Cobalt Chloride Thermometer – Teacher's Notes

For demonstration/class activity

Make Sure You Have…

Prepared test tube (with ethanol and $CoCl_2.6H_2O$ - see technicians notes)

2 x 250 ml beakers

Hot water

Cold water

What To Do….

1. Place the test tube into a beaker of cold water

   The solution in the test tube should be pink

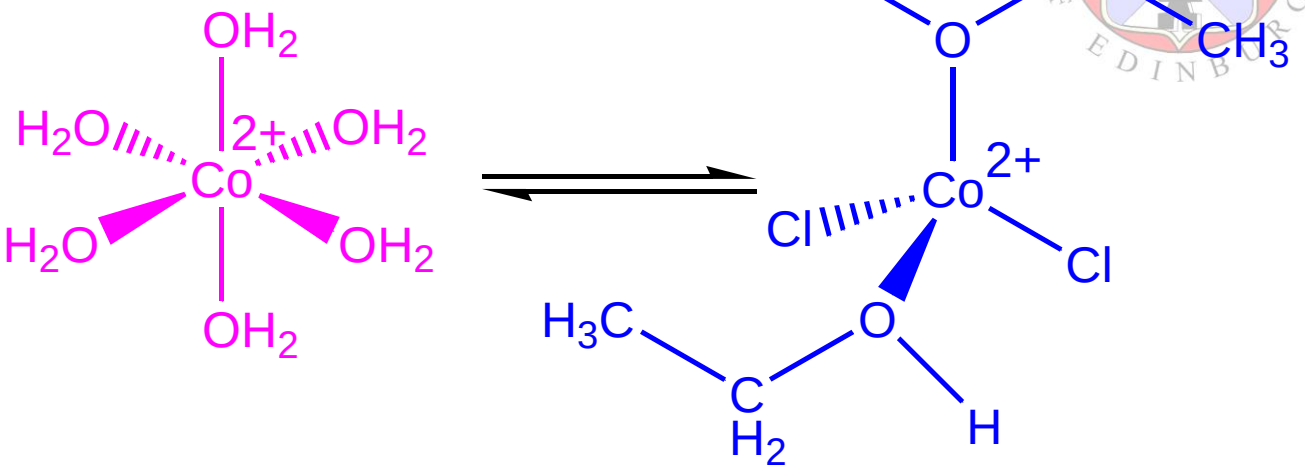
2. Place the test tube into a beaker of hot water

   The solution in the test tube should turn blue

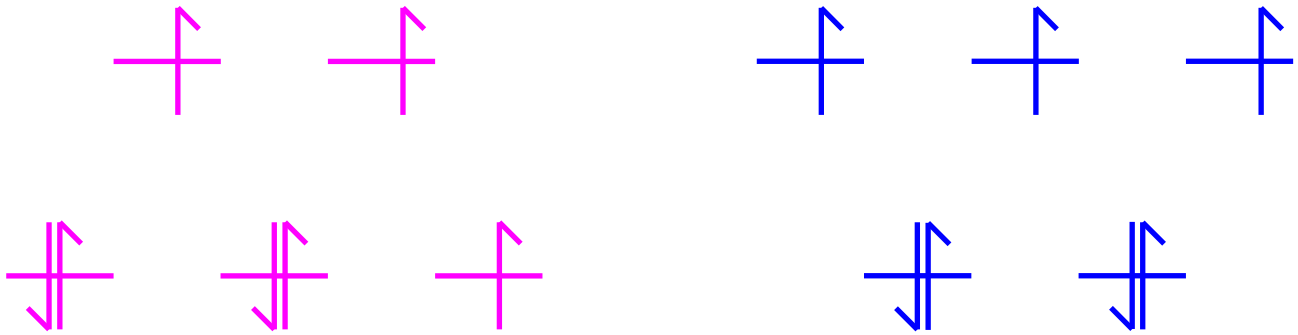
3. Wash everything up (solution can go down the sink).

What's Happening?

The cobalt(II) ion is a different colour depending on way other molecules (ligands) are stuck to it. In a cold solution of ethanol, water (the water of crystallisation in $CoCl_2.6H_2O$) is the ligand. This leads to the octahedral molecule shown below left and completely changes the arrangement of the electron energy levels . Heating the solution drives off the water to give the tetrahedral molecule shown below right. Thus, you can make the molecule change shape simply by heating it.



The Cobalt (II) ion is pink when octahedral and blue when tetrahedral



Electron Energy Levels for the octahedral (left) and tetrahedral (right) molecules.