



EXAM PAPERS PRACTICE

# Carbohydrates 1

Level: AQA AS 7401

Subject: Biology

Exam Board: Suitable for all boards

Topic: Carbohydrates 1

Type: Mark Scheme

To be used by all students preparing for AQA AS Biology 7401 foundation or higher tier but also suitable for students of other boards.

## Mark schemes

- |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 1 | (a) (i) 31 / 31.2;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1 |
|   | (ii) Ratio would be less / smaller;<br>Cell is thin / has large surface area / (adapted) for diffusion;<br><i>Accept converse. Must relate to concept of ratio.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2 |
|   | (b) (i) 6;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1 |
|   | (ii) 11;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1 |
|   | (c) Water potential inside vesicle more negative / lower;<br>Water moves into vesicle by osmosis / diffusion;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2 |
|   | (d) Mitochondria supply energy / ATP;<br>For active transport / absorption against concentration<br>gradient / synthesis / anabolism / exocytosis / pinocytosis;<br><i>Do not credit references to making,<br/>creating or producing energy.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2 |
|   | (e) 1 Phospholipids forming bilayer / two layers;<br>2 Details of arrangement with “heads” on the outside;<br>3 Two types of protein specified;<br>e.g. passing right through or confined to one layer /<br>extrinsic or intrinsic /<br>channel proteins and carrier proteins /<br>two functional types<br>4 Reference to other molecule e.g. cholesterol or glycoprotein;<br>5 Substances move down concentration gradient / from high to low<br>concentration;<br><i>Reject references to across or along a gradient</i><br>6 Water / ions through channel proteins / pores;<br>7 Small / lipid soluble molecules / examples pass between phospholipids /<br>through phospholipid layer;<br>8 Carrier proteins involved with facilitated diffusion;<br><i>Ignore references to active transport.<br/>Credit information in diagrams.</i> |   |

max 6

[15]



- 2** (a) Glucose (and glucose); 1
- (b) ( $\alpha$ 1,4) Glycosidic; 1
- (c) 1. Headings correct – mol dm<sup>-3</sup> **and** volume of water / cm<sup>3</sup>;  
2. Concentration correct. ie 0.2; 2
- (d) Line of best fit drawn;  
Read off value at 0.45. 2
- [6]**
- 3** (a) 1. Maltose;  
2. Salivary amylase breaks down starch. 2
- (b) Maltase. 1
- (c) (Mimics / reproduces) effect of stomach. 1
- (d) 1. Add boiled saliva;  
2. Everything same as experiment but salivary amylase denatured. 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
- [9]**



4

- (a) 1. Allow equal (time for) diffusion of iodine into apple cells;  
2. For comparison between apples / between harvest dates;  
1. *Accept equal time for reaction / colour change to occur*  
2. *For comparison alone is insufficient.*  
*Ignore unqualified references to fair test, controlling a variable, standardising the method.*

2

- (b) 1. Starch lost from the centre first / area with no starch gets bigger as it ripens;  
2. (Less starch / blue / black as the) starch is converted to sugars / maltose;  
3. (Less starch) as it is hydrolysed;  
4. By amylase;  
*Less starch as it is hydrolysed into sugars scores MP2 and MP3.*  
3. For 'hydrolysed' accept 'as a result of hydrolysis' or 'broken down by hydrolysis'.

3 max

[5]

5

- (a) 1.1 (g);  
(b) 300(%)

1

1

[2]

6

1. (Drink) contains carbohydrates / sugars **so** High GI / (drink) contains carbohydrates / sugars **so** raises blood glucose concentration quickly;  
*Each alternative requires both aspects for credit*  
*The second alternative requires a reference to speed eg 'quickly' or 'immediately'*  
2. Contains salt so glucose more rapidly absorbed;  
3. Increases glucose to muscles for respiration;  
4. More / faster respiration so more / faster energy release;  
*Reject reference to energy production*  
*Accept more ATP produced*

[3]



- 7**
- (a) 1. Contents of phloem vessel pushed into insect's mouth by high pressure;  
2. (High pressure in phloem vessel) caused by loading of sugars into phloem in leaf;  
3. And (resulting) entry of water by osmosis. 3
- (b) 1. Polysaccharides are insoluble;  
2. So do not affect water potential of gut. 2
- (c) 1. (Only few bacteria passed from parent, so) only a few (copies of) genes passed on (in bacteria);  
2. May not / does not include all alleles (of genes, so diversity reduced)  
**OR**  
Small number of bacteria transmitted means unrepresentative sample. 2
- (d) 1. Number / mass / density of insects per plant;  
2. Stage of development / size of plants / insects;  
*Ignore any abiotic factor* 2
- (e) Draw around leaf on graph paper **and** count squares; 1
- [10]**
- 8**
- (a) presence of nuclei; 1
- (b) (i) 1 mark growth clearly calculated from difference between lengths at beginning and end of lesson  
2 marks correct answer of 300  $\mu\text{m}$  2  
*(Allow for slight measurement errors)*
- (ii) divide by time (between measurements); 1
- (c) blue-black / dark blue / purple / black;  
iodine added to slide / specimen / granules; 2
- [6]**



- 9
- (a) (i) both are polymers / polysaccharides / built up from many sugar units / both contain glycosidic bonds / contain (C)arbon, (H)ydrogen and (O)xygen; 1
- (ii) hemicellulose shorter / smaller than cellulose / fewer carbons; hemicellulose from pentose / five-carbon sugars and cellulose from hexose / glucose / six-carbon sugars;  
(only credit answers which compare like with like.) 2
- (b) protein / nucleic acid / enzyme / RNA / DNA / starch / amylose / amylopectin polypeptide; 1
- (c) (i) to make sure that all the water has been lost; 1
- (ii) only water given off below 90 °C;  
(above 90°C) other substances straw burnt / oxidised / broken down; and lost as gas / produce loss in mass; 2
- (d) enzymes are specific;  
shape of lignin molecules will not fit active site (of enzyme);  
OR  
shape of active site (of enzyme);  
will not fit molecule; 2 max
- (e) 1. made from  $\beta$ -glucose;  
2. joined by condensation / removing molecule of water / glycosidic bond;  
3. 1 : 4 link specified or described;  
4. "flipping over" of alternate molecules;  
5. hydrogen bonds linking chains / long straight chains;  
6. cellulose makes cell walls strong / cellulose fibres are strong;  
7. can resist turgor pressure / osmotic pressure / pulling forces;  
8. bond difficult to break;  
9. resists digestion / action of microorganisms / enzymes;  
(allow maximum of 4 marks for structural features) 6 max

[15]



10

- (a) 1. Add iodine / potassium iodide solution to the food sample;  
*1. Allow 'iodine'*  
*2. Must be in the context of the correct reagent*
2. Blue / black / purple indicates starch is present; 2
- (b) 1. Starch digested to maltose / by amylase;  
*Ignore 'hard to digest / easily digested'*
2. Maltose digested to glucose / by maltase;
3. Digestion of sucrose is a single step / only one enzyme / sucrase;  
*3. Accept converse for starch*  
*3. Do not accept digestion of sucrose is faster* 3
- (c) 1. Smoking increases risk of CHD / introduces another variable; 1
- (d) (i) 1. No effect on risk with diet group 1 and 2 / lowest glycaemic load;  
*Simple statement of correlation is not enough for this mark*
2. Above diet group 2 / in higher groups, risk increases as glycaemic load increases; 1 max
- (ii) 1. (Higher GL diets lead to) more (harmful) lipids (in blood), so greater risk of atheroma;  
*Ignore reference to lipids in diet*
2. Atheroma leads to blockage of coronary artery / increased risk of blood clot in coronary artery;  
*Ignore references to myocardial infarction / heart attack* 2

[9]



- 11** (a) (i) 14 / 15 – 58 / 59 or 43 – 45 (mg per 100cm<sup>3</sup>);  
*Wrong calculation does not disqualify* 1
- (ii) The larger the person the more blood they would have so have a lower concentration of blood glucose;  
as same amount of glucose absorbed / all / 50g absorbed; 2
- (b) 1. Any reference to overlap between all 3 groups;  
2. One lactase deficient subject had high blood glucose / similar to control;  
3. Some control / Group A subjects had the similar blood glucose to LD / Group B subjects / some IBS subjects had similar results to lactase deficient subjects; 3
- [6]**
- 12** (a) Increase in the first 3 – 4 hours and then decrease; 1
- (b) Little / no difference (at 8 hours);  
Between all groups; 2
- (c) Respiration ( produce CO<sub>2</sub>);  
By cells / tissues; 2
- (d) Clear differences between the lactose deficient and IBS / control group;  
No overlap in SD;  
*Accept between all groups* 2
- [7]**
- 13** (a) (i) Assumed that did not eat due to discomfort in the past; 1
- (ii) Positive correlation / as lactose concentration increases the data in column C increases / percentage who do not eat the food or feel discomfort after eating the food increases; 1
- (iii) Correlation does not mean that there is a causal relationship;  
May be due to some other factor / example of factor;  
*Do not accept casual* 2





- (b)
1. People self-diagnosed lactose intolerant condition;
  2. Discomfort may be due to other factor / infection / other component of diet / is subjective;
  3. Large variation in lactose content of specific food items / e.g. variation in lactose content of different soft cheeses;
  4. Amount in a serving may vary;
  5. Untruthful responses / demand characteristics;
- Sample size = neutral.*

2 max

[6]

14

- (a) (Omega-3 concentration) falls more rapidly at first;  
Levels out at 140 days / concentration of 0.4%;
- (b) (i) Two marks for correct answer of 0.04 or 0.043;;  
One mark for incorrect answer which clearly identifies total fall of 1.7;
- (ii) To take into account variation in fat content of milk / fat content varies from cow to cow;  
Allows comparison;
- (iii) The graph shows a decrease with time feeding on corn;  
No control group;  
Might have fallen anyway / might decrease with time rather than with time spend feeding on corn;  
Other factors / other named factor might also have changed;  
Only one investigation so might not be representative;

2

2

2

4 max

[10]

15

- (a) High sucrose / starch diet leads to increase in lactase activity;
- (b) Not valid / cannot be certain because overlap in SD between high sucrose and high starch;
- Study based on rats (not human) so may not apply to human;

1

2

[3]



16

- (a) (i) **D** plasmid / ribosome(s) / cytoplasm / storage granules;  
(accept any sensible structure)

**E** (slime / mucous) capsule

OR

slime / mucous layer;

2

- (ii) protection / maintain shape / prevent lysis / strength / support;

1

- (b) two of the following:  
nucleus;

OR

nuclear envelope / mitochondria / chloroplasts / sER / rER /  
golgi apparatus / 80s ribosomes

linear DNA / chromosomes / lysosomes / vacuole / vesicles /  
cellulose cell wall;

2 max

- (c) (i) starch digested / broken down;  
by amylase / carbohydrase;

2

- (ii) any sensible suggestion e.g. no secretion of amylase /  
functional amylase /  
piece of fungus might have died;

(accept carbohydrase / enzyme for amylase)

(reject "no digestion" without qualification)

1

[8]

17

- (a) ATP

1

- (b) (i) 2.57:1/2.6:1/18:7;

Correct answer however derived scores two marks

72:28 scores one mark

Correct working from wrong figures scores 1 mark

Accept

0.4 / 0.39 / 0.389 / 0.3889

2 max



- (ii) Low intensity;  
At low intensity/below 40% mainly fat used / at high intensity/  
above 40% mainly carbohydrate used;  
Long duration exercise;  
Percentage fat used increases with time / percentage  
carbohydrate used decreases with time;

3

[6]

18

(a) Starch (max 3)

1. Helical/ spiral shape **so** compact;
2. Large (molecule)/insoluble **so** osmotically inactive;  
*Accept: does not affect water potential/ $\psi$ .*
3. Branched **so** glucose is (easily) released for respiration;  
*Ignore: unbranched.*
4. Large (molecule) **so** cannot leave cell/cross cell-surface  
membrane;

Cellulose (max 3)

5. Long, straight/unbranched chains of  $\beta$  glucose;
6. Joined by hydrogen bonding;  
*Note: references to 'strong hydrogen bonds' disqualifies this mark  
point.*
7. To form (micro/macro)fibrils;
8. Provides rigidity/strength;

5 max

(b) 1. (At source) sucrose is actively (transported) into the phloem/sieve element/tube;

*Accept: 'sugar/s' for sucrose but reject other named sugars e.g.  
glucose.*

*Accept: co-transport (with  $H^+$  ions).*

2. By companion/transfer cells;
3. Lowers water potential in phloem/sieve element/tube **and**  
water enters by osmosis;
4. (Produces) high (hydrostatic) pressure;  
*Accept: pressure gradient.*
5. Mass flow/transport towards sink/roots/storage tissue;  
*Accept: sieve element/tube.*
6. At sink/roots sugars are removed/unloaded;  
*Accept: at sink/roots sugars are used in respiration/stored.*

5 max

[10]



19

- (a)
1. Tertiary structure / 3D shape of enzyme (means);  
*Accept references to active site*
  2. Active site complementary to maltose / substrate / maltose fits into active site / active site and substrate fit like a lock and key;  
*Idea of shapes fitting together*
  3. Description of induced fit;
  4. Enzyme is a catalyst / lowers activation energy / energy required for reaction;  
*Accept "provides alternative pathway for the reaction at a lower energy level"*
  5. By forming enzyme-substrate complex;  
*Accept idea that binding stresses the bonds so more easily broken*  
**Do not award point 5 simply for any reference to E-S complex**

5

- (b)
1. Inhibitors reduce binding of enzyme to substrate / prevent formation of ES complex;  
*Max 3 if only one type of inhibition dealt with. Accept maltase and maltose as examples of enzyme and substrate (and others)*  
*Only once, for either inhibitor*

**(Competitive inhibition),**

2. Inhibitor similar shape (idea) to substrate;
3. (Binds) in to active site (of enzyme);  
*Accept allows max rate of reaction to be reached / max product will eventually be formed*  
*Accept complementary to active site*
4. (Inhibition) can be overcome by more substrate;

**(Non-competitive inhibition),**

5. Inhibitor binds to site on enzyme other than active site;
6. Prevents formation of active site / changes (shape of) active site;  
*Accept does not allow max rate of reaction to be reached / max product will not be formed*
7. Cannot be overcome by adding more substrate;

5 max

[10]



20

(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]



- 21 (a) 1. Sodium ions actively transported from ileum cell to blood;
2. Maintains / forms diffusion gradient for sodium to enter cells from gut (and with it, glucose);
3. Glucose enters by facilitated diffusion with sodium ions;

3

(b)

| Biochemical test   | Liquid from beaker | Liquid inside Visking tubing |
|--------------------|--------------------|------------------------------|
| Biuret reagent     |                    | ✓                            |
| I <sub>2</sub> /KI |                    | ✓ or blank                   |
| Benedict's         | ✓                  | ✓                            |

1 mark for each correct row

3

- (c) 1. Biuret: protein molecules too large to pass through tubing;  
*Neutral: enzyme molecules*
2. Iodine in potassium iodide solution: starch molecules too large to pass through tubing;  
*If no tick in 04.2, allow no starch hydrolysed*
3. Benedict's: starch hydrolysed to maltose, which is able to pass through tubing.  
*Reject: glucose*

3

[9]

- 22 (a) 1. (before reaction) active site not complementary to/does not fit substrate;
2. Shape of active site changes as substrate binds/as enzyme-substrate complex forms;  
*Note. Points 1 and 2 may be made in one statement and 'complementary' introduced at any point.*  
*Points 1&2 – active site mentioned once applies for both points*  
*Point 2 – Ignore references to how shape change is caused*
3. Stressing/distorting/bending bonds (in substrate leading to reaction);

2 max

- (b) 1. Tangent to curve drawn;  
*Tangent drawn at about 10 minutes*
2. Value in range of 8 to 11;  
*1 mark only for correct answer*

2



- (c) 1. (Rate of) increase in concentration of maltose slows as substrate/starch is used up  
**OR**  
High initial rate as plenty of starch/substrate/more E-S complexes;  
*Reject ref. to amylase being used up*
2. No increase after 25 minutes/at end/levels off because no substrate/starch left;  
*Accept 'little'*  
*Ignore references to substrate a limiting factor*

2

- (d) 1. Make/use maltose solutions of known/different concentrations (and carry out quantitative Benedict's test on each);  
2. (Use colorimeter to) measure colour/colorimeter value of each solution and plot calibration curve/graph described;  
*Axes must be correct if axes mentioned, concentration on x-axis and colorimeter reading on y-axis*
3. Find concentration of sample from calibration curve;

3

[9]

- 23** (a) (i) (Molecule) made up of many identical / similar molecules / monomers / subunits;  
*Not necessary to refer to similarity with monomers.*

1

- (ii) Cellulose / glycogen / nucleic acid / DNA / RNA;

1

- (b) (i) To keep pH constant;  
A change in pH will slow the rate of the reaction / denature the amylase / optimum for reaction;

2

- (ii) Purple / lilac / mauve / violet;  
*Do not allow blue or pink.*

1

- (iii) Protein present / the enzyme / amylase is a protein;  
Not used up in the reaction / still present at the end of the reaction;

2

[7]



- 24**
- (a) colour results from starch-iodine reaction;  
decrease due to breakdown of starch by carbohydrase / enzyme; 2
- (b) (i) curve drawn below curve on graph and starting at same point; 1
- (ii) curve drawn above curve on graph and starting at same point but finishing above;  
*(allow curve or horizontal line)*  
*(allow alternative curve for pH if explanation in (ii) is consistent)* 1
- (c) (i) 1. increase in temperature increases kinetic energy;  
2. increases collisions (between enzyme / active site and substrate) / increases formation of enzyme / substrate complexes;  
3. increases rate of breakdown of starch / rate of reaction / carbohydrase activity;
- (ii) 4. (decrease in pH) increases H<sup>+</sup> ions / protons which attach / attracted to amino acids;  
5. hydrogen / ionic bonds disrupted / broken which denatures enzyme / changes tertiary structure;  
6. changes shape / charge of active site so active site / enzyme unable to combine / fit with starch / enzyme-substrate complex no longer able to form;  
7. decreases rate of breakdown of starch / rate of reaction / carbohydrase activity;  
*(allow alternative explanation for pH if consistent with line drawn in (ii))* 7

[11]

- 25**
- (a) (i) in case normal coffee differs in some other way / to control concentration of caffeine; 1
- (ii) not telling them what the drink contained / purpose of experiment; 1
- (b) (i) able to continue for longer; *(not just increases performance)*  
*(disqualify if also refers to fatty acids and glycerol)* 1
- (ii) breakdown of fats;  
at increased rate / by mobilisation of fat stores; 2





- (c) (i) idea that volumes of oxygen and carbon dioxide the same;  
reference to equal moles, or quotient as 1 divided by 1 / or 6 by 6; 2
- (ii) glycogen is a carbohydrate / broken down to glucose, linked to RQ;  
with no caffeine, RQ nearer 1.0 / less carbon dioxide exhaled and  
more oxygen inhaled (or vice versa) / with caffeine higher proportion of fats /  
fatty acids respired;  
increased time to exhaustion suggests slower use of glycogen: 3
- [10]

26

- (a)  $C_{12} ; H_{22}O_{11} ;$  2
- (b) (i) heat with Benedict's;  
yellow / brown / orange / red; 2
- (ii) (yes)  
*(may appear on second line)*  
  
more precipitate in sample **B**;  
both sugars are reducing sugars / give a positive test; 2
- [6]

27

- (a) Lactase hydrolyses lactose in to glucose (and galactose); 1
- (b) No lactase in the milk  
**OR**  
Enzyme can be reused. 1
- (c)  $100 \text{ cm}^3 \text{ minute}^{-1}$  is too fast to bind to active site / converse for  $50 \text{ cm}^3 \text{ minute}^{-1}$ ; 1
- (d) 14.1(4); 1
- (e) 1. Galactose is a competitive inhibitor / attaches to the active site (of lactase);  
2. Fewer enzyme substrate complexes formed. 2
- [6]

28

- (a) 1. Starch formed from  $\alpha$ -glucose but cellulose formed from  $\beta$ -glucose;  
2. Position of hydrogen and hydroxyl groups on carbon atom 1 inverted. 2



- (b) 1. Insoluble;  
2. Don't affect water potential;

**OR**

3. Helical;  
*Accept form spirals*

4. Compact;

**OR**

5. Large molecule;  
6. Cannot leave cell.

2

- (c) 1. Long and straight chains;  
2. Become linked together by many hydrogen bonds to form fibrils;  
3. Provide strength (to cell wall).

3

[7]

29

- (a) (i) 1. Maltose;  
2. Water;

*Accept H<sub>2</sub>O*

2

- (ii) Condensation;

1

[3]

30

- (a) 1. Add iodine / potassium iodide solution;  
*Reject if heated*

2. Blue-black colour (with starch);

*Accept black*

*Ignore purple*

2

- (b) 1. Hydrolysed by enzymes / hydrolysed by amylase / maltase;  
*If named enzyme given, it must relate to the correct substrate*

2. Produces glucose (in the gut);

3. Small enough to cross the gut wall (into the blood) / monomers / monosaccharides (can) cross the gut wall (into the blood);

*Accept cell membranes / epithelium / cells for 'gut wall'*

3

- (c) 1. Time how long it takes to go brick red;  
2. Weigh precipitate;  
3. Dilute glucose samples / use smaller volume of glucose samples / use greater volume of Benedict's reagent;

*Ignore references to colorimeter*

1 max

[6]



31

(a)

Transport through a channel protein

Q

1

Transport of small, non-polar molecules

P

1

Transport of glucose with sodium ions

S

1

(b) 1. (Y is) an enzyme/has active site/forms ES complex;

*Accept catalyst*

2. That makes cellulose/attaches substrate to cellulose/joins  $\beta$  glucose;

**OR**

3. Makes cellulose/forms glycosidic bonds;

4. From  $\beta$  glucose;

*Mark in pairs (1&2 or 3&4)*

2

(c) Cell wall forms outside cell-surface membrane/has cellulose on it (on the outside);

1

(d) (Tick in box next to) Hydrogen;

1

[7]

32

(a) 1. Glucose;  
2. Fructose;

*Accept answers in either order*

*Ignore  $\alpha$  and  $\beta$  glucose*

2

(b) 1. Line graph with rate on y axis and days/time in days on x axis and linear scales;

*Correct answers  $\times 10^{-3}$  1.17, 1.50, 1.83, 2.50, 3.33, 4.00, 4.00 (accept to 1DP)*

2. Correct units of  $\mu\text{g min}^{-1}$ /per minute/minute $^{-1} \times 10^{-3}$ ;

*Reject  $\text{m}^{-1}$*

*Reject if put  $10^{-3}$  on axis for each point*

*'/' means separating units from what goes before i.e. accept*

*sucrose hydrolysis per min /  $\mu\text{g} \times 10^{-3}$*

3. Rates correctly calculated and plotted, with line connecting points/line of best fit and no extrapolation;

*Do not accept a ruled **straight line** of best fit*

*Accept y axis starting at 1*

3



- (c) 1. Sucrose hydrolysis linked to some aspect of growth;  
*Accept 'breakdown'*
2. Greater the rate of/faster hydrolysis/more SPS activity as plant grows/cells divide (up to 8/10 days);  
*Accept 'breakdown'*  
*Accept converse of greater rate of growth, greater rate of hydrolysis*  
*Reject 'sucrose broken down'*
3. Growth/division remains the same/slows after 8/10 days (because SPS activity is levelling off);  
*Accept after 8 days/at 10 days growth rate maximum/growth stops*

3

[8]

33

(a) Accept **three** suitable suggestions:

1. (Lactase / beads) can be reused / not washed away;  
*1. Accept lactase / beads not wasted*  
*1. Less lactase used is insufficient*
2. No need to remove from milk;  
*2. Accept lactase not present in milk.*
3. Allows continuous process;
4. The enzyme is more stable;
5. Avoid end-product inhibition.  
*Ignore ref to SA*

3 max

- (b) 1. (Lactose hydrolysed to) galactose and glucose;
2. (So) more sugar molecules;  
*2. Idea of **more** sugars essential*
3. (So) more / different receptors stimulated / sugars produced are sweeter (than lactose).

2 max

[5]

34

(a) (i) **(Both)**

1. Are polymers / polysaccharides / are made of monomers / of monosaccharides;
2. Contain glucose / carbon, hydrogen and oxygen;
3. Contain glycosidic bonds;
4. Have 1-4 links;  
*Neutral: references to 'unbranched', insoluble, formed by condensation, flexible and rigid*  
*Are made of the monomer glucose = MP 1 and 2 = 2 marks*
5. Hydrogen bonding (within structure).  
*Ignore reference to H bonds between cellulose molecules*

2 max



(ii) (Starch)

1. Contains  $\alpha$  / alpha glucose;  
*Assume 'it' refers to starch*  
*Accept: converse arguments only if linked directly to cellulose*  
*Accept: forms a glycosidic bonds*
2. Helical / coiled / compact / branched / not straight;
3. 1,6 bonds / 1,6 branching;
4. Glucoses / monomers same way up;
5. No H-bonds between molecules;
6. No (micro / macro) fibres / fibrils.

2 max

(b) (i)

1. No / few organelles / very little cytoplasm / cytoplasm at edge / more room / hollow / large vacuole / large space / thick walls;  
*Accept strong walls for thick walls*
2. (So) easier / more flow / (thick / strong walls) resist pressure.  
*Easier flow may be expressed in other ways e.g. lower resistance to flow*

2

(ii)

1. Mitochondria release energy / ATP / site of respiration;  
**Q** *Reject: 'produce energy'*  
*but accept produce energy in form of ATP*
2. For active transport / uptake against concentration gradient.  
*Note: no mark is awarded for simply naming an organelle*  
**OR:**
3. Ribosomes / rough endoplasmic reticulum produce(s) proteins;  
*Concept of making proteins needed*
4. (Proteins) linked to transport e.g. carrier proteins / enzymes.

2

[8]