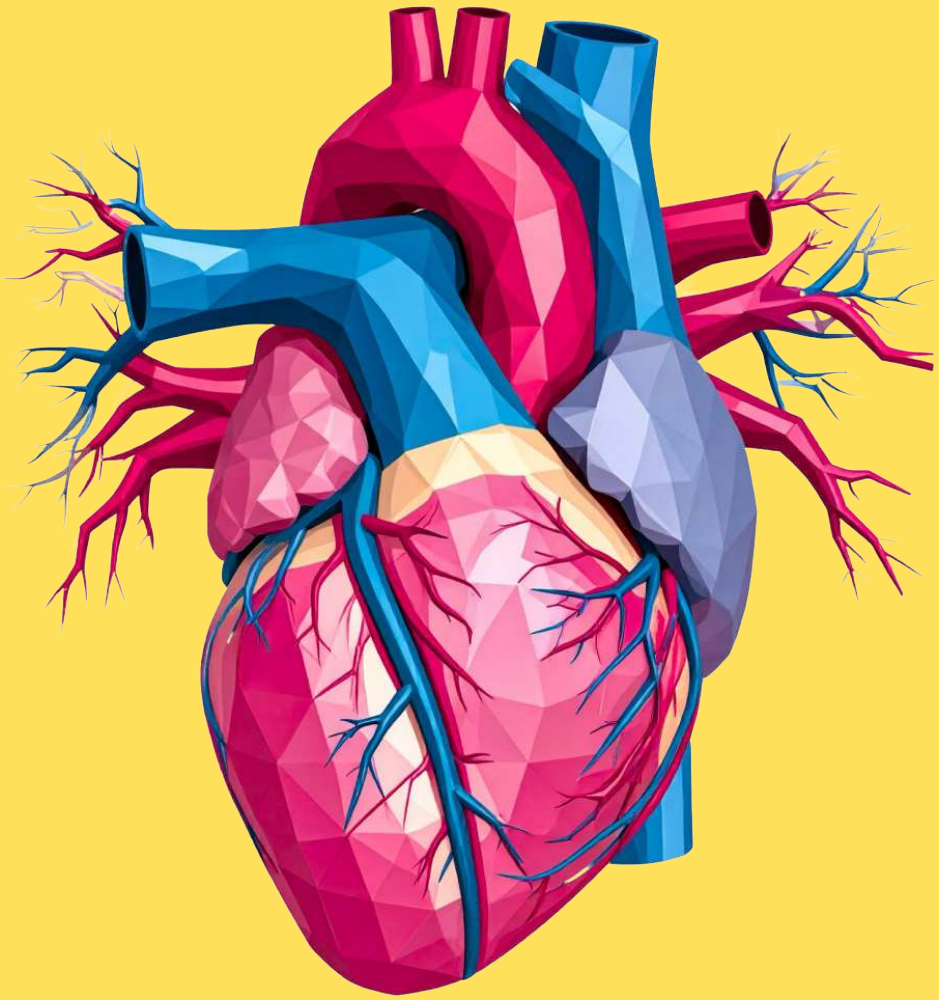
edexcel

AS Biology



Unit 1

Topical Questions

Examiner's Insight Edition

Edexcel IAL Biology

Unit 1 (WBI11/01) · Questions & Answers by Topic

Past-paper questions classified by topic · click a chapter to jump

Chapter 1

Water and carbohydrates

16 questions in this chapter

Water

Edexcel IAL Biology - Solved Past Paper

June 2019 · Unit 1 (WBI11/01) · Question 1 · Water as a solvent - dipole & solubility

hard medium easy

1 (a)

Draw · [2 marks]

Draw a diagram of a water molecule to show its dipole nature.

Model answer

✓ Two hydrogen atoms are joined to one oxygen atom by covalent bonds (a shared pair of electrons in each bond). ✓ Show the charge distribution: the oxygen carries a small negative charge (delta-) and each hydrogen a small positive charge (delta+) - the molecule is polar.

Mark scheme 2 marks

- ✓ Two H covalently bonded to one O (1)
- ✓ Charge distribution shown - delta- on O, delta+ on each H (1)

Accept: lines / overlapping circles / shared electrons to represent the covalent bonds

Examiner's insight

Most scored here; marks slipped away on careless diagrams. Use the delta signs so it is clear the charges are only partial, and keep - on the O and + on the H.

1 (b)(i)

Describe · [3 marks]

Describe the effect of temperature on the solubility of the three salts F, G and H.

Model answer

✓ For salt F, as temperature increases the solubility increases (a positive correlation). ✓ For salt G, solubility increases up to 30 °C and then decreases as temperature rises further. ✓ For salt H, temperature has no effect - the solubility stays constant.

Mark scheme 3 marks · one per salt

Salt F

- ✓ F: higher temperature -> higher solubility (1)

Salt G

- ✓ G: rises up to 30 °C then falls (1)

Salt H

- ✓ H: no effect / constant (1)

Accept: 'it' for solubility throughout; positive correlation; 'solubility does not change with temperature' for H

Do not accept: piecing the three salts together into one vague statement

Examiner's insight

Three lines and three marks means one separate sentence per salt. Weaker answers described only one or two salts, or talked about temperature ranges in general.

1 (b)(ii)

Calculate · [1 mark]

How many times more soluble is salt G than salt H at 30 °C?

- ☒ **A** 15.00
- ☒ **B** 1.67
- ☒ **C** 1.50
- ☒ **D** 0.60

Model answer

✓ At 30 °C, G ~ 50 and H ~ 30 g per 100 g water, so 50 ÷ 30 = 1.67 times - answer B.

Mark scheme 1 mark

✓ B - 1.67 (1)

Accept: 50 ÷ 30 = 1.67

Revise from your notes

- Water: The Dipolar Nature of Water · Solubility in Water · Importance of Water in Transport

Edexcel IAL Biology - Solved Past Paper

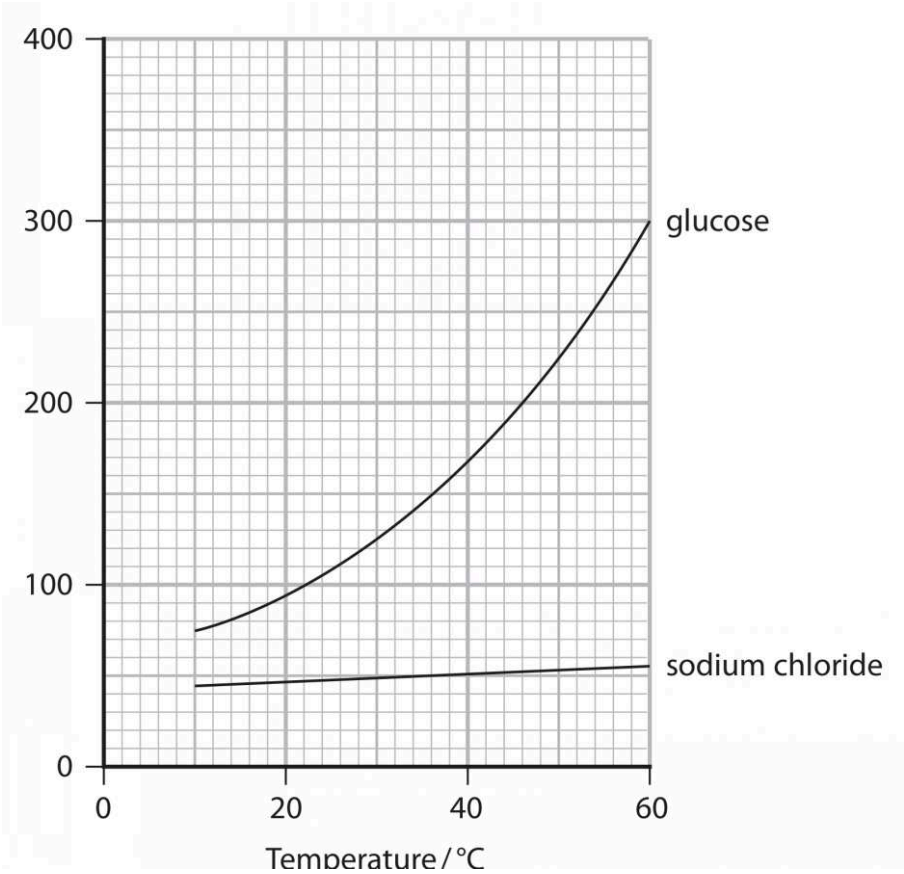
January 2020 · Unit 1 (WBI11) · Question 4 · Water, solubility & transport

hard medium easy

4 (a)(i)

Compare and contrast · [3 marks]

Compare and contrast the effect of temperature on the solubilities of sodium chloride and glucose in water.



Model answer

✓ The solubility of both sodium chloride and glucose increases as temperature increases. ✓ However, sodium chloride's solubility increases linearly, whereas glucose's increases non-linearly (exponentially). ✓ Temperature has a greater effect on the solubility of glucose than on that of sodium chloride.

Mark scheme

Similarity

✓ solubility of both increases with temperature (1)

Differences

✓ sodium chloride increases linearly but glucose does not (increases exponentially) (1)

✓ temperature has a greater effect on glucose than on sodium chloride (1)

Accept: converse; solubility of glucose increases more than that of sodium chloride

Ignore: 'dissolves faster'; describing glucose alone without comparison to the linear NaCl increase

Examiner's insight
Give matched comparisons - both rise, but NaCl linearly and glucose non-linearly, and temperature affects glucose more.

4 (a)(ii)

Calculate · [2 marks]

The formula mass of sodium chloride is 58.44. Calculate the molecular mass of glucose.

Element	Atomic mass
carbon	12
hydrogen	1
oxygen	16

Model answer

✓ Glucose is $C_6H_{12}O_6$, so it uses 6 carbons, 12 hydrogens and 6 oxygens. ✓ Molecular mass = (6 × 12) + (12 × 1) + (6 × 16) = 180.

Mark scheme 2 marks

- ✓ 6 C, 12 H and 6 O used in the calculation (1)
- ✓ molecular mass = 180 (1)

Accept: formula written down; CE if a wrong formula for glucose is used (as long as it is written)

4 (a)(iii)

Calculate · [1 mark]

Calculate how many times greater the molecular mass of glucose is than the formula mass of sodium chloride.

Model answer

✓ 180 ÷ 58.44 = 3.08 times greater (about 3×).

Mark scheme 1 mark

- ✓ 180 ÷ 58.44 = 3.08 (1)

Accept: 3 / 3.1; CE from (a)(ii)

4 (a)(iv)

Suggest · [2 marks]

Suggest why there is a difference in the solubility of sodium chloride and glucose in water.

Model answer

✓ Glucose has many hydroxyl (polar) groups, so it forms many hydrogen bonds with the surrounding water molecules, ✓ and being a larger molecule it can be surrounded by more water molecules; the forces holding glucose molecules together are weaker than the ionic bonding in sodium chloride.

Mark scheme

- ✓ glucose is larger, so can be surrounded by more water molecules (1)
- ✓ glucose has many hydroxyl / polar groups (1)
- ✓ so glucose forms more hydrogen bonds with water (1)
- ✓ strength of bonding between particles is lower in glucose than in sodium chloride (1)

Accept: converse for all points

Ignore: 'glucose is more polar' (unqualified)

4 (b)

Explain · [2 marks]

Explain why fatty acids are less soluble in blood than glucose and sodium chloride.

Model answer

✓ Water is a polar (dipolar) solvent, but fatty acids have long hydrophobic, non-polar tails.

✓ These non-polar tails cannot form hydrogen bonds with water, so fatty acids do not dissolve and tend to aggregate instead.

Mark scheme

- ✓ water is a polar solvent (1)
- ✓ fatty acids have hydrophobic / non-polar tails (1)
- ✓ non-polar molecules do not form hydrogen bonds / do not dissolve in polar liquids (1)

Accept: water is dipolar; fatty acids stick together / form micelles

Ignore: 'fatty acids are too big to dissolve'

Revise from your notes

- Solubility in water: 1.4
- Importance of water in transport: 1.3
- Triglycerides & lipids: 3.1 · 3.2

Edexcel IAL Biology - Solved Past Paper

June 2022 · Unit 1 (WBI11/01) · Question 1 · Water - dipole, solvent & hydrolysis

hard medium easy

1

Complete · [5 marks]

Complete the description of water by writing the most appropriate word on each dotted line (five gaps).

Model answer

✓ Water has an uneven charge distribution, so it is described as a dipolar molecule. ✓ The hydrogen ends of the molecule have a very slightly positive charge. ✓ Because substances dissolve in it, water is an important solvent in living organisms. ✓ Water is needed in hydrolysis reactions, ✓ which break down disaccharides such as lactose into glucose and galactose.

Mark scheme 5 marks · in order

- ✓ dipolar (1)
- ✓ positive (1)
- ✓ solvent (1)
- ✓ hydrolysis (1)
- ✓ lactose (1)

Accept: dipole / polar for the first gap; 'medium' for solvent

Do not accept: 'hydration' for gap 4; 'lactase' or other named molecules for gap 5

Examiner's insight

Read the whole passage before filling the gaps. Common slips: 'condensation' in gap 4 (it is hydrolysis that breaks a disaccharide), 'solute' for 'solvent' in gap 3, and 'polar' in gap 1 (allowed, but 'dipolar' is preferred).

Revise from your notes

- Water: The Dipolar Nature of Water · Importance of Water in Transport · Disaccharides

Edexcel IAL Biology - Solved Past Paper

January 2023 · Unit 1 (WBI11/01) · Question 1 · Water & carbohydrates

hard medium easy

1 (a)

Draw · [2 marks]

Draw a diagram of a water molecule to show its dipole nature.

Model answer

✓ Draw an oxygen atom joined to two hydrogen atoms by covalent bonds (a bent H-O-H shape). ✓ Mark the charge distribution: a small (delta-) charge on the oxygen and a small (delta+) charge on each hydrogen.

Mark scheme 2 marks

- ✓ two hydrogens joined to an oxygen by covalent bonds (1)
- ✓ charge distribution shown with delta signs / indication the charge is small (1)

Accept: lines, overlapping circles, shared electrons or touching atoms to show the bonds

1 (b)

Match · [3 marks]

Match each statement to the correct carbohydrate group (monosaccharides only / polysaccharides only / both / neither).

Statement	Carbohydrates			
	both monosaccharides and polysaccharides	monosaccharides only	polysaccharides only	neither monosaccharides nor polysaccharides
Have the general formula $C_nH_{2n}O_n$	☒	☒	☒	☒
Have glycosidic bonds	☒	☒	☒	☒
Have little effect on water potential	☒	☒	☒	☒

Model answer

✓ "Have the general formula CnH2nOn" -> monosaccharides only (e.g. glucose is C6H12O6; polysaccharides lose water on condensation, so they don't fit this formula). ✓ "Have glycosidic bonds" -> polysaccharides only (a single monosaccharide has no glycosidic bond).

✓ "Have little effect on water potential" -> polysaccharides only (they are large and insoluble; monosaccharides are soluble and lower the water potential).

Mark scheme 3 marks · one per row

- ✓ general formula CnH2nOn -> monosaccharides only (1)
- ✓ have glycosidic bonds -> polysaccharides only (1)
- ✓ little effect on water potential -> polysaccharides only (1)

Revise from your notes

- The dipolar nature of water: 1.1
- Monosaccharides & polysaccharides: 2.1 · 2.4

Edexcel IAL Biology - Solved Past Paper

January 2024 · Unit 1 (WBI11/01) · Question 4 · Water - dipole, hydrogen bonding & solubility

hard medium easy

4 (a)(i)

Explain · [2 marks]

Explain the dipole nature of water.

Model answer

✓ The oxygen atom is slightly negative (delta-) and the hydrogen atoms are slightly positive (delta+). ✓ This is because the charge/electrons are unevenly distributed - the oxygen pulls the shared electrons towards it (it is more electronegative).

Mark scheme 2 marks

- ✓ oxygen slightly negative, hydrogens slightly positive (1)
- ✓ uneven charge/electron distribution (oxygen pulls electrons towards it) (1)

Accept: delta-/delta+; electronegativity comparison; electrons closer to oxygen
Ignore: calling the atoms "molecules" (penalise once)

4 (a)(ii)

Complete · [1 mark]

Complete the diagram to show a hydrogen bond between two water molecules.

Model answer

✓ Draw a line between the oxygen (delta-) of one water molecule and a hydrogen (delta+) of another - a hydrogen bond forms between O and H on different molecules.

Mark scheme 1 mark

- ✓ line drawn between an O of one molecule and an H of another (1)

Ignore: H-bond drawn between two H atoms or two O atoms; extra bonds count only if all are correct

Examiner's insight

The hydrogen bond goes from an oxygen to a hydrogen on a different molecule - not H-to-H, not O-to-O; and draw only one unless you're sure the others are right.

4 (b)

Complete · [1 mark]

Complete the diagram to show two water molecules arranged around a dissolved sodium ion (Na+).

Model answer

✓ Cluster the water molecules around the Na^+ with the oxygen (delta-) end of each pointing towards the ion and the hydrogens pointing away.

Mark scheme 1 mark

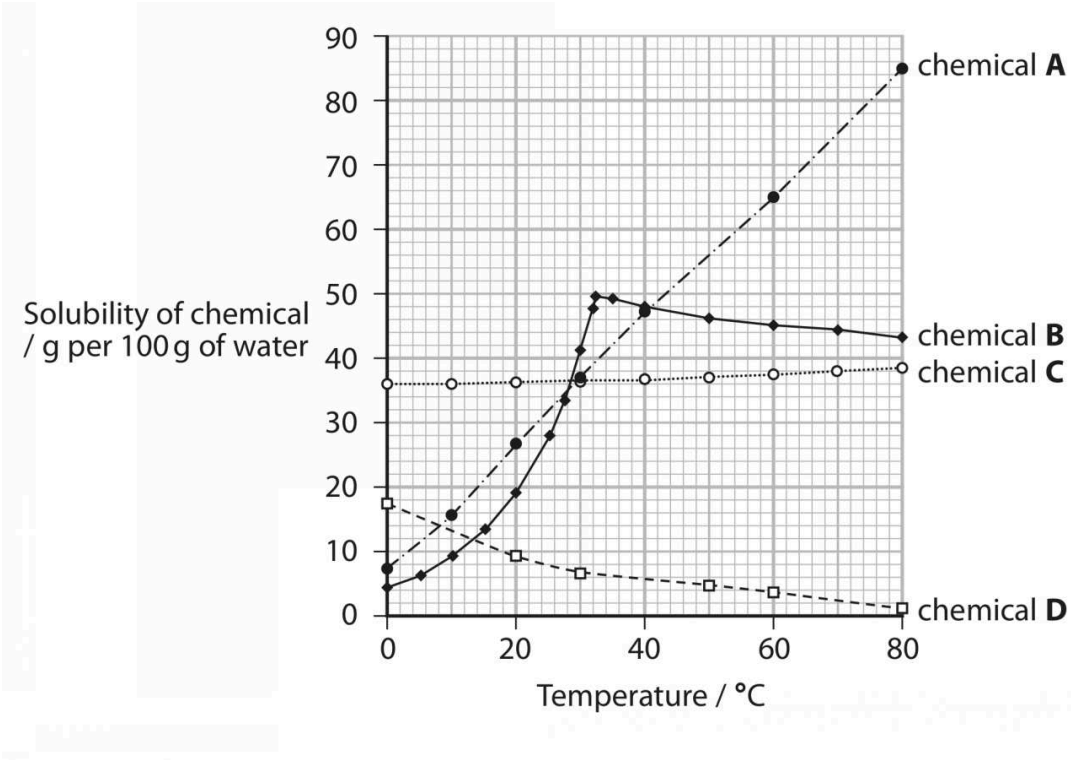
- ✓ water clustered around Na^+ with O facing the ion and Hs facing away (1)

Do not accept: overlapping circles; solid lines joining the circles

4 (c)

Describe · [4 marks]

Describe the effects of temperature on the solubility of chemicals A, B, C and D.



Model answer

✓ Chemical A: solubility increases (roughly linearly) as temperature rises. ✓ Chemical B: solubility rises steeply up to about 32°C, then falls. ✓ Chemical C: solubility increases only slightly with temperature; chemical D: solubility decreases as temperature rises. ✓ So different chemicals have different solubilities at different temperatures.

Mark scheme 4 marks

- ✓ A: temperature increase raises solubility (linear) (1)
- ✓ B: solubility rises up to ~32°C then decreases (1)
- ✓ C: slight increase in solubility (1)
- ✓ D: solubility decreases; and different chemicals differ at different temperatures (1)

Accept: positive/negative correlation; "no effect" for C

Revise from your notes

- The dipolar nature of water & hydrogen bonds: 1.1 · 1.2
- Solubility in water: 1.4

Edexcel IAL Biology - Solved Past Paper

January 2025 · Unit 1 (WBI11/01) · Question 1 · Water, starch & peptide bonds

hard medium easy

1 (a)

Which · [1 mark]

Which statements about water are correct? 1. an O joined to two H by hydrogen bonds; 2. water is a solvent; 3. the O is slightly negative and the H atoms slightly positive.

- ☒ **A** 1 and 2 only
- ☒ **B** 1 and 3 only
- ☒ **C** 2 and 3 only
- ☒ **D** 1, 2 and 3

Model answer

✓ C - statements 2 and 3 only. Statement 1 is wrong: the O and H within a water molecule are joined by covalent bonds, not hydrogen bonds (hydrogen bonds form between molecules).

Mark scheme 1 mark

✓ C (2 and 3 only) (1)

Ignore: options including statement 1 - the intramolecular bonds are covalent

1 (b)

Match · [3 marks]

For each structure, say whether it is found in amylose only, amylopectin only, both, or neither.

Structure	Structure found in			
	amylose only	amylopectin only	both amylose and amylopectin	neither amylose nor amylopectin
glycosidic bonds	☒	☒	☒	☒
1-4 *α* bonds	☒	☒	☒	☒
branched side chains	☒	☒	☒	☒

Model answer

✓ Glycosidic bonds -> both (both are polymers of glucose joined by glycosidic bonds). ✓ 1-4 alpha bonds -> both (amylose is all 1-4; amylopectin has 1-4 bonds as well as its 1-6 branch points). ✓ Branched side chains -> amylopectin only (from its 1-6 bonds; amylose

is unbranched).

Mark scheme 3 marks · one per row

- ✓ glycosidic bonds -> both (1)
- ✓ 1-4 alpha bonds -> both (1)
- ✓ branched side chains -> amylopectin only (1)

Examiner's insight

The common trap is thinking amylopectin has no 1-4 bonds - it has 1-4 bonds plus the 1-6 branch points.

1 (c)

Complete · [1 mark]

Complete the diagram to show a peptide bond joining the two amino acids.

Model answer

✓ Join the two amino acids by removing an -OH from the -COOH of one and an -H from the -NH2 of the other (releasing water), leaving a C-N peptide bond with the C still double-bonded to its O and one H on the N.

Mark scheme 1 mark

- ✓ peptide bond drawn correctly (1)

Accept: O on the C and H on the N facing up or down

Ignore: two Hs left on the N, or an O placed between the C and N

Examiner's insight

Two common drawing errors: leaving two Hs on the nitrogen, or slipping an O between the C and N - the bond is a direct C-N link.

Revise from your notes

- The dipolar nature of water: 1.1
- Polysaccharides - amylose & amylopectin: 2.4 · 2.5
- The primary structure of proteins: 4.1 · 4.2

Pearson Edexcel International Advanced Level

October 2025 · Unit 1: Molecules, Diet, Transport and Health (WBI11/01) · Question 5

Water, solvents & osmosis

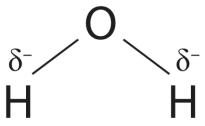
hard medium easy

(a)

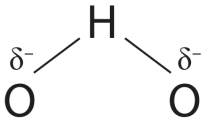
Select · [1 mark]

Which is the structure of a water molecule?

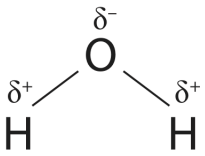
☒ **A**



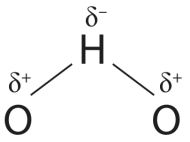
☒ **B**



☒ **C**



☒ **D**



Model answer

✓ C - one oxygen (slightly negative, delta-) bonded to two hydrogens (each slightly positive, delta+), giving water its dipole.

Mark scheme

✓ C - O is delta-, the two H are delta+ (the only correct answer) (1)

Ignore: oxygen is slightly negative; there is one O and two H

(b)

Calculate · [2 marks]

The volume of water on Earth is 1.4×10^{12} km^3. Fresh water is 2.5% of this, and 90% of that fresh water is frozen (unavailable). Calculate the volume of available fresh water. Give your answer in standard form.

Model answer

✓ Total fresh water = $1.4\times10^{12} \times 2.5\% = 3.5\times10^{10}$ km^3. ✓ Only 10% is available (90% frozen): $3.5\times10^{10} \times 0.10 = 3.5\times10^{9}$ km^3.

Mark scheme

✓ volume of fresh water calculated as 3.5×10^{10} (1)

✓ 3.5×10^{9} km^3 (1)

Accept: bald answer of 3.5×10^{9} = 2 marks; correct value in wrong standard form = 1 mark

(c)

Suggest · [1 mark]

The global demand for water is expected to rise to about 6 000 km^3 by 2050. Suggest one reason for an increase in the global demand for water.

Model answer

✓ An increase in the human (or farm-animal) population, which raises the demand for water for drinking, food production and industry.

Mark scheme

✓ increase in population / food demand / industrial demand (or decrease in rainfall) (1)

Ignore: increased temperature / global warming / climate change

Do not accept: contradictions e.g. more melting of ice caps

Examiner's insight

Give a comparative reason such as a growing population - vague answers about 'global warming' were not credited.

(d)

Explain · [2 marks]

Salt has positive sodium ions (Na^+) and negative chloride ions (Cl^-). Explain why salt can dissolve in water.

Model answer

✓ Water is polar (dipolar), so its charged ends are attracted to the charged ions: ✓ the positive sodium ions are attracted to the slightly negative oxygen of water, and the negative chloride ions are attracted to the slightly positive hydrogens – so the ions are surrounded and pulled into solution.

Mark scheme Two of the following:

✓ water is polar / dipolar (and the ions are charged) (1)

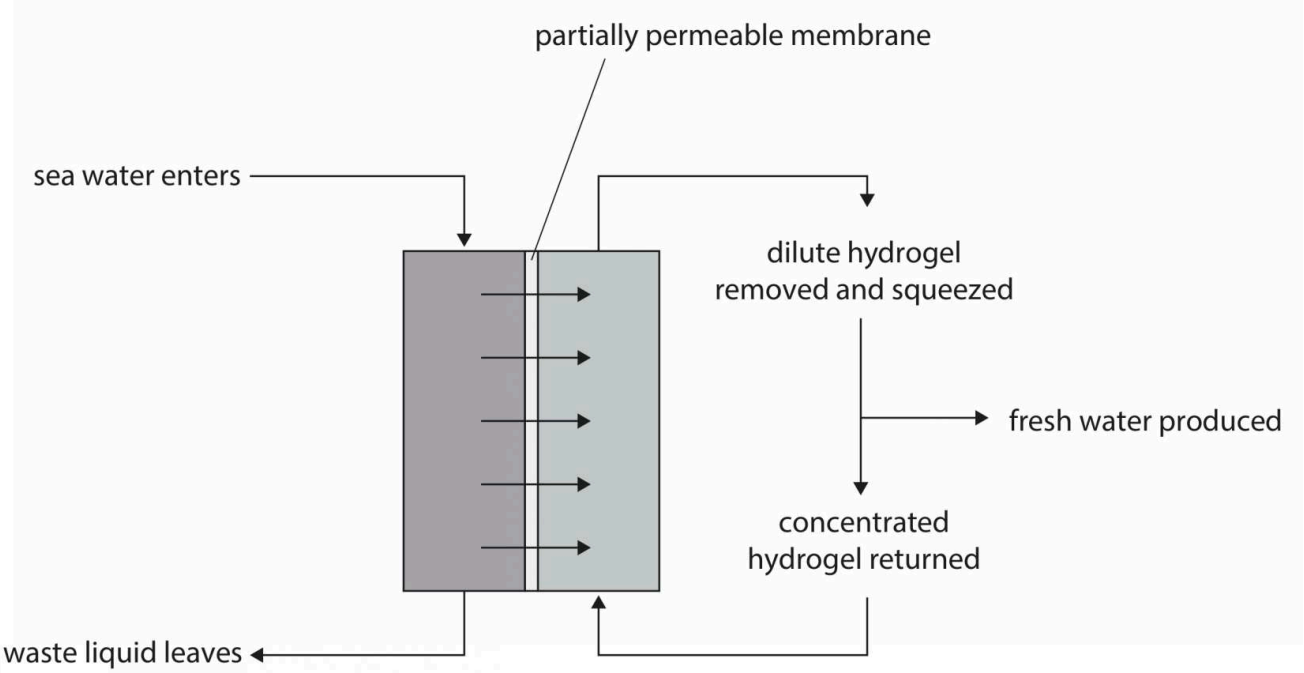
✓ sodium ions are attracted to the oxygen of water (1)

✓ chloride ions are attracted to the hydrogens of water (1)

(e)

Explain · [4 marks]

Hydrogels absorb water because they have a low water potential. The diagram shows forward osmosis desalination: sea water enters, dilute hydrogel is removed and squeezed to give fresh water, and the concentrated hydrogel is returned. Explain how forward osmosis desalination produces fresh water. Use the diagram.



Model answer

✓ The hydrogel has a lower water potential than the sea water, so pure water passes by osmosis out of the sea water and into the hydrogel across the partially permeable membrane. ✓ The membrane is partially permeable, so the salt (sodium and chloride ions) cannot pass through – only water moves. ✓ The now-dilute hydrogel is removed and squeezed to separate and collect the fresh water, ✓ and the squeezed hydrogel has a low water potential again, so it can be returned to absorb more water from the next batch of sea water.

Mark scheme Four of the following:

- ✓ water passes by osmosis out of the sea water into the hydrogel (1)
- ✓ because the water potential of the sea water is greater than that of the hydrogel (1)
- ✓ but the salt / ions cannot pass through the partially permeable membrane (1)
- ✓ the fresh water is separated / collected by squeezing the hydrogel (1)
- ✓ the squeezed hydrogel has a low water potential again (1)

Do not accept: sea water passing into the hydrogel (it is water that moves)

Ignore: high water concentration to low water concentration

Examiner's insight

Two traps: it is water (not sea water) that passes into the hydrogel, and don't just repeat 'the hydrogel is squeezed' from the diagram - add that it then has a low water potential again.

Revise from your notes

- Water: Dipole & solvent properties
- Transport: Osmosis & water potential

Sugars & glycosidic bonds

Pearson Edexcel International Advanced Level

January 2019 · Unit 1: Molecules, Diet, Transport and Health (WBI11/01) · Question 1
Carbohydrates - mono-, di- and polysaccharides

hard medium easy

(a)(i)

Select · [1 mark]

Which formula is correct for a monosaccharide?

- ☒ **A** $C_nH_nO_{2n}$
- ☒ **B** $C_nH_{2n}O_n$
- ☒ **C** $C_{2n}H_nO_n$
- ☒ **D** $C_{2n}H_{2n}O_n$

Model answer

✓ The correct answer is B, CnH2nOn, because a monosaccharide such as glucose (C6H1206) has twice as many hydrogen atoms as carbon or oxygen atoms.

Mark scheme

✓ B - CnH2nOn (the only correct answer) (1)

(a)(ii)

Name · [1 mark]

Name the reaction that joins two monosaccharides together to form a disaccharide.

Model answer

✓ A condensation reaction joins them, forming a glycosidic bond and releasing a molecule of water.

Mark scheme

✓ condensation (reaction) (1)

Ignore: polymerisation

Examiner's insight

Almost everyone scored across this question; just be sure the joining reaction is condensation, not polymerisation.

(b)(i)

Select · [1 mark]

Which carbohydrate is present in cow's milk? A amylose B galactose C lactose D sucrose

Model answer

✓ C, lactose - the disaccharide of glucose and galactose found in milk.

Mark scheme

✓ C - lactose (1)

(b)(ii)

Select · [1 mark]

Which carbohydrate contains only glucose subunits? A amylopectin B galactose C maltose D sucrose

Model answer

✓ C, maltose – a disaccharide made of two glucose units joined together.

Mark scheme

✓ C - maltose (1)

(b)(iii)

Select · [1 mark]

Which carbohydrate is the energy store in animals? A amylose B fructose C glycogen D sucrose

Model answer

✓ C, glycogen – the highly branched polysaccharide of glucose used as the animal energy store.

Mark scheme

✓ C - glycogen (1)

(b)(iv)

Select · [1 mark]

In which carbohydrate are 1-6 glycosidic bonds present? A amylose B amylopectin C fructose D maltose

Model answer

✓ B, amylopectin – its branch points are formed by 1-6 glycosidic bonds, whereas the main chains use 1-4 bonds.

Mark scheme

✓ B - amylopectin (1)

Revise from your notes

- Carbohydrates: Monosaccharides & disaccharides · Polysaccharides

Edexcel IAL Biology - Solved Past Paper

June 2019 · Unit 1 (WBI11/01) · Question 5 · Carbohydrates & osmotic dehydration

hard medium easy

5 (a)(i)

Identify · [1 mark]

Which row shows which sugars are monosaccharides and which are disaccharides?

	Monosaccharides	Disaccharides
☒ A	fructose only	glucose and sucrose
☒ B	glucose only	fructose and sucrose
☒ C	fructose and glucose	sucrose only
☒ D	glucose and sucrose	fructose only

Model answer

✓ Fructose and glucose are monosaccharides; sucrose is a disaccharide – answer C.

Mark scheme 1 mark

✓ C - fructose & glucose (mono), sucrose (di) (1)

5 (a)(ii)

Identify · [1 mark]

Which type of bond joins two monosaccharides to form a disaccharide?

☒ **A** ester

☒ **B** glycosidic

☒ **C** peptide

☒ **D** phosphodiester

Model answer

✓ Two monosaccharides join by a glycosidic bond – answer B.

Mark scheme 1 mark

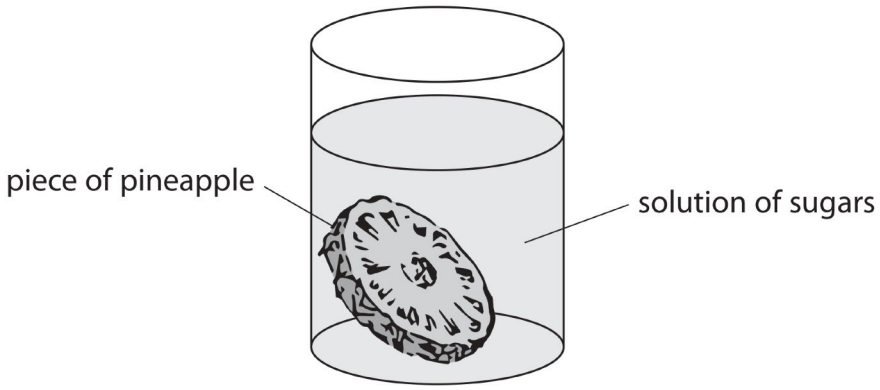
✓ B - glycosidic (1)

Do not accept: ester (acid + alcohol); peptide (amino acids); phosphodiester (nucleotides)

5 (b)(i)

Calculate · [2 marks]

Calculate the mean concentration of glucose in the three pineapples. Give your answer in g dm^{-3}.



Model answer

✓ Mean glucose = (1.22 + 1.02 + 1.00) ÷ 3 = 1.08 g cm^{-3}. ✓ Expressed in g dm^{-3} this is 1.08 × 10^{-3} g dm^{-3} (the value credited by the mark scheme).

Mark scheme 2 marks

- ✓ mean calculated = 1.08 (1)
- ✓ mean converted to g dm^{-3} = 1.08 × 10^{-3} (1)

Accept: 0.00108 / 0.0011 / 1.08 × 10^{-3}; a correct answer with no working scores both marks

Examiner's insight

Show your working - the mean earns a method mark even if the conversion goes wrong.

5 (b)(ii)

Explain · [6 marks]

*Explain what the solution of sugars should contain to preserve pineapples by osmotic dehydration. Use the table to support your answer.

Model answer

✓ The sugar solution must have a lower water potential than the pineapple cytoplasm – it must be hypertonic, ✓ so that water passes out of the cells by osmosis, reducing the water content and preserving the fruit. ✓ At the same time the total sugar concentration of the solution should equal that of the cytoplasm, ✓ so that sugars do not diffuse out of (or into) the pineapple and the sweet taste is kept unchanged. ✓ Ideally each individual sugar should be at the same concentration as inside the pineapple. ✓ Support with the calculated means – fructose 1.52, glucose 1.08, sucrose 8.55 g cm^{-3} – and quote the range across the three pineapples.

Mark scheme Indicative content · levels-marked

- ✓ Solution must be hypertonic - lower water potential than the cytoplasm
- ✓ So water leaves the cells by osmosis (dehydration)
- ✓ Total sugar concentration equal to the cytoplasm so sugars do not diffuse out
- ✓ Each individual sugar at the same concentration as in the pineapple
- ✓ Mean concentrations: fructose 1.52, glucose 1.08, sucrose 8.55 g cm^{-3}
- ✓ Quote the range of concentrations from the table

How to reach full marks

Full marks (6) need a developed answer covering BOTH ideas - a hypertonic solution to draw water out by osmosis AND matching each sugar's concentration to the cytoplasm so no sugar diffuses out - backed by numbers from the table. Address only one side and you cap at level 1.

Examiner's insight

The only levels question - you must address BOTH dehydration and keeping sweetness (one side alone = level 1). Use water potential, not 'water concentration', and because/therefore language. Top marks needed the insight that an extra solute is required to lower the water potential.

Revise from your notes

- Carbohydrates & osmosis: Monosaccharides · Disaccharides · Osmosis · Osmosis in the Plant Cell

Edexcel IAL Biology - Solved Past Paper

June 2023 · Unit 1 (WBI11/01) · Question 3 · Sucrose - glycosidic bond & a colorimetric test

hard medium easy

3 (a)(i)

Complete · [1 mark]

Complete the diagram to show a glycosidic bond between carbon 1 of glucose and carbon 2 of fructose.

Model answer

✓ Draw an oxygen atom joining C1 of glucose to C2 of fructose by covalent bonds (removing the two -OH/H to form the 1-2 glycosidic bond).

Mark scheme 1 mark

- ✓ O joined to C1 (glucose) and C2 (fructose) by covalent bonds (1)

Accept: bonds not touching the carbons if their intended attachment is clear; solid or dotted lines
Ignore: water shown
Do not accept: other groups added to C1 or C2

Examiner's insight

Common errors were leaving out the 'O', joining the wrong carbons, or adding extra atoms.

3 (a)(ii)

Complete · [2 marks]

Complete the formula equation for the reaction that makes sucrose from glucose and fructose.

Model answer

✓ $C_6H_{12}O_6 + C_6H_{12}O_6 \rightarrow C_{12}H_{22}O_{11}$ (sucrose) ✓ + H_2O (water is released - this is a condensation reaction).

Mark scheme 2 marks · written as a proper equation

- ✓ $C_{12}H_{22}O_{11}$ (1)
- ✓ H_2O (1)

Accept: numbers not written as subscripts
Ignore: the mark only if written as part of the equation

Examiner's insight

The surprising common error was omitting the H_2O, even when the sucrose formula was correct. Write it as a proper equation.

3 (b)(i)

Explain · [1 mark]

Give a reason why the colour intensity is directly proportional to the concentration of sucrose.

Model answer

✓ Each sucrose molecule contains exactly one fructose (a 1 : 1 ratio), so as the sucrose

concentration rises the fructose concentration rises in proportion – giving more fructose for the chemical to bind to.

Mark scheme 1 mark

- ✓ sucrose contains one / the same number of fructose (1 : 1) (1)

Accept: more sucrose -> more fructose for the chemical to bind to

Do not accept: glucose

3 (b)(ii)

Suggest · [1 mark]

Suggest why the line does not start at the origin of the graph.

Model answer

✓ The test is not sensitive enough at very low concentrations – a certain minimum concentration of fructose (sucrose) is needed before the colour change becomes visible.

Mark scheme 1 mark

- ✓ test not sensitive enough / colour intensity too low at low concentration (1)

Accept: a certain concentration needed for a visible colour; equipment not sensitive enough

Do not accept: glucose

Examiner's insight

This was aimed at stronger candidates - it is about the sensitivity of the test. It was low-scoring.

3 (b)(iii)

State · [1 mark]

State why the concentration of maltose and lactose cannot be measured using this test.

Model answer

✓ The chemical only binds to fructose, and neither maltose nor lactose contains fructose.

Mark scheme 1 mark

- ✓ chemical only binds fructose / no fructose in maltose or lactose (1)

Revise from your notes

- Carbohydrates: Disaccharides · Condensation and Hydrolysis · Colorimetry

Edexcel IAL Biology - Solved Past Paper

June 2024 · Unit 1 (WBI11/01) · Question 6 · Carbohydrates - glycosidic bonds & digestion

hard medium easy

6 (a)

Complete · [3 marks]

Complete the diagram to show how two glucose molecules join by a glycosidic bond to form two products.

Model answer

✓ Show the glycosidic bond (an oxygen bridge) correctly linking the two glucose molecules, ✓ with the rest of both glucose molecules drawn correctly (keep the H on C5), ✓ and indicate that one molecule of water (H2O) is released - this is a condensation reaction.

Mark scheme 3 marks

- ✓ glycosidic bond correctly shown (1)
- ✓ rest of the molecule drawn correctly (1)
- ✓ one molecule of water is formed (1)

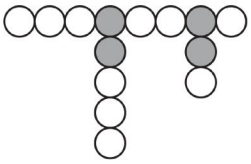
Examiner's insight

Complete the whole diagram carefully - the commonest slip was missing the H off carbon 5.

6 (b)(i)

Draw · [2 marks]

Draw one disaccharide and two different oligosaccharides that could be produced by this amylase digesting amylopectin.



Key

- ○ glucose molecule joined by 1–4 glycosidic bonds
- ● glucose molecule joined by 1–4 and 1–6 glycosidic bonds

Model answer

✓ Draw a disaccharide as two joined glucose circles. ✓ Draw two different oligosaccharides - e.g. a chain of three and a chain of four glucose circles (only 1-4 chains, since this amylase leaves the 1-6 branch points).

Mark scheme 2 marks

- ✓ one or two correct diagrams (1)
- ✓ a disaccharide AND two different oligosaccharides all correct (1)

Accept: circles touching, or joined by lines

6 (b)(ii)

Explain · [2 marks]

Explain why this amylase is able to break only 1-4 glycosidic bonds.

Model answer

✓ The amylase is specific – its active site is complementary in shape only to the 1-4 glycosidic bonds, ✓ so only a 1-4 glycosidic bond fits into and binds the active site, while the 1-6 branch-point bonds do not fit.

Mark scheme 2 marks · must refer to 1·4 bonds

- ✓ amylase is specific / complementary / only fits the 1-4 glycosidic bonds (1)
- ✓ only the 1-4 bond fits into / binds the active site (1-6 does not) (1)

Accept: 'active site of amylase is complementary to the 1-4 bond' = 2 marks

Examiner's insight

This tests enzyme specificity - surprisingly few recognised it. Refer specifically to the 1-4 glycosidic bonds as the substrate (not the whole molecule), using key words like active site, specific and complementary.

6 (c)(i)

Suggest · [3 marks]

Suggest how disaccharides and oligosaccharides are broken down in the small intestine. Give reasons.

Model answer

✓ They are broken down by hydrolysis of the glycosidic bonds, ✓ and because different bonds and different sugars need different enzymes, ✓ a different, specific enzyme is needed to break each type of glycosidic bond / each type of sugar.

Mark scheme 3 marks

- ✓ by hydrolysis of glycosidic bonds (1)
- ✓ different enzymes needed for each type of bond (1)
- ✓ different enzymes for the different disaccharides / oligosaccharides (1)

6 (c)(ii)

Explain · [2 marks]

Explain why glucose cannot diffuse into the bloodstream.

Model answer

✓ Glucose is a polar (hydrophilic) molecule, ✓ so it cannot pass through the non-polar fatty-acid tails of the phospholipid bilayer – it needs a transport protein.

Mark scheme 2 marks

- ✓ glucose is polar / hydrophilic (1)
- ✓ so cannot pass through the non-polar phospholipid tails (1)

Revise from your notes

- Carbohydrates: Monosaccharides & Disaccharides · Polysaccharides · Enzyme Specificity · Membrane Transport

Polysaccharides

Pearson Edexcel International Advanced Level

October 2019 · Unit 1: Molecules, Diet, Transport and Health (WBI11/01) · Question 4
Carbohydrates - sugars & starch

hard medium easy

(a)(i)

Select · [1 mark]

The graph shows the relative sweetness of lactose, maltose, glucose, sucrose and fructose. Which row gives the correct number of monosaccharides and disaccharides shown?

	Number of monosaccharides	Number of disaccharides
☒ **A**	1	4
☒ **B**	2	3
☒ **C**	3	2
☒ **D**	4	1

Model answer

✓ B - 2 monosaccharides (glucose and fructose) and 3 disaccharides (lactose, maltose and sucrose).

Mark scheme

✓ B - 2 monosaccharides and 3 disaccharides (the only correct answer) (1)

Ignore: glucose and fructose are monosaccharides; lactose, maltose and sucrose are disaccharides

(a)(ii)

Select · [1 mark]

Which bond joins two monosaccharides together to form a disaccharide?

☒ **A** ester

☒ **B** glycosidic

☒ **C** hydrogen

☒ **D** phosphodiester

Model answer

✓ B - glycosidic. It forms by **condensation** between two monosaccharides, releasing water.

Mark scheme

✓ B - glycosidic (the only correct answer) (1)

Ignore: ester bonds join acids and alcohols; hydrogen bonds do not join monosaccharides;

phosphodiester bonds link phosphate to an alcohol

(a)(iii)

State · [2 marks]

State two conclusions that can be made about the relative sweetness of monosaccharides and of disaccharides.

Model answer

✓ Monosaccharides are not consistently more or less sweet than disaccharides – the two groups overlap. ✓ The sweetest sugar overall is a monosaccharide (fructose) while the least sweet is a disaccharide (lactose).

Mark scheme Two of the following:

- ✓ monosaccharides are not more or less sweet than disaccharides (1)
- ✓ a disaccharide is the least sweet and a monosaccharide is the sweetest (1)
- ✓ sucrose is the sweetest disaccharide and fructose is the sweetest monosaccharide (1)

Accept: lactose is the least sweet disaccharide and glucose the least sweet monosaccharide

(a)(iv)

Devise · [3 marks]

Devise an investigation that a student could carry out to confirm the data shown in the graph.

Model answer

✓ Taste each sugar (or sugar solution) and rank it for sweetness against sucrose as the reference. ✓ Make every sugar solution the same concentration so the comparison is fair. ✓ Rinse the mouth out between samples so one taste does not carry over to the next.

Mark scheme Three of the following:

- ✓ the sugars / sugar solutions are tasted (1)
- ✓ sugars should be the same concentration (1)
- ✓ mouth is rinsed out between each sugar (1)
- ✓ sweetness is compared (relative) to sucrose (1)

Accept: OR a Benedict's-test route: add Benedict's and heat (1); rank sugars by colour change / time to a set colour (1)

(b)

Compare and contrast · [3 marks]

Amylose and amylopectin are components of starch. Compare and contrast the structure of amylose with the structure of amylopectin.

Model answer

✓ Similarity – both are polymers of alpha-glucose, ✓ and both contain 1-4 glycosidic bonds joining the glucose units. ✓ Difference – amylose has only 1-4 bonds (so it is an unbranched helix), whereas amylopectin also has 1-6 glycosidic bonds, making it branched.

Mark scheme An answer including:

similarities

✓ both are polymers composed of alpha-glucose (1)

similarities

✓ both contain 1-4 glycosidic bonds (1)

differences

✓ amylose has 1-4 bonds only; amylopectin has 1-4 and 1-6 glycosidic bonds (1)

Accept: amylose is a chain / helical / linear / unbranched and amylopectin is branched

Do not accept: do not piece points together unless in the same or linked sentences

Revise from your notes

- Carbohydrates: Mono/disaccharides · Starch: amylose & amylopectin

Edexcel IAL Biology - Solved Past Paper

January 2021 · Unit 1 (WBI11/01) · Question 3 · Glycogen, polysaccharides & inheritance

hard medium easy

3 (a)(i)

Which · [1 mark]

Which is the correct statement about the formation of glycogen?

- ☒ **A** α glucose molecules join together by a condensation reaction
- ☒ **B** α glucose molecules join together by a hydrolysis reaction
- ☒ **C** β glucose molecules join together by a condensation reaction
- ☒ **D** β glucose molecules join together by a hydrolysis reaction

Model answer

✓ A - alpha glucose molecules join together by condensation reactions.

Mark scheme 1 mark

✓ A (1)

Ignore: B/C/D - bonds form by condensation, and glycogen is built from alpha (not beta) glucose

3 (a)(ii)

Name · [1 mark]

Name the bond that joins two glucose molecules together.

Model answer

✓ A glycosidic bond (a covalent bond).

Mark scheme 1 mark

✓ glycosidic (bond / link) (1)

Accept: covalent (bond)

Ignore: the numbers, e.g. 1,4-glycosidic

3 (a)(iii)

Explain · [3 marks]

Explain how the structure of glycogen relates to its role as an energy storage molecule.

Model answer

✓ It is a polymer of many glucose units (a polysaccharide), so it stores a large amount of energy. ✓ It is a large, insoluble molecule, so it has no osmotic effect on the cell and does not affect its water potential. ✓ It is highly branched, so it can be hydrolysed from many ends at once - glucose is released quickly when energy is needed. ✓ It is compact/coiled, giving a high energy density: a lot of glucose stored in a small space.

Mark scheme 3 marks · any three

- ✓ polymer/polysaccharide of glucose -> high energy content (1)
- ✓ large molecule/polymer -> insoluble / no osmotic effect (does not diffuse) (1)
- ✓ branched -> broken down / hydrolysed faster (from several points) (1)
- ✓ compact -> high energy density (much glucose in a small space) (1)

Ignore: vague "easier to break down" without why

3 (b)(i)

Estimate · [2 marks]

GSD affects between 1 in 20 000 and 1 in 25 000 babies; ~25% of GSD patients have Von Gierke disease. 3.8 million babies are born per year. Estimate the number born each year with Von Gierke disease.

Model answer

✓ First estimate GSD babies: 3 800 000 ÷ 20 000 = 190, or ÷ 25 000 = 152 – so between 152 and 190. ✓ Then take 25% for Von Gierke: 0.25 × (152 to 190) ~ between 38 and 48 babies a year.

Mark scheme 2 marks

- ✓ estimate of babies with GSD (150-200) (1)
- ✓ estimate of babies with Von Gierke disease (38-50; non-whole values OK) (1)

Accept: correct answer with no working scores 2

3 (b)(ii)

Suggest · [2 marks]

Von Gierke disease is inherited. Suggest why the majority of affected babies are born to parents who are not themselves affected.

Model answer

✓ The Von Gierke allele is recessive, so a person is only affected if they inherit two copies. ✓ The parents are therefore usually heterozygous carriers – unaffected themselves, but each can pass on one recessive allele. ✓ Also, people who do have Von Gierke disease are less likely to survive and reproduce, so affected parents are rarer.

Mark scheme 2 marks · any two

- ✓ allele for Von Gierke disease may be recessive (disease needs two recessive alleles) (1)
- ✓ (both) parents may be heterozygous / carriers (1)
- ✓ individuals with Von Gierke disease are less likely to have babies (1)

Do not accept: "the gene/disease is recessive" (allele, not gene/disease)

Ignore: mutation

Examiner's insight

Say the allele is recessive and the parents are carriers - don't loosely call the "gene" or "disease" recessive.

Revise from your notes

- Polysaccharides & structure-function: 2.4 · 2.5
- Genetic terms - recessive alleles & carriers: 9.7

Edexcel IAL Biology - Solved Past Paper

January 2022 · Unit 1 (WBI11/01) · Question 1 · Carbohydrates - starch & disaccharides

hard medium easy

1 (a)

How many · [1 mark]

How many of these are correct for starch? · starch is a mixture of two polysaccharides · starch contains only 1-6 bonds · starch is insoluble in water

- ☒ **A** none
- ☒ **B** one
- ☒ **C** two
- ☒ **D** three

Model answer

✓ C - two are correct: starch IS a mixture of two polysaccharides (amylose + amylopectin) and IS insoluble; but it has 1-4 bonds as well as 1-6, so that statement is wrong.

Mark scheme 1 mark

- ✓ C (two correct) (1)

Ignore: B - chosen if starch wrongly thought soluble

1 (b)(i)

Complete · [4 marks]

Complete: monosaccharides are joined by a ..... covalent bond. Sucrose and lactose both contain ..... . Sucrose also contains ..... ; lactose also contains ..... .

Model answer

✓ glycosidic (covalent bond). ✓ Both contain (alpha) glucose. ✓ Sucrose also contains fructose. ✓ Lactose also contains galactose.

Mark scheme 4 marks

- ✓ glycosidic (1)
- ✓ (alpha) glucose (1)
- ✓ fructose (1)
- ✓ galactose (1)

Ignore: 1-4 / 1-6, and alpha vs beta

Examiner's insight

The usual slip is swapping the two - sucrose = glucose + fructose, lactose = glucose + galactose.

1 (b)(ii)

Name · [1 mark]

Name the type of reaction that joins two monosaccharides to form gentiobiose.

Model answer

✓ A condensation reaction.

Mark scheme 1 mark

✓ condensation (reaction) (1)

Accept: polymerisation

1 (b)(iii)

Which · [1 mark]

Each monosaccharide has molecular mass 180. Which is the molecular mass of gentiobiose (a disaccharide)?

- ☒ **A** 144
- ☒ **B** 162
- ☒ **C** 342
- ☒ **D** 360

Model answer

✓ C = 342 – two monosaccharides condense with the loss of a water molecule: 180 + 180 – 18 = 342.

Mark scheme 1 mark

✓ C (342) (1)

Accept: 180 + 180 - 18 = 342

Revise from your notes

- Disaccharides & condensation: 2.2 · 2.3
- Polysaccharides (starch): 2.4 · 2.7

Pearson Edexcel International Advanced Level

October 2023 · Unit 1: Molecules, Diet, Transport and Health (WBI11/01) · Question 6

Starch - amylose & amylopectin

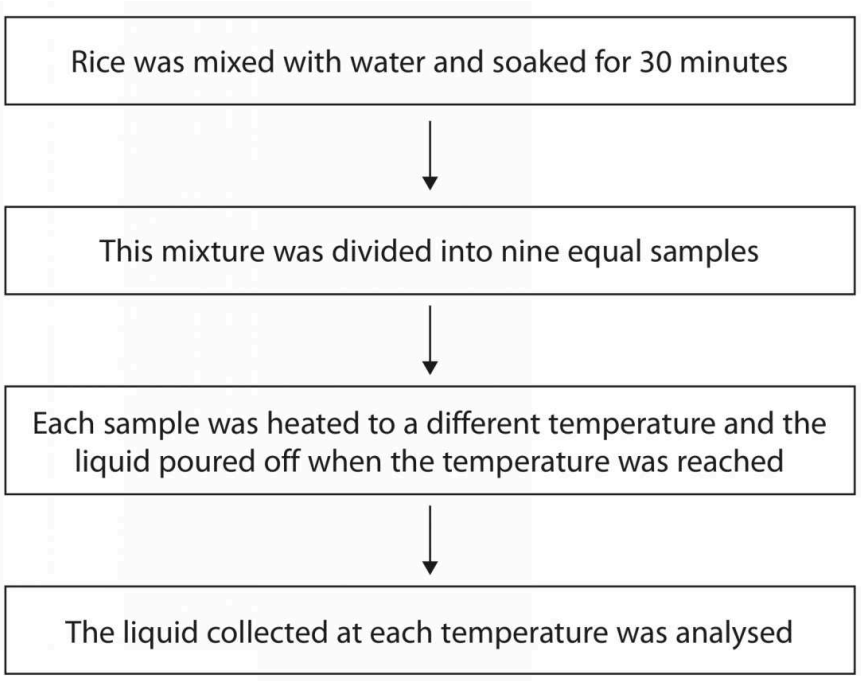
hard medium easy

(a)

Complete · [3 marks]

Put one cross in each row to show whether the bond is found in amylose only, amylopectin only, both, or neither: glycosidic bonds; 1-6 alpha bonds; hydrogen bonds.

Types of bond	Bonds found in			
	amylose only	amylopectin only	both amylose and amylopectin	neither amylose nor amylopectin
glycosidic bonds	☒	☒	☒	☒
1-6 α bonds	☒	☒	☒	☒
hydrogen bonds	☒	☒	☒	☒



Model answer

✓ Glycosidic bonds – both amylose and amylopectin (they join the glucose units in each).

✓ 1-6 alpha bonds – amylopectin only (these create its branches; amylose is unbranched).

✓ Hydrogen bonds – both amylose and amylopectin (holding the coiled/branched chains in shape).

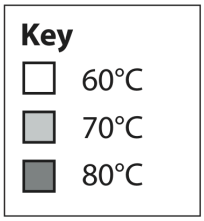
Mark scheme

- ✓ glycosidic bonds - both amylose and amylopectin (1)
- ✓ 1-6 alpha bonds - amylopectin only (1)
- ✓ hydrogen bonds - both amylose and amylopectin (1)

(b)

Describe · [2 marks]

The graph shows the percentage of amylose lost from four starch sources (potato, cassava, sweet potato, maize) at 60, 70 and 80 °C. Describe two conclusions about the effects of temperature and source of starch on amylose loss.



Model answer

✓ Effect of temperature: as the temperature increases, the percentage of amylose lost increases in all four sources. ✓ Effect of source: the most amylose is lost from cassava and the least from potato (at all three temperatures).

Mark scheme

temperature

- ✓ as temperature increases the loss of amylose increases in all four sources (1)

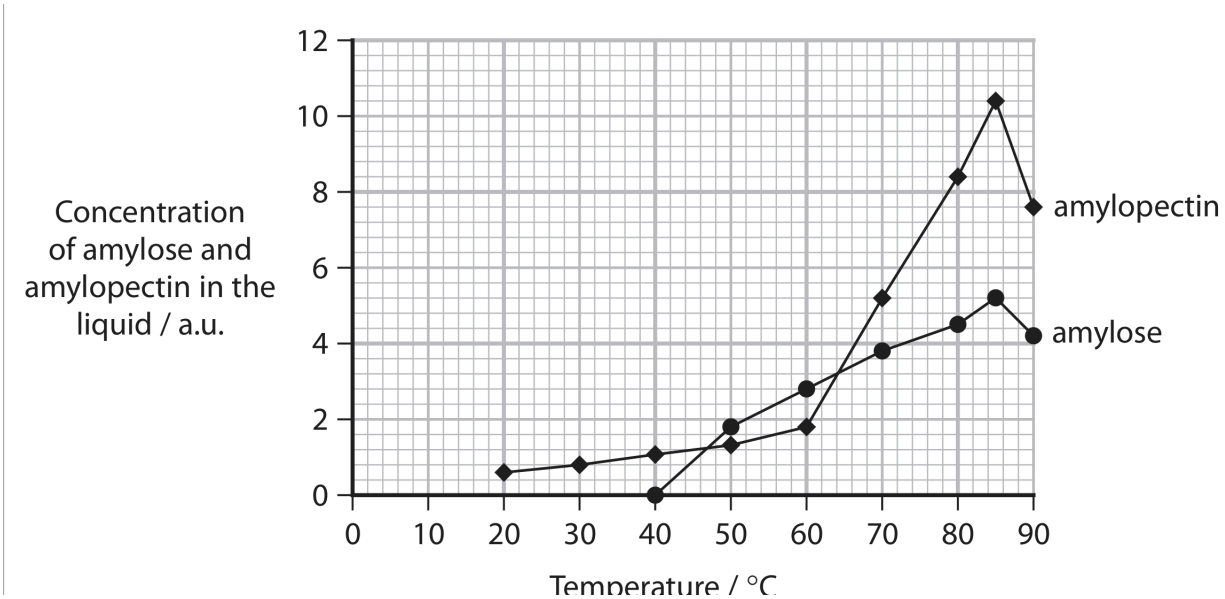
source

- ✓ most amylose lost from cassava / least from potato (1)

(c)(i)

Compare and contrast · [3 marks]

The graph shows the concentration of amylose and amylopectin in the liquid poured off rice at different temperatures. Compare and contrast the effects of temperature on the loss of amylose and amylopectin from rice.



Model answer

✓ Similarity – for both, an increase in temperature increases the loss (up to about 85 °C, then it decreases), and the highest loss of each is at the same temperature (~85 °C). ✓ Difference – amylopectin starts to be lost at a lower temperature (~20 °C) than amylose (~40 °C). ✓ Difference – overall more amylopectin is lost than amylose (especially above 64 °C).

Mark scheme Three points, at least one similarity and one difference:

similarities
- ✓ increase in temperature increases both amylose and amylopectin loss (up to 85 then decrease) (1)

similarities
- ✓ highest loss of both at ~85 °C (or both lose the same at 47/64 °C) (1)

differences
- ✓ amylopectin starts to be lost at a lower temperature (1)

differences
- ✓ more amylopectin is lost than amylose (overall / above 64 °C) (1)

Accept: positive correlation up to 85 °C

Examiner's insight

Read values off the graph accurately - the compare-and-contrast structure was fine, but marks were lost through imprecise read-offs.

(c)(ii)

Comment on · [3 marks]

The table shows the hardness and stickiness of rice cooked in four replacement liquids (water; water + amylose; water + amylopectin; water + both). Comment on the effect of the replacement liquids on the hardness and stickiness of cooked rice. Use the table to support your answer.

Replacement liquid	Hardness of cooked rice / a.u.	Stickiness of cooked rice / a.u.
Water	19.42	1.19
Water containing amylose	27.63	1.21
Water containing amylopectin	20.43	1.71
Water containing both amylose and amylopectin	27.65	1.70

Model answer

✓ The liquid containing amylose gave the higher hardness (27.63 vs 19.42 for water), so amylose contributes to hardness. ✓ The liquid containing amylopectin gave the higher stickiness (1.71 vs 1.19 for water), so amylopectin contributes to stickiness; the liquid with both gave high hardness and high stickiness. ✓ However, there are no error bars / standard deviations shown, so it cannot be judged whether the data are repeatable / the differences significant.

Mark scheme Three of the following:

- ✓ amylose liquid has higher hardness and amylopectin liquid has higher stickiness (both liquid highest overall) (1)
- ✓ amylose contributes to hardness (1)
- ✓ amylopectin contributes to stickiness (1)
- ✓ no error bars / standard deviation so data may not be repeatable (1)

Examiner's insight

'Comment on' means state the actual effect (amylose -> hardness, amylopectin -> stickiness), not just re-read the table numbers - this was low-scoring.

(c)(iii)

Suggest · [2 marks]

Suggest why rice should be cooked in a measured volume of water, with the lid on, until all the cooking liquid has been absorbed. Use the table to support your answer.

Model answer

✓ Keeping the lid on stops the cooking water being lost as steam, so more water is absorbed by the rice. ✓ Absorbing all the liquid means no amylose or amylopectin is poured

away, so the desired hardness and stickiness of the cooked rice are achieved.

Mark scheme

- ✓ lid on so cooking water is not lost / more is absorbed by the rice (1)
- ✓ so the correct hardness / stickiness is achieved (no amylose/amylopectin lost) (1)

Revise from your notes

- Carbohydrates: Amylose & amylopectin · Glycosidic bonds

Pearson Edexcel International Advanced Level

October 2025 · Unit 1: Molecules, Diet, Transport and Health (WBI11/01) · Question 6

Carbohydrates - structure, transport & storage

hard medium easy

(a)(i)

Select · [1 mark]

Which row shows a polysaccharide, a disaccharide and a monosaccharide?

		Polysaccharide	Disaccharide	Monosaccharide
☒	**A**	fructose	maltose	sucrose
☒	**B**	maltose	sucrose	fructose
☒	**C**	starch	maltose	sucrose
☒	**D**	starch	sucrose	fructose

Model answer

✓ D - starch (polysaccharide), sucrose (disaccharide), fructose (monosaccharide).

Mark scheme

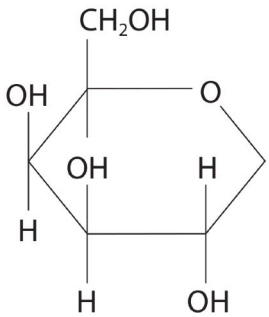
✓ D - starch / sucrose / fructose (the only correct answer) (1)

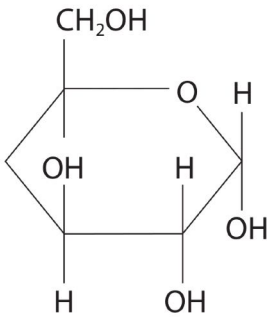
Ignore: sucrose and maltose are disaccharides; fructose is a monosaccharide

(a)(ii)

Complete · [2 marks]

Lactose is a disaccharide of galactose and glucose. Complete the diagram to show a molecule of lactose (from the two monosaccharide rings shown).





Model answer

✓ Draw the glycosidic bond correctly between C1 of one ring and C4 of the other (a straight line, not a zig-zag, since corners represent carbon atoms). ✓ Add an H to the positions on C1 and C4 that are left after the bond forms (a molecule of water is removed in the condensation).

Mark scheme

- ✓ glycosidic bond drawn correctly between C1 and C4 (1)
- ✓ H added to C1 and C4 (1)

Ignore: indications of water being formed

Examiner's insight

Add the hydrogen atoms on C1 and C4, and draw the glycosidic bond as a straight line - a zig-zag implies extra carbon atoms and was not accepted.

(a)(iii)

Describe · [2 marks]

Describe the structure of glycogen.

Model answer

✓ Glycogen is a polysaccharide - a polymer of many alpha-glucose units, ✓ and it is highly branched, with 1-4 glycosidic bonds along the chains and 1-6 glycosidic bonds at the branch points.

Mark scheme

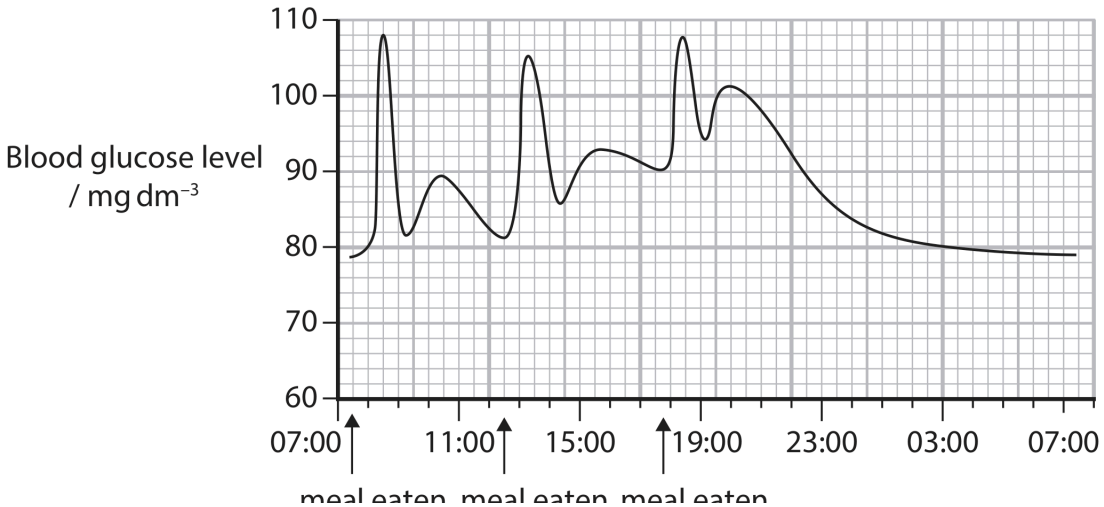
- ✓ polymer / polysaccharide of (alpha) glucose (1)
- ✓ branched with 1-4 and 1-6 glycosidic bonds (1)

Do not accept: made of amylose and amylopectin

(b)

Calculate · [2 marks]

The graph shows blood glucose level over a day. Calculate the maximum change in blood glucose level after the first meal is eaten. Give your answer to one significant figure with suitable units.



Model answer

✓ Maximum change = peak after the first meal - level just before it = 108 - 79 = 29 mg dm^{-3}. ✓ To one significant figure this is 30 mg dm^{-3}.

Mark scheme

- ✓ 108 - 79 = 29 (1)

✓ 30 mg dm^{-3} (1)

Accept: bald 30 mg dm^{-3} = 2 marks; 30 with no/wrong units = 1 mark; 29 mg dm^{-3} = 1 mark

Examiner's insight

Round 29 to one significant figure (30) as the question asks, and include the units - both were needed for full marks.

(c)

Explain · [6 marks]

*Explain how carbohydrates are metabolised, transported and used in the cells of the body, and stored in liver cells. Use the flowchart and your own knowledge of the structures, roles and properties of carbohydrates and transport mechanisms.

Model answer

✓ Metabolism: carbohydrates are broken down by hydrolysis, catalysed by enzymes, into monosaccharides - for example starch -> maltose -> glucose, and lactose -> glucose + galactose. ✓ This matters because starch is insoluble and cannot enter the blood, whereas the resulting single sugars are soluble and can be absorbed into the bloodstream. ✓ Transport: the monosaccharides pass into the blood by facilitated diffusion through carrier/channel proteins (because glucose is large and polar), and are then carried around the body by mass transport, dissolved in the blood plasma, to overcome the limits of diffusion. ✓ Use in cells: glucose enters cells by facilitated diffusion (down its gradient) and is used as a respiratory substrate to release energy, or to make glycoproteins for cell membranes. ✓ Storage: excess glucose in the liver is joined by condensation reactions into glycogen, which is insoluble and has no osmotic effect, so it can be stored safely, ✓ and when blood sugar falls the glycogen is hydrolysed back into glucose that re-enters the blood (glycogen itself is too large/insoluble to leave the cell).

Mark scheme Indicative content across the four aspects (levels-marked); descriptions with explanations (E):

metabolism

✓ metabolism: carbohydrates hydrolysed by enzymes to monosaccharides (e.g. starch -> maltose -> glucose); starch insoluble but sugars soluble so can enter the blood

transport

✓ transport: monosaccharides enter blood by facilitated diffusion (large/polar); carried by mass transport dissolved in plasma

use in cells

✓ use in cells: glucose enters cells by facilitated diffusion; used as a respiratory substrate / to form glycoproteins

storage

✓ storage: glucose joined by condensation into glycogen in the liver; insoluble, no osmotic effect; hydrolysed back to glucose when blood sugar is low

How to reach full marks

For full marks, cover all four aspects with reasons: METABOLISM (carbohydrates hydrolysed by enzymes to monosaccharides - e.g. starch -> maltose -> glucose - so the insoluble starch becomes soluble sugars that can enter the blood); TRANSPORT (glucose enters the blood by facilitated diffusion through carrier/channel proteins because it is large and polar, then moves by mass transport dissolved in the plasma); USE IN CELLS (glucose enters cells by facilitated diffusion and is a respiratory substrate to release energy, or forms glycoproteins for membranes); STORAGE (excess glucose joined by condensation into glycogen in the liver - insoluble with no osmotic effect - then hydrolysed back to glucose when blood sugar is low). This is a Paper 1 topic, so do NOT drift into the detail of the digestive system.

Examiner's insight

Stick to Paper 1 content - long accounts of the digestive process scored nothing; structure your answer around the four aspects named in the question.

Revise from your notes

- Carbohydrates: Mono/di/polysaccharides · Glycogen · Blood glucose

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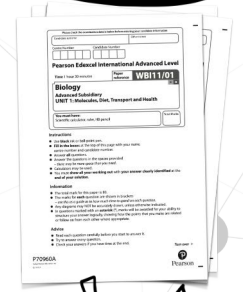

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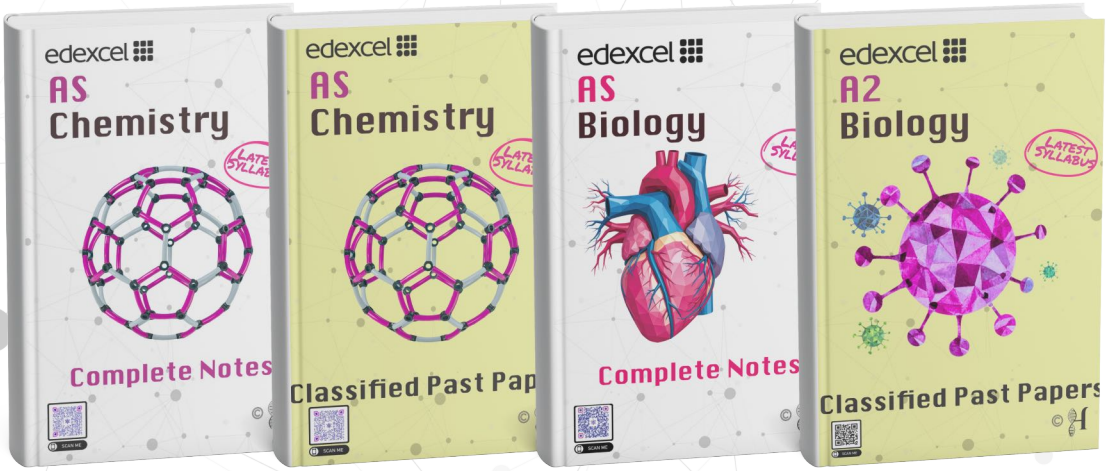

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