| Question number | Answer | Mark |
|---|---|---|
| 8(a)(i) | An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark):<br>• fatty acids are formed when the lipids are broken down by lipase (1)<br>• and fatty acids are acidic (so the pH decreases) (1) | **(2)** |

| Question number | Answer | Mark |
|---|---|---|
| 8(a)(ii) | An answer that combines up to a maximum of **two** points to provide a logical description:<br>• as the temperature increases from 20 °C to 37 °C the rate of lipase activity increases (from 0.2 to 0.8) (1)<br>• the rate of lipase activity is optimal at 37 °C (1)<br>• above 37 °C the rate of lipase activity decreases (from 0.8 to 0.1) (1) | **(2)** |

| Question number | Answer | Mark |
|---|---|---|
| 8(a)(iii) | An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark):<br>• an increase in temperature above 40 °C causes changes in the shape of the active site of the enzyme (1)<br>• therefore the enzyme becomes denatured and no longer functions (1) | **(2)** |

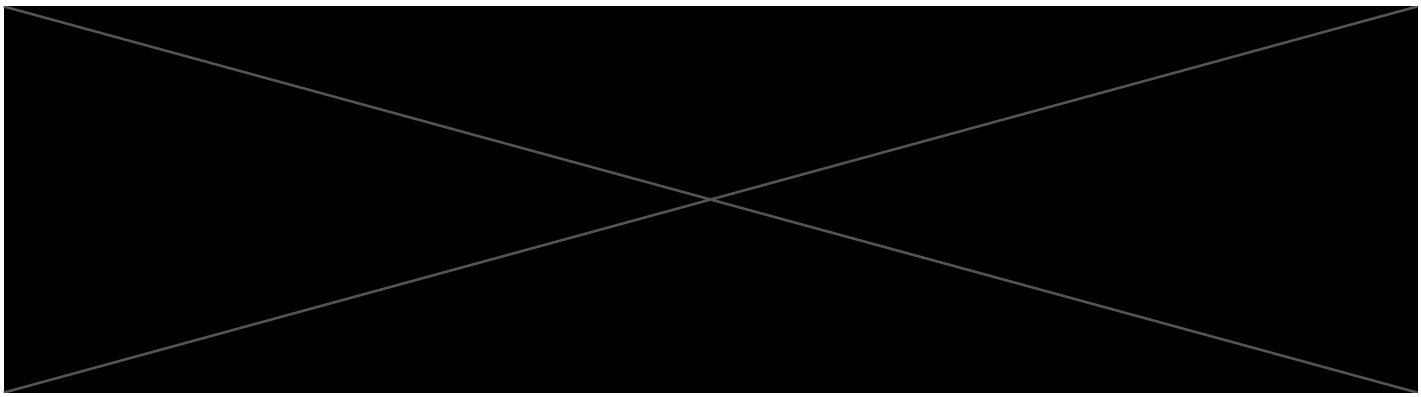
| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 8(b)(i) | • mean= 588/5 = 117.6 (1)<br>• rate = 1 ÷ 117.6 (1)<br>• 0.0085 (1) | award full marks for correct numerical answer without working<br><br>accept $1000/t$<br>accept $10/t$ | **(3)** |

| Question number | Answer | Mark |
|---|---|---|
| 8(b)(ii) | Any one variable from:<br>• concentration of the enzyme<br>• volume of enzyme solution<br>• volume of starch solution<br>• pH of the solutions | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| **8(c)** | An explanation that makes reference to: identification – knowledge (1 mark) and reasoning /justification – knowledge (1 mark):<br>• the active site of an enzyme has a specific shape because of the order of the amino acids (1)<br>• the substrate must have a shape which is complementary to the active site (1) | **(2)** |

| Question number | Answer | Mark |
|---|---|---|
| **9(a)** | An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (2 marks):<br>• penicillin prevents the bacteria from dividing as they cannot make a new cell wall (1)<br>• because humans cells do not have a cell wall (1)<br>• they are unaffected by penicillin (1) | **(3)** |

| Question number | Answer | Mark |
|---|---|---|
| **9(b)** | An answer that combines knowledge (2 marks) and understanding (2 marks) to provide a logical description:<br>• use restriction enzymes to remove the gene and cut the plasmid (1)<br>• use of ligase to join DNA molecules together (1)<br>• cut the gene from the genome of the fungus and extract a plasmid from the bacteria (1)<br>• insert the recombinant plasmid back into the bacteria (1) | **(4)** |



| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3(a)** | a group of (different) tissues | (different) types of tissue (working together) | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3(b)(i)** | **C** 2 | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3(b)(ii)** | **A** amino acids | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3(c)** | An explanation linking **four** of the following points<br>• microvilli (1)<br>• large surface (area) (1)<br>• single layer of cells / thin walls / small diffusion distance (1)<br>• capillary network / good blood supply / capillaries within villus (1)<br>• maintains diffusion gradient (1)<br>• increased / fast / maximises diffusion / absorption (1) | Accept - easier / efficient | **(4)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3(d)(i)** | • 86 (%) / 0.86 (1)<br>• correct answer = 4.3 million / 4 300 000 (1) | ecf<br>Accept bald correct answer for 2 marks | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3(d)(ii)** | Any **one** from<br>• chocolate is thicker / solid / chocolate digested slower (1)<br>• idea of different type of (probiotic) bacteria (1)<br>• more bacteria in the chocolate (initially) (1)<br>• more sugar/ nutrients in the chocolate (1) | ORA | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(a)(i)** | D - pancreas | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(a)(ii)** | B – fatty acids and glycerol | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(b)(i)** | protease / pepsin | **Reject** any other enzyme given | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(b)(ii)** | amino acid / amino acids | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(b)(iii)** | • correct values read from graph (= 12 and 9) (1)<br>• 3 arbitrary units (1) | award 2 marks for correct answer with no working<br>ecf<br>ignore + and - signs | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(b)(iv)** | Any **two** of the following points<br>• at pH 2 the active site is distorted / enzyme changes shape / enzyme is denatured (1)<br>• so less successful collisions / less enzyme substrate complexes /enzyme cannot bind to substrate (1)<br>• optimum pH is 1.4 (1)<br>• pH 1 is closer to the enzyme's optimum pH (1) | ignore any names of enzymes | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(c)** | An explanation including the following points<br><br>• neutralisation of stomach acid<br><br>• emulsification of fats | makes intestine more alkaline<br><br>breaks down fats but not into fatty acids and glycerol | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **5(a)** | **C** peristalsis | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **5(b)** | • neutralisation (of stomach acid) / raise pH (1)<br><br>• emulsification / break down of fats (1) | Accept makes stomach / intestine contents more alkaline<br><br>Accept breaks down large droplets /globules / increases surface area of fats<br>Reject molecules broken down | **(2)** |

| Question Number | | Indicative Content | Mark |
|---|---|---|---|
| **QWC** | ***5(c)** | A description including some of the following points in a logical sequence<br><br>Names of enzymes:<br>• carbohydrases<br>• named carbohydrase eg amylase<br>• proteases<br>• named protease eg pepsin<br>• lipases<br>• named lipase<br><br>General points about enzyme action:<br>• breakdown of large / insoluble / named molecules into small / soluble / named molecules<br>• for absorption<br>• catalysts<br>• speeds up reactions<br>• active sites that bind to substrate<br>• idea of specificity<br><br>Specific points:<br>• carbohydrates/ starch are broken down<br>• into sugars / glucose<br><br>• proteins /named protein are broken down<br>• into amino acids<br><br>• fats / oils / lipids / named lipid are broken down<br>• into fatty acids /glycerol | **(6)** |
| **Level** | **0** | No rewardable content | |
| **1** | **1 - 2** | • a limited description of enzyme action that includes at least three points<br>• the answer communicates ideas using simple language and uses limited scientific terminology<br>• spelling, punctuation and grammar are used with limited accuracy | |
| **2** | **3 - 4** | • a simple description of enzyme action that includes at least six points<br>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately<br>• spelling, punctuation and grammar are used with some accuracy | |
| **3** | **5 - 6** | • a detailed description of at least nine points<br>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately<br>• spelling, punctuation and grammar are used with few errors | |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **5(d)** | An explanation linking three of the following points<br><br>• (E) more /fast / maximises diffusion / absorption (1)<br><br>• (S) microvilli (1)<br><br>• (E) large surface area (1)<br><br>• (S) single layer of cells / one cell thick / thin walls (1)<br><br>• (E) small diffusion distance (1)<br><br>• (S) capillary network / good blood supply / capillaries inside villus (1)<br><br>• (E) maintains diffusion gradient (1) | To award all three marks at least one structure (S) and explanation (E) must be linked together.<br><br>Award once, linked to any structure Ignore efficient (in stem) / easier<br><br>Reject ref to cell wall | **(3)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **5(a)(i)** | A description including the following points:<br><br>• increase in concentration of glucose / glucose diffused into water/eq (1)<br><br>• levels off after 20 mins / at 0.79 g/cm$^3$(1) | small increase, followed by greater increase / eq | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **5(a)(ii)** | An explanation including **three** of the following points:<br><br>• starch broken down into glucose (1)<br><br>• by enzymes / amylase / carbohydrase (1)<br><br>• glucose passes through visking tubing / eq (1)<br><br>• by diffusion (1)<br><br>• down the (glucose) concentration gradient (1)<br><br>• (net) diffusion stops when {all starch is broken down / concentration of glucose is equal inside and outside the tubing} | reject: references to osmosis or active transport<br><br>accept: from area of high concentration to area of low concentration | **(3)** |

| Question Number | | Indicative Content | Mark |
|---|---|---|---|
| **QWC** | ***5(a) (iii)** | An evaluation including some of the following points:<br><br>Strengths<br><br>• thin membrane<br>• permeable membrane<br>• presence of amylase<br>• presence of (large) starch molecules<br>• digestion into glucose<br>• glucose diffuses out<br>• concentration gradient<br>• water represents the blood<br><br>weaknesses<br><br>• membrane not one cell thick<br>• not a large surface area<br>• shorter length / not same size<br>• no villi /micro villi<br>• only carbohydrate digestion<br>• no other enzymes present<br>• no peristalsis<br>• no blood movement<br>• other factors e.g. pH | **(6)** |
| **Level** | **0** | No rewardable content | |
| **1** | **1 - 2** | • a limited evaluation of the model including **at least one** strength OR weakness of the model<br>• the answer communicates ideas using simple language and uses limited scientific terminology<br>• spelling, punctuation and grammar are used with limited accuracy | |
| **2** | **3 - 4** | • a simple evaluation of the model showing evidence of **at least one** strength AND at least one weakness of the model OR a detailed evaluation of several strengths or several weaknesses of the model<br>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately<br>• spelling, punctuation and grammar are used with some accuracy | |
| **3** | **5 - 6** | • a detailed evaluation, commenting on **several** of the strengths AND weaknesses of the model and its limitations<br>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately<br>• spelling, punctuation and grammar are used with few errors | |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **5(b)** | **C** store bile | | **(1)** |