

AS Level Biology

Topic 1: Biological Molecules

AQA Biology (7401)

Question Paper

100 marks

Instructions

- Answer **all** questions.
- In calculations show your working and give your answer to an appropriate number of significant figures.
- In extended-response questions you should write in clear, well-organised continuous prose.
- There are 15 questions in this paper. The total mark is **100**.

Name: _____

Class: _____

Date: _____

Teacher: _____

1. This question is about monomers and polymers.

(a) Define the term *monomer*. (1)

(b) Name the type of reaction that joins two monomers together and releases a molecule of water. (1)

(c) Name the type of reaction in which a bond between two monomers is broken by the addition of water. (1)

2. This question is about carbohydrates.

(a) Name the bond formed between two monosaccharides in a disaccharide. (1)

(b) Name the disaccharide formed from two molecules of α -glucose. (1)

(c) Name the two monosaccharides that join together to form sucrose. (2)

(d) Name the disaccharide found in milk and the two monosaccharides that form it. (2)

3. A student carried out food tests on an unknown solution.

(a) Describe how the student could test the solution for the presence of a reducing sugar, and state the positive result. (3)

(b) The student found no reducing sugar was present. Describe how they could then test for a non-reducing sugar. (3)

(c) State the reagent used to test for starch and the colour change for a positive result. (2)

4. This question is about polysaccharides.

(a) Name the two polysaccharides that make up starch. (2)

(b) Explain how the structure of glycogen makes it a good storage molecule in animal cells. (3)

(c) Cellulose is a structural polysaccharide. Describe how the structure of cellulose is related to its function in plant cell walls. (4)

5. This question is about the structure of glucose.

(a) State the general formula of a hexose monosaccharide. (1)

(b) α -glucose and β -glucose are isomers. State what is meant by the term *isomers*. (1)

(c) State one property of glucose that makes it suitable for transport in the blood. (1)

6. This question is about lipids.

(a) Name the two types of molecule that join to form a triglyceride. (2)

(b) Name the bond formed between glycerol and a fatty acid. (1)

(c) Explain the difference between a saturated and an unsaturated fatty acid. (2)

(d) Describe how the structure of a phospholipid differs from that of a triglyceride. (2)

7. This question is about the role of phospholipids in membranes.

(a) State what is meant by the term *hydrophilic*. (1)

(b) Explain why phospholipids form a bilayer when placed in water. (3)

8. This question is about proteins.

(a) Name the monomer from which proteins are made. (1)

(b) Name the bond formed between two amino acids in a dipeptide. (1)

(c) Draw or describe the general structure of an amino acid, naming the groups present. (3)

(d) Describe how a dipeptide is formed from two amino acids. (2)

9. This question is about the structure of proteins.

(a) Describe what is meant by the *primary structure* of a protein. (1)

(b) Describe the *secondary structure* of a protein, including the bonds involved. (2)

(c) Describe the *tertiary structure* of a protein and name three types of bond that hold it in shape. (4)

(d) Describe what is meant by the *quaternary structure* of a protein. (2)

10. A student tested a solution for protein.

(a) Name the test used to identify the presence of protein and describe the procedure. **(2)**

(b) State the colour change seen for a positive result. **(1)**

11. This question is about enzymes as biological catalysts.

(a) State what is meant by the term *enzyme*. **(1)**

(b) Explain how an enzyme lowers the activation energy of a reaction. **(3)**

(c) Explain the difference between the 'lock and key' model and the 'induced fit' model of enzyme action. **(3)**

12. A student investigated the effect of temperature on the rate of an enzyme-catalysed reaction.

- (a) Describe and explain how increasing temperature from 10 °C to 40 °C affects the rate of reaction. **(3)**

- (b) Above the optimum temperature the rate decreases. Explain why. **(3)**

- (c) Explain how a change in pH away from the optimum can reduce the rate of an enzyme-catalysed reaction. **(3)**

13. This question is about enzyme inhibition.

- (a) Describe how a *competitive inhibitor* reduces the rate of an enzyme-catalysed reaction. **(3)**

- (b) Explain how the effect of a competitive inhibitor can be reduced by increasing the substrate concentration. **(2)**

- (c) Describe how a *non-competitive inhibitor* reduces enzyme activity. **(3)**

14. The graph below shows that as substrate concentration increases, the rate of an enzyme-catalysed reaction increases then levels off at a maximum value.

(a) Explain why the rate of reaction increases as substrate concentration increases (at low concentrations). **(2)**

(b) Explain why the rate levels off at high substrate concentrations. **(2)**

15. This question is about testing for lipids and interpreting biochemical tests.

(a) Describe how the emulsion test is used to test for the presence of a lipid, and state the positive result. **(3)**

(b) A student wanted to find which of four solutions contained both a reducing sugar and protein. Describe how they could test for each, and state the positive results. **(4)**

(c) Suggest why a student should use the same volume of each solution and the same volume of reagent when comparing the results of these tests. **(2)**

(d) The Benedict's test is described as a qualitative test. Describe how the test could be made semi-quantitative to compare the concentration of reducing sugar in different solutions. **(4)**
