

EXPERIMENTS WITH TEST TUBES

Hydrogen Bubbles: Making bubbles using vinegar and an iron nail!

1. Fill the test tube up to around 5cm with vinegar (this works best with clear vinegar, i.e. white vinegar or distilled malt vinegar).
2. Sand down the tip of an iron nail using sand paper (an adult should do this part!).
3. Place the nail in the vinegar...
4. After a few minutes you will be able to see bubbles forming on the nail and rising through the vinegar!



Behind the scenes: this happens because vinegar is made from acetic acid, which is full of Hydrogen ions (H^+). These positively-charged Hydrogen ions react with the iron in the nail by taking its negatively-charged electrons, and they become Hydrogen molecules instead (H_2). Hydrogen is a gas at room temperature, so it forms bubbles in the vinegar!

Oxidisation: Turning dull old pennies bright and shiny again!

1. Fill the test tube up to a few cm high with vinegar, and then add a pinch of salt. Swirl the test tube gently to mix the reagents!
2. Add the old, discoloured 1p (or 2p, if they will fit!) coins. Note: Only copper coins work!
3. Wait for a few minutes, and then take them out and dry them off with a kitchen towel. When dry, they should be just like new!

Behind the scenes: Why are old pennies so dull? They are not just dirty - you can try washing them with soap and water, but they won't get shiny... This is because 1p and 2p coins are made from copper-plated steel. Copper reacts with oxygen in the air to form copper oxide, which creates a dull coating. (This is called oxidisation). But an acid such as vinegar (acetic acid), will remove the copper oxide.

Extension: You can also try leaving some of the pennies on a kitchen towel for an hour **without washing off the salt and vinegar** (they may need to be left for longer with some more salt and vinegar added!). They should turn a blue-green colour as the copper in the coin reacts with the salt and vinegar to form various copper compounds, including green copper chlorate (from the salt, which is sodium chloride) and copper acetate (from the vinegar - acetic acid). This green is called 'verdigris'... and it is the reason why the Statue of Liberty is green!



How Plants Drink: Colour changing flowers!

1. You will need some white flowers, such as carnations. Cut the stem long enough so they can sit in the test tubes. Cut the stems underwater so that no air can get in, as trapped air bubbles will wilt the flowers. Another tip is to cut the stem diagonally.
2. Fill each test tube with around 5cm of water, and carefully add a drop of food colouring to all but one. You can use different colours for each test tube.
3. Put a flower into each test tube, and leave them for the day. You can monitor the flowers to see when they start to change colour – it should take around six hours before they start to change.



Behind the scenes: Plants 'drink' water through their roots, and the water moves up the stem to the leaves and flowers. By slicing the stem open, you will be able to see that the capillaries have been coloured as well. Water moves upwards through the plant mainly by a difference in pressure – water evaporating from the leaves causes negative pressure, while water entering the roots via osmosis causes positive pressure. It works the same as sucking up liquid through a straw.

Acid and Alkali: Mixing vinegar and baking powder!

1. Put a spoonful of baking soda into the test tube.
2. Carefully add a few drops of vinegar.
3. Watch out as the mixture froths and bubbles! You may need to wipe the area afterwards, so do this in an area suitable for messy play or outside.

Behind the scenes: The vinegar is an acid (acetic acid) and the baking soda (sometimes called bicarbonate of soda) is a base. When combined, they react and give off carbon dioxide gas, which is what causes the bubbles. However, carbon dioxide is heavier than air, so these bubbles collect at the surface of the liquid and cause frothing.

Extension: You can use this reaction to make a mini volcano! Fashion the volcano out of modelling clay, and then add the baking soda in the mouth. You can add red food colouring to the vinegar before adding it to the volcano to create bright red, bubbling lava as the volcano erupts! Warning: this will make a mess and food colouring stains, so be careful where this experiment is conducted – placing the volcano in a plastic tub is recommended!



Although the ingredients in these experiments are common, it is good practice for scientists to be wary of what chemicals have been produced by a reaction!

We would be very grateful if you can give us any feedback about these experiments. Please let us know if have any other ideas that can be added to our website, email:

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