

B

Sugar, sugar!

Sample responses



9

Science

Queensland Comparable
Assessment Tasks
(QCATs) 2010

Contact information

Direct questions about the implementation of QCATs or receipt of materials to:

Project Officer, Operations

Phone: (07) 3864 0299

email: qcats.administrator@qsa.qld.edu.au

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Queensland Studies Authority PO Box 307 Spring Hill Qld 4004

Phone: (07) 3864 0299 Fax: (07) 3221 2553 Email: office@qsa.qld.edu.au Website: www.qsa.qld.edu.au

B Sample: Response 1

Guide to making judgments — Year 9 Science

Name

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
Analyses an investigation for fairness of design and implementation. Questions 1–4	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. Questions 5–6	Analyses experimental evidence, graphical data and information to explain patterns and draw conclusions. Questions 7–14	Reflects on new understandings to suggest ways of minimising risks to health. Reflects on the influence of culture when making health-related choices. Questions 15–17
<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>◀ Considers all relevant understandings in justifying a range of specific recommendations to minimise health risks.</p> <p>◀ Gives a well-reasoned explanation of cultural influence on a poor health choice.</p> <p>◀ Considers some new understandings in justifying general recommendations to minimise health risks.</p> <p>◀ Gives an example of a culturally influenced poor health choice.</p>
<p>Demonstrates all the descriptors below and also makes a valid, general judgment of the fairness of the investigation.</p>	<p>Demonstrates all of the descriptors up to and including this level.</p>	<p>Demonstrates all of the descriptors up to and including this level.</p>	<p>Demonstrates all descriptors up to and including this level.</p>

Overall grade

This response demonstrates a high level of achievement across all assessable elements. On balance, it is judged to be a B.

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)

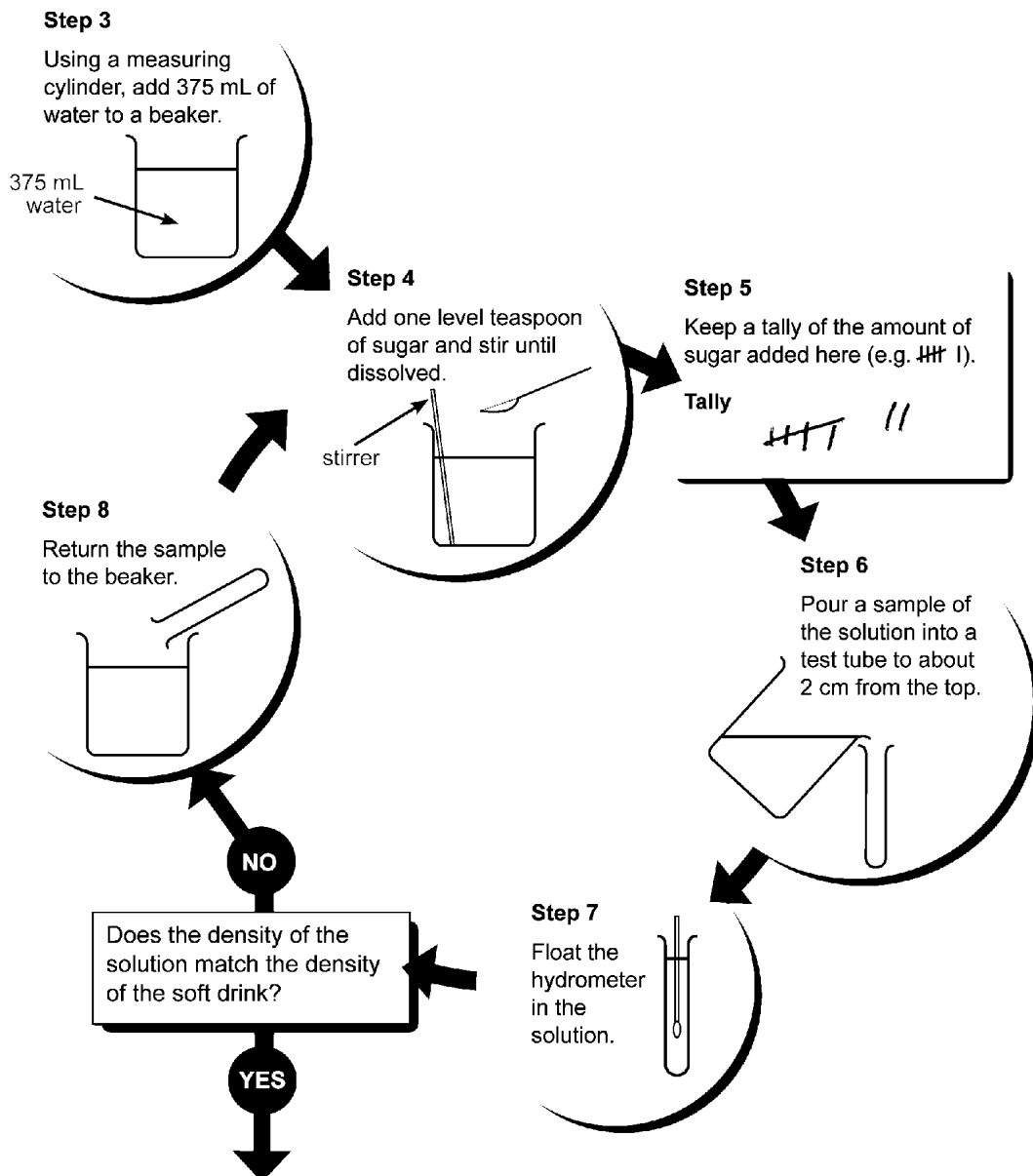
fruit fruit juice soft drinks cakes and desserts lollies the sugar bowl

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

I do believe my sugar intake is affecting my health slightly in that most is burnt off through playing sport and the remaining is sugar stored.

B Sample: Response 1

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 7 level teaspoons



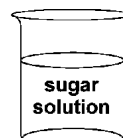
Stop here: Discussion point.

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	Yes.	Carefully measured.
Presence of bubbles	No/Yes	Bubbles are very hard to control. The meniscus was flat.
Presence of substances other than sugar	NO	Some small substances and gases are hard to minimize.
Other:	Yes.	1 level teaspoon at a time.
Other:	No	How long the sugar was stirred for. The flatness of the meniscus.

B Sample: Response 1

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.

Yes, the method was fair though minute, uncontrollable variables control the experiment. Though not to a point where results are visibly affected.

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	41.3g.	10.325.
My measurement (from page 5)		7 1/28 grams.

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

Our measurement was fairly accurate not very accurate, as there are 10.32 teaspoons of sugar in lemonade we only added 7 1/2.

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

- a) One reason relating to the method:

The teaspoon we were given was not equal to a metric teaspoon.

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

Our judgement of 'level' would have a great impact on the measurement.



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.

A ~~Tongue~~ Mouth
Breaks down food
via mastication

B oesophagus
moves food from
mouth to stomach by
muscular contraction
(peristalsis)

C Stomach ~~breaks~~
breaks down
protein and digests
food LCL

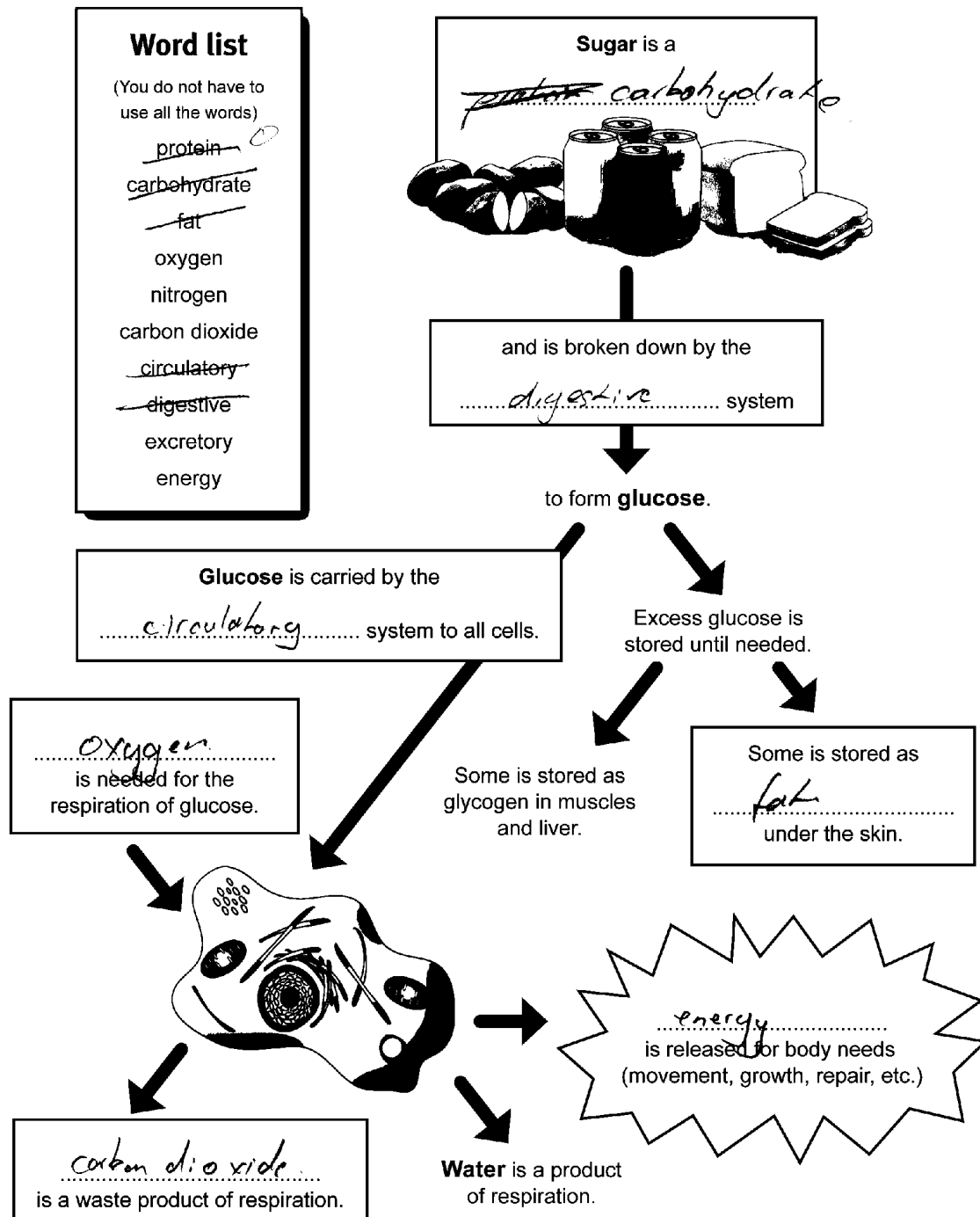
D Small intestine
begins absorbing
nutrients chemicals
etc. from food.

E large intestine
absorbs last
nutrients and
water from 'stools'

liver
pancreas
rectum

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.



B Sample: Response 1

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 = 41.5g

Energy in 375 mL of soft drink = 702.1

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: cycling

Intensity: racing

I will need to do approximately 13.7666667 minutes of exercise.

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

The unused energy from the soft drink would
be stored as fat under the skin



Stop here: Wait for your teacher's directions.

B Sample: Response 1

How does a sugary drink affect your body?

Use the information below to answer Questions 10 and 11.

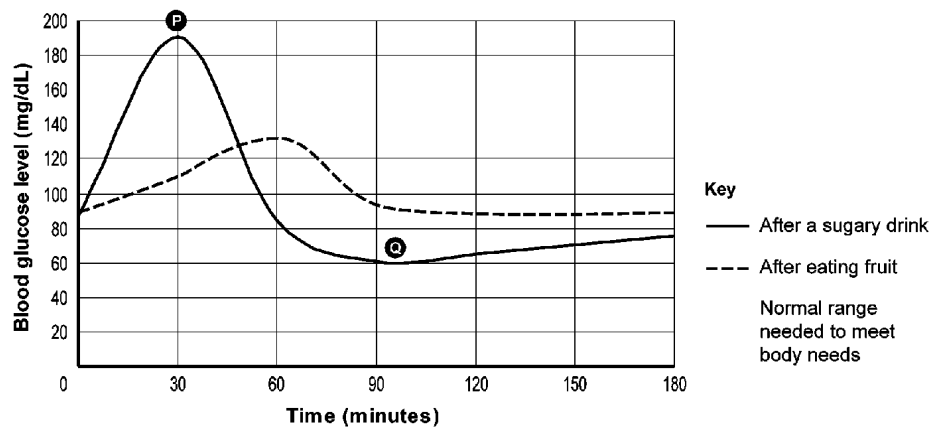
Glycaemic index (GI)

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



Adapted from Glycaemic Index database, Glycaemic index, accessed 21 Apr 2010, <www.glycaemic.com>.

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

After a sugary drink approx 30mins the Bgl reach 190 then one hour later drops to 60. After fruit one hour in Bgl reaches 130 then slowly drops to 90. This is the difference effects of a "sugar rush".

11. Complete the following statement.

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

because the amount of glucose in my circulatory system is lower than is required for proper body function.

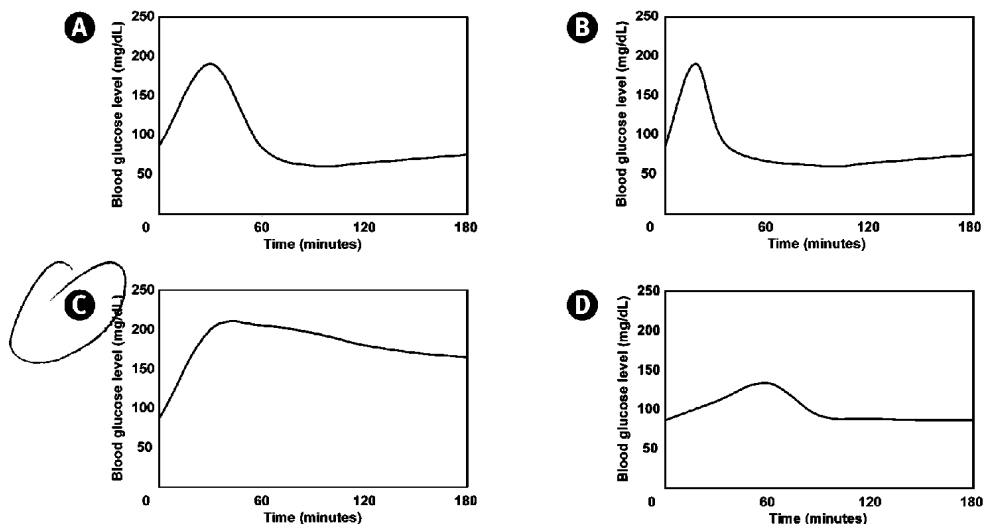
B Sample: Response 1

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.

The bgl reaches the spike and then very gradually drops. This is a good example of insulin resistance.

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

Insulin Resistance results in tiredness because of the amount of time and energy it takes for the body to reach the correct bgl levels.



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	41.3	Medium GI
orange juice	20.0	
chocolate bar	40.2	
orange	10.7	
wholegrain bread	2.0	
pasta, noodles	0.0	Low GI (slowly digested)
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.

I am unsure because I personally consume a lot of fruit, fish, fruit juice and potatoes. I think this would result in a higher sugar consumption.

B Sample: Response 1

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.

I could reduce my chance of developing insulin resistance by decrease my intake of sugary foods, i.e. soft drinks and cornflakes. I could also increase the amount of sport and recreational activities I do to minimise Insulin Resistance and decrease the amount of fat stored. Regular exercise and watching what you eat vastly helps you minimise the chance of developing insulin resistance.

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.

As a traditions we eat a lot of sugary food on birthdays and at celebrations.

b) Explain why the scientific evidence might be ignored.

To follow regular behaviour these experiences give us the choice to fit in or be antisocial. A lot of activities cause us to ~~stop~~ need drinks and food to replenish hunger. Usually the only food available is sugary so this is ultimately not good.

B Sample: Response 2

Guide to making judgments — Year 9 Science

Name

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
Analyses an investigation for fairness of design and implementation. Questions 1–4	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. Questions 5–6	Analyses experimental evidence, graphical data and information to explain patterns and draw conclusions. Questions 7–14	Reflects on new understandings to suggest ways of minimising risks to health. Reflects on the influence of culture when making health-related choices. Questions 15–17
<ul style="list-style-type: none"> ◀ Makes a valid judgment of the fairness of the investigation based on well-justified decisions about the control of all relevant variables. ◀ Describes two valid, specific reasons for a possible difference between measured and labelled sugar content. ◀ 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. ◀ 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. 	<ul style="list-style-type: none"> ◀ Fully describes the functions of the specified parts of the digestive system. ◀ Consistently makes correct word choices to describe how the body processes sugar. ◀ 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. ◀ Either correctly names some parts of the digestive system or makes some correct word choices to describe how the body processes sugar. 	<ul style="list-style-type: none"> ◀ Considers all relevant information about glycaemic index and insulin resistance to draw valid conclusions and offer full explanations. ◀ Interprets graphical data to clearly and accurately describe changes to blood glucose levels. Draws a valid conclusion about the effects of abnormal glucose levels. ◀ 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. ◀ 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. 	<ul style="list-style-type: none"> ◀ Considers all relevant understandings in justifying a range of specific recommendations to minimise health risks. ◀ Gives a well-reasoned explanation of cultural influence on a poor health choice. ◀ Considers some new understandings in justifying general recommendations to minimise health risks. ◀ Gives an example of a culturally influenced poor health choice.

A

B

C

D

E

Demonstrates all of the descriptors below and makes a valid though not well-explained judgment of the fairness of the investigation.

Demonstrates all of the descriptors up to and including this level.

Demonstrates almost all elements of the descriptors up to and including this level. While the description of changes to blood glucose level lacks clarity and accuracy, a valid conclusion is drawn about the effects of insulin resistance.

Demonstrates all the descriptors below and gives an explanation of cultural influence on a poor health choice.

Overall grade

This response demonstrates a high level of achievement in Investigating and Reflecting and a sound level of achievement in Knowledge and understanding. The focus of this QCAT is on Investigating and Reflecting. On balance, it is judged to be a B.

Setting the scene: Group discussion

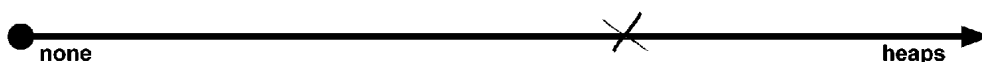


In this assessment, you will:

- 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)

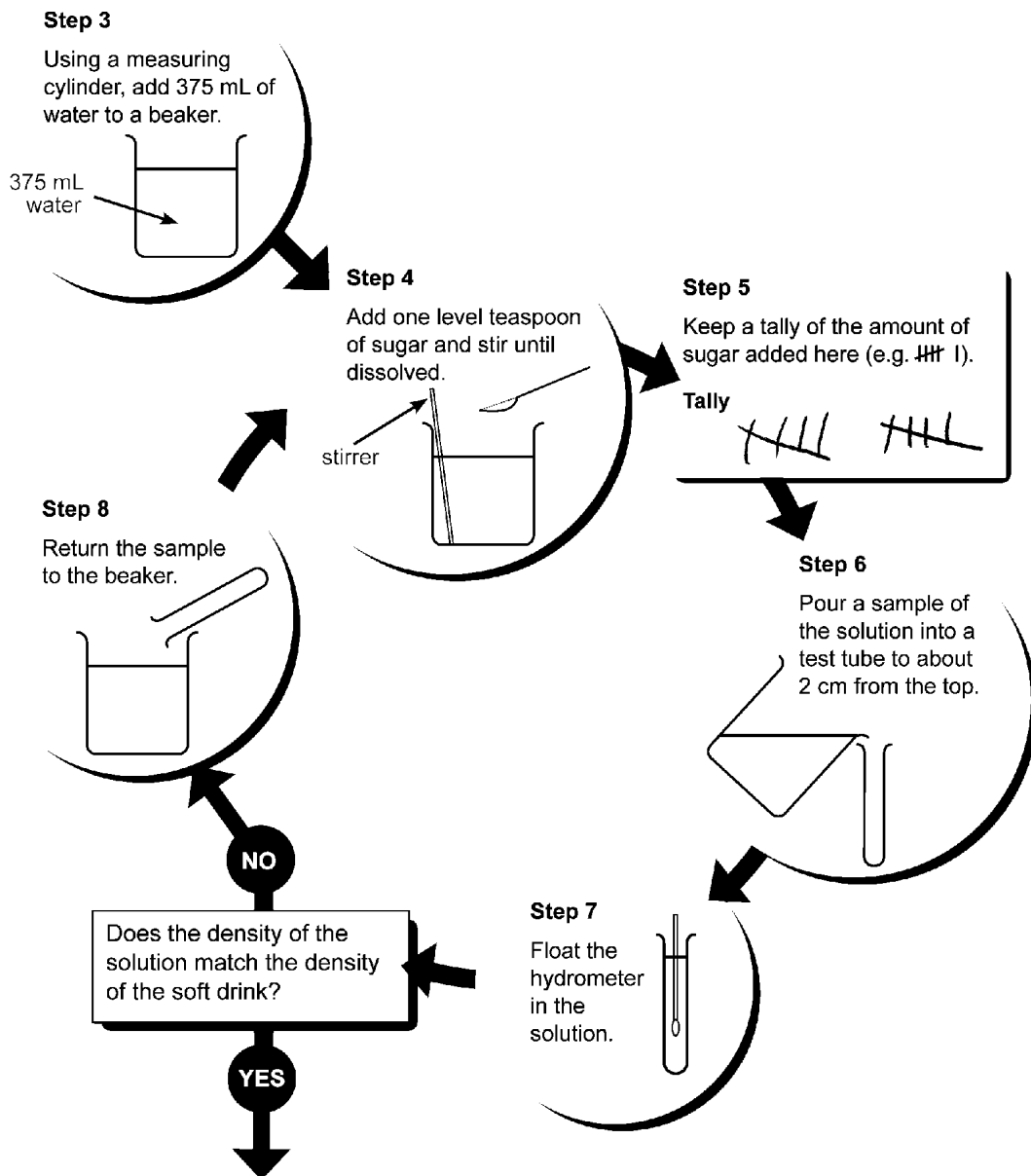
fruit fruit juice soft drinks cakes and desserts lollies the sugar bowl

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

Yes, because the more sugar I take in turns to fat and means I have to exercise a lot and I know I don't get enough exercise.

B Sample: Response 2

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 10 level teaspoons



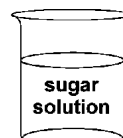
Stop here: Discussion point.

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	Yes	because we kept tipping the water back into the beaker
Presence of bubbles	Yes	there were no bubbles as it was flat
Presence of substances other than sugar	No	the chemicals added to the soft drink may have changed its density to water
Other: Size of top	Yes	we used the stirring rod on top of the spoon to make it level
Other:		

B Sample: Response 2

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.

No because water and the chemicals in soft drink would have different densities.

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	41.3g	10.325 tspns
My measurement (from page 5)		10 tspns

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

Our measurement was very accurate as we were only using teaspoons and didn't use half tspns.

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

- a) One reason relating to the method:

we used water and not the chemicals in soft drink excluding the sugar.

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

because we could have done bigger teaspoons than what we were meant to and affected the results



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.

A mouth
chews food, breaks down slightly and then moves to the oesophagus

B oesophagus
moves food from mouth to stomach by muscular contraction (peristalsis)

C stomach
the chemicals break down the foods eaten.

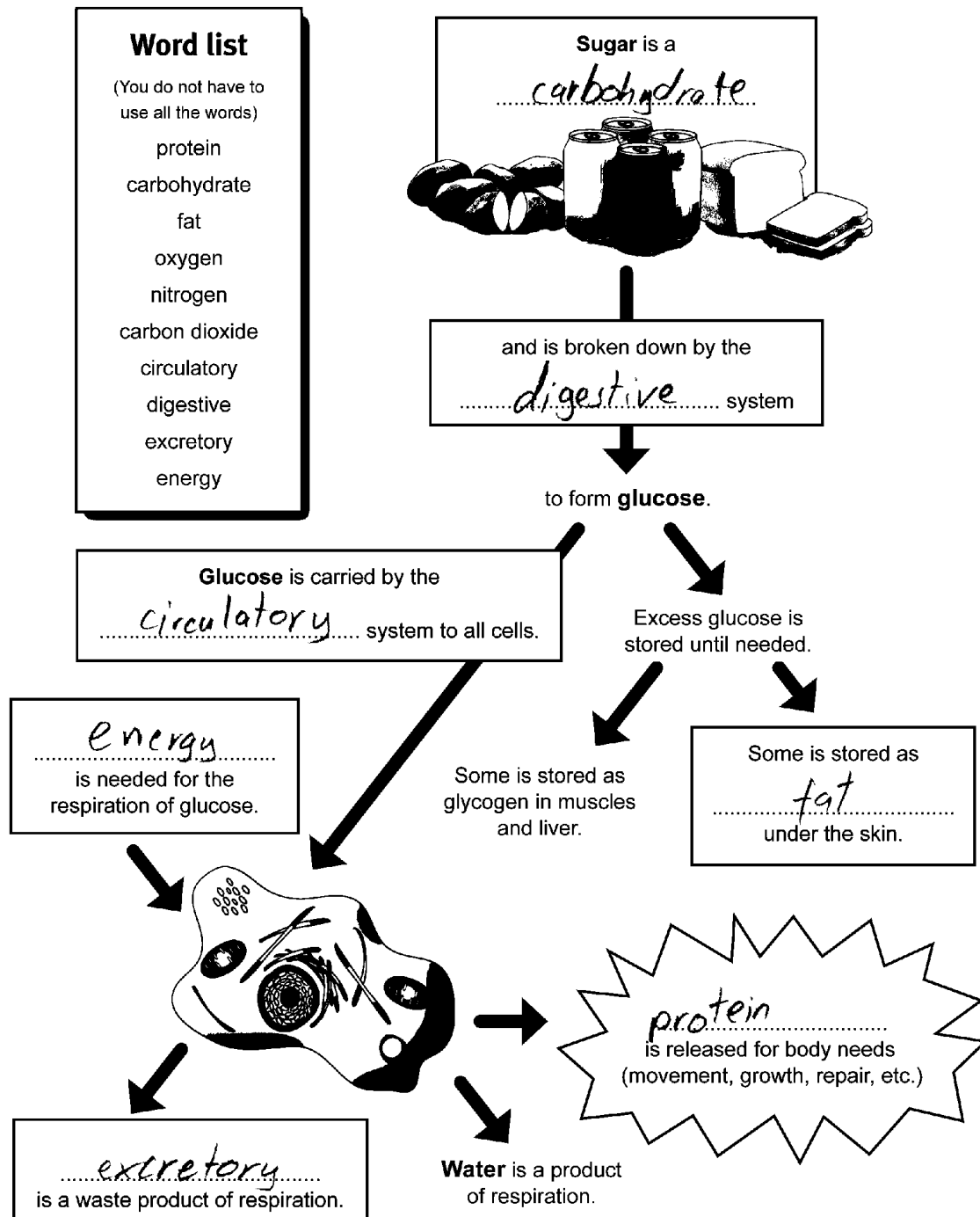
D small intestine
continues breaking down food and then the waste goes to large intestine.

E large intestine
stores the broken down food and then the waste exits the body

liver
pancreas
rectum

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.



B Sample: Response 2

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 = 413

Energy in 375 mL of soft drink = 102.1 energy

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: basketball competitive

Intensity: competitive

I will need to do approximately 23.40 minutes of exercise.

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

If the body does not use this energy it
turns to fat.



Stop here: Wait for your teacher's directions.

How does a sugary drink affect your body?

Use the information below to answer Questions 10 and 11.

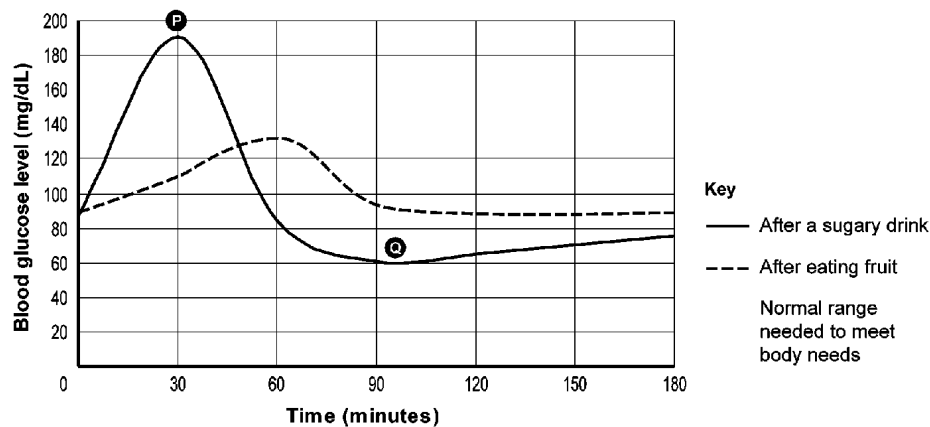
Glycaemic index (GI)

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



Adapted from Glycaemic Index database, Glycaemic index, accessed 21 Apr 2010, <www.glycaemic.com>.

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

Eating high GI foods means that you get the sugar in 30 mins. When the low GI stays in the normal range.

11. Complete the following statement.

I would feel tired if my blood glucose level was similar to point **Q** (**P** or **Q**) in Graph 1 because my sugar levels are below normal to what the body needs.

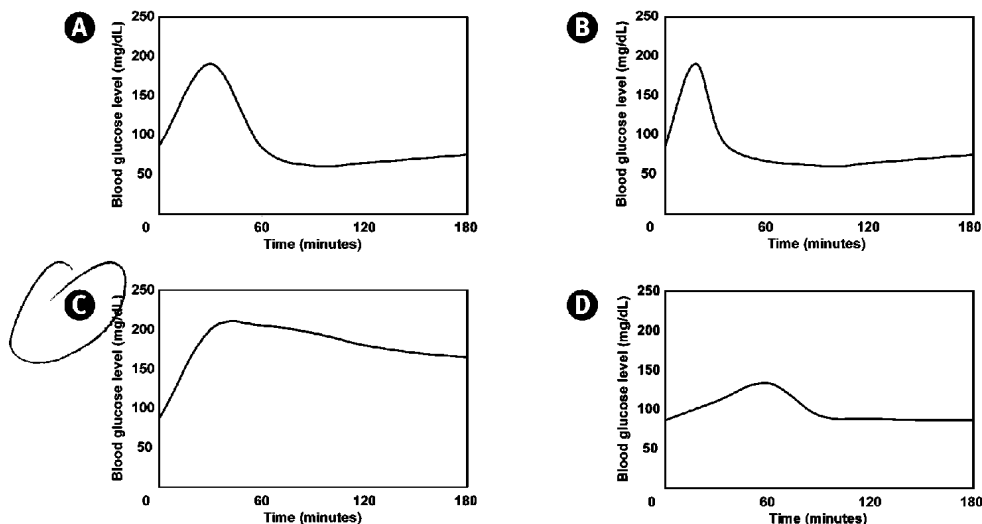
B Sample: Response 2

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.

because the blood has absorbed the sugar but the insulin doesn't take it out of the blood

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

because insulin isn't absorbing the sugar from the blood and putting it in the cells to use the energy. because there is no energy they are tired



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	Medium GI
orange juice	20.0	
chocolate bar	40.2	
orange	10.7	
wholegrain bread	2.0	
pasta, noodles	0.0	Low GI (slowly digested)
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.

I disagree as I have realised how much sugar is affecting my health and the different GI levels.

B Sample: Response 2

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.

by eating low GI foods so the insulin works and my blood cells absorb the sugar and get more exercise than what I normally do. By doing this I could stop insulin resistance (Type 2 Diabetes), because exercise reduces the effects of insulin resistance

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.

because friends or family may choose to watch tv instead of exercising or ~~ever~~ it might be a party and there is high foods.

- b) Explain why the scientific evidence might be ignored.

because every one else is watching tv you may want to be with them. If someone was exercising you might join them because every one else is doing something you usually do the same thing as them