sulphuric acid, and potassium dichromate(VI) solution acidified with dilute sulphuric acid are both oxidising agents. Are either, or both, strong enough to oxidise chloride ions to chlorine?



⑤ Water can be oxidised to oxygen according to the equation



Given the following E^\ominus values, what can you use to oxidise water in this way?

