

0 8

It is important to keep the blood glucose concentration within narrow limits.

0 8 . 1

A person eats a meal containing a lot of carbohydrate. This causes an increase in the person's blood glucose concentration.

Explain how the hormones insulin **and** glucagon control the person's blood glucose concentration after the meal.

[5 marks]

0 8 . 2

The body cells of a person with Type 2 diabetes do **not** respond to **insulin**.

A person with Type 2 diabetes often has a higher blood **insulin** concentration than a non-diabetic person.

Explain why.

[3 marks]

Turn over ►



Metformin is a drug used for treating people who have Type 2 diabetes.

Scientists investigated the effects of metformin and two other drugs, **A** and **B**.

The scientists wanted to see how the drugs affected the blood glucose concentrations of 220 people with Type 2 diabetes.

This is the method used.

1. Put the 220 people into five groups.
2. Treat each group with a different drug or combination of drugs for several weeks.
3. Give each person a meal high in carbohydrate.
4. Measure the blood glucose concentration of each person 30 minutes after the meal and again 3 hours after the meal.

0 8 . 3

Suggest **three** variables that the scientists should have controlled in the investigation. **[3 marks]**

1 _____

2 _____

3 _____



The scientists recorded their results as a mean value for each group.

The scientists calculated the 'standard deviation' for each group's result.

Standard deviation is a measure of the spread of the individual results above or below (\pm) the mean value.

The scientists gave each group's result as:

mean \pm standard deviation

The larger the standard deviation, the greater is the spread of results around the mean.

0 8 . 4 Which of the results is the most precise?

[1 mark]

Tick (\checkmark) **one** box.

Mean = 171.6 \pm 16.3

Mean = 177.2 \pm 15.4

Mean = 182.5 \pm 18.2

Mean = 205.2 \pm 19.4

Question 8 continues on the next page

Turn over ►

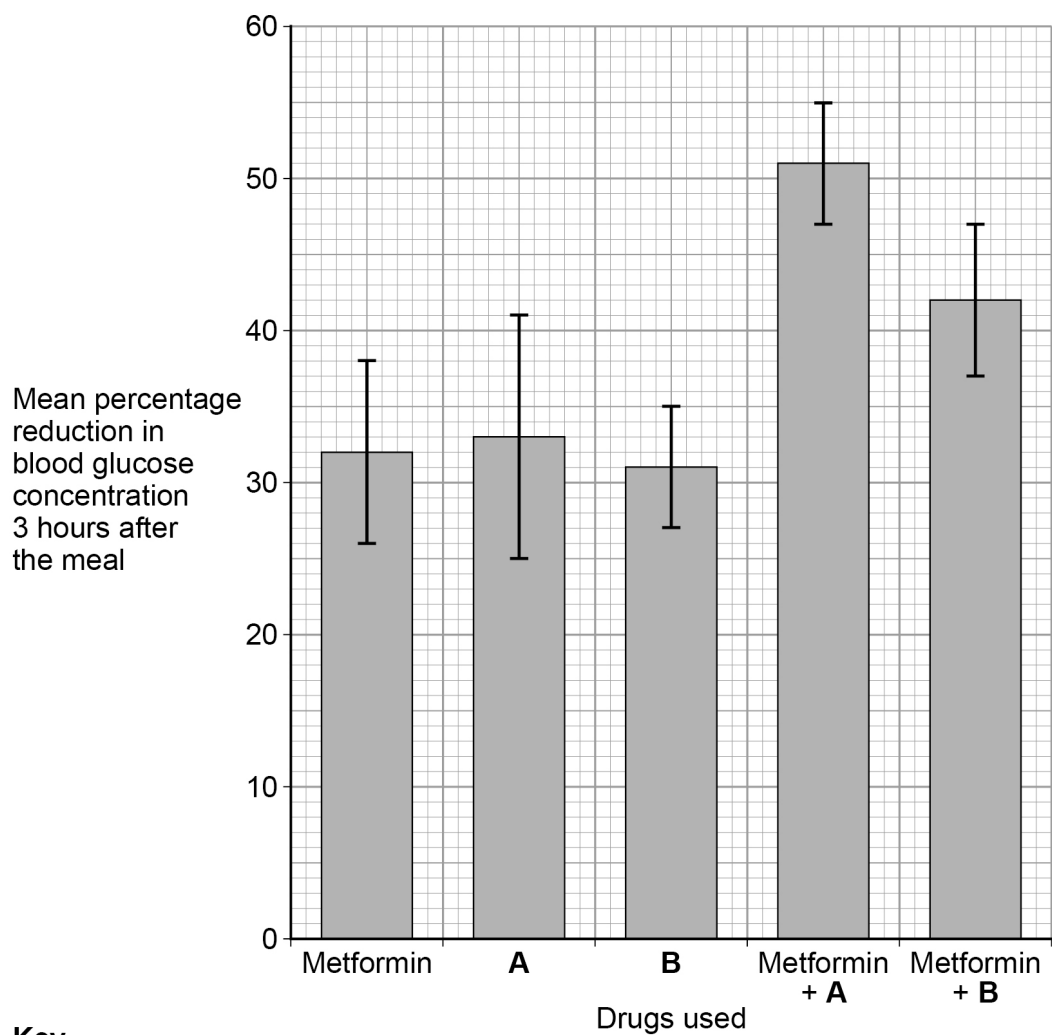


Table 3 and Figure 9 show the scientists' results.

Table 3

Drugs used	Metformin	A	B	Metformin + A	Metformin + B
Number of people	60	40	25	65	30
Mean blood glucose concentration 30 minutes after the meal in $\text{mg}/100 \text{ cm}^3$ \pm standard deviation	177.2 \pm 15.4	182.5 \pm 18.2	171.6 \pm 16.3	205.2 \pm 19.4	206.5 \pm 19.6

Figure 9



Key

\pm standard deviation



0 8 . 5

In **Table 3** and **Figure 9** some standard deviations of results overlap.

- An overlap of standard deviations shows the difference between the means is **not** significant.
- **No** overlap of standard deviations shows a significant difference between the means.

A student looked at the scientists' method and the results in **Table 3** and **Figure 9**.

The student stated:

'Metformin works better when used with other drugs.'

Evaluate the student's statement.

[6 marks]

18

END OF QUESTIONS



Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	(blood glucose increases after meal causing) insulin secretion	ignore incorrect organ secreting insulin / glucagon allow (blood glucose increases after meal causing) insulin increase	1	4.5.1 4.5.3.2 AO2
	insulin causes <u>glucose</u> to enter cells / liver / muscles] allow <u>glucose</u> converted to glycogen in cells / liver / muscles for 2 marks	1	AO1
	(insulin causes) <u>glucose</u> conversion to glycogen		1	AO1
	(so) blood glucose decreases causing glucagon secretion	allow increase in glucagon when blood glucose is low	1	AO2
	glucagon causes glycogen to be converted to <u>glucose</u>		1	AO1
08.2	cells / liver / muscles absorb less glucose	allow cells / liver / muscles convert less glucose to glycogen do not accept no absorption / conversion of glucose	1	AO2 4.5.3.2
	(so) glucose concentration in blood remains high	allow (so) glucose concentration in blood does not decrease	1	
	(high blood glucose stimulates / causes) <u>pancreas</u> to release more insulin	allow more insulin is released from <u>pancreas</u> to 'try' to reduce blood glucose	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	any three from: <ul style="list-style-type: none"> • age • height and mass • proportion of males and females or group size • (same) severity of diabetes • (same) activity (during investigation) • (same) type of meal • dose of drug • (similar) blood glucose concentrations at start • other health conditions or other drugs being taken 	allow BMI allow sex of the participants allow how much / type of food / drink consumed before allow may not have followed drug-taking regime beforehand	3	AO3 4.5.3.2
08.4	Mean = 177.2 ± 15.4		1	AO2 4.5.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	Level 3: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.		5–6	AO3
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.		3–4	
	Level 1: Relevant points are made. They are not logically linked.		1–2	
	No relevant content		0	
	Indicative content Pro: <ul style="list-style-type: none"> • Met + A gives larger (%) reduction (in blood glucose) than Met alone • so statement is supported • Met + B gives larger (%) reduction (in blood glucose) than Met alone • so statement is supported • Met + A SD does not overlap with Met SD • so difference is significant Con: <ul style="list-style-type: none"> • Met + B SD overlaps with Met SD • so difference is not significant • difference in results could be due to chance <p>-----</p> <ul style="list-style-type: none"> • number of people used is not very large • number of people in each group is different • so may not be representative or may not be repeatable / reproducible • so anomalies will have a bigger impact on smaller groups • 30 minute / starting levels of blood glucose are different • all 30 minute / starting levels are higher in the 2-drug trial • so may cause different % reductions • no information about control variables or named eg • concentration of drugs not given / may differ • so results may not be valid for level 3 an inclusion of a discussion of significance is required			4.5.3.2
Total			18	