

Forces (magnetism): Magic Pennies

What to do in advance: Tape a strong magnet to the bottom of an opaque plastic box or tray. Turn the box upside down and place on a table – this is your performance platform for this ‘practical prompt’. You may wish to mark the box in some subtle way (e.g. with a scratch) to show you where the magnet is located. You need three identical pots (e.g. black film canisters with lids) that are colour coded so that pupils can easily see which is which. You also need three coins, two of which are non-magnetic (e.g. pennies up to 1992) and one of which is magnetic (e.g. pennies post-1992 or 1/2/5 cent pieces in Euro currency). If using three identical coins, you will need to mark the magnetic one in some visible way.

What to do with pupils: Use up to 3 pupil volunteers to put the coins in the pots while you turn away and put your fingers in your ears! The pupils need to make it clear to the rest of the class which pot has the ‘different’ coin inside. Explain that you are going to perform a series of magical tests to work out which pot contains the ‘different’ coin. You can make as much of this as you want – picking up the pots and staring at them, shaking and listening, smelling, dropping, putting them inside a hat on top of your head and jumping around etc. You need to ensure that at some point, you put the pots on top of the box and move them around, as this is when you will be able to feel which pot holds the coin which is attracted to the magnet. Finally, you can make your (correct) choice and your pupils will be amazed!

Questions to stimulate pupils’ thinking

- How did I do it? (can ask pupils to ‘think, pair, share’ different ideas)
- In what ways could one coin be different to the others?
- What tests did you see me do? Were all the tests I performed useful or important?
- Could you perform the same magic trick with any other objects?

A nice way to reveal the answer is to place the three pots (with coins inside) on top of the upturned tray/box above the magnet and then to turn the box over.

The science behind it

Only three naturally occurring metals are attracted to a magnet – **Iron, Cobalt and Nickel** (a lot rarer). UK pennies made after 1992 (as well as 1, 2 and 5 cent Euro coins) are magnetic because they are made of copper-plated steel. Steel is an alloy of iron mixed with carbon (and sometimes e.g. manganese, nickel, and chromium). UK pennies before September 1992 were made from an alloy of copper, tin and zinc (bronze), so they are not attracted to magnets.

