

## Chemguide – answers

### GROUP 7: HALIDE IONS AS REDUCING AGENTS

1. a) It is acting as an acid by donating hydrogen ions to bromide ions in the sodium bromide to make hydrogen bromide.
- b) It is acting as an oxidising agent by removing electrons from the bromide ions to make bromine molecules. (Or: . . . by increasing the oxidation state of bromine from -1 in the bromide ions to 0 in the molecule.)
- c) The bromide ions are reducing agents. The easiest way to explain this is from oxidation states. The bromide ions are reducing the sulphur from an oxidation state of +6 in the sulphuric acid to +4 in  $\text{SO}_2$ .
- d) There would be steamy fumes (of hydrogen bromide) contaminated by orange fumes (of bromine).
- e) Sodium fluoride and sodium chloride will only give steamy fumes of the hydrogen halide (HF and HCl), because the sulphuric acid isn't a strong enough oxidising agent to oxidise fluoride or chloride ions.
- Sodium iodide will give mainly iodine which will be seen as purple fumes and dark grey iodine condensing at the top of the tube. There will also be red colours around the solid sodium iodide because of the formation of  $\text{I}_3^-$  ions where iodine reacts with the iodide ions. The sulphuric acid is also reduced further to give hydrogen sulphide rather than  $\text{SO}_2$ .
- f) Reducing ability gets greater as you go down the group.
- g) (This is actually asking the same question as the previous one!) The ease with which the halide ions are oxidised to halogen molecules gets greater as you go down the group.