Exercise walk-through

Cell Cycle ▪ 4.5

eXercise

You must be able to

- name the phases (**interphase** 间期: G1, S, G2; then **mitosis** 有丝分裂 and cytokinesis)
- state what happens in each phase
- explain that DNA is copied in S phase

Method — The phases

The cell cycle is **interphase** followed by division:

- **G1** — the cell grows and does its normal work.
- **S** — DNA is **replicated** (copied).
- **G2** — the cell grows more and prepares to divide.
- **Mitosis (M)** — the nucleus divides; then **cytokinesis** splits the cell.

Method — DNA copied in S

The genetic material is copied during **S phase**, so each new cell gets a full copy. After S, the cell has double the DNA until it divides.

Method — Mitosis divides the nucleus

Mitosis separates the copied chromosomes into two identical nuclei; cytokinesis then splits the cytoplasm into two cells.

Method — A worked link

A cell that has just finished S phase has twice its normal DNA; after mitosis and cytokinesis, each daughter cell has the normal amount again.

Practice 2.1 ▪ 1 mark

In which phase is DNA replicated?

Solution 2.1

Worked steps

S phase B1.

Practice 2.2 ▪ 1 mark

What happens during G1?

Solution 2.2

Worked steps

The cell grows and carries out its normal functions B1.

Practice 2.3 ▪ 1 mark

What does cytokinesis do?

Solution 2.3

Method: The phases

Worked steps

It divides the cytoplasm, splitting the cell into two B1.

Exam-style 3.1 ▪ 1 mark

DNA replication occurs during

A G1

B S phase

C G2

D mitosis

Solution 3.1

A G1

B S phase ✓

C G2

D mitosis

Worked steps

B — S phase.

Exam-style 3.2 ▪ 1 mark

A cell completes S phase.
(a) State how its amount of DNA compares to before S phase.
(b) Explain what mitosis and cytokinesis then achieve.

Solution 3.2

Method: A worked link

Worked steps

(a) It has doubled B1. (b) Mitosis separates the copied chromosomes into two identical nuclei, and cytokinesis splits the cytoplasm, producing two identical daughter cells M1 M1 A1.

Exam-style 3.3 ▪ 2 marks

Explain why DNA must be copied before mitosis, not after.

Solution 3.3

Worked steps

Each daughter cell needs a full copy of the DNA; copying it first (in S) ensures there are two complete sets for mitosis to separate M1 A1.