AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.5.3.2

Control of blood glucose concentration

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**6**
Available paper years	**2019–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.5.3.2 Control of blood glucose concentration

Answer 01 · Mark scheme June 2019 | 8464/B/2H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	regulation / control / maintenance of internal conditions (of a cell / body) for optimum (cell / enzyme activity)	allow keeping the internal conditions (of a cell / body) the same allow description of optimum functioning (of cell / body)	1 1	AO1 4.5.1
06.2	glucagon	correct spelling only	1	AO1 4.5.3.2
06.3	any **two** from: • fasting blood glucose is higher than normal range • reached a very high concentration after glucose drink • did not return to normal after 3 hours **or** fell slowly after reaching peak. use of correct data in comparison to normal ranges given for any of the above points	 allow ± half a small square for values quoted from the graph ignore references to person A	2 1	AO3 4.5.3.2
06.4	 (person A has Type) 2 (pancreas) producing (lots of) insulin but body cells cannot respond to it. (person B has Type) I (pancreas) not producing enough insulin (to control concentration of glucose in the blood)	type of diabetes must be correct allow cells becoming resistant to insulin for respond to insulin. do **not** accept the person has become resistant to insulin	 1 1	AO3 4.5.3.2

4.5.3.2 Control of blood glucose concentration

Answer 01 · Mark scheme

June 2019 | 8464/B/2H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	starving children have used up their glycogen stores	allow starving children have no / low glycogen stores	1	AO1 AO2 4.4.2.1
	(so) would need (liver enzyme) to release glucose from fats		1	4.5.3.2
	as enzyme is stopped from working they get low / no glucose	allow no working enzyme leads to hypoglycaemia	1	
	(cell) respiration is insufficient (so they die)	allow starving children use proteins to release energy (which leads to death)	1	
	children that are not starving have glycogen stores in liver / muscle		1	
	(so) glucagon will continue to release glucose (into the blood for them)		1	
Total			**14**	

4.5.3.2 Control of blood glucose concentration

Answer 02 · Mark scheme November 2020 | 8464/B/2H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	four daughter cells are formed the parent cell divides twice		1 1	AO1 4.6.1.2
04.2	thyroid (gland) adrenal (gland) ovary / ovaries	in this order only	1 1 1	AO1 4.5.3.1
04.3	<table><tr><th>Hormone</th><th>Name of gland which releases hormone</th><th>Target organ of hormone</th></tr><tr><td>Luteinising hormone (LH)</td><td>Pituitary gland</td><td>Ovary</td></tr><tr><td>Adrenaline</td><td>Adrenal gland</td><td>Heart / lungs / liver</td></tr><tr><td>Glucagon</td><td>Pancreas</td><td>Liver / muscle</td></tr></table>		1 1 1	AO2 4.5.3.3 4.5.3.6 4.5.3.2
04.4	only need 1 parent plant will produce (many genetically) identical plants	allow for **1** mark it is a faster process allow for **1** mark will produce a large number of plants at one time ignore clones unqualified	1 1	AO3 4.6.1.1

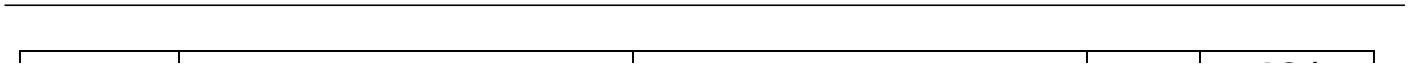
4.5.3.2 Control of blood glucose concentration

04.5	any **two** from: • genetically identical so will all be susceptible to same diseases / pathogens • no genetic variety for new colours / characteristics to offer customers • no genetic variety leads to weaker / unhealthy plants (due to lack of evolution)		2	AO3 4.6.1.1 4.6.2.2
Total			**12**	

4.5.3.2 Control of blood glucose concentration

Answer 02 · Mark scheme

November 2020 | 8464/B/2H | Original Q4



4.5.3.2 Control of blood glucose concentration

Answer 03 · Mark scheme

November 2021 | 8464/B/2H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	endocrine (system)	ignore hormonal (system)	1	AO1 4.5.3.1
01.2	D		1	AO1 4.5.3.1 4.5.3.2
01.3	A		1	AO1 4.5.3.1
01.4	(in / through / via) blood	allow (in / through / via) bloodstream allow (in / through / via) plasma allow (in / through / via) blood vessels **or** named blood vessel	1	AO1 4.5.3.1
01.5	ovary / ovaries testis / testes	in either order allow testicle(s) allow placenta if no other mark awarded allow gonad(s) for **1** mark	1 1	AO1 4.5.3.1 4.5.3.3
01.6	luteinising hormone (LH)		1	AO2 4.5.3.3

4.5.3.2 Control of blood glucose concentration

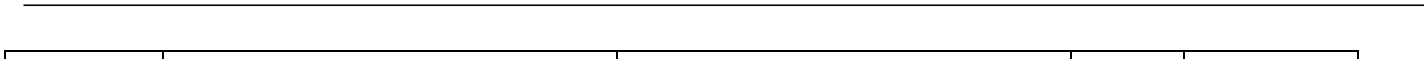
Answer 03 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
01.7	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 4.5.3.4 4.3.1.9
	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 Advantages • non-permanent like condom / diaphragm / IUDs / spermicides / abstinence **or** unlike surgical sterilisation • longer lasting than condom / diaphragm / IUDs / spermicides • no need to remember unlike oral contraceptive • one injection rather than surgery for sterilisation • surgery (for sterilisation) has risks, for example, infection • no other method of long-lasting contraception (rather than sterilisation) relies on men Disadvantages • no protection from sexually transmitted diseases unlike barrier methods **or** named barrier method • not as long lasting as (surgical) sterilisation • at clinical / drug trial stage, so unknown side effects • at clinical / drug trial stage, so unknown efficacy • do not know how long it will last (as info only states 'up to 13 years') • can stop taking a pill **or** using a condom if you change your mind / want to get pregnant, whereas have to wait 13 years with the injection • (minor) risk of infection posed with an injection compared to no risk with the oral contraceptive For **Level 3** references to advantages **and** disadvantages of the new drug compared to named existing methods are required.		
Total		**13**	

4.5.3.2 Control of blood glucose concentration

Answer 03 · Mark scheme

November 2021 | 8464/B/2H | Original Q1



4.5.3.2 Control of blood glucose concentration

Answer 04 · Mark scheme

June 2022 | 8464/B/2H | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	negative feedback (control)	ignore homeostasis	1	AO2 4.5.3.6 4.5.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	A = glucagon B = insulin	both required in correct order correct or phonetic spelling only	1	AO2 4.5.3.2

4.5.3.2 Control of blood glucose concentration

Answer 04 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3 **indirect marking** **view with 5.2**	(when blood glucose concentration is high after a meal) insulin / B is secreted (by the pancreas) causing glucose to enter cells		1	AO2
	(glucose is) converted to glycogen in the liver / muscle (cells for storage)		1	AO1
	(this causes) blood glucose concentration to return to normal so insulin / B secretion slows / stops / decreases		1	AO2
	when blood glucose concentration is low glucagon / A is secreted (by the pancreas)		1	AO2
	(which causes) breakdown of glycogen in the liver (into glucose)	allow (which causes) breakdown of glycogen in the muscle (cells)	1	AO1
	(this causes) blood glucose concentration to return to normal so glucagon / A secretion slows / stops / decreases		1	AO2 4.5.3.2

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Answer 04 · Mark scheme

June 2022 | 8464/B/2H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	FSH causes (several) ova / eggs to mature (in the ovary)	allow singular ovum / egg allow follicle for ovary	1	AO2 4.5.3.3 4.5.3.5
	(then) LH causes ovulation **or** LH causes release of the ova / eggs	allow singular ovum / egg	1	
	so more eggs / ova present therefore higher probability / chance of fertilisation **or** so more eggs / ova present therefore higher probability / chance of sperm fusing with an egg		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	collection of (mature) egg(s) from the ovary	allow follicle for ovary	1	AO1 4.5.3.5
	(which are) fertilised (in the laboratory)	do **not** accept if in fallopian tube allow egg and sperm fuse	1	
	develop into embryo(s) (in the laboratory)	allow develop / divide into small balls of cells (in the laboratory) do **not** accept foetus	1	
	embryo(s) inserted into uterus / womb		1	

4.5.3.2 Control of blood glucose concentration

Answer 04 · Mark scheme

June 2022 | 8464/B/2H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	any **three** from: • meiosis forms sperm **and** mitosis forms liver (cells) • two cell divisions to form sperm **and** one cell division to form liver (cells) • four genetically different sperm cells **and** two genetically identical liver cells • sperm cells have 23 chromosomes **and** liver cells have 46 chromosomes	ignore reproduction max **2** marks if reference to sperm cells dividing allow four genetically different cells formed from meiosis **and** two genetically identical cells formed from mitosis allow sperm cells have 23 chromosomes **and** liver cells have 23 pairs of chromosomes allow haploid (sperm) and diploid (liver cells)	3	AO1 4.6.1.2 4.1.2.2

Total Question 5		**18**

4.5.3.2 Control of blood glucose concentration

Answer 05 · Mark scheme

June 2024 | 8464/B/2H | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	pituitary		1	AO1 4.5.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	increased blood flow to muscles		1	AO1 4.5.3.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	receptor(s) (cells / neurones)	allow sensory (cells / neurones)	1	AO1 4.5.1

4.5.3.2 Control of blood glucose concentration

Answer 05 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4		allow converse if clearly describing people who do not have diabetes		
	blood glucose (concentration) varies more (than in people who do not have diabetes)	allow blood glucose (concentration) increases / decreases more allow blood glucose (concentration) goes very high allow to get a sufficient range of blood glucose (concentrations)	1	AO2 4.5.3.2
	(because) less / no insulin produced when blood glucose (concentration) increases **or** (because) less / no insulin produced to decrease blood glucose (concentration)		1	

4.5.3.2 Control of blood glucose concentration

Answer 05 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	any **two** from: • prior familiarity with reaction time test • type of (reaction time) test • insulin (injections) • example of named drug (that would affect reaction time) • amount of sleep • distractions	ignore health unqualified allow practice allow description of part of a reaction time test to control eg which hand is used to catch the ruler ignore caffeine / alcohol allow tiredness / sleep	2	AO1 4.5.3.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	low / high blood glucose (concentration) is dangerous / unsafe	allow (to monitor for) unconsciousness / coma / headache / dizziness ignore hypoglycaemia / hyperglycaemia unqualified	1	AO3 4.5.3.2

4.5.3.2 Control of blood glucose concentration

Answer 05 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.7	lowest reaction times recorded in (range of) blood glucose (concentration) found in people who do not have diabetes	allow high **and** low blood glucose (concentration) increase (mean) reaction time allow lowest reaction times recorded in range 4.0 to 7.8 ($mmol/dm^3$)	1	AO3
	homeostasis keeps blood glucose (concentration) in a narrow / small range **or** low(er) reaction times are a survival advantage		1	AO2 4.5.1 4.5.3.2

4.5.3.2 Control of blood glucose concentration

Answer 05 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.8	when blood glucose (concentration) increases the pancreas releases insulin	allow when blood glucose (concentration) is / nears 7.8 ($mmol/dm^3$) the pancreas releases insulin allow when blood glucose (concentration) is high the pancreas releases insulin	1	AO1 4.5.1 4.5.3.2
	(insulin causes) glucose to move (from the blood) into the liver / muscle (cells)	if neither mark awarded allow **1** mark for glucose moves into cells	1	
	in (liver / muscle) (excess) glucose is converted to glycogen		1	
	when blood glucose (concentration) decreases the pancreas releases glucagon	allow when blood glucose (concentration) is / nears 4.0 ($mmol/dm^3$) the pancreas releases glucagon allow when blood glucose (concentration) is low the pancreas releases glucagon	1	
	(glucagon causes) glycogen to be converted into glucose and released into the blood	allow (glucagon causes) glycogen to be converted into glucose which increases blood glucose (concentration)	1	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.9	any **two** from: (if more chemical produced / present) • diffusion of chemical (across synapse) is faster • an impulse in relay / motor / next neurone is more likely • an impulse is more likely to reach muscle	allow electrical signal for impulse throughout ignore signal / message allow an impulse in relay / motor / next neurone is faster / stronger / bigger allow there will be more impulses in relay / motor / next neurone(s) allow an impulse reaches muscle in less time allow an impulse reaches muscle faster allow bigger impulse causes faster muscle contraction	2	AO2 AO3 4.5.2

Total Question 6	17

4.5.3.2 Control of blood glucose concentration

Answer 06 · Mark scheme

June 2025 | 8464/B/2H | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	$y = mx + c$		1	AO1 4.5.3.2

4.5.3.2 Control of blood glucose concentration

Answer 06 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
06.2	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO3
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO2
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	No relevant content	0	4.5.3.2
	Indicative content **Type 1** • in Type 1 (diabetes) the pancreas does not produce (enough) insulin • (so) C-peptide (concentration in blood) would be low(er) • even if patient is taking / injecting insulin **Type 2** • in Type 2 (diabetes) the body / cells no longer respond to insulin • in Type 2 (diabetes) insulin is produced • (so) C-peptide (concentration in blood) would be high(er) / normal **The importance…** • if patient has Type 2 (diabetes) they could stop insulin injections • insulin injections have side effects • insulin injections are expensive • (Type 2 diabetes) can be treated with a carbohydrate-controlled diet and / or (increased) exercise • (Type 2 diabetes) can be treated with other medication (that is not injected) For **Level 3**, details of Type 1 and Type 2 diabetes must be considered, with the link to C-peptide and the importance of the test described.		

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Answer 06 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	pancreas		1	AO1 4.5.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	(in people with glucagon deficiency) when blood glucose concentration is low not enough glucagon is produced	allow (in people without glucagon deficiency) when blood glucose concentration is low glucagon is produced ignore reference to organ that produces glucagon	1	AO1
	(so) less / no glycogen converted to glucose	allow (so) less glucose produced from glycogen	1	AO1
	(so) less glucose for respiration		1	AO2
	(so) less energy released / transferred	do **not** accept less energy produced / made / created	1	AO2 4.5.3.2 4.4.2.1 4.4.2.3

Total Question 6	**12**

4.5.3.2 Control of blood glucose concentration

Answer 01 · Examiner comments

June 2019 | 8464/B/2H | Original Q6

Question 6 (standard/high & high demand)

06.1 This question required a straightforward and general definition of homeostasis – the idea that internal conditions of a body or cell are regulated so that they are optimal for all functioning.

The first strand of this definition was often given correctly, although no credit was allowed for statements such as 'control of the body' or 'maintenance of the body's living conditions' where there was no qualification of this being 'internal'. Answers which embraced regulation of both internal and external environments were clearly incorrect but probably reflected the students' knowledge that 'changes' in these environments are the triggers for homeostasis. Some students inappropriately referred to things, organs, reactions, activities, structures, functions, or systems being controlled.

The second strand of the definition, however, was seen far less frequently. Words such as regular, correct, normal, good, healthy or right were all too vague for 'optimal'. Similarly, references to conditions being kept stable, steady or balanced, whilst true, did not go far enough, as they may not necessarily be 'optimal'. Some students focused on hormones or on specific examples of homeostasis, but an overarching definition of the term was required for credit.

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Answer 01 · Examiner comments

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Others were completely confused and followed the trigger of the prefix 'hom(e)o' by referring to '(homozygous) genes' or to evolution, reflecting the generic name for a human. Some recalled 'environment' in their learned definition and then gave ecological responses. 41% of students earned the first mark point and 9% gained the second.

06.2 36% of students gave the correct response of glucagon as the hormone which is released if blood glucose concentration falls too low. It was expected that students could spell this scientific word and so the various combinations of glycogen, glucose and glucagon seen were not accepted.

06.3 This challenging question required students to describe how the data presented in a graph showed that one individual had diabetes. Many jumped too quickly, saw a graph of blood glucose concentration in two people and immediately thought that the question was actually asking something different i.e. for a comparison to show that one individual was 'normal' and the other was 'diabetic'. References to person A were ignored in the marking of the question but a student who followed this line of argument often found it difficult to gain much credit.

Although the command word in the question was 'describe' many students still felt the need to 'explain'. As a result, they both wasted time and also failed to home in on the detailed descriptions of events that were required. Students should have assessed the graph and question carefully and noted – firstly, that information about normal blood glucose concentrations was given for comparison; secondly, that this information referred separately to fasting and non-fasting levels; thirdly, that the question tariff was three marks and that plotted data on the graph followed through three distinct stages; finally, that the question asked specifically for the use of data.

One mark was available for appreciating that the fasting blood glucose level in person B was higher than normal. Students did not gain credit if 'fasting' was omitted or if the reference to 'high' was not comparative.

One mark was available for noting that blood glucose reached a very high level after the drink. Students failed to get credit if the context of 'non-fasting' or 'after the drink' was not made clear. No mark was awarded, either, if 'high' was not qualified in some way to imply that it was 'very' high. Blood glucose levels would go up immediately after a glucose drink, regardless of whether the person was diabetic or not. In addition, the mark was for the blood glucose reaching this (very) high level and not for the speed at which it achieved it. Blood glucose levels would rise quickly after a glucose drink, regardless of whether the person was diabetic or not. Consequently, answers such as blood glucose levels 'shot up' or 'rose rapidly' after the drink gained no credit.

One mark was available for appreciating that blood glucose levels fell slowly or took a long time to fall after the initial rise. This point had to relate to a description of the graph and it was insufficient to say 'it took much longer for the glucose to be converted to glycogen'.

Students could only access full marks in this question if they used correct data from the graph in support of one of the points they made. Some answers incorrectly referred to insulin, rather than to blood glucose levels, and no credit could be given.

6% of all students gained all three marks, 19% of students gained two marks and 24% gained one mark.

06.4 This question required students to understand the differences between the two types of diabetes. If the incorrect types were ascribed to the two people then no marks were available for the student's reasoning. The people referred to in the question were person A and person B and the two types of diabetes are Type 1 and Type 2. The correct and unambiguous use of letters and numbers in answers here was, therefore, a priority. Some students wrongly referred to type A/B diabetes; others hurriedly wrote the numbers 1 and 2 in a way that was unclear to examiners. Where specific letters or numbers are required in answers, students are advised to think very carefully before putting pen to paper and to, possibly, consider writing numbers in words if they feel that their figures might be misconstrued. The same applies to crossings out. If changes are made to answers, they must be unambiguous if credit is to be awarded.

Full and accurate answers relating to person A were rarely seen. Students had to refer both to the fact that insulin was 'produced' and also to body 'cells' being unable to respond or being resistant to it. If the context of production was incorrect, e.g. liver, then no mark was credited. If the lack of response was linked to the body without the qualification of cells or if the student said that 'the body was insulin resistant', again, no credit could be given.

Answers relating to person B were invariably better. The mark was not awarded, however, for responses that were too vague e.g. 'cannot produce the right amount of insulin' / 'cannot produce insulin properly' or 'the body is not producing enough'. Given the data in the question, it was also clearly wrong to say that person B produced 'no insulin'. Students occasionally referred to reasons which did not fully reflect the data given e.g. due to genetic factors or obesity; others described possible ways of treating the diabetes. Such answers gained no credit on their own. A third of students explained one answer, usually Type 1 for person B but very few gave the detail needed to explain Type 2.

06.5 This question required students to apply their knowledge of blood glucose control in a novel situation. Thus, a majority of students did not gain any credit. Although this was not an easy question, many students at least attempted to give reasoned and detailed answers. The context of the question was given in an order that was hoped might help understanding but, nevertheless, very few complete accounts were given.

Students were asked to explain the different possible outcomes when both starving and non-starving children ate lychee fruits. Many struggled to find appropriate biological knowledge to frame their responses and jumped at key words that they hoped would give clues. These included – 'THS', 'enzymes', 'liver', 'day (and night)', 'fat' and 'glucose'.

'THS' led some into thinking that this was an infectious disease, arguing that starving children would have very weakened immune systems that could not cope, leading to death. Enzymes' opened up several different approaches, apart from the expected one, including e.g. no amylase to break down the fruit and release glucose, no lipase to break down fats, enzymes being denatured as a result of high temperatures in the tropics, lychee fruits containing the enzyme which then attacked the liver. Others thought that an enzyme which led to the release of glucose had, in the context of the whole of question six, to be glucagon. Some answers, unfortunately, also referred to enzymes being 'killed'. 'Liver', in conjunction with 'fats', led a few students to discuss how no emulsification by bile was possible. Others referred to THS being a liver disease. 'The 'day and night' aspect led to

4.5.3.2 Control of blood glucose concentration

Answer 01 · Examiner comments

answers which suggested that starving children would be unable to cope with many lychee fruits on 'empty stomachs' just before going to sleep.

The most common incorrect lines of argument, however, centred on 'fats'. Many answers implied that a lack of food meant that the starving children would have no fats in their bodies at all meaning that no glucose could be released. The students were, therefore, paying little attention to the effects of eating lychee fruits. Other answers focused on fats not being broken down and, therefore, accumulating in the body, leading to eventual heart disease and death. Some mistakenly equated fats with 'glycogen'.

Discussions of 'glucose' itself were often misplaced. Rather than lychee fruits containing a molecule preventing the release of glucose, many argued that they would, themselves, contain large amounts of the sugar. It is possible these students confused hypoglycaemia and hyperglycaemia. The children would be overloaded with glucose and unable to store it, leading to other problems (e.g. with water levels and osmosis) and, ultimately, death.

Other misconceptions that arose in answers included e.g. respiration 'produces' energy or energy is 'used' in respiration. Weak answers were always too vague, even if not incorrect, to gain credit e.g. 'the body will not be at its optimum level' or it will not be possible to 'respire properly'. Few students correctly referred to glycogen stores in non-starving children, but good responses did make the link to their absence in starving children.

Students should, perhaps, be advised to marshal their ideas in a brief plan before answering questions of this sort. They should also pay heed to all information given in the stem of the question rather than to just a few aspects.

Only the most perceptive students recognised that the difference in effects on the children lay in the presence or absence of glycogen stores in the muscle or liver which could be used to restore blood glucose levels. If they did recognise this, they gained three to five marks. The most common single mark awarded was for the knowledge that without glucose respiration would stop, leading to death.

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Answer 01 · Examiner comments

June 2019 | 8464/B/2H | Original Q6

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

4.5.3.2 Control of blood glucose concentration

Answer 03 · Examiner comments November 2021 | 8464/B/2H | Original Q1

Question 1 (standard demand)

This question was about hormones and contraception. Early parts of the question involving recall of correct terms such as ‘endocrine’ were not well answered. Common incorrect answers were digestive system, respiratory system or attempts to name the organs. The vast majority of students knew that hormones travel in the blood. Some students knew the hormones were likely to be in the plasma, which was creditworthy. Inaccuracies in responses such as ‘in red blood cells’ did not gain the mark. Confusion was seen regarding the term ‘glands’ in **01.5** in this context, with a wide range of other parts of the reproductive system being named.

There was a generally a good attempt at evaluating a new contraceptive method with existing methods in **01.7**. In this extended response question students needed to consider both advantages and disadvantages compared with named existing methods of contraception to access 5 or 6 marks. Clear guidance relating to command words used in AQA GCSE Science examinations is available. Students were not given information regarding the efficacy of the new contraceptive, but some students attempted to compare the efficacy with existing contraceptive methods.

4.5.3.2 Control of blood glucose concentration

Answer 04 · Examiner comments

June 2022 | 8464/B/2H | Original Q5

Question 5 (standard, standard/high & high demand)

05.1 A quarter of students could identify this type of hormonal control as negative feedback. Common incorrect answers were homeostasis, diabetes and endocrine.

05.2 39% of students could interpret the figure to identify hormone A and hormone B as glucagon and insulin respectively. Both hormones were allowed to be spelt phonetically, however hybrid terms that indicated a possible confusion between glucagon and other terms such as glycogen, glucose and glycerol where not acceptable. Examples such as glycogen were seen.

Common mistakes were to confuse glucagon and insulin, or to name other hormones.

05.3 Explanations usually started with the first marking point but it was equally acceptable to start at the fourth marking point. The most frequently seen mark was for release of glucagon when blood glucose concentration is low.

Confusion was common between the terms glucagon and glycogen, plus glycerol was also regularly seen.

The third and sixth marking points were very challenging. These required an understanding of how negative feedback causes the reduction in the release of each hormone.

A fifth of students scored either three or four marks.

05.4 40% of students could identify the roles of FSH and LH. Few students gained the third marking point, to fully explain why the probability of pregnancy would be greater following FSH and LH injections.

05.5 Most students knew that IVF involves fertilisation in laboratory conditions. Some inaccuracies of language were seen, such as sperm and egg mix, with no reference to or description of fertilisation, and eggs being inserted into the body, with no reference to uterus or womb.

05.6 Students found this question challenging, with 4% achieving full marks. Confusion between meiosis and mitosis was common. Responses generally lacked the detail required for the points on the mark scheme. Some students only described one process or the other, rather than describing differences.

Responses could not gain full marks if there was an implication that sperm cells go through meiosis.

The third marking point was sometimes attempted, but not expressed clearly, such as four sperm cells are made that are different, but the two liver cells are the same. Reference to *genetically* different or *genetically* identical was required.

Answer 05 · Examiner comments

Question 6 (standard, standard/high & high demand)

06.1 Nearly all students could identify that the pituitary gland releases hormones to control other glands.

06.2 Most students knew that adrenaline increases blood flow to muscles.

06.3 Most students could give the correct answer of receptor or sensory neurone/cell.

Some students were unaware that receptors that respond to stimulus are types of cells. Common incorrect answers were red blood cells, white blood cells, effector, muscle, named organs and nerve cells or neurones unqualified.

06.4 Very few students gained 2 marks. Many students stated that blood glucose goes up or is high in people with diabetes, but this is also true of people without diabetes, so the mark could not be awarded. The answer needed to be comparative.

Many students simply stated that people with diabetes do not produce enough insulin. This did not go far enough for either mark to be awarded.

Some students demonstrated confusion between Type 1 and Type 2 diabetes. Other students tried to answer in terms of how reaction time would be affected rather than blood glucose concentration.

Confusion was evident in terms of incorrect responses stating that 'insulin breaks down into glucose', or 'people with diabetes don't produce enough glucose'.

The answers to this question highlighted that many students did not understand the biological basis of diabetes. Common misconceptions included:

- people with Type 1 diabetes cannot make their own glucose (and this was sometimes followed by comments implying it is therefore safer for people with diabetes to drink glucose)
- glucose is the same as insulin
- insulin is converted to glucose
- insulin is converted to glycogen
- a lack of insulin means blood glucose concentration is lower.

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4.5.3.2 Control of blood glucose concentration

Answer 05 · Examiner comments June 2024 | 8464/B/2H | Original Q6

06.5 The most frequent correct responses related to amount of sleep or minimising distractions.

Common misinterpretations of the question referred to controlling the volume or concentration of glucose solution. Students should take care to read all the information provided. Different volumes or concentrations of glucose solutions would be necessary to change the independent variable. Food and drink were controlled, so references to controlling caffeine and alcohol intake could not be credited.

Many students assumed the reaction time test was the ruler drop test. If they described a suitable control variable, such as 'using dominant hand to catch the ruler' this was credited, but often these attempts at control variables were incorrect, such as 'same ruler' or 'same person dropping the ruler'.

06.6 Some students incorrectly interpreted the question as being an issue with recording accurate results. Many responses did not go far enough to be awarded the mark, such as 'blood glucose goes too high' without giving a reason why this is problematic. Common incorrect responses were too vague, such as 'in case they fell ill' or 'to give insulin injections'.

Some students suggested the health of the patient would affect the results/reaction times in the experiment, rather than considering the risk to the person with diabetes. These were not awarded the mark.

There were some good answers in which the students understood that both low and high blood glucose concentration are dangerous.

06.7 Students found this question challenging. Many simply defined homeostasis rather than answering the question. Some students approached the right idea but were imprecise with their language, such as 'faster/slower reaction times' indicating confusion between reactions, reaction times and the time recorded. Students need to be careful they are not describing time as speeding up or slowing down, which is not possible. Reactions can be faster but not reaction times.

Some students did identify that reaction times in the range for people without diabetes were lower but did not go far enough to state lowest. Similarly, some identified high blood glucose concentration increased reaction time but did not refer to low blood glucose concentration.

06.8 Many students are confused between glucose, glycogen, glucagon. Glycerol was also seen. Hybrid spellings between these terms was common and whilst phonetic spelling is acceptable, marks cannot be credited where there is ambiguity between technical terms.

Common misconceptions were that insulin or glucagon are broken down into glucose. For marking point 1, students often missed mention of the pancreas, in which case the mark would not be awarded. Few students gave marking point 2.

Some students misunderstood the question and described how people with diabetes control their blood sugar levels through diet and exercise.

Students sometimes spend time starting this style of question by re-writing the question. This is not necessary.

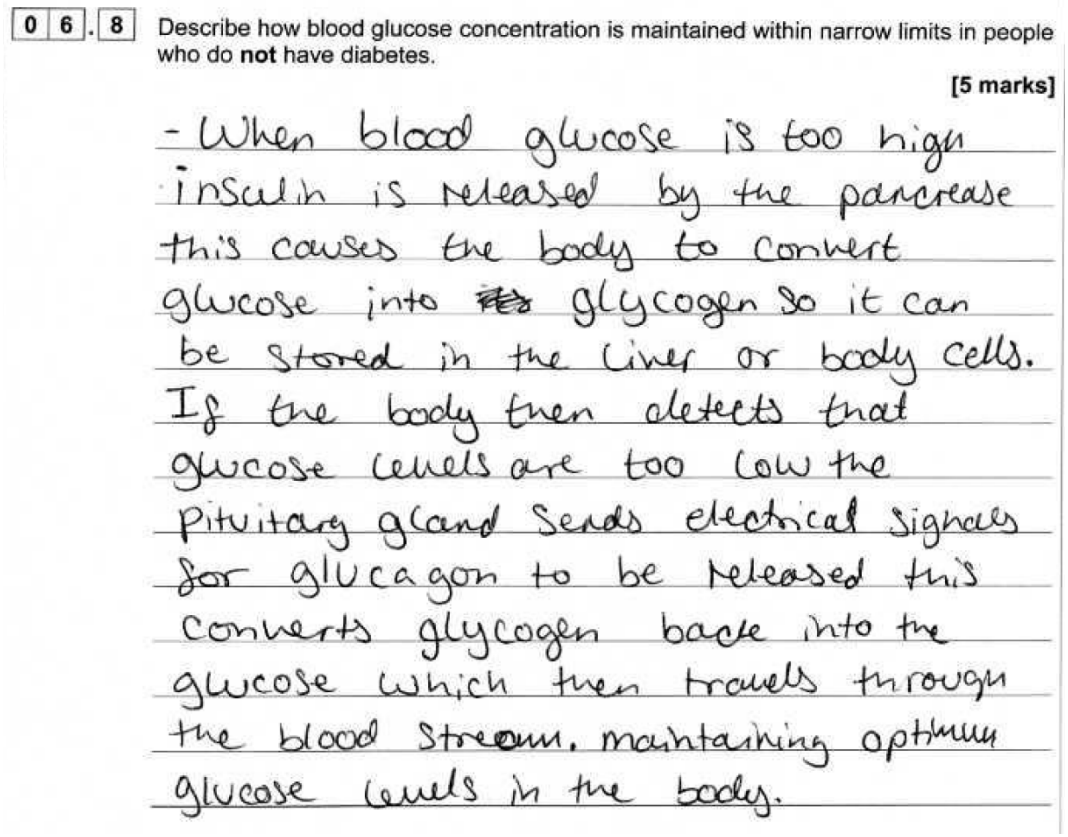
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4.5.3.2 Control of blood glucose concentration

Answer 05 · Examiner comments June 2024 | 8464/B/2H | Original Q6

0 6 . 8 Describe how blood glucose concentration is maintained within narrow limits in people who do **not** have diabetes.

[5 marks]



- When blood glucose is too high insulin is released by the pancrease this causes the body to convert glucose into ~~fats~~ glycogen so it can be stored in the liver or body cells. If the body then detects that glucose levels are too low the pituitary gland sends electrical signals for glucagon to be released this converts glycogen back into the glucose which then travels through the blood stream, maintaining optimum glucose levels in the body.

The student has given marking points 1 and 3. 'Pancrease' is given benefit of the doubt as a phonetic spelling of pancreas.

The student is not clear whether glucose or glycogen is entering liver cells, therefore marking point 2 cannot be awarded.

The student has not referred to where glucagon is released from when blood glucose concentration decreases, therefore marking point 4 cannot be given.

Marking point 5 is given, so the student gains 3 marks for this question.

06.9 Many students answered as if the reaction time has increased, despite the question. For the first marking point, many stated that the increase in chemical would decrease the rate of diffusion, or 'overwhelm' the body. Few students made appropriate mention of impulses. Very few students could link the role of the diffusion of chemicals to impulses in the next/motor/relay neurone.

There was frequent use of incorrect terminology, such as:

- electrical impulses travelling across a synapse
- chemical impulses travelling across a synapse
- chemicals diffusing down neurones
- neurones moving from receptors to effectors.

Although it's beyond the specification, the term 'neurotransmitters' was seen and could be used.

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4.5.3.2 Control of blood glucose concentration

Contact us

Our friendly team will be happy to support you between 8am and 5pm, Monday to Friday.

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Answer 06 · Examiner comments

Question 6 (Standard, Standard/High and High demand)

06.1 85% of students could identify the equation representing a linear relationship.

06.2 It was most common to award Level 2 for this question, with 35% of students gaining 3 or more marks.

Extended response questions are not marked as one idea gains one mark, five ideas gains five marks etc. See the level descriptors in addition to the indicative content in the mark scheme and section 4 in the preamble to the mark scheme. It is never necessary for all, or even most, suggested content to be included for the award of the highest marks. Note the statement at the end of the indicative content 'For Level 3, details of Type 1 and Type 2 diabetes must be considered, with the link to C-peptide and the importance of the test described'.

Most frequently, clear links were made when describing Type 2 diabetes; many students knew that insulin was still produced but the body had stopped responding to it, which allowed the entry into Level 2. Where the student had understood the question, it was also common to see the correct response to C-peptide production with the same answers.

Where responses did not enter Level 2, there was often confusion between the two types of diabetes or C-peptide production. The first bullet point for Type 1 was often missed as the pancreas was not mentioned.

A Level 3 response needed to include the importance of carrying out the test. It was most common to see reference to how Type 2 is treated, although it was often expressed as what is a risk factor for Type 2 diabetes instead which was insufficient to answer this question.

Many students used the additional pages at the end of the exam paper for this question. Students must remember to clearly label the question number if they use these pages.

Misconceptions included:

- referring to people with Type 2 diabetes being 'immune' to insulin
- stating insulin produced by people with Type 2 diabetes 'doesn't work'
- confusing Type 1 diabetes with Type 2 diabetes.

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4.5.3.2 Control of blood glucose concentration

Answer 06 · Examiner comments June 2025 | 8464/B/2H | Original Q6

0 6 . 2 When the body makes insulin, C-peptide is also made.

The concentration of C-peptide in the blood is **not** increased by insulin injections.

Some people with Type 2 diabetes are **incorrectly** told they have Type 1 diabetes.

Doctors can test the concentration of C-peptide in the blood to check which type of diabetes a person has.

Explain:

- how the test can indicate which type of diabetes a person has
- the importance of finding out whether a person being treated for Type 1 diabetes actually has Type 2 diabetes.

[6 marks]

The test can indicate if the person has enough insulin in their body, because people with type 1 diabetes, their pancreas are unable to make that much insulin and if the person has type 2 diabetes the body cells no longer respond to insulin produced by the pancreas. It is important to know weather the person has type 1 or type 2 diabetes so they can inject more insulin into the body.

Extra space

carbohydrate-controlled diet

This student has made a relevant statement about people with Type 1 diabetes (bullet point 1 in the indicative content), and two linked statements about people with Type 2 diabetes (bullet points 4 and 5). This exceeds the description for entering Level 2. However, the response does not enter Level 3 as there is no link to testing for C-peptide and nothing within the 'Importance' heading has been referred to. The statement on the final line ‘carbohydrate-controlled diet’ cannot be given credit without context. Therefore, this response was awarded 4 marks.

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4.5.3.2 Control of blood glucose concentration

Answer 06 · Examiner comments June 2025 | 8464/B/2H | Original Q6

06.3 70% of students knew that glucagon is produced by the pancreas.

06.4 As expected, this proved to be a challenging question. 40% of students gained one or more mark, with only 6% gaining 3 or 4 marks.

It was common to see students incorrectly stating that glucagon is a carbohydrate and is broken down to cause an increase in blood glucose or stating that if there is not enough glucagon this causes a low blood glucose concentration.

Spelling errors of glucagon and glycogen, including many hybrid terms were seen.

Some students referred to blood sugar rather than blood glucose or blood glucose concentration. This was a problem for a small number of students attempting to gain marking points 2 or 3, where reference to glucose was required as part of the marking points.

Some students started their response with 'glucagon is released when blood glucose is low' (gaining marking point 1) and then continued their answer with the 'normal' response to low blood glucose concentration rather than answering the question.

It was noted that it was very common to see 'production of energy' in responses, thus negating marking point 4.

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4.5.3.2 Control of blood glucose concentration

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