2 The Language of Life

Subject Outline terms and phrases	**genetic information, nucleotide, weak bonds, base-pairing, semi-conservative replication, universal, protein synthesis, gene, transcription, translation, mRNA, tRNA, amino acid, ribosome, codon, anticodon, exon, intron, polypeptide**

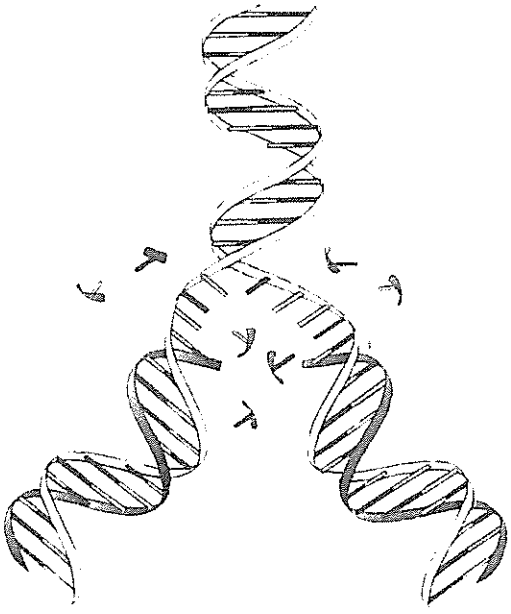
1. DNA is generally described as a double helix. Explain what this term means by referring to the structure of DNA.

2. Explain what is meant by 'Base-pairing rules and method of DNA replication are universal'.

3. Refer to the diagrams at right.

   (a) On the diagram label a **single nucleotide**, the **original DNA strands**, the **position of a weak bond betwe** the **strands of DNA**, and the **new DNA strands.**

   (b) Why is the replication of DNA is called semi-conservative?



   (c) Explain why the replication of DNA is necessary for DNA to carry genetic information from one generation to the next.

4. (a) Why is it that some of the information on a DNA molecule must be 'translated into proteins' in order to direct the activities of the cell?

_____

_____

(b) State the structure and function of a gene.

Structure: _____

Function: _____

5. Explain why the genetic code must be made up of codons that are at least three bases long.

_____

_____

6. What role does each of the following cell components play in protein synthesis?

(a) mRNA? _____

_____

(b) tRNA? _____

_____

(c) ribosomes? _____

_____

7. Complete the following table for human genetic diseases.

Human genetic disease	**Chromosome number on which the gene is located**	**Symptom of disease**
haemophilia		
red-green colourblindness		
Huntington's disease		
cystic fibrosis		
Duchenne muscular dystrophy		
retinitis pigmentosa		

8. Explain the role of codons and anticodons in protein synthesis.

codons: _____

_____

anticodons: _____

_____

9. Complete the following table showing details of transcription and translation.

Process	Site in eukaryotic cells	Molecules involved	Product
Transcription		(1) (2) (3)	
Translation		(1) (2) (3)	

10. Use the words **gene, chromosome, DNA, bases** and **protein** to fill in the gaps in the following sentence:

A segment of _____ on a _____ that contains the complete sequence of _____ required to direct the synthesis of a _____ is called a _____ .

11. Use the genetic code (textbook P16) to complete the following table of codons and anticodons.

DNA			TTA	
mRNA	CUA			
tRNA		GCC		
amino acid	leucine			glycine

12. How could a protein be affected by a change in the base sequence on the DNA ?

_____

_____

_____

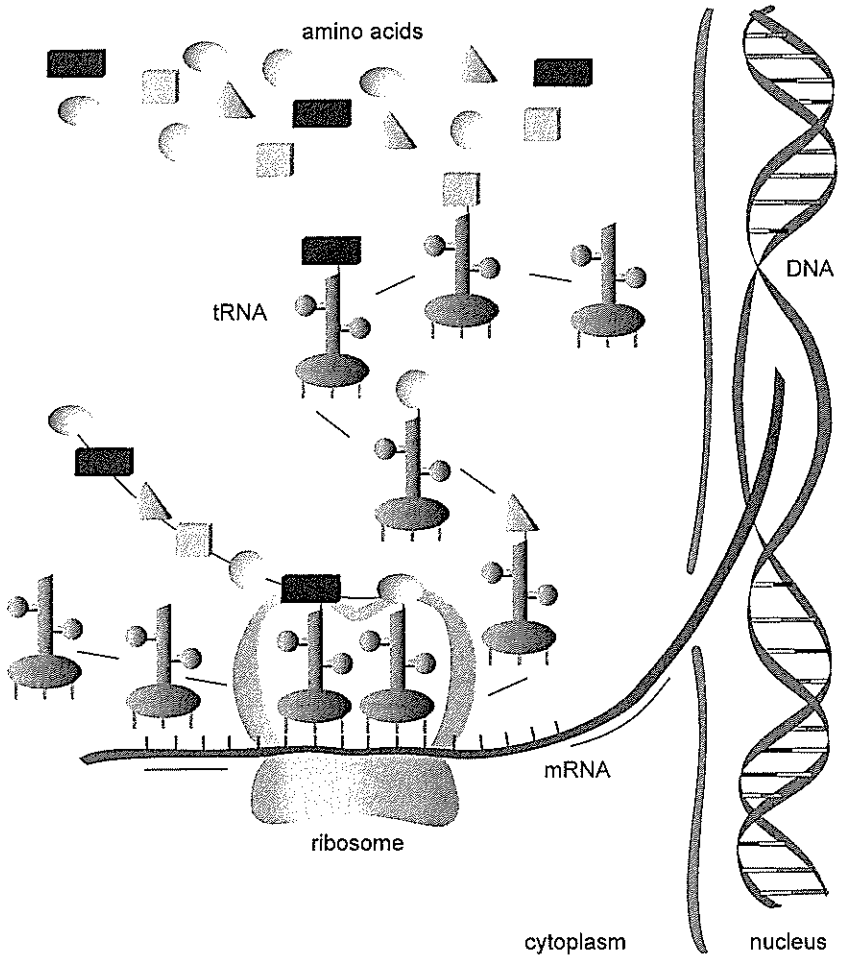
_____

13. Complete the following table showing details of nucleic acids.

Nucleic acid	Overall shape	Bases present	Type of sugar present	Structure formed	Site in the cell
DNA	double helix				
mRNA					
tRNA					
				ribosome	

14. (a) Label each of the following structures on the diagram below.
amino acids, DNA, mRNA, nuclear membrane, ribosomes, tRNA.

(b) On the same diagram, indicate where **transcription** and **translation** are occurring.



15. (a) Distinguish between an **exon** and an **intron.**

(b) Draw a diagram to show the changes that occur in the RNA during the process of producing mature RNA after transcription.