A-LEVEL BIOLOGY • HOLIDAY HOMEWORK 假期作业

6 Nucleic acids – Part 1

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			
Nucleic acids	核酸			
nucleotides	核苷酸			
phosphate	磷酸			
sugar	糖			
base	碱基			
purines	嘌呤			
pyrimidines	嘧啶			
double helix	双螺旋			
deoxyribose	脱氧核糖			
complementary base pairing	碱基互补配对			
hydrogen bonds	氢键			
antiparallel	反平行			
Replication	复制			
semi-conservative	半保留			
DNA polymerase	聚合酶			

Recall

At IGCSE you met **DNA** 脱氧核糖核酸 as the molecule in the nucleus that carries the genetic information. Now we look at what it is made of and how it is copied.

- DNA is a very long molecule built from small repeating units.
- It can be **copied** exactly, which is how cells pass on their information.

Nothing here is harder than IGCSE — it just adds detail and the right words.

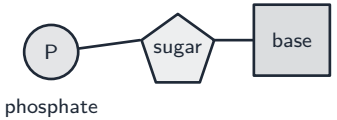
New ideas

Read these first, then do the Practice.

1 Nucleotides

Nucleic acids 核酸 (DNA and RNA) are polymers of **nucleotides** 核苷酸. Each nucleotide has three parts:

- a **phosphate** 磷酸 group,
- a 5-carbon **sugar** 糖,
- a nitrogen-containing **base** 碱基.



There are five bases in two groups: **purines** 嘌呤 (a double ring — adenine, guanine) and **pyrimidines** 嘧啶 (a single ring — cytosine, thymine, uracil).

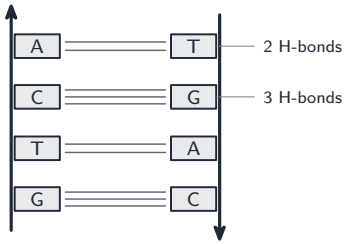
2 The DNA double helix

A DNA molecule is two strands twisted into a **double helix** 双螺旋. Each strand has a backbone of alternating sugar (**deoxyribose** 脱氧核糖) and phosphate.

The two strands are held together by **complementary base pairing** 碱基互补配对:

- A pairs with T (two **hydrogen bonds** 氢键).
- C pairs with G (three hydrogen bonds).

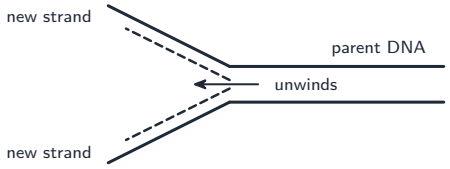
The strands run in opposite directions — they are **antiparallel** 反平行.



■ 3 DNA replication

Replication 复制 (copying) is **semi-conservative** 半保留: each new molecule keeps **one old strand and one new strand**.

1. the helix unwinds and the hydrogen bonds break, so the strands separate.
2. each old strand is a template; free nucleotides pair with the exposed bases.
3. the enzyme **DNA polymerase** 聚合酶 joins the new nucleotides into a strand.



Watch out: A pairs with T (two hydrogen bonds), C pairs with G (three). The strands are *antiparallel*. Replication is *semi-conservative* — each new molecule keeps *one* old strand and one new strand.

Practice

Try these in order.

6.1 Name the three parts of a nucleotide. [3]

6.2 In DNA, which base pairs with (a) adenine, (b) cytosine? [2]

6.3 A C–G base pair is held by three hydrogen bonds; an A–T pair by two. Which pair is harder to separate? [1]

6.4 What is meant by saying the two DNA strands are *antiparallel*? [1]

6.5 Explain why DNA replication is described as *semi-conservative*. [2]

6.6 Name the enzyme that joins new nucleotides together during replication. [1]

6.7 Challenge. One strand of DNA reads A–T–G–C–C. Write the base sequence of the complementary strand. [2]