

Chemistry: Chapter 16 Indicators and pH

Combined Science (Chemistry Part): Chapter 16 Indicators and pH

Sections 16.1–16.2

!!ELA041616001O!!

In a science experiment, Peter put two plant extracts into acids and alkalis of different pH values. The results are shown below:

pH value	Colour of extract from red cabbage	Colour of extract from blueberries
1	Deep red	Pink
2	Reddish purple	Pink
3	Reddish purple	Pink
4	Pale violet	Colourless
5	Pale violet	Colourless
6	Pale violet	Colourless
7	Blue	Colourless
8	Blue	Colourless
9	Blue	Colourless
10	Green	Brownish green
11	Yellowish green	Brownish green
12	Yellow	Brownish green
13	Yellow	Brownish green
14	Yellow	Brownish green

(a) Why can both extracts of red cabbage and blueberries be used as acid-base indicators?

(b) Which extract is a better acid-base indicator? Explain your answer.

(c) Why is a commercial universal indicator made by mixing a number of acid-base indicators?

[4M]

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- (a) Both extracts show different colours in acidic and alkaline conditions. [1]  
 (b) Red cabbage. It has more different colours in the pH range from 1 to 14. [2]  
 (c) To make sure that the universal indicator shows different colours at different pH values. [1]

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### Section 16.3

!!ELA041616002O!!

Four unlabelled bottles are known to contain solutions of different pH values. In order to identify them, Mary added a few drops of common acid-base indicators to the test tubes containing samples from the four bottles. The results were tabulated as follows:

Unknown solution	Litmus	Methyl orange	Phenolphthalein
<i>W</i>	Red	Red	Colourless
<i>X</i>	Red	Red	Colourless
<i>Y</i>	Purple	Yellow	Colourless
<i>Z</i>	Blue	Yellow	Pink

- (a) If the four solutions are sodium chloride, sodium hydroxide, 0.01 M hydrochloric acid and 0.1 M hydrochloric acid. Identify *Y* and *Z*.

- (b) Suggest a method to distinguish between *W* and *X*.

[4M]

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- (a) *Y* – sodium chloride; *Z* – sodium hydroxide [2]  
 (b) By using a pH meter, the solution that has a lower pH value is 0.1 M hydrochloric acid. [2]

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!!ELA041616003O!!

Ms Chan asked her students to test acid-base nature of different household products. The students had to report on their testing procedure and their results. In her students' reports, she found a number of common mistakes about their methods of measurement. Some of them are listed below. Comment on her students' mistakes.

- (a) When Ann was measuring the acidity of solid citric acid, the pH paper did not

show any colour change.

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(b) Peter immersed a piece of pH paper into a bottle of apple juice for measurement.

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(c) Drink *X* did not change the colour of red litmus paper. Paul concluded that *X* is acidic in nature.

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[3M]

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- (a) Solid acid shows its acidic properties in aqueous solution only. [1]
- (b) A pH paper has been soaked with universal indicator that may contaminate the tested solution. [1]
- (c) Neutral solution would not change the colour of red litmus paper too. [1]

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