REDOX POTENTIALS AND SIMPLE TEST TUBE REACTIONS

For these questions you will need to look at this table taken from the Chemguide page.

	E^0 (volts)
$Li^+_{(aq)} + e^- \rightleftharpoons Li_{(s)}$	-3.03
$K^+_{(aq)} + e^- \rightleftharpoons K_{(s)}$	-2.92
$Ca^{2+}_{(aq)} + 2e^- \rightleftharpoons Ca_{(s)}$	-2.87
$Na^+_{(aq)} + e^- \rightleftharpoons Na_{(s)}$	-2.71
$Mg^{2+}_{(aq)} + 2e^- \rightleftharpoons Mg_{(s)}$	-2.37
$Al^{3+}_{(aq)} + 3e^- \rightleftharpoons Al_{(s)}$	-1.66
$Zn^{2+}_{(aq)} + 2e^- \rightleftharpoons Zn_{(s)}$	-0.76
$Fe^{2+}_{(aq)} + 2e^- \rightleftharpoons Fe_{(s)}$	-0.44
$Pb^{2+}_{(aq)} + 2e^- \rightleftharpoons Pb_{(s)}$	-0.13
$2H^+_{(aq)} + 2e^- \rightleftharpoons H_{2(g)}$	0
$Cu^{2+}_{(aq)} + 2e^- \rightleftharpoons Cu_{(s)}$	+0.34
$Fe^{3+}_{(aq)} + e^- \rightleftharpoons Fe^{2+}_{(aq)}$	+0.77
$Ag^+_{(aq)} + e^- \rightleftharpoons Ag_{(s)}$	+0.80
$Cr_2O_7^{2-}{}_{(aq)} + 14H^+_{(aq)} + 6e^- \rightleftharpoons 2Cr^{3+}_{(aq)} + 7H_2O_{(l)}$	+1.33
$Cl_{2(g)} + 2e^- \rightleftharpoons 2Cl^-_{(aq)}$	+1.36
$Au^{3+}_{(aq)} + 3e^- \rightleftharpoons Au_{(s)}$	+1.50

1. In each of the following reactions, explain what is happening during the reaction in terms of the movements of the equilibria above, and write the ionic equation for the reaction.

   a) If you place a piece of zinc foil in a test tube of lead(II) nitrate solution, it becomes covered in dark grey crystals of lead. Colourless zinc nitrate solution is also formed. (The nitrate ions are spectator ions.)

   b) Aluminium powder reacts vigorously after some initial gentle heating with dilute hydrochloric acid to give hydrogen and a solution of aluminium chloride. (The chloride ions are spectator ions.)

   c) If you bubble chlorine gas through a very pale green solution of iron(II) chloride, the solution turns orange as iron(III) chloride solution is formed. (The original chloride ions in the solution are spectator ions.)