

# 5 Chromosomes and mitosis – Part 2

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) |       |       |
|-----------------------|--------|----------------------------|-------|-------|
| sister chromatids     | 姐妹染色单体 | _____                      | _____ | _____ |
| centromere            | 着丝粒    | _____                      | _____ | _____ |
| mitosis               | 有丝分裂   | _____                      | _____ | _____ |
| genetically identical | 基因相同   | _____                      | _____ | _____ |
| daughter cells        | 子细胞    | _____                      | _____ | _____ |
| multicellular         | 多细胞    | _____                      | _____ | _____ |
| asexual reproduction  | 无性生殖   | _____                      | _____ | _____ |
| prophase              | 前期     | _____                      | _____ | _____ |
| nuclear envelope      | 核膜     | _____                      | _____ | _____ |
| spindle               | 纺锤体    | _____                      | _____ | _____ |
| metaphase             | 中期     | _____                      | _____ | _____ |
| equator               | 赤道     | _____                      | _____ | _____ |
| anaphase              | 后期     | _____                      | _____ | _____ |
| poles                 | 两极     | _____                      | _____ | _____ |
| telophase             | 末期     | _____                      | _____ | _____ |

| English     | 中文   | Write it 3 times (English) |
|-------------|------|----------------------------|
| cytokinesis | 胞质分裂 | _____                      |
| tumour      | 肿瘤   | _____                      |

## Recall

From Part 1 you know a chromosome becomes two **sister chromatids** 姐妹染色单体 joined at the **centromere** 着丝粒 after copying. Here we watch how they are shared out in **mitosis** 有丝分裂.

- Mitosis makes two new cells that are **genetically identical** 基因相同 to the parent.
- At IGCSE you saw cells dividing in a root tip.

## New ideas

Read these first, then do the Practice.

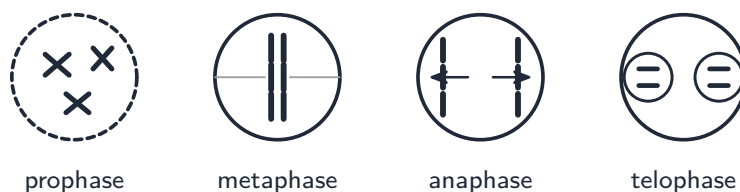
### ■ 1 Why mitosis matters

**Mitosis** 有丝分裂 makes two **daughter cells** 子细胞 with exactly the same genes as the parent. It is used for:

- **growth** of a **multicellular** 多细胞 organism (more cells).
- **repair** and **replacement** of damaged cells.
- **asexual reproduction** 无性生殖 (one parent, identical offspring).

### ■ 2 The four stages of mitosis

| Stage                  | What happens                                                                                                   |
|------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>prophase</b><br>前期  | chromosomes coil up and become visible; the <b>nuclear envelope</b> 核膜 breaks down; a <b>spindle</b> 纺锤体 forms |
| <b>metaphase</b><br>中期 | chromosomes line up along the middle (the <b>equator</b> 赤道)                                                   |
| <b>anaphase</b><br>后期  | the centromeres split; sister chromatids are pulled to opposite <b>poles</b> 两极                                |
| <b>telophase</b><br>末期 | a nuclear envelope forms around each set, making two nuclei                                                    |

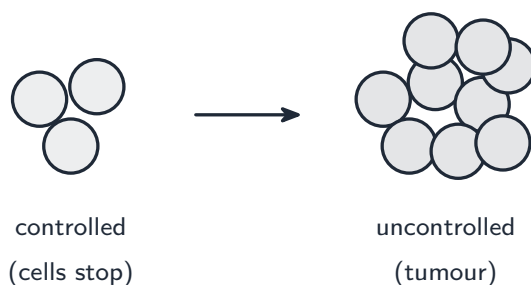


A simple way to remember the order: **P**rophase, **M**etaphase, **A**naphase, **T**elophase (“PMAT”).

### ■ 3 Cytokinesis and uncontrolled division

After telophase, **cytokinesis** 胞质分裂 splits the rest of the cell into two identical daughter cells.

The cell cycle is normally tightly controlled. If control is lost, a cell may divide again and again to form a lump of cells — a **tumour** 肿瘤.



**Watch out:** mitosis makes two *genetically identical* daughter cells; the stage order is PMAT (prophase → metaphase → anaphase → telophase). A tumour forms when the *control* of the cell cycle is lost — not from normal mitosis.

## Practice

Try these in order.

**5.1** State two uses of mitosis in the body.

[2]

**5.2** The two daughter cells made by mitosis are described as *genetically identical*. What does this mean?

[1]

**5.3** Name the stage of mitosis in which: (a) chromosomes line up at the equator, (b)

sister chromatids are pulled to opposite poles. [2]

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**5.4** During prophase, two things happen to prepare for division. State them. [2]

**5.5** What is the name of the process that splits the rest of the cell after mitosis? [1]

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**5.6** Explain how a tumour forms. [2]

**5.7 Challenge.** Mitosis normally makes genetically identical cells, yet a tumour keeps growing. Explain why a tumour still uses mitosis but is harmful. [2]

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