

## 5.1

### SCIENCE UNDERSTANDING

# What's in a fizzy drink?

## Looking at solutions

The 'fizz' in fizzy drinks is the carbon dioxide gas that is dissolved in the flavoured liquid. Carbon dioxide is pumped into bottles or cans at high **pressure**. The bottles and cans are then sealed to keep the carbon dioxide **dissolved** in the water. When you open the container, the pressure is reduced and the carbon dioxide bubbles out.

Like most substances, fizzy drinks are mixtures of other substances. If you look at the label on a bottle or can of soft drink, you will see that, as well as carbon dioxide, it also contains sugar, food colouring, flavouring and preservative. Preservatives stop the substances in soft drinks from going off. Flavourings are added to make the drink taste more pleasant and food colouring is added to make the drink look more attractive.

All of these substances are dissolved in water. A mixture of one substance dissolved in another is called a **solution**. The substance that dissolves is called the **solute**. The substance that the solute dissolves in is called the **solvent**. Solutions in which water is the solvent are called **aqueous solutions**. Water is a good solvent because many chemicals can dissolve in it. Fizzy soft drinks are aqueous solutions.

Substances that dissolve in a liquid are said to be **soluble**. Those that do not dissolve are said to be **insoluble**.

Adding  
a soluble  
substance  
to a liquid



When carbon dioxide is dissolved you can't see that it's there. When you open the container, the pressure is reduced. Adding a sugar-coated mint lilly makes all the carbon dioxide bubble out at once.



## INQUIRY: INVESTIGATION 5.2

### Soluble in water?

#### KEY INQUIRY SKILL:

- processing and analysing data and information

#### Equipment:

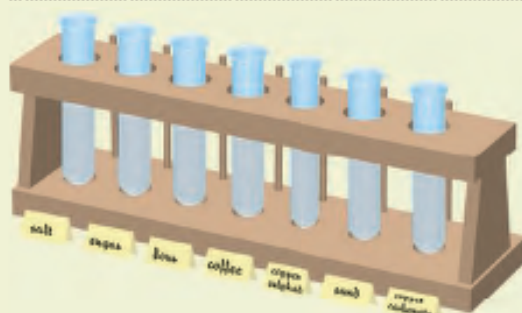
safety glasses and laboratory coat

heatproof mat

7 test tubes in a test-tube rack

spatula

samples of salt, sugar, flour, coffee, sand, copper sulfate and copper carbonate



- Half-fill each of the test tubes with cold water.
- Label the test tubes salt, sugar, flour and so on.
- Use a spatula to add a very small amount of each substance to its labelled test tube. Do not use more than a quarter of a spatula full.
- Draw up a table of your results like this incomplete one:

Substance mixed with water	Clear or cloudy?	Soluble or insoluble?
Salt		
Sugar		
Flour		

- Hold each test tube up to the light. Decide whether the mixture is clear or cloudy. Record your results in the table.
- Decide whether each mixture is soluble or insoluble. Record this in the table.

#### DISCUSS AND EXPLAIN

- Which of the substances dissolved in water?
- How can you tell if a substance has dissolved?
- How can you tell that a substance has not dissolved?

## INQUIRY: INVESTIGATION 5.3

### Froth and bubble

#### KEY INQUIRY SKILLS:

- questioning and predicting
- processing and analysing data and information

#### Equipment:

vinegar

stirring rod

bicarbonate of soda

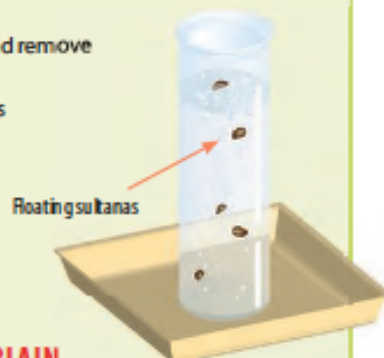
gas jar

spatula

sultanas

plastic tray

- Stand the gas jar on a plastic tray and pour the vinegar into the gas jar until it is 2 cm from the top.
- Add a spatula of bicarbonate of soda and several sultanas.
- Stir the vinegar and remove the stirring rod.
- Watch the sultanas as they rise and fall in the gas jar.



#### DISCUSS AND EXPLAIN

- Explain how the sultanas rise to the surface.
- When the sultanas get to the surface why do they drop back to the bottom?
- Try other things in the gas jar to see whether they can be carried to the surface.

### 'Do-it-yourself' fizz

You can make carbon dioxide gas using two chemicals found in your kitchen — vinegar and bicarbonate of soda.

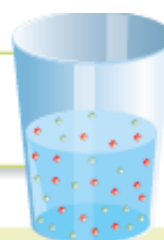
When these two chemicals are mixed in the experiment described above, a **chemical reaction** takes place. The vinegar and bicarbonate of soda change into new substances. One of these new substances is the gas carbon dioxide, a pure substance and the same gas that is in fizzy drinks. The rough surface of the sultanas allows the carbon dioxide bubbles to collect on the surface. The carbon dioxide bubbles rise, carrying the sultanas with them. When the bubbles reach the surface, they burst and the sultanas sink to the bottom.

## A matter of concentration

When more solute is dissolved in a solvent, the solution is said to be more **concentrated**. For example, by adding more and more sugar to a cup of hot water, you are making the solution more and more concentrated. Eventually the solution gets so concentrated that no more sugar will dissolve in it. When no more solute can be dissolved in a solvent, the solution is **saturated**.

You could make a solution of sugar and water less concentrated by adding more water. This process, where more solvent is added, is called **dilution**. When you add water to bottled cordial you are diluting it.

In a solution, the particles of one substance (the solute) are spread evenly throughout the other (the solvent). The particles of the solute are too small to be seen.



The cordial in these glasses is a coloured solution. Can you tell which has the greatest concentration of cordial syrup?

### UNDERSTANDING AND INQUIRING

#### REMEMBER

- 1 Is fizzy soft drink a solution, solvent or solute?
- 2 List the solutes likely to be found in a bottle or can of fizzy soft drink.
- 3 What leaves a fizzy drink to cause it to go flat?
- 4 What substance is added to cordial to make it more dilute?
- 5 Describe how an aqueous solution is different from other solutions.

#### THINK

- 6 Copy and complete this table by filling in the 'Solvent' and 'Solute' columns.

Solution	Solvent	Solute
Soft drink		
Sea water		
Swimming pool water		
Jelly		
Cup of coffee		

- 7 A bottle of soft drink left lying in the sun may burst open. Explain why.
- 8 What is the difference between a concentrated solution and a saturated solution?

- 9 What substance should you add to salt water to make it:
  - (a) more concentrated
  - (b) less concentrated?

#### INVESTIGATE

- 10 It is claimed by manufacturers that some washing powders work just as well in cold water as in hot water. Investigate washing powders to find out whether they dissolve as well in cold water as they do in hot water.
- 11 Conduct a survey of food and drink products. Use the list of ingredients to determine what is in them. What are the most common chemicals added to food and drink products?
- 12 Design your own experiment to test whether a fizzy drink will go flat faster when it's cold or when it's warm. Remember to use a **fair test**. You must keep everything the same except the one thing that you want to test.
- 13 Place an unopened can of soft drink and an unopened can of diet soft drink of the same type in a sink of water.
  - (a) Which can floats?
  - (b) Which can sinks?
  - (c) What does this tell you about the sugar in soft drinks and diet soft drinks?
- 14 Find out how much sugar can be dissolved in 200 mL of water at room temperature and what difference an increase in temperature of 10°C makes.

work  
sheets

- 5.1 Soluble or insoluble?  
5.2 Mail room mayhem

