



Sugar, sugar!

Sample responses



9

Science

Queensland Comparable
Assessment Tasks
(QCATs) 2010

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C 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
<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 up to and including this level.

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

Demonstrates all of the descriptors below. Also correctly chooses a graph that shows the effects of insulin resistance but does not explain the choice.

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

Overall grade

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

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)

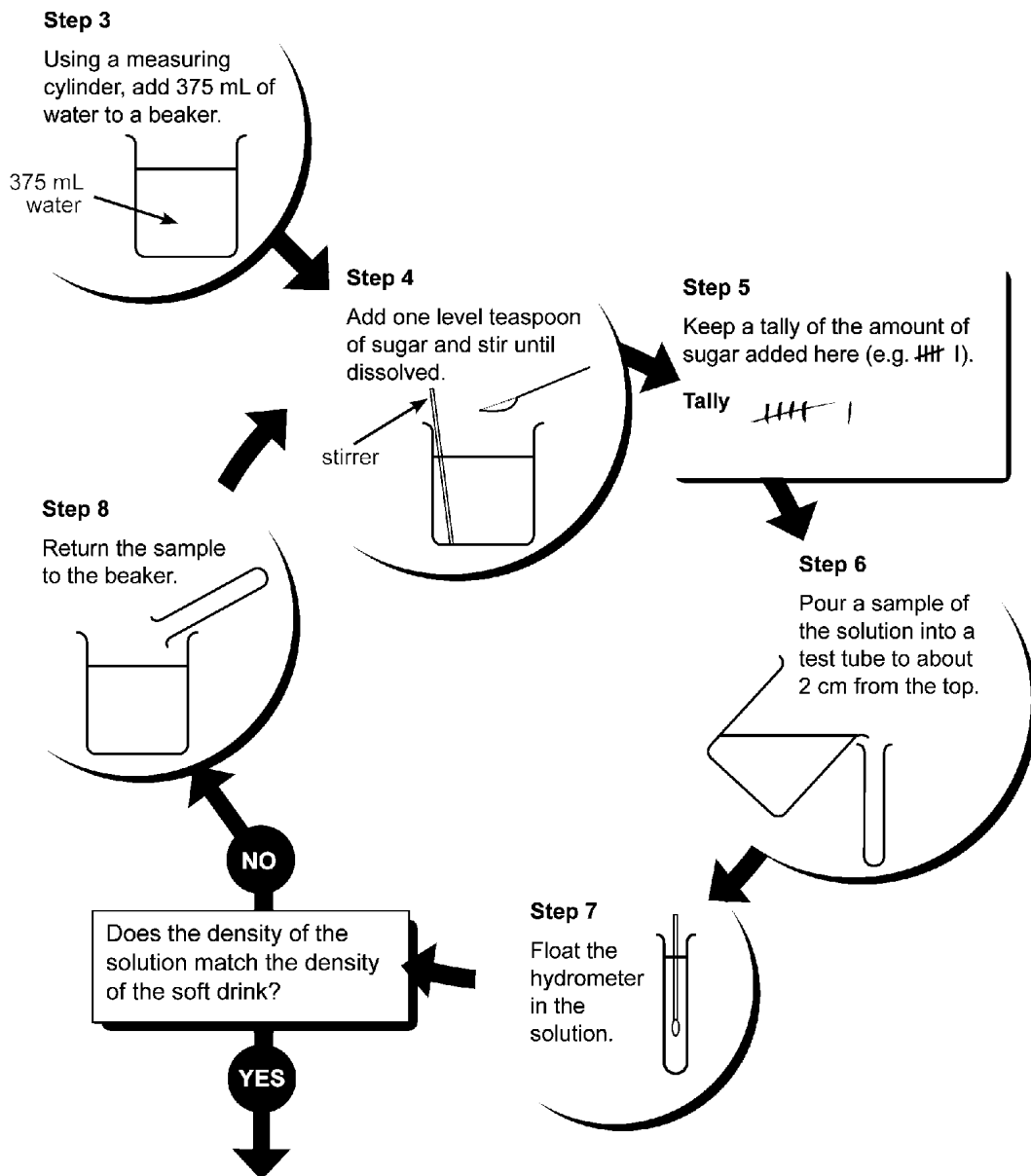
fruit fruit juice soft drinks cakes and desserts lollies the sugar bowl

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

No, because the sugar that I consume on a day to day basis is perfectly enough for my body.

C 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 drink6..... level teaspoons



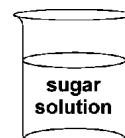
Stop here: Discussion point.

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	Both types of liquid were filled at an approximate equal value.
Presence of bubbles	No	Flat lemonade was used in this experiment so there were no bubbles.
Presence of substances other than sugar	No	The lemonade had other substances are carbonated H_2O , flavour etc.
Other:	Yes	A standard teaspoon of sugar each time.
Other:		

C 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.

No, because only three out of five factor are able to be controlled. Also, the hydrometer might indicate the wrong level depending on the amount of yellow tag placed upon the hydrometer.

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	41.3 g	approx 10 teaspoon
My measurement (from page 5)		approx 6 teaspoon

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

The measurement was far from accurate as there was a difference of 4 teaspoon of sugar between the info. on label and the experiment.

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

- a) One reason relating to the method:

The teaspoons of sugar might not be accurately measured when poured into the test tube.

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

The investigation was not carefully carried out at all. All of the factors was approximate only.



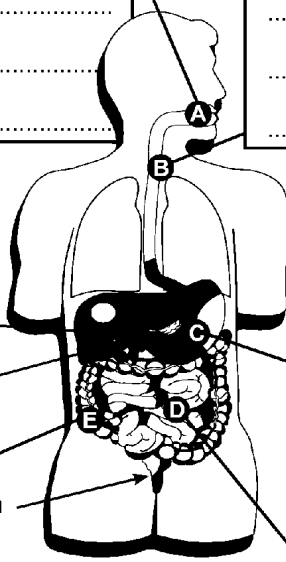
Stop here: Wait for your teacher's directions.

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 and
turn them into bits
and pieces for
digestion

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

C Stomach
-mixes food with
gastric juices
-protein extraction

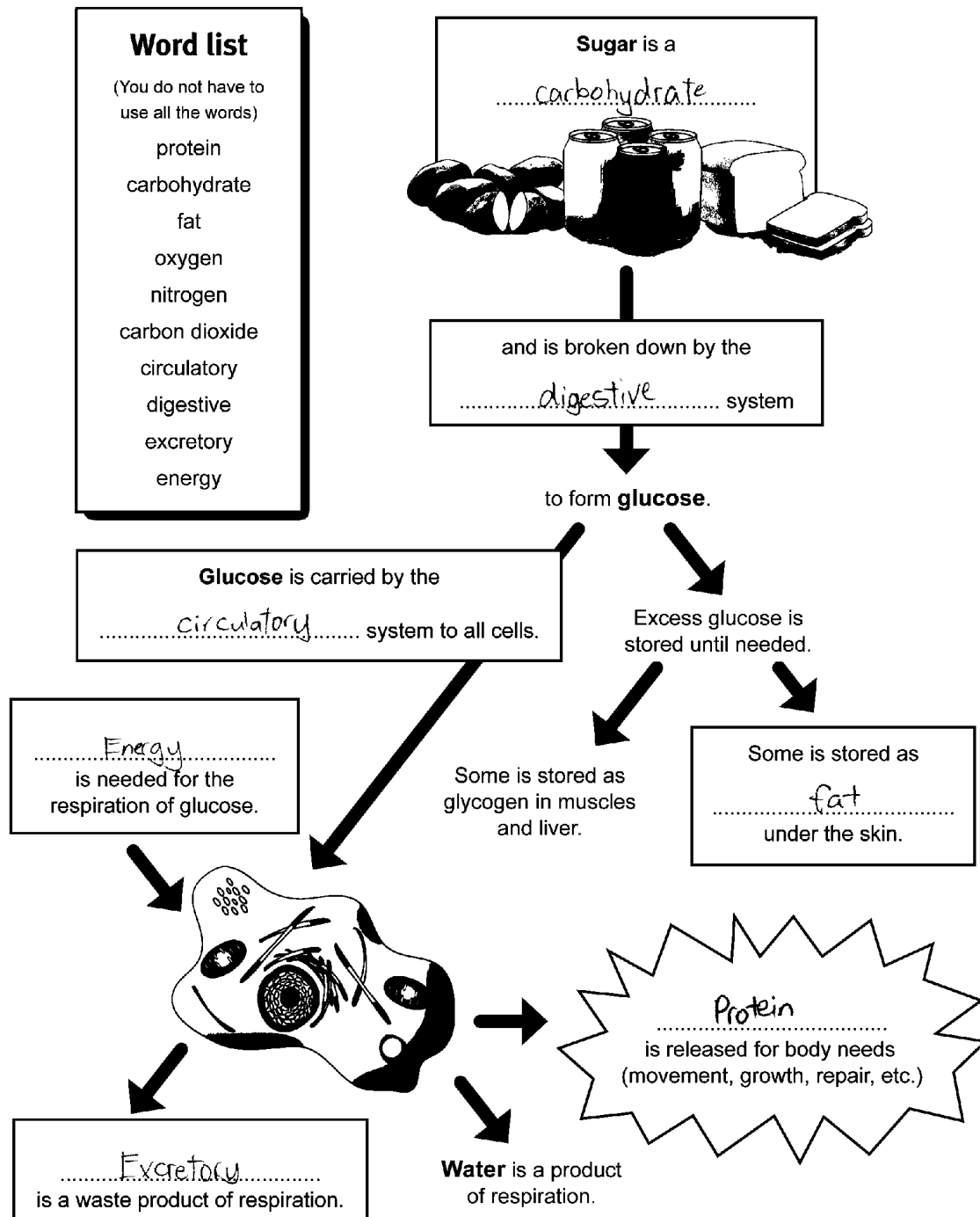
D Small intestine
carries the waste
to the rectum

E Large intestine
-water reabsorption

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.



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 = 41.3g

$$\begin{array}{r} 41.3\text{g} \\ \times 17\text{ kJ} \\ \hline 891 \\ 4130 \\ \hline 702.1\text{kJ} \end{array}$$

Energy in 375 mL of soft drink = 702.1 kJ

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: Football

Intensity: Competitive

I will need to do approximately 21.27 minutes of exercise.

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

All the energy will unfortunately be turned into 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.

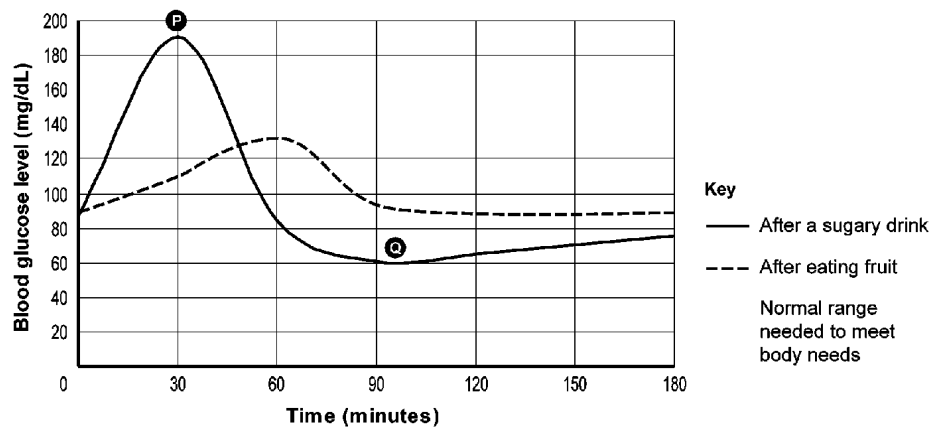
Glycaemic index (GI)

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 fruit makes your blood glucose level stay within the normal range to meet your body needs, whereas drinking a sugary drink increases the blood glucose level then significantly decreases it.

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 blood glucose level would be significantly low hence I would need some recharge like a mug of Milo® as it has low glycaemic index.

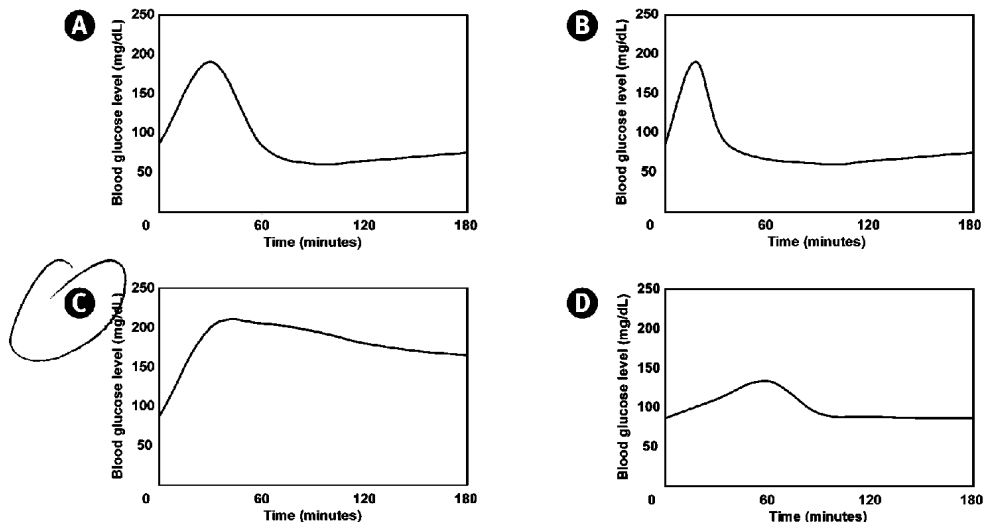
C Sample: Response 1

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.

Because the blood glucose level remains the highest after 180 minutes out of the 4 graphs.

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

Because the body needs a specific amount of glucose level (not too much nor too little) in order to operate "correctly".



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 agree because if a particular food has High GI, the body will rapidly digest it therefore causing an individual to eat more food, hence making him/her fatter.

C 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 would make sure that healthy food like fruits and longgrain rice are taken everyday where they have a low GI. These food may reduce the chance of me developing insulin resistance as they generally have a lower sugar level. I might also have to exercise on a day to day basis so that the excess glucose are being burnt out to reduce the chance of me becoming obese.

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.

McDonalds or KFC tastes so good and you can't resist not to eat them.

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

Because McDonalds and KFC usually sells yummy food where their TV ads are usually on 24/7. This would definitely have a large influence on the choice you make where these "unhealthy food" can be purchased at a significantly low amount of \$1.95 for a breakfast muffin.

C 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 most of the descriptors up to and including this level, but Question 2 is explained by referring to Table 2 rather than Table 1. While the response shows some confusion about whether variables were controlled, most explanations were valid.

Demonstrates all of the descriptors up to and including this level. Functions of parts of the digestive system were poorly described, but correct word choices were consistently made to describe how the body processes sugar.

Demonstrates most of the descriptors up to and including this level. The description of changes to blood glucose levels is vague and lacks direct references to the graph.

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

Overall grade

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

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)

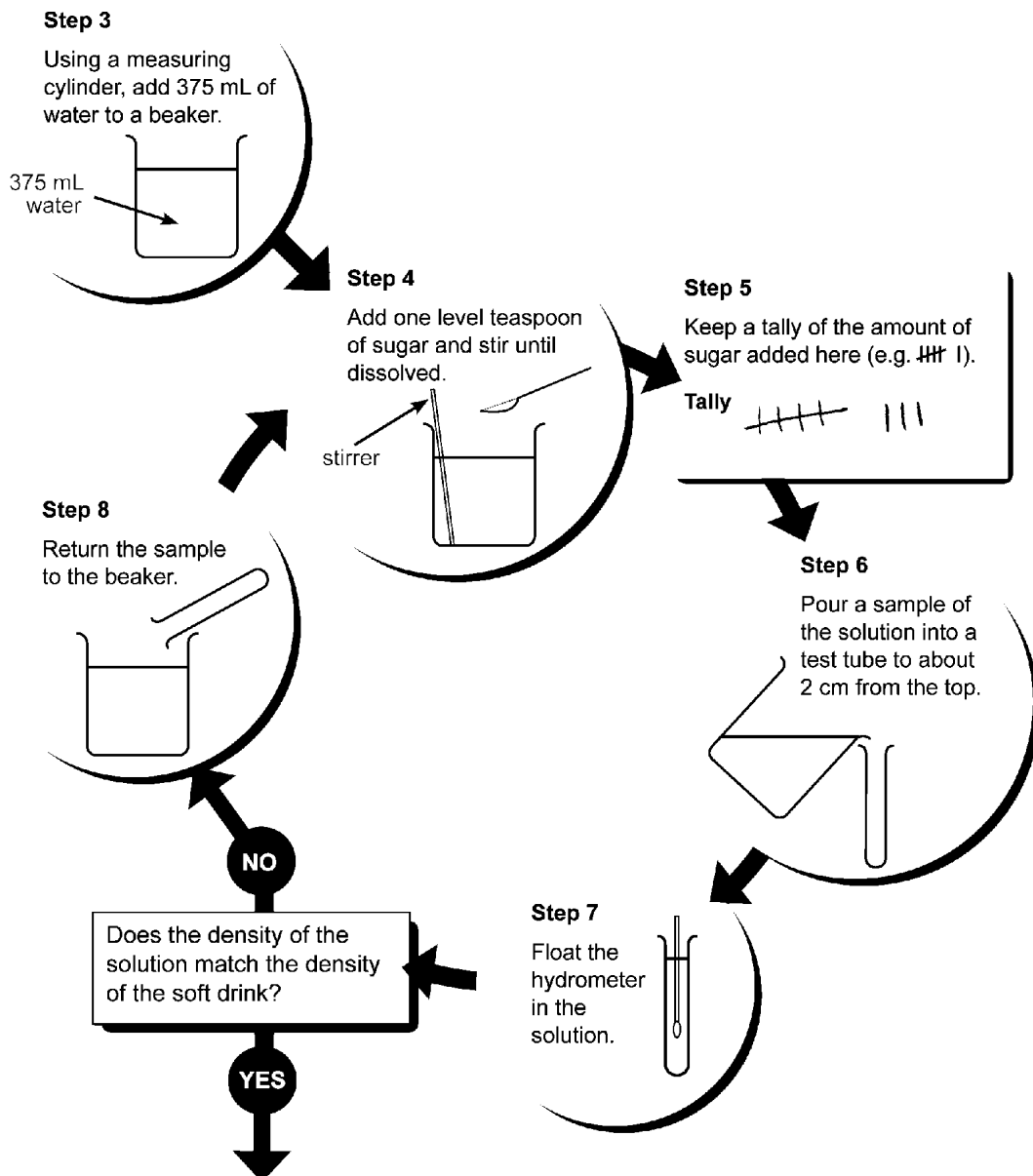
fruit fruit juice soft drinks cakes and desserts lollies the sugar bowl

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

I don't believe that my sugar intake is affecting my health at all. I don't consume much sugar daily for it to be jeopardising my health.

C 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

..... level teaspoons



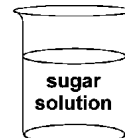
Stop here: Discussion point.

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	The level of the coke & water was the same everytime
Presence of bubbles	No	Water doesn't have bubbles & the coke was flat.
Presence of substances other than sugar	Yes	The only substances in the test tube was coke and water.
Other:	No	The coke's sugar level stayed the same everytime but more sugar was added to the water.
Other:		

C 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.

Yes it was fair because it showed pretty much exactly how much sugar was in the coke.

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	10.6g per 100mL 39.75g in 375mL	9.9 teaspoons in 375mL
My measurement (from page 5)		8 teaspoons in 375mL

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

It was close but not close enough, 1.9 teaspoons extra.

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

- a) One reason relating to the method:

The hydrometer that we made may have been faulty.

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

Maybe the teaspoons of sugar weren't as level as I thought they were.



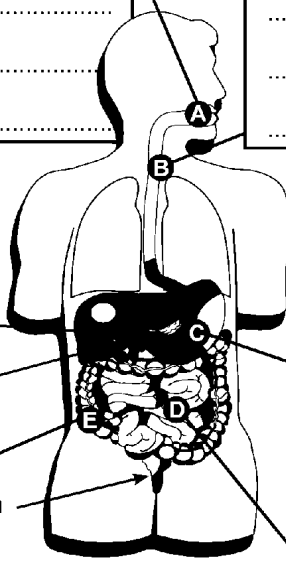
Stop here: Wait for your teacher's directions.

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
where the food goes in.

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

C Stomach
Where the food is stored.

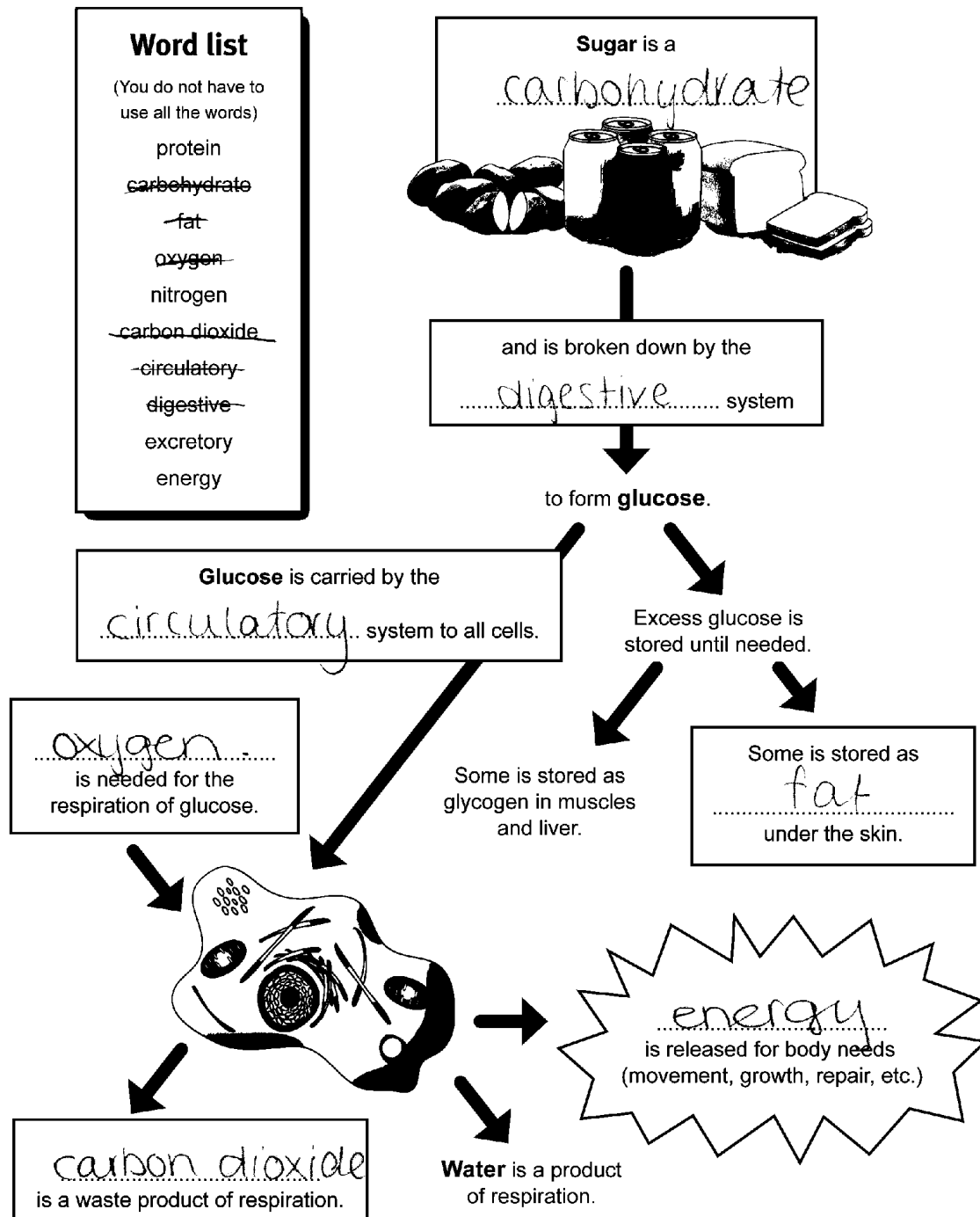
D small Intestine.
breaks food down.

E Large Intestine
Food passes through here

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.



C 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 = 39.75g

Energy in 375 mL of soft drink = 675.75

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: recreational

I will need to do approximately 28 minutes of exercise.

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

The sugar will store under the skin as
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.

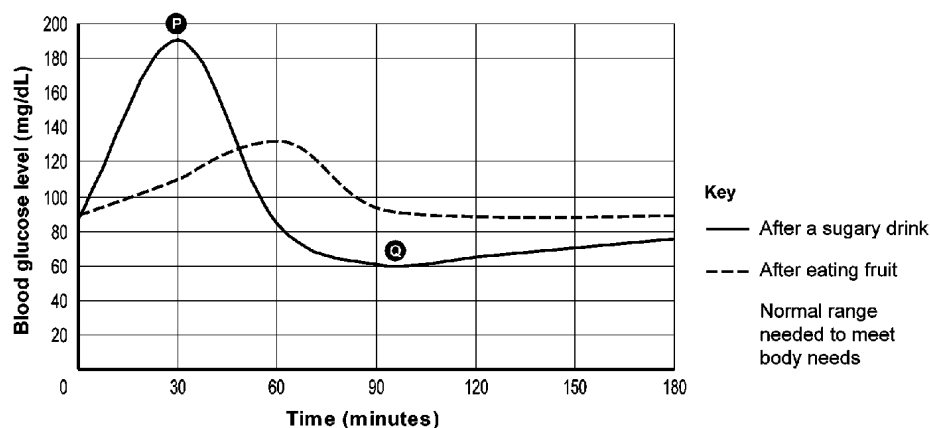
Glycaemic index (GI)

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.

After drinking a sugary drink I would be on a massive high and I would then deflate, be on a massive low & not want to do anything but the fruit will give a small high but I would be full of energy for the whole day.

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 I would have no energy at all because I had just finished being on a major high and would have no energy left at all.

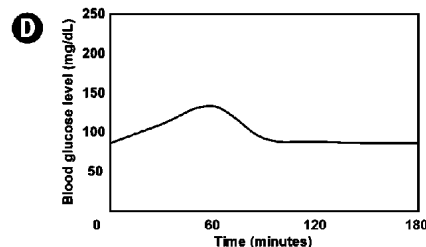
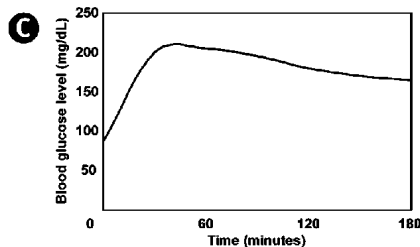
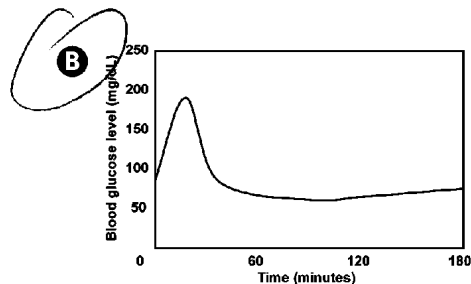
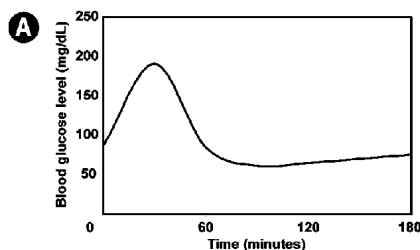
C Sample: Response 2

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.

The insulin brings your sugar level through the roof for a very short amount of time, it then goes all the way down again.

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

After the high from the insulin it goes all the way down again to cause extreme tiredness.



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 don't eat many of the foods & drinks on the list which means I don't have a large sugar intake.

C 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.

I believe that if I wanted to prevent insulin resistance in my life further then eating correctly, I could do more exercise daily. The minimum of 30 minutes of exercise everyday doesn't exactly happen in my lifestyle. I could also eat many more low glycemic index (GI) foods because they are slowly digested which means that I won't have different ranging energy levels.

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.

When with friends, they may eat a high GI food and you feel obligated to do so as well.

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

At a young age, friends help/impact a lot on decisions that are made. They are doing something so you go and do it too. Hence eating what they are eating when out on social outings.