AQA GCSE Biology | 8461

SPECIFICATION POINT 4.2.2.1

# The human digestive system

## Mark schemes and examiner comments

| | |
|---|---|
| Tier | **Higher** |
| Question groups | **35** |
| Available paper years | **2008–2025** |

## 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.

### 4.2.2.1 The human digestive system

**Answer 01 · Mark scheme**

January 2008 | BLY3H | Original Q6 | Legacy

**Question 6**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | any **two** from:<br>• transport up / against concentration gradient / low to high concentration<br>• uses energy<br>• use of protein / carrier | | 2 |
| (b) | microvilli – large(r) surface area | accept have carriers | 1 |
| | mitochondria – release energy **or** make ATP | do **not** accept 'makes energy' | 1 |
| total | | | 4 |

### 4.2.2.1 The human digestive system

**Answer 01 · Mark scheme** January 2008 | BLY3H | Original Q6 | Legacy

**BLY3H**

**Answer 02 · Mark scheme** June 2008 | BLY2H | Original Q1 | Legacy

| question | answers | extra information | mark |
|---|---|---|---|
| **1**(a) | lipase | allow phonetic spelling<br>allow lipidase | 1 |
| **1**(b)(i) | fall **then** rise owtte eg down **then** up<br>minimum / least / fastest / best / optimum at 39–41(°C) | allow faster **then** slower<br>ignore explanations<br>allow it falls to 40(°C)<br>if no other marks gained, 'falls to an optimum' gains **1** mark | 1<br>1 |
| **1**(b)(ii) | (yes)<br>any **two** from:<br>• less heat / energy / electricity / power required / used / wasted<br>• conserves fuel supplies **or** less fuel used<br>• less pollution from power stations owtte | there is no mark for circling 'yes'<br>maximum **1** mark if No is circled<br>ignore lower temperature<br>accept less global warming<br>**or**<br>less $CO_2$ / carbon emissions / greenhouse gases<br>**or**<br>less $SO_2$ / acid rain<br>**NB** only direct effects<br>less pollution only is not enough | 2 |

**Question 1 continued on next page...**

4.2.2.1 The human digestive system

Answer 02 · Mark scheme



**COMPONENT NUMBER: BLY2H**

**COMPONENT NAME: Additional Science / Biology**

**STATUS: Final**

**DATE: June 2008**

**Question 1 continued...**

| question | answers | extra information | mark |
|---|---|---|---|
| **1**(c) | any **two** from:<br>• enzyme / lipase<br>• destroyed / denatured<br>• reference to (specific) shape changed | max **1** mark for reference to cell<br>accept any named enzyme<br>allow damaged / broken down<br>**not** 'killed'<br>ignore detergent / it | 2 |
| **Total** | | | **7** |

4.2.2.1 The human digestive system

Answer 02 · Mark scheme

June 2008 | BLY2H | Original Q1 | Legacy

**COMPONENT NUMBER: BLY2H**

**COMPONENT NAME: Additional Science / Biology**

**STATUS: Final**

**DATE: June 2008**

### 4.2.2.1 The human digestive system

**Answer 03 · Mark scheme**

June 2008 | BLY2H | Original Q5 | Legacy

| question | answers | extra information | mark |
|---|---|---|---|
| **5**(a) | pancreas | | 1 |
| **5**(b) | protease | allow proteinase | 1 |
| **5**(c)(i) | (same) enzymes / named enzymes produced in other parts / named parts of digestive system | if named, enzymes and part must be correct | 1 |
| **5**(c)(ii) | diet / activity varies / amount of glucose in blood varies | accept too much insulin leads to coma / hypo / low blood sugar<br><br>accept too little insulin leads to coma / hyper / high blood sugar | 1 |
| **5**(d) | any **two** from:<br>pros<br>• less / no experimentation on humans<br>• dogs (more) similar to humans (than lower / named organisms)<br>• it allows us to find a treatment **or** improves medical understanding<br>cons<br>• harmful / cruel to dogs<br>• dogs may not be (metabolically) like humans<br><br>conclusion justified by argument | <br><br><br><br>accept allows us to find a cure<br><br><br>accept kills dogs<br><br><br><br> | 2<br><br><br><br><br><br><br><br>1 |
| **Total** | | | **7** |

### 4.2.2.1 The human digestive system

**Answer 03 · Mark scheme**

June 2008 | BLY2H | Original Q5 | Legacy

**COMPONENT NUMBER: BLY2H**

**COMPONENT NAME: Additional Science / Biology**

**STATUS: Final**

**DATE: June 2008**

### 4.2.2.1 The human digestive system

**Answer 04 · Mark scheme** January 2009 | BLY2H | Original Q3 | Legacy

| question | answers | extra information | mark |
|---|---|---|---|
| **3**(a) | opaque / less transparent / blue | allow mixture becomes dark / black<br>ignore thicker | 1 |
| **3**(b)(i) | 7 (minutes) **or** in range 6.7 to 7 | award **2** marks for correct answer<br>if answer is incorrect evidence of selection of 40(% light intensity) either in working **or** in graph 2 for **1** mark | 2 |
| **3**(b)(ii) | any **two** from:<br>• slower / takes longer at lower temperatures<br>• ($40^{o}$C is) optimum / best temperature<br>• enzyme denatured / destroyed / damaged at higher temperatures | <br><br>allow near to $37^{o}$C / body temperature where enzymes work best<br>allow description of denaturation | 2 |
| **3**(c)(i) | isomerase | allow phonetic spelling | 1 |
| **3**(c)(ii) | fructose is sweeter than glucose<br>needed in smaller quantities **or** less is needed | | 1<br>1 |
| **Total** | | | **8** |

4.2.2.1 The human digestive system

Answer 04 · Mark scheme

January 2009 | BLY2H | Original Q3 | Legacy

**COMPONENT NUMBER: BLY2H**

**COMPONENT NAME: Additional Science / Biology**

**STATUS: Final**

**DATE: January 2009**

### 4.2.2.1 The human digestive system

**Answer 05 · Mark scheme** June 2009 | BLY2H | Original Q4 | Legacy

**Question 4**

| question | answers | extra information | mark |
|---|---|---|---|
| **4**(a)(i) | B | | 1 |
| **4**(a)(ii) | any **one** from:<br>• largest area of / most digestion (of lipid)<br>• largest clear area | allow agar / jelly / mixture broken down / digested<br>do **not** allow digestion of bacteria / lipase<br>ignore digestion **by** bacteria | 1 |
| **4**(b) | any **two** from:<br>• effect of pH / pH described<br>• effect of temperature<br>• effect on different types of lipid / fat<br>• cost **or** allergic reactions **or** effect on skin / fabrics / **or** environment **or** interaction with other chemicals in powder **or** shelf life | | 2 |
| **4**(c) | enzymes / named enzyme denatured / destroyed | allow active site(of enzyme) altered | 1 |
| **Total** | | | **5** |

### 4.2.2.1 The human digestive system

**Answer 05 · Mark scheme**

June 2009 | BLY2H | Original Q4 | Legacy

**BLY2H**

4.2.2.1 The human digestive system

Answer 06 · Mark scheme

June 2009 | BLY3H | Original Q6 | Legacy

## Question 6

| question | answers | extra information | mark |
|---|---|---|---|
| **6**(a) | sucrose → smaller (molecules)<br><br>**or** it gives simple sugars / glucose / fructose | | 1 |
| | (products) can be absorbed / taken in | if answer refers to digestion, assume reference is to products | 1 |
| **6**(b)(i) | only small increase in yield at 25% | | 1 |
| | **or** not much difference in yield at 25% | | |
| | extra cost / less economic if using 25% fungus | | 1 |

**Question 6 continues on the next page…**

**BLY3H**

**Question 6 Continued**

| question | answers | extra information | mark |
|---|---|---|---|
| **6**(b)(ii) | any sensible suggestion plus explanation eg<br><br>• increased oxygen → increased respiration rate<br>• less substrate available for making enzyme / toxic product made<br>**or**<br>• more respiration occurs which releases heat (1)<br>• (increase in temperature) reduces amount of enzyme(1)<br>**or**<br>• anomalous result(1)<br>• suggestion why eg zero error on instrument (1)<br>**or**<br>• initial aeration limiting factor (1)<br>• later something else is limiting (1)<br>**or**<br>• 1.0 optimum fungus growth (1)<br>• higher concentrations oxygen becomes toxic / inhibits growth of fungus (1)<br>**or**<br>• aeration at 2.0 too vigorous / damages fungus (1)<br>• less fungus remains to make enzyme (1)<br>**or**<br>• higher aeration causes cooling (1)<br>• less growth / enzyme production if cooler (1)<br>**or**<br>• air contaminated with microorgamisms (1)<br>• microorganism compete **or** make toxin (1) | <br><br>suggestion<br><br>explanation<br><br><br>must mention heat or temperature | <br><br>1<br><br>1 |
| **Total** | | | **6** |

### 4.2.2.1 The human digestive system

**Answer 06 · Mark scheme**

June 2009 | BLY3H | Original Q6 | Legacy

**BLY3H**

### 4.2.2.1 The human digestive system

**Answer 07 · Mark scheme** January 2010 | BLY2H | Original Q3 | Legacy

## Question 3

| question | answers | extra information | mark |
|---|---|---|---|
| **3**(a)(i) | pancreas | allow phonetic spelling | 1 |
| **3**(a)(ii) | (increases movement of) glucose into cells / organs / named | allow (glucose) converted to glycogen / fat<br><br>allow (glucose) used in (increased) respiration<br><br>do **not** allow hybrid spellings of glycogen | 1 |
| **3**(b) | **Type of diabetes** / **Treatment**<br>Type 1 → Careful attention to diet only<br>Type 1 → Careful attention to diet **and** injection of insulin<br>Type 2 → Careful attention to diet **and** injection of insulin<br>Type 2 → Injection of insulin only | **1** mark per correct line<br>extra line from a type of diabetes cancels the mark | 2 |
| **3**(c)(i) | protein | | 1 |
| **3**(c)(ii) | gene / allele | | 1 |

**Question 3 continues on the next page**

**BLY2H**

**Question 3 continued**

| question | answers | extra information | mark |
|---|---|---|---|
| **3**(c)(iii) | any **three** from:<br>• (amino acids) broken down / converted<br>• (amino acids) form / into urea<br>• (break down / convert / urea formed) in liver<br>• (urea / broken down amino acids) removed / filtered by kidney<br>• (urea / broken down amino acids) in urine<br>• (urine / urea / broken down amino acids) stored / held in bladder | max **2** if any one process goes on in the wrong organ | 3 |
| **Total** | | | **9** |

### 4.2.2.1 The human digestive system

**Answer 07 · Mark scheme**

January 2010 | BLY2H | Original Q3 | Legacy

**BLY2H**

4.2.2.1 The human digestive system

Answer 08 · Mark scheme



## Question 6

| question | answers | extra information | mark |
|---|---|---|---|
| **6**(a) | pancreas<br><br>small intestine | either order | 1<br><br>1 |
| **6**(b) | any **two** from:<br>• to give them time to come to temperature of the water-bath<br>• at / near body temperature / best / optimum temperature<br>• otherwise reaction would take place at a series of different temperatures **or** sensible statement about control / fair test | accept so (they / both) are at the same temperature | 2 |
| **6**(c)(i) | 0.42 | allow in range 0.42 to 0.425 | 1 |
| **6**(c)(ii) | 0.021 | correct answer with or without working<br>allow ecf from 6(c)(i)<br>ie 6(c)(i) ÷ 20 correctly calculated for **2** marks<br><br>if answer incorrect 0.42 ÷ 20 **or**<br>(c)(i) ÷ 20 gains **1** mark | 2 |
| **6**(c)(iii) | (all) starch digested / gone / used up / turned to sugar | allow the amount of sugar stays the same / maximum | 1 |
| **6**(c)(iv) | any **two** from<br><br>• enzyme destroyed / denatured / damaged / shape changed<br>• unable to fit (starch molecule)<br>• starch can't be digested | allow reference to active site once only as alternative to first or second bullet point<br><br>do **not** accept killed<br><br>enzymes don't work is insufficient | 2 |
| **Total** | | | **10** |

4.2.2.1 The human digestive system

Answer 09 · Mark scheme



## Question 7

| question | answers | extra information | mark |
|---|---|---|---|
| **7**(a)(i) | to mix in oxygen / air<br>**or**<br>to allow aerobic respiration / prevent anaerobic | allow stops olive oil separating out | 1 |
| **7**(a)(ii) | so *Fusarium* not limiting<br>**or**<br>so can see effect of protein / oil (concentration) | | 1 |
| **7**(b)(i) | 300 | correct answer with or without working = **2** marks<br>$\frac{(8000-800)}{24}$ **or** $\frac{7200}{24}$<br>if one error only eg<br>**or** $\frac{8000-1000}{24}$<br>allow **1** mark | 2 |
| **7**(b)(ii) | cannot tell how accurate / precise / reliable the values are<br>**or**<br>there may be a wide range<br>results may overlap with values for other conditions<br>**or**<br>may not be significantly different from other conditions | do **not** allow – to make it more accurate / precise / reliable<br>allow suitable reference to anomalies | 1<br>1 |

**Question 7 continues on the next page...**

**BLY3H**

**Question 7 continued**

| question | answers | extra information | mark |
|---|---|---|---|
| **7**(c)(i) | <u>description</u>: | each point made must compare *Fusarium* growth **and** lipase production | |
| | *Fusarium* grows (mainly) before lipase production starts | allow correct use of figures | 1 |
| | as *Fusarium* growth slows lipase production speeds up | | 1 |
| **7**(c)(ii) | <u>explanation</u>:<br>any **two** from:<br>• need sufficient growth of *Fusarium* before it can release / make / produces (detectable) lipase<br>• initial *Fusarium* growth uses protein (from reaction mixture) **or** protein more important than lipid for *Fusarium* growth<br>• later *Fusarium* growth uses lipid / oil (from reaction mixture) | allow no lipase production until 'nutrients' used up / limiting | 2 |
| **Total** | | | **10** |

### 4.2.2.1 The human digestive system

**Answer 10 · Mark scheme**

June 2010 | BLY1BP | Original Q4 | Legacy

No matching mark scheme was available in the supplied archive for this question.

4.2.2.1 The human digestive system

Answer 11 · Mark scheme

June 2010 | BLY2H | Original Q6 | Legacy

**Question 6**

| question | answers | extra information | mark |
|---|---|---|---|
| **6**(a) | stomach is acidic / has low pH | allow any pH below 7<br>ignore stomach is not alkaline | 1 |
| | lactase works best / well in alkali / high pH / neutral / non-acidic conditions | allow any pH of 7 and above<br>accept works slowly in acid conditions<br>allow figures from table with a **comparison**<br><br>ignore reference to temperature | 1 |
| **6**(b) | any **three** from<br>• (below 45(°C)) increase in temperature increases rate / *speed* of reaction<br>• reference to molecules moving faster / colliding faster / harder / more collisions<br>• optimum / best at 45(°C)<br>• high temps / above 45(°C) (rate slows due to) denaturation of enzyme / lactase | <br><br><br><br>allow value(s) in range 41 – 49<br><br>allow synonyms of denaturation but **not** killed<br>denaturation at high **and** low temperature does **not** gain this mark<br><br>ignore body temperature<br><br>ignore references to time / pH | 3 |

**Question 6 continues on the next page**

4.2.2.1 The human digestive system

Answer 11 · Mark scheme



**BLY 2H**

**Question 6 continued**

| question | answers | extra information | mark |
|---|---|---|---|
| **6**(c) | any **two** from<br>• acid neutralised **or** conditions made neutral / alkali<br>• *(*allow*)* emulsification / greater surface area of fat / lipid<br>• enzymes (in small intestine) work (more effectively / better) | <br>accept bile is alkaline<br>allow description of emulsification eg fat is broken down / broken up into droplets<br>allow better for enzymes | 2 |
| **Total** | | | **7** |

### 4.2.2.1 The human digestive system

**Answer 11 · Mark scheme** June 2010 | BLY2H | Original Q6 | Legacy

**BLY 2H**

4.2.2.1 The human digestive system

Answer 12 · Mark scheme

June 2010 | BLY3H | Original Q3 | Legacy

**Question 3**

| question | answers | extra information | mark |
|---|---|---|---|
| **3**(a)(i) | without <u>oxygen</u> | ignore reference to air | 1 |
| **3**(a)(ii) | otherwise difficult to stir / to pump / to transfer | allow prevent 'clogging'<br>owtte | 1 |
| **3**(a)(iii) | need to stir / pump / heat | | 1 |
| **3**(b)(i) | rises then falls<br><br>then levels / slight rise<br><br>quantitative descriptor<br>eg to 80% / max. on day 4 / min. on day 16 | <br><br><br><br>accept other valid quantitative descriptor<br>allow accuracy ± $\frac{1}{2}$ small square | 1<br><br>1<br><br>1 |
| **3**(b)(ii) | 16 (15.5 to 16.4) | | 1 |
| **3**(c) | oxygen present<br><br>($CO_2$ produced) by <u>aerobic</u> respiration<br><br>**or** not much <u>anaerobic</u> respiration<br><br>**or** not much methane / $CH_4$ produced | | 1<br><br>1 |
| **Total** | | | **9** |

### 4.2.2.1 The human digestive system

**Answer 12 · Mark scheme**

June 2010 | BLY3H | Original Q3 | Legacy

**BLY 3H**

4.2.2.1 The human digestive system

Answer 13 · Mark scheme



## Question 4

| question | answers | extra information | mark |
|---|---|---|---|
| 4(a)(i) | carbohydrase | allow correct named example<br>eg amylase / maltase | 1 |
| 4(a)(ii) | fermentation / anaerobic respiration | accept alcoholic fermentation | 1 |
| 4(b) | any **three** from:<br>• ethanol renewable / can be re-made<br>**or**<br>petrol non-renewable / can't be re-made<br>• maize / plants / photosynthesis takes in $CO_2$<br>• (ethanol) causes less increase / no increase in $CO_2$ concentration in the atmosphere **or** (ethanol) is carbon neutral<br>• (ethanol) has less effect / no effect on climate / on global warming | accept converse for petrol<br>ignore ethanol gives off less $CO_2$<br>accept converse for petrol<br>accept correct reference to named pollutant / effect from petrol | 3 |
| **Total** | | | **5** |

### 4.2.2.1 The human digestive system

**Answer 13 · Mark scheme**

January 2011 | BLY3H | Original Q4 | Legacy

**BLY3H**

4.2.2.1 The human digestive system

Answer 14 · Mark scheme

January 2011 | BLY3H | Original Q6 | Legacy

**Question 6**

| question | answers | extra information | mark |
|---|---|---|---|
| 6(a) | maintain / constant / suitable / optimum temperature **or** to prevent overheating | ignore to cool (= question) | 1 |
| | high temperature denatures enzymes / proteins / high temperature kills microorganisms / fungus | do **not** allow death of enzymes / denatures microorganisms | 1 |
| | microorganisms / fungus / respiration release energy | allow release heat | 1 |
| 6(b) | any **four** from:<br>• very little / no measurable fungus / biomass before 20 h<br>• need fungus present to make protease enzyme **or** protease is a product from the fungus **or** protease not made until the fungus is made<br>• protease not made until glucose is used<br>• glucose needed for energy / respiration **or** glucose as material for growth / to make more fungus<br>• equipment not sensitive enough to measure low concentrations | allow spores take about 20 h to start growth<br>allow protease increases as glucose decreases | 4 |

**Question 6 continues on the next page**

4.2.2.1 The human digestive system

Answer 14 · Mark scheme



**BLY3H**

**Question 6 continued**

| question | answers | extra information | mark |
|---|---|---|---|
| **6(c)** | 40 (no mark)<br><br>any **two** from:<br><br>• (40) gives the highest yield / activity of enzyme per g glucose<br><br>• (40) gives highest yield / activity of enzyme per g fungus produced.<br><br>• (40) is more economic / saves money | if neither point made allow **1** mark for (40) gives the highest yield / activity of enzyme | 2 |
| **Total** | | | **9** |

### 4.2.2.1 The human digestive system

**Answer 14 · Mark scheme**

January 2011 | BLY3H | Original Q6 | Legacy

**BLY3H**

4.2.2.1 The human digestive system

Answer 15 · Mark scheme

June 2011 | BLY2H | Original Q3 | Legacy

## Question 3

| question | answers | extra information | mark |
|---|---|---|---|
| 3(a) | any **one** from:<br>• (same) volume / amount / 1 $cm^3$ lipase<br>• (same) volume / amount / 5 $cm^3$ lipid<br>• mixed after 3 minutes / same time before mixing | ignore reference to recording results every 5 minutes **or** concentrations of lipid / lipase<br>allow amount of solution<br>allow keep same volumes in the test tubes<br>do **not** accept temperature | 1 |
| 3(b) | so that the lipase and the lipid reached the right temperature | | 1 |
| 3(c) | any **two** from<br>• decrease in time **or** faster (breakdown)<br>• then increase in time **or** then slower (breakdown)<br>• fastest / least time / optimum at 35°C | ignore explanations | 2 |
| 3(d) | any **two** from:<br>• test more regularly eg test every minute<br>• test at smaller temperature intervals<br>• test between 50 ($^o$C) and 95 ($^o$C)<br>• repeat at same temperatures **or** repeat the investigation **or** compare results with others | ignore 'test at more temperatures' unqualified<br>any interval < 5min<br>any value <15°C<br>allow test more temperatures in the range<br>any value in range, eg test at 70<br>allow do **it** again | 2 |

**Question 3 continues on the next page**

4.2.2.1 The human digestive system

Answer 15 · Mark scheme

June 2011 | BLY2H | Original Q3 | Legacy

**Question 3 continued**

| question | answers | extra information | mark |
|---|---|---|---|
| 3(e)(i) | (lipase / it) denatured / destroyed / changed shape | allow damaged / deformed<br><br>do **not** accept killed<br><br>ignore broken (down) | 1 |
| 3(e)(ii) | fatty acids and glycerol | | 1 |
| **Total** | | | **8** |

**BLY2H**

4.2.2.1 The human digestive system

Answer 16 · Mark scheme

June 2011 | BLY3H | Original Q5 | Legacy

## Question 5

| question | answers | extra information | mark |
|---|---|---|---|
| 5 | D – many microvilli (1)<br>Ex – provide large surface area (1)<br><br>D – many capillaries / good blood supply (1)<br>Ex – maintain concentration / diffusion gradient **or** quickly removes food (1)<br><br>D – thin wall / one cell thick surface / capillaries near surface (1)<br>Ex – short distance for food to travel (1)<br><br>D – many mitochondria (1)<br>Ex – provide energy / ATP for active uptake / transport (1) | **five** points made<br><br>max **3** descriptions<br><br>max **3** explanations<br><br>allow villi are thin<br>ignore villi are one cell thick | max 5 |
| **Total** | | | **5** |

### 4.2.2.1 The human digestive system

**Answer 16 · Mark scheme**

June 2011 | BLY3H | Original Q5 | Legacy

**BLY3H**

4.2.2.1 The human digestive system

Answer 17 · Mark scheme



**Question 2**

| question | Answers | extra information | mark |
|---|---|---|---|
| 2(a)(i) | directly proportional<br>**or** 0.1 rise in rate for 1% rise in concentration | gains full marks<br>accept increased concentration: increased rate **or** positive correlation **or** proportional for **1** mark | 2 |
| 2(a)(ii) | 0.6 | allow ± 0.01 | 1 |
| 2(b) | (0.5 % trypsin) cheaper<br>(35 °C) faster reaction<br>so takes less time to make product<br>extra heating cost outweighed by savings on enzyme cost | ignore more profit<br>allow (35 °C) optimum / best temperature | 1<br>1<br>1<br>1 |
| 2(c)(i) | any **two** from:<br>• breaks down / digests food<br>• from protein into amino acids / peptides<br>• makes soft(er) / runni(er) | <br>allow pre-digests protein / food<br>allow easier for baby to digest<br><br><br>allow description of texture change<br>allow make (more) soluble | 2 |

**Question 2 continues on the next page . . .**

4.2.2.1 The human digestive system

Answer 17 · Mark scheme



**BL2HP**

**Question 2 continued . . .**

| question | answers | extra information | mark |
|---|---|---|---|
| 2(c)(ii) | correct named enzyme<br>correct function<br>Eg<br>carbohydrase<br>starch → sugar **or** lactose → glucose **or** making sugar syrup<br>**or**<br>isomerase<br>glucose → fructose **or** making slimming foods<br>**or**<br>lipase<br>fats / oils → fatty acids **or** removal of grease stains | <br>to gain **2** marks function must relate to correctly named enzyme<br><br>accept amylase / maltase / lactase<br><br><br><br><br><br><br><br><br>accept other correct example | 1<br>1 |
| **Total** | | | **11** |

### 4.2.2.1 The human digestive system

**Answer 17 · Mark scheme**

January 2013 | BL2HP | Original Q2 | Legacy

**BL2HP**

4.2.2.1 The human digestive system

Answer 18 · Mark scheme

June 2013 | BL2HP | Original Q3 | Legacy

**Question 3**

| question | answers | extra information | mark |
|---|---|---|---|
| 3(a)(i) | 8.6 | accept value in range 8.5 to 8.7 | 1 |
| 3(a)(ii) | hydrochloric acid / HCl | accept HCL<br>accept hydrogen chloride<br>ignore hcl / etc. | 1 |
| 3(a)(iii) | X | | 1 |

**Question 3 continues on the next page . . .**

**Question 3 continued . . .**

| | | | |
|---|---|---|---|
| **3(b)** | Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5. | | 6 |
| **0 marks** | **Level 1 (1-2 marks)** | **Level 2 (3-4 marks)** | **Level 3 (5-6 marks)** |
| No relevant content. | There is a simple description of part of a process including a reference to at least one of: mechanical digestion, lipase, product of enzyme action, bile, site of production or site of digestion | There is a description of at least one process linking ideas. | There is a clear description of the process including reference to the majority of: mechanical digestion, lipase, bile, where they are produced, products, function of bile and site of digestion / absorption |

**examples of biological points made in the response:**

- mechanical breakdown in mouth / stomach
- fats →fatty acids and / or glycerol
- by lipase
- (produced by) pancreas
- and small intestine
- fat digestion occurs in small intestine
- bile
- produced by liver
- neutralises acid from stomach
- produces alkaline conditions in intestine
- refs. to increased surface area related to emulsification or chewing
- products are small molecules / water-soluble
- products absorbed by small intestine

| | | | |
|---|---|---|---|
| **Total** | | | **9** |

### 4.2.2.1 The human digestive system

**Answer 19 · Mark scheme** June 2014 | BL2HP | Original Q1 | Legacy

| | | | | |
|---|---|---|---|---|
| **1(a)(i)** | amino acid(s) | accept peptide(s)<br><br>do **not** allow polypeptide(s) | 1 | AO1 2.5.2e |
| **1(a)(ii)** | protease | | 1 | AO1 2.5.2e |
| **1(b)(i)** | 2 | | 1 | AO3 2.5.2b, g |
| **1(b)(ii)** | repeat<br><br>using smaller pH intervals between pH1 and pH3 | do not allow other enzyme / substrate<br><br>allow smaller intervals on both sides of / around pH2<br>allow smaller intervals on both sides of / around answer to (b)(i) | 1<br><br>1 | AO3 2.5.2b |
| **1(b)(iii)** | <u>enzyme / pepsin</u> denatured / shape changed<br><br><u>enzyme / pepsin</u> no longer fits (substrate) | do **not** allow enzyme killed<br>allow enzyme 'destroyed'<br><br>allow enzyme / pepsin does not work | 1<br><br>1 | AO1 / AO2 2.5.2a, b |
| **1(c)** | hydrochloric (acid) | allow phonetic spelling<br>accept HCl<br>allow HCL<br>ignore hcl<br>do **not** allow incorrect formula – e.g. $H_2Cl$ / $HCl_2$ | 1 | AO1 2.5.2g |
| **Total** | | | **8** | |

### 4.2.2.1 The human digestive system

**Answer 19 · Mark scheme**

June 2014 | BL2HP | Original Q1 | Legacy

### 4.2.2.1 The human digestive system

**Answer 20 · Mark scheme** June 2015 | BL2HP | Original Q1 | Legacy

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **1(a)(i)** | glycerol | | 1 | AO1<br>2.5.2f |
| **1(a)(ii)** | pancreas / small intestine | accept duodenum / ileum<br><br>ignore intestine unqualified | 1 | AO1<br>2.5.2f |
| **1(b)** | any **two** from:<br><br>• type of milk<br>• volume / amount of milk<br>• vol. bile equals vol. water<br><br>• volume of lipase<br>• concentration of lipase<br><br>• temperature | ignore time interval<br>ignore solution unqualified<br>do **not** allow pH<br>ignore starting pH<br><br>ignore volume / amount of bile / water<br>ignore concentration of bile<br><br>accept amount of lipase if neither volume nor concentration given | 2 | AO3<br>2.5.2f,h |
| **1(c)(i)** | fatty acid (production) | | 1 | AO2<br>2.5.2f,h |
| **1(c)(ii)** | faster reaction / digestion (with bile)<br>**or**<br>pH decreases faster (with bile)<br>**or**<br>takes less time (with bile)<br>**or**<br>steeper fall / line (with bile) | allow use of data<br>ignore easier | 1 | AO3<br>2.5.2f,h |

### 4.2.2.1 The human digestive system

**Answer 20 · Mark scheme**



| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **1(c)(iii)** | all fat / milk digested<br>**or**<br>same amount of fatty acids present<br>**or**<br>(lower pH) denatures the enzyme / lipase | allow all reactants used up<br>ignore reference to neutralisation<br><br>allow enzyme won't work at low pH<br>do **not** allow enzyme killed | 1 | AO2<br>2.5.2f,h |
| **Total** | | | **7** | |

### 4.2.2.1 The human digestive system

**Answer 20 · Mark scheme**

June 2015 | BL2HP | Original Q1 | Legacy

| Question | Answers | Extra information | Mark | AO / Spec. Ref |
|---|---|---|---|---|

### 4.2.2.1 The human digestive system

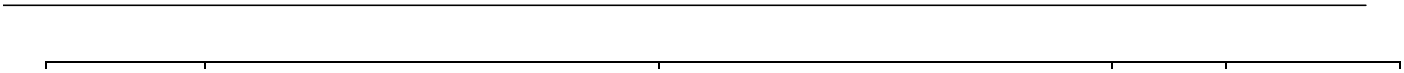
**Answer 21 · Mark scheme** June 2016 | BL2HP | Original Q4 | Legacy

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **4(a)** | digestive | | 1 | AO1<br>2.2,<br>2.2.1d |
| **4(b)(i)** | covers / lines (surface) | allow protects<br>ignore secretory functions | 1 | AO1<br>2.2.1b/c |
| **4(b)(ii)** | any **three** from:<br>• produces enzyme(s) / protease<br>• (digestive juice / enzyme) digests/breaks down protein<br>• produces HCl / acid<br>• (acid) kills bacteria/ pathogens **or** provides optimum pH | allow produces pepsin<br>apply list principle for incorrect enzymes<br>allow produces mucus<br>allow (mucus) protects stomach lining against proteases **or** acid **or** against break down | 3 | AO1<br>2.2.1b/c<br>2.5.2b/c/e/ g |
| **4(b)(iii)** | contracts<br>churns / mixes / moves stomach contents | ignore relaxes<br>do **not** allow expands<br>allow peristalsis **or** mechanical digestion | 1<br>1 | AO1<br>2.2.1b/c |
| **Total** | | | **7** | |

### 4.2.2.1 The human digestive system

**Answer 21 · Mark scheme**

June 2016 | BL2HP | Original Q4 | Legacy



4.2.2.1 The human digestive system

Answer 22 · Mark scheme

June 2017 | BL2HP | Original Q3 | Legacy

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 3(a) | sugar(s) / glucose | allow maltose<br>do not allow if extra incorrect answers | 1 | AO1<br>2.5.2d Prac |
| 3(b)(i) | any **two** from:<br>• volume of pH solution<br>• volume of amylase / enzyme solution<br>• volume of starch / suspension / substrate<br>• time left (before mixing) | allow amount for volume<br>if neither mark given allow 1 mark for volume(s) of solution(s)<br>ignore time between samples<br>ignore ref. to (room) temperature<br>ignore ref. to concentration | 2 | AO2<br>2.5.2b Prac |
| 3(b)(ii) | 4 minutes: (dark) blue<br>**and**<br>6 minutes: (light) brown | allow black<br>ignore purple<br>do **not** allow light blue<br>allow yellow / orange | 1 | AO3<br>2.5.2b Prac |
| 3(b)(iii) | any **two** from:<br>• take each reading more than once<br>• use colour standards for deciding end-point<br>• test more pH values between 6 and 8 **or** test at smaller pH intervals<br>• test at shorter intervals<br>• same temperature (in a water bath) | ignore take more readings<br>allow compare with another group<br>allow use a colorimeter<br>ignore wider range of pH unqualified<br>allow example – e.g. every half min | 2 | AO3<br>2.5.2b Prac |

### 4.2.2.1 The human digestive system

**Answer 22 · Mark scheme**

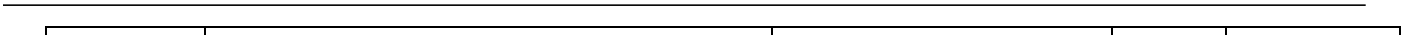


| | | | | |
|---|---|---|---|---|
| **3(b)(iv)** | no reaction **or** stays (dark) blue **or** takes >9 minutes<br><br>enzyme denatured | allow takes longer<br><br>allow description of denaturing, i.e. shape change<br>allow description of trend on graph | 1<br><br>1 | AO2/3<br>2.5.2a/b |
| **Total** | | | **8** | |

### 4.2.2.1 The human digestive system

**Answer 22 · Mark scheme**

June 2017 | BL2HP | Original Q3 | Legacy



### 4.2.2.1 The human digestive system

**Answer 23 · Mark scheme** June 2018 | 8461/1H | Original Q6

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **06.1** | DNA / deoxyribo(se)nucleic acid | | 1 | AO1<br>4.1.2.1 |
| **06.2** | controls the movement of substances in / out of cell | ignore allows substances in / out of cell | 1 | AO1<br>4.1.1.2 |
| **06.3** | **Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account. | | 5–6 | AO2<br>4.2.2.1<br>4.2.2.2<br>4.4.2.1 |
| | **Level 2**: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear. | | 3–4 | |
| | **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**<br><br>fewer (digestive) enzymes enter small intestine<br>• (so) enzymes break down / digest less food<br>• (therefore) less absorption of nutrients<br>• (so) less glucose can enter the blood(stream)<br>• (so) less (glucose) available for respiration<br>• (less absorption of nutrients so) fewer amino acids can enter the blood(stream)<br>• (so) less protein is made (for growth)<br>ignore ref to bile<br><br>less oxygen enters blood(stream) / reaches cells / organs / tissues (ignore body / lungs)<br>• (so) less (oxygen) available for (aerobic) respiration<br>• (so) less energy released / available (for growth)<br>do **not** accept energy produced<br><br>for **level 3**, reference to both enzymes and oxygen is required | | | |

4.2.2.1 The human digestive system

Answer 23 · Mark scheme

June 2018 | 8461/1H | Original Q6

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 06.4 | put ages in (ascending / descending / chronological) order<br><br>find middle value | <br><br>allow a way of achieving this<br>ie $\frac{(n+1)}{2}$<br>where n is the number of people | 1<br><br>1 | AO2 4.2.2.5<br><br>AO1 4.2.2.5 |
| 06.5 | most common in young people<br>**or**<br>(more) don't live to an old age | allow causes of this | 1 | AO3 4.2.2.5 |
| 06.6 | <br><br>$0.98 \times 10\,800$<br><br>10 584 | an answer of 10 584 scores **2** marks<br><br>allow $\frac{98}{100} \times 10\,800$<br><br>allow 10 800 – (0.02 ×10 800) or equivalent | <br><br>1<br><br>1 | AO2 4.2.2.5 |
| 06.7 | take stem cells from patient (bone marrow / skin)<br><br>remove / change / fix the faulty / CF gene<br><br>create embryo using these stem cells<br><br>remove stem cells (from embryo) and stimulate / allow them to divide / differentiate into lung (cells) | <br><br><br><br>allow idea of transferring nucleus from stem cells into enucleated egg / ovum<br><br><br><br>if no other marks awarded allow **1** mark for therapeutic cloning | 1<br><br>1<br><br>1<br><br>1 | AO2 4.1.2.3 |

### 4.2.2.1 The human digestive system

**Answer 23 · Mark scheme**

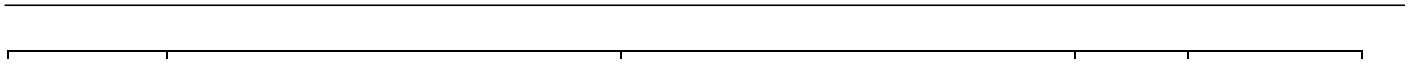
June 2018 | 8461/1H | Original Q6

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **06.8** | idea of ethical / religious concerns about use of embryos such as loss of (potential) human life | allow idea that embryo cannot give consent<br><br>ignore idea of against human rights of embryo unqualified<br>ignore religious / ethical reasons unqualified | 1 | AO3<br>4.1.2.3 |
| **Total** | | | **18** | |

### 4.2.2.1 The human digestive system

**Answer 23 · Mark scheme**

June 2018 | 8461/1H | Original Q6



4.2.2.1 The human digestive system

Answer 24 · Mark scheme

June 2018 | 8461/1H | Original Q7

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 07.1 | | an answer of 560 / 559.8 / 559.78 / 559 ($cm^3$) scores **3** marks<br><br>an incorrect answer for one step does not prevent allocation of marks for subsequent steps | | AO2<br>4.2.2.1 |
| | (for calcium)<br>$\frac{500}{605} \times 1000 = 826.446281$ ($cm^3$) | allow any correct rounding to minimum 3 significant figures<br>allow alternative route with correct rounding | 1 | |
| | (for vitamin B-12)<br>$\frac{500}{4.5} \times 2.4 = 266.67$ ($cm^3$) | allow alternative route with correct rounding | 1 | |
| | 560 / 559.8 / 559.78 / 559 ($cm^3$) | allow only correct answer based on values given for vitamin B-12 and calcium | 1 | |

| | | | |
|---|---|---|---|
| 07.2 | **Level 2**: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account. | 4–6 | AO1<br>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**<br><br>• Biuret reagent (allow $CuSO_4$ and NaOH) tests for protein<br>• add Biuret reagent to milk<br>• solution will turn (from blue) to lilac if positive<br><br>• iodine solution tests for starch (ignore iodine unqualified)<br>• add iodine solution to milk<br>• solution will turn (from orange / brown) to blue / black if positive<br><br>• Benedict's reagent tests for sugars<br>• add Benedict's reagent to milk and boil / heat (allow any temperature above 60 °C)<br>• solution will turn (from blue) to (brick) red / brown / orange / yellow / green if positive<br><br>for **level 2**, reference to all three food tests is required | | |

4.2.2.1 The human digestive system

Answer 24 · Mark scheme

June 2018 | 8461/1H | Original Q7

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 07.3 | lipase breaks down fat into fatty acids (and glycerol) | do **not** accept if 'glycerol' is contradicted | 1 | AO2 4.2.2.1 |
| | (and) fatty acids lower the pH | | 1 | |
| | (and when) fatty acids cause the pH to be below 10 (the indicator becomes colourless) | | 1 | |
| 07.4 | observation of colour change is subjective / based on opinion | ignore human error unqualified<br>ignore experimental error or examples of this | 1 | AO3 4.2.2.1 |
| 07.5 | bile emulsifies fats | allow a correct description of emulsification (ie breaks fat from large droplets into smaller droplets)<br><br>do **not** accept a description of chemical breakdown | 1 | AO1 4.2.2.1 |
| | creates a larger surface area (of fat) | | 1 | AO2 4.2.2.1 |
| | (so) lipase can break down fat (to produce fatty acids) more quickly / effectively | allow fatty acids produced by action of lipase more quickly | 1 | AO3 4.2.2.1 |
| Total | | | 16 | |

### 4.2.2.1 The human digestive system

**Answer 25 · Mark scheme**



| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **08.1** | any **one** from:<br>• (chemical which) catalyses / speeds up reactions in living organisms<br>• (chemical which) catalyses / speeds up biological reactions | allow biological catalyst<br>allow reduces activation energy (of reactions) in living organisms | 1 | 4.2.2.1 AO1 |
| | idea of specificity<br>**or**<br>(is a) protein | allow made of amino acids | 1 | |
| **08.2** | salivary gland | ignore mouth<br>ignore liver | 1 | 4.2.2.1 AO1 |
| | small intestine | allow duodenum / ileum<br>ignore intestine unqualified<br>do **not** accept large intestine | 1 | |

### 4.2.2.1 The human digestive system

**Answer 25 · Mark scheme** June 2019 | 8461/1H | Original Q8

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 08.3 | reduced / no enzyme production / release (from pancreas) | allow named example of enzymes<br><br>ignore reference to hormones | 1 | 4.2.2.1<br>4.4.2.3<br>4.4.2.1<br>AO2 |
| | food is not broken down fully **or** food is not digested fully | allow no food is broken down / digested<br>allow example | 1 | |
| | plus any **one** of the following routes for max **2** marks: | mark as pairs | | |
| | less glucose / sugar absorbed **or** less glucose / sugar passes into the blood(stream) | | 1 | |
| | (so) less glucose available for respiration so more (body / stored) fat used up in metabolism / respiration<br><br>**or**<br><br>fewer amino acids absorbed **or** fewer amino acids pass into the blood(stream) (1)<br><br>(so) fewer amino acids are available for making new protein for repair / replacement (1)<br><br>**or**<br><br>fewer fatty acids absorbed **or** fewer fatty acids pass into the blood(stream) (1)<br><br>(so) fewer fatty acids available so less fat is stored in the body (1)<br><br>**or**<br><br>chemotherapy / radiotherapy causes nausea / loss of appetite (1)<br><br>(so) less intake of food (1) | ignore glycerol<br><br>ignore glycerol | 1 | |

4.2.2.1 The human digestive system

Answer 25 · Mark scheme

June 2019 | 8461/1H | Original Q8

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 08.4 | (cancer) cells cannot divide<br>**or**<br>(cancer) cells are destroyed / killed | do **not** accept reference to the drug killing (cancer) cells | 1 | 4.2.2.7<br>AO3 |
| | (so) tumour doesn't grow / get bigger **or** tumour less likely to spread **or** tumour less likely to form secondary tumours | allow cancer cells less likely to spread / metastasise | 1 | |
| | (because) enzymes **A** and **B** are not working / active / effective / present<br>**or**<br>(because) enzymes **A** and **B** are inhibited | allow reference to both enzymes<br><br>ignore enzymes unqualified | 1 | |
| 08.5 | (functional) enzyme **B** would still be made / present | allow enzyme **B** is not inhibited | 1 | 4.2.2.7<br>AO3 |
| | (therefore cancer) cells would still divide uncontrollably<br>**or**<br>(therefore cancer) cells would not be destroyed<br>**or**<br>(therefore) the tumour will (continue to) grow / get bigger / spread **or** the tumour will form secondary tumours | | 1 | |
| 08.6 | any **two** from:<br>• to avoid the patients thinking they feel better with the drug **or** to take into account a psychological effect<br>• as a control / comparison<br>• to avoid bias(ed results) | ignore to make it more valid unqualified<br><br>ignore to provide an independent variable | 2 | 4.3.1.9<br>AO2 |
| 08.7 | testing on volunteers with the disease | | 1 | 4.3.1.9<br>AO1 |

### 4.2.2.1 The human digestive system

**Answer 25 · Mark scheme**

June 2019 | 8461/1H | Original Q8

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **08.8** | monoclonal antibody is attached to radioactive substance / toxin / drug / chemical | | 1 | 4.3.2.2 AO1 |
| | monoclonal antibody will (only) attach to / target (antigen on) cancer cells / tumour | | 1 | AO1 |
| | (so) radioactive substance / toxin / drug / chemical will (bind to cancer cells and) stop them growing / dividing | allow radioactive substance / toxin / drug / chemical will kill / destroy the cancer cells<br><br>**OR**<br>monoclonal antibody interrupts the cell cycle **or** monoclonal antibody aids immune response (1)<br><br>monoclonal antibody will (only) target cancer cells / tumour (1)<br><br>(so) action of monoclonal antibody stops cancer cells growing / dividing **or** (so) action of monoclonal antibodies helps immune system kill / destroy cancer cells (1) | 1 | AO1 |
| **Total** | | | **19** | |

### 4.2.2.1 The human digestive system

**Answer 26 · Mark scheme**

November 2020 | 8461/1H | Original Q4

The full source mark scheme begins on page 89. Follow original question 4 in that document.

### 4.2.2.1 The human digestive system

**Answer 27 · Mark scheme** November 2021 | 8461/1H | Original Q5

| | | | | |
|---|---|---|---|---|
| **05.1** | amino acid(s) | ignore monomers | 1 | AO1<br>4.2.2.1 |
| **05.2** | salivary gland<br><br>pancreas<br><br>small intestine | in any order<br>ignore mouth<br><br><br>allow duodenum / ileum<br>do **not** accept large intestine<br>ignore intestine unqualified<br><br>all three correct for **2** marks<br>two correct for **1** mark | 2 | AO1<br>4.2.2.1 |
| **05.3** | starch / substrate binds to <u>active site</u> (of enzyme)<br><br>(because) shape of <u>active site</u> and substrate are complementary<br><br>a chemical reaction occurs to produce smaller molecules<br>**or**<br>bonds between the (starch) molecules are broken to produce smaller molecules | ignore starch / substrate fits <u>active site</u> (of enzyme)<br><br>allow shape of starch / substrate and <u>active site</u> allow them to fit together<br><br>allow maltose / sugars for smaller molecules | 1<br><br>1<br><br>1 | AO1<br>4.2.2.1 |
| **05.4** | any **two** from:<br>• time before mixing (starch and amylase) solutions<br>• volume / 5 $cm^3$ of starch (solution)<br>• volume / 1 $cm^3$ of amylase (solution)<br>• volume / 1 drop of mixture added to spotting tile<br>• volume / 2 drops of iodine (solution) | ignore time unqualified<br><br>allow amount as an alternative to volume once only<br><br>do **not** accept temperature | 2 | AO2<br>4.2.2.1<br>RPA5 |
| **05.5** | to allow the solutions to reach the same temperature as the water<br>**or**<br>to allow both solutions to reach 5 °C | allow so the solutions can equilibrate with the temperature of the water | 1 | AO2<br>4.2.2.1<br>RPA5 |

4.2.2.1 The human digestive system

Answer 27 · Mark scheme

November 2021 | 8461/1H | Original Q5

| | | | | |
|---|---|---|---|---|
| **05.6** | as temperature increases, (amylase / enzyme) activity increases, to 35 °C after which activity decreases | ignore reference to time | 1 | AO3<br>4.2.2.1<br>RPA5 |

| | | | | |
|---|---|---|---|---|
| **05.7** | | allow enzyme for amylase and substrate for starch throughout | | AO2<br>4.2.2.1<br>RPA5 |
| | (iodine is not yellow-brown because) starch is still present **or** starch has not been broken down | | 1 | |
| | at 5 °C amylase / starch / molecules have low (kinetic) energy | | 1 | |
| | (therefore) there are fewer (enzyme-substrate) collisions | allow fewer enzyme-substrate complexes are formed | 1 | |
| | at 80 °C the amylase has been denatured | do **not** accept the amylase is killed / has died<br>allow the shape of the amylase / active site changes | 1 | |
| | (so) the starch can no longer fit | allow the bonds holding the amylase in its (3D) shape have broken | 1 | |

| | | | | |
|---|---|---|---|---|
| **05.8** | keep temperature constant | | 1 | AO3<br>4.2.2.1<br>RPA5 |
| | (but) change named factor **and** test a range of values of named factor | named factor e.g. pH **or** enzyme concentration **or** substrate concentration **or** inhibitor concentration | 1 | |

| | | | |
|---|---|---|---|
| **Total** | | | **17** |

### 4.2.2.1 The human digestive system

**Answer 27 · Mark scheme**

November 2021 | 8461/1H | Original Q5

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|

### 4.2.2.1 The human digestive system

**Answer 28 · Mark scheme** November 2021 | 8461/1H | Original Q7

| | | | | |
|---|---|---|---|---|
| **07.1** | cells grow / divide abnormally / uncontrollably | ignore mutation | 1 | AO1<br>4.2.2.7 |

| | | | | |
|---|---|---|---|---|
| **07.2** | has spread to other parts / organs of the body<br>**or**<br>has spread to the liver / lung<br>**or**<br>has formed a secondary tumour | allow tumour has metastasised | 1 | AO2<br>4.2.2.7 |

| | | | |
|---|---|---|---|
| **07.3** | **Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account. | 5–6 | AO2<br>4.2.2.3<br>4.3.1.6<br>4.4.2.1<br>4.4.2.2 |
| | **Level 2:** Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear. | 3–4 | |
| | **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:**<br><br>*Tiredness*<br>• fewer red blood cells<br>• so less haemoglobin<br>• so less oxygen transported around the body<br>• so less (aerobic) respiration can take place<br>• so more anaerobic respiration takes place<br>• less energy released for metabolic processes **or** less energy released so organs cannot function as well<br>• lactic acid produced (during anaerobic respiration) causes muscle fatigue<br><br>*Frequent infections*<br>• fewer white blood cells / phagocytes / lymphocytes<br>• so fewer antibodies produced **or** less phagocytosis<br>• so fewer pathogens / bacteria / viruses killed<br><br>*Bleeding*<br>• fewer platelets<br>• so blood does not clot as easily<br><br>For **Level 3**, reference to all three symptoms must be made. | | |

Answer 28 · Mark scheme

November 2021 | 8461/1H | Original Q7

| | | | | |
|---|---|---|---|---|
| **07.4** | anti-B antibodies in patient / receiver / recipient<br>will bind to type B antigens on person's / donor's red blood cells | | 1 | AO3 |
| | (so) red blood cells clump together and are wider than capillaries<br>**or**<br>(so) red blood cells clump together and block capillaries | allow (so) red blood cells clump together and capillaries burst | 1 | AO3 |
| | (so) cells have reduced supply of oxygen / glucose<br>**or**<br>(so) cells can't respire | ignore references to energy<br><br>if no other mark awarded allow antibodies from patient and antigens from donor are matching / complementary shapes for **1** mark | 1 | AO2<br><br>4.2.2.3<br>4.3.1.6 |
| **07.5** | no antigens (on type O red blood cells) | | 1 | AO3<br>4.2.2.3<br>4.3.1.6 |
| | (so) antibodies cannot bind (to the antigens / red blood cells) | allow no clumping (of red blood cells) | 1 | |
| **07.6** | hepatitis C infection | | 1 | AO3<br>4.2.2.3<br>4.3.1.1 |
| **07.7** | no / less bile reaches the small intestine | ignore less / no bile produced | 1 | AO3 |
| | (so) less / no emulsification of fat | allow correct description of emulsification<br>do **not** accept reference to chemical digestion | 1 | AO1 |
| | (so) smaller surface area for lipase to break down fat | | 1 | AO1 |
| | pH of small intestine is not neutralised / alkaline | allow pH of small intestine is acid / low | 1 | AO2 |
| | (so) lipase is not at its optimum pH to break down fat | pH (of small intestine) is not suitable for lipase to break down fat | 1 | AO2<br>4.2.2.1 |
| **Total** | | | **19** | |

### 4.2.2.1 The human digestive system

**Answer 29 · Mark scheme** November 2021 | 8461/2H | Original Q7

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **07.1** | from light / sunlight<br><br>absorbed by chlorophyll / chloroplasts | ignore sun unqualified<br><br>if no other mark awarded allow by photosynthesis for **1** mark | 1<br><br>1 | AO1<br>4.7.2.1<br>4.7.4.3<br>4.4.1.1 |
| **07.2** | krill / herring / copepod | | 1 | AO2<br>4.7.2.1<br>4.7.4.1 |
| **07.3** | algae | | 1 | AO2<br>4.7.2.1<br>4.7.4.1 |
| **07.4** | 1 algae<br>2 krill **or** copepod<br>3 squid<br>4 mackerel<br>(5 Human) | all correct for **1** mark | 1 | AO2<br>4.7.2.1 |
| **07.5** | any **two** from:<br>(losses due to)<br>• non-eaten parts (of squid / krill)<br>• <u>respiration</u> **or** <u>respiring</u> (in mackerel)<br>• excretion (by mackerel) | <br><br>allow bones / shells<br>allow eaten by other animals<br>do **not** accept respiration<br>produces / makes / creates energy<br>allow loss of a named waste product such as $CO_2$ / urea<br>ignore loss of waste unqualified<br>ignore faeces | 2 | AO1<br>4.7.4.3 |

4.2.2.1 The human digestive system

Answer 29 · Mark scheme

November 2021 | 8461/2H | Original Q7

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 07.6 | 2.3 **and** 0.1 (million) | allow in the range 2.25 to 2.3 for 2.3 (million) | 1 | AO2 4.7.5.3 |
| | $\frac{2.3 - 0.1}{2.3} \times 100$ **or** $\frac{220}{2.3}$ | | 1 | |
| | 95.65217..... | allow answer from correct substitution of incorrect values from **Figure 11** | 1 | |
| | 96 | allow student's calculated answer correctly rounded to the nearest whole number | 1 | |

4.2.2.1 The human digestive system

Answer 29 · Mark scheme

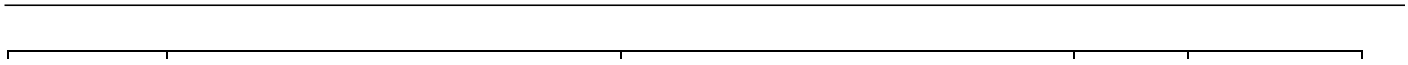
November 2021 | 8461/2H | Original Q7

| Question | Answers | Mark | AO / Spec Ref. |
|---|---|---|---|
| 07.7 | **Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given. | 5–6 | AO3 4.7.5.3 |
| | **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**<br>figures may be given without units (million tonnes) throughout<br>**points for:**<br>• small fish are not caught so can live long enough to reproduce<br>• biomass / stocks have generally increased after these laws introduced<br>• '77-'81 law (total ban) resulted in increase in biomass, eg 0.1 to 0.48 **or** to 0.9 by '84<br>• '84 law (mesh size) resulted in increase in biomass, eg 0.9 to 1.8 (by '90)<br>• '97 law (quotas) resulted in increase, eg 1.15 to 1.25<br>• '98 law (ban in breeding season) resulted in increase, eg 1.25 to 2.5<br><br>**points against:**<br>• could be a cause other than the law **or** correlation does not necessarily indicate causal relationship **or** other factors<br>• laws superimposed so can't necessarily tell the effect of each<br>• each law results in an increase followed by a decrease<br>• quotas lead to dead fish being thrown back into sea<br><br>For **Level 3** points both for and against must be considered together with appropriate use of data | | |
| **Total** | | **17** | |

### 4.2.2.1 The human digestive system

**Answer 29 · Mark scheme**

November 2021 | 8461/2H | Original Q7



4.2.2.1 The human digestive system



## Question 2

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.1** | (cell) wall<br>**or**<br>(large / permanent) vacuole | ignore cellulose | 1 | AO3<br>4.1.1.1<br>4.1.1.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.2** | rose black spot | | 1 | AO1<br>4.3.1.4 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.3** | $\frac{24 \times 60}{90}$<br>**or**<br>$\frac{24}{1.5}$<br><br>16 | allow $\frac{1440}{90}$<br><br><br><br>do **not** accept if a unit is given | 1<br><br><br><br>1 | AO2<br>4.1.1.6<br>4.1.1.1 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.4** | stomach | | 1 | AO1<br>4.2.2.1 |

### 4.2.2.1 The human digestive system

**Answer 30 · Mark scheme**



| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.5** | biuret reagent | | 1 | AO1<br>4.2.2.1<br>RPA4 |

4.2.2.1 The human digestive system

Answer 30 · Mark scheme



| Question | Answers | Mark | AO / Spec. Ref. |
|---|---|---|---|
| 02.6 | **Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given. | 5-6 | AO3 |
| | **Level 2:** Some logically linked reasons are given. There may also be a simple judgement. | 3-4 | AO2 |
| | **Level 1:** Relevant points are made. They are not logically linked. | 1-2 | AO1 |
| | **No relevant content.** | 0 | 4.2.2.1<br>4.2.2.4<br>4.2.2.5<br>4.2.2.6 |
| | **Indicative content**<br><br>• meat-free burgers contain more fibre<br>  • aids digestion **or** prevents constipation<br><br>• meat burgers contain more protein<br>  • for growth<br><br>• meat burgers contain more fat<br>  • can cause CHD **or** heart attack **or** narrowing of arteries<br>  • may lead to needing a stent<br>  • may lead to obesity<br>  • obesity is a risk factor for (type 2) diabetes<br><br>• meat burgers contain more cholesterol<br>  • can cause narrowing of arteries **or** CHD **or** heart attack<br>  • may lead to needing a stent<br>  • may need to take statins<br><br>• both burgers have similar amounts of carbohydrate<br>  • good for providing energy<br><br>• no information on vitamins / minerals provided for either burger<br><br>• meat burgers require animals to be farmed<br>  • increase in methane in atmosphere<br>  • (methane) contributes to global warming<br><br>• meat burgers require animals to be slaughtered<br>  • ethical issues<br><br>• some people won't eat meat-free burgers<br>  • (because) some people don't like the idea of eating fungus<br>  • (because) some people prefer the taste of meat<br><br>For **Level 2**, comparisons and linked reasons using own knowledge are required. | | |

| | | |
|---|---|---|
| **Total Question 2** | | **12** |

4.2.2.1 The human digestive system

Answer 31 · Mark scheme

June 2024 | 8461/1H | Original Q2

## Question 2

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.1 | nucleus | allow chromosome<br>ignore in the DNA | 1 | AO1<br>4.1.1.2<br>4.1.2.1 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.2 | **A**, **D** and **E** | | 1 | AO1<br>4.2.2.1<br>4.2.2.2 |

4.2.2.1 The human digestive system

Answer 31 · 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 | 4.2.2.1<br>4.4.2.1<br>4.4.2.3 |
| | **Indicative content:**<br><br>**Difficulty digesting food**<br>• less / no lipase<br>• (so) less / no fat broken down<br>o into fatty acids<br>o into glycerol<br><br>• less / no carbohydrase / amylase<br>• (so) less / no carbohydrate / starch broken down<br>o into glucose / sugar<br><br>• less / no protease<br>• (so) less / no protein broken down<br>o into amino acids<br><br>**Difficulty gaining body mass**<br>• less / no absorption<br>o of small / soluble molecules<br>o of fatty acids<br>o of glycerol<br>o of glucose / sugar<br>o of amino acids<br><br>• fewer molecules **or** fewer amino acids available for building protein / muscle / cells / tissues<br>• less fat stored<br>• less respiration<br>• less energy<br>• (so less energy) for building new molecules / cells / tissues<br><br>For **Level 3** details of difficulty digesting food **and** difficulty gaining body mass are needed. | | |

4.2.2.1 The human digestive system

Answer 31 · Mark scheme



| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.4 | large surface / area | allow large surface / area to volume (ratio) | 1 | AO1<br>4.1.3.1<br>4.2.2.2 |
| | (large) capillary network<br>**or**<br>good / efficient blood supply | allow many capillaries | 1 | |
| | walls are thin<br>**or**<br>walls are one cell thick | ignore references to membranes<br>ignore alveoli are thin<br>ignore alveoli are one cell thick<br>do **not** accept thin cell walls<br><br>ignore references to alveoli being moist<br>ignore steep concentration gradient | 1 | |

4.2.2.1 The human digestive system

Answer 31 · Mark scheme



| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.5 | less (aerobic) respiration | allow (more) anaerobic respiration | 1 | AO2 4.4.2.1 4.4.2.2 |
| | (so) less energy (released) | do **not** accept less energy produced / made / created | 1 | 4.4.2.3 |
| | (results in) less muscle contraction **or** (results in) reduced metabolism **or** | allow relevant named metabolic processes | 1 | |
| | (results in) increased breathing rate / depth **or** (results in) increased heart rate | allow (results in) person getting out of breath | | |
| | **OR** | | | |
| | (more) anaerobic respiration (1) | | | |
| | (so) lactic acid produced (1) | | | |
| | (results in) muscle fatigue **or** (results in) less muscle contraction **or** | allow muscle ache / cramp / tiredness / pain | | |
| | (results in) increased breathing rate / depth **or** (results in) increased heart rate (1) | allow (results in) person getting out of breath | | |

| Total Question 2 | 14 |
|---|---|

4.2.2.1 The human digestive system

Answer 32 · Mark scheme

June 2024 | 8461/1H | Original Q3

## Question 3

| Question | Answers | Mark | AO / Spec Ref. |
|---|---|---|---|
| 03.1 | **Level 3**: The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced. | 5–6 | AO1 4.2.2.1 RPA4 |
| | **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**<br><br>• iodine solution tests for starch<br>• iodine changes from yellow / orange / brown<br>• to blue-black **or** black **or** dark blue (to show starch is present when added to cake)<br><br>• Benedict's (reagent) tests for sugar / glucose<br>• heat (to at least 60 °C) / boil cake with Benedict's (reagent)<br>• Benedict's (reagent) changes from blue<br>• to green / yellow / orange / brown / (brick) red (to show sugar / glucose is present when added to cake)<br><br>• risk of skin burns from flame (when heating) **or** risk of skin burns from hot glass **or** risk of scald / burn from boiling water<br>o use a water bath<br>o wait for equipment to cool before touching<br>• risk of Benedict's (reagent) spitting into face / eyes when heating<br>o wear eye protection<br>o point test tube away from face(s) when heating<br><br>• risk of Benedict's (reagent) as an irritant **or** risk of iodine (solution) as an irritant<br>o clean up spills immediately<br>o wear (protective) gloves **or** wear eye protection<br>o use a dropper bottle (to reduce chance of spills)<br><br>(allow answers in terms of bread)<br><br>For **Level 3** answers should include the reagents used to test for starch and sugar with correct positive results, and a risk assessment. | | |

4.2.2.1 The human digestive system

Answer 32 · Mark scheme



| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **03.2** | time taken (for bread) to taste / become sweet | ignore time unqualified | 1 | AO2 4.2.2.1 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **03.3** | any **one** from:<br>• size / mass of bread<br>• surface area of bread<br>• location of bread on tongue<br>• clean mouth between tests | allow amount of bread<br><br>allow position of bread in mouth<br>allow a method of cleaning the mouth between tests<br>ignore temperature of bread<br>ignore use the same student | 1 | AO3 4.2.2.1 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **03.4** | bread contains <u>starch</u><br><br>(starch is) broken down into sugar<br><br>by amylase (in saliva) | <br><br>allow (starch is) broken down into glucose / maltose<br><br>ignore by carbohydrase (in saliva)<br>allow (sugar / glucose) solution reaches taste receptors (on tongue)<br><br>**alternative route**:<br>bread contains sugar / glucose (1)<br><br>sugar / glucose dissolves in saliva (in mouth) (1)<br><br>(sugar / glucose) solution reaches taste receptors (on tongue) (1) | 1<br><br>1<br><br>1 | AO2 4.2.2.1 |

4.2.2.1 The human digestive system

Answer 32 · Mark scheme

June 2024 | 8461/1H | Original Q3

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 03.5 | any **one** from:<br>• investigation not repeated (by the same / different student(s))<br>• (results) rely on student's (perception of) taste **or** taste is subjective<br>• amount of saliva / amylase produced is variable | ignore mean not calculated<br><br>ignore reference to control variables | 1 | AO3<br>4.2.2.1 |

| | |
|---|---|
| **Total Question 3** | **12** |

4.2.2.1 The human digestive system

Answer 33 · Mark scheme

June 2024 | 8461/2H | Original Q2

## Question 2

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.1 | lack of oxygen for (aerobic) respiration | do **not** accept ref to respiration in dead plants | 1 | AO3 |
| | (so) less / no energy (released) | do **not** accept energy produced / made / created | 1 | AO2 |
| | (for) microorganisms / bacteria / fungi / microbes / decomposers<br><br>**OR**<br><br>low pH denatures enzymes (1) | allow low pH / acidity reduces enzyme activity | 1 | AO2<br><br>4.2.2.1<br>4.4.2.1<br>4.7.1.2<br>4.7.2.3 |
| | (so) less / no (chemical) reactions / metabolism / respiration **or** less **/** no energy released (1)<br><br>in microorganisms / bacteria / fungi / microbes / decomposers (1) | do **not** accept energy produced / made / created | | |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.2 | 34 g/m$^2$/year | | 1 | AO2<br>4.7.4.3 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.3 | DNA | | 1 | AO1<br>4.6.1.5<br>4.7.1.2<br>4.7.1.4 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.4 | protein | | 1 | AO1<br>4.4.1.1<br>4.4.2.1<br>4.4.2.3<br>4.7.1.2<br>4.7.1.4 |

4.2.2.1 The human digestive system

Answer 33 · Mark scheme

June 2024 | 8461/2H | Original Q2

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.5 | increase in temperature | allow global warming<br>allow heat (energy) is trapped<br>ignore reference to greenhouse gases | 1 | AO3 |
| | (because) carbon dioxide is released (from the peat bog) | | 1 | AO2 |
| | (because) carbon dioxide is produced by burning / decay of peat | ignore methane is released from burning / decay of peat<br>allow fewer plants to take in carbon dioxide (for photosynthesis) | 1 | AO2 |
| | (because) methane is released (from the peat bog) | | 1 | AO2 |
| | | | | 4.4.2.1<br>4.7.2.3<br>4.7.3.3<br>4.7.3.5 |

| Total Question 2 | 10 |
|---|---|

4.2.2.1 The human digestive system

Answer 34 · Mark scheme

June 2025 | 8461/1H | Original Q2

## Question 2

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.1 | type 2 diabetes | ignore diabetes unqualified<br>do **not** accept type 1 diabetes<br><br>allow high blood pressure<br>allow (coronary) heart disease **or** CHD<br>allow cardiovascular disease **or** CVD<br>allow stroke<br>allow heart attack<br>allow (osteo)arthritis<br>allow cancer<br>allow sleep apnoea<br>allow liver disease<br>allow other correct diseases<br><br>ignore high cholesterol<br>ignore heart failure | 1 | AO1<br>4.2.2.6<br>4.2.2.7 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.2 | correct scale **and** *y*-axis labelled 'mean obesity rate in arbitrary units' | | 1 | AO2<br>4.2.2.6 |
| | all points plotted correctly | allow a tolerance of ± ½ small square<br>allow 3 or 4 correct plots for **1** mark<br>ignore letters | 2 | |
| | line of best fit drawn | ignore line extended beyond plotted points<br>ignore line joined point to point with straight lines | 1 | |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.3 | scatter (diagram / graph) | allow scattergram | 1 | AO2<br>4.2.2.6 |

4.2.2.1 The human digestive system

Answer 34 · Mark scheme



| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.4 | positive correlation | | 1 | AO2<br>4.2.2.6 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.5 | (30 °C)<br>(iodine solution remains yellow-brown because)<br>starch is not present | allow (iodine solution remains yellow-brown because)<br>all / the starch had been broken down | 1 | AO3 |
| | (because) amylase / enzyme broke starch down | allow (because) the amylase / enzyme is active / working<br>allow (because this is close to) the optimum / best temperature for amylase / enzyme | 1 | AO2 |
| | (90 °C)<br>(iodine solution blue-black because) starch was (still) present | allow (iodine solution blue-black because) starch was not broken down<br>allow (because) the amylase / enzyme had no effect on starch | 1 | AO3 |
| | (because) the amylase / enzyme has denatured | allow description of denaturation<br>allow amylase / enzyme is destroyed / damaged<br>do **not** accept amylase / enzyme has been killed | 1 | AO2<br>4.2.2.1<br>RPA5 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 02.6 | test more temperatures between 10 °C and 60 °C | | 1 | AO3<br>4.2.2.1<br>RPA5 |

4.2.2.1 The human digestive system

Answer 34 · Mark scheme

June 2025 | 8461/1H | Original Q2

| Question | Answers | Mark | AO / Spec Ref. |
|---|---|---|---|
| 02.7 | <table><tr><th>Protease enzyme</th><th>Optimum pH</th><th>Organ where enzyme is active</th></tr><tr><td></td><td></td><td>stomach</td></tr><tr><td></td><td></td><td>small intestine<br>allow ileum / duodenum</td></tr></table> | 1<br>1 | AO2<br>4.2.2.1 |

| Total Question 2 | 14 |
|---|---|

4.2.2.1 The human digestive system

Answer 35 · Mark scheme

June 2025 | 8461/1H | Original Q7

## Question 7

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 07.1 | (stem cells) can <u>differentiate</u> into any type of cell | allow (stem cells) can <u>differentiate</u> into liver cells<br>ignore specialisation | 1 | AO1<br>4.1.3.2 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 07.2 | any **one** from:<br>• (it is) destroying a (potential) life / embryo<br>• embryo cannot give consent<br>• (against) religious / cultural / personal beliefs | <br><br><br>allow the embryo does not have a choice<br><br>allow against (someone's) faith<br>ignore against God's will<br>ignore religion unqualified | 1 | AO2<br>4.1.3.2 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 07.3 | **A** = lymphocyte (specific to the antigen)<br><br>**B** = tumour (cell)<br><br><br><br>**C** = hybridoma | ignore white blood cell<br><br>allow myeloma<br>allow other specific types of tumour (cell)<br>ignore cancer (cell) | 1<br><br>1<br><br><br><br>1 | AO2<br>4.3.2.1 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 07.4 | (the mouse is) injected with (liver) antigens | allow (by) injecting (the mouse) with <u>liver</u> cells<br>do **not** accept (by) injecting (the mouse) with a pathogen | 1 | AO2<br>4.3.2.1 |

4.2.2.1 The human digestive system

Answer 35 · Mark scheme



| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 07.5 | monoclonal antibodies bind to (liver) antigens / cells | allow drug sticks to (liver) antigens / cells | 1 | AO2 4.2.2.3 4.3.1.6 |
| | (because) monoclonal antibodies are complementary (in shape) to (liver) antigen | allow description of complementarity<br>ignore reference to specificity<br>do **not** accept (because) monoclonal antibodies are the same shape as (liver) antigen | 1 | 4.3.2.1 4.3.3.2 |
| | (so) antibodies released by white blood cells cannot bind to (liver) antigens / cells | allow (so) antibodies released by lymphocytes cannot bind to (liver) antigens / cells<br>allow (so) phagocytes are unable to identify / detect cells to engulf<br>do **not** accept (so) antibodies released by phagocytes cannot bind to liver antigens / cells | 1 | |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 07.6 | any **one** from:<br>• tests to detect pathogens | allow COVID tests **or** lateral flow tests **or** LFTs | 1 | AO1 4.3.2.2 |
| | • tests to detect hormones / chemicals / drugs<br>• to locate / identify (specific) molecules in a cell / tissue<br>• to locate / detect cancer (cells)<br>• to deliver (toxic) chemicals / drugs to cells | allow chemotherapy / immunotherapy<br>allow to treat named disease<br>ignore to diagnose / treat disease unqualified | | |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| 07.7 | gall bladder | | 1 | AO1 4.2.2.1 |

4.2.2.1 The human digestive system

Answer 35 · Mark scheme



| Question | Answers | Mark | AO / Spec Ref. |
|---|---|---|---|
| 07.8 | **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 | 4.2.2.1 |
| | **Indicative content**<br>• less / no bile produced (by liver) so less / no emulsification of fats<br>o (so) fats not made into small(er) droplets<br>o (so) surface area (of fat) not increased<br>o (so) lipase cannot digest fat as quickly / much (due to smaller surface area)<br>• less / no bile produced (by liver) so acid not neutralised<br>o (because) bile is alkaline<br>o (so) lipase **or** small intestine not at optimum pH<br>o (so) lipase denatures<br>o (so) lipase cannot digest fat as quickly / much (due to reduced / incorrect pH)<br>For **Level 3**, there must be consideration of the effect on lipase activity and on both emulsification **and** the effects of pH. | | |

| Total Question 7 | 17 |
|---|---|

AQA

# GCSE
# BIOLOGY
# 8461/1H

Paper 1 Higher Tier

**Mark scheme**

June 2020

Version: 1.0 Final

206G8461 1H/MS

### 4.2.2.1 The human digestive system



MARK SCHEME – GCSE BIOLOGY – 8461/1H – JUNE 2020

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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# Information to Examiners

## 1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement
- the Assessment Objectives, level of demand and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

## 2. Emboldening and underlining

**2.1** In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

**2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.

**2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

**2.4** Any wording that is underlined is essential for the marking point to be awarded.

## 3. Marking points

### 3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution?

**[1 mark]**

| Student | Response | Marks awarded |
|---|---|---|
| 1 | green, 5 | 0 |
| 2 | red*, 5 | 1 |
| 3 | red*, 8 | 0 |

Example 2: Name two planets in the solar system.

**[2 marks]**

| Student | Response | Marks awarded |
|---|---|---|
| 1 | Neptune, Mars, Moon | 1 |
| 2 | Neptune, Sun, Mars, Moon | 0 |

### 3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

### 3.3 Marking procedure for calculations

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

### 3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

### 3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ecf in the marking scheme.

### 3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

### 3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

### 3.8 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

### 3.9 Ignore

Ignore is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

### 3.10 Do <u>not</u> accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

## 4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

**Step 1: Determine a level**

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

**Step 2: Determine a mark**

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this.

The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

4.2.2.1 The human digestive system



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| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **01.1** | | allow correct chemical symbols<br>ignore any attempt at balancing equation<br>ignore light / chlorophyll | | AO1<br>4.4.1.1 |
| | *before arrow*<br>carbon dioxide **and** water | either order | 1 | |
| | *after arrow*<br>glucose | ignore sugar / carbohydrate<br>do **not** accept starch | 1 | |
| **01.2** | | ignore description of subsequent parts of the photosynthesis reaction | | AO1<br>4.1.1.2<br>4.4.1.1 |
| | <u>light</u> | allow sun<u>light</u><br>ignore sun | 1 | |
| | (light) is captured / trapped / absorbed by chlorophyll / chloroplasts | allow (light) is used by chlorophyll / chloroplasts | 1 | |
| **01.3** | $\frac{18.5 + 19.3 + 19.5}{3}$<br>**or**<br>$\frac{57.3}{3}$ | | 1 | AO2<br>4.4.1.2<br>RPA 6 |
| | 19.1 ($cm^3$/hour) | allow an answer correctly calculated using only two correct values | 1 | |
| **01.4** | a ring around 14.2 | allow clear indication of correct result | 1 | AO3<br>4.4.1.2<br>RPA 6 |

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| | | | | |
|---|---|---|---|---|
| **01.5** | any **one** from:<br>• scale / value was misread<br>• there was air / oxygen in the syringe / measuring cylinder / apparatus<br>• the lamp / light was moved<br>• temperature changed<br>• had different mass / length of pondweed<br>• pondweed had not acclimatised | ignore human error<br>ignore references to counting bubbles or time<br>allow measurement error<br>allow light intensity changed<br>ignore different bulb / lamp unqualified | 1 | AO3<br>4.4.1.2<br>RPA 6 |
| **01.6** | did not use it in calculation (of mean) | | 1 | AO3<br>4.4.1.2<br>RPA 6 |
| **01.7** | any **one** from:<br>• light (intensity)<br>• carbon dioxide (concentration)<br>• pondweed size / amount<br>• pondweed species | do **not** accept temperature<br>ignore time<br>allow distance / power / colour of lamp / light<br>allow same (piece of) pondweed | 1 | AO3<br>4.4.1.2<br>RPA 6 |
| **01.8** | enzyme(s) lose the shape of the active site | allow enzyme(s) (start to) denature<br>allow enzyme(s) destroyed / damaged<br>do **not** accept enzyme(s) killed | 1 | AO2<br>4.2.2.1 |

### 4.2.2.1 The human digestive system





| | | | | |
|---|---|---|---|---|
| **01.9** | y-axis labelled '(rate of) photosynthesis in $cm^3$/hour' | | 1 | AO2<br>4.4.1.2<br>RPA 6 |
| | suitable scale on y-axis | must take up half or more of grid provided | 1 | |
| | all points plotted to within ± ½ small square | allow 3 or 4 correct plots for **1** mark<br>ignore any attempt to plot a point at 20 °C | 2 | |
| | correct curved line of best fit | ignore line joined point to point with straight lines<br>ignore extrapolation | 1 | |
| **Total** | | | **16** | |

### 4.2.2.1 The human digestive system





| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.1** | movement / spreading out of molecules / particles | allow movement / spreading out of (named) substances / chemicals / gases / liquids<br>ignore reference to membranes / cells | 1 | AO1<br>4.1.3.1 |
| | from (an area of) high(er) concentration to (an area of) low(er) concentration | allow down / with the concentration gradient<br>ignore along / across the concentration gradient<br>do **not** accept movement from / to a concentration gradient | 1 | |
| **02.2** | increased carbon dioxide concentration in the air | | 1 | AO2<br>4.1.3.1<br>4.2.3.2 |
| | increased number of stomata that are open | | 1 | |

4.2.2.1 The human digestive system





| | | | |
|---|---|---|---|
| **02.3** | **Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account. | 5–6 | AO1<br>4.1.3.1<br>4.2.2.2<br>4.2.2.3 |
| | **Level 2:** Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear. | 3–4 | |
| | **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**<br>• (many) alveoli<br>  • provide a large(r) surface area (**:** volume)<br><br>• capillaries are thin<br>  **or** alveoli / capillary walls are thin **or** one cell thick<br>  **or** capillaries are close to the alveoli<br>  • which provides short diffusion path (for oxygen / carbon dioxide)<br><br>• breathing (mechanism) moves air in and out<br>**or** lungs are ventilated<br>  • to bring in (fresh) oxygen<br>  • to remove carbon dioxide<br>  • to maintain a concentration / diffusion gradient<br><br>• large capillary network (around alveoli)<br>**or** good blood supply<br>  • to remove oxygen(ated blood) quickly<br>  • to bring carbon dioxide to the lungs quickly<br>  • to maintain a concentration / diffusion gradient | | |

### 4.2.2.1 The human digestive system





| | | | | |
|---|---|---|---|---|
| **02.4** | osmosis | allow diffusion | 1 | AO1<br>4.1.3.1<br>4.2.3.2<br>4.1.3.2 |
| **02.5** | active transport<br><br>(because) energy is needed<br><br>(to move nitrate ions) from a low(er) concentration (in the soil) to a high(er) concentration (in the root / cell) | <br><br><br><br>allow (to move nitrate ions) against / up the concentration gradient<br><br>allow (because) there is a lower concentration (of nitrate ions) in the soil **or** (because) there is a higher concentration (of nitrate ions) in the root / cell<br><br>ignore reference to amount / number of nitrate ions<br><br>ignore along / across the concentration gradient<br><br>do **not** accept if reference to molecules / atoms moving | 1<br><br>1<br><br>1 | AO3<br><br>AO2<br><br>AO2<br><br>4.1.1.3<br>4.2.3.2<br>4.1.3.3 |
| **Total** | | | **14** | |

### 4.2.2.1 The human digestive system





| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.1** | any **two** from:<br>(both have)<br>• cytoplasm<br>• (cell) membrane<br>• DNA / genetic material<br>• ribosomes | ignore reference to shape<br>allow RNA<br>ignore genetic information<br>if no other mark awarded allow sub-cellular structures for **1** mark<br>if no other mark awarded allow correct cellular process, e.g. respiration for **1** mark | 2 | AO2<br>4.1.1.1<br>4.1.1.2<br>4.1.2.1 |
| **03.2** | any **three** from:<br>• prokaryotic cell is smaller<br>• prokaryotic cell has no mitochondria<br>• prokaryotic cell has no nucleus **or** DNA is free in the cytoplasm **or** genetic material is free in the cytoplasm<br>• prokaryotic cell has a single loop of DNA **or** prokaryotic cell has a single loop of genetic material<br>• prokaryotic cell has plasmids | allow converse for eukaryotic cells<br>allow reference to bacterium instead of prokaryotic cell<br>ignore reference to features not shown in Figure **5**<br>if neither mark awarded, allow prokaryotic cell has no membrane-bound organelles<br>ignore genetic information<br>ignore genetic information<br>ignore circular / rings of DNA<br>allow prokaryotic cells have smaller ribosomes | 3 | AO2<br>4.1.1.1<br>4.1.1.2<br>4.1.2.1 |

| | | | | |
|---|---|---|---|---|
| **03.3** | 1 µm = 0.001 mm<br>**or** 1 mm = 1000 µm<br>**or** 0.05 mm = 50 µm<br>**or** 0.05 × 1000<br><br>(1:) 50 | <br><br><br><br><br>do **not** accept if a unit is given | 1<br><br><br><br><br>1 | AO2<br>4.1.1.1<br>4.1.1.2 |
| **03.4** | mitosis | correct spelling only | 1 | AO1<br>4.1.2.2 |
| **03.5** | 35% | | 1 | AO2<br>4.1.2.2 |
| **03.6** | <br><br>(stage 1)<br>DNA / chromosomes replicate / duplicate<br><br><br>mitochondria / ribosomes / sub-cellular structures increase in number<br>**or** mitochondria / ribosomes / sub-cellular structures replicate<br><br>(stage 2)<br>one set of chromosomes is pulled / moved to each end of the cell<br><br><br>(stage 3)<br>the cytoplasm **and** cell membrane divides (to form two cells) | ignore names of the stages of the cell cycle<br><br>ignore genetic material<br>ignore DNA / chromosomes double / reproduce<br><br>allow cytoplasm increases<br>ignore cell grows unqualified<br><br><br><br>allow one of each chromosome is pulled / moved to each end of the cell<br>ignore nucleus divides<br><br><br>allow cytoplasm divides **and** (new) cell membranes form<br>ignore nucleus divides | <br><br>1<br><br>1<br><br><br><br>1<br><br><br><br>1 | AO1<br>4.1.2.2 |
| **Total** | | | **13** | |

4.2.2.1 The human digestive system





| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **04.1** | fatty acids<br><br>glycerol | | 1<br><br>1 | AO1<br>4.2.2.1<br>4.4.2.3 |
| **04.2** | enzyme binds to the substrate because they are complementary (shapes)<br><br>(so) substrate is broken down (into products)<br><br>(so) products are released **or** enzyme is not changed | allow enzyme joins to the substrate because they fit together exactly<br>allow enzyme joins to the substrate because the substrate fits the active site<br>ignore reference to specificity<br>do **not** accept same shape<br>allow (so) substrate splits (into products)<br>ignore products are formed, unqualified<br>allow enzyme is not used up<br><br>allow reference to activation energy for either marking point 2 **or** marking point 3 | 1<br><br>1<br><br>1 | AO2<br>4.2.2.1 |
| **04.3** | each <u>active site</u> has a specific shape (so only fits one type of lipid molecule) | allow each <u>active site</u> is a different shape<br>do **not** accept reference to the substrate having an active site | 1 | AO2<br>4.2.2.1 |
| **04.4** | add Benedict's (solution / reagent to the liquid)<br><br>boil / heat<br><br>(if glucose is present the blue) colour changes to yellow / green / orange / brown / (brick)red | <br><br>allow any temperature of 65 °C or above<br><br> | 1<br><br>1<br><br>1 | AO1<br>4.2.2.1<br>RPA 4 |

| | | | | |
|---|---|---|---|---|
| **04.5** | add iodine solution / reagent (to the liquid)<br><br>(if starch is present) it changes colour to blue / black (from yellow / orange / brown) | allow add a drop of iodine<br>ignore iodine unqualified | 1<br><br>1 | AO1<br>4.2.2.1<br>RPA 4 |
| **04.6** | glucose from photosynthesis<br><br>(excess) glucose converted to starch | do **not** accept starch made in photosynthesis<br><br>allow (excess) glucose is stored as starch | 1<br><br>1 | AO2<br>4.2.2.1<br>4.4.1.1<br>4.4.1.3<br>4.4.2.3 |
| **04.7** | starch (stores) have been converted to glucose<br><br>(so the glucose can be) used for respiration / (named) metabolic reactions<br>**or** (so the glucose can be) used to release energy<br><br>(because) there is no light to make (new / more) glucose by photosynthesis | ignore reference to residual glucose from previous photosynthesis<br><br>do **not** accept idea of energy being produced / created / made | 1<br><br>1<br><br>1 | AO3<br>4.4.1.1<br>4.4.2.1<br>4.4.1.3 |
| **04.8** | any **one** from:<br>• test roots / stems of plants (in the light and dark)<br>• test other species of plant<br>• measure the concentrations of glucose **and** starch<br>• vary the time in the dark / light<br>• test variegated leaves | do **not** accept reference to changing the independent variable<br><br>allow test other parts of the plants<br>allow test other types of plant<br>ignore mass / amount<br><br>allow any other valid extension<br>ignore repeats | 1 | AO3<br>4.4.1.2<br>4.4.1.3 |
| **Total** | | | **17** | |

### 4.2.2.1 The human digestive system





| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **05.1** | mechanical | allow physical<br>allow structural | 1 | AO3<br>4.3.3.2 |
| **05.2** | any **one** from:<br>• to deter herbivores<br>• to prevent animals damaging it | ignore to injure animals, unqualified<br>allow to deter animals eating it<br>do **not** accept to deter predators | 1 | AO2<br>4.3.3.2 |
| **05.3** | chemical | | 1 | AO3<br>4.3.3.2 |

### 4.2.2.1 The human digestive system





| | | | | |
|---|---|---|---|---|
| **05.4** | any **two** from :<br>• lack of magnesium (ions) (1)<br><br>(so) not enough chlorophyll for (efficient) photosynthesis (1)<br><br>(so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1)<br><br>• infection by pathogen / bacteria / virus / fungus (1)<br><br>(so) leaves become discoloured / yellow so less photosynthesis (1)<br><br>(so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1)<br><br>• infected by aphids (1)<br><br>(which) remove sugars from phloem (1)<br><br>(so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1)<br><br>• lack of (available) light (1)<br><br>(so) chlorophyll breaks down (1)<br><br>(so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) | allow (so) lack of chlorophyll produced causes yellow leaves (1), (so) not enough photosynthesis to produce glucose which is used to make proteins for growth (1)<br><br>allow correctly named pathogen<br>allow has rose black spot / TMV<br><br>allow other symptoms of named pathogens / disease<br><br>award once only<br><br>award once only<br><br>award once only | 5 | AO2<br>4.3.3.1<br>4.3.1.1<br>4.3.1.2<br>4.3.1.4<br>4.4.1.1<br>4.4.1.2<br><br>AO1<br>4.4.2.3<br>4.4.1.3 |

### 4.2.2.1 The human digestive system





| | | | | |
|---|---|---|---|---|
| **05.5** | (bacteria) obtain glucose / sugar (from the plant)<br><br>(glucose used) for respiration **or** (glucose used) for making other named substances | <br><br>allow (glucose used) to release energy | 1<br><br>1 | AO3<br><br>AO2<br><br>4.2.3.2<br>4.4.1.3 |
| **05.6** | (gorse plant) obtains nitrate (ions)<br><br>needed for amino acids / proteins | <br><br>allow needed to make chlorophyll / DNA | 1<br><br>1 | AO2<br>4.1.3.3<br>4.4.2.3<br><br>AO1<br>4.3.3.1 |
| **05.7** | willow bark | | 1 | AO2<br>4.3.1.9 |
| **Total** | | | **13** | |

### 4.2.2.1 The human digestive system





| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **06.1** | any **two** from:<br><br>• BMI / morphology / obesity level<br><br>• smoking habits<br>• diet<br>• medication<br><br>• family history of liver disease<br>• fitness levels<br>• ethnicity<br>• area of UK they live in | ignore genetic factors<br><br>allow mass / weight **and** height<br><br>allow previous drinking habits<br>allow medical conditions<br>allow drug use<br><br>allow level of exercise<br>allow race | 2 | AO3<br>4.2.2.6 |
| **06.2** | 2.55 – 1.60 (= 0.95)<br><br>$\left(\frac{0.95}{2.55} \times 100 = \right)$<br><br>37 (.2549019608…) (%) | allow 1.60 – 2.55 (= –0.95)<br><br>allow value for with meals in range 1.60 to 1.65 (for 1.60)<br><br>allow answer correctly calculated from values in ranges 1.60 to 1.65 and 2.50 to 2.60<br><br>allow – 37(.2549019608...)(%) | 1<br><br>1 | AO2<br>4.2.2.6 |
| **06.3** | 12 × 2 × 7 = 168 (g/week)<br><br>1.8 | <br><br>allow in range 1.8-1.9<br><br>allow correct reading from a calculation that omits the 2 **or** the 7<br><br>do **not** accept if a unit is given | 1<br><br>1 | AO2<br>4.2.2.6 |

### 4.2.2.1 The human digestive system





| | | | | |
|---|---|---|---|---|
| **06.4** | any **two** from:<br>• consuming alcohol increases the RR (with / without meals) **and** supporting data<br>• consuming less than 50 g/week of alcohol with meals does not increase the RR<br>• even (small amounts of alcohol at) 25 g/week increases the RR if not with meals | allow risk for RR throughout<br>allow data in terms of number of glasses of wine<br>allow increasing alcohol consumption increases the RR at an increasing rate<br>allow any value between 35 and 60 g/week | 2 | AO3<br>4.2.2.6 |
| **06.5** | any **two** from:<br>• large number in survey<br>• long term / 15 year survey<br>• well controlled | allow 800 000 in survey<br>if neither mark awarded allow large study<br>allow many controls | 2 | AO3<br>4.2.2.6 |
| **06.6** | any **one** from:<br>• people underestimate / overestimate alcohol consumption<br>• people may change (lifestyle / drinking) habits over time<br>• some people may drink all their weekly alcohol at once | allow people lie about alcohol consumption<br>**or** people lie about other named control variables<br>ignore survey only tested women | 1 | AO3<br>4.2.2.6 |

| | | | |
|---|---|---|---|
| **06.7** | **Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account. | 3-4 | AO2<br>4.4.2.3<br>4.2.2.1 |
| | **Level 1:** Facts, events or processes are identified and simply stated but their relevance is not clear. | 1-2 | AO1<br>4.4.2.2<br>4.2.2.6<br>4.2.2.5<br>4.5.3.3 |
| | **No relevant content** | 0 | |
| | **Indicative content**<br><br>Responses may refer to either total or partial liver failure<br><br>• no bile made (in the liver)<br>○ fats / lipids are not emulsified<br>○ surface area of fats / lipids not increased<br>○ pH of small intestine will not be alkaline / neutralised<br>○ enzymes (in small intestine) will not work effectively **or** (named) food not digested / absorbed<br>○ so may lose weight<br><br>• lactic acid not broken down / oxidised<br>○ accumulation of lactic acid in blood / body<br>○ lactic acid is toxic **or** body will be poisoned<br>○ oxygen debt higher / prolonged<br>○ so muscle pain / fatigue<br><br>• proteins / amino acids will not be broken down (in liver)<br>○ (amino acids) not deaminated<br>○ amino acids not made into urea **or** will not form ammonia<br>○ (however) any ammonia formed is toxic<br>○ so accumulation of amino acids in blood / body<br><br>• liver does not break down / remove other toxins (like alcohol)<br>○ toxins accumulate in blood / body<br>○ body will be poisoned<br>○ so pain **or** jaundice **or** swollen liver **or** portal hypertension occurs<br><br>• glycogen stores will not be formed<br>○ cannot control blood glucose<br>○ so hyperglycaemia / hypoglycaemia / diabetes / coma may occur | | |

| | | | |
|---|---|---|---|
| **Total** | | | **15** |

### 4.2.2.1 The human digestive system





| Question | Answers | Extra information | Mark | AO / Spec.Ref. |
|---|---|---|---|---|
| **07.1** | | ignore add mAbs and dye to slide (unbound) | | AO2<br>4.3.2.2 |
| | bind fluorescent dye to mAbs | | 1 | |
| | put (bound) fluorescent mAbs on the slide (and rinse off) | | 1 | |
| | mAbs will bind to Candida albicans / pathogens and show up under the microscope | allow mAbs will bind to Candida albicans / pathogens and show up under UV (lamp) | 1 | |
| **07.2** | more Candida albicans / pathogens will be engulfed / killed by phagocytes / white blood cells | allow Candida albicans / pathogens will be engulfed / killed by phagocytes / white blood cells more quickly<br>do **not** accept white blood cells produce antibodies<br>do **not** accept lymphocytes engulf Candida albicans | 1 | AO2<br>4.2.2.3<br>4.3.1.6<br>4.3.1.7 |
| | therefore less damage to cells / tissues / organs | ignore less toxin released (by Candida albicans) | 1 | |

| | | | | |
|---|---|---|---|---|
| **07.3** | **Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account. | | 4-6 | AO1<br>4.3.1.9 |
| | **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**<br>• given first to healthy volunteers<br>o at (very) low dose<br>o to test it is safe **or** to test for toxicity **or** to check for any side effects<br>• then to some patients (with the disease) **or** people with the disease<br>o to test for the correct / optimum dose<br>o to check for any side effects<br>o to test for efficacy **or** to test if it works<br>o in a double blind trial<br>o where neither patients nor doctors know who has the mAbs and who has a placebo (or alternative treatment)<br>• reference to large trial **or** long duration **or** control variables | | | |
| **07.4** | any **one** from:<br>• (the body will) not reject the mAbs<br>**or** (the body is) less likely to reject the mAbs<br>• mouse mAbs are (more likely to be) rejected<br>• the human lymphocytes have already responded to that infection / cancer cell so they are known to work against the disease | do **not** accept idea of rejection of cells | 1 | AO3<br>4.3.2.2<br>4.3.2.1<br>4.3.1.6 |
| **Total** | | | **12** | |

4.2.2.1 The human digestive system

Answer 23 · Examiner comments

June 2018 | 8461/1H | Original Q6

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

Following updated research information and communications with parents of children with cystic fibrosis, we have decided to withdraw the question on this topic from this paper.

It has been decided not to provide a replacement question as it would not be possible to determine accurately how a replacement question would have performed if it had been part of the original paper taken in 2018.

The following statistics may help you to make effective use of the remainder of the paper:

| Mean mark (maximum mark) | |
|---|---|
| 06.1 | 0.47 (1) |
| 06.2 | 0.65 (1) |
| 06.3 | 2.27 (6) |
| 06.4 | 1.27 (2) |
| 06.5 | 0.69 (1) |
| 06.6 | 1.33 (2) |
| 06.7 | 0.56 (4) |
| 06.8 | 0.42 (1) |
| Question 6 | 7.66 (18) |

Answer 24 · Examiner comments

June 2018 | 8461/1H | Original Q7

## Question 7 (standard / high & high demand)

**07.1** The most common reason why students who took the right route but did not achieve full marks for this question was incorrect rounding part way through the calculation, eg, a value of 266.6 being used rather than 266.7. It was common for students to write down a long string of decimal places in their calculations.

**07.2** Generally this question was well answered with 48% achieving three or more marks. Most students made good attempts to gain full marks and often wrote at length. The test for protein was well known by the majority of students. However, the need to describe both the starch test and the test for glucose was not recognised by a significant number of students, who often gave only the former.

In the starch test, students needed to refer to iodine solution, rather than just iodine. When describing the test for sugars, the need for heat was often omitted, with some students only referring to a water bath, rather than a hot water bath. Some students confused the colour changes for positive results.

4.2.2.1 The human digestive system

Answer 24 · Examiner comments



**07.3** Those students who started their answer with the idea that the lipase was breaking down fat into fatty acids (and glycerol) often went on to achieve full marks. However, many students attempted to describe their answers in terms of the neutralising effect of bile and thus resulted in no marks.

**07.4** Many students gave the correct reason, referring to the subjective nature of the values. However, a significant number suggested that the measurement of time might be inaccurate due to a human error or a stop clock that was not accurate.

**07.5** There were a number of students who confused the answers with that for question **07.3**. It was not uncommon for students to suggest that bile is an enzyme or described their answers in terms of the pH of bile or its effects on pH of the mixture.

Those students who recognised that the difference was due to emulsification of the fat in milk often went on to describe the consequence on surface area. However, the final mark was often poorly explained or lacked detail, with students often suggesting that the bile, rather than the lipase, broke down the fat more quickly.

4.2.2.1 The human digestive system

Answer 24 · Examiner comments



## 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.

### 4.2.2.1 The human digestive system

**Answer 26 · Examiner comments** November 2020 | 8461/1H | Original Q4

**Question 4 (standard, standard/high & high demand)**

Full marks were rarely seen in **04.2** with many students confusing or interchanging key terminology. There was frequent repetition of the words 'lock and key' without explanation; reference to 'fit' as though the word equated to 'join'; and reference to 'specific' as though the word equated to 'complementary'. In this unusual series, as some students may have begun their AS level studies, reference to activation energy was seen, although this would not usually be expected at GCSE level.

As in previous years, many students missed heating the Benedict's reagent (or only heated it to low temperatures such as 30 °C) in **04.4**. Students' understanding of the structure of starch was generally weak, with many thinking that glucose is broken down to form starch. In addition, many students stated that photosynthesis 'creates' energy or that the glucose provides the energy for photosynthesis. Many students thought that light was needed for starch to be made. Students should be reminded to use descriptive terminology when describing variables; 'amount' is not creditworthy at this level.

**Answer 27 · Examiner comments** November 2021 | 8461/1H | Original Q5

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

Many students were unable to access the marks available in **05.3** due to confusion over the difference between the enzyme and the substrate. Several students thought that starch was an enzyme or that amylase fitted into the enzyme. Few students referred to the shape of the active site needed for marking point 2 and many stated that the substrate fits into the active site, but did not go on to say that binding occurred. A lack of specificity of language was common in **05.4** with students referring to 'amount' regularly. A common response was temperature, despite this being the independent variable in the investigation. **05.6** was not answered well with common references to time rather than activity.

Answer 28 · Examiner comments



**Question 7 (standard, standard/high & high demand)**

In **07.4** and **07.5**, many students had not read the stem of the question in detail and therefore gave ideas about the donor transferring antibodies to the patient. In **07.5**, several students stated that the red blood cells do not have a specific antigen 'shape' so therefore all of the antibodies can fit and bind.

In **07.7**, most students were able to describe the function of bile as an emulsifier, and many students gave long explanations of how bile works, however, they did not link this to a lack of bile and why this would cause difficulty digesting fat.

This question highlighted several misconceptions in this area. Some students thought that fat, lipase or food molecules pass through the bile duct and that big molecules of fat would not fit past the blockage. Some students stated that bile is an enzyme and were confused over the difference between lipase and bile, often thinking that they are one in the same.

**Concluding Remarks**

The standard of responses seen in this paper was lower than in previous years. Students generally scored well on simple recall of knowledge questions (AO1) and questions on the topic of cell structure were generally well answered. Some students were able to apply their knowledge effectively in straightforward questions (AO2), but many found application of knowledge to new situations more difficult. There was indication that many students had not carried out the Required Practical Activities assessed throughout the paper. Many student's understanding of the structure and function of plant tissues was limited and a lack of clear knowledge meant that some students did not articulate themselves well throughout the paper. Generally, students scored well on the mathematical skills, however, a lack of precision when reading data from graphs was common.

4.2.2.1 The human digestive system

Answer 28 · Examiner comments



**Mark Ranges and Award of Grades**

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

4.2.2.1 The human digestive system

Answer 29 · Examiner comments

November 2021 | 8461/2H | Original Q7

**Question 7 (standard, standard/high & high demand)**

This question was about a marine food web and legislation to ensure sustainable fishing of herring in the North Sea. In **07.1**, almost two-thirds of students scored 1 mark for stating either that light was the source of energy for the algae or that the algae used photosynthesis. Many stated that the energy came 'from the Sun' which did not distinguish between light and other forms of solar energy. Incorrect answers included carbon dioxide, water, mineral ions and even from eating other organisms. 1% of answers mentioned that chlorophyll or chloroplasts absorbed the light energy.

Most students were able to identify a primary consumer and the producer in the food web in **07.2** and **07.3**, respectively. A common incorrect answer for the primary consumer was the 'human', presumably confusing primary with top. Similarly, around three-quarters of students were able to assign 5 organisms from the food web to a food chain ending in the human.

In **07.5**, although one reason for the lower biomass of the mackerel than that of the combined biomass of the krill and squid was given as non-digestibility of parts of these animals, many students suggested 'lost in faeces' as an additional reason. Around one-third of students gained some credit for their answers by suggesting losses due to respiration or excretion or, alternatively, that some parts of the krill and squid were not even eaten or they were eaten by other animals.

Answer 29 · Examiner comments

November 2021 | 8461/2H | Original Q7

**07.6** was a 4-mark calculation of percentage decrease using figures read from a graph. Fewer than half of students were completely successful. Errors included the use of an incorrect starting point – the first and highest value on the graph for the year 1950 was quite a common error, or reading the value for 1977 as '0.2' or '0.05' instead of 0.1. Many students did not get credit for not rounding their answer to the nearest whole number as instructed in the question. Some calculated a percentage reduction in excess of 100%, the highest such value being '2300%'. Around one-sixth of students scored no marks.

**07.7** was a 6-mark extended response question requiring the evaluation of the data from the graph in relation to various acts of legislation introduced at different times. Many students found this very difficult with more than two-thirds attaining no higher than Level 1. The question instructed students to use data from the graph and information from the diagram showing the relationship between mesh size of fishing nets and the sizes of herring of different ages. Many students did not cite any data, or did not consider all four pieces of legislation and their subsequent effects on herring biomass. It was rare to read any negative points – the most common being the decrease in biomass at certain times despite the legislation that had been introduced – and hardly any students thinking that causes in addition to the given legislation might have been responsible for the changes in biomass or that, since the acts of legislation overlapped in their application, it was hard to ascertain the effect of each. Very few students attempted to make a judgement on the basis of the points they had made and no-one scored all 6 marks.

4.2.2.1 The human digestive system

Answer 30 · Examiner comments — June 2022 | 8461/1H | Original Q2

**Question 2 (Standard demand)**

**02.1** 95% of students correctly identified ‘vacuole’ or ‘cell wall’ as features found in plant and fungal cells but not in animal cells. The most common error was to give ‘membrane’ or ‘nucleus’, though such answers were fairly rare.

**02.2** 95% of students were able to identify the fungal disease rose black spot.

**02.3** While many students were able to carry out a simple calculation to find the number of times a fungal cell would divide in 24 hours, some students made errors, including stating that one and half hours is 1.3 hours or reversing the numerator and denominator in their calculation. A small but significant proportion of students went further, perhaps deciding that the sum they had completed had not been sufficient to gain the 2 marks or had simply misread the question. These students attempted to determine the total number of cells there would be in 24 hours and frequently calculated $2^{16}$.

**02.4** Generally, the stomach was correctly identified as the site where protein was digested in the human digestive system**,** although a significant number of students selected large intestine.

**02.5** Over 90% of students correctly identified Biuret regent as able to identify the presence of protein.

**02.6** The extended response question was well attempted by most students, however, some failed to acknowledge the instruction to ‘use your own knowledge’, and gave lengthy comparisons about the nutrient content of both burgers, without referring to why this did, or did not, contribute to a balanced diet, thus limiting these students to level 1. Some students did not make effective comparisons, using statements such as ‘high in fat’ rather than ‘higher in fat’ or simply repeated figures from the table, therefore, gaining no credit. Some students who did go on to attempt to use their own knowledge gave only vague statements about the burger being ‘better for the body’ and many confused the significance of each food component, stating that fat is needed for muscle growth and that excess cholesterol causes obesity, for example. Many students understood that protein is needed for muscle development but failed to go on to use the term ‘growth’ to gain credit. A few students wasted time by giving fairly detailed, (but irrelevant in terms of the question) accounts of enzymic digestion of carbohydrates, fats and proteins in the digestive system. A small number of students offered a valued judgement as to which type of burger might be ‘better overall’.

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Answer 30 · Examiner comments — June 2022 | 8461/1H | Original Q2

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However; as the evaluation was taken to be the comparison between the nutritional content of the two burgers, this was not required and so was ignored.

4.2.2.1 The human digestive system

Answer 31 · Examiner comments



**Question 2 (standard demand)**

**02.1** Most of the students who gained this mark (93%), identified 'nucleus', with many also suggesting 'chromosome'. 'DNA' formed part of the response for a significant proportion of students, but this was often associated with either of the two acceptable answers, so credit could be awarded. Very few students gave alternative components of a cell.

**02.2** 98% of students identified organs A, D and E as being the lungs, small intestine and pancreas.

**02.3** This extended response question provided students with the opportunity to express their knowledge of the enzymes produced by the pancreas and how the products of digestion are used within the body. However, as this question was phrased in the context of a person with cystic fibrosis, marks could only be gained by students who described the details they had revised not occurring. Thus, those who only described what normally goes on in the body without any indication that in this context, these processes would not occur or would be reduced, could not gain credit. Students went about describing their answers in two ways: either giving the details they knew, followed by a statement that these processes would not happen or happen less, or by describing each step in terms of reduction (eg 'less amylase is produced so less starch is digested into glucose').

Lower-attaining students often got no further than repeating the details they had been given; 'less of each enzyme, so less digestion occurs', was a common response by many students, although they often repeated this in multiple ways to fill up the available space. It was also noticeable that lower-attaining students got no further than repeating the information in second bullet point from the question and did not attempt to respond to the command word of the question, 'explain'.

Although knowledge of the enzymes and their actions was generally good, the impact their lack would have on the body's ability to gain mass was less well understood. Few students referred to respiration, energy or the reasons why amino acids are needed by the body or cells. However, many did describe the reduction of absorption, often including the products of digestion in this story, and so could gain access to Level 3 as they had answered both parts of the question. Many students' answers lacked precision, describing the lack of absorption of starch, fat or protein, rather than of the products of the digestion of these large molecules, whilst others went on the describe the egestion of non-digested molecules; neither of which idea was creditworthy.

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### 4.2.2.1 The human digestive system

**Answer 31 · Examiner comments** June 2024 | 8461/1H | Original Q2

Those who only gave an answer to one side of the question (almost always the difficulty digesting food), however detailed this was, could not score higher than a mark in Level 2. Hence, students should be reminded, once they have completed their responses to questions such as this, to re-read the question, to ensure they have answered all parts of it.

Less than one third of students scored full marks in this question, with 13% scoring zero.

**02.4** This question was generally well answered with nearly 50% of students gaining at least two marks. Despite the command word, 'describe', many students also added explanatory detail, often regarding diffusion in some way, but as the question did not ask for explanations, these were ignored. A 'large surface area' and a 'good blood supply' were frequently given. However, having 'thin walls' or having 'walls only one cell thick' was often poorly expressed, with answers implying that the alveoli themselves were thin or that they have a thin membrane; neither of which are correct. A few students drifted into an insecure knowledge of plant cell structure, describing the presence of 'thin cell walls', which was also not creditworthy.

It is a long-held and often repeated misconception that the alveoli being moist aids gas exchange. This is not correct and did not gain credit, although if included in an answer with three creditworthy points, was ignored.

**02.5** Students could tackle this question in either of two routes: the reduction in (aerobic) respiration and its consequences or the occurrence of anaerobic respiration and its consequences. For many students, their responses contained elements of both routes, in which case the description which gave the higher mark was credited.

It should be noted that a reduction of oxygen supply will not stop (aerobic) respiration occurring altogether, so students who described this idea could not gain credit for this first point, although they might still have scored full marks for descriptions involving anaerobic respiration. In describing either route, 'tiredness' and 'fatigue' were common suggestions, however, without further qualification in terms of 'muscle' in the anaerobic respiration route, could not gain credit. Lower-attaining students gave descriptions which contradict the principle of conservation of energy, suggesting that energy is produced, rather than being transferred or released. Others suggest that energy is used *for* respiration, rather than being released by respiration.

27% of students scored full marks in this question, 35% scored two marks, and 22% one mark.

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4.2.2.1 The human digestive system

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**Question 3 (standard and standard/high demand)**

**03.1** In this extended response question, students were asked to describe two food tests and formulate a risk assessment for their method. It was clear that the majority of students understood this Required Practical Activity, however, some students mixed up the reagents, with a number suggesting that Biuret solution should be used to test for carbohydrates.

In order to achieve a mark within Level 3 (which 16% of students did), students needed to plan a method that would work, and hence, Benedict's reagent needed to be heated (to an appropriate temperature) or boiled, and the iodine used needed to be in solution, rather than a solid.

In addition, a clear risk assessment was required, and this is where the majority of students fell down. Risk assessments often lacked detail, with few students correctly identifying a hazard specific to the tests being described and even fewer giving a valid control measure. The majority of students listed generic lab safety rules such as 'wear goggles' or 'tie hair back' but did not link these steps to the method being used. It was clear that students knew many good practices in lab safety, but often failed to link the control measures to a risk in the food tests they described, or gave vague / incorrect descriptions of the risk, which were insufficient. A number of students did not include a risk assessment at all.

56% of students achieved a mark within Level 2 and 18% within Level 1.

**03.2** 83% of students were able to identify the independent variable in the investigation in this question. The most common incorrect answers simply stated 'time', which unqualified, was not creditworthy.

**03.3** 82% of students were able to identify a control variable the student should have used in the investigation, with the size/mass of bread being the most frequently seen correct answer. Students often did not achieve the mark because they gave variables that were already being controlled, such as the shape of the bread.

**03.4** One third of students scored full marks on this question, and a further third scored two marks. Most students identified amylase as being found in the saliva and many could link this to the breaking down of starch into sugars. The majority of students did not identify the starch as being located in the bread and many referred to starch simply as 'carbohydrates' or 'the carbohydrate' rather than by name. Of those not achieving the third marking point, this was usually due to a lack of specificity in naming the enzyme, instead referring simply to 'carbohydrase'.

**03.5** 68% of students answered this question correctly, with the majority referencing the lack of repeats in the investigation, often by stating that 'it was only tested on one person'. A number of students were able to correctly use the term 'subjective'. Common incorrect answers seen referred to control variables, which students were specifically told not to refer to in the question, or an incorrect reference to bias.

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Answer 33 · Examiner comments



**Question 2 (standard demand)**

**02.1** Some students appeared to be confused as to how decay happens, believing that the dead plant matter would decay itself. However, the majority of students did indicate that some sort of microorganism is involved in the decay process, gaining the third mark in the mark scheme. 40% of students gained at least 2 or more marks overall.

Some students spent time unnecessarily describing the factors needed for decay and often needed to extend their answers onto the additional pages.

There were two routes students could use to gain marks. Many students' answers included elements of both routes, so examiners awarded a mark for the described route which gave the higher mark. In most cases this was the first route given in the mark scheme.

The information in the question told students that layer B contains 'very little oxygen' and 'has a low pH'; thus, simply repeating either of these was insufficient to gain credit. To gain the first mark, students needed to link one of these pieces of information to their own knowledge, either in terms of respiration or in terms of enzymes being denatured or reducing in activity. Many students also gained this first marking point, although some who took the second route demonstrated confusion about what a 'low pH' constitutes, describing it as 'low acidity' or 'being 'alkaline'.

Achieving marking point 2 proved to be more problematic for many students, most simply by omitting any reference to energy or metabolism. Students should be advised that when referring to respiration in their answers (as many did), they should then go on to describe the role of respiration: 'releasing energy'. For those who did refer to energy, it was noted that very few described energy being 'produced', which is never acceptable as this would contradict the principle of conservation of energy.

**02.2** Just under 70% of students identified the correct answer regarding the approximate biomass of moss that becomes biomass in primary consumers.

**02.3** Half of students identified DNA as a substance that can be made using phosphates.

**02.4** Around 65% of students could identify protein as the substance that can be made using nitrogen.

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### 4.2.2.1 The human digestive system

**Answer 33 · Examiner comments** June 2024 | 8461/2H | Original Q2

**02.5** This was a well answered question, with almost all students gaining at least one mark, and 65% of those gaining three or more marks. A number of students described a rise in temperature of the Earth's atmosphere, gaining marking point 1.

It should be noted that the 'greenhouse effect' and 'climate change' are not equivalent to 'global warming'. A significant number of students attempted to describe the mechanism of global warming. This was often confused, including references to the 'ozone layer' and incorrect descriptions of long and short-wave radiation. However, such descriptions are beyond the requirements of the specification, so were ignored.

Students who merely repeated the information that the peat bog 'contains' carbon dioxide and methane could not be awarded marking points 2 or 4. Instead further added value was required, in that these gases would be 'released' from the peat when the bog was destroyed. A significant number of students omitted any reference to methane, so were unable to gain marking point 4.

Again, students should be advised that repeating the information in the question will not gain credit, such as those that described 'the use of peat as a fuel' releasing carbon dioxide. To gain credit here, students needed to indicate that the peat would have to be 'burned' to produce carbon dioxide. In this case, examiners ignored the idea that burning would also release (trapped) methane, as this would inevitably also be burned, releasing more carbon dioxide.

## Question 2 (standard demand)

**02.1** Nearly 80% of students gave a creditworthy answer to this question, very often by referring to heart disease or to Type 2 diabetes. Heart failure was considered too vague and did not gain credit. The most frequently seen error was one of omission when students simply suggested 'diabetes' without the qualification of 'Type 2'.

**02.2** Nearly 60% of students achieved full marks in this question, with a further 32% achieving 2 marks. MP1 was occasionally missed due to labelling the axis with 'y' only, omitting to include 'arbitrary units' or the use of an incorrect scale. It was sometimes difficult to determine the plotted points in responses, because they were either far too small or far too large or were concealed by a very thick line of best fit. Students should ideally be advised to give clear crosses for plotted points and to draw graphs in pencil so that alterations can be made without any ambiguity. MP4 was usually awarded for a straight line which went through or between the majority of the plotted points, regardless of whether some of these had been incorrect. The most common error was to draw the line of best fit through the origin. It was rare to see students drawing straight lines between individual points but, where this alone was given, they did not match MP4.

**02.3** 77% of students answered this question correctly, with the most common incorrect responses including 'dot', 'line' or 'spot' graph, or references to conclusions in respect of correlations shown, such as 'directly proportional'.

**02.4** 99% of students gained credit in this question.

**02.5** Over half of all students scored full marks in this question, correctly interpreting the results and using their knowledge of the starch test to explain the results shown in the table. A lack of acknowledgement of the command word (explain) and confusion over the colour changes at each temperature (thinking that at 30 °C, the enzyme was not working) were the most common errors seen. A small proportion of students incorrectly stated that iodine solution showed the presence (or absence) of both starch *and* sugar, or that the amylase itself was being broken down. Unspecific references to 'carbohydrates' in place of starch and / or glucose were not creditworthy.

**02.6** 53% of students gained credit in this question.

**02.7** 60% of students scored full marks in this question, with a further 28% scoring 1 mark, most commonly MP1. A substantial number of students gave their answers the wrong way around and the 'pancreas' was often chosen mistakenly in the context of being a site of production, rather than activity of, protease. Unqualified references to 'intestine' were frequently seen but were not credited and a number of students think that the liver is an organ that manufactures, and is a site of, digestive enzyme activity.

4.2.2.1 The human digestive system

Answer 35 · Examiner comments

June 2025 | 8461/1H | Original Q7

## Question 7 (standard, standard/high demand and high demand)

**07.1** Nearly 60% of students were able to use the correct terminology to achieve the mark in this question. Common incorrect answers included referring to the process of differentiation as 'specialisation' or describing undifferentiated cells turning into specialised cells.

**07.2** 47% of students achieved the mark in this question, with the most common correct answer being the idea of embryos or a potential life being destroyed or killed. A smaller proportion of students achieved credit for the idea that embryos are unable to give consent but very few were able to articulate ideas about beliefs clearly enough to be awarded the third bullet point in the mark scheme. Incorrect responses were often less biological or were emotive in nature e.g. 'it's murder', 'a baby is killed', 'embryos are a potential life', and 'it would have grown into a baby', that did not answer the question.

**07.3** 62% of students scored full marks in this question, with a further 17% scoring 2 marks, and 9% scoring 1 mark. The majority were able to identify and spell hybridoma (for MP3) correctly, but credit could not be awarded for reference to cancer, rather than tumour cell (for MP2), and white blood cell rather than lymphocyte (for MP1). A small number of students incorrectly named cell A as 'spleen cell' and cell B as a dead or weakened pathogen.

**07.4** 42% of students scored the mark for this question with most referring to injection of antigens rather than liver cells. Incorrect answers were almost always related to injecting the mouse with a pathogen or disease, confusing this context with that of vaccination against infectious disease.

**07.5** Around 30% of students scored a mark on this question with only 11% scoring 2 marks and 1% scoring full marks. MP1 was most frequently scored, with the statement that monoclonal antibodies bind to antigens (on liver cells). A common incorrect response was that the monoclonal antibody would bind to white blood cells to stop them rejecting the liver cells. MP3 was scored infrequently, mostly with the idea that antibodies made by the patient's white blood cells would be blocked from binding to the liver antigens, after MP1 had already been scored. A few students did correctly describe that phagocytes could not detect the liver cells as the monoclonal antibodies

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were bound to the antigens on their surface. MP2 was very rarely scored. Whilst most students had attempted this question using some correct terminology, the responses were often confused and either showed that the information provided in the stem of the question had not been used, or that the student had misunderstood the nature of the monoclonal antibody treatment for liver disease. It was very common to see the idea that if the monoclonal antibody was bound to the liver cell antigens, that the white blood cells would not produce antibodies at all.

**07.6** This question was well-answered by most students with 67% scoring the mark. A range of answers was seen, although responses relating to cancer detection and treatment were most common. Drug and COVID testing were also seen frequently. Most incorrect answers were due to students not fully qualifying their responses for example 'treat diseases' or 'fighting cancer'.

**07.8** This was a levelled response question about the function of the liver during liver failure. The majority of students attempted the question, but 43% of students achieved no marks. Level 2 responses were the most common with 24% of students achieving marks. 11% of students achieved Level 3 and 20% Level 1. The majority of Level 2 responses that did not match the criteria for Level 3, were due to an omission to refer to the role of lipase, or to distinguish that the rate of breakdown of fats would be slow*er* with liver disease. In addition, students were limited to Level 2 if they only described the effect on emulsification **or** on the neutralisation of acid.

In Level 1, the majority of students did not develop their answers, scoring 1 mark for reference to the effect on emulsification and neutralisation, but with no further detail, or scoring 2 marks for a linked idea about either emulsification or neutralisation. Common misconceptions included lipase being made in the stomach, fat *molecules* being broken down by the process of emulsification (rather than by lipase action), the liver producing lipase and bile neutralising acid in the stomach. Other incorrect answers included the idea that there would be no digestion of fat without bile, that lipase is found within bile, that bile is an enzyme and that lipase engulfs fats. The context of many students' responses related to the usual role of bile in a healthy liver, whilst mentioning less bile production in patients with liver disease. Some students scored no marks for this approach as they did not reference the disease causing less bile production, or said that the patient had *difficulty* producing bile, which was not creditworthy. Occasionally, some students did not mention bile at all, despite it being in the stem of the question. A few students thought that the diseased liver would stop producing enzymes or lipase which is why digestion of fat was difficult.