

6 Nucleic acids – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	Write it 3 times (English)		
DNA	_____	_____	_____
gene	_____	_____	_____
protein	_____	_____	_____
RNA	_____	_____	_____
ribose	_____	_____	_____
uracil	_____	_____	_____
Messenger RNA (mRNA) triplets	_____	_____	_____
amino acid	_____	_____	_____
transcription	_____	_____	_____
RNA polymerase	_____	_____	_____
template strand	_____	_____	_____
translation	_____	_____	_____
codons	_____	_____	_____
transfer RNA (tRNA)	_____	_____	_____

English	Write it 3 times (English)		
anticodon	_____	_____	_____
ribosome	_____	_____	_____
peptide bonds	_____	_____	_____
mutation	_____	_____	_____
substitution	_____	_____	_____
deletion	_____	_____	_____
insertion	_____	_____	_____
frameshift	_____	_____	_____

Recall

From Part 1 you know **DNA** is a double helix of paired bases. Here we see how a **gene** is used to build a **protein**.

- A gene is a length of DNA that codes for one polypeptide.
- The information is carried out of the nucleus by **RNA**.

New ideas

Read these first, then do the Practice.

■ 1 RNA and the genetic code

RNA is also made of nucleotides, but it is a **single strand**, its sugar is **ribose**, and it uses **uracil** in place of thymine. **Messenger RNA (mRNA)** RNA carries a copy of a gene out of the nucleus.

The code is read in **triplets** – groups of three bases. Each triplet codes for one **amino acid** (or a start/stop signal). There are 64 triplets but only 20 common amino acids, so most amino acids have more than one triplet.

■ 2 Transcription (in the nucleus)

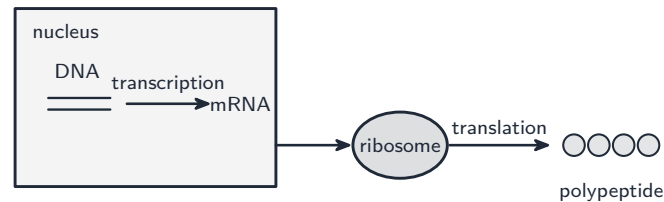
Copying a gene into mRNA is **transcription** :

- the enzyme **RNA polymerase** joins RNA nucleotides that pair with the **template strand** (uracil pairs with adenine).
- the finished mRNA leaves the nucleus.

■ 3 Translation (at the ribosome)

Building the polypeptide from the mRNA is **translation** :

- the mRNA is read in **codons** (each codon is one triplet).
- transfer RNA (tRNA)** RNA brings amino acids; each tRNA has an **anticodon** that pairs with a codon.
- the **ribosome** joins the amino acids with **peptide bonds** .



■ 4 Gene mutations

A **mutation** is a change in the base sequence of DNA. Three types:

- substitution** – one base is swapped; changes at most one amino acid.
- deletion** – a base is removed.
- insertion** – a base is added.

A deletion or insertion shifts how every later triplet is read (a **frameshift**), so it usually changes many amino acids.

original	A	T	G		C	A	T		G	G	A
substitution	A	T	G		C	Ⓢ	T		G	G	A
deletion	T	G	C		A	T	G		G	A	

every triplet shifts

Watch out: transcription (DNA → mRNA) happens in the *nucleus*; translation (mRNA → protein) at the *ribosome*. In RNA, uracil replaces thymine, so A pairs with U. A frameshift (deletion/insertion) changes *many* amino acids; a substitution at most one.

Practice

Try these in order.

6.1 State two ways RNA differs from DNA. [2]

6.2 A triplet (codon) is how many bases? [1]

6.3 Name the process that: (a) copies a gene into mRNA, (b) builds a polypeptide at the ribosome. [2]

6.4 What does a tRNA molecule bring to the ribosome, and what part of it pairs with a codon? [2]

6.5 A substitution changes only one amino acid, but a deletion can change many. Explain why. [2]

6.6 Define a gene mutation. [1]

6.7 Challenge. A DNA template strand reads T–A–C. Write the mRNA codon transcribed from it. [2]