

Inheritance

IGCSE Biology ■ Topic 17

IGCSE Biology



What we will cover

1 Chromosomes, genes & DNA

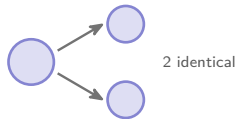
2 Sex determination

3 Making a protein

4 Mitosis vs meiosis

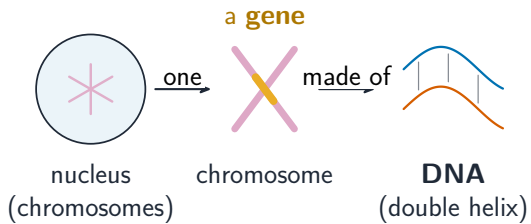
5 Inheritance key words

6 Monohybrid crosses



mitosis vs meiosis

Chromosomes, genes and DNA



DNA

carries the genetic code

Sex determination

mother **XX** × father **XY**

father

X

Y

X

XX

XY

1 : 1

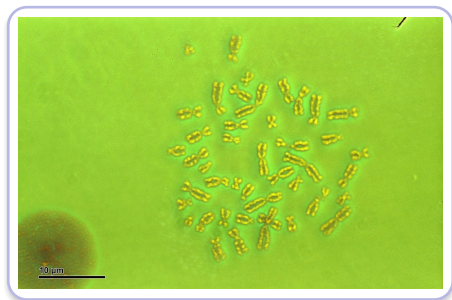
mother

X

XX

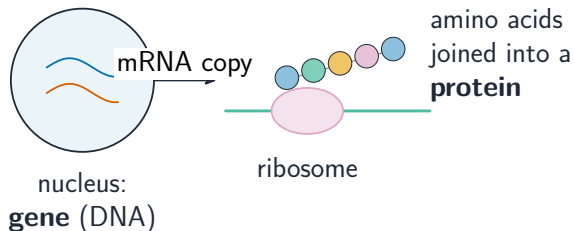
XY

girls (XX, purple)
boys (XY, blue)



Chromosomes package DNA in pairs

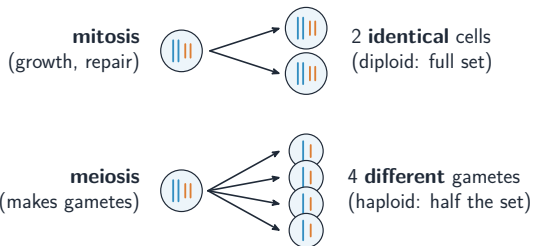
Making a protein



A gene's **base sequence** 碱基序列 sets the amino-acid order.

- **mRNA** 信使 RNA copies the gene
- a **ribosome** 核糖体 reads it
- amino acids join into the protein

Mitosis vs meiosis



- **mitosis** 有丝分裂 – 2
identical **diploid** 二倍体 cells;
growth & repair
- **meiosis** 减数分裂 – 4
different **haploid** 单倍体
gametes 配子

Inheritance key words

BB → brown eyes

Bb → brown eyes

bb → blue eyes

B (brown) is dominant

b (blue) is recessive

- **genotype** 基因型 – the alleles;
phenotype 表现型 – what you see
- **dominant** 显性 (B) shows with one copy
- **recessive** 隐性 (b) needs two
- **homozygous** 纯合子 BB/bb;
heterozygous 杂合子 Bb

Monohybrid crosses

Bb × **Bb** (both parents)

gametes

	B	b
B	BB	Bb
b	Bb	bb

3 : 1

3 dominant (blue)

1 recessive (orange)

A **Punnett square** 庞纳特方格 predicts the offspring.

■ **Bb** × **Bb** → **3:1**

■ **Bb** × **bb** → **1:1**

A **test cross** 测交 (against **bb**) reveals an unknown genotype.

Codominance and sex linkage

codominance 共显性

both alleles show: $I^A I^B \rightarrow$
blood group 血型 AB

sex linkage 伴性遗传

a gene on the X; **colour blindness** 色盲 is commoner in boys

Worked example – a monohybrid cross

In peas, **T** (tall) is dominant to **t** (dwarf). Two heterozygous tall plants are crossed. Give the offspring ratio.

- Heterozygous tall $\Rightarrow$ both parents are **Tt**.
- Each parent makes two kinds of gamete: **T** and **t**.
- Fill in every combination (the square, right).
- Genotypes: **1 TT : 2 Tt : 1 tt**.
- **TT** and **Tt** both **look** tall, so phenotypes are **3 tall : 1 dwarf**.

	T	t
T	TT	Tt
t	Tt	tt

Only **tt** is dwarf: **1 in 4**.

Show the **parent genotypes**, the **gametes**, then the square. A recessive phenotype needs **both** recessive alleles.

Topic 17 – key takeaways

1

Genes

a gene codes for a protein; alleles are forms

2

Division

mitosis identical; meiosis halves & varies

3

Dominant

shows with one copy; recessive needs two

4

Crosses

$Bb \times Bb \rightarrow 3:1$; $Bb \times bb \rightarrow 1:1$

Check yourself

- 1 What does a gene code for?
- 2 Which gamete decides a baby's sex?
- 3 What does meiosis make?
- 4 What ratio does $Bb \times Bb$ give?



Answers 1. one protein 2. the sperm 3. four different haploid gametes 4. 3:1