

Sugar, sugar!

Student booklet



9

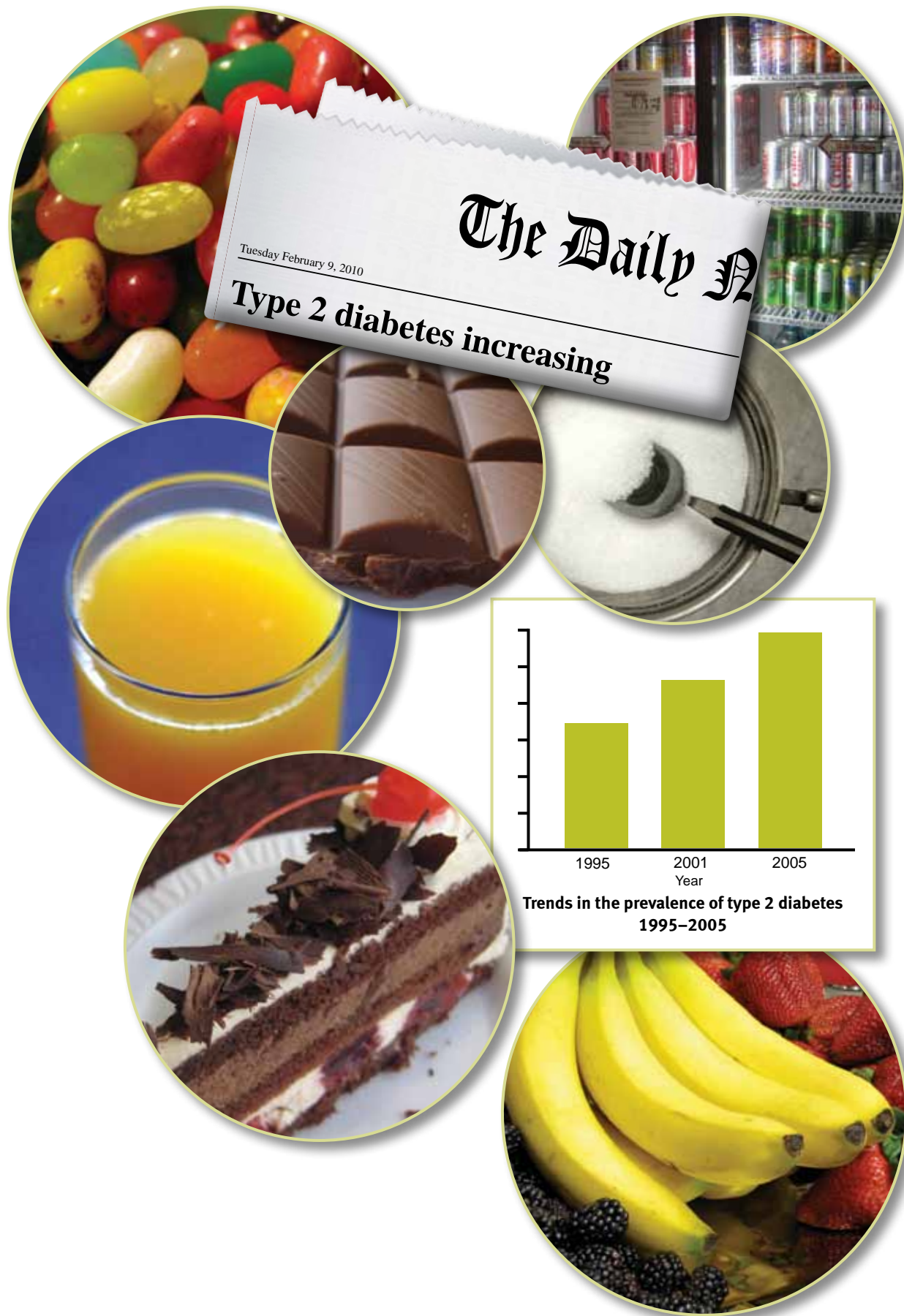
Science

Queensland Comparable
Assessment Tasks (QCATs)
2010

Given name:

Family name:

School:



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Setting the scene: Group discussion



In this assessment, you will:

- measure the sugar content of a soft drink and evaluate the method of measurement
- describe how our body systems work together to provide fuel for the body
- explore the effects of high-sugar drinks on health
- reflect on how sugar may be affecting your health.

Before you start: Assess your sugar consumption

How much sugar do think you consume? (place a mark on the arrow)



Where does most of the sugar you consume come from? (circle one)

fruit fruit juice soft drinks cakes and desserts lollies the sugar bowl

Do you think your sugar consumption is affecting your health? Explain.

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Investigation: How much sugar is in soft drink?



Follow your teacher's directions to carry out the investigation.

Aim: To measure how many teaspoons of sugar there are in a 375 mL can of soft drink.

Sugar concentration

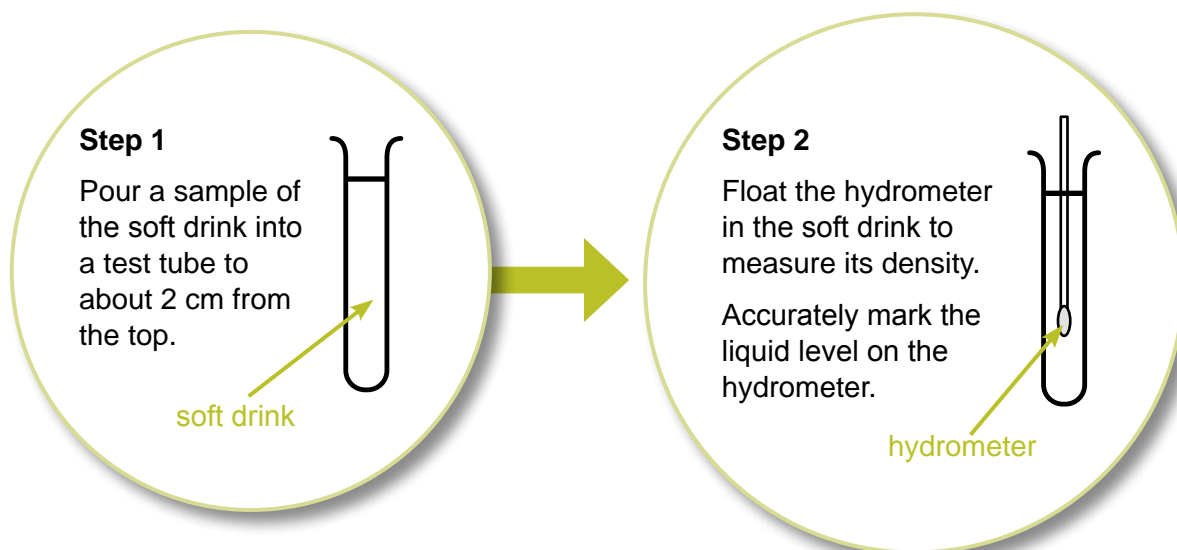
Solutions with higher sugar concentration have higher densities. The sugar concentration of solutions can be compared by comparing densities, using a hydrometer.

Materials

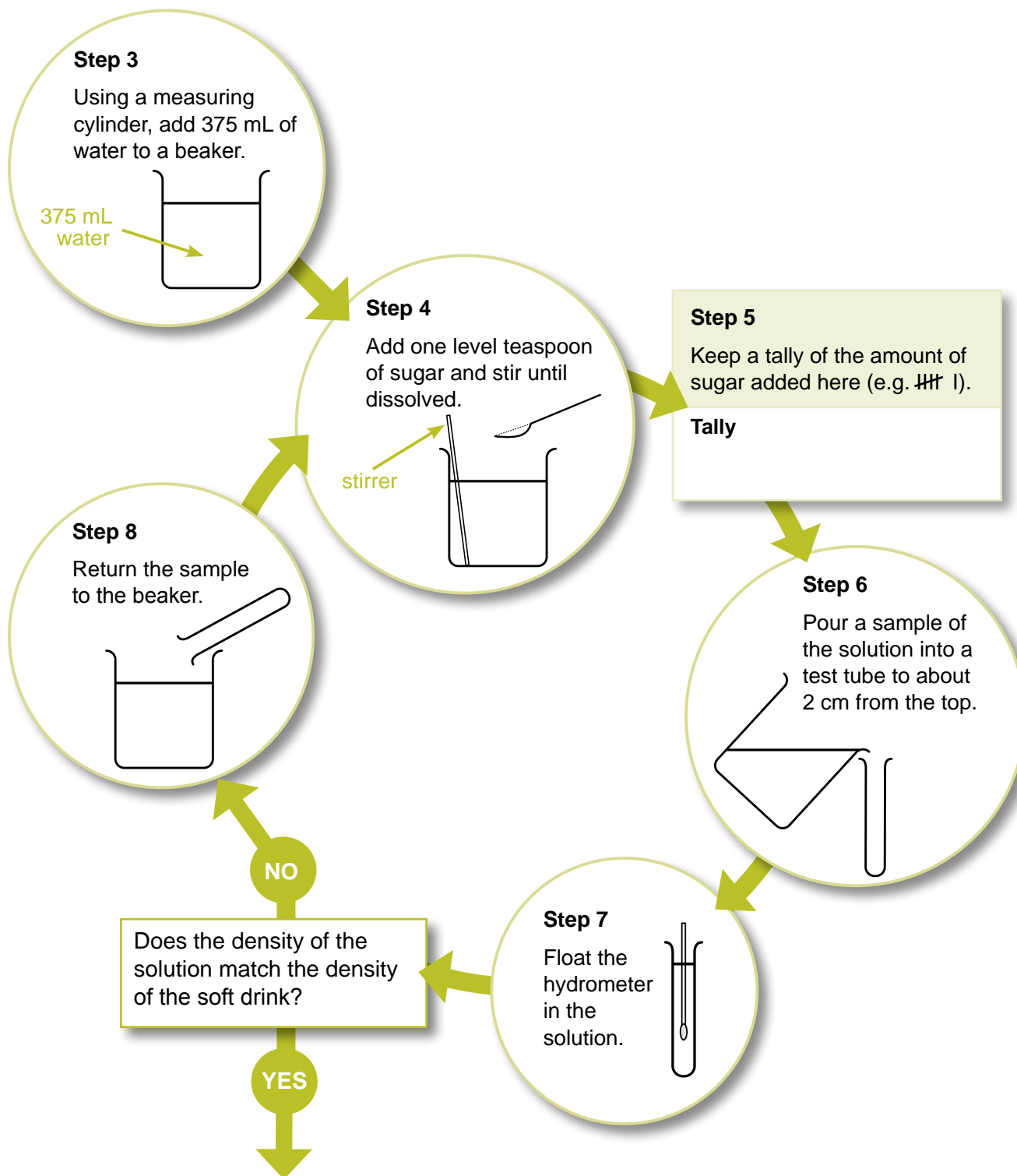
- beaker
- 2 test tubes
- test-tube rack
- measuring cylinder
- can of soft drink, flat and at room temperature
- water at room temperature
- white sugar
- teaspoon
- stirrer
- fine permanent marking pen
- a hydrometer (prepared earlier)

Method

In Steps 1 and 2 you will use your hydrometer to measure the density of the soft drink.



In Steps 3 to 8, you will find out how much sugar to add to water to match the density of the soft drink.



Record below the number of level teaspoons of sugar needed to match the density of the soft drink. Count up your tally from Step 5.

Results	
Amount of sugar added to 375 mL of water to match the density of soft drink level teaspoons



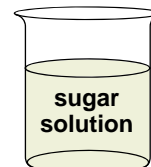
Stop here: Discussion point.

Analysing the investigation



Work on your own to complete the remainder of the assessment.

In the investigation, you measured the amount of sugar in a can of soft drink by comparing the density of a sugar solution to the density of soft drink.



What factors could have affected your measurement?

1. Complete Table 1 to show:

- factors (variables) that could have affected the measurement
- whether each factor was controlled (kept the same)
- how these factors were controlled.

Table 1: Factors that could affect the measurement of the amount of sugar in the soft drink

Factor (variable)	Was it kept the same? (controlled)	Explain how it was controlled (or not controlled)
Temperature	Yes	The soft drink and water were both at room temperature.
Volume		
Presence of bubbles		
Presence of substances other than sugar		
Other:		
Other:		

2. Is the investigation a fair (suitable) method of measuring the amount of sugar in a can of soft drink? Explain by referring to Table 1.

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3. a) Complete Table 2 to compare your measurement to the information on the drink label.

Table 2: Sugar content of soft drink

	Mass of sugar in 375 mL (grams)	Teaspoons of sugar in 375 mL (1 standard level teaspoon of sugar = 4 grams)
From the information on the label		
My measurement (from page 5)		

b) How accurate was your measurement? Explain by referring to Table 2.

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4. State two reasons why your measurement could be different from the information on the label.

a) One reason relating to the method:

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b) One reason relating to how carefully you carried out the investigation:

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Stop here: Wait for your teacher's directions.

Sugar and your body

As with all foods, when you drink a sugary drink, it must be digested before the body can use it.

What do you know about your digestive system?

5. Complete the diagram of the digestive system by naming parts A, C, D and E and describing their functions. B has been completed for you.

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B oesophagus

moves food from

mouth to stomach by

muscular contraction

(peristalsis)

C

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liver

pancreas

E

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rectum

D

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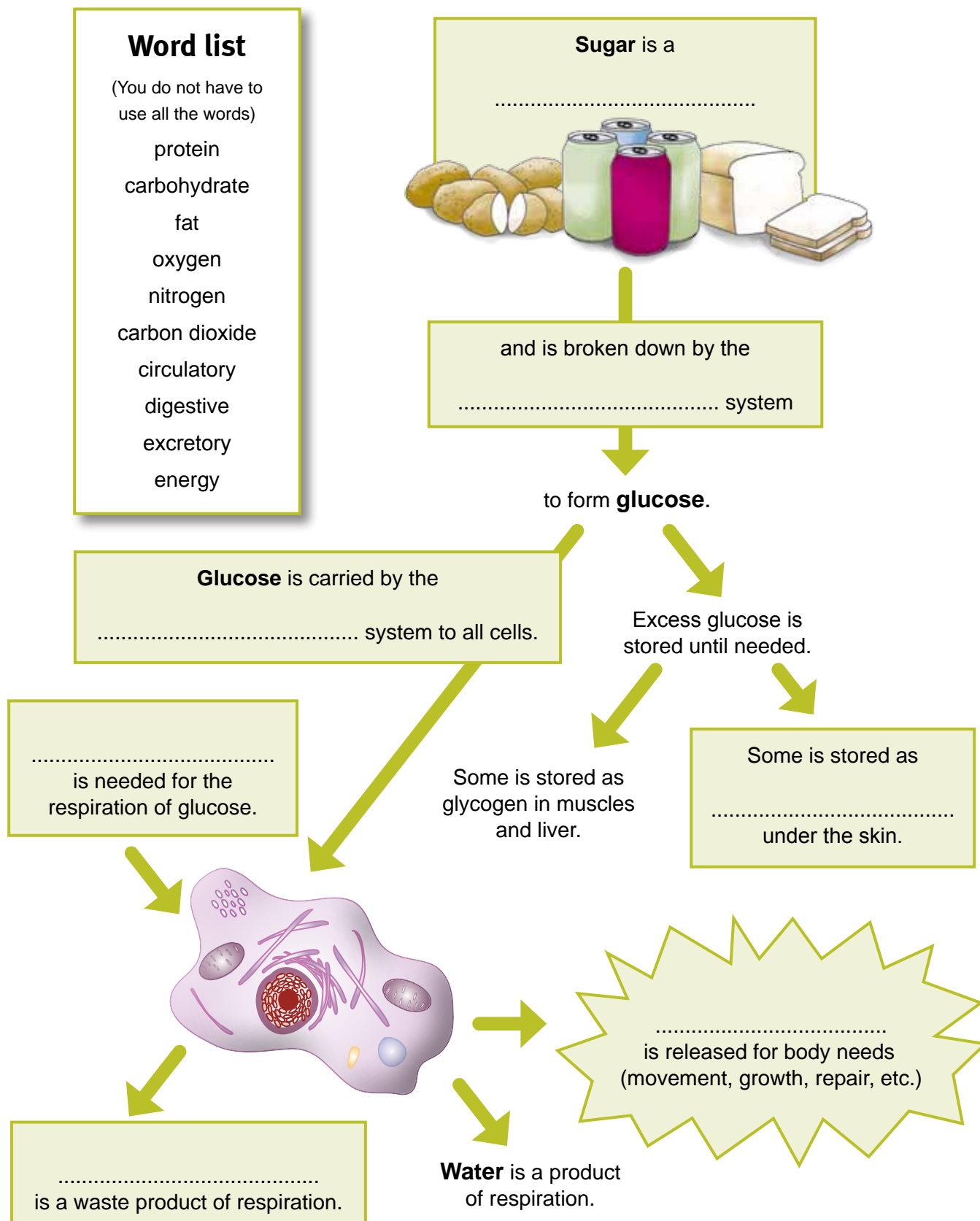
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What happens to sugar in the body?

6. Complete the diagram below, using words from the list, to show what happens to the sugar in a soft drink after you drink it.



How can you use the energy from a sugary drink?

Sugar fact

1 gram of sugar provides 17 kilojoules (kJ) of energy.

7. Calculate how much energy your body could get from a can of soft drink.

Refer to Table 2, page 7.

Mass of sugar in 375 mL soft drink =

Energy in 375 mL of soft drink =

8. How many minutes of exercise will you need to do to use the energy in 375 mL of soft drink?

Choose a type of exercise and intensity from Table 3 on page 11.

Activity:

Intensity:

I will need to do approximately minutes of exercise.

9. What happens to the sugar from the soft drink if you don't use all the available energy?

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Stop here: Wait for your teacher's directions.

Table 3: Energy used during exercise

Activity	Intensity	Energy used* (kJ per minute)
Basketball	shooting hoops	15
	competitive	30
Computer games	general	7
Cycling	recreational	24
	racing	51
Dancing	aerobic	24
Football	recreational	27
	game	33
Martial arts	general	33
Netball	recreational	27
	game	38
Running	jog	31
	sprint	55
Skateboarding	general	18
Surfing	small wave	17
	big wave	26
Swimming	recreational	21
	competitive	43
Tennis	recreational	21
	competitive	32
Volleyball	recreational	12
	competitive/beach	29
Walking	stroll	11
	brisk	19
Watching TV	couch potato	5

Adapted from Energy expenditure database, Fitness2live, accessed 21 Apr 2010, <www.fitness2live.com.au/energy-expenditure>.

*A guide only — actual values vary between people

How does a sugary drink affect your body?

Use the information below to answer Questions 10 and 11.

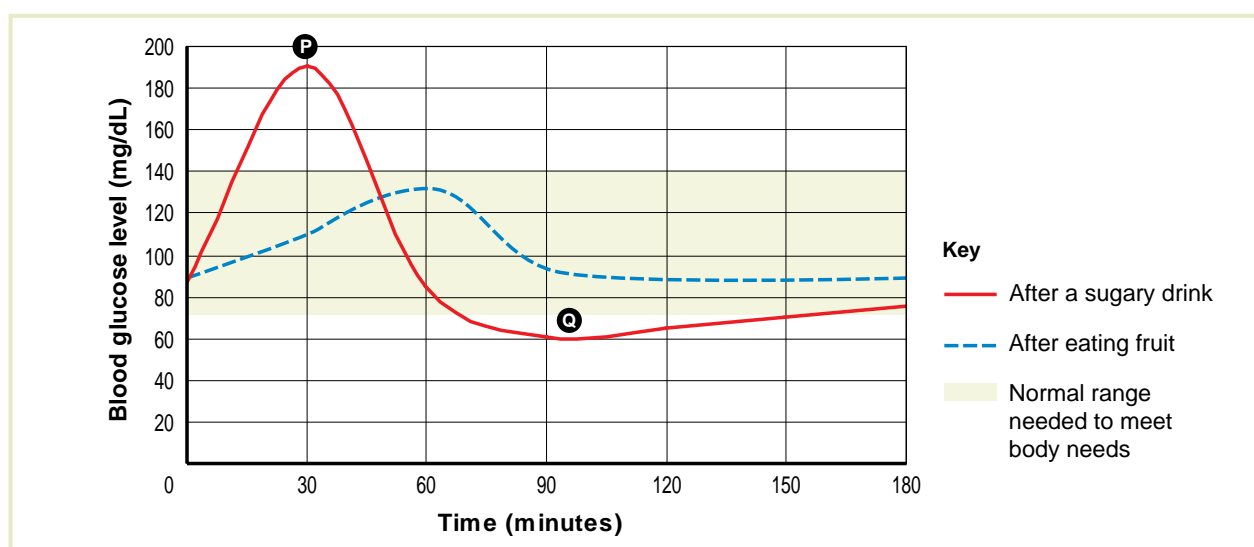
Glycaemic index (GI)

Sugary drinks have a high **glycaemic index**, meaning that they are digested very quickly.

Graph 1 shows how the glucose levels in the blood change after:

- eating fruit (low GI)
- drinking a sugary drink (high GI).

Graph 1: Blood glucose levels



10. Describe how eating fruit and drinking sugary drinks affect blood glucose levels. Refer to Graph 1.

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11. Complete the following statement.

I would feel tired if my blood glucose level was similar to point (**P** or **Q**) in Graph 1

because

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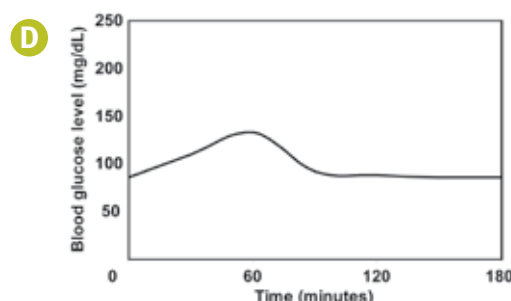
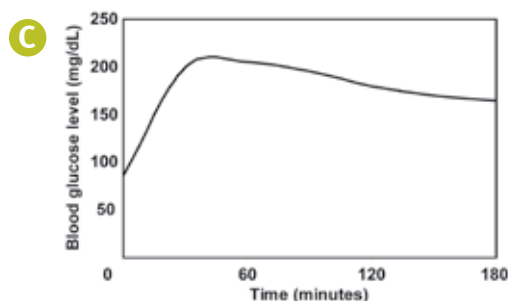
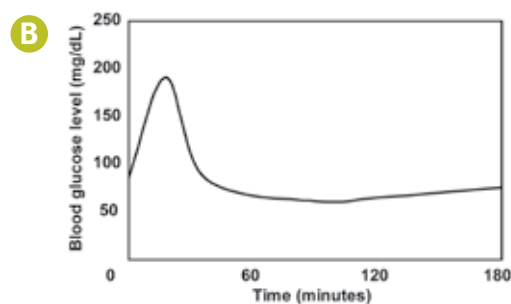
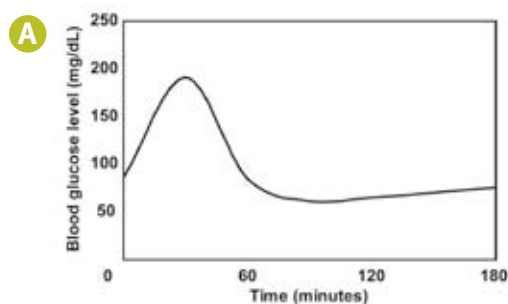
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Use the information below and on pages 9 and 12 to answer Questions 12 to 14.

Insulin facts

- The pancreas releases the hormone **insulin** when blood glucose levels rise after eating or drinking.
- Insulin causes:
 - the cells of the body to absorb glucose from the blood
 - excess glucose to be removed from the blood and stored as glycogen until it is needed.
- Regular **spikes** in blood glucose levels (similar to **P** on Graph 1) can eventually cause **insulin resistance** (type 2 diabetes), a decrease in the body's ability to use insulin.
- Regular exercise and weight control can reduce the effects of insulin resistance.

12. Which graph below best shows the effect of **insulin resistance** on blood glucose levels after a sugary drink? (circle one)



13. Explain your choice by referring to your chosen graph.

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14. Explain why **tiredness** is a symptom of insulin resistance.

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Stop here: Wait for your teacher's directions.

Reflecting on your sugar habit

In this section, you will reconsider how sugar may be affecting your health.

Use Table 4 to help you answer Questions 15 to 17.

Table 4: Sugar content and GI of some common foods

Common food	Typical sugar content* (grams per serve)	GI (Glycaemic index)*
white bread	1.3	High GI (rapidly digested)
jasmine rice	0.2	
potatoes	1.2	
cornflakes	25.1	
doughnut	10.6	
soft drink	
orange juice	20.0	Medium GI
chocolate bar	40.2	
orange	10.7	Low GI (slowly digested)
wholegrain bread	2.0	
pasta, noodles	0.0	
long grain rice	0.2	
fresh vegetables	3.1	
kidney beans	0.5	
rolled oats	2.2	
lean meat, fish	0.0	
chocolate cake	30.8	
vanilla ice cream	15.9	

Adapted from: Australian Food database, Calorie King Australia, accessed 21 Apr 2010, <www.calorieking.com.au> and Glycemic index database, Glycemic index, accessed 21 Apr 2010, <www.glycemicindex.com>.

*A guide only — actual values vary between brands

15. Do you still agree with your assessment of your sugar consumption and its effects on your health? (Refer to page 3.)

Circle your answer: **yes** **unsure** **no**

Explain why you agree, disagree or are unsure.

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16. Do you need to change your lifestyle to minimise your risk of developing insulin resistance? Justify your answer by referring to:

- your intake of particular foods (see Table 4 on page 14)
- how much exercise you do
- **Insulin facts** (page 13) and any other relevant information in the booklet.

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Making choices

Even when we are presented with scientific evidence, we don't always use the evidence to make choices that are good for our health.

17. a) Give an example of a poor health choice that might be made because of the influence of family, social or cultural experiences.

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b) Explain why the scientific evidence might be ignored.

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Focus: Investigate the sugar content of a soft drink, analyse the effects of sugary drinks and reflect on health implications.

Investigating	Knowledge and understanding	Investigating	Reflecting
<p>Analyses an investigation for fairness of design and implementation.</p> <p>Questions 1–4</p>	<p>Names and describes the functions of parts of the digestive system and demonstrates understanding of how digestion, circulation and respiration work together to provide fuel for the body.</p> <p>Questions 5–6</p>	<p>Analyses experimental evidence, graphical data and information to explain patterns and draw conclusions.</p> <p>Questions 7–14</p>	<p>Reflects on new understandings to suggest ways of minimising risks to health. Reflects on the influence of culture when making health-related choices.</p> <p>Questions 15–17</p>
<p>◀ Makes a valid judgment of the fairness of the investigation based on well-justified decisions about the control of all relevant variables.</p> <p>◀ Describes two valid, specific reasons for a possible difference between measured and labelled sugar content.</p> <p>◀ Provides valid explanations for decisions about the control of some variables and partially justifies a judgment of the fairness of the investigation. Makes an accurate comparison of measured and labelled sugar content and provides a valid reason for a possible difference.</p> <p>◀ Makes a superficial judgment about one of the following: control of a variable, fairness of the investigation, a reason for difference between measured and labelled sugar content.</p>	<p>◀ Fully describes the functions of the specified parts of the digestive system.</p> <p>◀ Consistently makes correct word choices to describe how the body processes sugar.</p> <p>◀ Correctly names the specified parts of the digestive system and describes a function of most parts. Makes word choices to correctly describe most aspects of how the body processes sugar.</p> <p>◀ Either correctly names some parts of the digestive system or makes some correct word choices to describe how the body processes sugar.</p>	<p>◀ Considers all relevant information about glycaemic index and insulin resistance to draw valid conclusions and offer full explanations.</p> <p>◀ Interprets graphical data to clearly and accurately describe changes to blood glucose levels. Draws a valid conclusion about the effects of abnormal glucose levels.</p> <p>◀ Determines the duration of exercise required to use the energy in soft drink. Uses graphical data to broadly describe changes to blood glucose levels. Draws a valid conclusion about the effects of excess sugar.</p> <p>◀ Some success in determining the duration of exercise required to use the energy in soft drink. Either provides a partial description or draws a conclusion.</p>	<p>A</p> <p>◀ Considers all relevant understandings in justifying a range of specific recommendations to minimise health risks.</p> <p>B</p> <p>◀ Gives a well-reasoned explanation of cultural influence on a poor health choice.</p> <p>C</p> <p>◀ Considers some new understandings in justifying general recommendations to minimise health risks.</p> <p>D</p> <p>◀ Gives an example of a culturally influenced poor health choice.</p> <p>E</p>

Feedback

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