

Exercise walk-through

Meiosis ■ 5.1

eXercise

You must be able to

- describe **meiosis** 减数分裂 producing four **haploid** 单倍体 gametes
- contrast meiosis with mitosis
- explain the reduction from diploid to haploid

Method — What meiosis does

Meiosis makes **gametes** (sex cells). One **diploid** ($2n$) cell divides **twice** to make **four** **haploid** (n) cells, each with **half** the chromosome number.

Method — Two divisions

- **Meiosis I** separates **homologous pairs** (halving the chromosome number).
- **Meiosis II** separates sister chromatids (like mitosis).

Method — Meiosis vs mitosis

- **Mitosis** — one division, two identical **diploid** cells (growth/repair).
- **Meiosis** — two divisions, four genetically varied **haploid** cells (reproduction).

Method — Restoring diploidy

At fertilization, two haploid gametes fuse to restore the **diploid** number — which is why gametes must be haploid.

Practice 2.1 ■ 2 marks

How many cells does one meiosis produce, and are they haploid or diploid?

Solution 2.1

Method: What meiosis does

Worked steps

Four cells; haploid **B1** **B1**.

Practice 2.2 ■ 1 mark

What is separated in meiosis I?

Solution 2.2

Worked steps

Homologous pairs of chromosomes **B1**.

Practice 2.3 ■ 1 mark

State one difference between meiosis and mitosis.

Solution 2.3

Worked steps

Any one: meiosis has two divisions / makes four haploid varied cells vs mitosis' one division making two identical diploid cells **B1**.

Exam-style 3.1 ■ 1 mark

Meiosis produces gametes that are

A diploid and identical

B haploid and varied

C diploid and varied

D haploid and identical

Solution 3.1

Method: What meiosis does

A diploid and identical

B haploid and varied 

C diploid and varied

D haploid and identical

Worked steps

B — haploid and varied.

Exam-style 3.2 ■ 1 mark

A diploid cell with 8 chromosomes undergoes meiosis.

- (a) How many chromosomes will each gamete have?
- (b) Explain why gametes must be haploid.

Solution 3.2

Method: What meiosis does

Worked steps

(a) 4 chromosomes **B1**. (b) At fertilization two gametes fuse; if they were diploid the chromosome number would double each generation, so they must be haploid to keep it constant **M1 A1**.

Exam-style 3.3 ■ 3 marks

Compare the products of mitosis and meiosis in terms of number, ploidy, and variation.

Solution 3.3

Method: Two divisions

Worked steps

Mitosis: 2 cells, diploid, genetically identical; meiosis: 4 cells, haploid, genetically varied **M1** **M1** **A1**.