

# 2.3 Proteins

## Question Paper

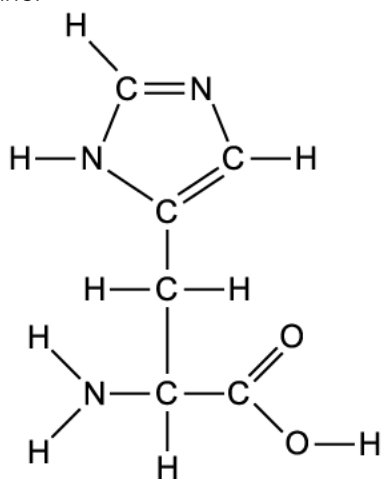
Course	DP IB Biology
Section	2. Molecular Biology
Topic	2.3 Proteins
Difficulty	Easy

**Time allowed:** 50  
**Score:** /35  
**Percentage:** /100

### Question 1a

a)

The image below shows the amino acid histidine.



Circle the section of the amino acid that is unique to histidine.

[1 mark]

[1 mark]

### Question 1b

b)

State the type of reaction that occurs when two amino acids bond with each other.

[1 mark]

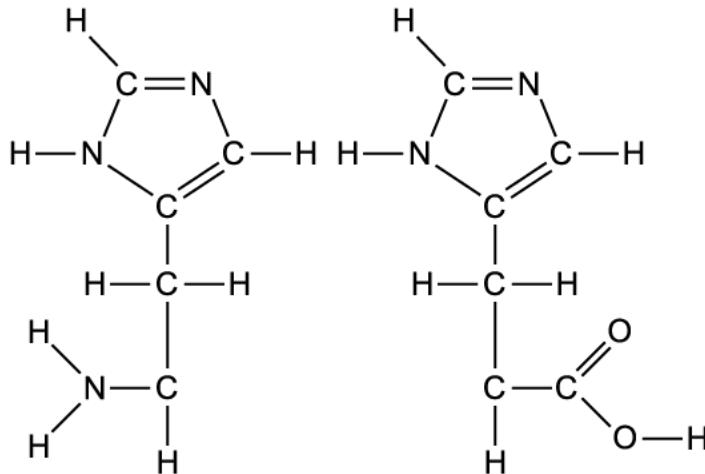
[1 mark]

### Question 1c

c)

The image shows two histidine amino acids with the diagrams not fully complete.

Complete the image to include the structure of a peptide bond joining the two amino acids together into a dipeptide.



[1 mark]

[1 mark]

### Question 1d

d)

In a polypeptide with 100 amino acids, how many peptide bonds exist within the chain?

[1 mark]

[1 mark]

### Question 2a

a)

The protein Rubisco is an enzyme.

What is the function of the enzyme Rubisco in living organisms?

[2 marks]

[2 marks]

## Question 2b

b)

Enzymes have a specific three-dimensional conformation that enables them to carry out their roles in living organisms.

Which part of the amino acid determines the conformation of the protein?

[1 mark]

[1 mark]

## Question 2c

c)

In certain conditions, such as high temperatures, the 3D conformation of proteins can be lost.

i) What is the scientific name given to when a protein loses its 3D conformation?

[1 mark]

ii) State one condition, other than temperature, that can cause the 3D conformation of a protein to be lost.

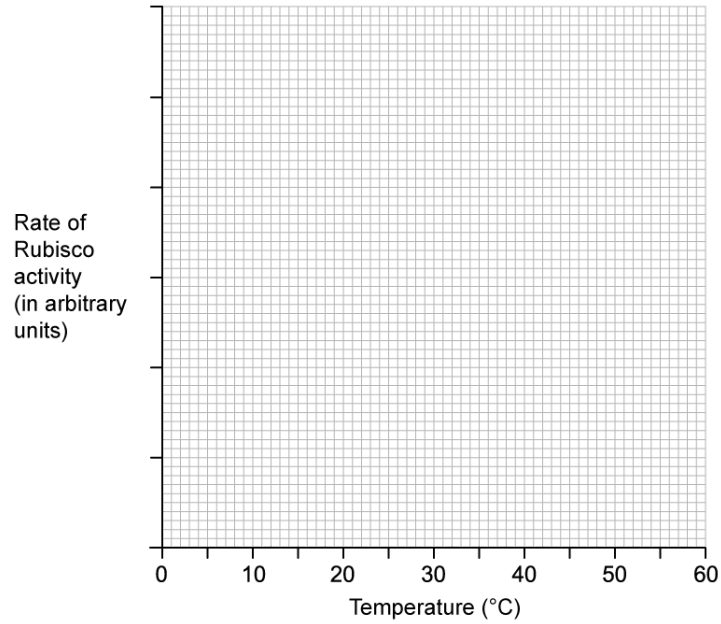
[1 mark]

[2 marks]

### Question 2d

d)  
Sketch a graph to show how the rate of reaction of Rubisco changes over a range of temperatures.

Use the axes provided below.



[2 marks]

[2 marks]

### Question 3a

a)  
What is the name of the part of the cell where polypeptide synthesis takes place?

[1 mark]

[1 mark]

### Question 3b

b)  
When a polypeptide is synthesised it is important that the amino acids are combined in the correct order to produce a functional protein.

Outline the process that allows the amino acids to be added to the polypeptide in the correct order.

[3 marks]

[3 marks]

### Question 3c

c)  
After a polypeptide has been synthesised it must undergo a series of changes before it can become a functional protein.

Describe the changes that occur between polypeptide synthesis and the formation of the functional protein.

[3 marks]

[3 marks]

### Question 3d

d)  
How might a change in the DNA affect the way that the process of protein folding occurs?

[2 marks]

[2 marks]

**Question 4a**

a)

What is meant by the term proteome?

[1 mark]

[1 mark]

**Question 4b**

b)

There are two main categories of proteins: globular and fibrous.

The protein insulin is a hormone.

State whether insulin is a globular or a fibrous protein, and give a reason for your choice.

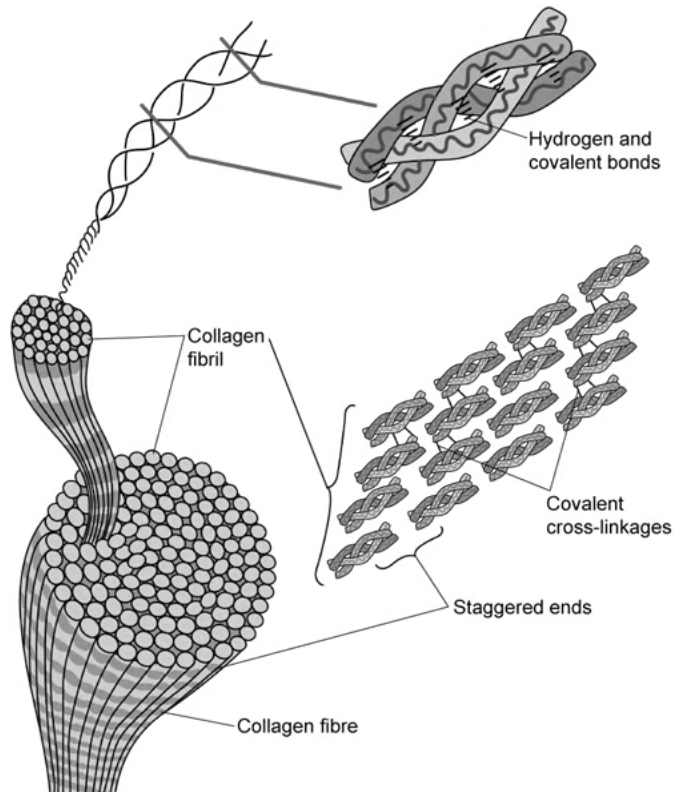
[2 marks]

[2 marks]

**Question 4c**

c)

The image below shows the structure of collagen at various levels of detail.



Use the image to suggest two features of collagen that enable it to be a strong, structural protein.

[2 marks]

[2 marks]

**Question 4d**

d)

One of the polypeptide chains that forms a molecule of collagen contains 1049 peptide bonds.

Assuming all the chains that form collagen are identical in length, how many amino acids would be found in a single molecule of collagen?

Explain your answer.

[3 marks]



[3 marks]

### Question 5a

*One mark is available for clarity of communication throughout this question.*

a)

Every individual has a unique proteome.

Explain how this is possible.

[3 marks]

[3 marks]

### Question 5b

b)

Describe the process of protein denaturing.

[4 marks]

[4 marks]



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