GROUP 7: HALIDE IONS AS REDUCING AGENTS

1. Sodium bromide reacts with concentrated sulphuric acid in two different ways:

   Reaction 1: $NaBr + H_2SO_4 \longrightarrow NaHSO_4 + HBr$

   Reaction 2: $H_2SO_4 + 2H^+ + 2Br^- \longrightarrow Br_2 + SO_2 + 2H_2O$

   In the second equation, the hydrogen ions come from more sulphuric acid, and the bromide ions from the sodium bromide.

   a) What is the function of the sulphuric acid in the first equation? Explain your answer.

   b) What is the function of the sulphuric acid in the second equation? Explain your answer.

   c) What is the function of the bromide ions in the second equation? Explain your answer.

   d) If you did this reaction by adding concentrated sulphuric acid to solid sodium bromide, what would you see?

   e) Suppose you repeated this reaction using sodium fluoride, sodium chloride and sodium iodide instead of sodium bromide. How would this differ in each case?

   f) The title of this page of questions is "Halide ions as reducing agents". How does the reducing ability of the halide ions change as you go down the group?

   g) How does the ease with which the halide ions are oxidised to halogen molecules change as you go down the group?

I am not going to ask questions about the explanations for these changes as you go down the group, because it is too dependent on what your examiners might want. Use your syllabus, past papers and mark schemes if they are available to find out exactly what sort of questions (if any) your examiners ask, and what they expect you to say. There is no point in learning a complex explanation if your examiners only want a simple one (however faulty!). And, equally, there is no point in learning an over-simplified explanation if your examiners want you to do it properly – and no point in worrying about an explanation at all if your syllabus doesn't mention it.