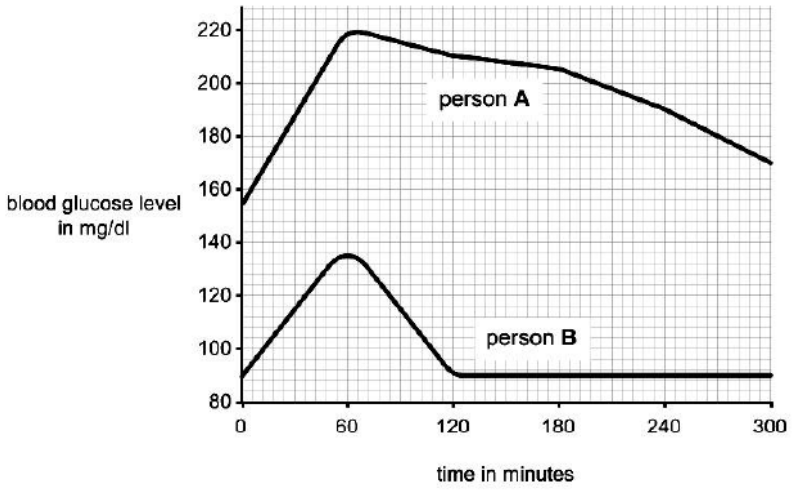
1.

(i) Insulin is a hormone produced by the pancreas.

The graph below shows data from two people who were given a sugary drink.

Their blood sugar level was recorded every 60 minutes from when they had the drink.



There are two types of diabetes – type 1 and type 2.

Person A has type 2 diabetes. Person B does not have diabetes.

Describe how the graph shows this and explain why there is a difference in the blood sugar level.

---

[2]

(ii) The statements below are all to do with type 1 and type 2 diabetes.

Draw two lines to identify the sentences which are to do with **type 1 diabetes.**

[2]

	body no longer responds to the insulin produced
Type 1 diabetes	should eat a diet high in complex carbohydrates and exercise
	will need to inject insulin
	pancreas stops producing insulin

2(a). Dementia is caused by damage to the brain.

People with dementia often have difficulty remembering things they have just done. However, they can clearly remember things from many years ago.

Which part of their memory is still functioning well and which part is not?

---

[2]

(b). Name a technique that could be used to find the area of the brain that is damaged.

---

[1]

(c). Emma is trying to remember a phone number but is finding it difficult.

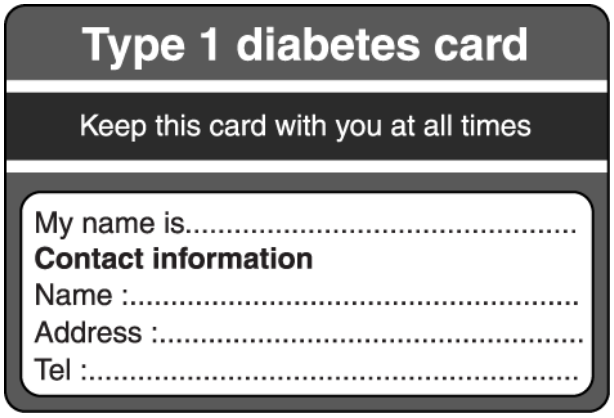
Suggest a method that she could use to help her remember it.

---

[1]

3. It is very important to control the level of sugar in the blood.
A person can become unconscious if there is too much or too little sugar in the blood.

Steve has a card that says he has type 1 diabetes.



Steve is found unconscious.

Suggest how diabetes could cause Steve to become unconscious.
Explain how he should be treated.

The quality of written communication will be assessed in your answer.

[6]

4(a). The eye is a sense organ.

Each part of the eye is adapted to its specific function.

The table describes the functions of different parts of the eye.

Complete the table by writing the **part of the eye** that matches each **description**.
Choose from the words below:

ciliary muscle **cornea** **iris** **lens**

Part of the eye	Description
	A ring of tissue that changes size to alter the diameter of the pupil, to control the amount of light entering the eye.
	A thin layer of transparent tissue in front of the pupil which bends light as it enters the eye.
	A thick layer of transparent tissue behind the pupil which bends light so it focusses on the retina.
	Changes the thickness of the lens to focus light from far and near objects.

[3]

(b). Amir is investigating what happens to pupil size when a person moves from an area of bright light to an area of darkness.

He measures the size of his friend's pupil in bright light.

His results are shown in the table below.

Experiment number	Pupil size (mm)
1	4.0
2	3.8
3	6.0

(i) Calculate the mean pupil size.

Mean pupil size = ---------- mm **[2]**

(ii) Amir reads an article that suggests the average pupil size in bright light should be in the range of 2 – 4 mm.

Amir thinks one of his results is an anomalous result.

Which result is most likely to be the anomalous result?

Give a reason for your choice.

---

[2]

(iii) What can Amir do to make his results more precise?

---

[1]

(iv) To create dark conditions Amir asks his friend to put on sunglasses.

Amir draws two diagrams (**Fig. 1.1** and **Fig. 1.2**) to show how the pupil changes when the light conditions change.

Fig. 1.2 is incomplete.

Complete **Fig. 1.2** to show the pupil in dark conditions.

Pupil in bright light

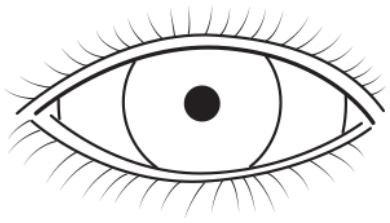


Fig. 1.1

Pupil in the dark

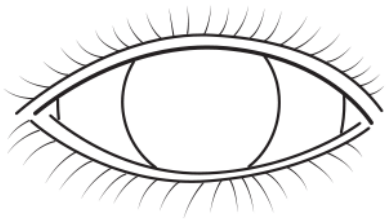


Fig. 1.2

[1]

(v) The change in pupil size is an example of a reflex.

Which statement best describes a reflex?

Tick (✓) **one** box.

A rapid and involuntary response. ☐

A rapid and voluntary response. ☐

A slow and involuntary response. ☐

A slow and voluntary response. ☐

[1]

(vi) What name is given to the structure that transmits electrical impulses from the eye to the central nervous system?

Put a (ring) around the correct answer.

effector **receptor** **relay neuron** **sensory neuron**

[1]

(c). Amir is reading a newspaper but the words look blurry.

When he looks out the window he can see everything outside clearly.

Explain to Amir why the words in the newspaper look blurry and explain how this defect could be corrected.

Explanation ----------

Correction ----------

---

[3]

5. Diabetes and cardiovascular disease are common diseases in the UK.

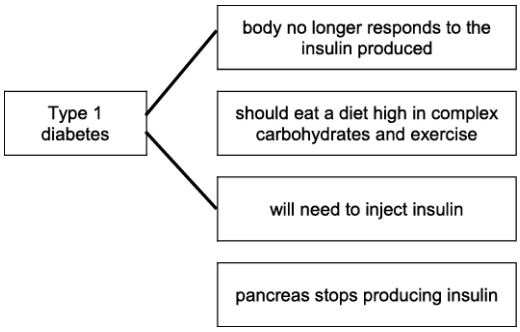
There are two different types of diabetes.

Put one tick (✓) in each row of the table to show whether the statement applies to **both types of diabetes, only type 1 diabetes, or only type 2 diabetes**.

Statement	Both types of diabetes	Only type 1 diabetes	Only type 2 diabetes
The person cannot control their blood sugar level.			
The body stops responding to the insulin it makes.			
The disease can be treated using injections of insulin.			
In the future, the disease could be treated using stem cells to replace insulin-secreting cells in the pancreas.			

[4]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1		i	**Any one from** *Descriptions* **1.** Person B sugar level falls faster / person A sugar level falls more slowly ✓ **2.** Person B sugar level falls back to starting level after just over 2 hours / Person A sugar level remains high ✓ **Any one from** *Reasons why* **3.** Person A does not respond to the hormone / insulin produced to convert sugar to glycogen ✓ **4.** Person B produces a hormone / insulin in response to the rise in blood sugar and this causes cells to convert the sugar to glycogen so the level falls ✓	2	Max 1 for description and max 1 for the reason why MPs 3 and 4 **DO NOT ALLOW** a reference to hormone response or lack of response without reference to the role of insulin.
		ii		2	Award one mark for each correct line. However, if more than 2 lines are drawn, delete one mark for each incorrect line
			Total	**4**	
2	a		long term memory still works (1) problems with short term memory (1)	2	**Accept** long term better than short-term (2 marks). **Examiner's Comments** The terms long term and short term memory were quite well known.
	b		MRI / CAT / CT scan	1	**Do not accept** X rays. **Examiner's Comments** The question asked for a technique to find areas of the brain which are damaged. MRI and CAT scans were quite well known. Brain scan and just “scan” did not gain marks, nor did answers which involved brain surgery or questioning of the patient.

Question			Answer/Indicative content	Marks	Guidance
	c		repetition / chunking / pattern / link to stimulus	1	Do not accept write it down unless qualified by repeated. Accept any sensible answer. Examiner's Comments Candidates were required to give a way of remembering a telephone number. Answers which suggested writing it down were not credited. Repetition was the commonest correct response.
			Total	4	

Question			Answer/Indicative content	Marks	Guidance
3			**[Level 3]** Answer to include references to high AND low blood sugar and reference to correct treatment. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer to include reference to high / low blood sugar and description of correct treatment. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer to include reference to high / low blood sugar OR reference to treatment. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	This question is targeted at grades up to C References to high blood sugar may include: • occurs after a meal • pancreas produces insulin • insulin lowers glucose • lack of insulin results in high blood sugar that can lead to unconsciousness References to low blood sugar may include: • occurs when a meal is missed • low blood sugar can lead to unconsciousness • injected too much insulin References to treatment may include: • needs insulin injection • needs sugary drink / injection / food • dietary control (for longer term control) Use the L1, L2, L3 annotations in Scoris; do not use ticks. Examiner's Comments This extended writing question differentiated well. Many candidates understood that insulin had a role in control of blood sugar, however were unsure whether it raised or lowered the level.
			Total	6	

Question			Answer/Indicative content	Marks	Guidance
4	a		iris ✓ cornea ✓ lens ✓ ciliary muscle ✓	3 (AO 1.1 × 3)	three or four correct = 3 marks two correct = 2 marks one correct = 1 mark <u>Examiner's Comments</u> This question assessed AO1 knowledge in isolation. Most candidates were able to score two marks for identifying the function of the iris and ciliary muscle. There was confusion over the function of the lens and cornea which prevented full marks being credited to more candidates.
	b	i	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 4.6 (mm) award 2 marks (4.0 +3.8+6.0)/3 ✓ = 4.6 (mm) ✓ OR 13.8/3 ✓ = 4.6 (mm) ✓	2 (AO 3.3 × 2)	<u>Examiner's Comments</u> This question assessed objective AO2. Most candidates were able to correctly calculate the mean, although some demonstrated a correct approach (adding the three values and dividing by 3) without arriving at the correct answer, highlighting the need to check calculations. Some candidates did not know what the term mean meant and gave the median value instead.

Question			Answer/Indicative content	Marks	Guidance
		ii	6.0 / experiment 3 ✓ because it is far greater than the other two results / it is greater than the range stated ✓	2 (AO 3.1b ✓ 2)	ALLOW outside the range / the other two results are **only** 0.2mm different / too high (compared to the other results) / the other results are between 2 -4mm or within the range IGNORE not closely related / 6.0 (it) is the greatest Examiner's Comments Three quarters of candidates were able to gain one mark for identifying the anomalous result, and around half of candidates were able to give a correct reason, the most common explanation referring to the value of 6.0 mm being outside the range. Some candidates misinterpreted the question and attempted to explain why the anomalous result could have happened. This question assessed objective AO3.
		iii	repeat his experiment again ✓	1 (AO 3.3b)	IGNORE do more experiments / repeat it on different people / another experiment / do it more than once Examiner's Comments Just over a third of candidates were able to answer this question, assessing AO3, successfully, and these candidates were often the ones who went on to score the highest total marks on the paper. Candidates who did not answer correctly suggested that Amir should do his experiment on different people or simply do "more experiments" without making it clear they meant him to repeat this experiment.
		iv	pupil drawn is bigger than that in the first diagram ✓	1 (AO 2.1)	Examiner's Comments This question assessing AO2 was answered particularly well and attempted by almost all candidates.

Question			Answer/Indicative content	Marks	Guidance
		v	A rapid and involuntary response ✓	1 (AO 1.1)	more than one tick = 0 marks Examiner's Comments This question assessed AO1. Almost all candidates knew that a reflex action is a rapid response, but approximately a quarter did not know what voluntary and involuntary meant in terms of a reflex action and therefore were not able to gain the mark.
		vi	sensory neuron ✓	1 (AO 1.1)	more than one ring = 0 marks Examiner's Comments This question also assessed AO1. Around half of candidates correctly identified sensory neuron, but many thought that the answer was receptor.
	c		Any three from: Amir is long sighted ✓ the light rays do not meet at the retina / the light is not focussed at the retina / light is focussed behind the retina / light rays meet behind the retina ✓ use glasses with convex lenses ✓ they will make the light rays bend more / focus the light or the image on the retina ✓	3 (AO 2.1 × 3)	ALLOW has hyperopia or hypermetropia ALLOW the eyeball is too **short** / lens is too thin or narrow / light is not refracted or bent **enough** / lens cannot become round enough DO NOT ALLOW responses that refer to light reflecting in the eye Examiner's Comments Half of candidates gained one or more marks here with more achieving one mark (for identifying Amir as long sighted) than two or three marks. Although some candidates could suggest a correction for the defect, very few were able to explain why Amir was long sighted. Most candidates who did not obtain any marks wrote about wearing glasses or contact lenses or visiting the optician. This question assessed objective AO2.
			Total	14	

Question			Answer/Indicative content	Marks	Guidance
5			<table><tr><th>both</th><th>type 1</th><th>type 2</th></tr><tr><td>✓</td><td></td><td></td></tr><tr><td></td><td></td><td>✓</td></tr><tr><td>✓</td><td></td><td></td></tr><tr><td></td><td>✓</td><td></td></tr></table>	4 (AO 1.1 × 4)	<u>Examiner's Comments</u> Most candidates scored 1 or 2 marks here, but only approximately 5% of candidates were able to score full marks. This question assesses the depth of candidates' understanding of ideas about type 1 and type 2 diabetes and how they can be treated (B5.6.3), as well as the potential use of stem cells to treat diabetes (B4.5.1).
			Total	4	