

# Diabetes Mellitus

## Teacher Presentation Slides

### Learning Objective 5

Te Maki Toto Vene (T2): E Manamanata no Toku Iti Tangata

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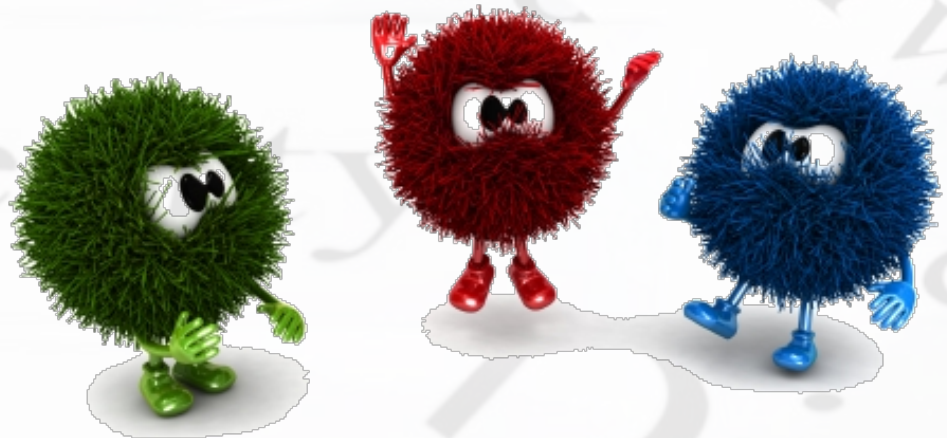
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[www.lenscience.auckland.ac.nz](http://www.lenscience.auckland.ac.nz)



Role  
play

# What is insulin resistance?



# Insulin resistance leads to type 2 diabetes

Type 2  
diabetes


Insulin  
resistance



# How do people develop insulin resistance?

SLR 10A

3



Role  
play

The Play

**Act 1:** Glucose travels from the small intestine in the bloodstream to a muscle cell. Then, with the help of insulin, moves into the cell.

**Act 2:** Glucose travels to the muscle cell but it can't get in!



Cell membrane

The Roles



Insulin



Pancreas




Narrator



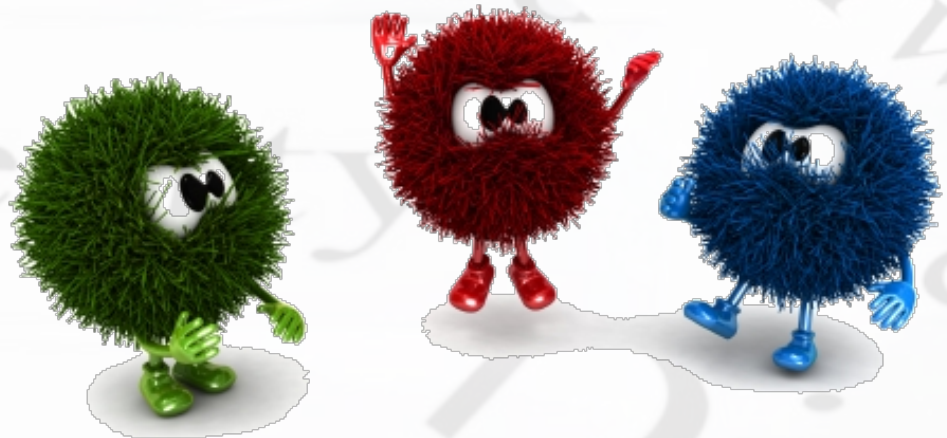
Glucose

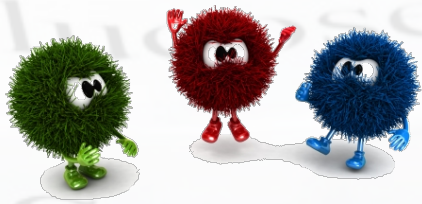




Writing  
task

# What is insulin resistance?





## Writing Task

SLR 10B


2

To write about insulin resistance, you need to find out important information first ...

SLR 10B Insulin Resistance: Extended Writing Task 1 of 3


Instructions


Insulin resistance leads to type 2 diabetes  
Write a series of short paragraphs that describe what insulin resistance is and explain the effect of insulin resistance on the control of blood glucose in a person with type 2 diabetes.

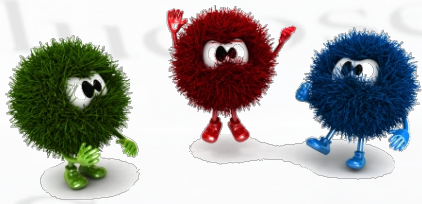


Use the following resources to prepare your ideas before you start writing:

1. SPS: Insulin Resistance  
Read through this resource to find out important information about insulin resistance.
2. SLR 9: Glucose: A Journey From Plate to Cell  
Review your completed work from this activity and use it to help you with this task.
3. Insulin Resistance: Comparison Table  
Using the information from 1 and 2 above, complete the table to compare and contrast the response of a healthy individual to glucose entering the blood stream with that of someone who has insulin resistance.
4. Insulin Resistance: Writing Frame
  - a. Referring to the information from 1, 2 and 3 above, use the writing frame to develop your paragraphs.
  - b. Review your paragraphs, reading them aloud to yourself and/or to a partner.
  - c. Edit your paragraphs in response to feedback you receive.
  - d. When you are satisfied that your writing is complete and of a high standard, submit it to your teacher for evaluation.

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# Writing Task

SLR 10B

3

Use these resources to help you find out about insulin resistance.


1. Student Presentation Slides: Insulin Resistance
2. SLR 9 – Glucose: A Journey From Plate to Cell



SPS IR: Insulin Resistance

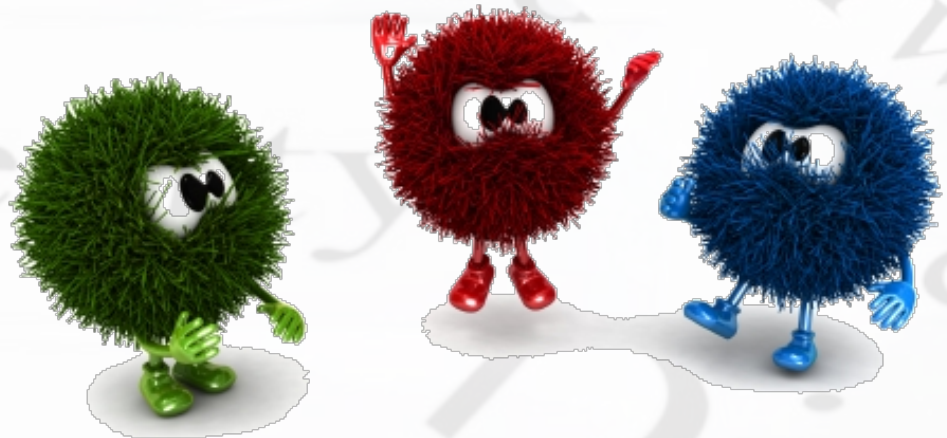
Now work on the writing frames to develop your paragraphs.

When your writing is completed, you need to:  
– review/peer review  
– edit your work



Practical  
task

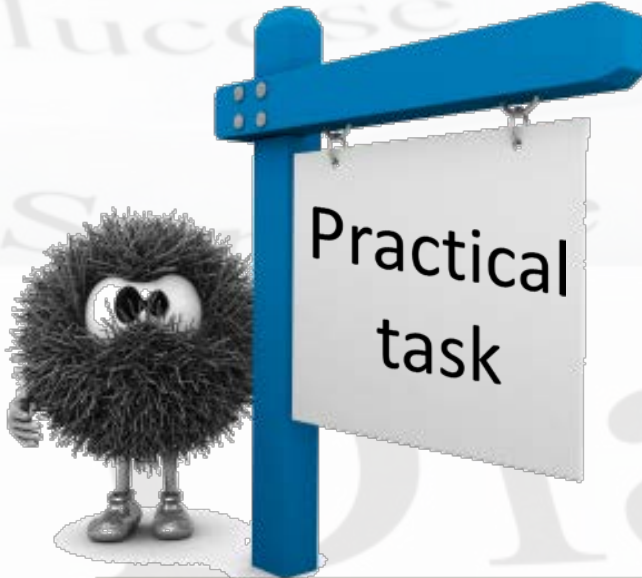
# Testing urine for glucose





## Practical Task

2



## Testing urine for glucose

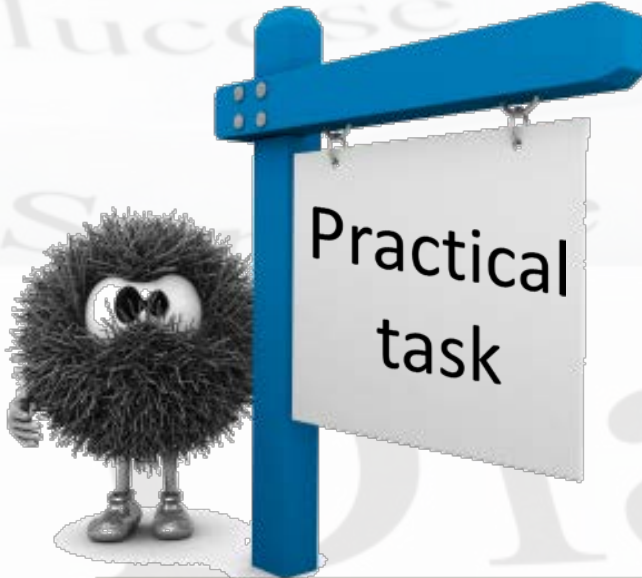
Ancient Egyptians first recognised the disease now known as *diabetes mellitus*.

The name relates to 'sweet tasting urine'.

Physicians in medieval times would have tasted the urine of patients to detect *diabetes mellitus*!

## Practical Task

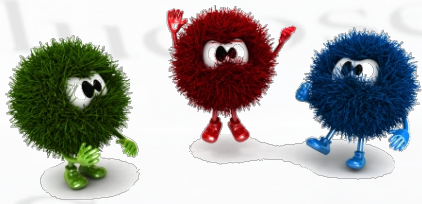
3



## Testing urine for glucose

Since then, scientists' understanding of this disease has improved and doctors can diagnose diabetes by testing for glucose in the urine or blood.

You will be carrying out tests on urine samples to identify patients who have glucose in their urine.



# Practical Task

SLR 11

4

## Read the sheet SLR 11

Your task: urine samples have been obtained from three 'patients' who may have the disease diabetes.

Your task is to analyse each sample, record your observations and give a preliminary diagnosis for each patient.

SLR 11

Testing Urine for Glucose

1 of 2

### Background Information

Sugar (glucose) is not normally found in the urine. However, when blood glucose levels rise above a safe level (i.e. above 180 mg per 100 mL), the kidneys often release some of the excess glucose from the blood into the urine. This occurs when people have diabetes.

In the past, doctors tasted the urine of patients to test for diabetes, as 'sweet tasting urine' has high amounts of glucose present. In more modern times, doctors use blood tests. Urine testing gives a preliminary, but not final diagnosis.

**Urine testing includes:**

1. Testing for the presence of glucose
2. Smelling the urine to detect any odour
3. Testing the pH.

- The Benedict's test is used to test for the presence of glucose. A small sample of urine is mixed with Benedict's solution and heated. If glucose is present, a chemical reaction will occur. A colour change provides evidence of this chemical reaction. The different colours that the mixture can change to indicate how much glucose is in the urine.

Blue

Green

Yellow

Orange

Brick red

No glucoseLittle glucoseMost glucose

- The odour of normal urine varies between people and is affected by a number of factors, such as diet. Abnormal smells include 'fruity', like acetone or fingernail polish remover, putrid (faecal smelling), or like ammonia.
- The pH of normal urine is between 5 and 7.

**Your Task:**

Urine samples have been obtained from three 'patients' who may have the disease diabetes.

Your task is to analyse each sample, record your observations and give a preliminary diagnosis for each patient.

**Aim:** To analyse samples of urine to give a preliminary diagnosis for the possibility of diabetes.

**Equipment:** Each group will need:

- 30mL of Benedict's solution
- 1 x 200mL beaker
- 200mL of boiling water
- 4 plastic droppers
- Safety glasses
- 1 test tube rack and 7 test tubes

**SAFETY NOTE:**

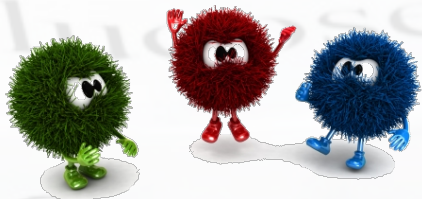
You should wear eye protection during this practical.

- 1 pen for labelling test tubes and recording results
- 1 spotting tile
- 5 mL of universal indicator solution or 3 strips of pH test paper
- universal indicator chart.

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## Practical Task

SLR 11

5

### Record your results

#### Discussion questions:

1. What does a positive test for glucose indicate?
2. If a patient has glucose in their urine, can you explain how this has happened?
3. What advice would you give to a patient with an abnormal glucose urine test?

#### SLR 11 Testing Urine for Glucose

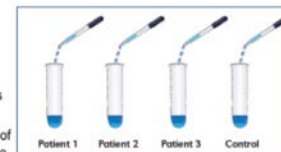
2 of 2

##### Method:

1. Collect 10mL of each urine sample provided and put into 3 separate test tubes.
  2. Label each tube clearly with the patient number.
  3. Carry out the following tests for each sample collected:
    - **Smell/odour:** Wave your hand across the top of the test tube towards your nose. Keep your face away from the test tube and DO NOT put your nose right over the sample. Note down your observation in the chart below.
    - **pH:** Place a strip of universal indicator paper in each of the samples, compare the colours against a universal indicator chart and record your results on the table below
- OR
- Using a pipette, place 3 drops of each of the samples into a clean spotting tile and one drop of universal indicator into each sample. Compare the colours against a universal indicator chart and record the result on the table below.

##### Glucose:

1. Using a clean pipette, add 5 mL of Benedict's solution (blue colour) to the 4 remaining test tubes.
2. Label three of the test tubes with each patient number and the fourth test tube as your control.
3. Using a clean pipette each time, add 2mL of the urine samples to their labelled test tube.
4. Place the four test tubes in a 200mL beaker of boiling water (or use a water bath). Watch for a colour change. Note, it may take about 10 minutes to see a colour change.
5. Record the colour change on the table below for the sample from each patient.



	Patient 1	Patient 2	Patient 3
Smell/ odour			
pH			
Glucose			
Result: abnormal or normal?			

##### Discussion questions:

What does a positive test for glucose indicate?

If a patient has glucose in their urine, can you explain how this has happened?

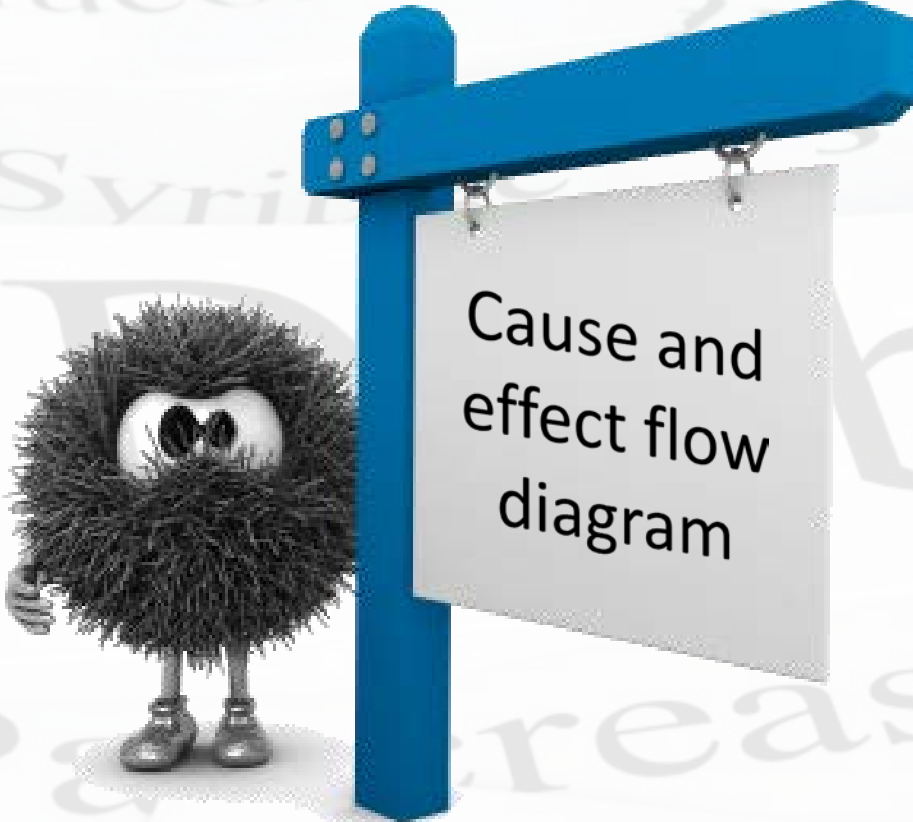
What advice would you give to a patient with an abnormal glucose urine test?



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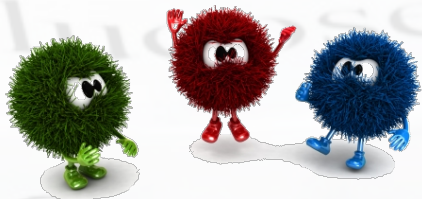




Cause and  
effect flow  
diagram

# Symptoms of diabetes



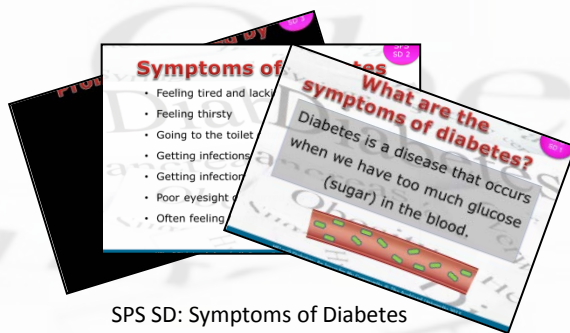


# Cause and Effect

SLR 12A

2

View the Student Presentation Slides: Symptoms of Diabetes to help you complete this Student Learning Resource.



SPS SD: Symptoms of Diabetes

**SLR 12A Cause and Effect Flow Diagram** 1 of 1

**Instructions**

1. View the Student Presentation Slides 'Symptoms of Diabetes' (SPS SD).
2. In the first box, describe what type 2 diabetes is (in 10 words or less).
3. In the next 6 boxes below, identify and describe the various effects that type 2 diabetes has on different parts of the body.

**The biological cause**

Type 2 diabetes

↓

*The effects of type 2 diabetes on the body*

**POSSIBLE EFFECTS**

←

→

←

→

**POSSIBLE EFFECTS**

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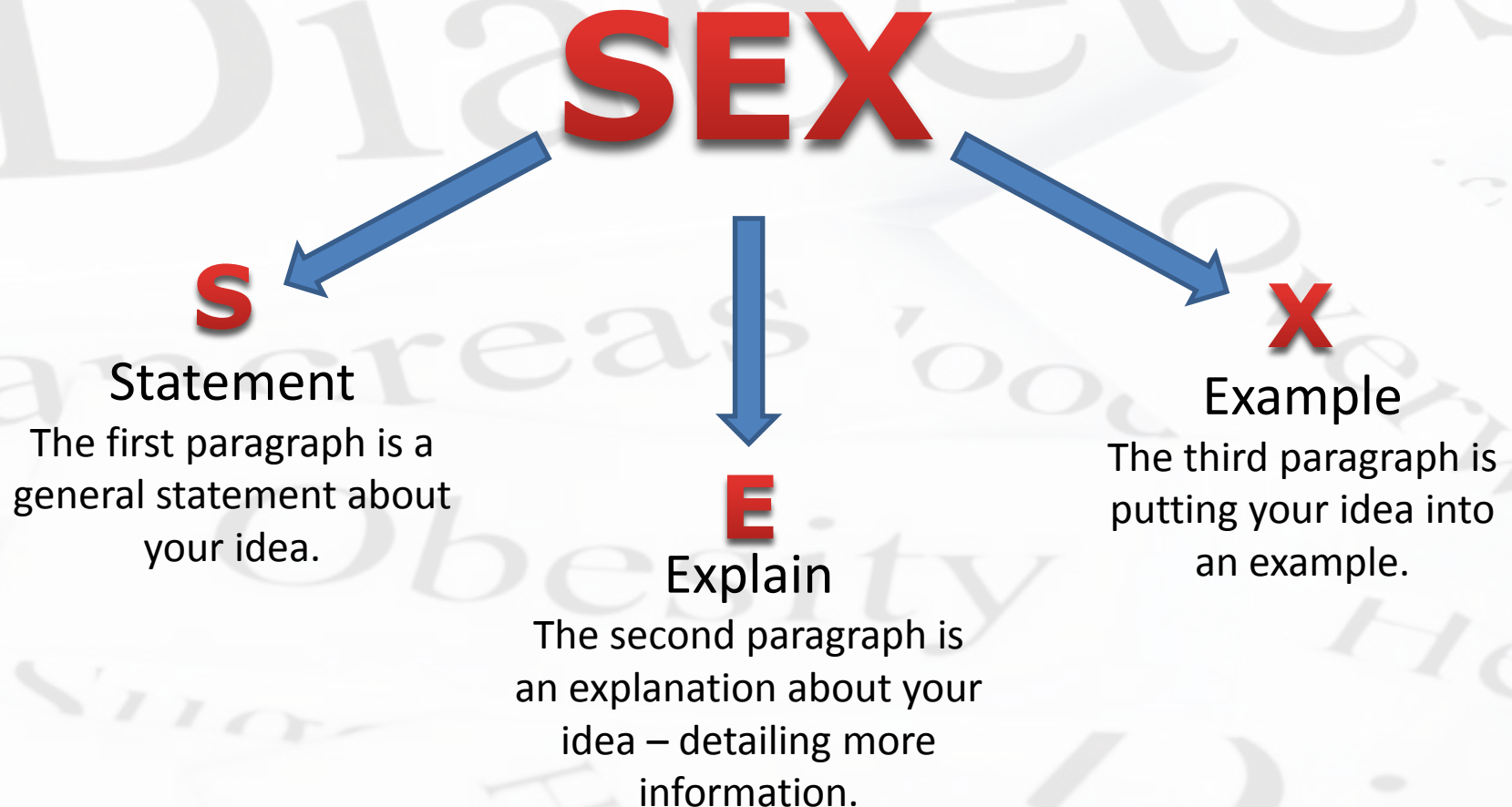


Writing  
paragraphs

# Symptoms of diabetes



Use the writing strategy 'SEX' to help you organise your ideas into paragraphs.





# Paragraph Writing

SLR 12B

3

**S**

**Statement**

The first paragraph is a general statement about your idea.

**E**

**Explain**

The second paragraph is an explanation about your idea – detailing more information.

**X**

**Example**

The third paragraph is putting your idea into an example.

Using the **SEX** writing strategy, write 3 paragraphs to describe the effects that type 2 diabetes has on the body of a person with diabetes, and explain why these occur.

## Key words

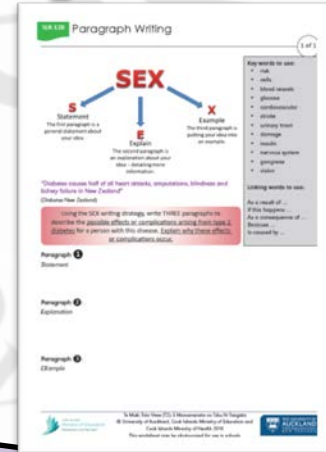
risk	urinary tract
cells	damage
blood vessels	insulin
glucose	nervous system
cardiovascular	gangrene
stroke	vision

## Linking words

As a result of ...  
If this happens ...  
As a consequence of ...  
Because ...  
Is caused by ...

## “Diabetes causes half of all of the heart attacks, amputations, blindness and kidney failure in New Zealand” (Diabetes New Zealand)

Using the **SEX** writing strategy, write 3 paragraphs to describe the effects that type 2 diabetes has on the body of a person with diabetes, and explain why these occur.



### Key words

risk	urinary tract
cells	damage
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### Linking words

As a result of ...  
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