9.4 $2Na(s) + 2H_2O(\ell) \rightarrow 2NaOH(aq) + H_2(g)$

9.5 C: Chlorine gas
E: Hydrogen gas

9.6 Amalgam

Experiment 25: Page 401

Aim: To determine the galvanic cell with the highest cell potential.

Investigative question:
Which galvanic cell will have the highest cell potential at the same temperature and with the same electrolyte concentrations: Aℓ/Zn, Aℓ/Pb, Aℓ/Cu, Zn/Pb, Zn/Cu or Pb/Cu?

Hypothesis:
The cell potential of an Aℓ/Cu cell will have a higher cell potential than an Aℓ/Zn, Aℓ/Pb, Zn/Pb, Zn/Cu or Pb/Cu cell at the same temperature and with the same electrolyte concentrations.

Observations:
The voltmeter shows a reading when the salt bridge connects the two half cells.
If the current flows for a while, the voltmeter reading decreases gradually. To ensure a fair test, the voltmeter reading is taken the moment that the salt bridge is placed in the solutions and the current starts to flow.

Anode	Cathode	Cell potential (V)
$A\ell(s)/A\ell^{3+}(aq)$	$Cu(s)/Cu^{2+}(aq)$	**2,00**
$A\ell(s)/A\ell^{3+}(aq)$	$Zn(s)/Zn^{2+}(aq)$	**0,90**
$A\ell(s)/A\ell^{3+}(aq)$	$Pb(s)/Pb^{2+}(aq)$	**1,53**
$Zn(s)/Zn^{2+}(aq)$	$Pb(s)/Pb^{2+}(aq)$	**0,63**
$Zn(s)/Zn^{2+}(aq)$	$Cu(s)/Cu^{2+}(aq)$	**1,10**
$Pb(s)/Pb^{2+}(aq)$	$Cu(s)/Cu^{2+}(aq)$	**0,47**

Results:
In order of increasing cell potential, the galvanic cells are: Pb/Cu, Zn/Pb Aℓ/Zn, Zn/Cu, Aℓ/Pb and Aℓ/Cu. According to the Table of Standard Reduction Potentials, Aℓ is the strongest reducing agent of the metals, and Cu is the weakest reducing agent of the metals, but Cu^{2+} is the strongest oxidising agent of the metal cations in the electrolyte solutions.

Conclusions:
The hypothesis is correct. The Aℓ/Cu cell will have a higher cell potential than an Aℓ/Zn, Aℓ/Pb, Zn/Pb, Zn/Cu or Pb/Cu cells at the same temperature and with the same electrolyte concentrations.