

6 Nucleic acids – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
DNA	脱氧核糖核酸	_____
gene	基因	_____
protein	蛋白质	_____
RNA	核糖核酸	_____
ribose	核糖	_____
uracil	尿嘧啶	_____
Messenger RNA (mRNA)	信使	_____
triplets	三联体	_____
amino acid	氨基酸	_____
transcription	转录	_____
RNA polymerase	聚合酶	_____
template strand	模板链	_____
translation	翻译	_____
codons	密码子	_____
transfer RNA (tRNA)	转运	_____

English	中文	Write it 3 times (English)
anticodon	反密码子	_____
ribosome	核糖体	_____
peptide bonds	肽键	_____
mutation	突变	_____
substitution	替换	_____
deletion	缺失	_____
insertion	插入	_____
frameshift	移码	_____

Recall

From Part 1 you know **DNA** 脱氧核糖核酸 is a double helix of paired bases. Here we see how a **gene** 基因 is used to build a **protein** 蛋白质.

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

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** 核糖, and it uses **uracil** 尿嘧啶 in place of thymine. **Messenger RNA (mRNA)** 信使 RNA carries a copy of a gene out of the nucleus.

The code is read in **triplets** 三联体 — groups of three bases. Each triplet codes for one **amino acid** 氨基酸 (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)

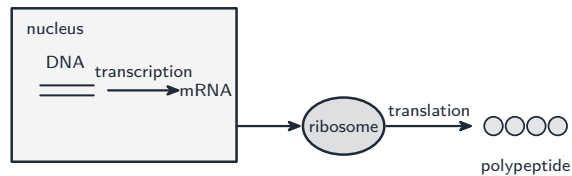
Copying a gene into mRNA is **transcription** 转录:

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

■ 3 Translation (at the ribosome)

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

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



■ 4 Gene mutations

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

- substitution** 替换 — one base is swapped; changes at most one amino acid.
- deletion** 缺失 — a base is removed.
- insertion** 插入 — a base is added.

A deletion or insertion shifts how every later triplet is read (a **frameshift** 移码), 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]
