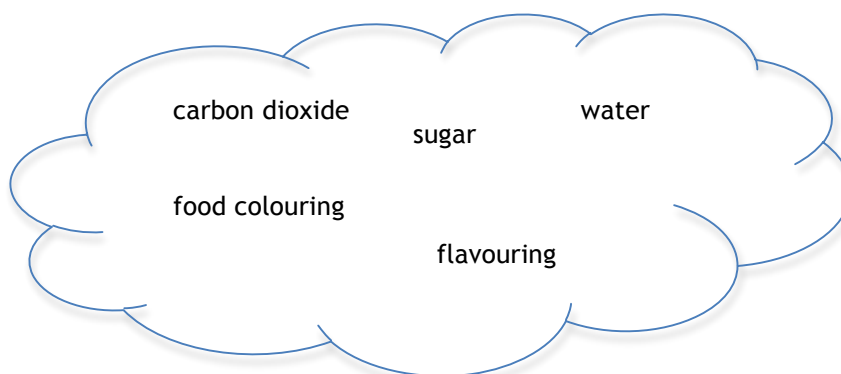


Worksheet answers

1. What's in a soft drink?



2. How do you think you might be able to separate from the drink each of these ingredients, you may need to use more than one method.

INGREDIENT	HOW WILL YOU SEPARATE IT?
sugar	evaporation
carbon dioxide	add salt (nucleation) and collect it in a balloon
water	distillation
food colourings	chromatography

3. Write a list of the equipment that you will use.

Answers will vary, but may include: soft drink, small bottle, filter funnel, filter paper, beakers, test tube stopper with tubing, evaporating basin, clay triangle, balloon, test tubes, Bunsen burner, tongs, tripod, salt, chromatography paper, capillary tubes or pipettes.

4. Write the method you will follow to do your experiment.

1. *Pour some soft drink into evaporating basin, place it on clay triangle on tripod and light Bunsen burner underneath.*
2. *Evaporate all liquid.*
3. *Pour new portion of soft drink into small bottle, put two teaspoons of salt into balloon and carefully stretch over neck of bottle.*
4. *Let salt fall in once balloon is securely on. Watch balloon expand.*
5. *Pour some fresh soft drink into test tube and put on stopper with tubing. Put other end of tubing into a clean dry test tube.*
6. *Light Bunsen burner and heat test tube, containing soft drink, over it, using tongs, until all liquid has dripped into second test tube.*
7. *Use capillary tube or pipette to put a dot of soft drink onto piece of chromatography paper.*
8. *Put chromatography paper into beaker with a small amount of water at bottom, being careful that dot is not underwater. Let water travel up paper.*

Results

5. Write down your observations as you do the experiment.

What I did. (eg evaporated soft drink)	What the drink looked like during the experiment.	Describe the substance that was separated.	Describe the substance that was left behind.
<i>evaporated soft drink</i>	<i>bubbled and got more viscous</i>	<i>colourless gas (steam)</i>	<i>dark brown solid</i>
<i>added salt (nucleation)</i>	<i>bubbled up</i>	<i>colourless gas</i>	<i>liquid with no bubbles</i>
<i>distilled soft drink</i>	<i>bubbled in test tube, turned into a gas then into clear liquid</i>	<i>clear liquid</i>	<i>dark brown solid or thick liquid</i>
<i>chromatography</i>	<i>colours separated out up paper</i>	<i>colours of liquid</i>	<i>pale brown spot</i>
<i>filtration</i>	<i>brown liquid went through filter paper</i>	<i>none observed</i>	<i>none observed</i>

Processing results

6. After looking at your results, what ingredients do you think your soft drink contained? Explain why you think this.

It contained a solid (or mixture of solids), possibly sugar, flavourings and colourings. This solid could be seen at the bottom of the evaporating dish and in the test tube after distillation.

It contained a colourless gas, carbon dioxide, which could be seen as bubbles in the drink before the experiment. This gas could have been tested using a lit taper (which it would have put out).

There was a clear liquid, probably water, seen in the distillation experiment.

It also contained a mixture of food colourings seen in the chromatography experiment.

Evaluating the experiment

7. Do you think you managed to separate out all of the ingredients in your soft drink?

Some of the ingredients were not pure. The solid was a mixture of different substances. This could be seen by its colour and texture.

8. Are there other ingredients in your drink that you didn't separate? If so, what makes you think they are there and how could you separate them?

There is sugar, in soft drink, which can be tasted when drinking it, but this was not obtained in a pure form. Perhaps crystallisation over a long period of time could help to separate this. Flavourings and preservatives are also present but may be difficult to separate.

Further thinking

9. There are three states of matter: solid, liquid and gas. Which ingredients in your soft drink belong to each of these states?

SOLID	LIQUID	GAS
<i>sugar</i>	<i>Water, food colouring</i>	<i>carbon dioxide</i>

10. How did you decide which ingredients were solid, liquid or gas?

Sugar is hard and stayed at the bottom of the dish when heated.

Water changes shape: it could be heated to a gas then cooled back to a liquid.

Carbon dioxide made bubbles and filled the balloon.

11. The way that substances can be separated often depends on their state of matter. Which techniques do you think are useful for separating which states of matter? Explain your answer.

evaporation – solid from liquid, the liquid turns to gas when heated

nucleation – gas from liquid, gas bubbles out of solution when salt is added

distillation – liquid from liquid or solid, liquid turns into gas then back to pure liquid

chromatography – liquid from liquid, some liquids travel up the paper faster than others