

F212: Module 1: Nucleic Acids
From June 2009-January 2013
Questions

- (a) state that deoxyribonucleic acid (DNA) is a polynucleotide, usually double stranded, made up of nucleotides containing the bases adenine (A), thymine (T), cytosine (C) and guanine (G);
- (b) state that ribonucleic acid (RNA) is a polynucleotide, usually single stranded, made up of nucleotides containing the bases adenine (A), uracil (U), cytosine (C) and guanine (G);
- (c) describe, with the aid of diagrams, how hydrogen bonding between complementary base pairs (A to T, G to C) on two antiparallel DNA polynucleotides leads to the formation of a DNA molecule, and how the twisting of DNA produces its 'doublehelix' shape
- (d) outline, with the aid of diagrams, how DNA replicates semi-conservatively, with reference to the role of DNA polymerase;
- (e) state that a gene is a sequence of DNA nucleotides that codes for a polypeptide
- (f) outline the roles of DNA and RNA in living organisms (the concept of protein synthesis must be considered in outline only).

7 (a) Fig. 7.1 represents part of a DNA molecule.

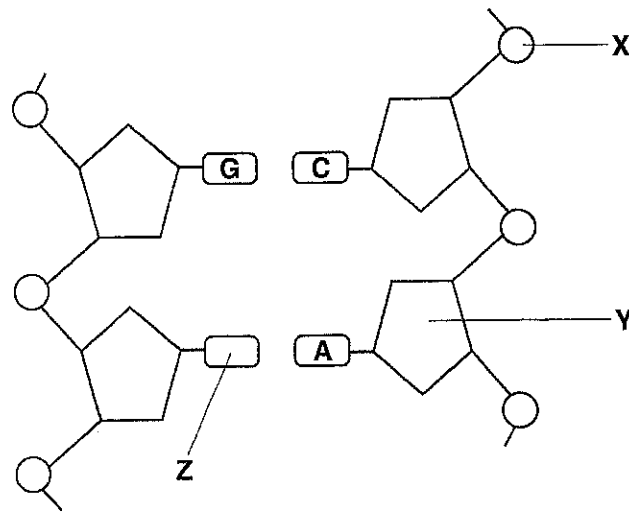


Fig. 7.1

State the **precise name** of each of the parts of the DNA molecule labelled X, Y and Z.

X

Y

Z [3]

4 (a) Fig. 4.1 is a drawing that represents molecules of DNA and messenger RNA (mRNA).

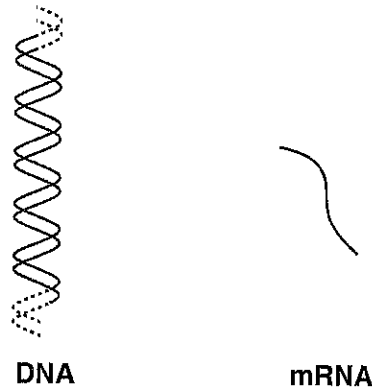


Fig. 4.1

The mRNA molecule is shorter than the DNA molecule.

(i) State, using **only** the information in Fig. 4.1, **one other** way to distinguish between DNA and mRNA.

.....
..... [1]

(ii) Give **one** further difference in **structure** between DNA and RNA.

.....
..... [1]

DNA and mRNA are both involved in protein synthesis. The mRNA molecule, carrying the code for protein, leaves the nucleus and attaches to a ribosome. The ribosome is the site where a protein molecule is formed.

(iii) Complete the following statement:

A sequence of DNA nucleotides that codes for a protein is a [1]

(iv) Suggest why DNA is not able to leave the nucleus.

.....
.....
..... [1]

(v) Explain why the mRNA molecule is shorter than a DNA molecule.

.....
.....
.....
.....
..... [2]

6 DNA and RNA are nucleic acids.

(a) (i) State the components of a **DNA** nucleotide.

.....
.....
.....
..... [3]

(ii) Describe how the structure of RNA differs from that of DNA.

.....
.....
.....
..... [2]

(c) (i) State what a gene codes for.

.....
.....
..... [1]

(ii) Suggest how changing the sequence of DNA nucleotides could affect the final product the DNA codes for.

.....
.....
.....
.....
..... [2]

[Total: 15]

3

(ii) Suggest how the data given in Table 1.1 might have been helpful to scientists in working out the structure of DNA.

.....

.....

.....

..... [2]

(c) DNA in the nucleus acts as a template for the production of RNA.

Complete the table below to show **three** ways in which the structure of DNA differs from that of RNA.

feature	DNA	RNA
number of strands		
bases present		
sugar present		

[3]

(d) DNA codes for the structure of polypeptides.

State the role of messenger RNA (mRNA).

.....

.....

.....

.....

..... [2]

[Total: 14]