# WORKBOOK

## AQA A-LEVEL

# Biology 1

### YEAR 1 TOPICS

- Biological molecules
- Cells
- Organisms exchange substances with their environment
- Genetic information, variation and relationships between organisms

- ✔ Build confidence with practice questions
- ✔ Practise key maths and practical skills
- ✔ Prepare for assessment with exam-style questions

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# Contents

# About this book

1 **This workbook** will help you to prepare for AQA A-level Biology Topics 1–4.

2 **Topics 1–4** could be assessed in:

- A-level Paper 1, which lasts for 2 hours and covers Topics 1–4. Paper 1 is worth 35% of the A-level. There is a mixture of short- and long-answer questions, worth 76 marks. There are also some questions requiring extended-response answers, worth 15 marks.
- A-level Paper 3, which lasts for 2 hours and covers Topics 1–8. Paper 3 is worth 30% of the A-level. Section A has structured questions, including practical techniques, worth 38 marks. Some questions require critical analysis of experimental data, worth 15 marks. Section B requires one essay from a choice of two titles and is worth 25 marks.

3 **For each topic** in this workbook there are:

- stimulus materials, including key terms and concepts
- short-answer questions that build up to exam-style questions
- spaces for you to write or plan your answers
- questions that test your mathematical skills

4 **Answering the questions** will help you to build your skills and meet the assessment objectives AO1 (knowledge and understanding), AO2 (application), AO3 (analysis and evaluation). Quantitative skills will make up a minimum of 20% of the total marks across the A-level.

5 **Worked answers** are included throughout the practice questions to help you understand how to gain the most marks.

6 Icons next to the question will help you to identify:


where the practical elements of the course are covered


where your calculations skills are tested


where questions draw on synoptic knowledge, i.e. content from more than one topic

how long this question should take you

7 **You still need** to read your textbook and refer to your revision guides and lesson notes.

8 **Marks available** are indicated for all questions so that you can gauge the level of detail required in your answers.

9 **Timings** are given for the exam-style questions to make your practice as realistic as possible.

10 **Answers** are available at: **www.hoddereducation.co.uk.workbookanswers.**

# Topic 1 Biological molecules

## Monomers and polymers

The structural components of cells are built up from a limited number of carbon (organic) compounds. The simplest units of these compounds are called monomers. Monomers can be combined together to form larger, complex polymers. For example, nucleotides are the monomers of the nucleic acids DNA and RNA.

### Practice questions

**1** Carbohydrates, lipids, proteins and nucleic acids are important biological molecules. Some of these molecules form polymers. Complete the table below to show which monomers which make up the polymers. **3 marks**

| Biological molecule | Name of monomer | Name of polymer |
|---|---|---|
| Carbohydrate | | Polysaccharide |
| Protein | | Polypeptide |
| Nucleic acid | | DNA and RNA |

**2** Name a polymer found in a plant cell. **1 mark**

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**3** When two monomers join together, water is released. What sort of reaction is this? **1 mark**

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**4** How does the bond between two monomers get broken? **2 marks**

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**5** Why are lipids not classed as polymers? **2 marks**

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**6** Name a polysaccharide. **1 mark**

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**7** How is this polysaccharide formed from its monomers? **2 marks**

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# Carbohydrates

Carbohydrates are important respiratory substrates and many of their polymers form structural components of cells. Monosaccharides are carbohydrates that can be classified by the number of carbon atoms. For example, hexose monosaccharides are monomers with six carbon atoms. Hexoses can be built up into disaccharides and polysaccharides.

**Practice questions**

**1** Monosaccharides are all sugars. List three properties of these sugars. **3 marks**

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**2** Write down the chemical formula for a triose monosaccharide. **1 mark**

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**3** Write down the chemical formula for a pentose monosaccharide. **1 mark**

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**4** Monosaccharides are monomers of carbohydrate polymers. What is a polymer? **1 mark**

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**5** Name one polymer that is formed from β-glucose monomers. **1 mark**

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**6** Monosaccharides can join together to form disaccharides and polysaccharides by forming covalent bonds. What is the difference between a disaccharide and a polysaccharide? **2 marks**

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**7** Name the covalent bond that is formed between the adjacent monomers in a polysaccharide. **1 mark**

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**8** Name the type of reaction that occurs during the formation of this bond. **1 mark**

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**9** How can this covalent bond be broken to release the monomers? **1 mark**

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**10** Name the compound formed when glucose and galactose bond. **1 mark**

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**11** Name the compound formed when two α-glucose molecules bond. **1 mark**

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**12** Write out the equation showing how sucrose is produced from its monomers. **2 marks**

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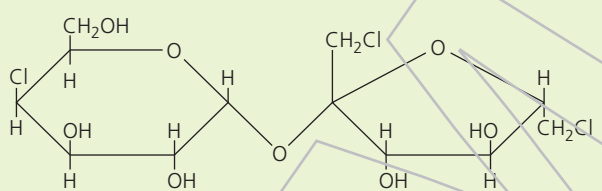
**13** Using an annotated diagram, show how a covalent bond forms between two α-glucose molecules. **3 marks**

**14** Sucralose is an artificial sweetener that is made by altering the structure of sucrose. It is a disaccharide with a similar structure to sucrose, but cannot be digested in the gut. The diagram below shows the structure of sucralose.




**a** How is the structure of sucrose different from sucralose? **1 mark**

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**b** Sucralose and sucrose are both sugary and sweet. Sucrose can be digested. Describe the process by which sucrose can be absorbed into the gut. **2 marks**

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**c** Explain why sucralose cannot be digested in the body. **1 mark**

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**d** Suggest why sucralose could be beneficial to the health of an individual. **1 mark**

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# Lipids

Lipids are composed of carbon, hydrogen and oxygen but the proportions are different from those in carbohydrates. Lipids are not polymers because they are not made of repeating units. Lipids are respiratory substrates, but they also act as waterproofing layers and insulating materials, and are essential components of cell membranes.

**Practice questions**

**1** Why do fats form good waterproofing layers? **1 mark**

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**2** Why are lipids referred to as triglycerides? **1 mark**

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**3** What chemical group does glycerol belong to? **1 mark**

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**4** What are the two different types of fatty acid? **2 marks**

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**5** In a triglyceride, what type of covalent bond is formed between a fatty acid and glycerol? **1 mark**

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**6** What type of reaction takes place when these covalent bonds form? **1 mark**

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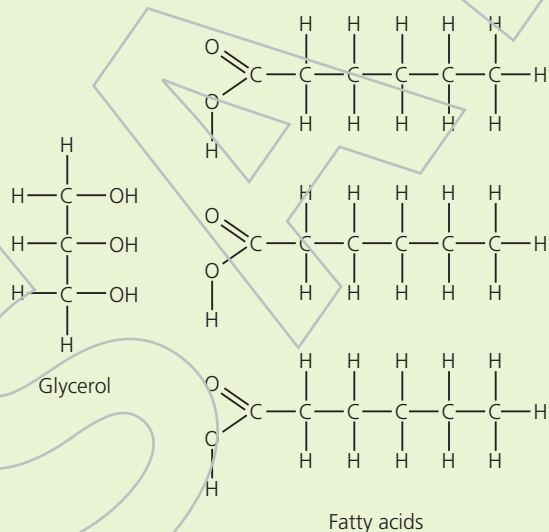
**7** Using the diagram below, or the writing lines on the next page, describe how a triglyceride is formed from the fatty acids and glycerol. **3 marks**



Glycerol

Fatty acids

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**8** Name the biochemical test that is used to show the presence of lipids. **1 mark**

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**9** Describe how this biochemical test would be carried out. **2 marks**

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**10** What would be observed if the lipid test described was positive? **1 mark**

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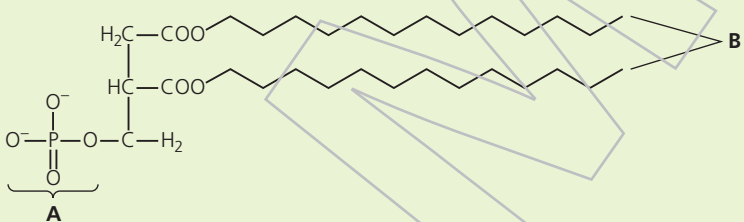
**11** The diagram shows a phospholipid.




**a** Name the parts A and B. **2 marks**

A .....

B .....

**b** Which part of the phospholipid molecule is non-polar? **1 mark**

.....

**c** Which part of the phospholipid molecule is hydrophobic? **1 mark**

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**12 a** What is a respiratory substrate? **2 marks**

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**b** How do animals get energy from a respiratory substrate? **1 mark**

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**c** Why do lipids molecules store more chemical potential energy than carbohydrates? **3 marks**

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**d** The respiratory quotient of a substrate is calculated using the equation:

$$\text{RQ} = \frac{\text{volume of carbon dioxide released}}{\text{volume of oxygen absorbed}}$$

The RQ values of three respiratory substrates are: carbohydrate 1.0, protein 0.9, lipid 0.7.

Why would a person suffering from COPD, who is struggling to breathe, be given a diet that is higher in lipids? **2 marks**

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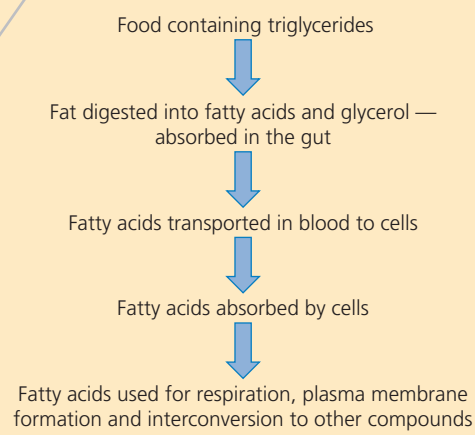
## Exam-style questions

**1** A balanced diet should contain adequate amounts of triglycerides. Omega-3 fatty acids are found in the triglycerides in food like oily fish, walnuts and olive oil. These fatty acids have been found to be beneficial to health and may help protect against heart disease and cancer.

8

The diagram shows how triglycerides are processed and how the fatty acids are used in different body processes.



Fats are insoluble in water. Describe how fats are processed in the gut so that they can be transported in the blood. **4 marks**

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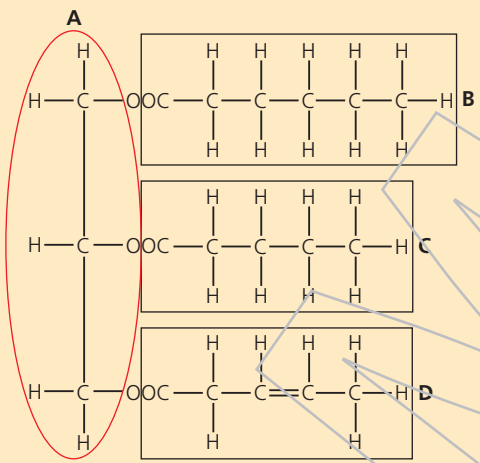
**2** The diagram shows a triglyceride molecule.




14

**a** Name part A. **1 mark**

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**b** Name the component parts labelled B, C and D **1 mark**

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**c** Components B, C and D can be further classified as saturated or unsaturated.

**i** State which of these structures is unsaturated. **1 mark**

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**ii** Describe the differences between saturated and unsaturated triglycerides. **2 marks**

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# WORKBOOK

## AQA A-LEVEL

# Biology 1

### YEAR 1 TOPICS

**Improve key skills and reinforce understanding with this write-in workbook, providing extra guidance, practice and scaffolding to support you in AQA A-level Biology.**

- ✔ Develop and consolidate understanding using the practice questions to check your knowledge
- ✔ Build key skills and practise the different question types with maths, practical-based and synoptic questions
- ✔ Prepare for assessment using exam-style questions that get progressively more difficult
- ✔ Study independently with answers, including worked solutions, available online

**Also available for AQA A-level Biology:**

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