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| Chemistry Skills |
| Using a pH meter |



# Using a pH meter

## Introduction

This experiment uses buffer solutions to prepare a series of solutions of 10 different pH values. To make it relatively simple, the process involves mixing different proportions of just 2 base buffers.

You can then use these either for simple pH measurements or to more closely investigate the colour changes of indicators, both commercial and natural ones prepared from plants.

## You will need

|  |  |
| --- | --- |
| Combo-plate\*  | Indicators or plant extracts |
| Solution A – Dissolve 3.1g of boric acid + 2.86g of citric acid make up to 250cm3 with distilled water. | Solution B – Dissolve 9.0 g of disodium hydrogen phosphate-12-water and 1 g of sodium hydroxide make up to 250 cm3 with distilled water. |
| pH meter  | Results sheet (on next page) |

(\*this is most easily done using a combo-plate but, while convenient, they are not essential. The buffers could be prepared in test tubes or vials)

## Health & Safety

*Solution B is irritant. Wear eye protection.*

## Preparation

1. Using a Pasteur pipette,
	1. If using a combi-plate, fill the two rows of **larger** wells as follows\*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **E1** | 20 drops of **A** |  | **F1** | 8 drops of **A** + 12 drops of **B** |
| **E2** | 18 drops of **A** + 2 drops of **B** |  | **F2** | 6 drops of **A** + 14 drops of **B** |
| **E3** | 16 drops of **A** + 4 drops of **B** |  | **F3** | 4 drops of **A** + 16 drops of **B** |
| **E4** | 14 drops of **A** + 6 drops of **B** |  | **F4** | 2 drops of **A** + 18 drops of **B** |
| **E5** | 12 drops of **A** + 8 drops of **B** |  | **F5** | 20 drops of **B** |
| **E6** | 10 drops of **A** + 10 drops of **B** |  | **F6** | empty |

* 1. Alternatively, use 12 test-tubes or bijoux
1. Add water to each of the wells so the level is about 3mm from the top – this will take about 1.5 – 2.0 cm3

*If you are using test tubes or bijoux, you will need to make sure that they are deep enough to cover the pH electrode to the required depth.*

*\* If the volumes here are not sufficient, you can simply double the number of drops in the table above. Or make up larger volumes using the same ratios.*

## Measuring pH

1. Rinse a pH meter in clean water. Remove as much water as possible then dip it into the liquid in well E1 (or whichever is your first tube). Note the reading (to 1 decimal place).
2. Take it out and rinse again.
3. Dip the pH meter into water and take a reading of well E2 (or the next one). Continue in this way up to F5.

**Extension**

1. If you wish, you can then use your series of buffer solutions to investigate indicators.

# Example results using commercial indicators

Sample pH values for the buffer solutions are:

1.9 2.1 3.2 4.2 5.9 6.8 9.1 10.1 11.6 12.1 12.4

The photo below (courtesy of Bob Worley at CLEAPSS) shows the buffers and their use testing indicators in a combi-plate.

