



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

E 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.
			<div>A</div> <div>B</div> <div>C</div> <div>D</div> <div>E</div>
Provides a valid explanation for a judgment about the control of a variable.	Correctly names the parts of the digestive system and makes a correct word choice.	Provides a partial description of changes to blood glucose levels.	Makes one recommendation to minimise health risk.

Overall grade

This response demonstrates a limited level of achievement in Knowledge and understanding and a very limited level of achievement in Investigating and Reflecting. The focus of this QCAT is on Investigating and Reflecting. On balance, it is judged to be an E.

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)

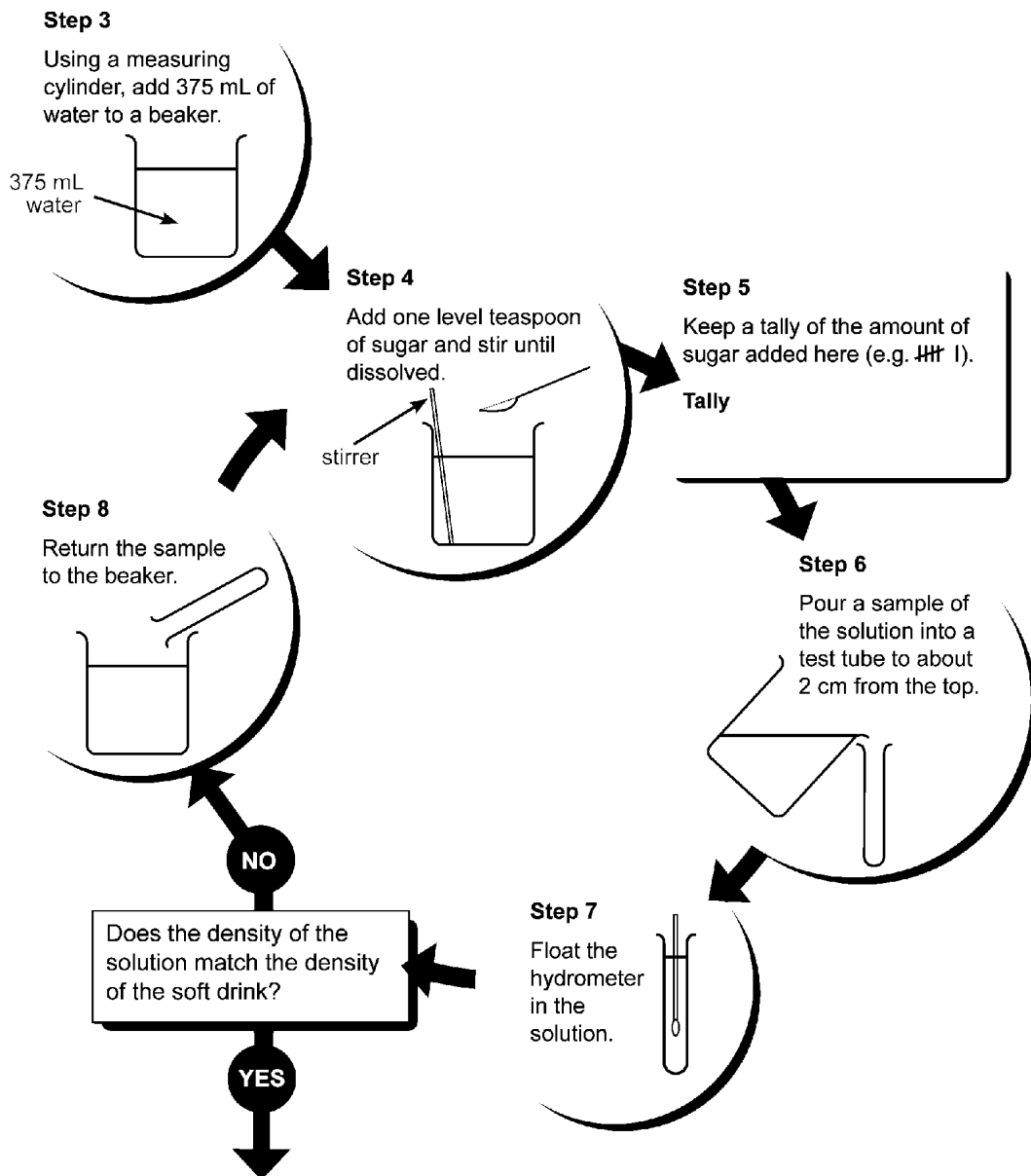
fruit fruit juice soft drinks cakes and desserts lollies the sugar bowl

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

I Don't know, I think I have too much
sugar.

E 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

10 level teaspoons



Stop here: Discussion point.

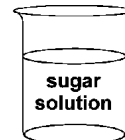


Analysing the investigation



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	The tubes were marked where to fill tube to.
Presence of bubbles	Yes	The water didn't have bubbles
Presence of substances other than sugar	No	
Other:		
Other:		

E 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

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		36
My measurement (from page 5)		10

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

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

- a) One reason relating to the method:

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

We weren't very careful



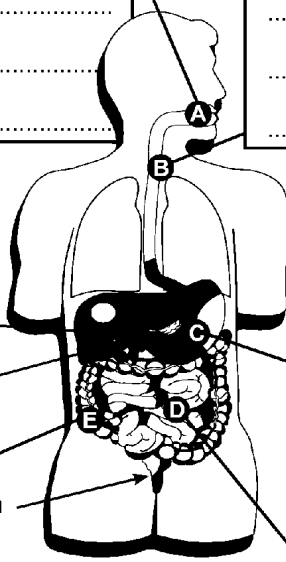
Stop here: Wait for your teacher's directions.

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

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

C stomach

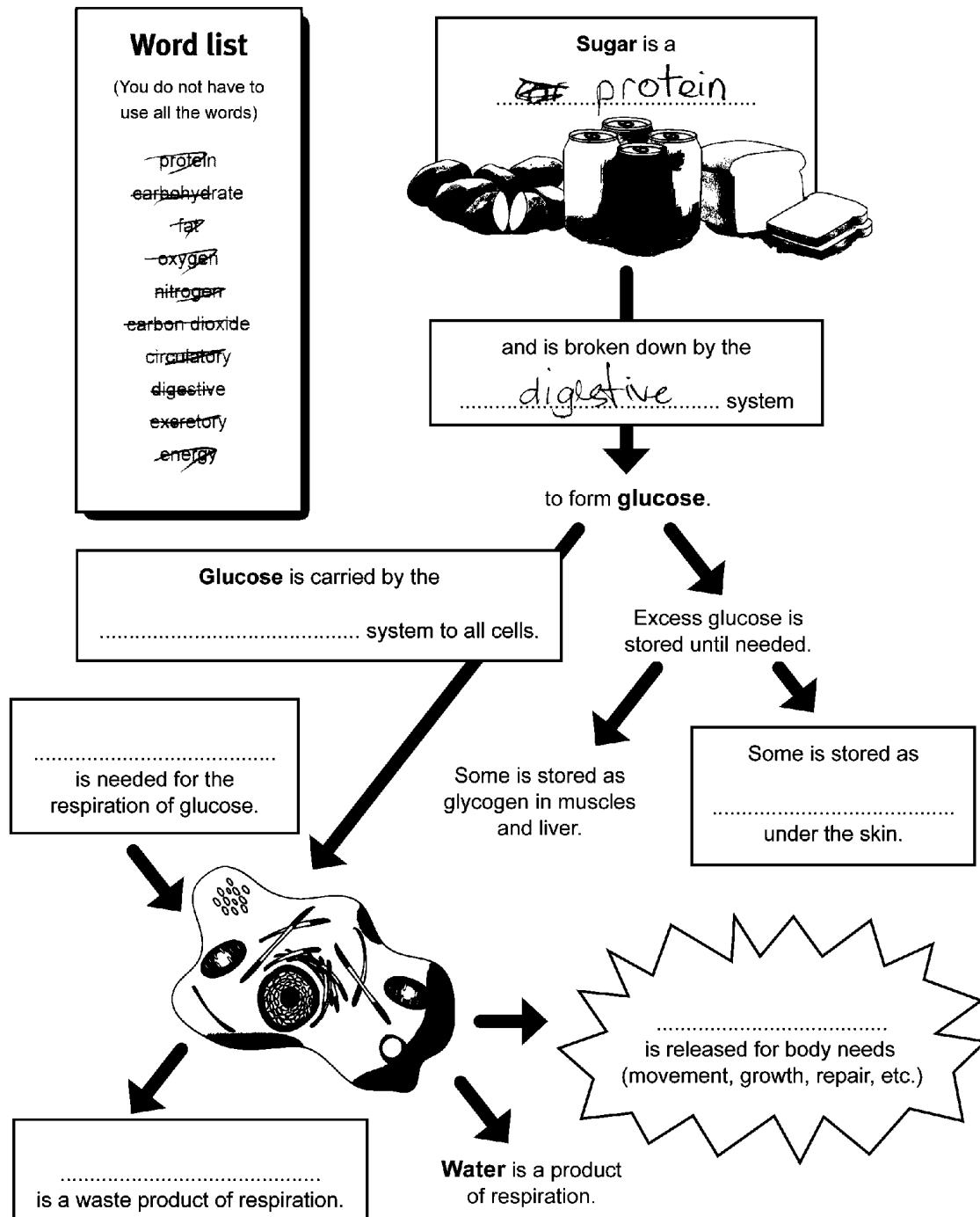
D small intestine

E Large intestine

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.



E 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 = 36gm

Energy in 375 mL of soft drink =

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

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

Activity: Basketball

Intensity: Competition

I will need to do approximately minutes of exercise.

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

It is wasted



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.

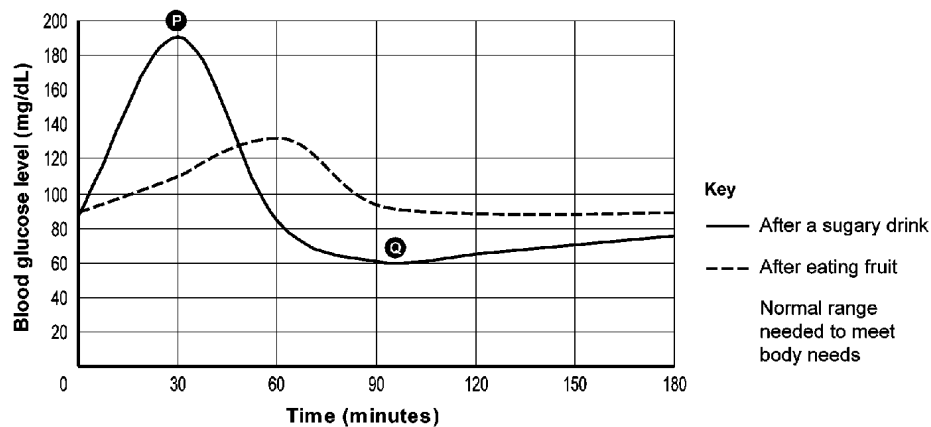
Glycaemic index (GI)

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.

The fruit is gradual

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 sugar would be low

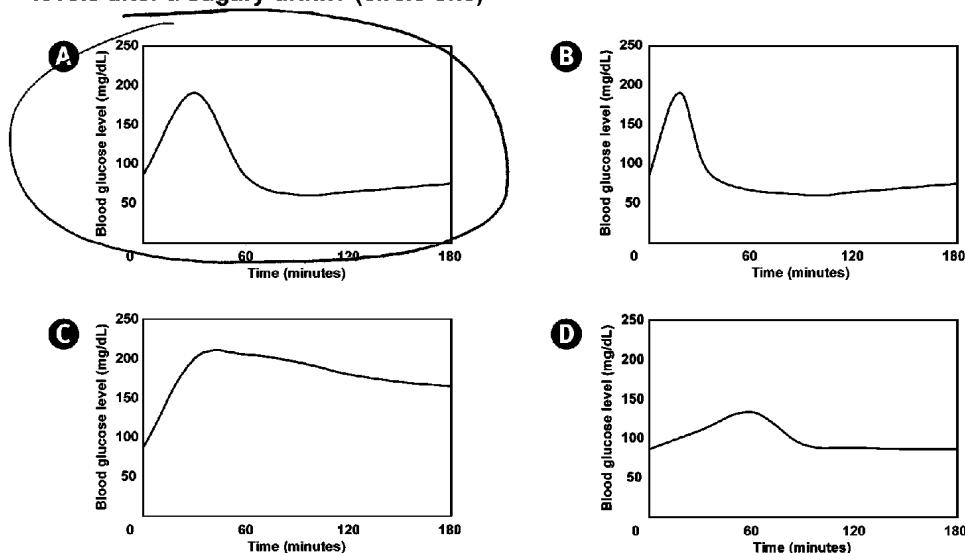
E Sample: Response 1

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.

It looks the most like the graph 1.

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

tiredness would be a symptom of insulin resistance because you don't eat when your asleep.



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	36	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 really know

E 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.

Drink less coke

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.

b) Explain why the scientific evidence might be ignored.

E 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.
			<div>A</div> <div>B</div> <div>C</div> <div>D</div> <div>E</div>
Makes judgments about control of variables and provides a superficial explanation about the fairness of the investigation.	Correctly names some parts of the digestive system and makes some correct word choices.	Attempts calculations and explanations show conceptual errors.	Gives an example of a personal health choice.

Overall grade

This response demonstrates a limited level of achievement in Knowledge and understanding and a very limited level of achievement in Investigating and Reflecting. The focus of this QCAT is on Investigating and Reflecting. On balance, it is judged to be an E.

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 so

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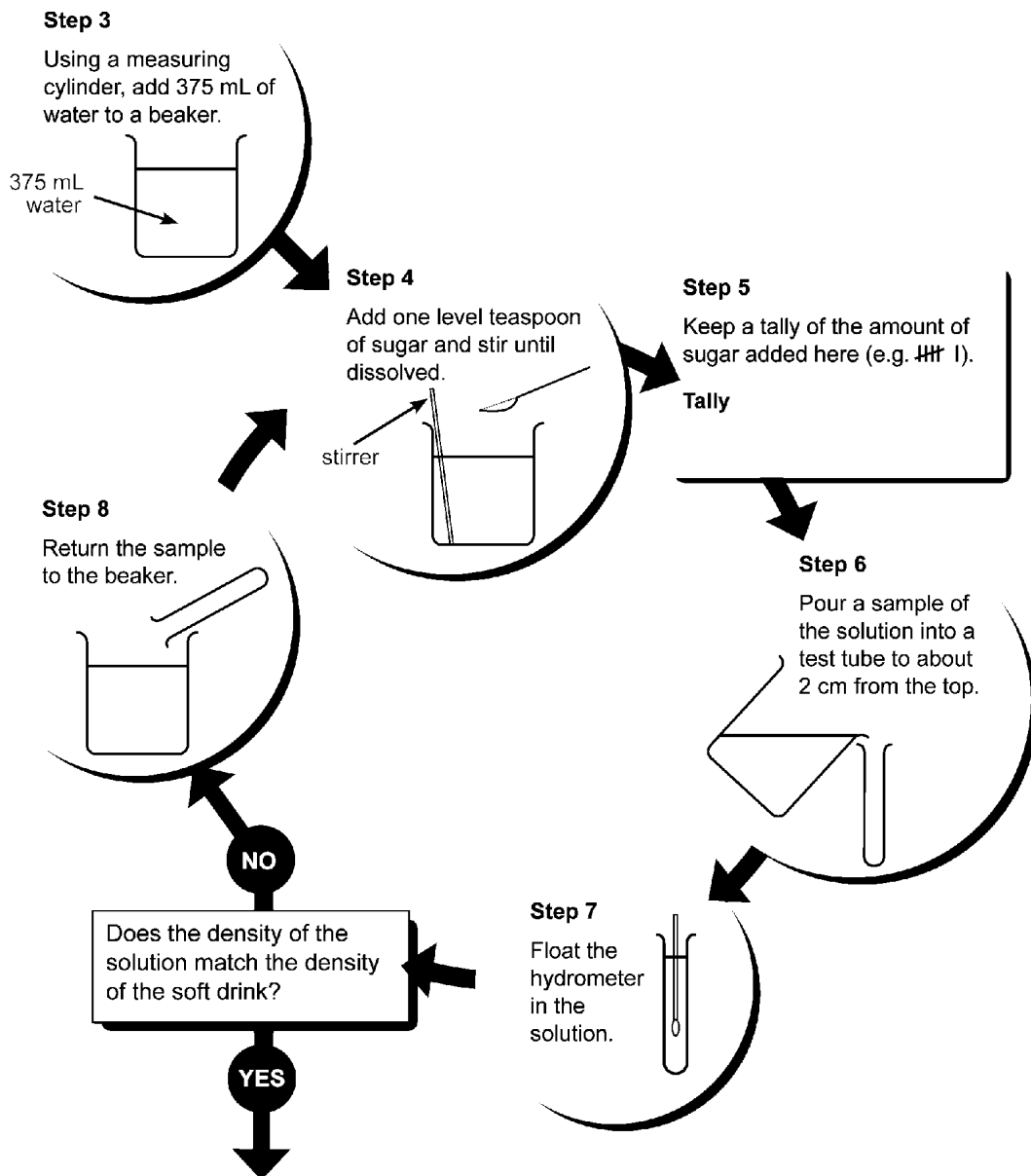
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E Sample: Response 2

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 12 level teaspoons



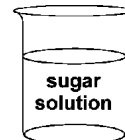
Stop here: Discussion point.

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	
Presence of bubbles	yes	
Presence of substances other than sugar	no	
Other:		
Other:		

E 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 we kept all of the measurements the same.

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 g	10
My measurement (from page 5)		12

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

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

- a) One reason relating to the method:

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

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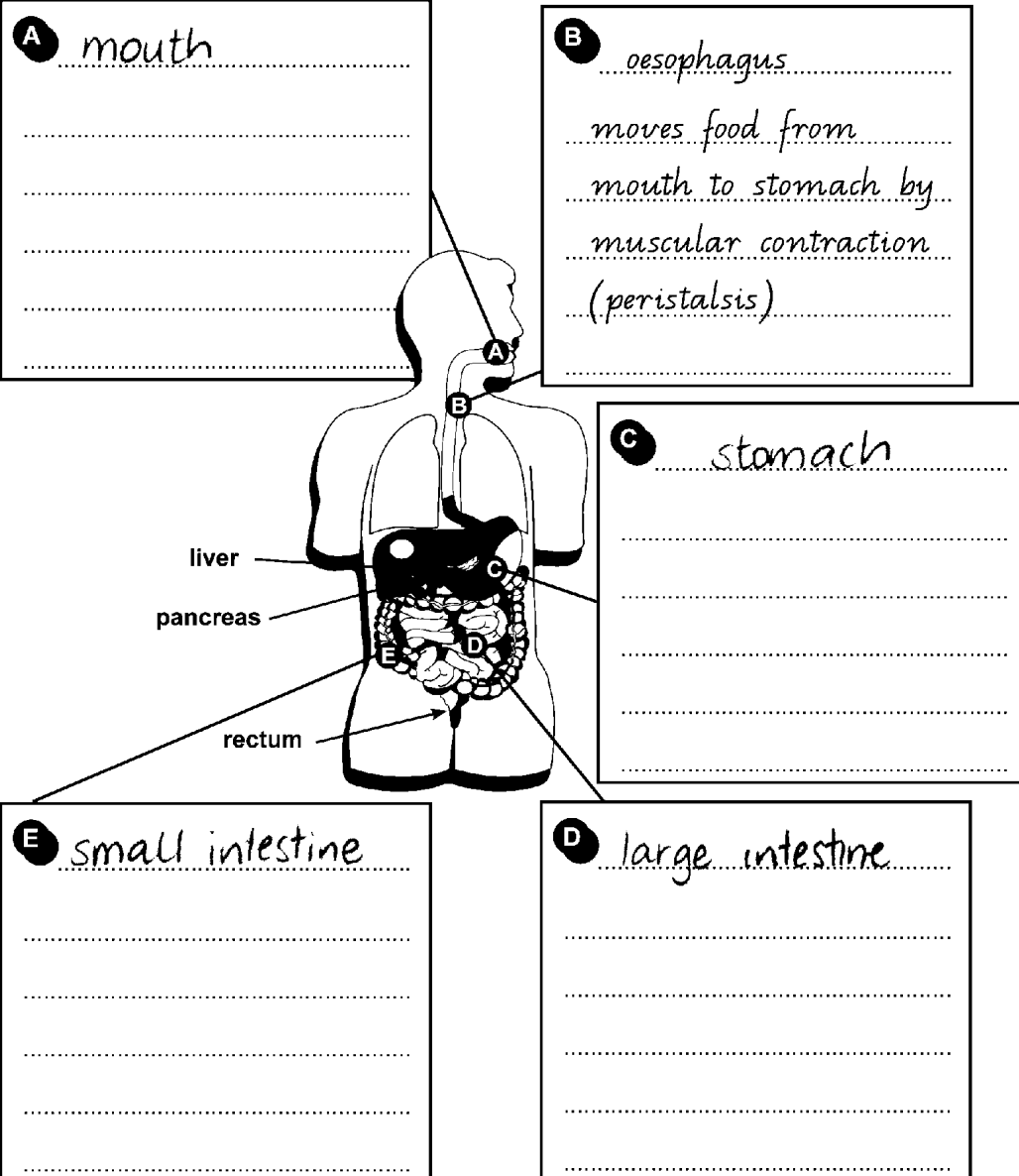
Stop here: Wait for your teacher's directions.

Sugar and your body

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

What do you know about your digestive system?

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



The diagram shows a human silhouette with the digestive system highlighted. Labels A through E point to specific organs: A (mouth), B (oesophagus), C (stomach), D (large intestine), and E (small intestine). A central anatomical drawing shows the liver, pancreas, and rectum. Handwritten labels and descriptions are provided for each part.

A mouth

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

C stomach

D large intestine

E small intestine

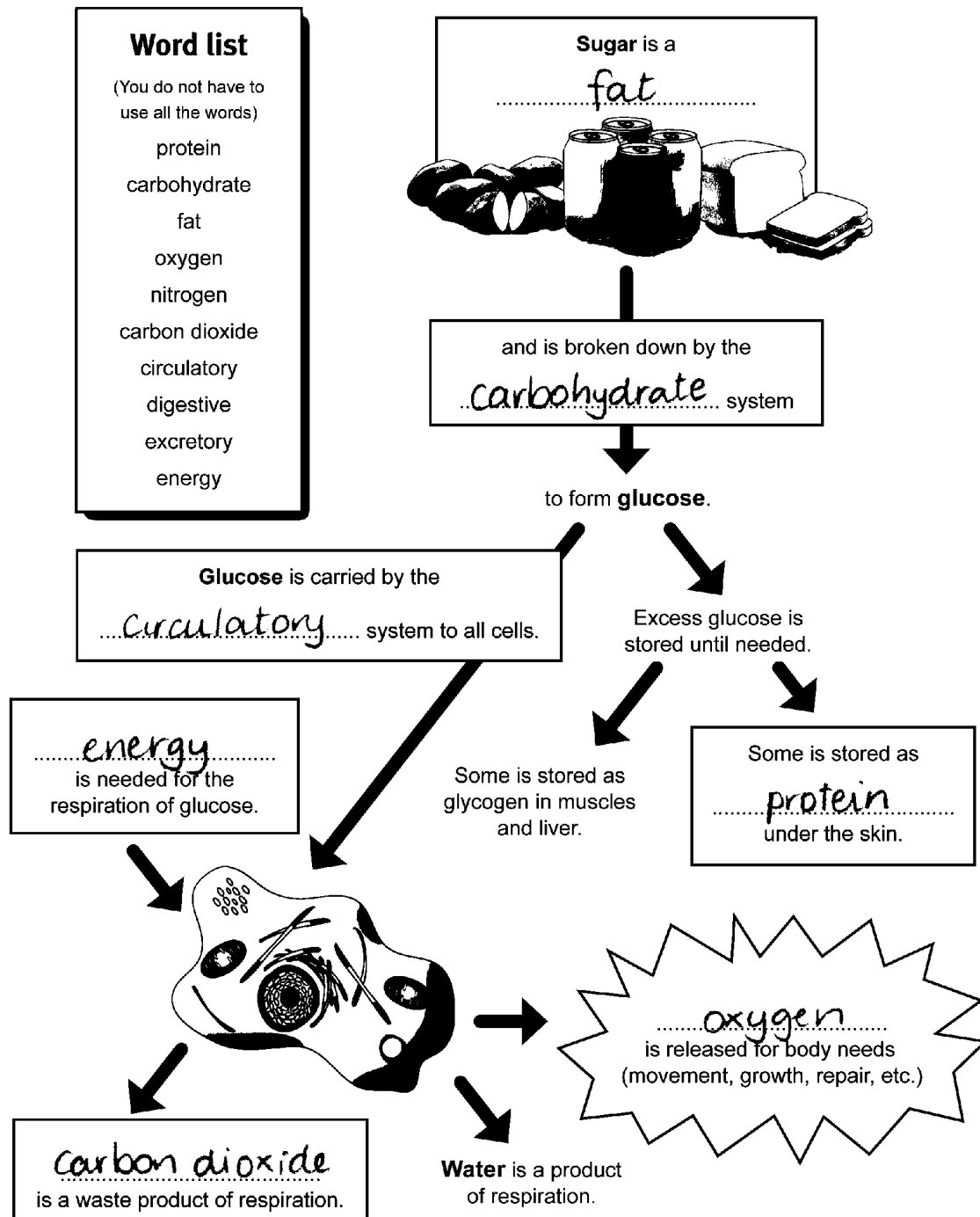
liver

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 = 40g

$$40 \div 17$$

Energy in 375 mL of soft drink = 2.352941176 kg

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 minutes of exercise.

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

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Stop here: Wait for your teacher's directions.

How does a sugary drink affect your body?

Use the information below to answer Questions 10 and 11.

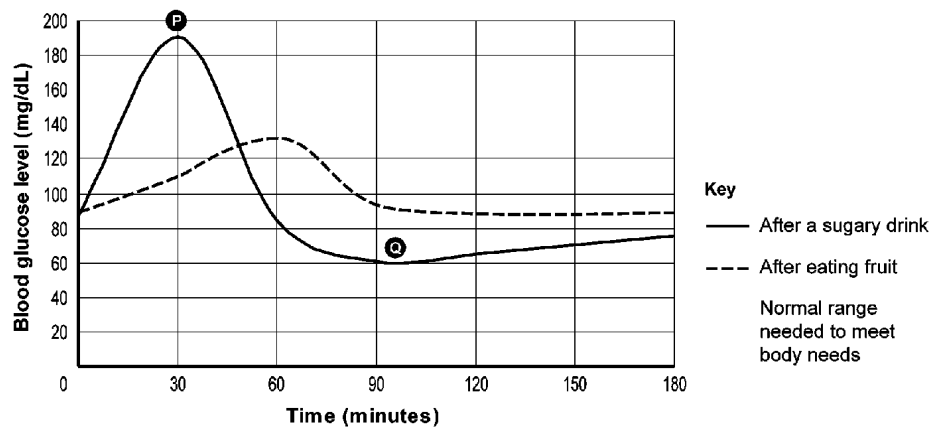
Glycaemic index (GI)

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.glycaemicindex.com>.

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

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11. Complete the following statement.

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

because I feel tired because its used so much energy that now it has to shut down

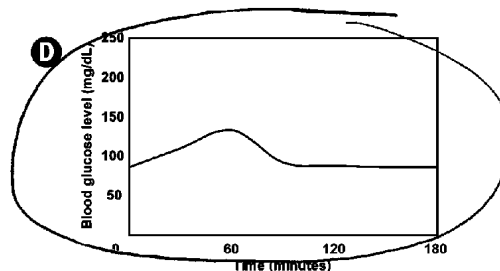
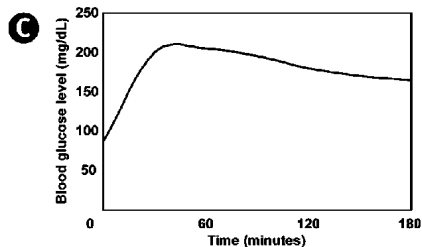
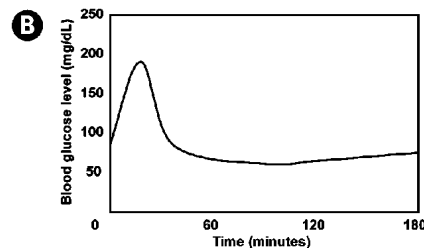
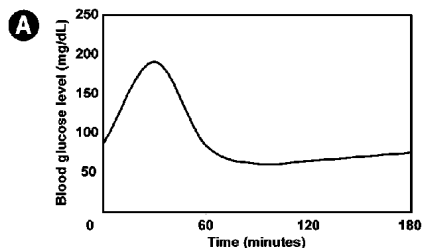
E Sample: Response 2

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 sugar level stays low.

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

because your body shuts down.



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.

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E 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.

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Making choices

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

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

I like junk food.

b) Explain why the scientific evidence might be ignored.

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