



Sugar, sugar!

Sample responses



9

Science

Queensland Comparable
Assessment Tasks
(QCATs) 2010

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A 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>
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 up to and including this level.	Demonstrates all descriptors up to and including the level below. Also makes specific recommendations to minimise health risk, but with little justification.

Overall grade

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

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)

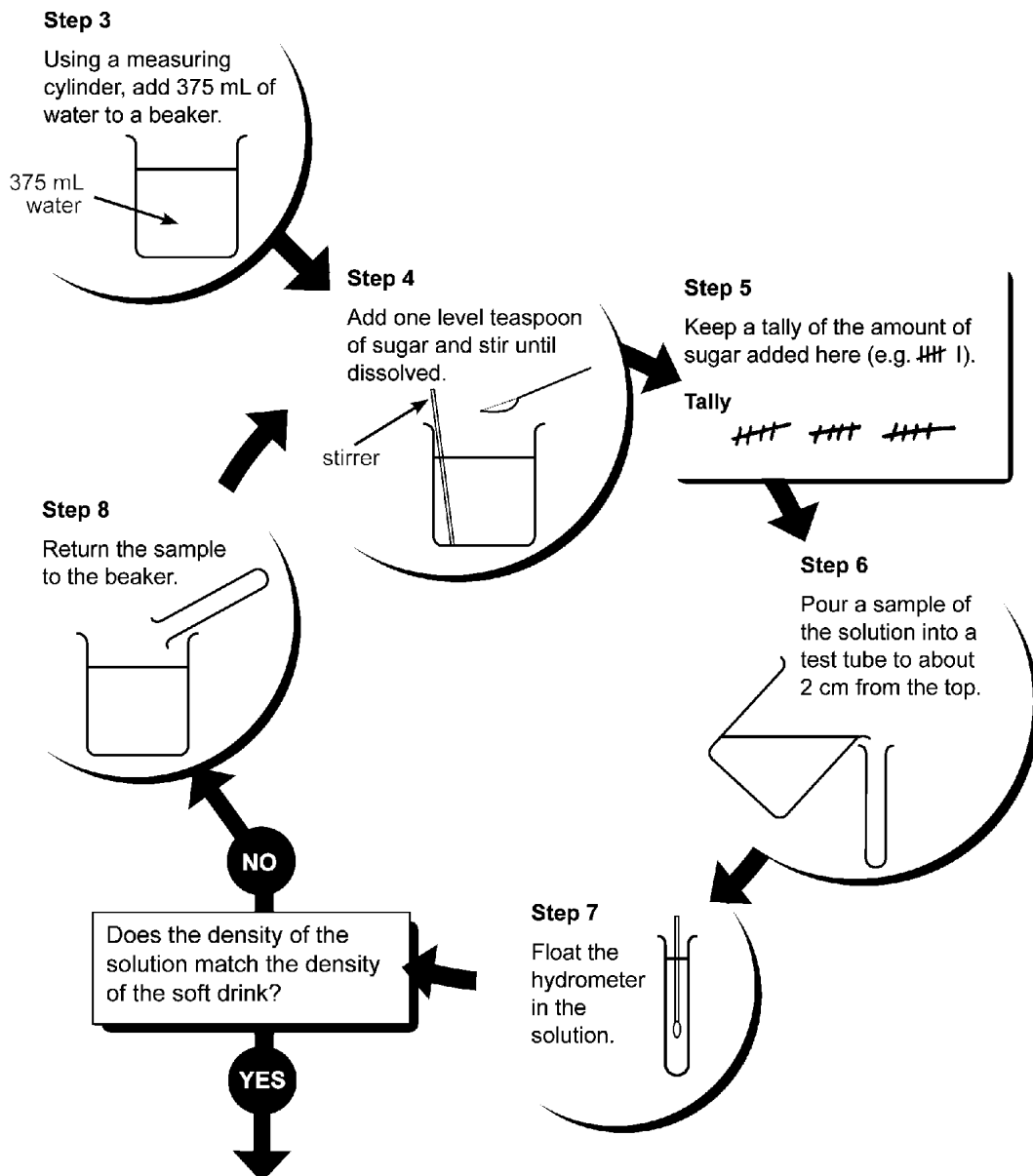
fruit fruit juice soft drinks cakes and desserts lollies the sugar bowl

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

No. I believe it is improving my health giving me a good supply of energy for keeping fit.

A 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 drink¹⁵ level teaspoons



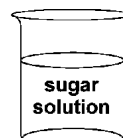
Stop here: Discussion point.

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 soft drink and water were 375 ml
Presence of bubbles	Yes	We used flat lemonade
Presence of substances other than sugar	No	The lemonade contained flavouring
Other: The size of the teaspoon	Yes	We always used a level teaspoon
Other:		

A 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. All the variables were controlled except the flavouring and I think there would only be a tiny amount.

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	40	10
My measurement (from page 5)		15

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

Not very accurate. We measured 5 more teaspoons than the label showed.

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 used may have been smaller than a standard teaspoon.

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

We were not very careful in making sure that the teaspoons were all exactly levelled.



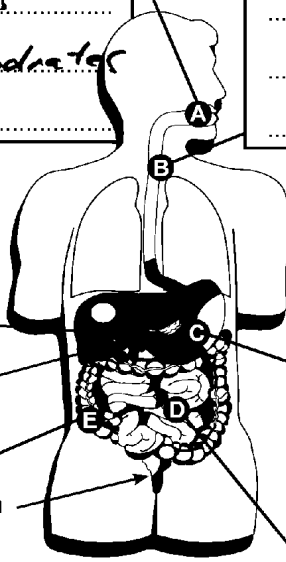
Stop here: Wait for your teacher's directions.

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
physically grinds up food, and saliva breaks down carbohydrates

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

C stomach
stores and churns food
stomach acid breaks it down more

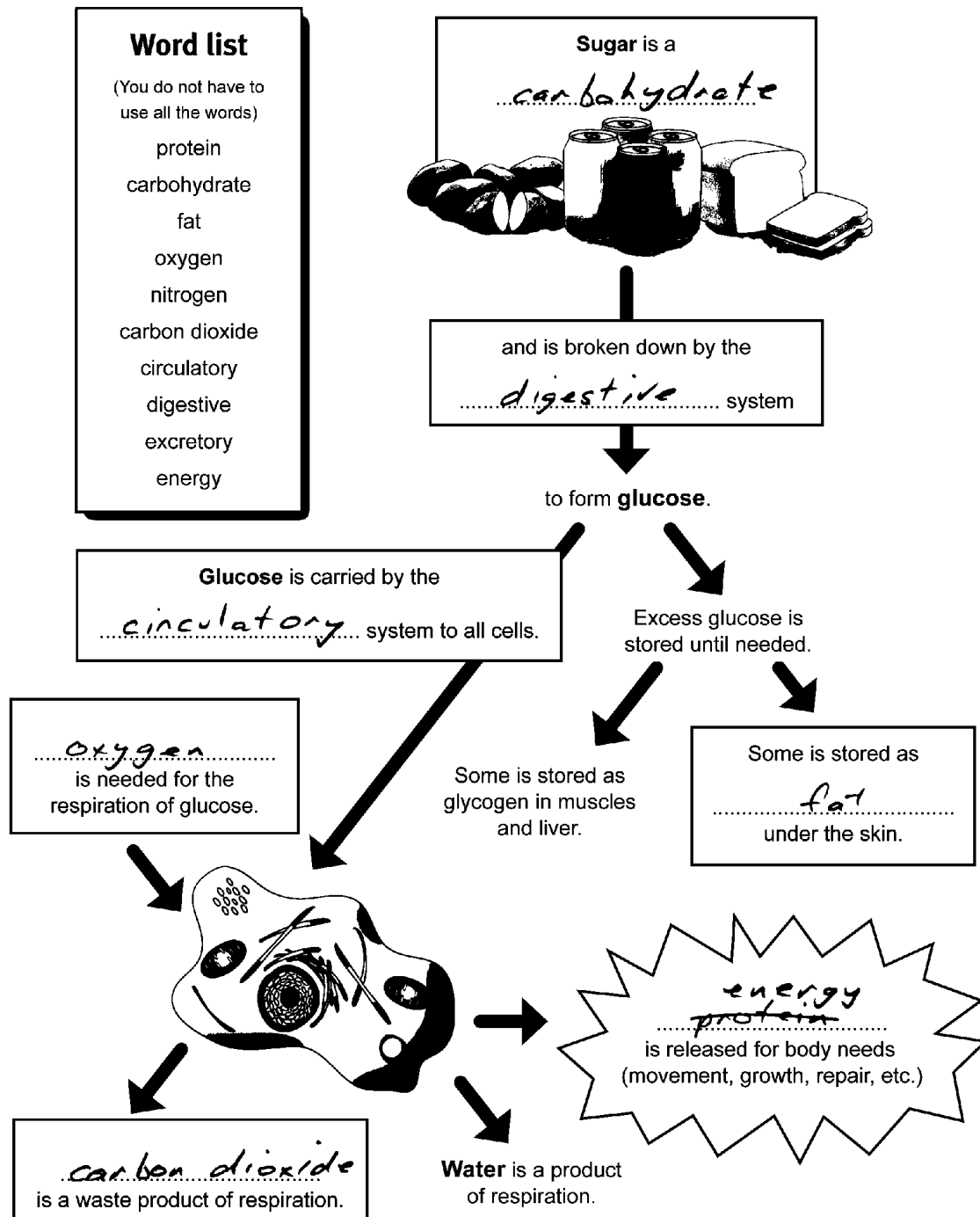
D small intestine
villi absorb nutrients from the food as it breaks down more

E large intestine
takes out the remaining water and connects to the rectum

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.



A 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 = 40g

$$40 \times 17 = 680$$

Energy in 375 mL of soft drink = 680 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: cycling

Intensity: competitive

$$680 \div 51 \\ = 13.33$$

I will need to do approximately 13 minutes of exercise.

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

It can get stored as fat and you
put on weight



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.

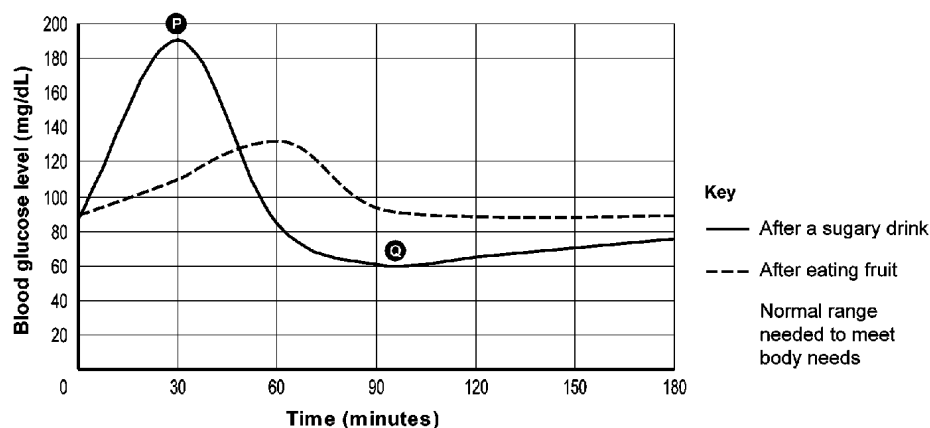
Glycaemic index (GI)

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 eating fruit the bgl stays within the normal range of 70-140 mg/dL. Sugary drinks give you a quick high of 190 mg/dL after 30 mins and then a low before returning to the normal range after 150 minutes.

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 my glucose levels are lower than my body needs

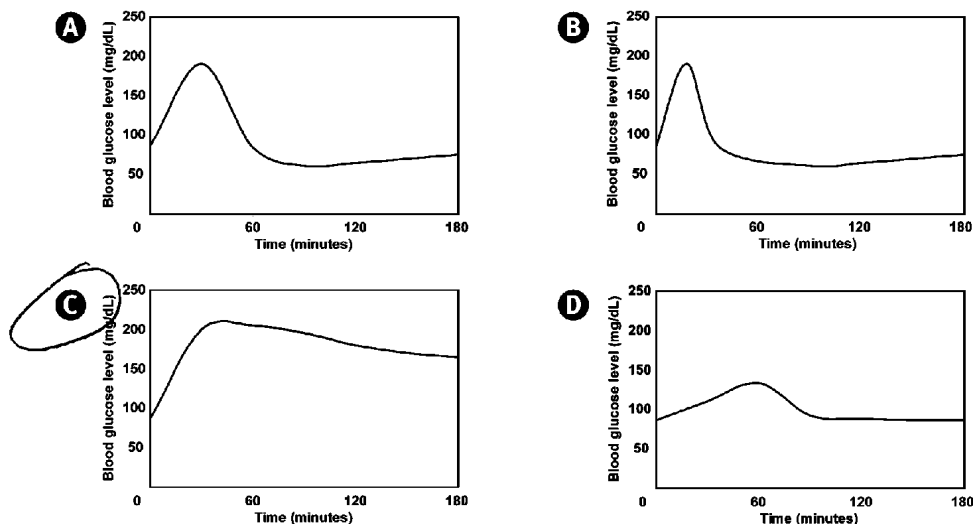
A Sample: Response 1

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.

Insulin resistance causes the glucose level to remain high because the body can't absorb it.

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

Glucose isn't getting to the cells, so they have no energy, making you 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 agree because I'm fit enough to work off the bad things I do to my body and eat healthy enough to maintain a balance

A 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 lay off the soft drink
a bit and substitute it with
fruit or juices with little sugar,
but I don't think I'm at risk of
developing insulin resistance
because I get about 9 hrs of
exercise every week

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.

Eating at Kfc when out with mates
cuz you don't want to eat a salad in
front of them.

b) Explain why the scientific evidence might be ignored.

- Don't want to look like a fool in front of your friends
- It's an easier option to choose
- You're seen as "cool" cuz you eat whatever you want.

A 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 the descriptors below. Also makes a valid judgment of the fairness of the investigation but does not fully justify why an uncontrolled variable was ignored. The explanation of how volume was controlled shows a misconception.

Demonstrates almost all elements of the descriptors up to and including this level. Does not fully describe the functions of each specified part of the digestive system.

Demonstrates almost all elements of the descriptors up to and including this level. The explanation for the choice of graph in Question 13 involves a misconception.

Demonstrates all descriptors up to and including this level.

Overall grade

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

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)

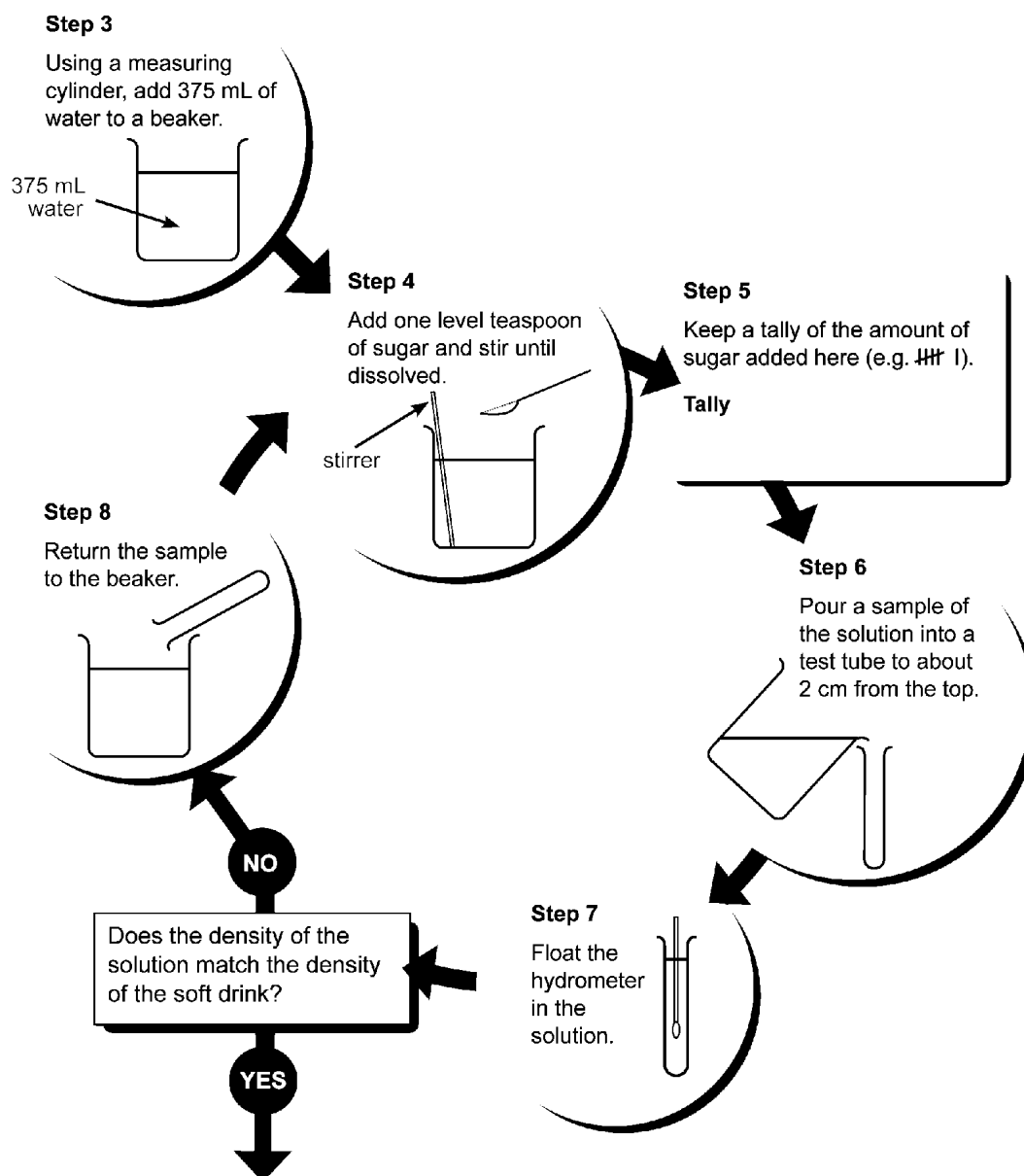
fruit fruit juice soft drinks cakes and desserts lollies the sugar bowl

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

I don't think it effects myself because I get a lot of physical activity (dancing) and try to not have too much sugar

A 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 drink7..... level teaspoons



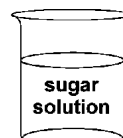
Stop here: Discussion point.

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	were to be filled 2cm from the top
Presence of bubbles	Yes	no bubbles were present
Presence of substances other than sugar	No	Because coke is made up of many different substances besides sugar, but probably only in tiny amounts.
Other:		
Other: amount of sugar added	Yes	had to use a paddle-pop stick to assure that all sugar tbsp were levelled

A 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.

I believe that the investigation was a suitable method as, shown on table 1, follows the criteria of a fair test; all variables were controlled.

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	40g	10
My measurement (from page 5)		7

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

Not very accurate we were 3 teaspoons below the actual amount.

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 used may not have been a standard teaspoon.

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

I don't think we always checked that the sugar was all dissolved before we measured the density.



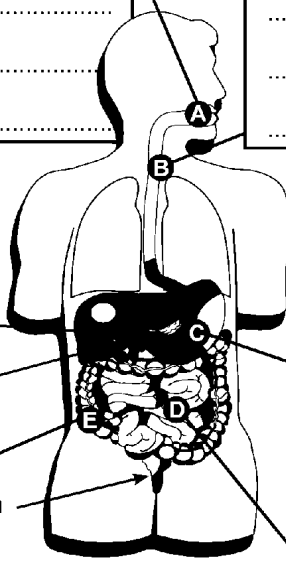
Stop here: Wait for your teacher's directions.

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
breaks down the food by chewing

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

C stomach
stores food and breaks it down with acid

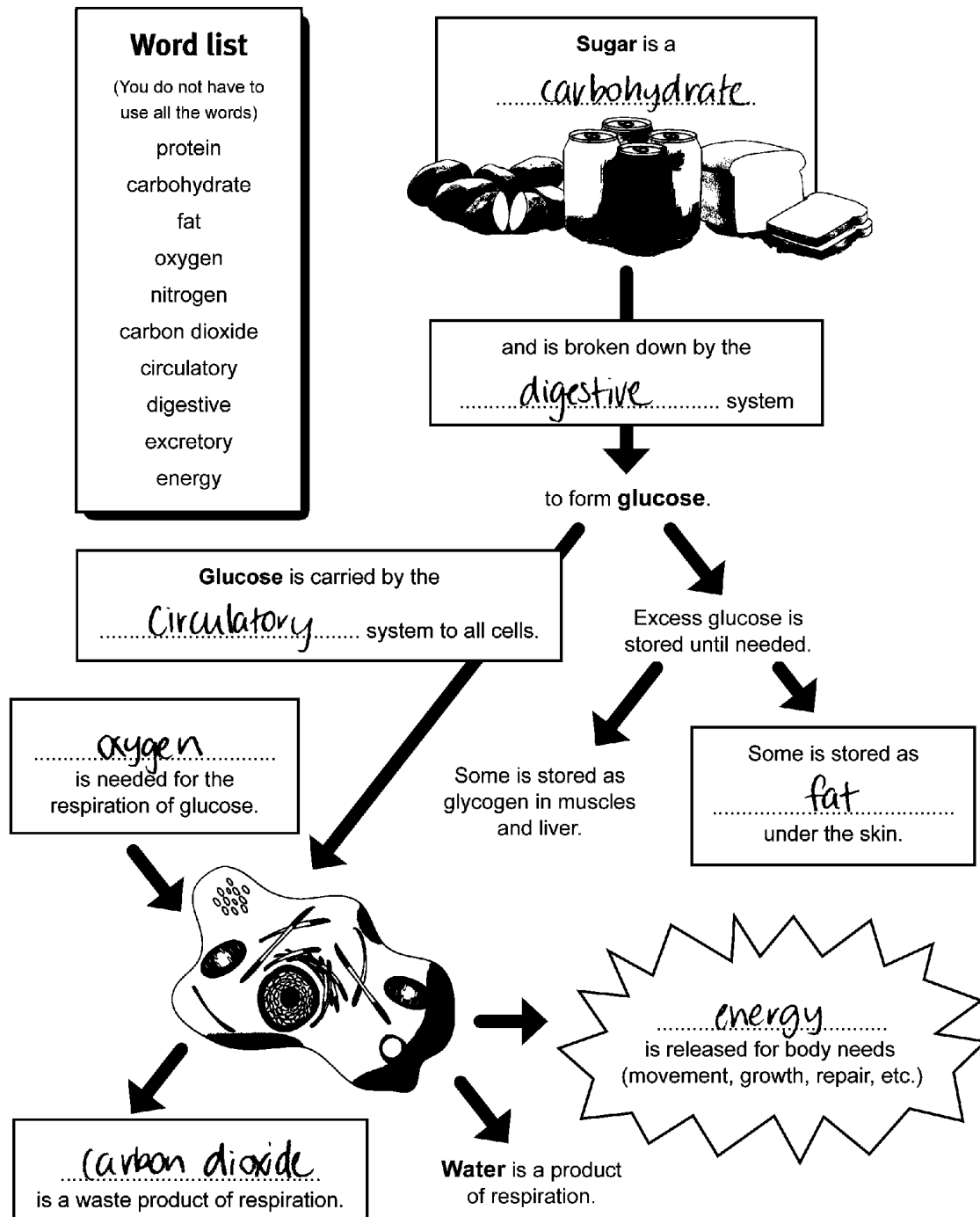
D small intestine
digested food is absorbed into the blood.

E Large Intestine
carries waste fibre to the rectum

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.



A 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 = 38.69 g

Energy in 375 mL of soft drink = 657.73 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: dancing

Intensity: aerobic

I will need to do approximately 27.4 minutes of exercise.

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

The sugar [energy] that is not used will turn
into body 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.

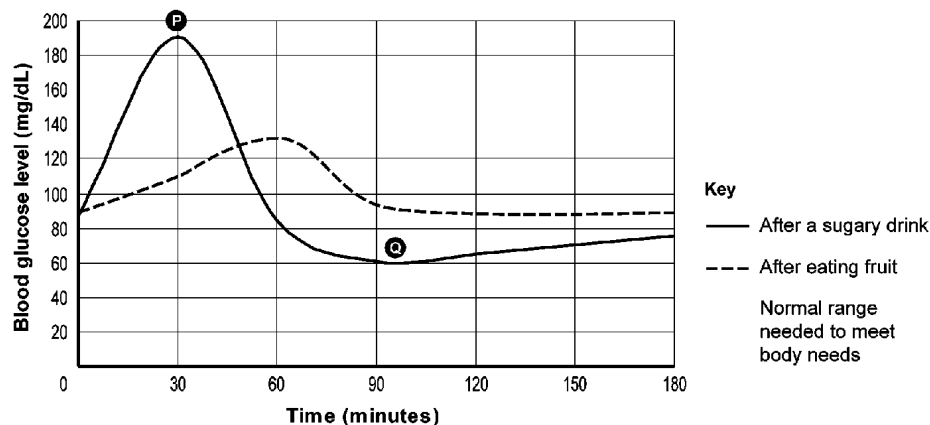
Glycaemic index (GI)

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 eating fruit, the body will experience a minor increase in blood glucose before returning to the previous level after 90 mins.

With a sugary drink, there is a major increase in blood glucose in the first 30 mins before dropping below the normal level, then slowly rising to normal.

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 don't have enough glucose in my blood to meet my body needs.

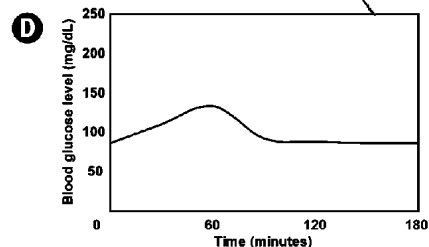
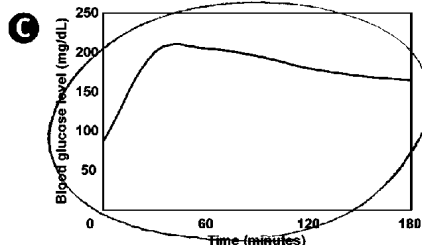
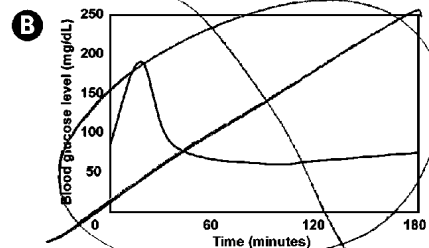
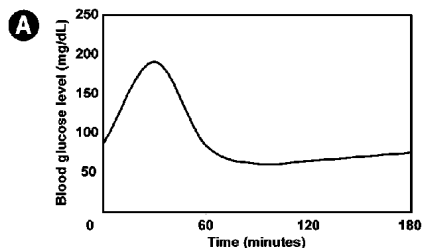
A Sample: Response 2

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, once the body experiences the energy, the insulin is released and the excess glucose is stored until needed.

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

As the body is unable to absorb the glucose, the body will constantly feel 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 agree that too much sugar consumption affects your health. This is because when too much is consumed and not enough exercise is done, the sugar turns to fat.

A 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.

To reduce my risk of developing insulin resistance I would make sure to be consuming all types of low G.I. food (pasta, vegetables, fruit) in my diet, not just sugar.

I already participate in approximately 17 hours of dance a week, and as it is aerobic I would be using 24 kJ per minute. As regular exercise and weight control can reduce the risk of insulin resistance I will keep eating healthy and exercising.

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.

Some people choose to smoke even though they know it is unhealthy.

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

Many teenagers feel the need to rebel and see smoking as a way of doing this. Others see these 'rebels' as cool and feel they need to smoke to be considered cool too.