

Chemistry

Polypocket Chemistry 1

– acidity

(Bulgaria)

Background:

This low-cost chemistry kit is designed to be glass free, using easily and cheaply obtained components, and micro amounts of reagents. Contained in a small cardboard box, it is portable and easy to store, (Fig 1 & 2).

Designed to optimise student learning, workplace for each small group of students is minimal and takes up the space of an A4 sheet of paper. All experiments are carried out by the means of pipetting, so it is possible to conduct lessons in a non-specialist room, with some simple precautions.

Reagent solutions are 0.1M in concentration, and are stored in 10ml screw-top plastic containers. As are



any solids, and the indicator papers. The PVC polypockets are hydrophobic, so the dilute water-based solutions used can be easily wiped with minimal amounts of tissue paper. The disposable Pasteur pipettes being similarly hydrophobic, they do not necessarily need to be rinsed by students between uses. It may however be simpler to

provide enough pipettes for each reagents' use.

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

This example focuses on testing and comparing the acidity of various substances (Fig 3)



You will need,

(per small group):

- ✓ Universal indicator (red cabbage juice indicator paper)
- ✓ Sodium hydroxide (0.1M)
- ✓ Sodium hydrogen carbonate (0.1M)
- ✓ Sodium carbonate (0.1M)
- ✓ Hydrochloric acid (0.1M)
- ✓ Vinegar
- ✓ Phenolphthalein indicator

ACIDITY OF SOLUTIONS						
UNIVERSAL INDICATOR						
METHYL ORANGE						
PHENOLPHTHALEIN						

- ✓ Methyl orange indicator
- ✓ Seven disposable Pasteur pipettes
- ✓ Polypocket insert for acidity

5. Remember not to place any reagent on the fourth column so this can act as a reference, sitting between the base and acid solutions.

Phenolphthalein works in the 8.2 – 10.0 range, changing colour when pH rises to this range (colourless to red). This also highlights that an indicator colour change to red is not just an acid indicator, simply that most indicators that students use have this colour change)

Follow these steps:

1. Break up some universal indicator strips in approximately 1cm lengths, placing one in each of the squares in the top row of the table.
2. For both methyl orange and phenolphthalein, place 1-2 drops of solution in each of the corresponding squares, in the table.
3. For the first column, place one drop of sodium hydroxide on the indicator paper, the methyl orange and the phenolphthalein.
4. Repeat this process for sodium hydrogen carbonate, sodium carbonate, vinegar and hydrochloric acid

So what happened?

The colour range allows you to engage students with how different indicators work.

Universal indicators work across a wide range of pH, as they are usually a combination of a number of indicators. In red cabbage there are several pH sensitive chemicals called anthocyanins, allowing it to work as a universal indicator.

Methyl orange works in pH 3.1 – 4.4 range, so only changes colour when pH drops into this range, (orange to red), and shows no colour change for bases.

What next?

- Its possible to test a wider range of substances, perhaps pooling observations from one or more groups, who have examined different sets of reagents.
- As a home assignment student could be given some cabbage indicator strips and a single Pasteur pipette, to test substances at home. A ceramic saucer and some tissue, as well as frequent rinsing between test liquids would be advisable, in this situation.