Fizzy drinks

Download the teacher notes,
student worksheet and technician notes
that accompany this resource from
rsc.li/3o5OV1P.

ROYAL SOCIETY OF CHEMISTRY

Learning objectives

By the end of this session, you will be able to:

- Compare the sugar content and pH of a range of soft drinks.
- Discuss the health implications of sugar and acidity.

Activity 1

Cola and milk

See student workbook

Activity 1

Cola and milk

Watch the video and record your observations in the table in your workbook.

Use your observations to answer questions (a) and (b).

Answers

(a) A white precipitate settles out, leaving a clear solution behind.

(b) This is due to a reaction between phosphoric acid and calcium in the protein in the milk:

$$3Ca + 2H_3PO_4 \longrightarrow Ca_3(PO_4)_2 + 3H_2$$

The milk ‘curdles’ as the protein changes shape – the protein changes from being soluble to insoluble in water.

What is pH?

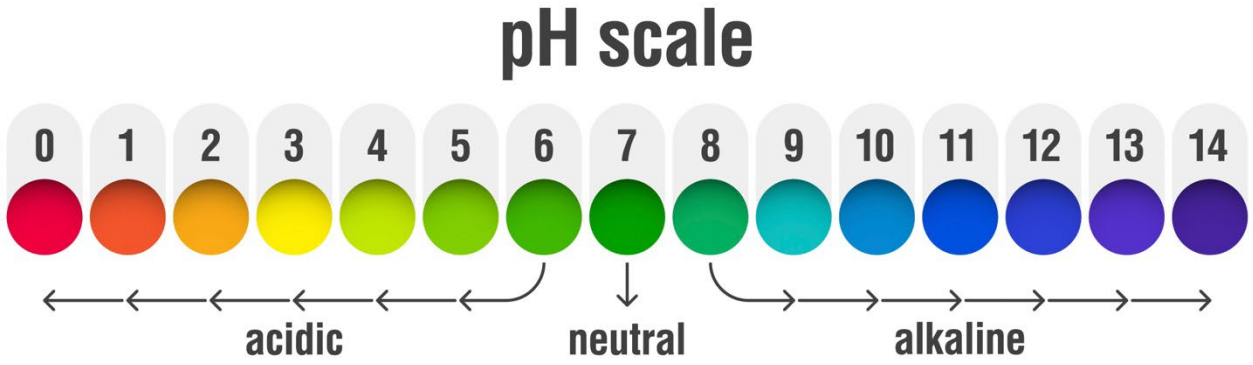
The pH scale is used to measure the acidic or alkaline nature of a solution.

The pH scale values range from pH 0 (strongly acidic), to pH 7 (neutral) through to pH 14 (strongly alkaline).

Pure water has a pH of 7.

Vinegar (ethanoic acid) has a pH between 2 and 3.

Soaps have a pH between 9 and 10.



Activity 2

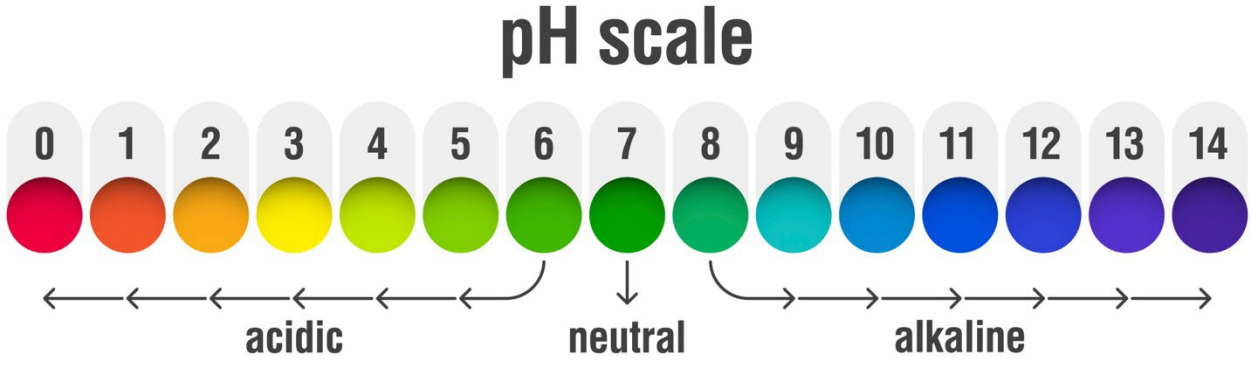
pH of soft drinks

See student workbook

Activity 2

pH of soft drinks

1. Transfer 5 ml of the soft drink being tested from the labelled beaker to a 50 ml beaker using a 5 ml syringe.
2. Add two drops of universal indicator (keep this consistent for all the drinks).
3. Repeat for all the fizzy drinks.
4. Interpret any colour change for each of the drinks and complete the results table in your workbook.
5. Answer the question in your workbook.



pH of soft drinks answers

(a) The drinks with pH values lower than 3 were the most acidic.

(b) The more acidic the drinks are, the more likely they are to do damage to the enamel of the teeth.

Career link

Senior science manager

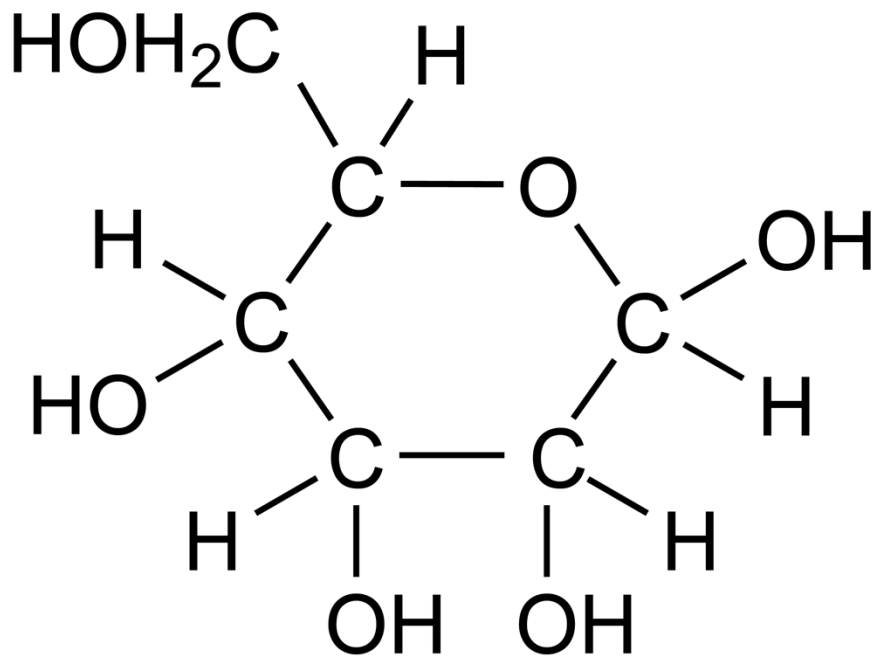
Meet Paul, a senior science manager, who manages the scientific services across the largest Sugar Beet factory in the world.

What is sugar?

Sugar is a short-chain carbohydrate.

It provides a source of energy for the body.

Glucose is a common sugar found in lots of fizzy drinks and sweets.



Demonstration: sugar in soft drinks: answers

(a) The ‘zero’ drink produces almost no residue after the water is evaporated. The ‘normal’ version produces a significant amount of residue, showing that it contains a much higher amount of sugar.

(b) The ‘zero’ drink contains less sugar so is less harmful to your health. Drinking too much sugar can cause health issues such as dental disease, obesity and diabetes.

Activity 3

Sugar or no sugar?

See student workbook

Activity 3

Sugar or no sugar?

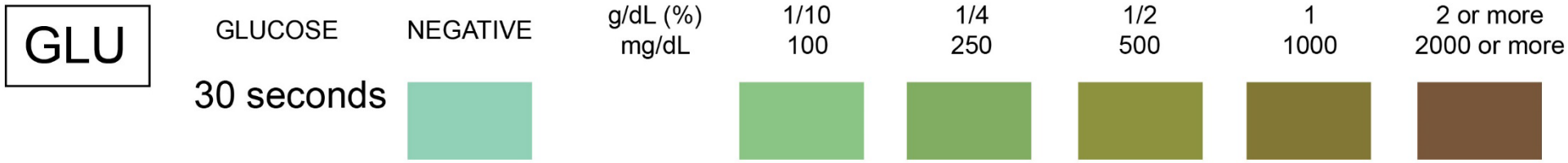
1. Transfer 5 ml of each drink to a 50 ml beaker using the 5 ml syringe. Label the beaker with the name of each drink.

2. Dip a test strip into each drink for 1 second. Remove the strip and then leave for 30 seconds for colour to develop. Observe any colour change.

3. Record observations in the table in your workbook.

4. Use your observations to answer questions (a)–(d) in your workbook.

Sugar scale



Activity 3

Soft drinks

Identify each of the soft drinks you tested from the following list:

- Coca-Cola®
- Coca-Cola® zero sugar or diet Coke®
- Lucozade®
- Lucozade® zero
- Oasis®
- Oasis® zero

Answers

(a) Provide the list of drinks matched with their letter labels – discuss who got the correct answers.

(b) Provide the name of the drink containing the most sugar.

(c) The test strips only measure glucose, so are not necessarily a good tool for comparing sugar content in drinks. Sucrose and fructose, for example, will not be detected. The strips are used to test blood glucose. As sucrose is broken down to glucose and fructose during digestion, sucrose in the diet will affect blood glucose levels.

Activity 3

Plenary

What are the health implications of drinking too many sugary drinks?

Discuss your ideas in pairs.

Activity 3

Sugary drinks and tooth damage

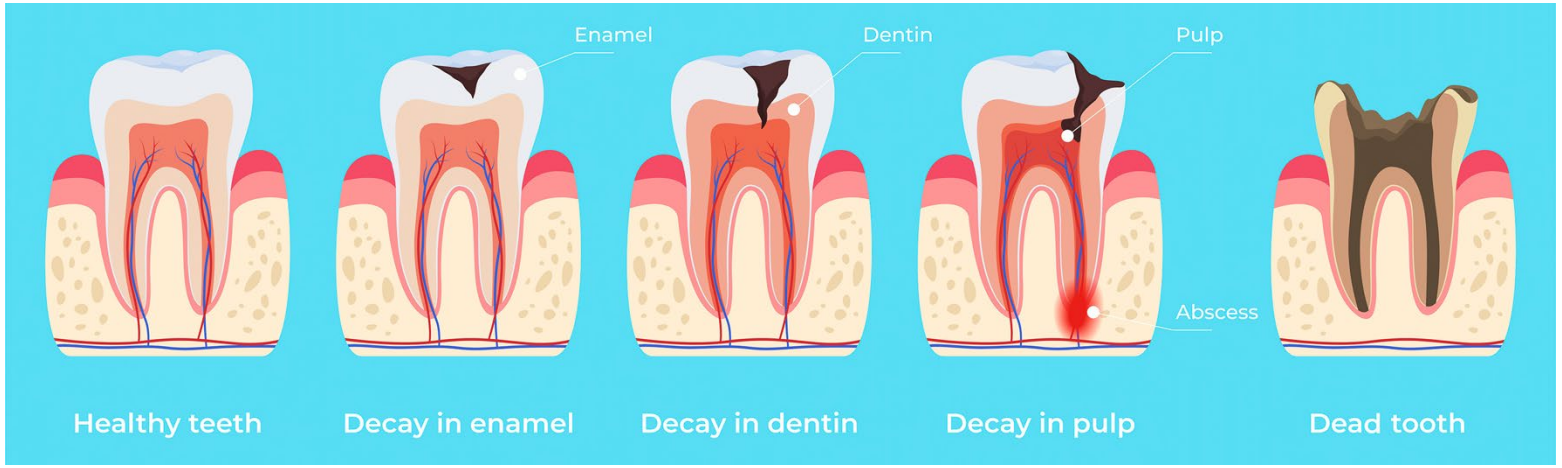
Drinking too many sugary drinks without brushing your teeth with a suitable toothpaste increases the risk of tooth decay.

The more acidic the sugary drinks are, the greater the amount of damage that can be done.

Dentin dissolves below pH 6.50.

Enamel dissolves below pH 5.50.

Stages of tooth decay



Activity 3

Which of these will dissolve your teeth?

Drink	pH
Fanta® orange	2.73
Pepsi®	2.53
Coca-Cola®	2.52
Red Bull®	3.37
Diet 7UP®	3.70
Coca-Cola® zero sugar	3.18
Diet Lipton® citrus green tea	3.22
Evian® bottled water	8.10

Answers: which of these will dissolve your teeth?

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Acknowledgements

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To find out more about the project, and get more resources to help widen participation, visit our Outreach resources hub: rsc.li/3CJX7M3.