

1 Reflex actions are rapid and automatic.

(a) Name the following structures in a reflex action.

(i) The structure that detects the stimulus.

(1)

(ii) The neurone that carries impulses to the central nervous system.

(1)

(iii) The neurone that carries impulses away from the central nervous system.

(1)

(iv) The structure that brings about the response.

(1)

(b) Describe what happens at a synapse when an impulse arrives.

(2)

(c) Some people have a condition in which information from the skin does not reach the brain.

Explain why this is dangerous for the person.

(2)

(Total 8 marks)

2

Coordination of the body can be affected
by chemicals called hormones

(a) (i) Where are hormones produced?

(1)

(ii) How do hormones move around the body?

(1)

(b) Insulin is a hormone.

(i) Where is insulin produced?

(1)

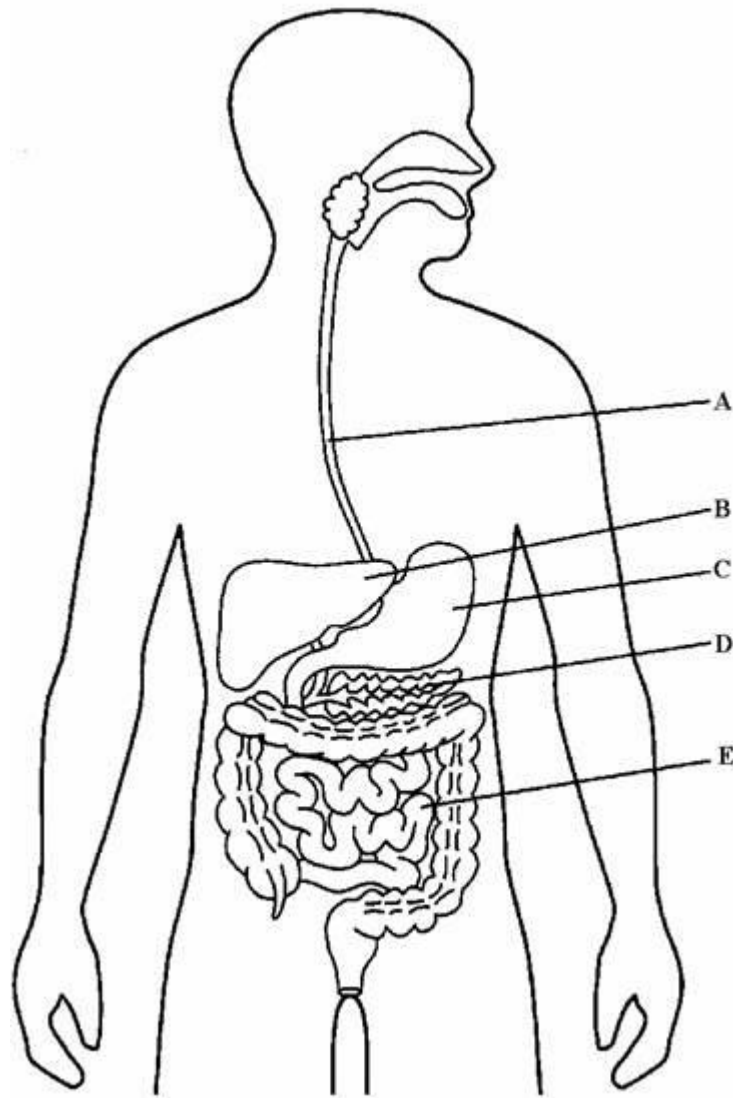
(ii) Explain the role of insulin in controlling blood sugar levels.

(4)

(Total 7 marks)

3

The diagram shows part of the human digestive system.



(i) Name part **B**.

(1)

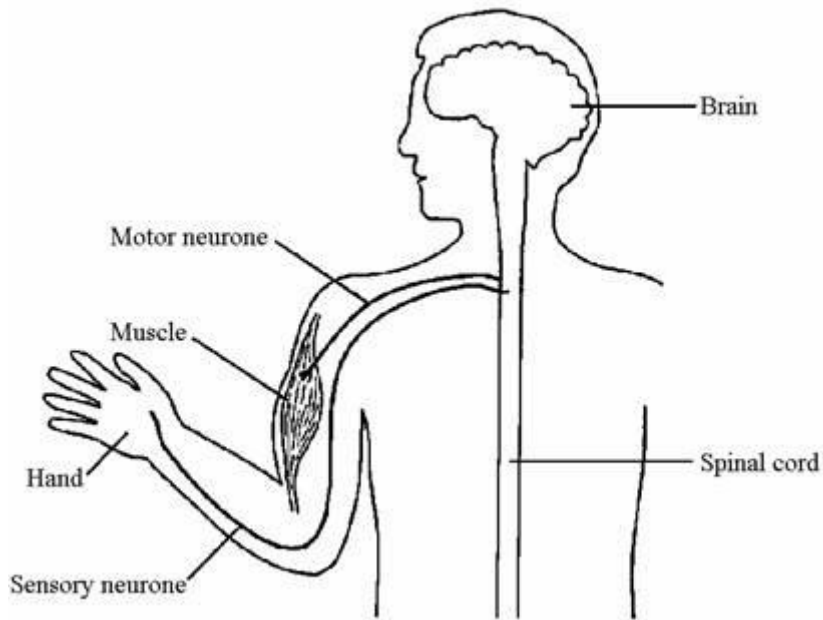
(ii) Describe the role of **B** and **D** in reducing blood sugar levels.

(2)

(Total 3 marks)

4

The diagram shows a reflex pathway in a human.



(a) Label the *receptor* on the diagram.

(1)

(b) Label the *effector* on the diagram.

(1)

(c) (i) Suggest a stimulus to the hand that could start a reflex response.

(1)

(ii) Describe the response that this stimulus would cause. _____

(1)

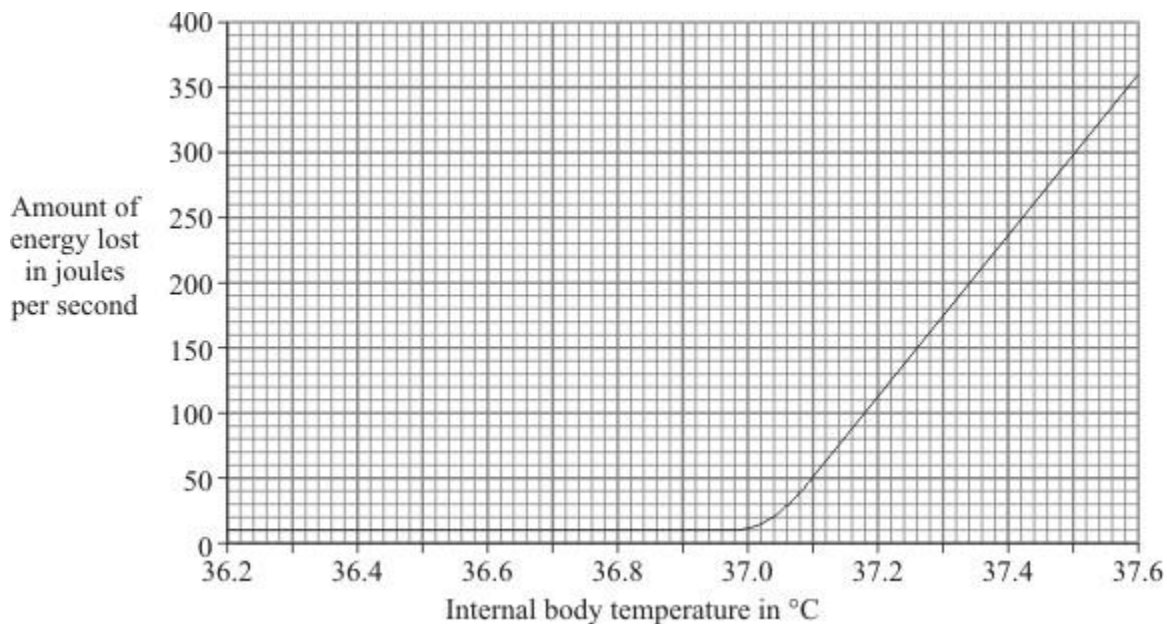
(d) Put arrows on the diagram to show the direction of the path taken by the nerve impulses.

(1)

(Total 5 marks)

5

The internal body temperature determines how much a person sweats. The graph shows the effect of different internal body temperatures on a person's rate of energy loss by sweating.



(a) How much more energy was lost from the body each second by sweating when the body temperature was 37.6 °C than when it was 36.6 °C? Show clearly how you work out your final answer.

Amount of energy = _____ joules per second

(2)

(b) Explain why a person would feel more thirsty when the body temperature was 37.6 °C than when it was 36.6 °C.

(2)

(c) Explain how sweating helps to control body temperature.

(3)
(Total 7 marks)

6

Hormones are sometimes used to regulate human reproduction.

(a) (i) What is a hormone?

(1)

(ii) How are hormones transported around the body?

(1)

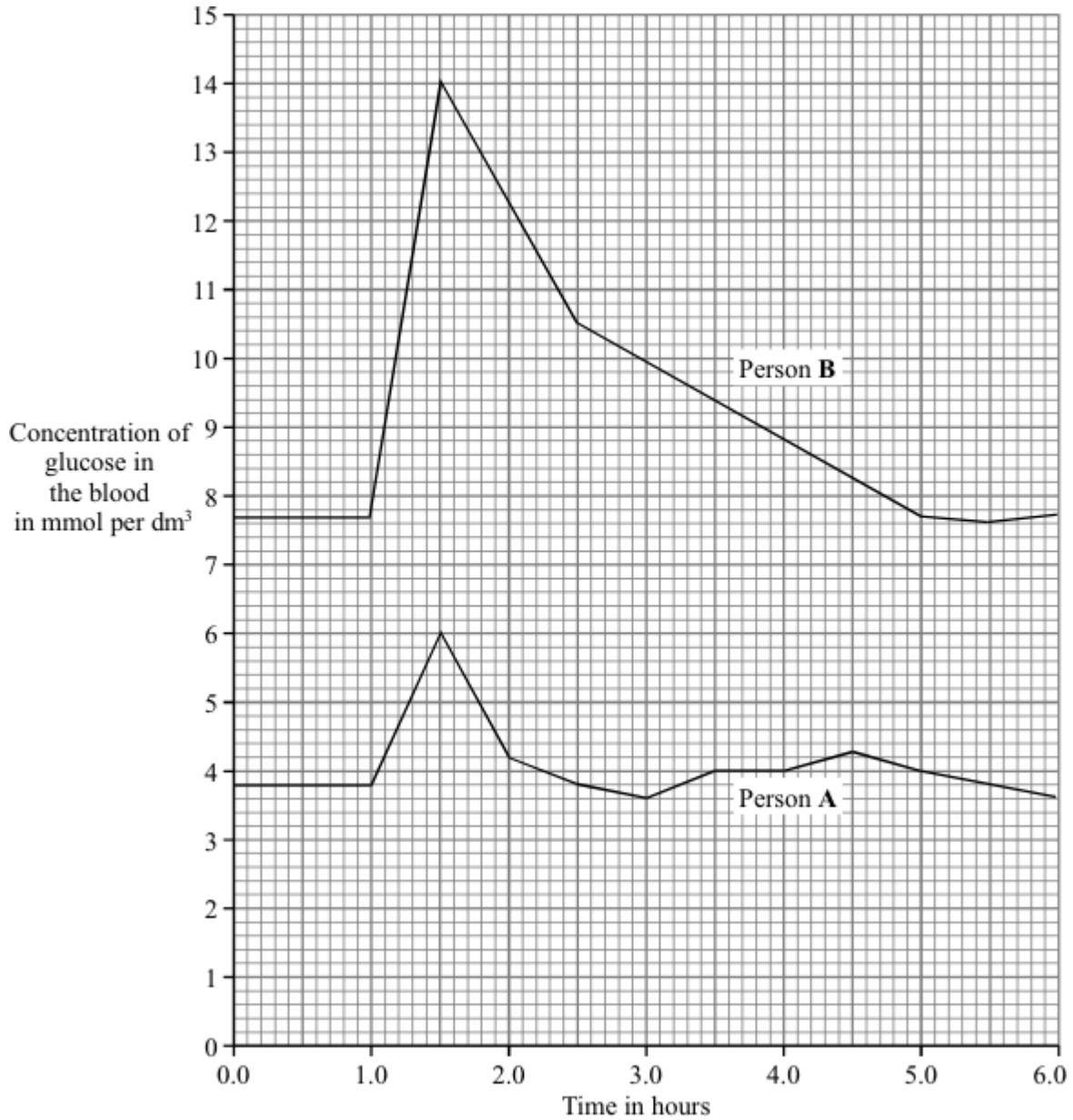
- (b) Describe the benefits and possible problems that may result from the use of hormones to regulate human reproduction. You should refer to fertility drugs and contraceptives in your answer.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

(4)
(Total 6 marks)

7

The graph shows the concentration of glucose in the blood of two people. Person **A** is a non-diabetic. Person **B** has diabetes. Each person ate 75 grams of glucose at 1.0 hours.



(a) (i) What was the maximum concentration of glucose in the blood of Person **A**?

_____ mmol per dm³

(1)

(ii) After eating the glucose, how long did it take for the concentration of glucose in the blood of Person **B** to return to normal?

_____ hours

(1)

(b) A diabetic person does not produce enough insulin.

(i) Which organ produces insulin?

(1)

(ii) Write the letter **X** on the graph to show one time when the blood of Person **A** would contain large amounts of insulin.

(1)

(c) A high concentration of glucose in the blood can harm body cells as a result of osmosis. Explain why.

(4)

(Total 8 marks)

8

Diabetes is a disease in which a person's blood glucose concentration rises to higher levels than normal.

Diabetes is caused by insufficient insulin being produced.

(a) (i) Which organ monitors blood glucose concentration?

(1)

(ii) Insulin reduces the concentration of glucose in the blood.

Describe how insulin does this.

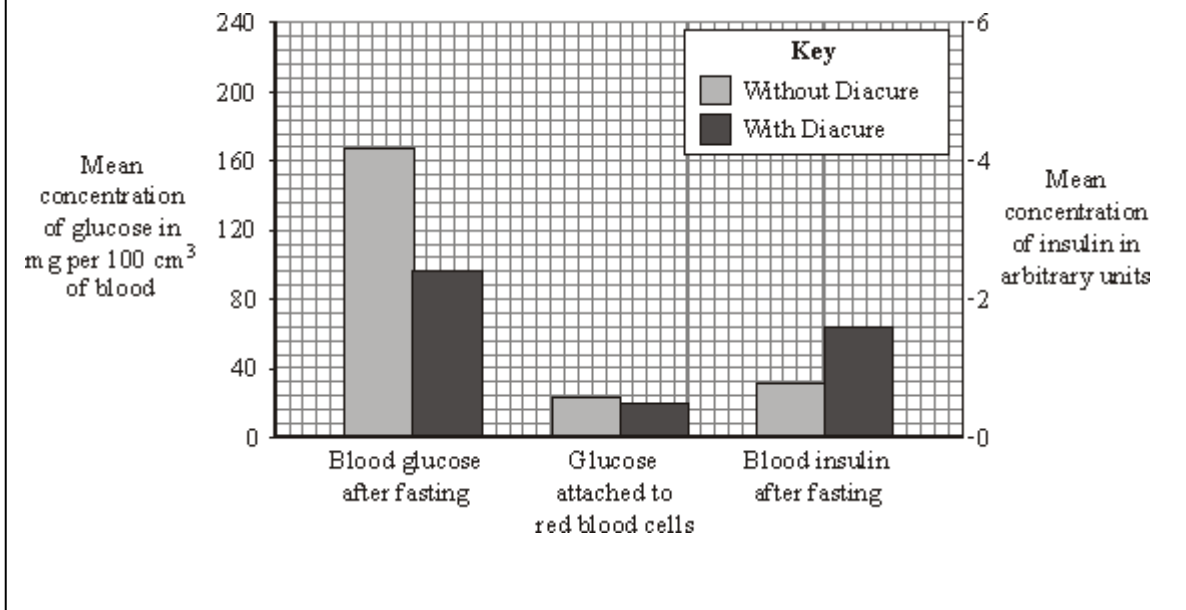
(1)

(b) A person with diabetes can be monitored in three ways:

- measuring the blood glucose concentration after fasting (going without food for 12 hours)
- measuring the amount of glucose attached to red blood cells: this is a measure of the average blood glucose concentration over the previous three months
- measuring the concentration of insulin in the blood after fasting

The manufacturer of a new treatment for diabetes, called Diacure, publishes the following two claims.

1. 98.6% of all people who used Diacure reported an improvement in their condition.
2. An independent study of 30 diabetic patients showed a significant reduction in blood glucose concentrations and a significant increase in insulin production, as shown by the graph.



(i) Which of the manufacturer's claims is **not** based on scientific evidence?

(1)

(ii) Why might the data in this study be unreliable?

(1)

- (iii) The manufacturer did **not** draw attention to the data for the amount of glucose attached to red blood cells.

Suggest an explanation for this.

(2)

- (iv) The study of diabetic patients was carried out by an independent company.

Why is it important that the study should be independent?

(1)

(Total 7 marks)

9

The pancreas is involved in digestion and controlling the internal conditions of the body.

- (a) Name **two** digestive enzymes produced by the pancreas.

1. _____

2. _____

(2)

- (b) Diabetes may be caused by a lack of insulin.

Part of the treatment for someone with diabetes is to pay careful attention to the diet.

- (i) Give **one** symptom of diabetes.

(1)

(ii) Give **one** way in which a diabetic may be advised to change their diet.

(1)

(iii) How does this change in diet help the diabetic?

(1)

(iv) State **one** other way in which the symptoms of diabetes may be treated.

(1)

(c) Many of the cells in the pancreas contain large numbers of ribosomes.

What is the function of ribosomes in a cell?

(1)

(Total 7 marks)

Mark schemes

1

- (a) (i) receptor
allow named receptor eg light receptor
ignore sensory neurone
allow sense organ / named sensory organ eg skin / eye 1
- (ii) sensory (neurone)
allow afferent 1
- (iii) motor (neurone)
allow efferent 1
- (iv) effector / muscle / gland / named 1
- (b) any **two** from:
- impulse / information passes from one neurone to another
or impulse / information passes across gap
 - chemical / transmitter involved
 - diffusion (across gap) 2
- (c) brain / person not aware of pain / stimulus / can't feel
allow brain/ person doesn't know / realise / unable to coordinate
ignore reflex
ignore information 1
- possibility of (permanent / serious) damage / eg burning
ignore danger 1

[8]

2

- (a) (i) endocrine glands **or** endocrine system
allow a specific named gland 1
- (ii) (dissolved) in the blood(stream) **or** plasma 1
- (b) (i) pancreas **or** islets of Langerhans 1

(ii) (it **or** insulin) lowers blood sugar level [1]

(by) (speeding up **or** increasing)
conversion of glucose to glycogen [1]

in the liver [1]

(and) speeding up **or** increasing uptake of glucose by body cells [1]

4

[7]

3

(i) liver

1

(ii) liver **or** B stores glycogen
or pancreas **or** D makes insulin

1

clear description of link

1

[3]

4

(a) label drawn to the hand

may be labelled as 'a'

accept the receptor identified as the hand

1

(b) label drawn to the muscle

may be labelled as 'b'

accept the effector identified as the muscle

1

(c) (i) sharp point **or** heat

accept specific examples such as pain, bee sting, cut, burning

*do **not** accept touch by itself*

1

(ii) move the hand (or arm) away from stimulus

or

muscle in the arm contracts

*do **not** credit reference to impulse reaching brain unless it is clear
that this is in addition to the reflex act*

*do **not** credit 'reflex action' already given*

1

- (d) an arrow on the sensory fibre from hand to spine

*award **one** mark for both arrows in the correct direction*

and

- note the arrows may be drawn separately from the printed neurone*

an arrow on the motor fibre from spine to muscle

- do **not** credit if the impulse travels to the muscle via the brain **but** a 'one way' journey to the brain will be neutral*

1

[5]

5

- (a) 345 to 350

ignore working or lack of working

*use of 355 to 360 **and** 10 for 1 mark*

2

- (b) any **two** from:

more sweating (at 37.6 °C)

'more' at least once in the first 2 points

more water loss **or** dehydration occurs

*do **not** accept prevents dehydration only*

blood becomes (more) concentrated / (more) salty **or** need to replace water

stimulation of the hypothalamus

2

- (c) any **three** from:

evaporation

of water

*do **not** accept just water loss unqualified*

cools skin **or** uses heat from skin

cools blood / heat from blood (passing through skin)

related to sweating

cooling the blood

ignore vasodilation

3

[7]

6

(a) (i) any **one** from:

- chemical messenger
- chemical / substance released in one part to have effect elsewhere in body
- chemical / substance which affects another / target organ / tissues / cells
allow chemical from endocrine gland

1

(ii) in blood / circulatory system / any named part including plasma

extra wrong answer would cancel example

not red blood cells

1

(b) **Quality of written communication:**

correct use of at least two relevant scientific terms spelt phonetically

e.g. pregnancy, ovulation, FSH, oestrogen, progesterone, ovary, follicle, circulation, thrombosis, feminisation, sperm count, STD

Q ✓ or Q ✗

1

any **three** from:

Oral contraceptives:

(benefit)

- prevent (unwanted) pregnancy **or** prevent egg release
- regulate menstrual cycle / periods

(problems)

- prolonged use may prevent later ovulation / cause infertility
- named side-effect on female body
e.g. circulatory problems / weight gain / nausea / headache / breast cancer / mood swings
- increased promiscuity / increase in STD's / STI's
- named side-effect on environment
e.g. feminisation of fish **or** lowered sperm count in human males

Fertility drugs:

(benefit)

- can enable woman to have children **or** to become pregnant
or stimulates egg release

(problem)

- multiple births

*for full marks must score at least **one** re contraceptives **and** at least **one** re fertility drugs
if unclear which type of hormone maximum **2** marks from 3*

3

[6]

7

(a) (i) 6

1

(ii) 4

1

(b) (i) pancreas

ignore islets of langerhans

1

(ii) 'X' anywhere between >1 and ≤ 2 hours
anywhere in that column

1

(c) any **four** from:

water movement

*do **not** accept solution*

out of cells

dilute to concentrated solution

accept reference to correct gradient -

*high Ψ to low Ψ **or** high to low ' water concentration'*

*must be unambiguous – i.e. **not** 'high to low concentration'*

accept low to high concentration

reference to partially / selectively

permeable membranes **or** described

cells shrink / get smaller

allow crenated

ignore plasmolysed / flaccid / floppy

etc

4

[8]

8

(a) (i) pancreas

allow phonetic spelling

1

(ii) glucose into cells / liver / muscles

allow any named organ / cell

allow turned into / stored as glycogen

but

*do **not** allow hybrid spellings for glycogen*

allow increases respiration

allow stored as / turned into fat

1

(b) (i) reference to "98.6% of all people who used Diacure reported an improvement in their condition".

allow claim 1 / 1 / the first one

1

(ii) (only) 30 patients **or** not enough / not many patients

*allow only one trial **or** only done once **or** not repeated*

ignore bias

1

(iii) little effect / difference
allow no effect
allow only drops by 4 (± 1) 1

suggest drug is not effective (in long term)
allow wouldn't persuade people to take it 1

(iv) avoid bias / owtte
eg company could change / ignore results / might lie
ignore fair / accurate / reliable / valid 1

[7]

9

(a) any **two** from:

- amylase / carbohydrase
 - protease
allow trypsin
 - lipase
- 2

(b) (i) high / above normal blood sugar
or cannot control blood sugar

allow other symptoms
*eg frequent / plentiful urination **or** sugar in urine **or** thirst **or** weight loss **or** coma*
ignore consequential effects eg blood pressure / circulation / glaucoma / tiredness

1

(ii) any **one** from:

- small / regular meals
- low sugar (meals) or low GI / GL **or** carbohydrates as starch
allow high fibre
ignore reference to low carbohydrate

1

(iii) any **one** from:

- keep constant (blood) sugar **or** prevent high (blood) sugar
or reduces surge / rush of sugar into blood
- reduce the need for insulin

1

(iv) (take) insulin

allow pancreas transplant

1

(c) protein / hormone / enzyme synthesis **or** synthesis of named example
or combine amino acids

1

[7]