

# CHEM 9.3.1 INDICATORS

Indicators were identified with the observation that the colour of some flowers depends on soil composition

## 1.1 Classify **common substances** as **acidic, basic or neutral**

- **Acid:** substance which, in solution, **produces H<sup>+</sup> ions**
- **Base:** substance which either contains **oxide O<sup>2-</sup> or OH<sup>-</sup>** or produces **OH ion** in solution
  - Soluble bases are called **alkalis**
- Common **acids:** **Vinegar** (acetic acid), **lemon juice** (citric acid), **fizzy drinks** (carbonic acid)
  - Sour taste, stings and burns skin
  - Conducts electricity
  - Blue litmus turns **RED**
- Common **bases:** **Drain cleaners** (sodium hydroxide), **household cleaners** (ammonia), **baking powder**
  - Bitter taste, soapy feel
  - Good conductors of electricity
  - Red litmus turns **BLUE**
- Common **neutral:** pure water, table salt, milk, sugars

1.2 Identify that indicators such as **litmus, phenolphthalein, methyl orange and bromothymol blue** can be used to determine the **acidic or basic nature** of a material **over a range**, and that the range is identified by **change in indicator colour**

- **Indicator:** substance (usually **vege dye**) that, in solution, **changes colour** depending on acidic/alkaline of solution

<b>Indicator</b>	<b>Initial</b>	<b>Middle</b>	<b>Final</b>
<b>Methyl Orange</b>	Red ( <b>3.1</b> )	Orange	Yellow ( <b>4.4</b> )
<b>Litmus</b>	Red ( <b>4.5</b> )	Purple	Blue ( <b>8.5</b> )
<b>Phenolphthalein</b>	Colourless ( <b>8.2</b> )	Pink	Dark Pink ( <b>10.0</b> )
<b>Bromothymol Blue</b>	Yellow ( <b>6.0</b> )	Green	Blue ( <b>7.6</b> )

1.3 Identify and describe some **everyday uses of indicators** including the **testing of soil** acidity/basicity

- **Acidity of soils** – **Camellias** (4.5-5.5), **Apples** (5.8-6.8), **Carrots** (5.5-6.8), **Annual flowers + veges** (basic)
- **Home swimming pools** – needs to be approx. neutral
  - Chemicals change this balance
- **Waste from laboratories** – often basic, e.g. processing of photographic film

### 1.P1 Perform a first-hand investigation to **prepare and test a natural indicator**

- Indicator used: **red cabbage**, finely shredded and boiled with 500 mL water, and decanted (purple)
- **2 mL** of **HCl**, **CH<sub>3</sub>COOH**, **NH<sub>4</sub>** and **NaOH** placed into 4 separate test tubes and **2 drops** of indicator added
  - **HCl**: red, **CH<sub>3</sub>COOH**: light pink, **NH<sub>4</sub>**: green, **NaOH**: dark green

<b>Justification</b>	<b>Limitations</b>	<b>Safety</b>
Fresh cabbage used, as <b>preservatives</b> are acidic	<b>Exact pH</b> of colours not determined	Dilute ammonia solution mildly toxic – fumes
HCl and NaOH used to <b>show range of colours</b>	Cabbage amount not controlled	Knife

### 1.P2 Identify data and choose resources to gather information about the **colour changes** of a **range of indicators**

- pH is portrayed as a **change in colour** – see table on Page 1

### 1.P3 Solve problems by applying information about the **colour changes of indicators** to classify some **household substances** as acidic, neutral or basic

- Colour changes, shown in table on Page 1, allow classification of substances, for example:
  - Vinegar turned red when methyl orange was added. Thus, it is an acid.