

The blueprint reaction

Education in Chemistry

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Technician notes

Kit

The following quantities will generate enough for at least five A4 prints.

- 0.6 g iron(III) chloride-6-water (harmful, irritant, causes serious eye damage)
- 0.6 g citric acid (irritant)
- 0.9 g ammonium carbonate (harmful)
- 1.0 g potassium hexacyanoferrate(III)
- absorbent paper (eg watercolour paper)
- a paint brush or sponge for applying the mixture to the paper
- hairdryer (electrically tested if brought in from home)
- objects to silhouette or a black and white image printed on acetate film
- a plastic tray (eg a Gragnells tray) for washing in the sink

Preparation

Wear eye protection. Dissolve the hydrated iron chloride and citric acid in 20 cm³ of water. Add the ammonium carbonate in small portions and wait for the frothing to dissipate before continuing to dissolve more.

In front of the class

Add the potassium hexacyanoferrate(III) and dissolve. **The mixture is now light sensitive so work in a dim room.** Use a sponge or paint brush to apply the mixture to the paper and mop up any excess moisture with lab roll. A hairdryer on a cool setting can finish the drying.

Place the paper in direct sunlight and cover with objects (such as leaves, scissors, or a black and white image on acetate film) to generate a negative image. As the reaction proceeds, the colour of the exposed paper changes from yellow through green to blue. When satisfied by the intensity of the colour (approximately 20 minutes in direct sunlight; diffuse sunlight on a cloudy day may require a number of hours), place the paper in a tray under running water and agitate it to thoroughly wash out any unreacted chemicals and leave the negative image as white against blue. The image is now colour-fast and can be hung up to dry.

The paper can be fully prepared ahead of time but must be kept in the dark.

In an earlier Exhibition chemistry, the [Magic Beakers demonstration](#), the last step generates Prussian blue.

Safety and disposal

Wear eye-protection when preparing the cyanotype mixture. The mixture and excess starting materials can be washed down a sink with plenty of water. Potassium hexacyanoferrate(III) can release hydrogen cyanide (highly toxic) if brought into contact with strong acids. While this is unlikely to occur during this procedure, care should be taken to ensure that no acid is already present in the drain/sink when disposing of materials.