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
prophase 前期	chromosomes coil up and become visible; the **nuclear envelope** 核膜 breaks down; a **spindle** 纺锤体 forms
metaphase 中期	chromosomes line up along the middle (the **equator** 赤道)
anaphase 后期	the centromeres split; sister chromatids are pulled to opposite **poles** 两极
telophase 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]

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]

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]