

4.5 Cell Cycle

Name: _____ Class: _____ Date: _____

Total: 10 marks**KEY WORDS** mitosis 有丝分裂 • cell cycle 细胞周期 • interphase 间期

Objective

Build the skills to answer exam questions on the **cell cycle**.**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

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ 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.

■ 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.

■ Mitosis divides the nucleus

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

■ 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.

2 Practice

Now apply the methods above.

2.1 In which phase is DNA replicated? [1]**2.2** What happens during G1? [1]**2.3** What does cytokinesis do? [1]

3 Exam-style questions

3.1 DNA replication occurs during [1]

- A** G1
- B** S phase
- C** G2
- D** mitosis

3.2 A cell completes S phase.

(a) State how its amount of DNA compares to before S phase. [1]

(b) Explain what mitosis and cytokinesis then achieve. [3]

3.3 Explain why DNA must be copied before mitosis, not after. [2]

Solutions

2.1 S phase.

2.2 The cell grows and carries out its normal functions.

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

3.1 B — S phase.

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

3.3 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.