For Teachers **Let's make Recycling Blue**

Module 2

Objective: Extraction of metal ions from water

Retrieving metal ions from different solutions using Prussian Blue.

Necessities

Reagents	Formula		Quantity (g) or Concentration (M)
Solution of Copper (II)	Cu^{2+}	*	0.05 M in Cu^{2+}
Solution of Cobalt (II)	Co^{2+}	*	0.05 M in Co^{2+}
Solution of Manganese (II)	Mn^{2+}	*	0.05 M in Mn^{2+}
Solution of Hexacyanoferrate	$K_4[Fe(CN)_6] \cdot 3H_2O$		1.0 g in 10 ml of distilled water
Prussian blue	$Fe_4[Fe(CN)_6]_3$	None	solid

* For the preparation of the solutions it is necessary to use soluble salts of the metals to be tested. Depending on the salt used the danger symbols change, so pay attention to what is on the container and follow the safety advice on the label.

List of materials/tools

- Test tubes
- Paper towels
- Pasteur pipette
- Solution of Copper (II) 0.05 M
- Solution of Cobalt (II) 0.05 M
- Solution of Manganese (II) 0.05 M
- Solution of Hexacyanoferrate
- Prussian blue
- Cotton wick

It is possible to try other solutions of metal ions to see if the experiment works with those as well.

Lab Procedure

- Put the cotton plug into a pasteur pipette.
- Fill the pipette with Prussian blue and water, up to 1/3 of its volume, to get a well-packed column.
- Let some droplets fall.

- Add the solution containing the metal ions.
- Put the paper towel (soaked with hexacyanoferrate) under the pipette.
- Observe the reaction between the drops, fallen from the pipette, and the hexacyanoferrate.

Additional Safety Notes

$K_4[Fe(CN)_6]$ has a long-lasting harmful effect on aquatic life, and it must not be dispersed in the environment.

For more information read the relevant safety data sheets.

Conclusions

Students can observe that the treated solution has become transparent, meaning that it has lost the metal ions. Then:

- CRMs which are not treated with Prussian Blue change color once they fall on the paper soaked with hexacyanoferrate.
- CRMs which are treated with Prussian Blue do not undergo a color change when they come into contact with the aforementioned paper.
- This demonstrates that Prussian Blue can absorb CRMs from solutions.