EXAM PAPERS PRACTICE

Carbohydrates 2

Level: OCR A Level H420
Subject: Biology
Exam Board: Suitable for all boards
Topic: Carbohydrates 2
Type: Mark Scheme

To be used by all students preparing for OCR A Level Biology H420 foundation or higher tier but also suitable for students of other boards.

Mark schemes

1

(a) Any two from:
Loop of DNA; Non-cellulose cell wall;
Plasmid; Capsule;
Flagellum; Mesosome;
Accept small ribosomes

2

(b) (i) (Granules) turn blue-black / dark blue / black / purple with iodine;

1

(ii) Cellulose / pectin;

1

(c) Use principle:
Feature of starch;
Consequence in terms of storage;
e.g.
Insoluble;
Therefore will not "wash" out of cell / affect water potential / affect osmosis;
OR
Molecule coiled / branched;
Therefore large amount stored in small space / compact
OR
Does not affect water potential;
So no effect on entry of water (into cell);

2

[6]

2

use of water;
must be above arrowhead
OH drawn correctly in place of glycosidic bond on each monosaccharide;

[2]

3

(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

[5]

4

(a) (i) fructose;

1

(ii) correctly drawn (OH group at bottom left);

1

(b) hydrolysis;

1

(c) (i) heat with Benedict's solution (*disqualify if HCl added*);
orange / brown / brick red / green / yellow colour or precipitate;

2

(ii) biuret test / NaOH + $CuSO_4$;
purple / violet / lilac / mauve;

2

[7]

5

(a) A – granum / thylakoid;
chlorophyll molecules to trap light / light absorbing pigments /
light dependent reaction / part of light dependent reaction;

2

B – stroma;
(contains enzymes for) carbon dioxide fixation / light-independent reaction /
part of light-independent reaction;
(allow ribosome role of protein in photosynthesis)

2

(b) (i) C – starch;

1

(ii) from glucose in a condensation / polymerisation reaction / many
glucose molecules joined together;

1

[6]

6

(a) (i) condensation;

1

(b) (i) **D**;

1

(ii) **C**;

1

(iii) **A**;

1

(c) absence of a double bond;
in the (hydrocarbon) chain;
unable to accept more hydrogen / saturated with hydrogen;

2 max

[6]

7 (a) 1. **A**: phospholipid (layer);

1. Reject hydrophobic / hydrophilic phospholipid

2. **B**: pore / channel / pump / carrier / transmembrane / intrinsic / transport protein;

2. Ignore unqualified reference to protein

2

(b) (i) Condensation (reaction);

1

(ii) Organelle named; Function in protein production / secretion;

Function must be for organelle named

Incorrect organelle = 0

eg

1. Golgi (apparatus);

1. Accept smooth endoplasmic reticulum

2. Package / process proteins;

OR

3. Rough endoplasmic reticulum / ribosomes;

3. Accept alternative correct functions of rough endoplasmic reticulum. ER / RER is insufficient

3. Accept folding polypeptide / protein

4. Make polypeptide / protein / forming peptide bonds;

OR

5. Mitochondria;

6. Release of energy / make ATP;

6. Reject produce / make energy

6. Accept produce energy in the form of ATP

OR

7. Vesicles;

8. Secretion / transport of protein;

2

[5]

8 (a) (i) Glucose and fructose;

Ignore reference to alpha and beta

Either way around

1

(ii) Glucose and galactose;

Ignore reference to alpha and beta

Either way around

1

(b) 1. (Amylase) pancreas, produces maltose;

Place and product = 1 mark

(mark horizontally)

2. (Maltase) in / on epithelium (of small intestine), produces glucose;

Ignore references to salivary glands or saliva

Accept wall / lining of small intestine

Ignore reference to cells alone

Ignore reference to ribosomes / rER

2

[4]

9 (a)

Statement	Starch	Cellulose	Glycogen
Found in plant cells	✓	✓	
Contains glycosidic bonds	✓	✓	✓
Contains β-glucose		✓	

One mark for each correct row

3

(b) Hydrolysis;

Accept: if phonetically correct

Do not accept: 'hydration'

1

(c) 1. Coiled / helical / spiral;

Feature = one mark

Explanation = one mark

Note: these are independent marking points

These must be related for <u>both</u> marks but can be in reverse order

2. (So) compact / tightly packed / can fit (lots) into a small space;

3. Insoluble;

4. (So) no osmotic effect / does not leave cell / does not affect <u>water potential</u>;

Accept: prevents osmosis

5. Large molecule / long chain;

6. (So) does not leave cell / contains large number of glucose units;

4. and 6. Accept: can' t cross membranes

7. Branched chains;

8. (So) easy to remove glucose;

2 max

(d) Two marks for correct answer of 479 - 521;

Accept: measured and actual lengths in different but correct units for 1 mark

One mark for incorrect answers in which candidate clearly divides measured length by actual length;

The actual range is 23 - 25mm, If they just divide this by 48 they gain 1 mark

Just writing the formula is insufficient, numbers must be used

2

[8]

10 (a) (i) β / <u>Beta</u> glucose;

Accept b / B

*Reject any reference to alpha / **α***

1

(ii) Glycosidic;

*Reject references to **α**(1-4) glycosidic bond, but allow beta 1-4, or unspecified reference to 1-4 (1,4)*

1

(iii) OH / hydroxyl / HO;

Reject hydroxide

Reject OH / HO <u>molecule</u>

Ignore alcohol

1

(b) (i)

Starch	Cellulose
1. (1,4 and) 1,6 bonds / contains 1,6 bonds / branching	1. 1,4 bonds / no 1,6 bonds / unbranched / straight;
2. All glucoses / monomers same way up	2. Alternate glucoses / monomers upside down;
3. Helix / coiled / compact	3. Straight;
4. Alpha glucose	4. Beta glucose;
5. No (micro / macro) fibrils / fibres	5. Micro / macro fibrils / fibres;

1 mark per pair of contrasts, both starch and cellulose required

*Accept other comparable differences eg hydrogen bonds **within** starch but **between** cellulose molecules*

2 max

(ii) 1. H-bonds / micro / macro fibrils / fibres;

Reject strong hydrogen bonds

2. Strength / rigidity / inelasticity;

'Strong hydrogen bonds' = 0 but 'Strong hydrogen bonds give strength (to the molecule)' = 1

2

[7]

11 (a) (i) (Human cells) don't have a cell wall;

Accept "they" refers to human cells.

1

(ii) (Affects) protein synthesis;

Allow description e.g. 'amino acids not joined together / translation.

Reject: affects transcription.

1

(b) 1. Mutation present / occurs;

Ignore antibiotic causes mutation.

2. Resistance gene / allele;

1. or 2.

Reference to immunity disqualifies first credited marking point.

3. Resistant bacteria (survive and) reproduce;

Reference to mitosis negates marking point 3.

2

[4]

12

(a) (i) Hydrolysis;

Accept phonetic spelling.

Ignore reaction.

1

(ii) (Alpha) glucose;

Accept α glucose.

Reject β glucose / beta glucose

1

(b) (i) Add Benedict's (reagent) and heat / warm;

Red / orange / yellow / green (colour);

Reject Add HCl

Accept brown, reject other colours

2

(ii) 2 products / 2 sugars produced;

*Look for idea of **two***

Accept named monosaccharides produced.

"More" insufficient for mark

Neutral if incorrect products named

Neutral "lactose is a polysaccharide"

Neutral "lactose is not a reducing sugar"

Neutral: Reference to surface area.

1

(c) 1. Galactose is a similar shape / structure to lactose / both complementary;

Q Reject: Same shape / structure

2. (Inhibitor / Galactose) fits into / enters / binds with active site (of enzyme);

Accept blocks active site

3. Prevents / less substrate fitting into / binding with (active site) / fewer or no E-S complexes;

Look for principles:

1. Shape

2. Binding to active site

3. Consequence

2 max

[7]

13 (a) Helical / spiral / coiled;
Compact / description e.g. 'tightly packed';

Feature = one mark
Explanation = one mark

Insoluble;
Prevents osmosis / uptake of water / does not affect water potential / (starch) does not leave cell;

These must be related for both marks but can be in reverse order.

Large molecule / long chain;
Does not leave cell;

Allow idea of compact / helical / spiral / coiled due to bonding for two marks.

2 max

(b) (i) β / beta Glucose;

***Q** Reject alpha glucose*

1

(ii) Glycosidic;

1

(c) Long / straight / unbranched chains (of glucose joined by) hydrogen bonds;

***Q** Ignore reference to alpha glucose*

Form (micro)fibrils / (macro)fibrils;

Provide rigidity / strength / support;

Allow suitable descriptions for last point e.g. 'prevents bursting';

3

[7]

14 (a)

✓	✓	✓	
			✓
		✓	✓

One mark for each correct column

Mark ticks only and ignore crosses

4

(b) 1. Two marks for box round two hydrogens and one of the oxygens from OH groups on carbons 1 and 4;;

2. One mark from incorrect answer involving any two hydrogens and an oxygen from carbons 1 and 4;

Do not award marks if all atoms concerned are on same carbon atom or are on carbon atoms other than 1 and 4 or where the answer does not have two hydrogen and one oxygen

2

(c) (i) 1. Holds chains / cellulose molecules together / forms cross links between chains / cellulose molecules / forms microfibrils, providing strength / rigidity (to cellulose / cell wall);

2. Hydrogen bonds strong in large numbers;x

Principles here are first mark for where hydrogen bonds are formed and second for a consequence of this.

Accept microfibres

2

(ii) Compact / occupies small space / tightly packed;

Answer indicates depth required. Answers such as "good for storage", "easily stored" or "small" are insufficient.

1

[9]

15 So there is no / less food in digestive system;

Which could affect the absorption of glucose;

[2]

16 (a) (i) (Lactose +) Water; → (Glucose +) Galactose;

Accept: H_2O for water

2

(ii) Hydrolysis;

Accept: if phonetically correct

1

(b) (i) (Add Biuret reagent to both solutions) – no mark;

Neutral: positive / negative result

Lactase / enzyme will give purple / lilac / mauve;

Neutral: incorrect reference to the method

OR

Lactose / reducing sugar will not give purple / lilac / mauve / will remain blue;

1

(ii) Lactase / enzyme is a protein;

Accept: lactase / enzyme contains peptide bonds

1

[5]

17 (a) (Group of) similar / identical cells / cells with a common origin;

Q *Ignore references to function*

1

(b) (i) Add iodine / stain specific for starch to the slide / cells / tissue / add iodine / stain specific for starch and examine under microscope;

Blue-black / blue / black / purple;

Reject sample

2

(ii) Need a single layer of cells / only a few cells thick / not too many layers / detail obscured by cells underneath;

Light must be able to pass through;

2

(c) Both are polymers / made of monomers;

Joined by condensation / molecules can be broken down by hydrolysis;

Both have 1-4 links;

Contain C(arbon), H(ydrogen) and O(xygen) / both made up of glucose;

Both insoluble;

Both contain glycosidic bonds;

Accept other valid answers.
Ignore ref to unbranched.

2 max

[7]

18 (a) Enzyme / active site has a (specific) tertiary structure;

Only glucose has correct shape / is complementary / will bind / fit to active site;

(Forming) enzyme-substrate complex;

Q *Allow second mark if candidate refers to correct shape or complementary in terms of the enzyme. Do not allow 'same' shape*

Q *Do not allow third mark if active site is described as being on substrate.*

3

(b) (Only detects glucose whereas) Benedict's detects (all) reducing sugars / named examples;

Provides a reading / is quantitative / Benedict's only provides a colour / doesn't measure concentration / is qualitative / semiquantitative;

Is more sensitive / detects low concentration;

Red colour / colour of blood masks result;

Can monitor blood glucose concentration continuously;

Q *Do not credit quicker / more accurate unless qualified.*

Q *Allow Benedict's detects monosaccharides for first mark point.*

2 max

(c) (i) Broken down by enzymes / digested / denatured (by pH) too large to be absorbed;

1

(ii) Study not carried out on humans / only carried out on rats;
Long-term / side effects not known;
Scientists have vested interest;
Study should be repeated / further studies / sample size not known;

2 max

[8]

19 (a) (i) Glucose;

Fructose;

Any order.

2

(ii) Lactose has a different shape / structure;

Does not fit / bind to active site of enzyme / sucrase;

Only allow a second mark if reference is made to the active site.
Max 1 mark if active site is described as being on the substrate.

OR

Active site of enzyme / sucrase has a specific shape / structure; Does not fit / bind to lactose;

Do not accept same shape.

2

(b) (i) Rose and fell;

Peak at 45 (minutes) / concentration of 6.6 (mmol dm^{-3});

2

(ii) Glucose (produced by digestion) is absorbed / enters blood;

Decrease as used up / stored;

2

[8]