1. Chlorine gas is bubbled through potassium bromide solution.
   a) Describe what you would see.
   b) Write the ionic equation for the reaction.
   c) Explain why this is a redox reaction, stating clearly what is being oxidised and what is being reduced.
   d) Explain why the equivalent reaction with fluorine would be more complicated than this.
   e) What happens to the oxidising ability of the halogens as you go down the group.

2. The following table is taken from the Chemguide page, and shows the various enthalpy changes involved in the reaction:

   \[
   \frac{1}{2}X_{2(s, l \text{ or } g)} + e^{-} \rightarrow X^{-}_{(aq)}
   \]

<table>
<thead>
<tr>
<th></th>
<th>atomisation energy (kJ mol(^{-1}))</th>
<th>electron affinity (kJ mol(^{-1}))</th>
<th>hydration enthalpy (kJ mol(^{-1}))</th>
<th>overall (kJ mol(^{-1}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>+79</td>
<td>-328</td>
<td>-506</td>
<td>-755</td>
</tr>
<tr>
<td>Cl</td>
<td>+121</td>
<td>-349</td>
<td>-364</td>
<td>-592</td>
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<tr>
<td>Br</td>
<td>+112</td>
<td>-324</td>
<td>-335</td>
<td>-547</td>
</tr>
<tr>
<td>I</td>
<td>+107</td>
<td>-295</td>
<td>-293</td>
<td>-481</td>
</tr>
</tbody>
</table>

   a) Define:
      (i) atomisation energy;
      (ii) electron affinity;
      (iii) hydration enthalpy.

   b) Ignoring fluorine for the moment, why do the electron affinities of the other three elements decrease as you go down the group?

   c) Why is the fluorine value lower (less negative) than you might expect?
Chemguide – questions

d) Why is the fluorine value also out of line with the general trend in atomisation energy?

e) Why do the hydration enthalpies of the halogens fall as you go down the group?

f) Explain how the final column (in red) relates to the oxidising ability of the halogens.

g) What are the two most important factors in producing the changes in the last column as you go down the group from chlorine to iodine?