



University of
Nottingham

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EPSRC

Engineering and Physical Sciences
Research Council

A-Level chemistry revision session: Buffers - Teacher

Prepared by the EPSRC CDT in Sustainable Chemistry



A-level revision circuits

This circuit is designed to re-affirm basic knowledge on the topic of **buffers** and provide new ways of revising for the students.

These activities are designed to make up a revision class of a specific topic in the A-level syllabus. They can be done either immediately after finishing a topic as consolidation exercise, or at the end of the year as pre-exam revision.

The circuit format is used to enhance the revision experience and provide tools and examples for revision on many aspects of the topic, in many different formats.

Using more interactive techniques should allow for better understanding of the principles and theory.



How buffers work - Game

In pairs, one person is “the acid” one person is “the equilibrium”

The “acid” is added to the tray, as this happens the “equilibrium” works to combine the added

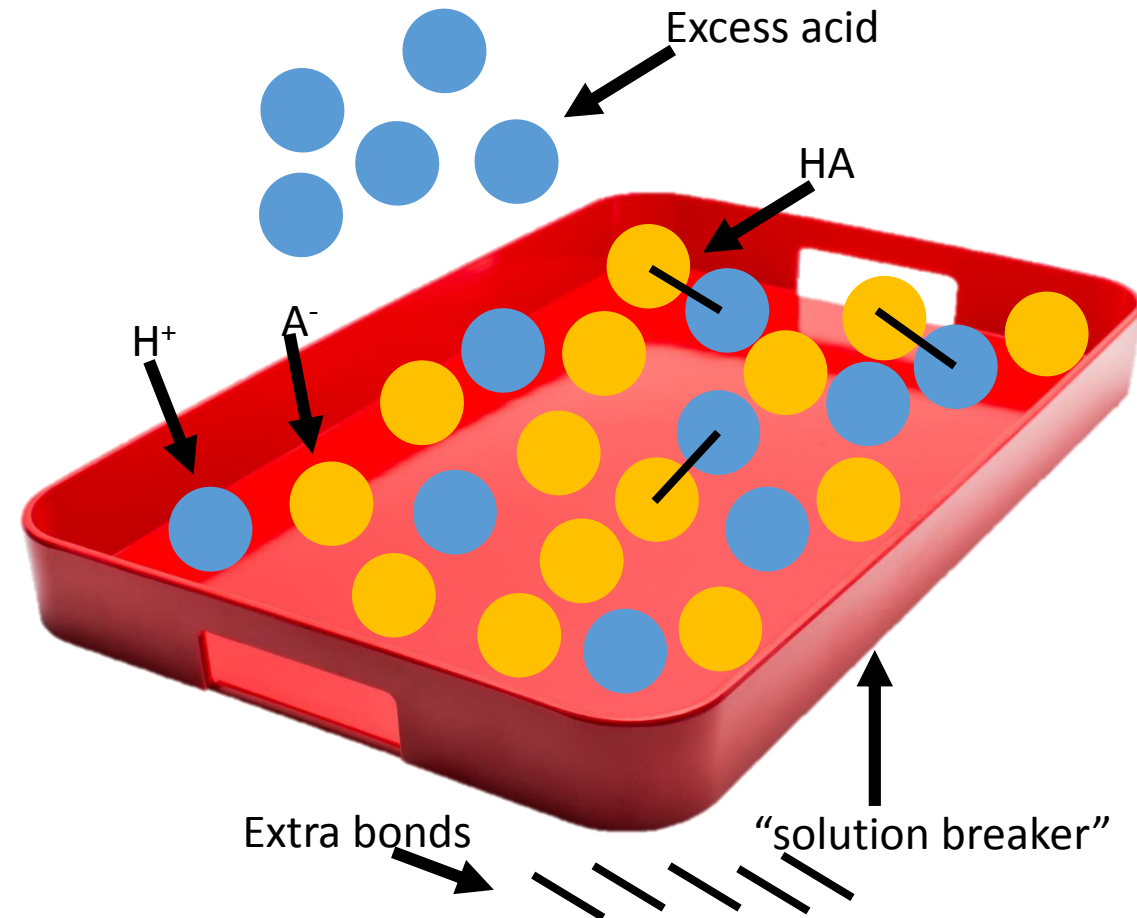


This means that when the activity is finished, there are the same number of H^+ in the tray as at the beginning

This activity makes use of MolyMod kits and can be altered to use as various buffers for both acidic and basic buffers

As part of the circuit activity we envisage there will be 2 trays, one acidic and one basic, 4 students will participate at once and time permitting experience both roles over the 2 trays

Time permitting, students can be asked to “write up” the game as if it were an experiment, explaining how the buffer has worked

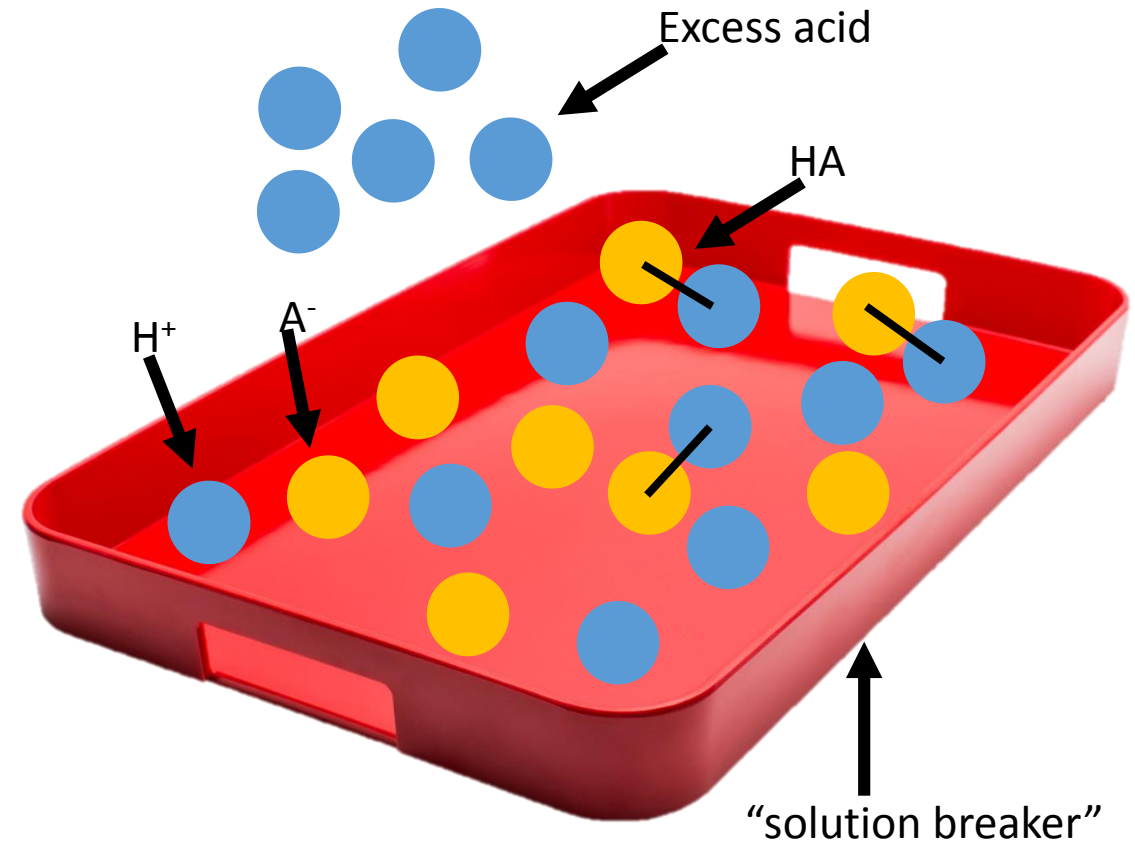




You are “**the acid**”, it is your job to raise the overall number of H^+ in the “solution”. To do this you must add the excess acid

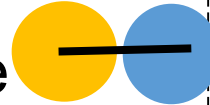
Write up a “lab report” on the experiment answering the following questions

- What was the initial number of H^+ in the solution?
- What happened during the experiment?
- What was the final number of H^+ in the solution?
- Why has this happened?



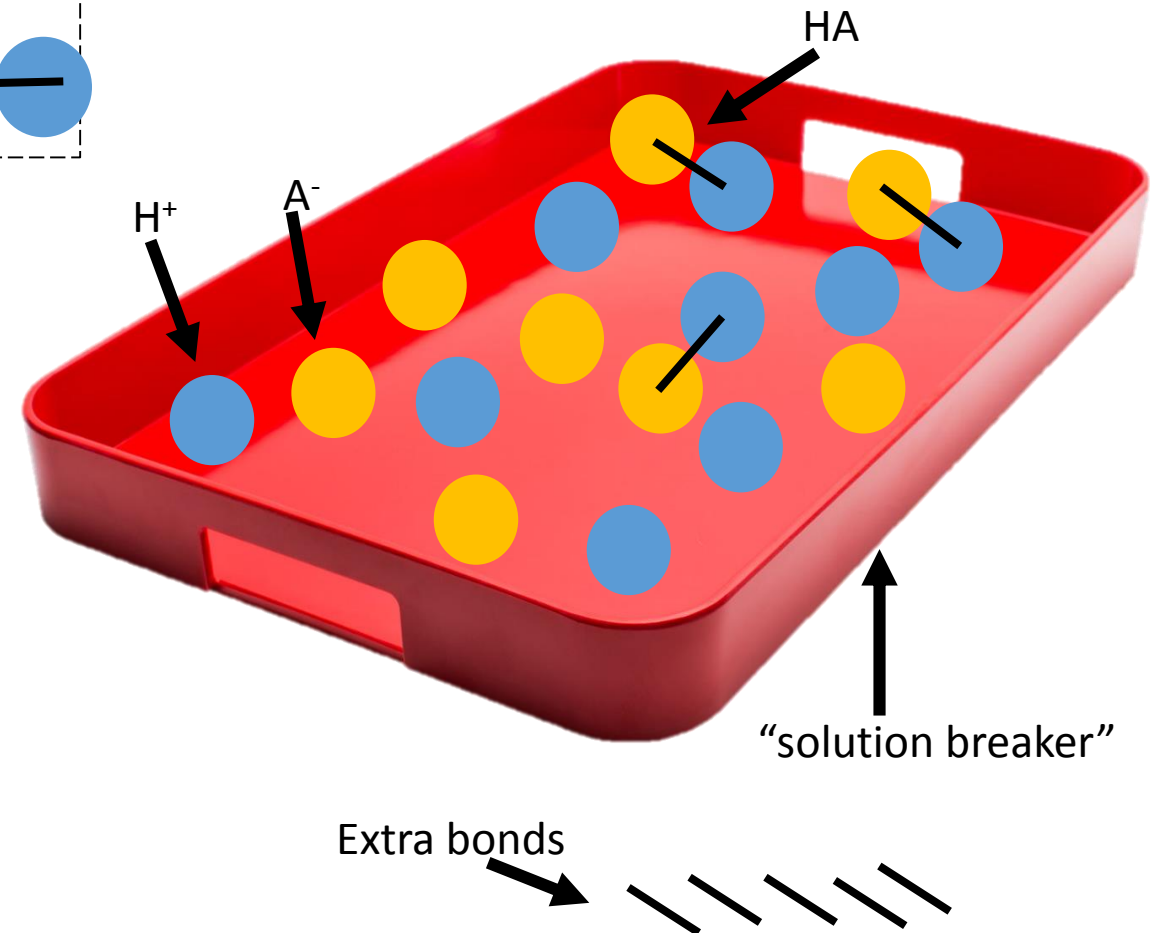


You are “**the equilibrium**”, it is your job to ensure the number of H^+ stays the same. To do this you must use your extra bonds and the A^- in the “solution” to make more



Write up a “lab report” on the experiment answering the following questions

- What was the initial number of H^+ in the solution?
- What happened during the experiment?
- What was the final number of H^+ in the solution?
- Why has this happened?





Buffers – exam questions

Calculations

Past papers depending on exam board



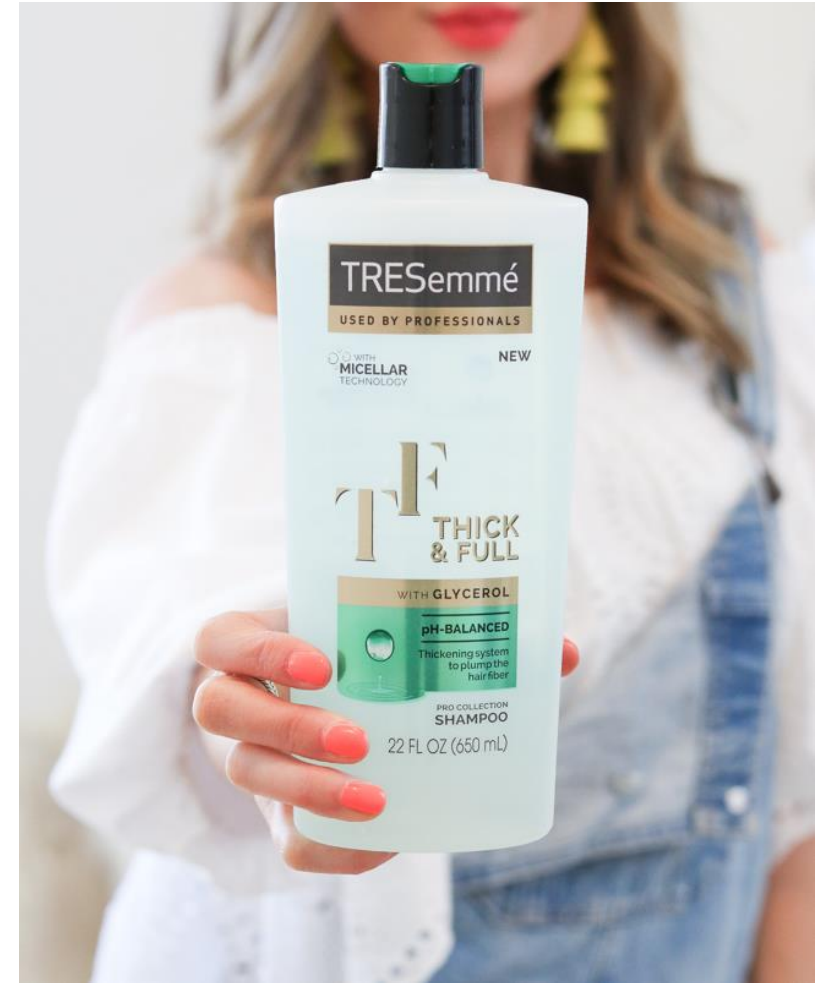
Applications of buffers - Shampoo

Nowadays many shampoos are described as “pH balanced” in their adverts, however after some market research Tresemmé have discovered that many of their customers don't understand what that means.

As Research and Development scientists you have been asked to issue a press release explaining to the public what this means.

You may want to include:

- What pH hair your hair and scalp are naturally
- How Tresemmé make sure their shampoo meets this natural pH
- Other examples of this effect happening in nature and biology





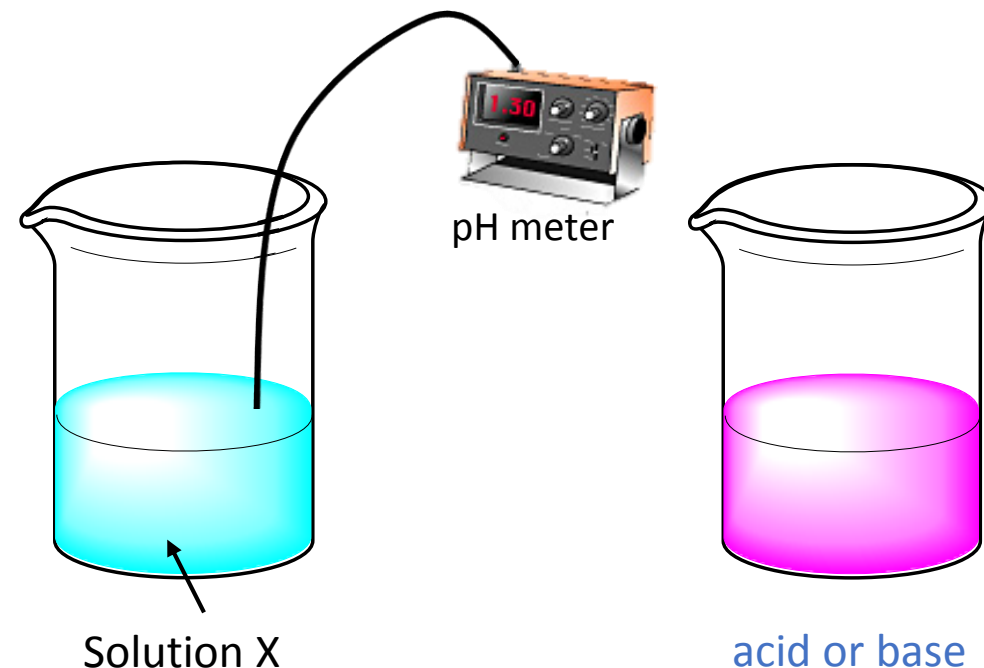
Buffers – experiment

5 buffer solutions and 5 acidic or basic solutions must be prepared for this experiment. A base or acid is also required to add to the solutions, the nature will be determined by the type of buffer and other solution used.

2 pH meters are required if available. If not the experiment can be done with indicator however the comparison will not be so clear.

2 sets of apparatus are set up – one is a buffer the other is an acid or a base. 4 students will work in pairs, one pair will work with buffer, the other with the acid or base. They will be given the instructions overleaf

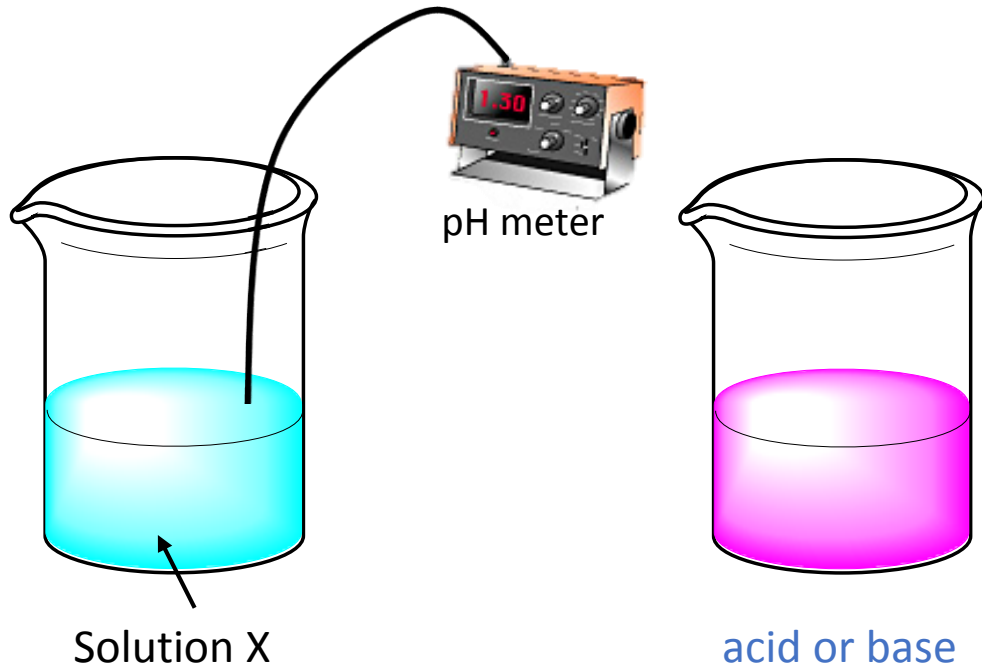
In pairs they record they record the pH change as the acid or base is added dropwise. Students should plot a graph of pH vs. drops added and share these results with the pair working on the other experiment.



Students should be able to identify immediately which pair have been using a buffer and which have been using the acid or base.



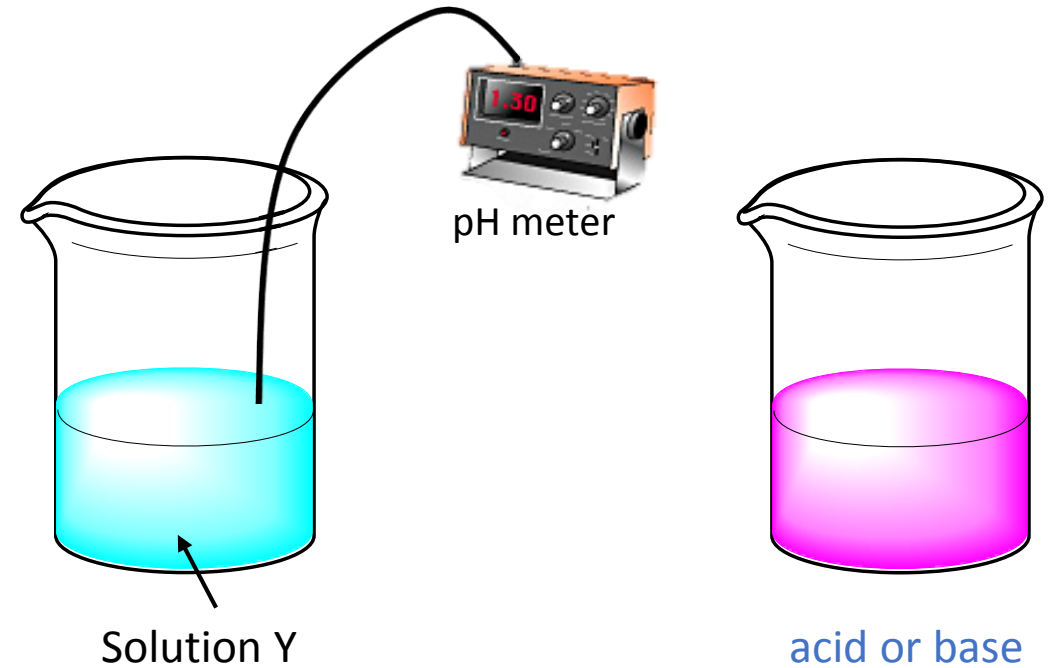
Buffers – experiment



- Add the **acid or base** dropwise to solution X and record the pH.
- Plot a graph of pH vs. number of drops of acid/base
- Compare this graph with the other pair
- Who has been using a buffer?

Extra: can you work out the XYZ of the PQR

Buffers – experiment

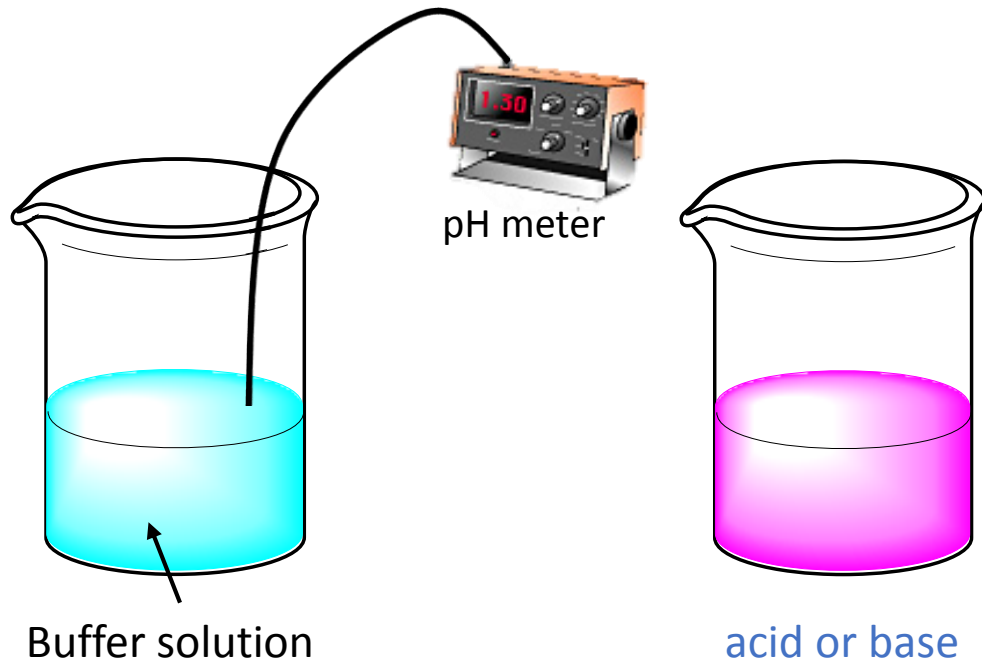


- Add the **acid or base** dropwise to solution Y and record the pH.
- Plot a graph of pH vs. number of drops of acid/base
- Compare this graph with the other pair
- Who has been using a buffer?

Extra: can you work out the XYZ of the PQR



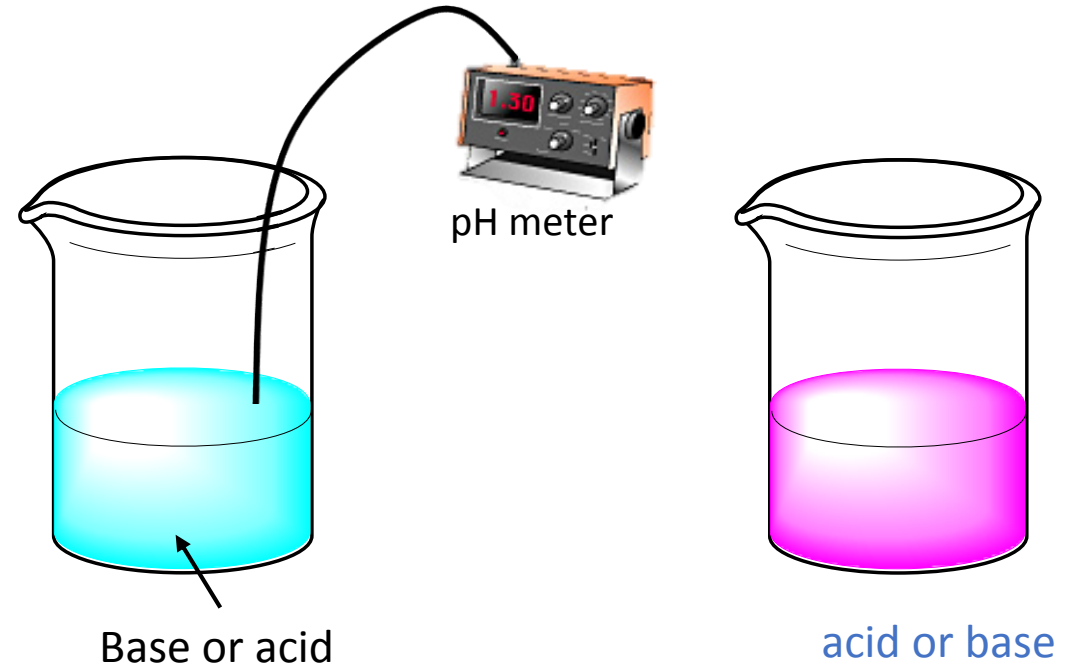
Buffers – experiment - teacher



- Add the **acid or base** dropwise to the buffer solution and record the pH.
- Plot a graph of pH vs. number of drops of acid/base
- Compare this graph with the other pair
- Who has been using a buffer?

Extra: can you work out the XYZ of the PQR

Buffers – experiment - teacher



- Add the **acid or base** dropwise to the **basic or acidic** solution and record the pH.
- Plot a graph of pH vs. number of drops of acid/base
- Compare this graph with the other pair
- Who has been using a buffer?

Extra: can you work out the XYZ of the PQR



Buffers – exam questions

Explanations

Past papers depending on exam board