

A-PLUS BIOLOGY

Exam Practice Biological Molecules

for AQA A-Level Biology

QUESTION WORKBOOK

30 questions | 100 marks

Original, independent practice material • Not official AQA material • Not endorsed by AQA

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Suggested practice time: 45 minutes (my recommendation; not an official exam duration).

Answer each question in the space indicated. The mark allocation is shown in brackets.

Section A: Topic Practice

20 questions | 60 marks

Monomers and polymers

1. Explain how a condensation reaction joins two monosaccharides. Name the bond formed and the molecule released. (2 marks)

2. Describe hydrolysis of a polymer and identify the type of bond broken when a protein is hydrolysed. (2 marks)

Carbohydrates

3. State one structural difference between α -glucose and β -glucose. (1 mark) Name the bond formed when glucose molecules join to form a disaccharide. (1 mark) State the type of reaction that forms this bond. (1 mark) (3 marks)

4. Describe two ways in which the structures of starch and glycogen are similar, and one way in which they differ. (3 marks)

5. A student has samples of a reducing sugar, sucrose and starch. Describe the tests and expected positive results that could be used to identify reducing sugar, sucrose and starch. (3 marks)

Lipids

6. Describe the components of a triglyceride and explain how they are joined. (3 marks)

7. Explain why phospholipids form bilayers in water. State how the emulsion test can be used to test a sample for lipid. (3 marks)

Proteins

8. Describe the general structure of an amino acid and name the bond joining amino acids in a polypeptide. (3 marks)

9. Explain how hydrogen bonds and ionic bonds contribute to protein structure. State the reagent and positive result for the biuret test. (3 marks)

Enzymes

10. Explain the induced-fit model of enzyme action, including how substrate binding affects the active site and how this can lower activation energy. (4 marks)

11. Explain how increasing temperature can affect enzyme-controlled reaction rate, including what happens above the enzyme's optimum temperature. (4 marks)

12. Explain how pH can affect enzyme activity. (3 marks)

13. Describe how substrate concentration affects reaction rate when enzyme concentration is fixed. Explain how a competitive inhibitor and a non-competitive inhibitor affect enzyme activity. (3 marks)

DNA, RNA and replication

14. Name the three components of a DNA nucleotide. State one structural difference between DNA and RNA. (3 marks)

15. A double-stranded DNA molecule contains 18% adenine. Calculate the percentage of cytosine and explain your reasoning. (3 marks)

16. Describe semi-conservative DNA replication. Explain how the results of the Meselson-Stahl experiment supported this model. (4 marks)

ATP

17. Name the components of ATP. Describe ATP hydrolysis and explain how phosphorylation can help drive a cellular reaction. (3 marks)

Water

18. Explain how the polarity of water molecules enables water to act as a solvent for ions and other polar substances. (2 marks)

19. Explain how water's high specific heat capacity helps organisms maintain stable temperatures. State one further property of water and link it to a biological function. (3 marks)

Inorganic ions

20. State one biological role for each of the following ions: hydrogen, iron, sodium and phosphate. (3 marks)

Section B: Mixed Mini-Test

10 new questions | 40 marks

The questions below follow a student investigating enzyme activity in extracts from germinating seeds. Use the data supplied where relevant.

21. The student adds starch solution and seed extract to a tube and incubates it at 35°C. Explain why the extract could digest starch and name the products expected from starch hydrolysis. (4 marks)

22. At the end of an incubation, the student tests a sample with iodine solution. The sample remains orange-brown. State what this result indicates about starch and explain why a control tube containing starch but no seed extract is useful. (4 marks)

23. A second sample gives a positive Benedict's test after heating. Describe the positive result and explain what it indicates about the products of starch digestion. (4 marks)

24. The student measures reducing sugar produced at different temperatures. Each tube contains the same volumes of starch solution and seed extract and is incubated for 5 minutes.

Temperature (°C)	Reducing sugar produced (arbitrary units)
10	8
20	18
30	32
40	27
50	5

Identify the temperature with the greatest measured product formation. Describe the trend from 10°C to 50°C and suggest why product formation falls at the highest temperature. (4 marks)

25. A student repeats the investigation at 30°C using different pH buffer solutions. All other conditions are kept the same.

pH	Reducing sugar produced (arbitrary units)
4	7
6	24
7	32
8	20
10	4

Identify the pH with the greatest measured product formation. Explain why activity is lower at pH 4 and pH 10. (4 marks)

26. At 30°C and pH 7, the student varies starch concentration while keeping the amount of seed extract constant.

Starch concentration (arbitrary units)	Reducing sugar produced per minute (arbitrary units)
1	6
2	11
4	19
8	29
16	30

Describe the relationship between starch concentration and rate. Explain why the rate changes very little between concentrations 8 and 16. (4 marks)

27. The student adds inhibitor X to the reaction mixture. Without inhibitor, the rate is 30 arbitrary units per minute. With inhibitor X, the rate is 12 units per minute; when extra starch is added, the rate rises to 28 units per minute. Deduce the likely type of inhibition and explain the evidence for your answer. (4 marks)

28. The student prepares a fresh seed extract by grinding seeds in cold water and filtering the mixture. Explain why grinding and filtering are used, and give one reason for keeping the extract cold. (4 marks)

29. A sample of the seed extract gives a purple colour when tested with biuret reagent. State what this result indicates. The student then tests the same extract with ethanol and water and observes a cloudy white emulsion. State what this second result indicates. (4 marks)

30. The student reports only one measurement at each temperature. Explain why repeating each temperature condition would improve the investigation. State one variable, other than temperature, that must be controlled and explain why. (4 marks)

Workbook total

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Section A: 60 marks | Section B: 40 marks