Questions

Q1.

Carbohydrates provide energy for growth.
Use words from the box to complete the sentences.

| amino acids | amylase | large intestine | protease |
| proteins    | small intestine | stomach | sugars |

Carbohydrates are broken down by .................. into simple ..................
Glucose is absorbed into the blood through villi found in the ..................

Q2.

(a) Draw one straight line from each digestive enzyme to its substrate.

(b) (i) Complete the sentence by putting a cross ( ✗ ) in the box next to your answer.
Pepsin is an enzyme that digests protein into

A amino acids  
B fatty acids  
C glucose  
D glycerol

(ii) An experiment was carried out to investigate the effect of pH on the activity of pepsin and another enzyme called trypsin.
The graph shows the results of the experiment.
The graph shows that

A pepsin only works at a pH of 3
B pepsin has an optimum pH of 3
C trypsin only works at a pH of 3
D trypsin has an optimum pH of 3

(iii) Using the graph, describe two ways in which the activity of pepsin is different to the activity of trypsin.

1. ........................................................................................................................................
2. ........................................................................................................................................
3. ........................................................................................................................................
4. ........................................................................................................................................

(iv) Explain why the activity of trypsin is different at pH 11 compared to pH 9.

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(Total for Question is 8 marks)
Q3.

Enzymes and digestion

(a) (i) The diagram shows an enzyme and four substrates.
    Draw one straight line from the enzyme to its correct substrate.

(ii) The diagram models one way enzymes are thought to work with their substrates.
    Complete the sentence by putting a cross (X) in the box next to your answer.
    This model represents the hypothesis known as

    [ ] A base pairing
    [x] B DNA replication
    [ ] C lock and key
    [ ] D protein synthesis

(b) Some babies have difficulty absorbing nutrients from their food.
    Protease enzymes can be added to baby food during its manufacture.
    (i) Explain why protease enzymes are added to baby food.
(ii) A baby food is manufactured at 35 °C. Higher temperatures affect the protease enzymes in baby food. Explain how enzymes are affected by temperatures above 40 °C.

(c) Describe the action of carbohydrase and lipase enzymes in different parts of the digestive system.

(Total for question = 12 marks)
### Mark Scheme

#### Q1.

<table>
<thead>
<tr>
<th>Answer</th>
<th>Acceptable answers</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>amylase (1) sugars (1) small intestine (1)</td>
<td>answers must be in this order accept phonetic spellings</td>
<td>(3)</td>
</tr>
</tbody>
</table>

#### Q2.

<table>
<thead>
<tr>
<th>Answer</th>
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</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td></td>
<td>(2)</td>
</tr>
<tr>
<td>(b)(i) A amino acids</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>(b)(ii) B pepsin has an optimum pH of 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| (b)(iii) A description including two from the following points  
• pepsin has a lower activity  
• pepsin works at a lower pH  
• pepsin works within a narrower pH range  
• the optimum pH of pepsin is lower  
ORA Accept: pepsin works in acidic conditions | (2)  |
| (b)(iv) A explanation linking the following points  
• it is less active/activity only 6 arbitrary units (1)  
• (starting to) denature (1)  
• active site is changing shape (1)  
• cannot bind to its substrate as well at this pH (1)  
Accept: reference to pH9 being the optimum/pH11 is not the optimum | (2)  |
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<th>Mark</th>
</tr>
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<tbody>
<tr>
<td>(a)(i)</td>
<td><img src="image" alt="Diagram" /></td>
<td>Reject if more than one line drawn from enzyme</td>
<td>(1)</td>
</tr>
<tr>
<td>(a)(ii)</td>
<td>lock and key</td>
<td></td>
<td>(1)</td>
</tr>
</tbody>
</table>
| (b)(i)          | A explanation including **two** of the following:  
|                 | - (baby food) contains proteins (1);  
|                 | - (protease) breaks down/digests proteins (1);  
|                 | - into amino acids (1);  
|                 | - amino acids can then be absorbed (1);  
|                 | - reference to growth (1);  
|                 | Accept large/insoluble molecules  
<p>|                 | Accept small/soluble molecules | (2)  |</p>
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| (b)(ii)         | An explanation including **two** of the following:  
  - less/no activity/not at optimum(1);  
  - enzyme/active site changes shape(1);  
  - cannot bind to substrate(1);  
  - denatures(1);                     | Accept destroyed | (2)  |

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<th>Mark</th>
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</table>
| QWC             | *(c)* A description that links some of the following points  
  - carbohydrazed breaks down carbohydrates  
  - to maltose/glucose/sugar  
  - carbohydrazed in small intestine/ mouth  
  - reference to amylase  
  - lipase breaks down fats  
  - to fatty acids/glycerol  
  - in the (small) intestine | (6)  |

<table>
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<tr>
<th>Level</th>
<th>0</th>
<th>No rewardable content</th>
</tr>
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</table>
| 1     | 1 - 2 | a limited description that gives one correct link between an enzyme and its substrate OR product OR location e.g. carbohydrazes in the mouth  
  - the answer communicates ideas using simple language and uses limited scientific terminology  
  - spelling, punctuation and grammar are used with limited accuracy |
| 2     | 3 - 4 | a simple description that gives one correct link between one enzyme, its substrate, product and its location e.g. carbohydrazes break down carbohydrates to glucose in the small intestine OR two enzymes with their substrates and either the products OR location  
  - the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately  
  - spelling, punctuation and grammar are used with some accuracy |
| 3     | 5 - 6 | a detailed description that links BOTH enzymes with their substrates AND their products AND their location.  
  - the answer communicates ideas clearly and coherently using a range of scientific terminology accurately  
  - spelling, punctuation and grammar are used with few errors |