

Chemguide – questions

THE ELECTROCHEMICAL SERIES

For these questions you will need to look at this table taken from the Chemguide page.

	E^0 (volts)
$\text{Li}^+_{(\text{aq})} + \text{e}^- \rightleftharpoons \text{Li}_{(\text{s})}$	-3.03
$\text{K}^+_{(\text{aq})} + \text{e}^- \rightleftharpoons \text{K}_{(\text{s})}$	-2.92
$\text{Ca}^{2+}_{(\text{aq})} + 2\text{e}^- \rightleftharpoons \text{Ca}_{(\text{s})}$	-2.87
$\text{Na}^+_{(\text{aq})} + \text{e}^- \rightleftharpoons \text{Na}_{(\text{s})}$	-2.71
$\text{Mg}^{2+}_{(\text{aq})} + 2\text{e}^- \rightleftharpoons \text{Mg}_{(\text{s})}$	-2.37
$\text{Al}^{3+}_{(\text{aq})} + 3\text{e}^- \rightleftharpoons \text{Al}_{(\text{s})}$	-1.66
$\text{Zn}^{2+}_{(\text{aq})} + 2\text{e}^- \rightleftharpoons \text{Zn}_{(\text{s})}$	-0.76
$\text{Fe}^{2+}_{(\text{aq})} + 2\text{e}^- \rightleftharpoons \text{Fe}_{(\text{s})}$	-0.44
$\text{Pb}^{2+}_{(\text{aq})} + 2\text{e}^- \rightleftharpoons \text{Pb}_{(\text{s})}$	-0.13
$2\text{H}^+_{(\text{aq})} + 2\text{e}^- \rightleftharpoons \text{H}_{2(\text{g})}$	0
$\text{Cu}^{2+}_{(\text{aq})} + 2\text{e}^- \rightleftharpoons \text{Cu}_{(\text{s})}$	+0.34
$\text{Ag}^+_{(\text{aq})} + \text{e}^- \rightleftharpoons \text{Ag}_{(\text{s})}$	+0.80
$\text{Au}^{3+}_{(\text{aq})} + 3\text{e}^- \rightleftharpoons \text{Au}_{(\text{s})}$	+1.50

1. a) Define oxidation and reduction in terms of electron transfer.
b) Does an oxidising agent donate electrons to another substance or remove them from it?
c) Does a reducing agent donate electrons to another substance or remove them from it?

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2. Take your time over this question. It is *very* easy to get confused.
- a) Which species in the table above is the strongest reducing agent? (A species could be either an atom or an ion.)
 - b) Which species in the table above is the strongest oxidising agent?
 - c) Which species is the most easily reduced?
 - d) Which species is the most easily oxidised?
 - e) Considering only the Mg^{2+}/Mg and the Zn^{2+}/Zn equilibria, which species is the strongest oxidising agent?
 - f) Considering only the Cu^{2+}/Cu and Ag^{+}/Ag equilibria, which species is the strongest reducing agent?
 - g) Considering only the Ca^{2+}/Ca and Al^{3+}/Al equilibria, which species is most easily oxidised?
 - h) Considering only the Fe^{2+}/Fe and Pb^{2+}/Pb equilibria, which species is most easily reduced?