

Worksheet 9.3: Solutions

The electrochemical series

No.	Answer
1	a Top left-hand corner b Bottom left-hand corner c Bottom right-hand corner d Top right-hand corner
2	a $\text{H}_2\text{O}_2 > \text{Cu}^{2+} > \text{H}^+ > \text{Fe}^{2+} > \text{Zn}^{2+}$ b $\text{Na} > \text{Pb} > \text{Fe}^{2+} > \text{Ag} > \text{Cl}^-$
3	The reference cell is the hydrogen half-cell, which consists of a 1 mol L ⁻¹ solution of hydrochloric acid at 25°C through which hydrogen gas at 1 atm pressure is bubbled. The electrode is platinum coated with platinum black.
4	25°C, aqueous concentrations of 1 mol L ⁻¹ , and gas pressures of 1 atm
5	The reaction may not be proceeding under standard conditions of temperature and pressure and/or the reaction may be proceeding at too slow a rate to be noticeable.
6	A coating of silver and copper metal will occur on the tin in the beakers containing AgNO ₃ and Cu(NO ₃) ₂ respectively.
7	The unknown metal is nickel or cobalt and it will react with the solution of tin(II) chloride (SnCl ₂).
8	a No reaction b No reaction c $2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$ $\text{Sn}(\text{s}) \rightarrow \text{Sn}^{2+}(\text{aq}) + 2\text{e}^-$ $2\text{H}^+(\text{aq}) + \text{Sn}(\text{s}) \rightarrow \text{H}_2(\text{g}) + \text{Sn}^{2+}(\text{aq})$
9	$2\text{H}_2\text{O}(\text{l}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g}) + 2\text{OH}^-(\text{aq})$ $\text{K}(\text{s}) \rightarrow \text{K}^+(\text{aq}) + \text{e}^-$ $2\text{K}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{K}^+(\text{aq}) + 2\text{OH}^-(\text{aq}) + \text{H}_2(\text{g})$
10	$\text{B}^+ > \text{D} > \text{A}^{2+} > \text{C}^{2+}$ In cell 1, the electrons flow towards the strongest oxidant, D; hence $\text{D} > \text{C}^{2+}$. In cell 2, the electrons flow towards the strongest oxidant, B ⁺ ; hence $\text{B}^+ > \text{D}$. In cell 3, the electrons flow towards the strongest oxidant, A ²⁺ ; hence $\text{A}^{2+} > \text{C}^{2+}$. The cell potential in cell 1 (0.7) is greater than that in cell 3; hence $\text{D} > \text{A}^{2+}$.