

1. (a) Digestion/hydrolysis/breakdown of a disaccharide into monosaccharides;  
OR  
(glucose and galactose form lactose) glucose is a monosaccharide; max 1
- (b) (i) Dipeptidase / disaccharidase / named disaccharidase; 1  
(ii) Enzymes not lost (with gut contents) / more effective absorption  
of products formed by these enzymes; 1
- (c) No ATP formed / no energy released by respiration; [*reject "making" energy*]  
Link ATP to active transport (of galactose) into cells; 2
2. (i) Lack of ATP;  
Pump = active transport / requires energy / ATP provides energy /  
transport is up  
concentration gradient; 2
- (ii) Concentration of Na<sup>+</sup> inside cell no longer less than concentration in  
gut lumen / no longer a concentration gradient;  
No (facilitated) diffusion of Na<sup>+</sup> ions possible / amino acid absorption  
requires diffusion of Na<sup>+</sup> ions into cell; 2
- (iii) Diffusion / facilitated diffusion; 1
3. (a) Two marks for correct answer of 64.285/64.3/64; 2  
*(allow 1 mark for (8100/100 × 30) / 37.8)*
- (b) dissolve in / add ethanol then mix with water;  
emulsion / white colour indicates triglycerides present; 2

[5]

[5]

- (c) (i) increase the surface area for absorption; 1  
*(ignore wrong ref. to name)*
- (ii) **R** = tissue fluid/interstitial fluid/extracellular fluid/intercellular space; 2  
**S** = lymph(atic) vessel/lymph capillary/lacteal;
- (iii) proteins are synthesised by **U**;  
involvement of ribosomes;  
protein isolation / transport (inside RER);  
vesicle formation; 2 max
- (iv) exocytosis / description of;  
because of size / too large to leave by other methods; 2
- [11]**
4. (a) use of water; *must be above arrowhead*  
OH drawn correctly in place of glycosidic bond on each monosaccharide; 2
- (b) water potential made lower / more negative;  
less water absorption / water enters gut – by osmosis / by diffusion; 2
- [4]**
5. (a) extracellular/secreted enzymes;  
reference to diffusion (of enzyme into agar);  
starch digested;  
to maltose/glucose;  
smaller molecules absorbed into fungus/ do not react iodine solution;  
B must have greater production of enzyme/more active enzyme; max. 4
- (b) does not produce amylase/enzyme able to hydrolyse starch/mutation causes  
production of an inactive enzyme; 1
- [5]**
6. (a) (i) villi;  
microvilli;  
longer intestine; max. 2
- (ii) more time in intestines 1

- (b) Principles:  
 diffusion into capillaries;  
 active transport/facilitated diffusion involved;  
 ATP used by active transport;  
 Detail:  
 disaccharidases/enzymes in cell surface membrane;  
 glucose /monomers/monosaccharides actively transported **into** epithelial cells;  
 via protein carriers/channels (in membranes);  
 facilitated diffusion **from** epithelial cell / towards blood; max. 4
- [7]**
7. large surface area provided by villi / microvilli;  
 long / folds increase surface area / time for absorption;  
 thin epithelium;  
 short diffusion pathway;  
 capillary network absorbs amino acids / sugars;  
 lacteal for absorption of digested fats;  
 mitochondria supply ATP / energy for active transport;  
 carrier proteins (in membranes); max 6
- [6]**
8. Hydrolysed by maltase;  
 Maltase enzymes in membranes of epithelial cells of small intestine;  
 Glucose absorption involves diffusion;  
 Associated with uptake of sodium ions;  
 Involves active transport/energy dependent;  
 Requires carrier molecules;  
 Role of villi/microvilli in increasing surface area;  
 Transported in solution/in plasma;  
 To liver via hepatic portal vein; max 7
- [7]**
9. (a) Starch digested to maltose by amylase;  
 Found in saliva; Secreted by pancreas;  
 Maltase converts maltose to glucose;  
 Found in membranes of cells lining small intestine;  
 Both reactions involve hydrolysis; 4

- (b) Glucose absorption involves diffusion;  
 Associated with uptake of sodium ions;  
 Involves active transport/energy dependent;  
 Requires carrier molecules;  
 Role of villi and microvilli in increasing surface area;  
 Transport into capillaries/hepatic portal vein; 4 **[8]**
10. (a) Cells all the same/similar structure/function. 1
- (b) (i) 
$$\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{C}-\text{OOC}\cdot\text{R} \\ | \\ \text{H}-\text{C}-\text{OOC}\cdot\text{R} \\ | \\ \text{H}-\text{C}-\text{OOC}\cdot\text{R} \\ | \\ \text{H} \end{array}$$
 2  
*2 marks if fully correct; 1 mark if glycerol attached to 3 fatty acids*
- (ii) Condensation / esterification. 1
- (c) (i) (Unsaturated fatty acids) lower the melting point. 1
- (ii) Triglycerides are oils / melting point below body temperature;  
 Explanation of advantage, e.g. prevents hard layer of fat forming  
 under skin / mobility of lipid / deposition in arteries. 2 **[7]**
11. (i) **X** = Mitochondria;  
**Y** = Microvilli / brush border; 2
- (ii) **X** = Provide energy/for active uptake;  
**Y** = Increase surface area; 2 **[4]**

12. (allow general points provided correct molecule/particle involved)

diffusion

movement along / down concentration gradient;  
 monoglycerides / micelles/fatty acids move into epithelial cells;  
 monoglycerides move from epithelium into blood;  
 chylomicrons move into lacteals / lymph;

facilitated diffusion

movement along / down concentration gradient;  
 reference to carrier / channel proteins;  
 monosaccharides or named / amino acids move into epithelial cells;

active transport

movement against concentration gradient;  
 energy / ATP required;  
 reference to carrier proteins;  
 monosaccharides or named / amino acids moved into epithelial cells;  
 reference to co-diffusion e.g. glucose and NaCl;  
 monosaccharides or named / amino acids move into blood;  
 (maximum 5 marks if any one or 4 if any two processes completely omitted)

6 max

[6]

13. (a) (i) villus; (*reject microvilli*)

1

(ii) contracts / peristalsis;  
 moves/pushes/forces food through gut;

2

(b) many / projecting villi (X) (*no double penalty for microvilli*);  
 large surface area (for absorption);  
 large/good blood supply / many capillaries/blood vessels;  
 maintains concentration gradients / efficient removal of digested products;  
 thin outer layer / blood vessels near to surface;  
 short diffusion pathway;

4 max

[7]

14. (i) cold - no / reduced enzyme action / e.g. stops autolysis;  
*(reject "cell activity reduced")*  
 isotonic - stops osmotic effects / description of effect on cells or organelles;  
 buffer - prevents damage to enzymes / proteins; 3
- (ii) break open the cells / release the cell contents; 1
- (iii) supernatant / liquid above the pellet;  
 spun at a high(er) speed; 2  
*(mark as independent points)* [6]
15. (i) active sites contain substrate / ethylene glycol;  
 all active sites occupied / enzyme is limiting; 2  
*(reject idea of active sites used up)*
- (ii) Ethanol is a similar shape to the substrate (ethylene glycol) /  
 complementary to active site;  
*(reject "same shape")*  
 ethanol is a competitive inhibitor / reduces enzyme-substrate complexes /  
 prevents substrate (ethylene glycol) entering the active site; 2  
*(reject "decreases rate of reaction")* [4]
16. (a) Hydrolysis; 1
- (b) C<sub>12</sub>;  
 H<sub>22</sub>O<sub>11</sub>; 2
- (c) (i) One mark for answer that simply refers to increase and  
 subsequent decrease  
 Two marks for answer that refers to reaching a peak at  
 approximately 6.6 mol dm<sup>-3</sup>/45 minutes. 2  
*Q Descriptions must refer to concentration of glucose and time  
 to gain credit. Do not accept vague references to "It . . ."*
- (ii) No lactase;  
 Therefore lactose not digested/glucose not produced;  
 No glucose absorbed therefore concentration in blood stays the  
 same/does not rise; 3 [8]
17. (a) Amylase;

(Starch) to maltose:

Maltase;

Maltose to glucose;

Hydrolysis;

(Of) glycosidic bond;

5 max

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

(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;

5 max

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

**[10]**