Summary: redox reactions and electrode potentials

Electrochemical cells

Something must control the direction of electron transfer in a redox reaction. To find out more about redox reactions, and what makes them go in a particular direction, we need to be able to study the half-reactions.
We can arrange for the two half-reactions to occur separately with electrons flowing through an external wire from one half-reaction to the other.

A system like this is used in all batteries an 'dry' cells. In one part of the cell an oxidation reaction occurs. Electrons are produced. And transferred through an external circuit to the other part of the cell where a reduction reaction takes place, accepting the electrons. The two parts are called **half-cells**, which, when combined, make an **electrochemical cell**. Figure 4 shows the general arrangement.

The energy given out, instead of heating the surroundings, becomes available as electrical energy which we use to do work for us.
Cells are labelled with positive and negative terminals and a voltage. The voltage measures the potential difference between the two terminals
As current flows in a circuit, the voltage con drop. The higher the current drawn, the lower the voltage the cell may give.
If we want to compare cells, and half-cells, be measuring voltages, we do need to be careful to compare like with like. We can do this if we measure the potential difference is given the symbol $\mathbf{E_{cell}}$. (It is sometimes called the electromotive force, or emf of the cell, although this is not a very good term because it is not a force).
To measure E_{cell} we use a high resistance voltmeter so that almost zero current flows. We record the maximum potential difference is a measure of how much each electrode is tending to release or accept electrons.

Electrical units

Electrical charge is measured in coulombs (C)
Electric current is a flow of charge an is measured in amps (A)
One amp is a flow of charge of one coulomb per second.
The potential difference between the terminals of the cell is measured in volts (V). The voltage of the cell tells you the number of joules of energy transferred whenever one coulomb of charge flows round the circuit.
$1\ V = 1\ JC^{-1}$
For example if one coulomb of charge flows through a potential difference of 3 V, then 3 J are transferred.

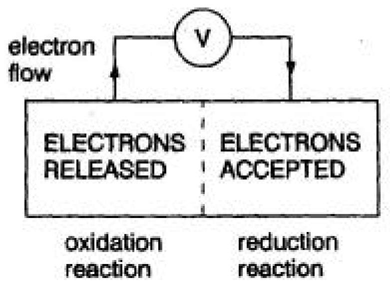

Figure 4 The general arrangement for an electrochemical cell