Monomers, Water and Inorganic Ions: AQA A Level Biology Exam Questi

17 questions · 44 marks · about 57 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · AS Paper 1 · June 2018 · Q02.1 · 1 mark

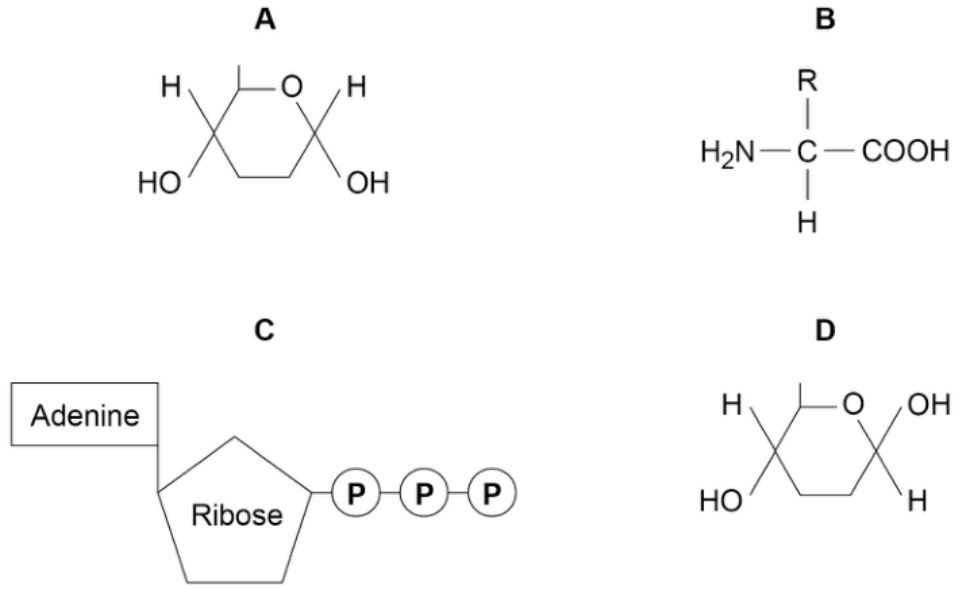
0 2 . 1 What is a monomer?

[1 mark]

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0 1 **Figure 1** shows the structure of molecules found in organisms.

Figure 1



0 1 . 1 Complete **Table 1** by putting the correct letter, **A**, **B**, **C** or **D**, in the box next to each statement. Each letter may be used once, more than once, or not at all.

[4 marks]

Table 1

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

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Question 3 · A level Paper 1 · June 2019 · Q10.3 · 5 marks

1 0 . 3 Describe the chemical reactions involved in the conversion of polymers to monomers and monomers to polymers.

Give **two** named examples of polymers and their associated monomers to illustrate your answer.

[5 marks]

[Extra space]

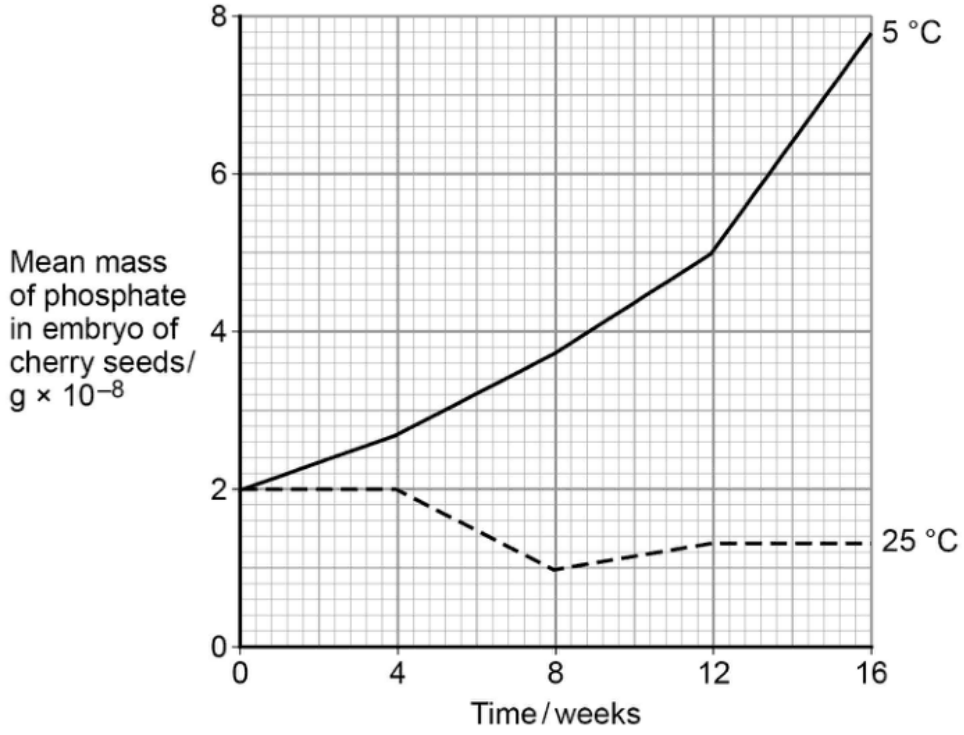
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Question 4 · AS Paper 2 · June 2016 · Q05.1 · 1 mark

0 5 The seeds of some plant species require chilling (exposure to low temperatures) before the embryos they contain grow into plants. During chilling, storage molecules in the seed that contain phosphate are broken down and phosphates are transported to the embryo. Scientists investigated the change in the mass of phosphate in the embryos of cherry seeds exposed to two different temperatures for 16 weeks.

Figure 6 shows their results.

Figure 6



0 5 . 1 Phospholipids are one of the storage molecules found in cherry seeds.

Name the type of reaction used to break down phospholipids to release phosphate.

[1 mark]

Question 5 · information from earlier in the question

0 2 In mammals, in the early stages of pregnancy, a developing embryo exchanges substances with its mother via cells in the lining of the uterus. At this stage, there is a high concentration of glycogen in cells lining the uterus.

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Question 5 · A level Paper 1 · June 2017 · Q02.2 · 2 marks

0 2 . 2 During early pregnancy, the glycogen in the cells lining the uterus is an important energy source for the embryo.

Suggest how glycogen acts as a source of energy.

Do **not** include transport across membranes in your answer.

[2 marks]

Question 6 · AS Paper 1 · June 2017 · Q08.1 · 3 marks

0 8 . 1 Give **three** properties of water that are important in biology.

[3 marks]

1

2

3

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Question 7 · AS Paper 2 · June 2016 · Q02.5 · 2 marks

0 2 . 5 The student then compared the rate of transpiration (evaporation of water) from the two species of plant. She did this by measuring the rate of water uptake by each plant species.

Suggest **two** reasons why the rate of water uptake by a plant might **not** be the same as the rate of transpiration.

[2 marks]

1 _____

_____

2 _____

_____

Question 8 · AS Paper 1 · June 2018 · Q08.1 · 2 marks

0 8 . 1 State **and** explain the property of water that can help to buffer changes in temperature.

[2 marks]

_____

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Question 9 · AS Paper 2 · June 2024 · Q01.1 · 2 marks

0 1 . 1 Water has a high heat capacity and a large latent heat of vaporisation.

Describe the importance of each of these properties to living organisms.

[2 marks]

High heat capacity _____

_____

_____

Large latent heat of vaporisation _____

_____

_____

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Question 10 · AS Paper 2 · November 2021 · Q09.1 · 5 marks

0 9 . 1 Explain **five** properties that make water important for organisms.

[5 marks]

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Question 11 · AS Paper 1 · June 2022 · Q06.1 · 2 marks

0 6 . 1 Explain a property of iron ions that enables these ions to carry out their role in red blood cells.

[2 marks]

Question 12 · AS Paper 1 · June 2024 · Q06.1 · 2 marks

0 6 . 1 Give **two** roles of phosphate ions in cells.

[2 marks]

1

2

Question 13 · AS Paper 1 · June 2024 · Q06.2 · 2 marks

0 6 . 2 Diseased lungs can cause carbon dioxide to build up in the blood plasma. This leads to an increase in hydrogen ion concentration in the plasma.

Describe the effect this increase in hydrogen ion concentration has on the plasma **and** on the proteins in the plasma.

Do **not** refer to the Bohr effect.

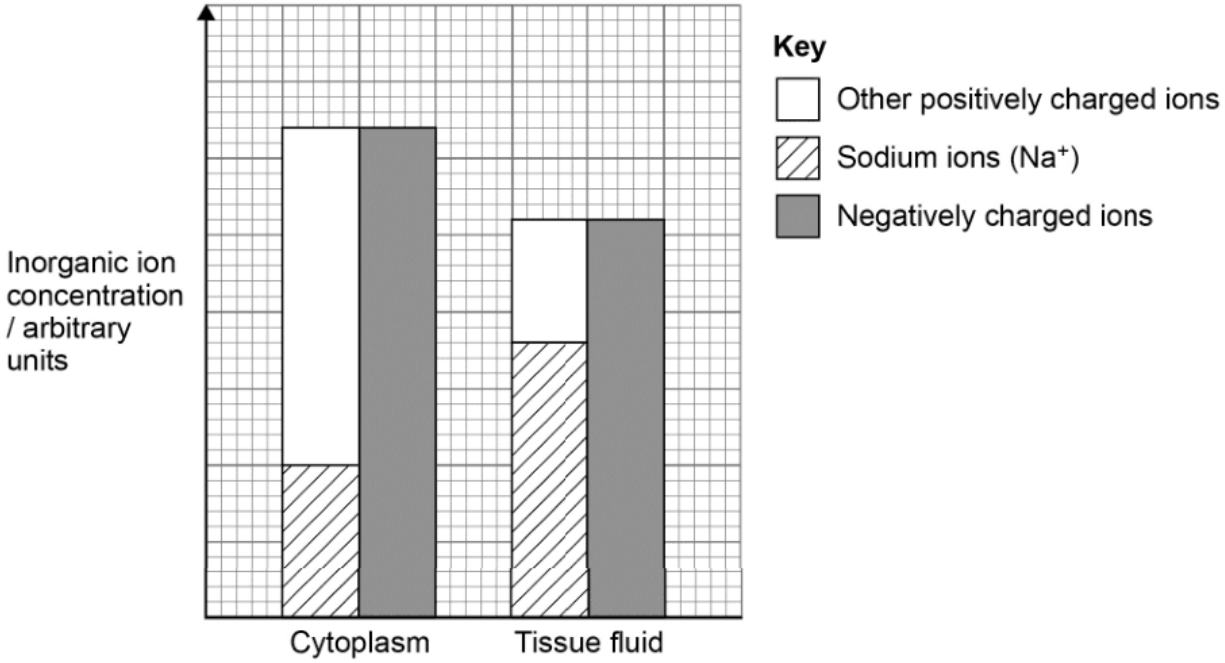
[2 marks]

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Scientists measured the concentration of inorganic ions in the cytoplasm of mammalian cells and in the tissue fluid surrounding those cells.

Figure 7 shows their results.

Figure 7



0 6 . 3 Use **Figure 7** to describe **two** patterns shown in the **total** concentrations of positively and negatively charged ions in the cytoplasm and in tissue fluid.

[2 marks]

1 _____

_____

_____

2 _____

_____

_____

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Question 15 · AS Paper 2 · June 2019 · Q09.1 · 5 marks

0 9 . 1 Describe the roles of iron ions, sodium ions, and phosphate ions in cells.

[5 marks]

[Extra space]

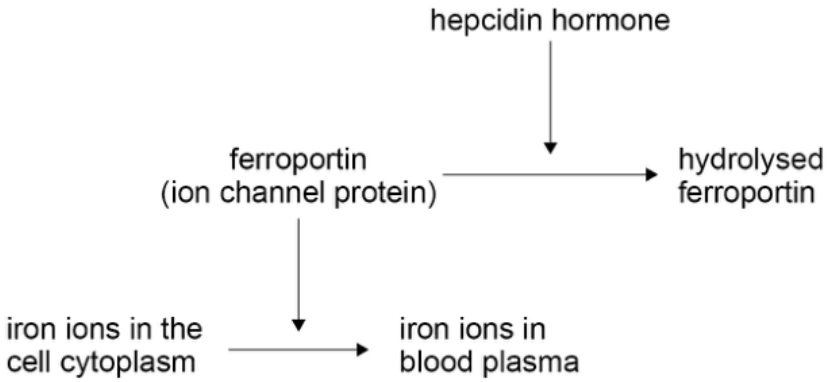
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Question 16 · information from earlier in the question

0 6 . 2 The hormone hepcidin controls the iron ion concentration in blood plasma. Hepcidin affects ferroportin, the iron ion channel protein in cell-surface membranes.

Figure 7 shows how hepcidin controls the iron ion concentration in plasma.

Figure 7



People with the disease haemochromatosis do **not** produce hepcidin.

Use information in **Figure 7** to explain why the iron ion concentration is higher in the plasma of people with haemochromatosis.

[3 marks]

Question 16 · AS Paper 1 · June 2022 · Q06.3 · 2 marks

0 6 . 3 The mass of iron ions in the plasma of a person with haemochromatosis is 6104 µg
The iron ion concentration in the plasma of a healthy person is 50 µg dm^{-3}
The volume of blood in each of these people is 4000 cm^3

Calculate the ratio of the mass of iron ions in the plasma of the person with haemochromatosis to the mass of iron ions in the plasma of the healthy person.

[2 marks]

Answer _____

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Question 17 · AS Paper 1 · June 2018 · Q02.4 · 2 marks

0 2 . 4 Lactulose can also be used to treat people who have too high a concentration of hydrogen ions (H^+) in their blood.

The normal range for blood H^+ concentration is 3.55×10^{-8} to 4.47×10^{-8} mol dm^{-3}

A patient was found to have a blood H^+ concentration of 2.82×10^{-7} mol dm^{-3}

Calculate the minimum percentage decrease required to bring the patient's blood H^+ concentration into the normal range.

[2 marks]

Answer = _____

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Mark schemes

Question 1 · AS Paper 1 · June 2018 · Q02.1 · 1 mark

02.1	(a monomer is a smaller / repeating) unit / molecule from which larger molecules / polymers are made;	1	Reject atoms / elements / 'building blocks' for units / molecules Ignore examples

Question 2 · AS Paper 1 · November 2020 · Q01.1 · 4 marks

01.1 4

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

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Question 3 · A level Paper 1 · June 2019 · Q10.3 · 5 marks

10.3	1. A condensation reaction joins monomers together **and** forms a (chemical) bond **and** releases water; 2. A hydrolysis reaction breaks a (chemical) bond between monomers **and** uses water; 3. A suitable example of polymers and the monomers from which they are made; 4. A second suitable example of polymers and the monomers from which they are made; 5. Reference to a correct bond within a named polymer;	5	Ignore reference to dimers. 3. and 4. Polymers must contain many monomers. 3. and 4: suitable examples include • amino acid **and** polypeptide, protein, enzyme, antibody or specific example • nucleotide **and** polynucleotide, DNA or RNA • Alpha glucose **and** starch/glycogen • Beta glucose **and** cellulose. If neither specific carbohydrate example is given, allow monosaccharide/glucose **and** polysaccharide. 3. and 4. Reject (once) reference to triglycerides. 5. Reject reference to ester bond.

Question 4 · AS Paper 2 · June 2016 · Q05.1 · 1 mark

05.1	Hydrolysis (reaction);	1

Question 5 · A level Paper 1 · June 2017 · Q02.2 · 2 marks

2.2	1. Hydrolysed (to glucose); 2. Glucose used in respiration;	2	1. Ignore 'Broken down' 2.'Energy produced' disqualifies mp2

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Question 6 · AS Paper 1 · June 2017 · Q08.1 · 3 marks

08.1	Accept any three suitable properties e.g.: 3 max • Is a metabolite • Is a solvent • Has a (relatively) **high** heat capacity • Has a (relatively) **large** latent heat of vaporisation / evaporation • Has cohesion / hydrogen bonds between molecules;;;	No explanations are needed However do not accept 'polar' unqualified

Question 7 · AS Paper 2 · June 2016 · Q02.5 · 2 marks

02.5	1. Water used for support/turgidity; 2 max 2. Water used in photosynthesis; 3. Water used in hydrolysis; 4. Water produced during respiration;	

Question 8 · AS Paper 1 · June 2018 · Q08.1 · 2 marks

08.1	1. (water has a relatively) high (specific) heat capacity; 2 2. Can gain / lose a lot of heat / energy without changing temperature; **OR** Takes a lot of heat / energy to change temperature;	1. Ignore numbers relating to heat capacity 2. Accept due to H bonding between water molecules

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01.1	1. Buffers changes in temperature; 2. (Provides a) cooling effect (via evaporation);

2 (2 x AO1)	1. Accept descriptions of buffering changes in temperature, eg resists temperature changes

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Question 10 · AS Paper 2 · November 2021 · Q09.1 · 5 marks

09.1	1. A metabolite **in** condensation/hydrolysis/ photosynthesis/respiration; 2. A solvent **so** (metabolic) reactions can occur **OR** A solvent **so** allowing transport of substances; 3. High (specific) heat capacity **so** buffers changes in temperature; 4. Large latent heat of vaporisation **so** provides a cooling effect (through evaporation); 5. Cohesion (between water molecules) **so** supports columns of water (in plants); 6. Cohesion (between water molecules) **so** produces surface tension supporting (small) organisms;	5 max

3. For 'buffer' accept 'resist'.
4. Reject latent heat of evaporation
5. For 'columns of water' accept 'transpiration stream'. Do not credit 'transpiration' alone but accept description of 'stream'.
5. For 'columns of water' accept 'cohesion-tension (theory)'.
5. and 6. For cohesion accept hydrogen bonding

Ignore reference to pH.

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06.1	1. (Is) charged/polar **OR** (Is) part of haem(oglobin); 2. (So) binds/associates/loads (with) oxygen **OR** (So) forms oxyhaemoglobin **OR** (So) transports oxygen;	2 (2 x AO1)

1. Accept Fe^{2+} **OR** Fe^{3+} for 'charged'
2. Accept 'carries' for transports

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Question 12 · AS Paper 1 · June 2024 · Q06.1 · 2 marks

06.1	1. (In) DNA; 2. (In) RNA; 3. (In) ATP/ADP; 4. Phosphorylation; 5. (In) phospholipids;	2 max (2 x AO1)	1. and 2. If neither DNA or RNA named allow 1 mark for nucleotide/nucleic acid/phosphodiester bond/sugar-phosphate backbone 1, 2 and 3. Accept any other correct biological compound containing phosphate; eg (in)RuBP or GP or triose phosphate or NAD 4. Accept binds with substance to make it more reactive

Question 13 · AS Paper 1 · June 2024 · Q06.2 · 2 marks

06.2	1. Increased (plasma) acidity **OR** Decreased (plasma) pH; 2. Denatures (protein) **OR** Changes (protein) tertiary structure **OR** Changes active site (shape) **OR** Changes antigen-binding site (shape);	2 (2 x AO1)	2. Accept description of bond changes, eg 'disrupts hydrogen/ ionic bonds' for 'changes in tertiary structure'

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06.3	1. Equal positive and negative (in both); 2. Higher (ion concentration) in cytoplasm;

2 (2 x AO2)	Accept answers in either order Ignore reference to sodium ions 1. Accept no overall charge or no net charge 2. Ignore more ions in cytoplasm

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09.1

Iron ions 5 max

1. Haemoglobin binds/associates with oxygen
   OR
   Haemoglobin transports/loads oxygen;

Sodium ions

2. Co-transport of glucose/amino acids (into cells);
3. (Because) sodium moved out by active transport/Na – K pump;
4. Creates a sodium concentration/diffusion gradient;
5. Affects osmosis/water potential;

Phosphate ions

6. Affects osmosis/water potential;
7. Joins nucleotides/in phosphodiester bond/in backbone of DNA/RNA/in nucleotides;
8. Used in/to produce ATP;
9. Phosphorylates other compounds (usually) making them more reactive;
10. Hydrophilic/water soluble part of phospholipid bilayer/membrane;

Must have MP1 for 5 max

3 max for sodium and 3 max for phosphate

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06.3	Correct answer for 2 marks = 30.52:1 / 30.5:1 / 31:1;; Accept for 1 mark, 31 (ratio not given) **OR** 30:1 (incorrect rounding) **OR** 200 (correct mass in healthy person) **OR** 1526 (correct iron concentration in person with haemochromatosis) **OR** 6104 : 200 (correct ratio, but not simplified)	2 (2 x AO2)

Accept for 1 mark any correct ratio (not simplified) e.g. 763:25 or 1526:50

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02.4	(-) 84.1(%);;	2	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** $\frac{2.37 \text{ x } 10\text{-}7}{2.82 \times 10^{-7}}$

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