AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.2.2.1

The human digestive system

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**7**
Available paper years	**2019–2024**

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.

4.2.2.1 The human digestive system

Answer 01 · Mark scheme June 2019 | 8464/B/1H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	amylase	allow phonetic spelling allow carbohydrase ignore references to source of enzyme e.g. salivary / pancreatic do **not** accept amylose	1	AO1 4.2.2.1
02.2	(partially permeable tubing) small intestine (water in test tube) blood	allow stomach ignore intestine unqualified do **not** accept large intestine allow plasma	1 1	AO3 4.2.2.1
02.3	(Starch): Iodine (solution) (Sugar): Benedict's (solution)	allow phonetic spelling ignore iodide unqualified	1 1	AO1 4.2.2.1
02.4	enzyme had not started to work **or** none of the starch had been digested / broken down	allow idea of not enough time (for digestion)	1	AO2 4.2.2.1
02.5	(enzyme) digested / broke down starch to form sugar (however) not all the starch was digested / broken down		1 1	AO2 AO3 4.2.2.1
02.6	sugar molecules formed are small enough to pass through tubing (but) starch molecules too large (to pass through tubing)		1 1	AO3 4.2.2.1 AO2 4.2.2.1
Total			**10**	

4.2.2.1 The human digestive system

Answer 01 · Mark scheme

June 2019 | 8464/B/1H | Original Q2

4.2.2.1 The human digestive system

Answer 02 · Mark scheme November 2020 | 8464/B/1H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	amylase	allow phonetic spelling allow carbohydrase do **not** accept amylose	1	AO1 4.2.2.1
02.2	small intestine		1	AO1 4.2.1 4.2.2.1
02.3	any **one** from: • greater magnification • higher resolving power	allow can see (smaller) sub-cellular structures / parts allow can see more detail (inside cells) allow reference to 3-D images	1	AO1 4.1.1.5
02.4	capillary		1	AO2 4.2.2.1 4.2.2.2
02.5	$20 = \frac{\text{image length}}{0.8}$ image length = 0.8 x 20 image length = 16 (mm)		1 1 1	AO2 4.1.1.5 RPA 1
02.6	diffusion		1	AO3 4.1.3.1
02.7	active transport	allow active uptake	1	AO3 4.1.3.3

4.2.2.1 The human digestive system

Answer 02 · Mark scheme

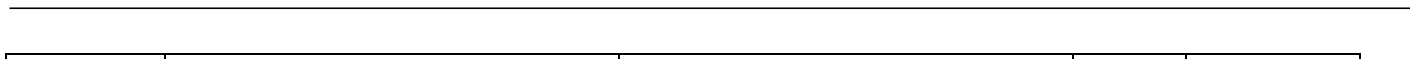
November 2020 | 8464/B/1H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	any **one** from: • respiration • to form glycogen • to make amino acids / proteins	allow as an energy source do **not** accept to make / use / create / produce energy allow to make lipid / fat	1	AO1 4.4.2.1 4.4.2.3
02.9	**Level 2:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.		3–4	AO2 4.1.1.3 4.1.3.1 4.1.3.3 4.2.2.1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.		1–2	
	No relevant content		0	
	Indicative content • have (many) microvilli • (to) increase surface area • wall of villus only one cell thick **or** is thin • capillaries are close to surface • (so) short pathway • good blood supply • (to) transport food molecules away **or** to the body • (and) maintain a diffusion gradient • cells have many mitochondria • (where) respiration takes place • (where) energy is transferred • (as) active transport requires energy • energy is needed to absorb sugar / food / molecules For Level 2 must make links between structure and it's function			
Total			14	

4.2.2.1 The human digestive system

Answer 02 · Mark scheme

November 2020 | 8464/B/1H | Original Q2



4.2.2.1 The human digestive system

Answer 03 · Mark scheme

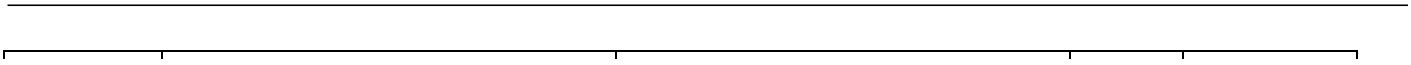
November 2021 | 8464/B/1H | Original Q2

Question	Answers	Mark	AO / Spec. Ref.
02	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO1 4.2.2.1 RPA3
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content **Protein** • grind up food • add Biuret (reagent / solution) **or** add copper sulfate (solution) **and** sodium hydroxide (solution) **or** add Biuret 1 and Biuret 2 • turns purple / lilac **Starch** • add iodine (solution) • turns black / blue-black / dark blue - ignore blue / purple **Sugar** • grind up food • mix with water • add Benedict's (reagent / solution) • heat mixture (≥ 65 °C) • in a water bath • turns (brick) red / orange / brown / green / yellow For Level 3 correct references to all three tests are needed.		
Total		**6**	

4.2.2.1 The human digestive system

Answer 03 · Mark scheme

November 2021 | 8464/B/1H | Original Q2



4.2.2.1 The human digestive system

Answer 04 · Mark scheme

June 2022 | 8464/B/1H | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	salivary glands, pancreas and small intestine		1	AO1 4.2.1 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	pH (of amylase / solution / buffer)	ignore upper and lower case letters allow hydrogen ion / H^+ concentration ignore acidity / alkalinity	1	AO1 4.2.2.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	iodine (solution / reagent) would **not** turn black / blue-black **or** iodine (solution / reagent) would stay orange / brown	allow iodine (solution / reagent) would **not** turn dark blue / dark purple ignore iodine solution / reagent would not turn blue / purple allow iodine (solution / reagent) would not change colour	1	AO1 4.2.2.1 RPA3 RPA4

4.2.2.1 The human digestive system

Answer 04 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	6.8	answer line takes precedence allow answer in range 6.75 to 6.85	1	AO3 4.2.2.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	82 (seconds)	answer line takes precedence allow answer in range 80 to 84 (seconds)	1	AO3 4.2.2.1 RPA4

4.2.2.1 The human digestive system

Answer 04 · Mark scheme

June 2022 | 8464/B/1H | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6 View with **Figure 7**	tangent drawn at 40 seconds		1	AO2 4.2.2.1 RPA4
	(rate =) $\frac{\text{value for dy}}{\text{value for dx}}$	eg (rate =) $\frac{2.25}{60}$	1	
	calculation of rate at 40 seconds	(rate =) 0.0375 (arbitrary units per second) allow an answer in the range 0.035 to 0.042 (arbitrary units per second)	1	
	(0.0375 × 60 =) 2.25 (arbitrary units per minute)	allow an answer in the range 2.1 to 2.5 (arbitrary units per minute)	1	
		if no other marks awarded allow **1** mark for $\left(\frac{3.5}{40} \times 60 =\right)$ 5.25 (arbitrary units per minute) allow an answer in the range 5.175 to 5.25 (arbitrary units per minute) for this mark only		

4.2.2.1 The human digestive system

Answer 04 · Mark scheme

June 2022 | 8464/B/1H | Original Q3

Question	Answers	Mark	AO / Spec. Ref.
03.7	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO2
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO1
	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	
	Indicative content • enzymes are protein molecules • (so) have a 3D structure • lock and key theory • have an active site • (which) has a specific shape • shape of active site will only match shape of substrate • starch is substrate for amylase • at pH values above or below the optimum the shape of active site is changed (in some molecules) • (so) substrate can no longer fit the active site • at extreme pH values enzyme is denatured • (so) shape of active site is changed • (so) amylase can no longer digest starch • (so) rate of digestion decreases For Level 3 reference to enzyme structure and effect of pH on enzyme activity are needed		4.2.2.1

Total Question 3		**15**

4.2.2.1 The human digestive system

Answer 05 · Mark scheme

June 2023 | 8464/B/1H | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	starch (molecules) are large / insoluble (so) cannot be absorbed (into the blood)	 allow (so) cannot pass through the wall of the (small) intestine / gut allow (so) cannot diffuse into the blood allow sugar (molecules) are small / soluble (1) (so) can be absorbed into the blood **or** (so) can pass through the wall of the (small) intestine / gut (1)	1 1	AO1 4.2.2.1 4.4.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	(10 cm^3 dilute) iodine solution and (1 cm^3 of) water	allow (10 cm^3 dilute) iodine solution allow water ignore iodine unqualified	1	AO3 4.2.2.1 RPA3

4.2.2.1 The human digestive system

Answer 05 · Mark scheme

June 2023 | 8464/B/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	percentage of light passing through the liquid decreased with increasing starch concentration	allow the more concentrated the starch (suspension) the less light could pass through	1	AO2 4.2.2.1 RPA3
	(because iodine) solution was darker (in colour)	allow (iodine) solution was blacker allow the more (insoluble) starch the more cloudy the mixture	1	
	(so) absorbed more light	ignore less light passes through	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	any **one** from: • to allow them to reach 37 °C • so they would be at the optimum / same temperature	allow to allow them to reach body temperature allow to equilibrate	1	AO3 4.2.2.1 RPA4

Answer 05 · Mark scheme

June 2023 | 8464/B/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	6.6 (g/dm^3)	allow answer in range 6.5 to 6.7 (g/dm^3)	1	AO2 4.2.2.1 RPA3
	6.6 – 0.3 **or** 6.3 (g/dm^3)	allow correctly calculated value consistent with range allowed in step 1	1	RPA4
	$\frac{6.3}{3}$	allow correct subtraction of answer to step 1 minus 0.3 for 6.3 in this equation	1	
	2.1 (g/dm^3 per minute)	allow correctly calculated rate using incorrectly calculated value for 6.3 if no other marks awarded allow **1** mark for the concentrations 1.8 **and** 0.8 (g/dm^3)	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	(at pH 1) shape of active site would be altered	allow (at pH 1) enzyme / amylase would be denatured	1	AO2
	(so) starch would not be digested	allow (so) enzyme / amylase would not work allow (so) no reaction would occur allow (so) reaction would be (a lot) slower	1	AO2
	(so) percentage of light passing through liquid would stay at 10	allow (so) percentage of light passing through liquid would not change / increase	1	AO3 4.2.2.1 RPA3 RPA4

Total Question 6	14

4.2.2.1 The human digestive system

Answer 06 · Mark scheme

June 2023 | 8464/B/2H | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	humans have not found evidence of every species		1	AO3 4.6.3.2 4.6.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	fossils	allow fossil record allow remains of organisms allow DNA do **not** accept fossil fuels	1	AO1 4.6.3.1 4.6.3.2 4.6.3.3

4.2.2.1 The human digestive system

Answer 06 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
02.3	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO2
	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	

	Indicative content
	Methods of reducing rate of evolution and linked explanation
	• doctors should not prescribe antibiotics inappropriately
	  ○ so fewer *C. difficile* are exposed to antibiotic(s)
	• do not use antibiotics to treat mild (bacterial) infection
	  ○ because the immune system can respond (to mild bacterial infection)
	• do not use antibiotics to treat (any) viral infections
	  ○ because antibiotics do not kill viruses
	• patients should complete their course of antibiotics
	  ○ so (more likely that) all *C. difficile* are killed
	  ○ so none survive to mutate (and form resistant strains)
	• the agricultural use of antibiotics should be restricted
	  ○ so fewer *C. difficile* are exposed to antibiotic(s)
	• hand washing after going to toilet
	  ○ will reduce spread of *C. difficile*
	• people with diarrhoea / *C. difficile* should stay away from school / work
	  ○ to reduce spread of *C. difficile*
	• develop new antibiotic against *C. difficile*
	  ○ so all *C. difficile* are killed
	  ○ so none survive to mutate and form (another) resistant strain
	• develop vaccine against *C. difficile*
	  ○ would decrease the use of antibiotics
	For **Level 3**, answers must refer to method(s) and linked explanation(s).
			4.6.3.4
			4.6.3.1
			4.6.2.2

Total Question 2	8

4.2.2.1 The human digestive system

Answer 07 · Mark scheme

June 2024 | 8464/B/1H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	any **two** from: • less (fructose / sugar) needed • cheaper to produce / buy the drink • less energy in the drink (so people are more likely to buy it)	ignore fructose is sweeter than glucose allow less (sugar) tax allow more profit ignore cheaper unqualified allow less calories / J / KJ in the drink allow less (fructose / sugar) needed so would be cheaper for **2** marks	2	AO3 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	add Benedict's (reagent / solution) heat reagent / solution green / yellow / orange / brown / (brick) red	 allow appropriate method of heating if a temperature is given, must be at least 60 °C ignore warm ignore starting colour	1 1 1	AO1 4.2.2.1 RPA3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	add Biuret (reagent / solution) mauve / purple / lilac / pink-purple	allow add Biuret A **and** Biuret B allow add potassium / sodium hydroxide solution **and** copper sulfate solution ignore starting colour	1 1	AO1 4.2.2.1 RPA3

4.2.2.1 The human digestive system

Answer 07 · Mark scheme

June 2024 | 8464/B/1H | Original Q1

Question	Answers	Mark	AO / Spec. Ref
01.4	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO1 4.2.2.1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–3	
	No relevant content	0	
	Indicative content ***Protein*** • protease ○ (protein) broken down into amino acids ○ (protease) produced in the stomach ○ (protease) produced in the pancreas ○ (protease) produced in the small intestine ○ (hydrochloric) acid provides the correct pH for protease (in the stomach) ***Fat*** • lipase ○ (fat) broken down into fatty acids ○ (fat) broken down into glycerol ○ (lipase) produced by the pancreas ○ (lipase) produced by the small intestine ○ bile ○ (bile) produced by the liver ○ (bile) released from the gall bladder ○ emulsification of fats ○ larger surface area for lipase ○ neutralises acid to provide the correct pH for enzymes For **Level 2**, answers must describe digestion of fat **and** protein linked to correct type of enzyme for both		

Total Question 1	**13**

4.2.2.1 The human digestive system

Answer 01 · Examiner comments

June 2019 | 8464/B/1H | Original Q2

Question 2 (standard demand)

02.1 About 69% of students correctly named amylase or carbohydrase as the enzyme that digests starch. Phonetic spellings were allowed.

02.2 The question informed students that Figure 2 was a model to represent the digestion and absorption of food molecules in the digestive system. Students should know that digestion and absorption occur in the small intestine. Named parts of the small intestine, including villi and microvilli, were all allowed. The stomach was also allowed. Just saying the gut or intestines was insufficient. Reference to the large intestine was incorrect. Other incorrect responses included organs such as the pancreas or lungs.

Some students gave partially permeable membrane as their answer, but this was labelled on the diagram. Quite a lot gave the stomach, but thought the water in the test tube was stomach acid, so only gained the first marking point. Over half of the students correctly stated that the water represented the blood or bloodstream. Hydrochloric acid was a common incorrect response.

02.3 About 61% of students gained both marks. The most common error was to give the names of other food test reagents, for example Sudan III and Biuret reagent.

02.4 About 41% of students gained the mark from this question. Some students gave both ideas – that the enzyme hadn't had time to start working and that the starch hadn't been broken down yet.

Quite a few students said that no sugar had been put in at the start, which was ignored. Misconceptions included that the sugar had diffused out of the tubing.

4.2.2.1 The human digestive system

Answer 01 · Examiner comments June 2019 | 8464/B/1H | Original Q2

02.5 Around 23% of students gained both marks for realising that there had not been enough time for all the starch to be broken down into sugar. The response needed to refer to the digestion, or breakdown, of starch into sugar. Many students just described the test results, saying starch and sugar were both present, which did not gain credit as an explanation was asked for.

Many students talked about the substances dissolving, or moving out of the tubing by diffusion, osmosis or active transport, demonstrating a poor understanding of these three processes. Some said the starch had been digested into sugar by the water, which negated the first marking point. Quite a lot of responses were answers to question 02.6, which was about the size of the molecules.

02.6 About 12% of students gained any marks for this question. Most students just described the results, saying that sugar was present in the test tube, but not starch. Those who attempted to explain the results often gave an extended response to question 02.4 and said that all the starch had been digested to form sugar.

Few realised that the sugar had passed through the tubing, but the starch had not. Some assumed that both molecules had passed through the membrane, but then the starch had dissolved in the water. References to diffusion, osmosis and active transport were often made.

Answer 03 · Examiner comments November 2021 | 8464/B/1H | Original Q2

Question 2 (standard demand)

This question assessed knowledge and understanding of Required Practical Activity 3: using qualitative reagents to test a sample of food for protein, starch and sugar. Only a few detailed, and logically sequenced methods were seen which indicated few students had carried out investigations on this practical.

A fifth of students scored more than 3 marks. This was generally because the methods had not appeared to have been learnt. Many students could not give one complete method which linked a correct reagent to the food it is used to test, and to the colour of a positive result. This limited the response to Level 1 of this question which required an extended response. To achieve Level 3, at least two complete tests plus another correct statement was required.

4.2.2.1 The human digestive system

Answer 04 · Examiner comments

June 2022 | 8464/B/1H | Original Q3

Question 3 (standard, standard/high & high demand)

03.1 Three-quarters of students knew that amylase is produced by the salivary glands, pancreas and small intestine.

03.2 Three-quarters of the students correctly identified the pH of the amylase solution as the independent variable. Many did not write pH correctly, but as the skill was to identify the independent variable, this was ignored. Some students gave control variables, whilst a few gave the dependent variable.

03.3 30% of students answered this question correctly**.** The question was set at high demand, so to score the mark the student had to say that iodine solution would not turn blue-black, or iodine solution would stay orange. Both the test solution and the colour had to be given. Many students gave a description of the colour of the solution, but they did not name it.

03.4 Half of the students interpreted the graph correctly and gave the optimum pH for the amylase as 6.8

03.5 92% of students interpreted the graph correctly. The time for all the starch to be digested was 82 seconds, but the vast majority of students gave the value 80 seconds. This was within the range allowed.

03.6 This question was set at the highest level of demand. A third of students scored one mark. This was usually for the compensation mark. They calculated the mean rate of sugar production at 40 seconds. Some students drew a suitable tangent, but made errors when reading the change in concentration and the change in time from the graph. 4% of the students scored full marks for the question.

03.7 47% of students performed at Level 2 or above. Most students referred to enzymes having an active site, and some went on to describe how enzymes work. Less than a fifth of students clearly explained the effect of pH on the activity of amylase; with some saying that the enzyme could be denatured.

4.2.2.1 The human digestive system

Answer 05 · Examiner comments

June 2023 | 8464/B/1H | Original Q6

Question 6

06.1 Quite a lot of students simply stated that starch has to be digested to form sugar. Some went on to give uses of sugar, for example for respiration. These ideas were not creditworthy. A reference to the size of starch molecules, or that starch is insoluble, was needed for the first mark. A third of students scored at least 1 mark, usually for saying that starch molecules are big. Just over a tenth of students also gave a correct explanation in terms of absorption or diffusion into the blood. Some thought starch had to be digested because it is harmful.

06.2 Four fifths of students scored this mark for saying the control liquid for the investigation was water, which was allowed. A few gave the better answer of iodine solution.

06.3 Most students scored at least 1 mark for describing the pattern that the percentage of light passing through the liquid decreased with increasing starch concentration. Simply giving data was ignored, a clear pattern had to be described. Just over a quarter of students scored the second mark as well by explaining that this was because the iodine solution would be darker. The final mark which was set at the highest level of demand was rarely seen. A clear statement that a darker liquid would absorb more light was needed.

06.4 Half of the students scored the mark for explaining why the starch suspension and amylase solution were kept in the warm water bath for 10 minutes before being mixed together. Most said so they would be at the same temperature. Others gave a better answer saying that 37 °C was the optimum temperature for enzymes to work, or that it was body temperature.

06.5 The calculation of the mean rate of digestion was set at the highest level of demand, and involved the use of two graphs. Many students did not realise this, and only just over a tenth of students scored 1 mark. This was either for giving the concentration at zero time as being 6.6 g/dm^3 or for giving the concentrations 1.8 g/dm^3 and 0.8 g/dm^3 for the concentrations at 1 and 2 minutes. These three values all required use of both graphs. Quite a lot of students gave the percentage of light passing through the mixture at 1, 2 and 3 minutes. This only involved the use of one graph, so was not creditworthy at the level of demand at which the question was set.

06.6 Almost two fifths of students scored at least 1 mark for saying that the enzyme would be denatured at pH1. Half of these went on to say that therefore the starch would not be digested, or that the reaction would be much slower, to score 2 marks. The final mark was set at the highest level of demand. Very few could explain how this would affect the percentage of light passing through the liquid.

4.2.2.1 The human digestive system

Answer 06 · Examiner comments

June 2023 | 8464/B/2H | Original Q2

Question 2 (Standard demand)

02.1 In this question students were asked to identify why the percentage of species that are extinct is only an estimate. Over 95% of students gave the correct answer.

02.2 Most students could state that fossils or DNA are used as evidence to study species that have become extinct. References to fossil fuels were seen and did not gain credit. A few students misread the question and gave details of the reasons why species become extinct instead.

02.3 This was an 'extended response' style of question. Such questions are marked holistically. There are overall generic descriptions for the three levels of response at the top of the scheme, giving a hierarchy of response. Within each level there are 2 marks.

In this question, students were asked to explain how the evolution of an antibiotic-resistant bacterium could be slowed down. As students were asked to explain how this could be done, it was necessary to link suggested actions with reasons in order to achieve higher level marks.

The question was not asking how antibiotic resistant bacteria evolve in the first place and neither was it about genetic engineering.

Students achieving Level 1 gave simple unconnected but appropriate suggestions such as 'isolation of infected people' or 'don't use antibiotics when not necessary'. To enter Level 2 there had to be evidence of at least an attempt at linking an idea with the underlying reason(s) behind it together with some limited but additional relevant information. To enter Level 3 students had to make several appropriate points as well as show at least one clear, logical link.

The most frequently seen suggestion was that patients should complete courses of antibiotics. This was often correctly linked with the need to kill all *C. difficile* but fewer answers then went on to say that none would therefore (survive and) mutate to form resistant strains.

Simple rewording of the question did not gain credit. Answers that simply said 'so the bacteria would not be able to evolve and become antibiotic resistant' added nothing else to be credited.

Other points that were commonly made included references to isolation of patients and to hand washing. The question context here was of infection of the digestive system by *C. difficile* and, therefore, suitable qualification of hand washing, such as 'after going to the toilet' or 'before preparing food' was required in order for a strong, reasoned link to be credited. Vague answers relating to 'good hygiene' only were insufficient. Some students thought that diet and exercise would kill the bacteria.

Several students made references to doctors not prescribing antibiotics inappropriately but few students went on to explain why. Similarly, the reason for not using antibiotics for mild infections – 'the body's own immune system can respond effectively' – was rarely seen. Students do seem to appreciate, though, that antibiotics cannot kill viruses and so a mention of this linked to no antibiotics being used in such cases often gained credit.

Some answers suggested that new antibiotics might be developed but the idea that antibiotics can be made 'stronger' is incorrect. As with the point about completing courses of antibiotics, the advantage of a new antibiotic would need to be linked to 'all *C. difficile* being killed' or 'none could survive to mutate' in order to gain credit for a linked statement.

Some students commented on developing a vaccine against *C. difficile* but very few then managed to link this to an explanation.

The indicative content in the mark scheme can never cover all ideas that are worthy of credit, but are there to guide examiners. Other ideas such as 'Treatment with several antibiotics at the same time to kill all of them' was another appropriate method with linked explanation.

Many students referred to 'it' in their answer. Sometimes this meant antibiotics and other times this meant bacteria. We always read for context to make sense of the term 'it'.

'Immune bacteria' was not an acceptable alternative to resistant bacteria. It was assumed that bacteria referred to in a response meant *C. difficile*.

0 7 . 3 A bacterium called *Clostridioides difficile* (*C. difficile*) can infect the human digestive system.

C. difficile can multiply and produce toxins. The toxins cause diarrhoea.

Doctors are concerned that new strains of *C. difficile* may evolve.
Antibiotics may **not** be able to kill these new strains.

Explain how the evolution of antibiotic resistant *C. difficile* can be slowed down.

[6 marks]

the evolution of the antibiotic resistant C. difficile can be slowed down by getting people who have it on the antibiotics instantly and make sure they take the full course correctly. Another way to stop the evolution from happening so quick is by quarantining people who have it or have been near someone who had it to stop it spreading and developing fast. also staying out/away from lots of heat as that lets bacteria multiply faster.

The student (from a Foundation tier paper) has given bullet point 7 and then linked bullet points 14 and 15 from the indicative content. This exceeds the minimum requirement to meet the Level 2 descriptor, but does not meet the Level 3 descriptor, therefore 4 marks were awarded.

4.2.2.1 The human digestive system

Answer 06 · Examiner comments June 2023 | 8464/B/2H | Original Q2

0 2 . 3 A bacterium called *Clostridioides difficile* (*C. difficile*) can infect the human digestive system.

C. difficile can multiply and produce toxins. The toxins cause diarrhoea.

Doctors are concerned that new strains of *C. difficile* may evolve.
Antibiotics may **not** be able to kill these new strains.

Explain how the evolution of antibiotic resistant *C. difficile* can be slowed down.

[6 marks]

Evolution of antibiotic resistant C. difficile can be slowed down if the overuse of the antibiotics used to treat this bacterial disease, is reduced by taking precautions. These might be ~~that's~~ making ~~the~~ the rules for its prescription more strict and actually having the regulations properly in place.
Another way is to encourage people to use full course of their antibiotic treatment even if the symptoms are relieved, because ~~they~~ when it is not used fully, ~~antibiotics~~ bacteria that's left alive can reproduce and develop resistance to the drug which is what ~~it~~ might cause it to evolve.
Also for lighter symptoms, if it is not serious, it might be better for the body to overcome the bacteria by itself to not ~~over~~ introduce the drug to the bacteria.

The student (from a higher paper) has given bullet point 1 from the indicative content. They link bullet points 7 and 8. In the final paragraph they link bullet points 3 and 4. This exceeds the minimum required for the Level 3 descriptor, therefore 6 marks were awarded.

Answer 07 · Examiner comments

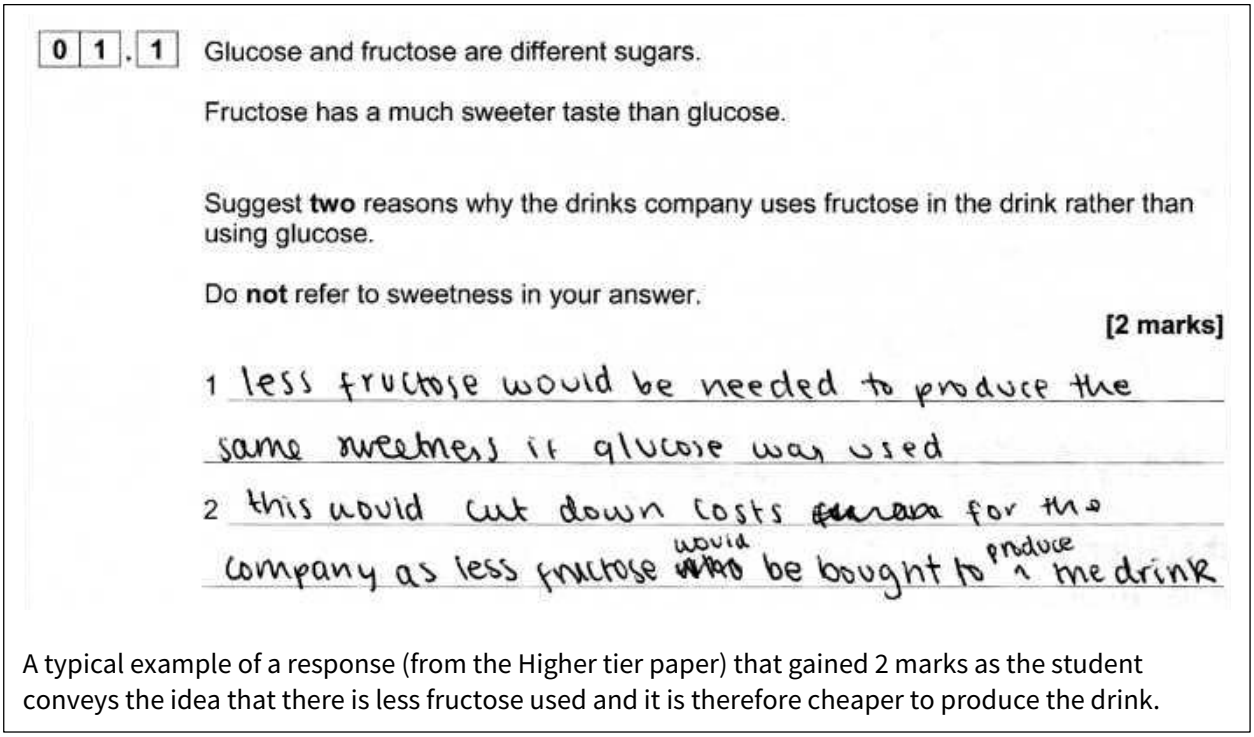
June 2024 | 8464/B/1H | Original Q1

Question 1 (standard demand)

01.1 Nearly all students attempted this question however, 78% could not gain any marks. Many made the link to fructose being cheaper but simply stated that 'it' or 'the fructose' would be cheaper or easier to get without stating why fructose would be cheaper. Despite being told not to refer to sweetness some students still said the drink would taste better.

Several students suggested that more people with diabetes would buy the drink but had not linked this to why (less sugar used). Many students said that the company would sell more as people would like the sugary taste of it or that people would become addicted to the drink.

It was very rare to see the suggestion that the consumer would pay less sugar tax.



0 1 . 1 Glucose and fructose are different sugars.

Fructose has a much sweeter taste than glucose.

Suggest **two** reasons why the drinks company uses fructose in the drink rather than using glucose.

Do **not** refer to sweetness in your answer.

[2 marks]

1 less fructose would be needed to produce the same sweetness if glucose was used

2 this would cut down costs ~~for~~ for the company as less fructose ~~would~~ would be bought to produce the drink

A typical example of a response (from the Higher tier paper) that gained 2 marks as the student conveys the idea that there is less fructose used and it is therefore cheaper to produce the drink.

01.2 On the Higher tier paper this question was generally well answered with over 70% gaining 2 or 3 marks, although there was some confusion with other food tests, especially the Biuret test. The most common errors were to omit heating the mixture, to heat to a temperature below 60 °C, or to refer to the use of a water bath without a reference to heat.

With reference to the final colour of the solution indicating a positive test, some students included an incorrect colour along with correct colours. In such cases, 'list principle' applies and the incorrect answer negates the correct one.

01.3 Most students correctly named the test, but the spellings of Biuret were very varied. The most common colours for the positive test were purple and lilac, although some students included an incorrect colour with correct colours, in which case 'list principle' applied and no mark was awarded. An answer of 'blue–purple' for the result was insufficient as it wasn't clear which colour the result was (blue or purple); however, 'blue to purple' was accepted.

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4.2.2.1 The human digestive system

Answer 07 · Examiner comments June 2024 | 8464/B/1H | Original Q1

01.4 On the Higher tier this question was generally well answered, with just over a third of students gaining 6 marks. This was an 'extended response' style of question. Such questions are marked holistically using overall generic descriptions, in this case, for the two levels of response at the top of the mark scheme, giving a hierarchy of responses. Within each level there are 3 marks.

Students were asked to describe how protein and fat are digested, including the enzymes involved and where these enzymes are produced. To access Level 2 students needed to include information for both fat **and** protein.

Nearly all students could name both enzymes involved and give detailed explanations of how protein and fat are digested. Students who could not name both enzymes limited their response to Level 1.

There were many very good answers that gained full marks. The most common errors seen in responses from the few students who were less confident was to state that lipase is produced in the stomach and to confuse the sites of enzyme production with the sites of digestion. Some students described the whole digestive system instead of focusing on enzymes. There is still a common misconception that hydrochloric acid breaks down food and statements about hydrochloric acid providing the correct pH for the protease to function were less often seen.

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4.2.2.1 The human digestive system

Answer 07 · Examiner comments June 2024 | 8464/B/1H | Original Q1

0 1 . 4 The human digestive system breaks down protein and fat in the drink.

Describe how **protein** and **fat** are digested.

You should include:

- the enzymes involved protease, lipase
- where the enzymes are produced. pancreas

[6 marks]

- Protease breaks down proteins into amino acids
- Lipase breaks down fats into fatty acids and glycerol
- They are both produced in the pancreas
- The long chain of protein must be broken down as it's too big to digest. Protease breaks it down into smaller amino acids which are small enough to be absorbed into the blood stream
- Lipase does the same, breaking down large fats into smaller fatty acids and glycerol
- This means that they are small enough to be absorbed into blood

This response clearly describes both fat and protein digestion, so was able to access Level 2. There is sufficient information in the first six lines to merit the award of full marks.

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