



A-Level Biology

Digestion and Absorption

Mark Scheme

Time available: 78 minutes

Marks available: 55 marks

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Mark schemes

1.

- (a) 1. Exopeptidases hydrolyse peptide bonds at the ends of a polypeptide/protein **AND** endopeptidases hydrolyse internal peptide bonds within a polypeptide/protein;

Reference to 'hydrolyse' required at least once

2. More 'ends'

OR

More surface area;

Accept even if via action of incorrect enzyme

2

- (b) 1. Actin/myosin/tropomyosin;

Accept troponin

Accept ATP synthase/hydrolase

2. Antibodies;

Accept immunoglobulins

Accept lysozyme

2

- (c) Whey (no mark) as it:

1. Is absorbed quicker

OR

It has a faster/higher/greater/the highest/the greatest/the fastest rate of absorption;

2. Still stimulates/increases protein synthesis (even if lower than casein);

3. Prevents/inhibits/limits breakdown of body proteins;

4. **Significantly** more becomes body protein;

*If student selects casein allow 1 mark **only** for 'as it stimulates a higher rate of protein synthesis'*

Accept use of data to show differences

3 max

[7]

2.	<p>(a) 1. (Reference to) hydrolysis of peptide bonds; 2. Endopeptidase act in the middle of protein/polypeptide OR Endopeptidase produces short(er) polypeptides/ increase number of ends; 3. Exopeptidases act at end of protein/polypeptide OR Exopeptidase produces dipeptides/amino acids; 4. Dipeptidase acts on dipeptide/between two amino acids OR Dipeptidase produces (single) amino acids;</p> <p style="text-align: center;"><i>Accept chain/chain of amino acids/peptide for polypeptide</i> <i>Accept digest/breakdown/ break for 'act'</i> <i>Mark points 2, 3 and 4 reject answers where substrate or product is incorrect eg 'Endopeptidase produces dipeptides'</i> <i>Ignore references to source and location of enzymes</i></p>	4
	<p>(b)</p> <p style="text-align: center;"><i>Ignore reference to 'significance' unless qualified, eg 'difference'</i></p> <p>1. No significant difference (in protein absorption); 2. (because ± 2) SDs overlap; <i>Accept error bar for SD</i> 3. (So mean) <u>percentage</u> absorbed not affected by <u>percentage</u> in diet; 4. Amount of protein (in diet) is not a limiting fact OR Something else is limiting factor eg amount of protease; 5. (But) small range of protein in diet OR (Should) Investigate wider range;</p>	3 max
	<p>(c) 1. More/remaining/undigested (protein) broken down; <i>Accept all (protein) broken down</i> 2. (So more) amino acids absorbed; 3. (Because) protein/food passes again through stomach/ileum;</p>	3
		[10]
3.	<p>(a) 1. Maltose; 2. Salivary amylase breaks down starch.</p>	2
	<p>(b) Maltase.</p>	1
	<p>(c) (Mimics / reproduces) effect of stomach.</p>	1
	<p>(d) 1. Add boiled saliva; 2. Everything same as experiment but salivary amylase denatured.</p>	2

- (e) 1. Some starch already digested when chewing / in mouth;
 2. Faster digestion of chewed starch;
 3. Same amount of digestion without chewing at end.

Accept use of values from graph

3

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4.

- (a) Dipeptidase/s;

Accept: membrane bound dipeptidase/s.

1

- (b) 1. Endopeptidases hydrolyse internal (peptide bonds)

OR

Exopeptidases remove amino acids/hydrolyse (bonds) at end(s);

Accept: break for hydrolyse.

Accept: endopeptidases break (proteins) into shorter chains.

2. More ends or increase in surface area (for exopeptidases);

2

- (c) 1. No/less ATP produced

OR

No active transport;

2. Sodium (ions) not moved (into/out of cell);

Accept: sodium (ions) increase in cell.

Accept: sodium (ions) cannot diffuse into cell.

3. No diffusion gradient for sodium (to move into cell with amino acid)

OR

No concentration gradient for sodium (to move into cell with amino acid);

Accept: converse for all three points.

Note: no active transport of sodium (ions) equals 2 marks.

3

[6]

5.

- (a) Measure with eyepiece graticule / scale;
 Calibrate with stage micrometer / scale on slide / object of known size;
 Repeats and calculate the mean;

OR

Use a ruler to estimate the field diameter under microscope;

How many droplets go across the field;

Repeats and calculate mean;

Accept references to radius

3

- (b) (i) Two mark for correct answer of 4 : 1;;
One mark for incorrect answer but working shows that candidate has clearly attempted to compare values of $r^2 / 6^2$ and $3^2 / 36$ and 9;

Idea of comparing ratios

A ratio of 1 : 4 should gain 1 mark

2

- (ii) Small droplets have a larger surface area to volume ratio;
More surface for lipase (to act), leading to faster digestion of triglycerides;
Fatty acids are produced more quickly so pH will drop more quickly in curve Y / with bile salts / less fatty acids in curve Z / without bile salts so pH drop more slowly;

3

[8]

6.

- (a) Amylase;

(Starch) to maltose:

Maltase;

Maltose to glucose;

Hydrolysis;

(Of) glycosidic bond;

Q Do not penalise incorrect site for digestion or incorrect site of enzyme production.

5 max

- (b) Glucose moves in with sodium (into epithelial cell);

Via (carrier / channel) protein / symport;

Sodium removed (from epithelial cell) by active transport / sodium- potassium pump;

Into blood;

Maintaining low concentration of sodium (in epithelial cell) / maintaining sodium concentration gradient (between lumen and epithelial cell);

Glucose moves into blood;

By (facilitated) diffusion;

Q Only allow diffusion mark in context of movement of glucose into the blood.

5 max

[10]

7.

- (i) Lack of ATP;
Pump = active transport / requires energy / ATP provides energy / transport is up concentration gradient;

2

(ii) Concentration of Na^+ inside cell no longer less than concentration in gut lumen / no longer a concentration gradient;
No (facilitated) diffusion of NA^+ ions possible / amino acid absorption requires diffusion of Na^+ ions into cell;

2

(iii) Diffusion / facilitated diffusion;

1

[5]