

Q1.

The diagram below shows part of a DNA molecule.



- (a) Name the type of bond between:
 complementary base pairs _____
 adjacent nucleotides in a DNA strand _____ (2)

- (b) The length of a gene is described as the number of nucleotide base pairs it contains.

Use information in above diagram to calculate the length of a gene containing 4.38×10^3 base pairs.

Answer _____ nm (2)

- (c) Describe **two** differences between the structure of a tRNA molecule and the structure of an mRNA molecule.

1 _____

2 _____

_____ (2)

Q3.

- (a) Describe how mRNA is produced from an exposed template strand of DNA.

Do **not** include DNA helicase or splicing in your answer.

(3)

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)

Q5.

(a) What is the proteome of a cell?

(1)

(b) Give **two** structural differences between a molecule of messenger RNA (mRNA) and a molecule of transfer RNA (tRNA).

1. _____

2. _____

(2)

(c) Starting with mRNA in the cytoplasm, describe how translation leads to the production of a polypeptide.

Do **not** include descriptions of transcription and splicing in your answer.

(5)
(Total 8 marks)

Q6.

Table 1 shows mRNA codons and the amino acids coded for by each codon. It also shows some properties of the R group of each amino acid.

Table 1

1st base	2nd base				3rd base
	U	C	A	G	
U	Phe	Ser	Tyr	Cys	U
	Leu		Stop	Stop	C
C	Leu	Pro	His	Arg	A
			Gin		Trp
	Ile	Thr	Asn	Ser	U
			Met	Arg	C
G	Val	Ala	Asp	Gly	A
			Glu		G
					U

Key to the properties of the R group of each amino acid

No overall change
 Positively charged
 Negatively charged

(b) The genetic code is described as degenerate.

What is meant by this? Use an example from **Table 1** to illustrate your answer.

(2)

A scientist investigated changes in the amino acid sequence of a human enzyme resulting from mutations. All these amino acid changes result from single base substitution mutations.

This enzyme is a polypeptide 465 amino acids long.

Table 2 shows the result of three of the base substitutions.

Table 2

Amino acid number	Correct amino acid	Amino acid inserted as a result of mutation
203	Val	Ala
279	Glu	Lys
300	Glu	Lys

- (c) What is the minimum number of bases in the gene coding for this polypeptide?

Answer = _____

(1)

- (c) The table below shows the base sequence of part of a pre-mRNA molecule from a eukaryotic cell.

Complete the table with the base sequence of the DNA strand from which this pre-mRNA was transcribed.

									DNA
A	C	G	C	A	U	U	A	U	pre-mRNA

(1)

- (d) In a eukaryotic cell, the base sequence of the mRNA might be different from the sequence of the pre-mRNA.

Explain why.

(2)

(Total 7 marks)

