

# 2.5 Nucleic Acids: Structure & DNA Replication

## Question Paper

Course	DP IB Biology
Section	2. Molecular Biology
Topic	2.5 Nucleic Acids: Structure & DNA Replication
Difficulty	Easy

**Time allowed:** 50  
**Score:** /37  
**Percentage:** /100

### Question 1a

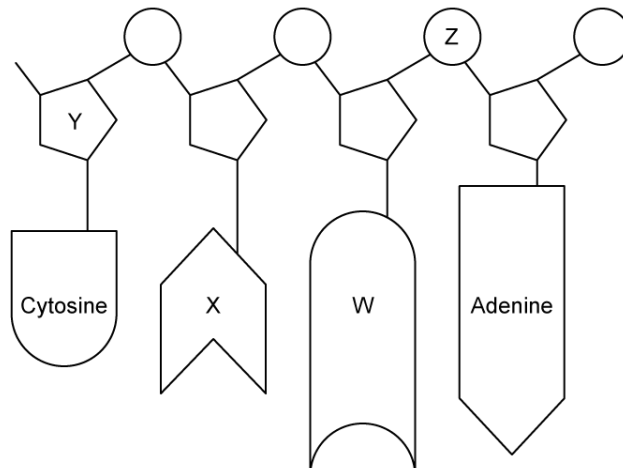
a)  
Describe the main role of DNA.

[2 marks]

[2 marks]

### Question 1b

b)  
The image below shows a representation of several nucleotides in a molecule of DNA.



Identify the structures marked **Y** and **Z**.

[2 marks]

[2 marks]

### Question 1c

c)  
Identify the nitrogenous bases in part b) marked **X** and **W**.

[2 marks]

[2 marks]

### Question 1d

d)

DNA and RNA are referred to as polynucleotides.

State the meaning of the prefix '**poly**' in the term **polynucleotide**.

[1 mark]

[1 mark]

### Question 2a

a)

In a section of DNA 17 % of the nucleotides were found to contain cytosine.

Calculate the percentage of thymine in this section of DNA.

[2 marks]

[2 marks]

### Question 2b

b)

State **one** reason why the calculation from part a) could not be performed for a piece of RNA.

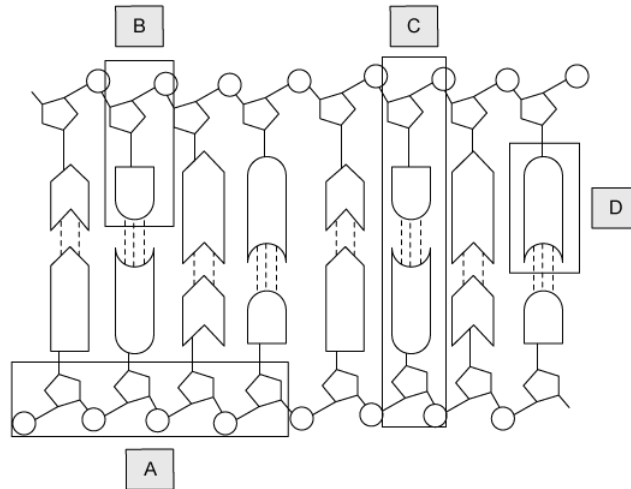
[1 mark]

[1 mark]

**Question 2c**

c)

The diagram below shows a representation of part of a DNA molecule.



Identify the structures labelled **A**, **B**, and **D**.

[3 marks]

[3 marks]

**Question 2d**

d)

Identify **one** type of bond found within the structure labelled **C** in the diagram at part c).

[1 mark]

[1 mark]

### Question 3a

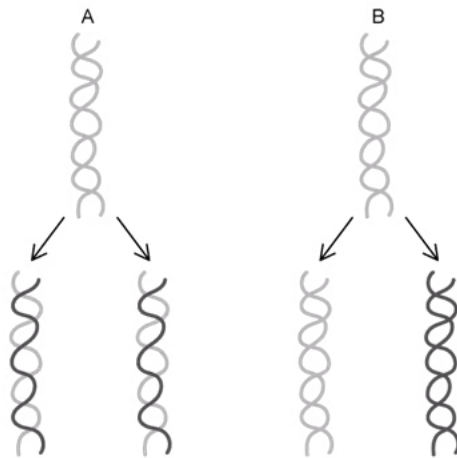
a)  
State the purpose of DNA replication.

[1 mark]

[1 mark]

### Question 3b

b)  
The diagrams below show two models of DNA replication.



State, with a reason, which diagram, **A** or **B**, is correct.

[2 marks]

[2 marks]

### Question 3c

c)  
Identify **two** enzymes that are involved with the process of DNA replication.

[2 marks]

[2 marks]

### Question 3d

d)  
Calculate the fraction of a cell's **original** DNA that will be present after 3 full cycles of DNA replication.

[2 marks]

[2 marks]

### Question 4a

a)  
Both DNA and RNA contain pentose sugars in their sugar-phosphate backbones.

Define the term **pentose** in reference to sugar molecules.

[1 mark]

[1 mark]

### Question 4b

b)  
During DNA replication the new bases are added to the new strand by the enzyme DNA polymerase in the 5' to 3' direction.

Use your knowledge of enzymes to explain why it would **not** be possible for DNA polymerase to add the new bases in the 3' to 5' direction.

[2 marks]

[2 marks]

### Question 4c

c)  
When bases are bonded to the new DNA strands during replication they undergo a condensation reaction.

Describe the events that occur during a condensation reaction.

[2 marks]

[2 marks]

### Question 4d

d)  
In a length of DNA 1 000 nucleotides long there are 382 guanine nucleotides in one of the strands.

Explain why it is not possible to calculate the number of guanine nucleotides in the opposite strand from the information provided.

[2 marks]

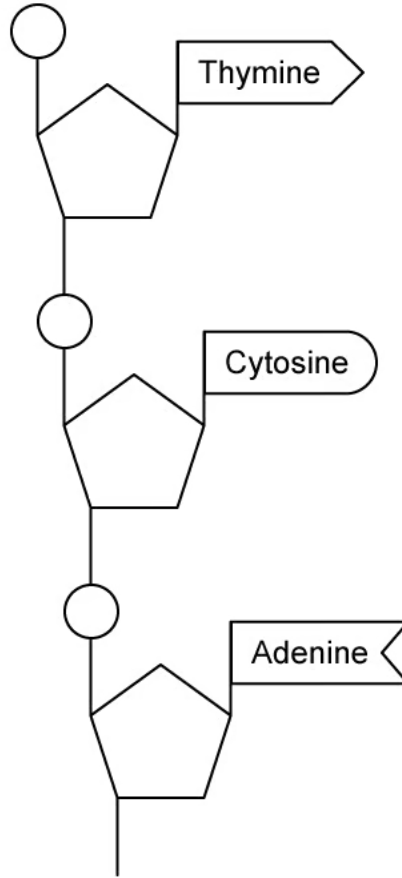
[2 marks]

### Question 5a

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

a)

Draw on and annotate the diagram below to show the correct structure of double-stranded DNA.



[4 marks]

[4 marks]



**Question 5b**

b)

Compare and contrast the structures of DNA and RNA.

**[5 marks]****[5 marks]**