GROUP 2: REACTIONS WITH WATER

1. a) Beryllium doesn't react with water, and magnesium reacts with it very very slowly. Reactivity then increases as you go down the group.

   b) $Sr + 2H_2O \longrightarrow Sr(OH)_2 + H_2$

   c) $Mg + H_2O \longrightarrow MgO + H_2$

   d) You would get a fairly vigorous reaction producing a colourless gas. The calcium would disappear to leave a white precipitate in a colourless solution.

   (Note: make sure you answer the question exactly as it is asked! You wouldn't *see* that "hydrogen was produced" - you would have to test it in order to find that out, and the question doesn't ask you to do that. And similarly, you wouldn't *see* "calcium hydroxide" being produced. That is a deduction, not an observation. Neither would you see that the solution was alkaline unless you had tested it in some way, and the question doesn't say anything about that either. It wouldn't matter if you offered all this as additional information, but the danger is that you will give an answer which says "hydrogen is produced together with calcium hydroxide" without giving any description of what you would *see*, and therefore lose all the marks for a trivial question.)

2. a) (i) $Ca_{(s)} \longrightarrow Ca_{(g)}$

   (ii) $Ca_{(g)} \longrightarrow Ca^+_{(g)} + e^-$

   (iii) $Ca^+ \longrightarrow Ca^{2+}_{(g)} + e^-$

   b) When these elements react with water, the solid metal has to be turned into metal ions, and the totals in the chart show the energy input terms needed for this to happen. This will be related to the activation energy for the reactions, and this energy input clearly falls as you go down the group.

   A lower activation energy leads to a faster reaction. The activation energy for beryllium is so high that the reaction doesn't happen.