**23 Electrochemistry**

**Topic summary**

**•**  A metal dipping into a solution of its ions forms a **half-cell**. When this is connected to another half-cell by means of a salt bridge, an **electrochemical cell** is set up. Under standard conditions, the voltage set up by this cell is the **standard cell e.m.f.**, http://reader.dynamic-learning.co.uk/epub_content/9781471840494/OEBPS/images/ts_23-1.jpg, for the cell.

http://reader.dynamic-learning.co.uk/epub_content/9781471840494/OEBPS/images/ts_23-2.jpg

**•**  If the left-hand half-cell is the standard hydrogen electrode, the standard cell e.m.f. is the standard electrode potential, http://reader.dynamic-learning.co.uk/epub_content/9781471840494/OEBPS/images/ts_23-3.jpg, for the right-hand half-cell.

**•**  The value of http://reader.dynamic-learning.co.uk/epub_content/9781471840494/OEBPS/images/ts_23-3.jpg measures the oxidising/reducing power of the half-cell system, and the feasibility of redox reactions can be predicted from http://reader.dynamic-learning.co.uk/epub_content/9781471840494/OEBPS/images/ts_23-4.jpg values.

**•**  A redox reaction that is predicted to be feasible from http://reader.dynamic-learning.co.uk/epub_content/9781471840494/OEBPS/images/ts_23-4.jpg values might not take place in practice, either because the conditions are non-standard or because the activation energy is very high.

**•**  If the conditions are non-standard, the **Nernst equation** in the form

http://reader.dynamic-learning.co.uk/epub_content/9781471840494/OEBPS/images/ts_23-5.jpg

    can be used to calculate the cell voltage.

**•**  Electrolysis is the process of driving a reaction that is not thermodynamically feasible by passing an electric current through it.

**•**  The ions that are discharged in electrolysis are the ones that require the least energy.

**•**  The amount of substance in moles dissolved or deposited during electrolysis is given by:

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    where *I* is the current, *t* the time in seconds, *z* the charge on the ion and *F* the Faraday constant.

**•**  If *e* is the charge on an electron, then *Le* = *F*.