# Obesity & BMI

1. By calculating body mass index (BMI), it can be determined whether an individual is obes
The table contains information about four individuals.

| Individual | Height (m) | Mass (kg) |
|---|---|---|
| 1 | 1·60 | 90 |
| 2 | 2·10 | 130 |
| 3 | 1·80 | 100 |
| 4 | 1·30 | 56 |

Which of these individuals would be classified as obese?

A 2 only
B 2 and 3 only
C 1, 3 and 4 only
D 1, 2, 3 and 4

2. A person is 170 cm tall and weighs 70 kg.
They have a body mass index (BMI) of

A 2·4
B 24·2
C 28·8
D 41·2.

3.

| *Patient* | *Height* (m) | *Starting weight* (kg) | *Starting BMI* | *Final Weight* (kg) | *Final BMI* |
|---|---|---|---|---|---|
| P | 1·74 | 92 | 30·5 | 82 | 27·2 |
| Q | 1·68 | 98 | 34·8 | 90 | 32·1 |
| R | 1·81 | 104 | 31·8 | 97 | 29·7 |
| S | 1·89 | 121 | 33·9 | 113 | 31·4 |
| T | 1·90 | 100 | 32·3 | 94 | |

(a) (i) Calculate the final BMI of patient T. **1**

Final BMI = _____

(ii) State why patient Q was still classed as obese after 12 weeks. **1**

_____

_____

b) Explain why all the patients were advised to exercise regularly to increase their weight loss. **1**

_____

_____

_____

# Obesity & BMI

4 a) State **one** piece of advice that an obese individual would be given to adapt their diet or lifestyle in order to avoid long-term health problems. **1**

_____

_____

b) Explain how BMI is calculated. **1**

_____

_____

c) Rugby players may have a BMI which indicates that they are obese.

Suggest why a BMI reading may not be a reliable indicator of obesity in rugby players. **1**

_____

_____

_____

d) Suggest reasons why the percentage of obese children increased between the ages of 2 and 15. **1**

_____

_____

# Obesity & BMI Answers

1. C

2. B

3a (i) 26

(ii) BMI greater than 30

b) Exercise increases energy expenditure/increases respiration rate/uses up (stored) fats.

4a) increase exercise or reduce fat/sugar in diet

b) Weight divided by height squared.

c) they have a high muscle mass

d) as children get older they choose what to eat/do less exercise

# Blood Glucose Control & Diabetes

1. The flow chart below shows how the concentration of glucose in the blood is regulated.

Blood glucose concentration rises → Pancreas secretes less of compound X and more of compound Y → Liver converts glucose to insoluble carbohydrate → Blood glucose concentration falls

Which line identifies correctly the compounds X and Y?

| | *Compound X* | *Compound Y* |
|---|---|---|
| A | glycogen | insulin |
| B | insulin | glycogen |
| C | glucagon | insulin |
| D | insulin | glucagon |

2. Which of the following statements about diabetes is correct?

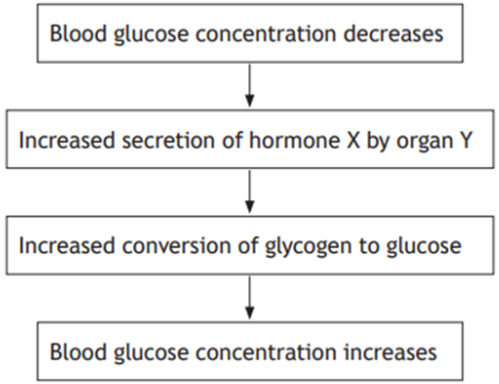
A Type 2 diabetes typically develops in overweight individuals during childhood.

B Type 1 diabetes usually develops in childhood and can be treated by dietary management.

C Individuals with Type 1 diabetes are unable to produce insulin and have no insulin receptors within their liver.

D Individuals with Type 2 diabetes are typically overweight and have liver cells which are less sensitive to insulin.

3. The flow diagram shows how the concentration of glucose in the blood is controlled during exercise.




Which row in the table identifies hormone X and organ Y?

| | *Hormone X* | *Organ Y* |
|---|---|---|
| A | insulin | liver |
| B | glucagon | liver |
| C | insulin | pancreas |
| D | glucagon | pancreas |

4. Which row in the table describes features typical of type 2 diabetes?

| | **Onset** | **Effect** |
|---|---|---|
| A | Occurs in childhood | Cells unable to produce insulin |
| B | Occurs in childhood | Cells less sensitive to insulin |
| C | Develops later in life | Cells unable to produce insulin |
| D | Develops later in life | Cells less sensitive to insulin |

# Blood Glucose Control & Diabetes

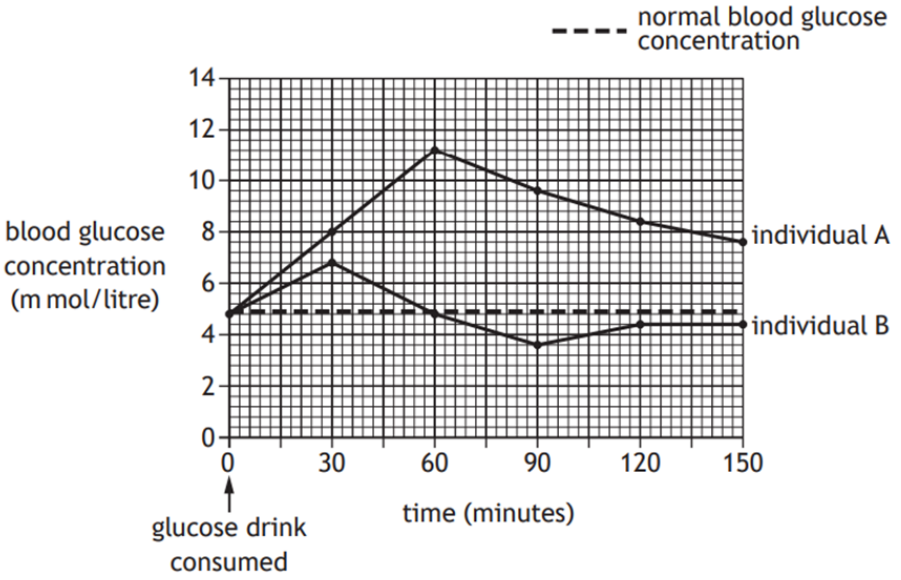
5. Which of the following describes typical features of Type 1 diabetes?

| | *Feature of Type 1 diabetes* | |
|---|---|---|
| A | occurs in childhood | cells unable to produce insulin |
| B | develops later in life | cells unable to produce insulin |
| C | occurs in childhood | cells less sensitive to insulin |
| D | develops later in life | cells less sensitive to insulin |

6. Which line in the table below identifies correctly the effects of Type 1 and Type 2 diabetes?

| | *Type 1 diabetes* | *Type 2 diabetes* |
|---|---|---|
| A | develops mainly in children | develops mainly in adults |
| B | cells become insensitive to insulin | cells remain sensitive to insulin |
| C | no glucose lost in urine | some glucose lost in urine |
| D | reduced insulin production | no insulin production |

1. The graph shows changes in blood glucose concentration in a diabetic and a non-diabetic individual after each had consumed a glucose drink.




Describe how the graph indicates that individual B is **not** a diabetic. **1**

_____

_____

# Blood Glucose Control & Diabetes

2 Research has shown that some individuals who are obese can prevent the onset of type 2 diabetes by reducing their body mass.

(a) Name the test used to diagnose diabetes. **1**

_____

(b) The office worker developed Type 2 diabetes.

Explain why this condition causes the blood glucose concentration to remain high. **2**

_____

_____

_____

_____

(b) Describe how the glucose tolerance test is carried out and how the results can indicate if an individual has diabetes. **3**

_____

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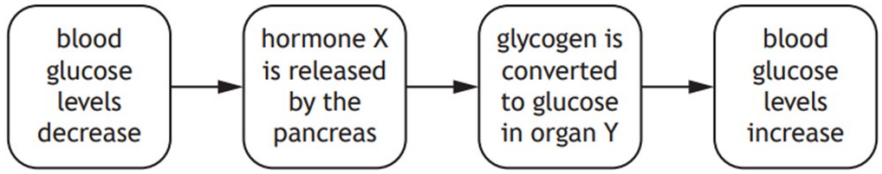
3 The diagram shows part of the hormonal regulation of blood glucose levels.




(a) Name hormone X and organ Y. **2**

Hormone X _____

Organ Y _____

(b) Describe the role of insulin in the development of type 1 and type 2 diabetes. **2**

Type 1 _____

_____

Type 2 _____

_____

(c) Describe how type 2 diabetes affects liver cells. **2**

_____

_____

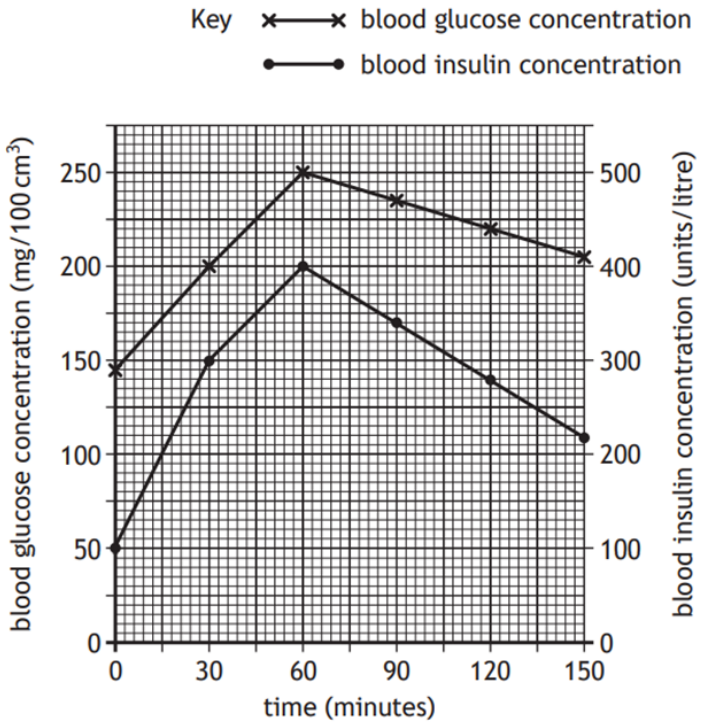
_____

_____

# Blood Glucose Control & Diabetes

4. A man had a glucose tolerance test to indicate if he had type 2 diabetes.

The graph shows changes in the concentrations of glucose and insulin in his blood during 150 minutes, after drinking the glucose solution.




a) The glucose tolerance test indicated that this man had type 2 diabetes.

Explain why production of insulin did not lower his blood glucose concentration in the first hour of the test. **2**

(ii) Suggest **one** reason why this man's blood glucose concentration started to decrease after 60 minutes. **1**

b) Describe evidence from the graph that indicates this man does **not** have type 1 diabetes. **1**

c) Apart from reducing the sugar intake in his diet, suggest another way in which this man could control his blood glucose levels. **1**

# Blood Glucose Control & Diabetes Answers

1. C

2. D

3. D

4. D

5. A

6. A

1. Their blood glucose concentration increases at a slower rate / to a lower level / for a shorter time compared to individual A.

   Their blood glucose concentration starts to decrease after 30 minutes/returns to normal after 60 minutes.

2a) glucose tolerance test

b) liver cells are less sensitive/resistant to insulin (1 mark) They can't convert/convert less glucose to glycogen (1 mark)

c)

| | | | | | |
|---|---|---|---|---|---|
| | | | 1. (The individual) fasts/does not eat for a period of time.<br>2. (The individual) then drinks a glucose solution.<br>3. Blood glucose concentrations/ levels are then measured regularly/for at least two hours.<br>**Any 2 from 3**<br>4. A diabetic's blood glucose concentration/level is higher/ starts higher.<br>**OR**<br>A diabetic's blood glucose concentration/level increases to a much higher level.<br>**OR**<br>A diabetic's blood glucose concentration/level takes longer to return to the starting concentration/does not return to initial value. **(1)** | **3** | Accept sugar for glucose.<br><br>Accept monitored for measured regularly.<br><br>Point 4. must be comparative. |

# Blood Glucose Control & Diabetes Answers

3a ) X = glucagon Y = liver

b) type 1 cannot produce insulin in the pancreas

Type 2 liver cells are resistant/less sensitive to insulin OR they have less receptors/less sensitive receptors at the liver

c) liver cells are less sensitive/resistant to insulin (1 mark) They can't convert/convert less glucose to glycogen (1 mark)

4a (i) cells are less sensitive/receptor to insulin OR they less insulin receptors at liver

a (ii) glucose used for aerobic respiration OR the glucose is lost in urine

b) the man is able to produce insulin

C) increase exercise or lost body fat