



A-Level Biology

Carbohydrates

Mark Scheme

Time available: 76 minutes

Marks available: 60 marks

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Mark schemes

1.

(a)

Letter	Statement
B;	is a monomer in an enzyme's active site
D;	is a monomer in cellulose
C;	is produced during photosynthesis and respiration
B;	forms a polymer that gives a positive result with a biuret test

Must be in correct order

4

(b) C = 18, H = 32, O = 16;

Accept only these answers

1

(c) 1. Heat with acid **and** neutralise;

Accept boil/water bath for heat

Accept named alkali for neutralise

Accept named examples, eg HCl, NaHCO₃

2. Heat with Benedict's (solution);

3. Red precipitate/colour;

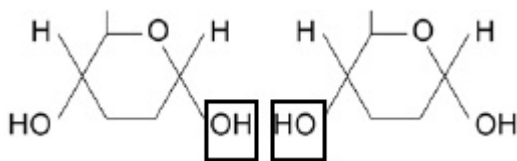
Accept other colours eg orange/ brown/green

3

[8]

2.

(a)



Accept a box drawn around any OH and H from another OH
OR

Accept one box around two OHs

1

(b) 1. Filter **and** dry (the precipitate);

*Accept: correct reference to evaporation **after** filtration*

2. Find mass/weight;

2

- (c) 1. A = glucose **and** B = maltose;
 2. Because **more** sugar/precipitate **after** hydrolysis/maltase action;
Accept 'higher concentration of sugar' for 'more sugar'
Accept 'break down' for hydrolysis

2

- (d) 1. Quantitative
OR
 (Colour change is) subjective;
Accept: accurate/precise

2. Standardises (the) method;

1 max

- (e) 16.67 – 17 = 2 marks;
 (cumulative percentage error of both measuring vessels)

If incorrect final answer, accept for 1 mark:

0.167 – 0.17 (not a percentage)

$$\frac{1}{15} + \frac{0.5}{5} \times 100$$

OR

evidence of

$$\frac{1}{15} + \frac{0.5}{5}$$

(correct understanding, but not calculated)

Ignore: ± (plus or minus) in answer

2

[8]

3.

- (a) (a monomer is a smaller / repeating) unit / molecule from which larger molecules / polymers are made;

Reject atoms / elements / 'building blocks' for units / molecules

Ignore examples

1

- (b) **Similarity**

1. Both contain galactose / a glycosidic bond;

Ignore references to hydrolysis and / or condensation

Difference

2. Lactulose contains fructose, whereas lactose contains glucose;

Ignore alpha / beta prefix for glucose

Difference must be stated, not implied

2

- (c) 1. (Lactulose) lowers the water potential of faeces / intestine / contents of the intestine;
Accept Ψ for water potential
2. Water retained / enters (due to osmosis) **and** softens the faeces;
Accept descriptions of soft faeces, eg faeces is less dry / less hard

2

- (d) (-) 84.1(%);;

Accept (-) 84.15(%)

Allow 1 mark for

84

OR

$$\frac{2.82 \times 10^{-7} - 4.47 \times 10^{-8}}{2.82 \times 10^{-7}}$$

OR

$$\frac{2.37 \times 10^{-7}}{2.82 \times 10^{-7}}$$

2

[7]

4.

- (a) 1. Cellulose is made up of β -glucose (monomers) **and** glycogen is made up of α -glucose (monomers);
2. Cellulose molecule has straight chain **and** glycogen is branched;
3. Cellulose molecule has straight chain **and** glycogen is coiled;
4. glycogen has 1,4- and 1,6- glycosidic bonds **and** cellulose has only 1,4-glycosidic bonds;

Ignore ref. to H bonds / microfibrils

2 max

- (b) Any **two** from:

1. Insoluble (in water), so doesn't affect water potential;
 2. Branched / coiled / (α -)helix, so makes molecule compact;
- OR**
- Branched / coiled / (α -)helix so can fit many (molecules) in small area;
 3. Polymer of (α -)glucose so provides glucose for respiration;
 4. Branched / more ends for fast breakdown / enzyme action;
 5. Large (molecule), so can't cross the cell membrane

*Require feature **and** explanation for 1 mark*

1. *Accept Ψ or WP*

1. *Accept Insoluble so doesn't affect osmosis*

1. *Do **not** allow ref to 'doesn't affect water leaving cells*

4. *Ignore 'surface area'*

4. *Accept 'branched so glucose readily released'*

2 max

- (c) Iodine/potassium iodide;

1

- (d) For correct answer of 40 (μm) award 2 marks;
Evidence of division by 500: award 1 mark

Allow tolerance of 0.5mm i.e. $20 \pm 0.5\text{mm}$

2

- (e) 1. Scanning electron (microscope);
2. 3D (image);

Accept SE(M)

2. *Ignore any other correct features*

2

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5.

- (a) 1. Polysaccharide of α -glucose;

OR

polymer of α -glucose;

2. (Joined by) glycosidic bonds

OR

Branched structure;

2

- (b) 1. Hydrolysed (to glucose);
2. Glucose used in respiration;

1. *Ignore 'Broken down'*

2. *'Energy produced' disqualifies mp2*

2

- (c) 1. Membrane folded **so** increased / large surface area;

OR

Membrane has increased / large surface area **for** (fast) diffusion / facilitated diffusion / active transport / co-transport;

2. Large number of protein channels / carriers (in membrane) **for** facilitated diffusion;

3. Large number of protein carriers (in membrane) **for** active transport;

4. Large number of protein (channels / carriers in membrane) **for** co-transport;

1. *Accept 'microvilli to increase surface area'*

1. *Reject reference to villi.*

Note feature and function required for each marking point and reference to large / many / more.

List rule applies.

2 max

- (d) 3.3×10^{-5} **OR** 3.28×10^{-5} **OR** 3.281×10^{-5} ;

1 mark for

Evidence of 128 (cells)

Correct numerical calculation but not in standard form gains 1 mark (0.00003281 **OR** 0.0000328 **OR** 0.000033);

Accept any number of significant figures as long as rounding correct

(3.28125×10^{-5} scores 2 marks)

2

[8]

- 6.** (a) 1. Starch formed from α -glucose but cellulose formed from β -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]**
- 7.** (a) Isomer(ism); 1
- (b) Higher absorbance (has more sugar)
- OR**
- Lower transmission (has more sugar);
Accept a description of absorbance or transmission 1
- (c) 1. Benedict's (solution) volume;
2. Benedict's (solution) concentration;
3. (Fruit) juice volume;
4. Water bath/water temperature;
5. Duration of heating (in water bath); 2 max

(d) Correct answer for 2 marks, 12;;

Accept for 1 mark,

30 (correct mass of apple core)

OR

150 (correct mass of apple flesh)

OR

$0.08 / \frac{8}{100} \times$ incorrect mass calculated using the ratio

OR

14.4 (correct mass in whole apple)

2

(e) 1. Starch hydrolysis (to maltose);

2. Maltose is soluble, but starch is insoluble; 2 (2 x AO2)

Accept glucose for maltose

Reject sugar

2

[8]

8.

(a) glucose;

(reject alpha glucose)

1

(b) hydrolysis;

(accept catabolic)

1

(c) (long) straight / unbranched chains;
(idea of more than 1) chains lie side by side / form (micro)fibrils;
idea of H bonds holding chains together;

3

[5]