

Investigating indicators

Why do this?

Some chemical substances can tell you if a solution has acidic, neutral or alkaline properties by displaying colour changes. This practical is a simple, safe method to observe how everyday indicators behave and could provide opportunities for independent working, investigation skills or encouraging effective teamwork.



Curriculum links: *plants, properties and uses of materials, changing materials, food and everyday materials*

Suitability

Y4, Y5, Y6.

Practical details

Safety points

This activity has been prepared using relevant CLEAPSS guides (search 'supervision' and 'knives' on the CLEAPSS website for more information). Ensure children do **not** taste or put any of the food substances or liquids used in this practical experiment near their mouths. For further information, contact CLEAPSS.



Equipment per table for preparing an indicator

- 1 chopping board
- 1 vegetable knife
- 1 tea strainer
- 2 beakers/plastic cups
- 1 plastic spoon
- 1 permanent marker pen
- Disposable shot glasses (or similar sized container)
- Plenty of paper towels
- Hand-hot water

Suggested indicators (you can explore other materials):

- Raw red cabbage
- Red rose petals/red geranium petals
- Raw or cooked beetroot
- Fresh or frozen blackberries

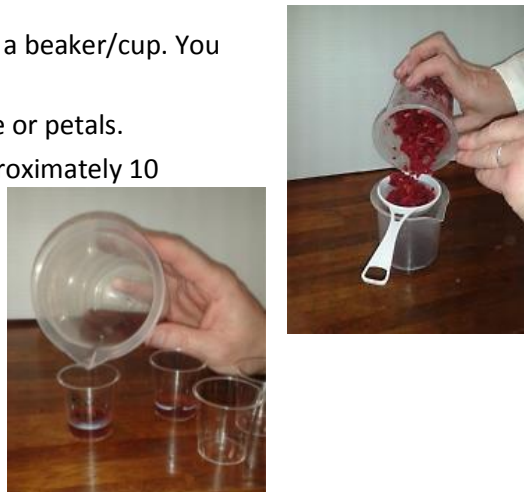
Equipment per group for observing indicators

- 1 laminated sampling grid
- 1 sample of lemon juice (acid)
- 1 sample of bicarbonate of soda solution (alkali)
(Pre-prepare this solution by mixing $\frac{1}{2}$ tsp bicarbonate & 4 tblsp of water)
- 1 sample of red cabbage indicator
- 1 permanent marker pen
- 2 plastic pipettes
- 1 disposable stirrer
- Plenty of paper towels

Like the indicators, the samples can be used in dropper bottles, plastic cups, small beakers or shot glasses

Procedure for making the indicators

1. Chop then mash your raw indicator material and put it into a beaker/cup. You will need to fill it to about $\frac{3}{4}$ full.
2. Add hand-hot water (approx. 15 cm^3) to the fruit, vegetable or petals.
3. Mash and squidge each indicator and leave to soak for approximately 10 minutes.
4. Pour the mixture through a tea strainer and collect the indicator liquid in a new beaker.
5. Write on each shot glass the name of the indicator.
6. Pour the liquid into the shot glasses or dropper bottles.
7. Give each group a sample of the indicator made.



Procedure for observing the indicator

1. On the sampling grid, drip 4 drops of lemon juice into a circle. Add 2–3 drops of red cabbage indicator. Watch for a few minutes and describe any observations. Is lemon juice an acid or an alkali?
2. Into the next circle drip 4 drops of bicarbonate of soda solution. Add 2–3 drops of red cabbage indicator. Watch for a few minutes and describe any observations. Is bicarbonate of soda an acid or an alkali?
3. Mix the liquids in the two circles together. Watch for a few minutes and describe any observations. (When the two are mixed together the resulting solution will turn a purple colour indicating that it is neutral. It will also fizz because a chemical reaction is taking place producing carbon dioxide gas.)



Which is the best indicator?

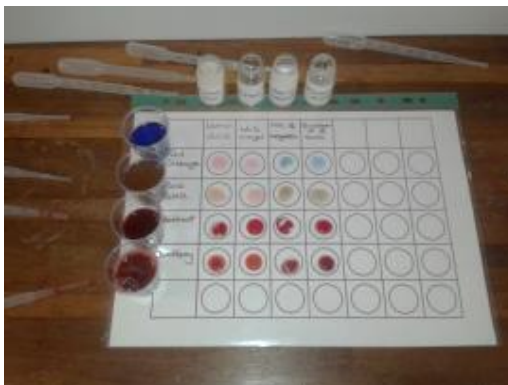
Suggested equipment (one set per group)

- 1 laminated sampling grid
- 1 sample of red cabbage indicator
- 1 sample of red rose petal indicator
- 1 sample of blackberry indicator
- 1 sample of beetroot indicator
- Plenty of paper towels
- 8 plastic pipettes – one for each indicator and sample liquid
- 1 permanent marker pen
- 1 sample of lemon juice (acid)
- 1 sample of white vinegar (acid)
- 1 sample of milk of magnesia (alkali)
- 1 sample of bicarbonate of soda solution (alkali)

This document supports teachers planning practical activities. It is not designed as a worksheet for classroom use

Procedure

1. Place the sample liquids along the top of the sampling sheet, write the name of each liquid in the boxes on the sheet.
2. Place the sample indicators down the side of the sampling sheet and write each name in the boxes on the sheet.
3. Drip 4 drops of each sample liquid in each circles down its column.
4. Add 2–3 drops of the indicator to each sample in its row.
5. Watch for a few minutes and describe any observations.



Expected observations and results

A good indicator gives a clear distinct colour change in different conditions. If the object of the investigation is to find the best indicator to distinguish between acids and alkalis, then the children should look for the indicator that gives the most distinct colour change between the acidic and alkaline liquids. For example, red cabbage turns deep pink in the lemon juice or vinegar and distinctly blue in the bicarbonate of soda.

Not all the samples will turn equally blue or pink because some liquids are more acidic/alkaline than others (the deeper the colour the stronger the acid/alkali).

Possible further activities

Once the children have explored indicators and chosen one to use (red cabbage tends to work the best), there are a variety of research-based enquiries they could undertake, including:

- Which toothpaste is the most acidic and which is the most alkali?
- From a range of different toothpastes which one is best and why?
- Which hand cream is the most acidic and which is the most alkaline?
- From a range of different hand creams which one is best and why?
- Which soft drink is worst for your teeth?
- Which drinks might you avoid if you had an acid stomach?
- Which fruits or vegetables will fizz (react) if they are mixed with bicarbonate of soda?

Background notes

Children will cross-contaminate the sample if they use the same pipettes for more than one liquid.

Indicators are best made and used on the same day or kept refrigerated and used the following day.

For the observing indicators procedure, it's best to use only red cabbage.

Some reactions do not happen for several minutes. It is worth waiting, leaving and returning to any of the samples to see if any further changes have occurred.

Think carefully about which products are suitable for children to investigate. Cleaning products such as bleach and oven cleaner are not suitable for this activity as they are often strong alkalis

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