Producing ‘gold’ coins on a microscale

This resource is part of a collection of ideas and activities for chemistry lessons in the festive season. Find more at: [rsc.li/3h40uXc](https://rsc.li/3h40uXc).

A student sheet with questions, teacher notes including answers, plus integrated instructions are available at [rsc.li/3TZmRLN](https://rsc.li/3TZmRLN).

Equipment (per group)

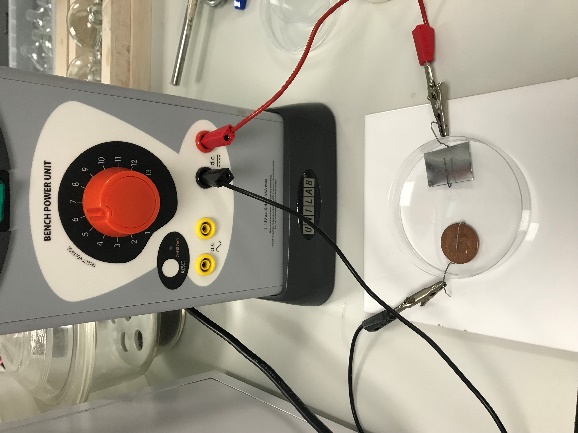
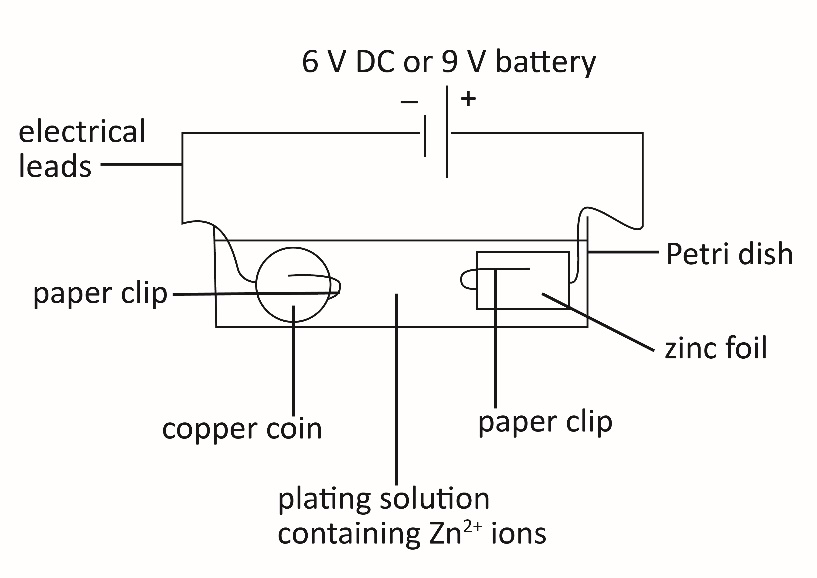
* 6 V DC source or 9 V battery
* 2 electrical leads
* 2 crocodile clips
* 2 steel paper clips
* Petri dish
* Measuring cylinder, 10 cm3
* Measuring cylinder, 25 cm3
* Beaker, 50 cm3
* Bunsen burner
* Heat proof mat
* Tongs
* Wash bottle or dropping pipette
* Cloth
* Copper coin (copper foil can be used if you do not have access to copper coins)
* Zinc foil
* Sodium hydroxide, 0.4 mol dm-3
* Zinc sulfate(VI), 0.1 mol dm-3

**Safety equipment:** safety spectacles

Preparation

Prior to the start of the lesson, clean the copper coins or strips of copper foil. Using plastic forceps, immerse the copper coins or foil in a beaker of warm 0.5 mol dm-3 nitric acid for a few seconds. Rinse the copper coin/strip with water and dry with a cloth.

Equipment set-up



Safety

[Read our standard health and safety guidance](https://edu.rsc.org/resources/explaining-our-health-and-safety-guidance/1752.article) and carry out a risk assessment before running any live practical.

Refer to SSERC/CLEAPSS Hazcards and recipe sheets.

Hazard classification may vary depending on supplier.

|  |  |
| --- | --- |
| **Chemical supplied for the practical** | **Preparation** |
| Nitric(V) acid, 0.5 mol dm-3  HNO3(aq)  Health hazard (Symbol: exclamation mark)  WARNING  Irritant (skin, eyes)  May produce toxic fumes | Nitric(V) acid, concentrated  HNO3(l)  MW = 63.01 g mol-1  Acute toxicity (Symbol: skull and crossbones)Oxidising (Symbol: flame over circle)Corrosive (Symbol: corrosion)  DANGER  May intensify fire; oxidiser  Causes severe skin burns and eye damage Toxic if inhaled  Corrosive to the respiratory tract |
| Sodium hydroxide solution, 0.40 mol dm-3  NaOH(aq)  Health hazard (Symbol: exclamation mark)  WARNING  Irritant (skin, eyes) | Sodium hydroxide solid  NaOH(s)  MW = 40.00 g mol-1  Corrosive (Symbol: corrosion)    DANGER  Causes severe skin burns and eye damage |

|  |  |
| --- | --- |
| Zinc sulfate(VI), 0.10 mol dm-3  ZnSO4 (aq)  Health hazard (Symbol: exclamation mark)  WARNING  Irritant (eyes) | Zinc sulfate(VI) heptahydrate solid  ZnSO4.7H2O (s)  MW = 287.54 g mol-1  Health hazard (Symbol: exclamation mark) Hazardous to the environment (Symbol: environment) Corrosive (Symbol: corrosion)  DANGER  Harmful if swallowed  Causes serious eye damage  Very toxic to aquatic life with long lasting effects |
| Sulfuric(VI) acid, 1.0 mol dm-3  H2SO4(aq)  Health hazard (Symbol: exclamation mark)  WARNING  Irritant (skin, eyes) | Sulfuric(VI) acid, concentrated  H2SO4 (l)  MW = 98.07 g mol-1  Corrosive (Symbol: corrosion)  DANGER  Cause severe skin burns and eye damage |
| Copper coin  Cu(s)  Currently not classified as hazardous |  |
| Zinc foil  Zn(s)  Currently not classified as hazardous |  |

Hazards

* Wear safety glasses.
* Beware of sharp edges when manipulating the zinc foil.
* Take care to avoid skin contact with the electrolyte solutions.
* Work in a dry area. Make sure that the power supply is switched off when the equipment is put together and that it is switched off again when dismantling.
* Hot coins could cause burns. Allow to cool before handling.

Disposal

* Dilute the plating solution in a bucket of water and pour down a foul water drain.
* Dilute the sulfuric acid solution down to 0.1 mol dm-3 and pour down a foul water drain.
* Dilute the nitric acid solution down to 0.1 mol dm-3 and pour down a foul water drain.