

Chemistry

Polypocket Chemistry 2

– hydrochloric acid

(Bulgaria)

Background:

Continuing with the low-cost chemistry This example focuses on testing and comparing the reactions of hydrochloric acid

The full details of how to assemble the kit, and prepare the reagents, and other polypocket activities can be found via this link bit.ly/SonS2019

You will need,

(per small group):





- ✓ Universal indicator (red cabbage juice indicator paper)
- ✓ Sodium chloride (0.1M)
- ✓ Silver nitrate (0.1M)
- ✓ Hydrochloric acid (0.1M)
- ✓ Copper strip
- ✓ Copper oxide (powder)
- ✓ Zinc granule
- ✓ One wooden splint
- ✓ Three disposable Pasteur pipettes
- ✓ Polypocket insert for hydrochloric acid

Follow these steps:

1. Split a strip of red cabbage universal indicator into two and place on the black indicator square, (Fig 1).
2. Place 1 – 2 drops of sodium chloride and hydrochloric acid in their respective white squares.
3. Place 1 – 2 drops of silver nitrate on a black test square for both sodium chloride and hydrochloric acid.
4. Slide both pieces of indicator paper into their reagents and note any colour change.

HYDROCHLORIC ACID

1. The acidity of hydrochloric acid

SODIUM CHLORIDE	SILVERNITRATE
	
HYDROCHLORIC ACID	
	

2. Reactions with metals and metal oxides

ZINC	COPPER	COPPER OXIDE

5. Add a drop of reagent to their corresponding silver nitrate drops. A white precipitate forms in each case.
6. Add 1 – 2 drops of hydrochloric acid to each of zinc granule, copper stirp and copper oxide powder. Note any changes.

So what happened?

The pH testing of two chlorine containing compounds demonstrates that chlorine does not determine acidity

Students know that hydrogen chloride is acidic, so may conclude that hydrogen determines acidity. Scientists created the pH scale based on this idea which has been refined with further research since.

Both compounds react in the same way with silver nitrate, so chlorine is the common reactive element (chlorine displaces the nitrate ion).

Chlorine is a strong reagent used in many industrial processes and in synthesising other chemicals.

The concept of displacement can be introduced here

The metal reactions show that one metal is resistant to a strong acid, while another reacts evolving a gas (bubbling)

Will all metals react in similar ways? How do we know this?

Opportunity for students to design a follow-up experiment

The oxygen in copper oxide is displaced by the chlorine forming copper chloride, and causing a colour change from black to blue. The reaction is also not as rapid as with zinc (not all chemical reactions are fast, due to a range of factors)

What next?

- Extension into the reactivity series of metals
- Looking at the factors that affect the speed of a reaction (concentration, warmed solutions)
- Testing other acids in a similar way.