'Let's get Practical'
– How Science Works

OCR
RECOGNISING ACHIEVEMENT

Ion Racing

Apparatus and chemicals:

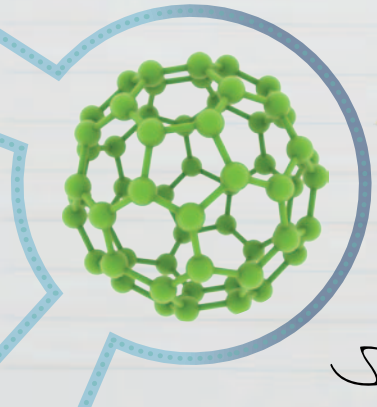
Petri Dishes
Distilled water
Saturated solution of lead (II) nitrate [approx 5 cm^3] [TOXIC]
Saturated solution of potassium iodide [approx 5 cm^3]
1% starch solution [approx 5 cm^3]
Iodine in potassium iodide solution [approx 5 cm^3]
Pasteur pipettes
Stopwatch

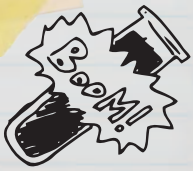
Reference: Gateway Suite Chemistry Module 5h – *Carry out simple precipitation reactions*

Twenty First Century Science Suite Chemistry Module C5.2 – What reactions happen in the hydrosphere?

Learning outcomes - this fun activity allows students to investigate the behaviour of ionic compounds in solution, using visually striking precipitation reactions. At a low level, the need for reactants to collide in order for a reaction to occur is demonstrated. Students will be familiar with diffusion from key stage 3, but here is an opportunity to extend their understanding and to begin to quantify the rate of diffusion (mobility) of different compounds and ions.

The activity also provides an opportunity for students to carry out a risk assessment, useful preparation for their controlled assessment.





Procedure

1. Place a Petri dish on a white sheet of paper, away from draughts and other disturbances.
2. Pour in sufficient water to just cover the bottom, and leave to settle to allow the turbulence caused by filling to calm.
3. Mark two spots diagonally opposite each other adjacent to the side of the dish. Label one "lead" and the other "iodide"
4. Use a Pasteur pipette to introduce one drop of each solution into the water, next to the appropriate spot and start the stopwatch.
5. The reaction between the lead ions and the iodide ions will precipitate bright yellow crystals of lead (II) iodide along the boundary where they meet. The time of first contact should be noted, as should the positions of the boundary. The dish may also be photographed as shown [figure 1].
6. The experiment may be repeated using starch solution and iodine solution, where the interaction between the two will be indicated by the typical blue-black colour of the starch-iodine complex. This result is also shown below [figure 2].

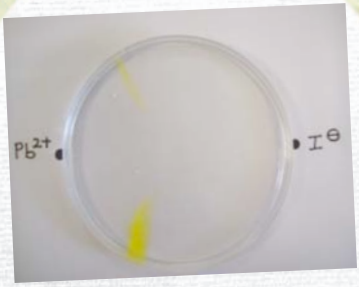


fig.1

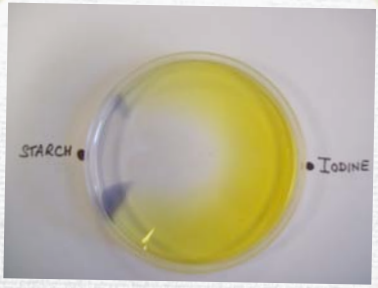
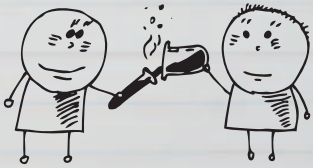


fig.2

Teacher notes

Relative ionic mobilities: $Pb^{2+}(aq)$ 0.48 : $I^{-}(aq)$ 1.045.



Questions

1 Ask students to predict where the boundary is likely to form, and why?

Extensions

1 Why does the boundary form closer to the glass edges?

2 What would happen if the Petri dish were to be filled to give a convex surface before the two solutions were introduced?

3 What would be the effect of placing the Petri dish under a bright lamp [thereby warming the water?]. Perhaps stand the dish on an overhead projector.

4 What would be the effect of using a concentrated solution of table sugar instead of distilled water? Does the presence of large inert molecules influence diffusion rate?