A-level Chemistry exemplar for required practical 8

Measuring the EMF of an electrochemical cell

Student sheet

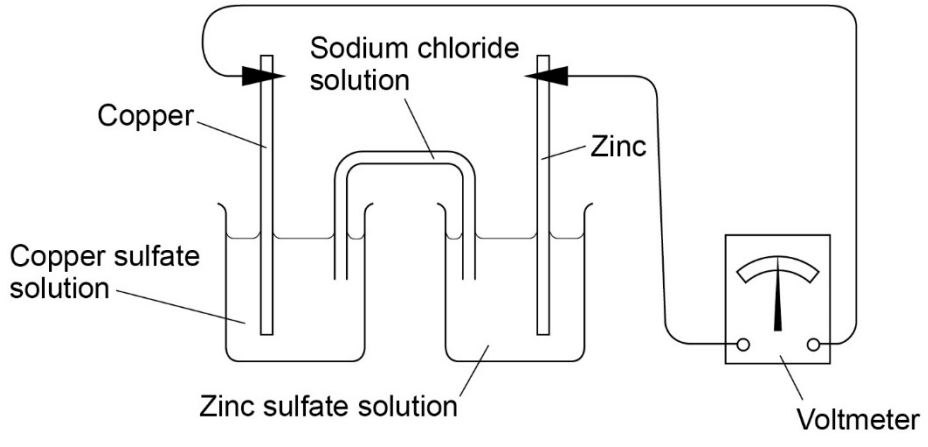
Requirements

You are provided with the following:

- pieces of copper and zinc foil (about 2 cm × 5 cm)
- propanone
- 2.0 mol dm^{-3} NaCl solution
- 1.0 mol dm^{-3} $CuSO_4$ solution
- 1.0 mol dm^{-3} $ZnSO_4$ solution
- emery paper or fine grade sandpaper
- two 100 cm^3 beakers
- plastic or glass U-tube
- cotton wool soaked in sodium chloride solution
- voltmeter (digital or high impedance)
- two electrical leads with connectors for the voltmeter at one end and crocodile clips at the other end
- samples of metals.

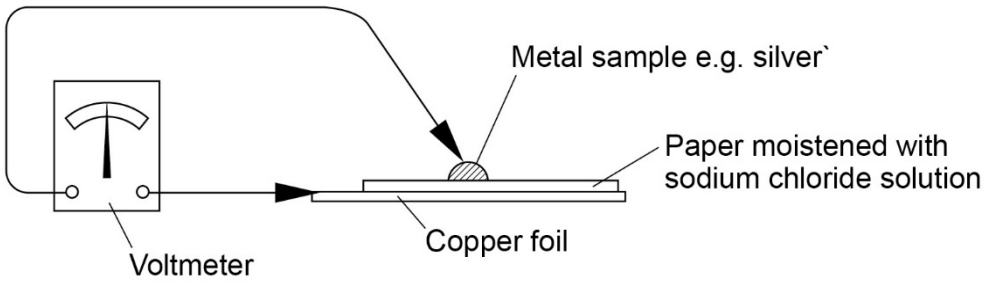
Suggested method for setting up a standard cell

a) Clean a piece of copper and a piece of zinc using emery paper or fine grade sandpaper.
b) Degrease the metal using some cotton wool and propanone.
c) Place the copper into a 100 cm^3 beaker with about 50 cm^3 of 1 mol dm^{-3} $CuSO_4$ solution.
d) Place the zinc into a 100 cm^3 beaker with about 50 cm^3 of 1 mol dm^{-3} $ZnSO_4$ solution.
e) Lightly plug one end of the plastic tube with cotton wool and fill the tube with the solution of 2 mol dm^{-3} NaCl provided.
f) Plug the free end of the tube with cotton wool which has been soaked in sodium chloride. Join the two beakers with the inverted U-tube so that the plugged ends are in the separate beakers.
g) Connect the $Cu(s)|Cu^{2+}(aq)$ and $Zn(s)|Zn^{2+}(aq)$ half-cells by connecting the metals (using the crocodile clips and leads provided) provided to the voltmeter and read off the voltage.



Suggested method for measuring comparative electrode potentials of different metals

a) Clean a piece of copper using emery paper or fine grade sandpaper.
b) Connect the positive terminal of the voltmeter to the copper using a crocodile clip and one of the leads.
c) Cut a piece of filter paper to about the same area as the copper, moisten the filter paper with the sodium chloride solution and place on top of the copper.
d) Connect the second lead to the voltmeter and use the crocodile clip on the other end of the lead to grip a piece of another metal.
e) Hold the metal against the filter paper and note the voltage reading and sign.



f) Repeat steps (d) and (e) with different metals and record your results in a table.
g) Write the conventional representation for each of the cells that you have constructed
h) Suggest how you could construct the cell with the largest EMF from the metals provided.