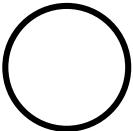
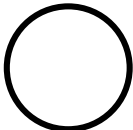
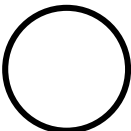
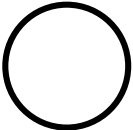
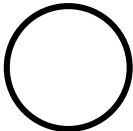
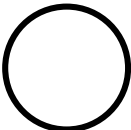
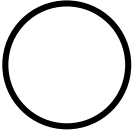
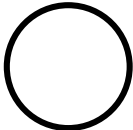
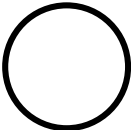
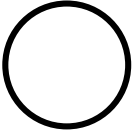
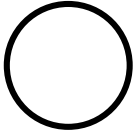
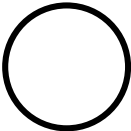


Testing Acid–Base Indicator Colours

Insert the sheet into a plastic folder and put the drops on the plastic. Place 1 drop of the indicator in each of the circles along the row. Now add 1 drop of the reagent shown at the head of the column.

	0.02M hydrochloric acid	Tap Water of pH Buffer 7	0.02M sodium hydroxide
Methyl orange			
Bromothymol blue			
Phenolphthalein)			
Litmus solution			

Indicator reactions are reversible

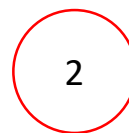
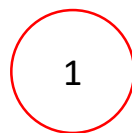
Insert the sheet into a plastic folder and put the drops on the plastic.

Stir solutions with a wooden splint.

The indicator solutions (1 drop) is added to circle 1 or a well-plate,
You can use. methyl orange, bromothymol blue, phenolphthalein, red cabbage or other natural indicators.

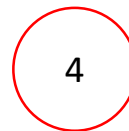
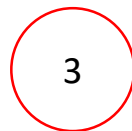
Place 1 drop of indicator in circles 1 2 3 and 4.

Add 2 drops of 0.01M hydrochloric acid

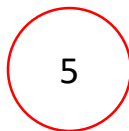


Take one drop from 1, add it to circle 2 and add 2 drops of 0.01M sodium hydroxide

Take one drop from 2, add it to circle 3 and add 2 drops of 0.01M hydrochloric acid.



Take one drop from 3, add it to circle 4 and add 2 drops of 0.01M sodium hydroxide



In circle 5, can you make an intermediate colour? It is quite tricky. You need to go back and forth, but do you have the patience?

Extension: Use pH paper or a pH meter to find the pH of this solution.

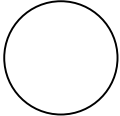
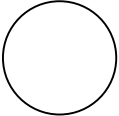
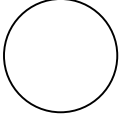
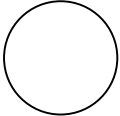
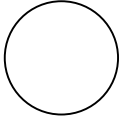
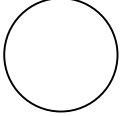
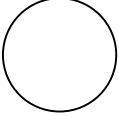
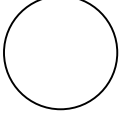
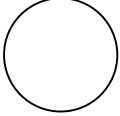
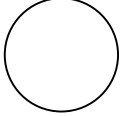
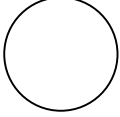
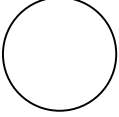
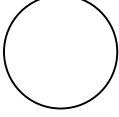
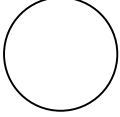
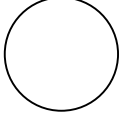
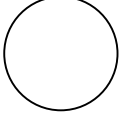
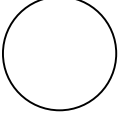
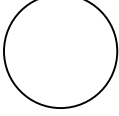
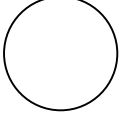
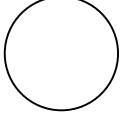
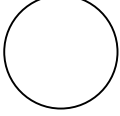
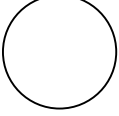
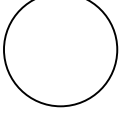
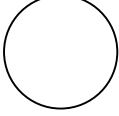
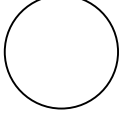
Making a Universal Indicator

Insert the sheet into a plastic folder and put the drops on the plastic.

Put **2-3 drops** strong acid into circle **A1** to create one large drop. Repeat for each circle **A2 – A5, B1 to B5, etc.** with the relevant solutions.

Put **1 drop** of **bromothymol blue** into each circle **A1 to E1**; **1 drop** of **methyl orange** in **A2 – E2** and **1 drop** of phenolphthalein in **A3 – E3**.

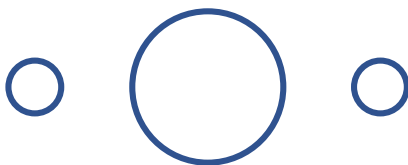
Make a mixture of indicators (do this in the glass vial or well plate) using the recipe in green-shaded italics below.. Put **1 drop** of your mixed indicator into each solution in circles **A4 – E4**. use a commercial UI for **A5 to E5**.

	pH = 1 Strong acid	pH = 4 Weak acid	pH = 7 Neutral	pH = 9 Weak Alkali	pH = 13 Strong Alkali
Bromothymol blue (BB)	A1 	B1 	C1 	D1 	E1 
Methyl orange (MO)	A2 	B2 	C2 	D2 	E2 
Phenolphthalein (PP)	A3 	B3 	C3 	D3 	E3 
<i>Mixed indicator: BB = 10 drops MO = 5 drops PP = 5 drops</i>	A4 	B4 	C4 	D4 	E4 
Commercial Universal Indicator	A5 	B5 	C5 	D5 	E5 

Neutralization; the reaction between sodium carbonate and citric acid

Insert the sheet into a plastic folder and put the drops on the plastic.

1 Add crystals of citric acid to this little circle on the right. Make sure they do not spill into the big circle.



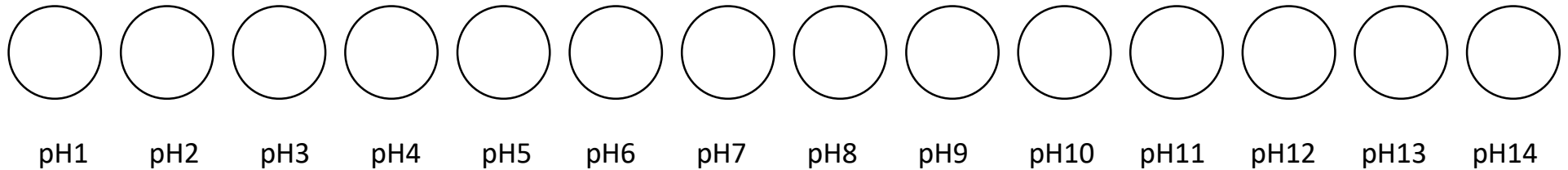
2 Add crystals of anhydrous sodium carbonate to this little circle on the left. Make sure they do not spill into the big circle.

3 Add 2 drops of Universal Indicator and enough drops of water to just fill the circle.

4 Now use the flat end of a wooden splint to push the crystals into the edge of the large puddles

5 Watch carefully the colour changes and other effects over the next 4 minutes to 6 minutes.

A pH profile of a Natural Indicator



Insert the paper into the plastic folder

Place the correct buffer solution onto the relevant circle

Add one drop of the indicator to each circle

Cut a wooden splint to a point and stir each circle before photographing the results