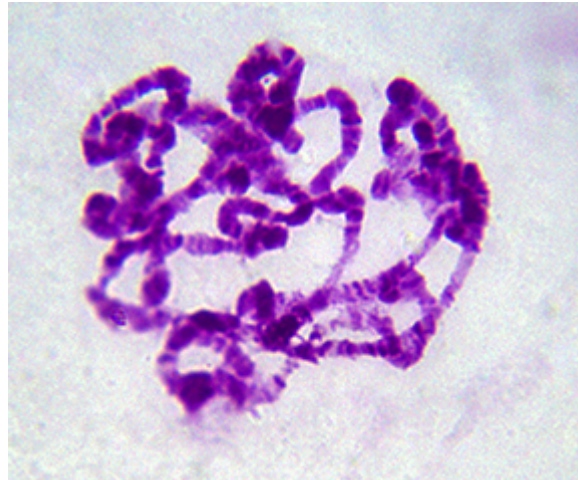


Q1.

This question is about mitosis in cells.

The image below shows the arrangement of the genetic material in a cell during prophase.



(c) Name the fixed position occupied by a gene on a DNA molecule.

(1)

(d) Describe how a gene is a code for the production of a polypeptide. Do **not** include information about transcription or translation in your answer.

(3)

Q2.

- (b) Define the term exon.

(1)

The table below shows **mRNA** codons for some amino acids.

Serine	Proline	Glycine	Threonine	Alanine
UCU	CCU	GGA	ACU	GCA
UCC	CCA	GGG	ACC	GCG

- (c)
- Figure 1**
- shows the DNA template nucleotide base sequence that determines the sequence of four amino acids.

Figure 1**AGG CGT CCT GGA**

Use information from the table and **Figure 1** to give the amino acid sequence determined by this sequence of nucleotides.

(1)

Q3.

- (a) Describe how a phosphodiester bond is formed between two nucleotides within a DNA molecule.

(2)

- (b) The two DNA strands of a particular gene contain 168 guanine bases between them. The relationship between the numbers of guanine bases (G), adenine bases (A), thymine bases (T) and cytosine bases (C) in these two strands of DNA is shown in the following equation.

$$G = 4(A + T) - C$$

Use this information and your understanding of DNA structure to calculate the maximum number of amino acids coded by this gene.

Show your working.

Answer _____

(2)

- (c) Name the protein associated with DNA in a chromosome.

(1)

Q4.

- (a) Complete **Table 1** to show **three** differences between DNA in the nucleus of a plant cell and DNA in a prokaryotic cell.

Table 1

DNA in the nucleus of a plant cell	DNA in a prokaryotic cell
1	
2	
3	

(3)

- (b) Scientists investigated the genetic diversity between several species of sweet potato. They studied non-coding multiple repeats of base sequences.

Define 'non-coding base sequences' and describe where the non-coding multiple repeats are positioned in the genome.

(2)

Q5.

- (a) The nucleus and a chloroplast of a plant cell both contain DNA.

Give **three** ways in which the DNA in a chloroplast is different from DNA in the nucleus.

1 _____

2 _____

3 _____

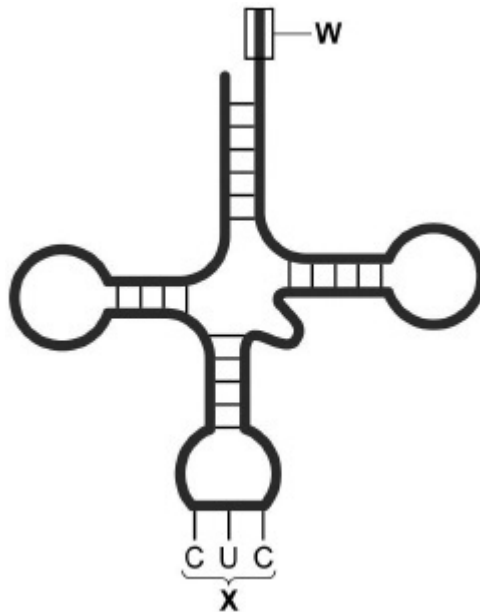
(3)

- (b) Some DNA nucleotides have the organic base thymine, but RNA nucleotides do not have thymine. RNA nucleotides have uracil instead of thymine.

Give **one** other difference between the structure of a DNA nucleotide and the structure of an RNA nucleotide.

(1)

The diagram shows a tRNA molecule.



- (c) Name the structures labelled **W** and **X** in the diagram.

W _____

X _____

(1)

- (d) Not all mutations in the nucleotide sequence of a gene cause a change in the structure of a polypeptide.

Give **two** reasons why.

1 _____

2 _____

(2)
(Total 7 marks)

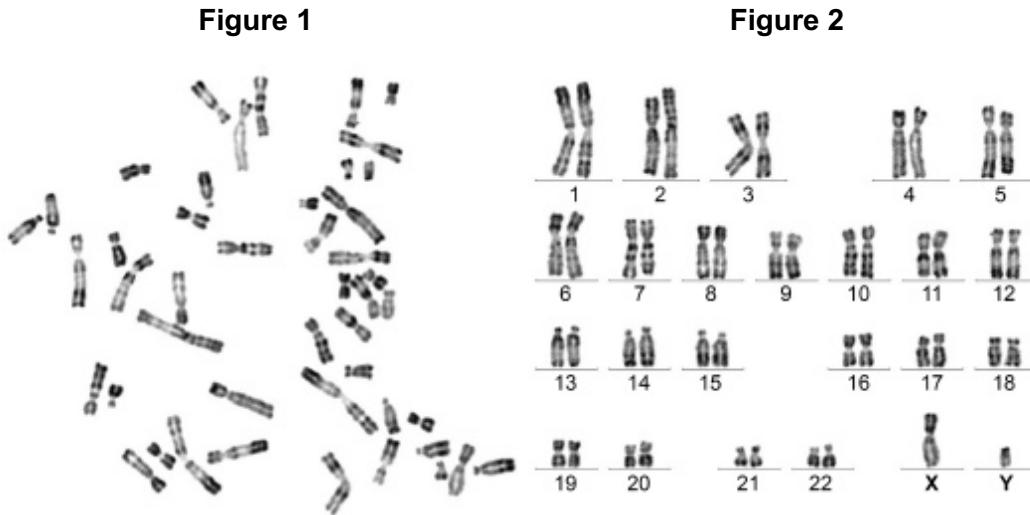
Q6.

- (a) Compare and contrast the DNA in eukaryotic cells with the DNA in prokaryotic cells.

(5)

Q7.

Figure 1 shows all the chromosomes present in one human cell during mitosis. A scientist stained and photographed the chromosomes. In **Figure 2**, the scientist has arranged the images of these chromosomes in homologous pairs.



- (d) The dark stain used on the chromosomes binds more to some areas of the chromosomes than others, giving the chromosomes a striped appearance.

Suggest **one** way the structure of the chromosome could differ along its length to result in the stain binding more in some areas.

(1)

- (e) In **Figure 2** the chromosomes are arranged in homologous pairs. What is a homologous pair of chromosomes?

(1)

