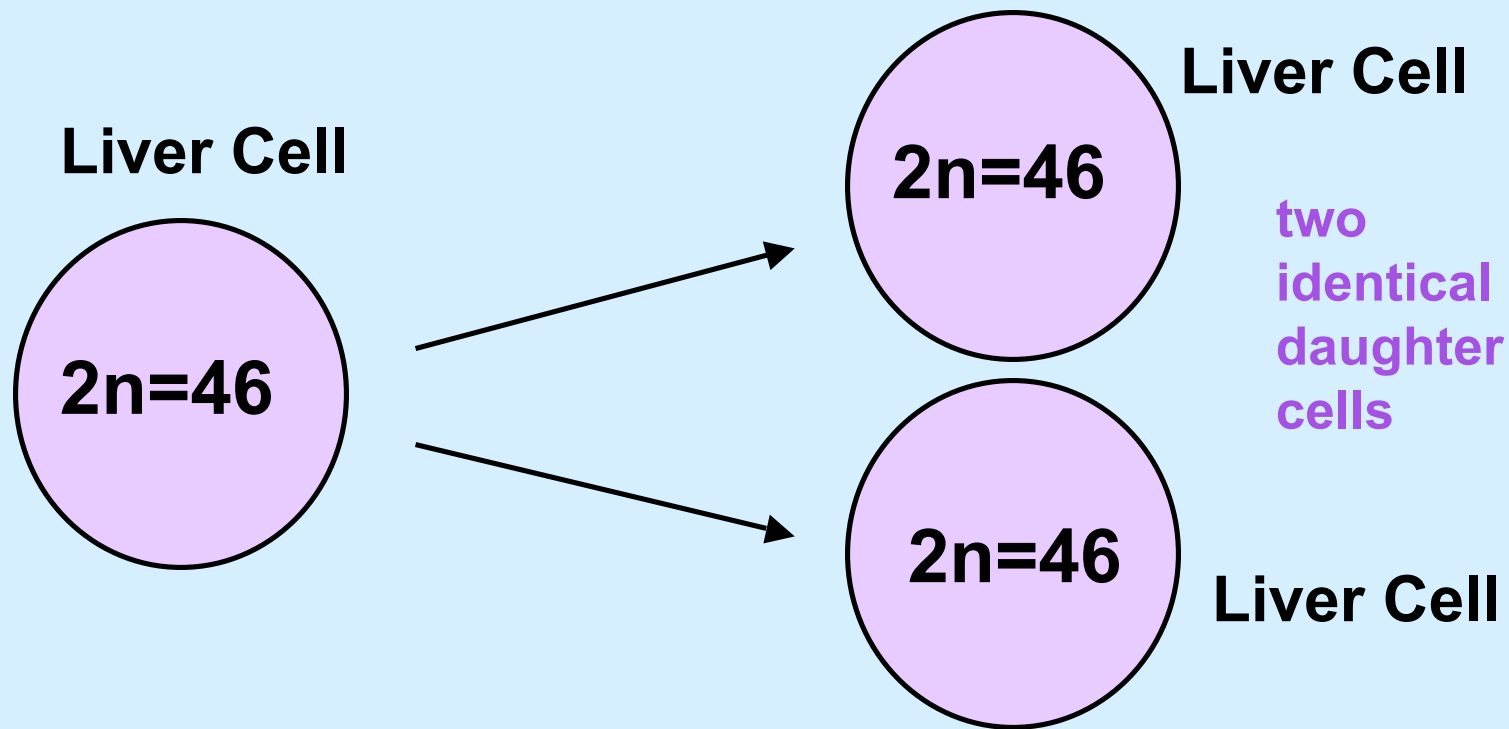


MITOSIS

Mitosis



Somatic Reproduction

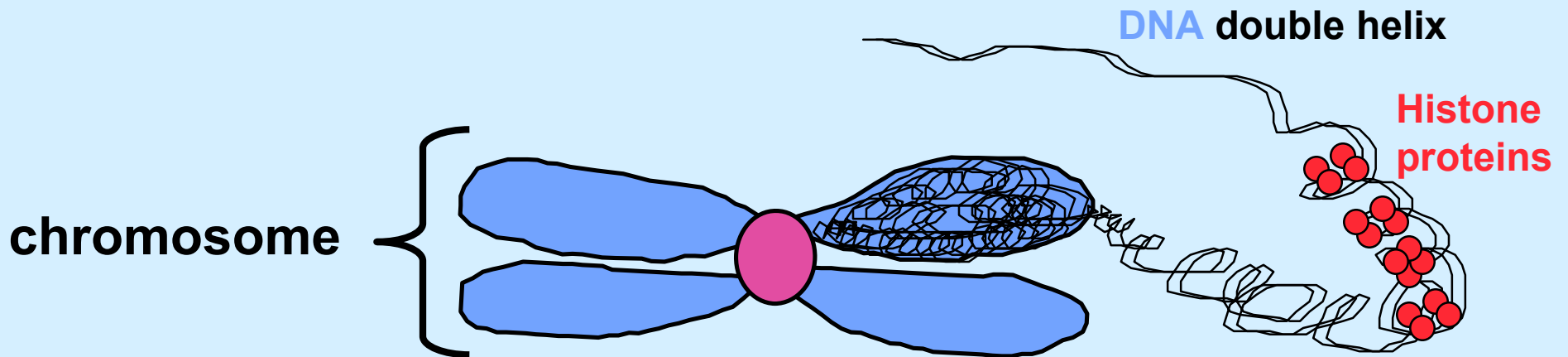
- Most eukaryotic cells reproduce asexually by **mitosis**.
- **Somatic cells** are all **body cells (like nerve, liver, etc...)** except sperm and ova (egg).
- All Somatic cells have the same number of **chromosomes**.

Question:

- What is a **chromosome**?

Answer:

- A **chromosome** is made up of a **DNA - histone protein** complex called **chromatin**.
- **Chromatin** is a long, thin fiber that is folded and coiled to form **chromosomes**.

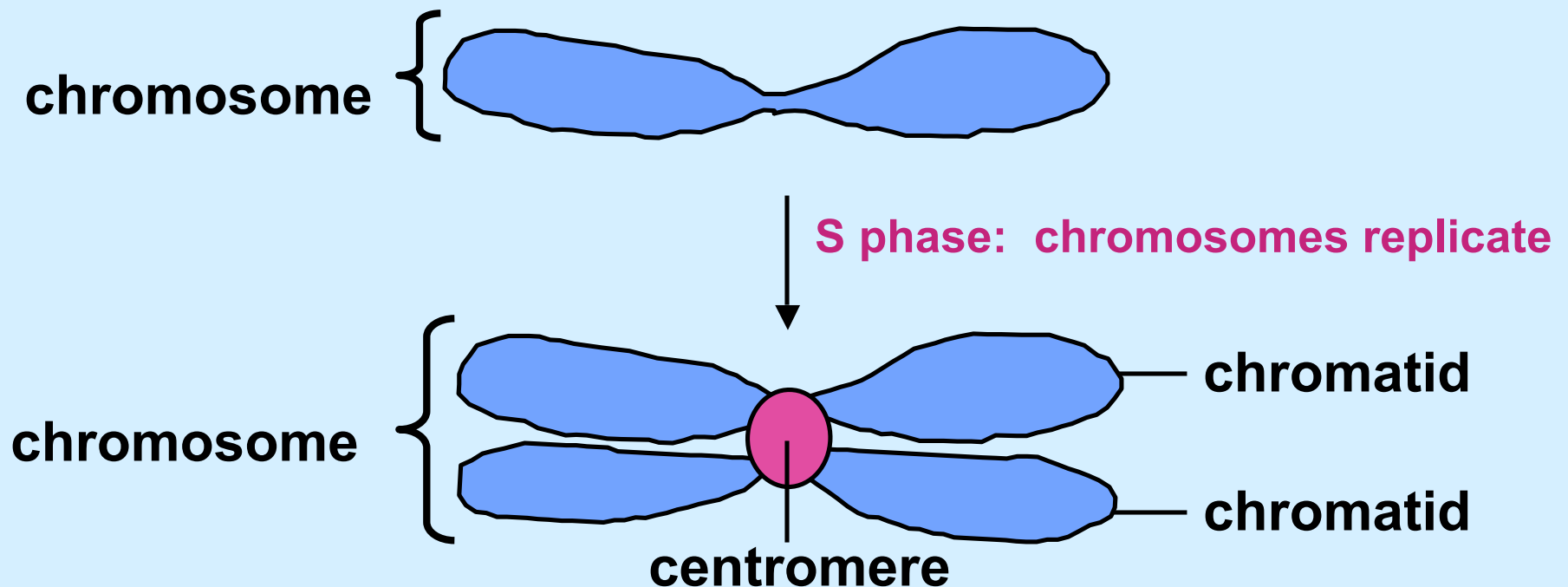


Question:

- What is a replicated **chromosome**?

Answer:

- A replicated **chromosome** consist of two strands of identical chromosomal material called **chromatids (sister chromatids)**.

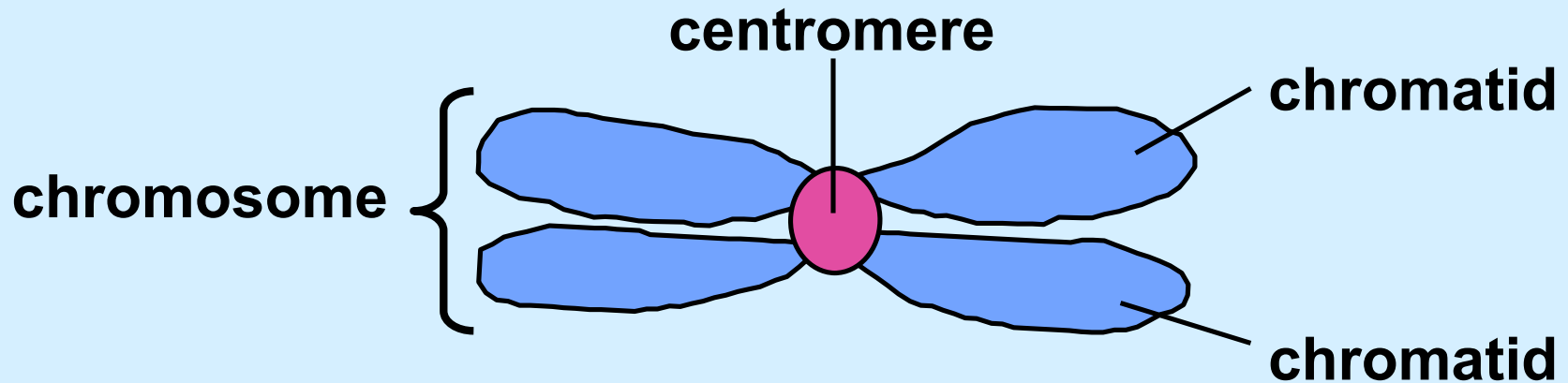


Question:


- When is a chromatid a chromatid?

Answer:

- A **chromatid** is a **chromatid** as long as it is held in association with a **sister chromatid** at the **centromere**.

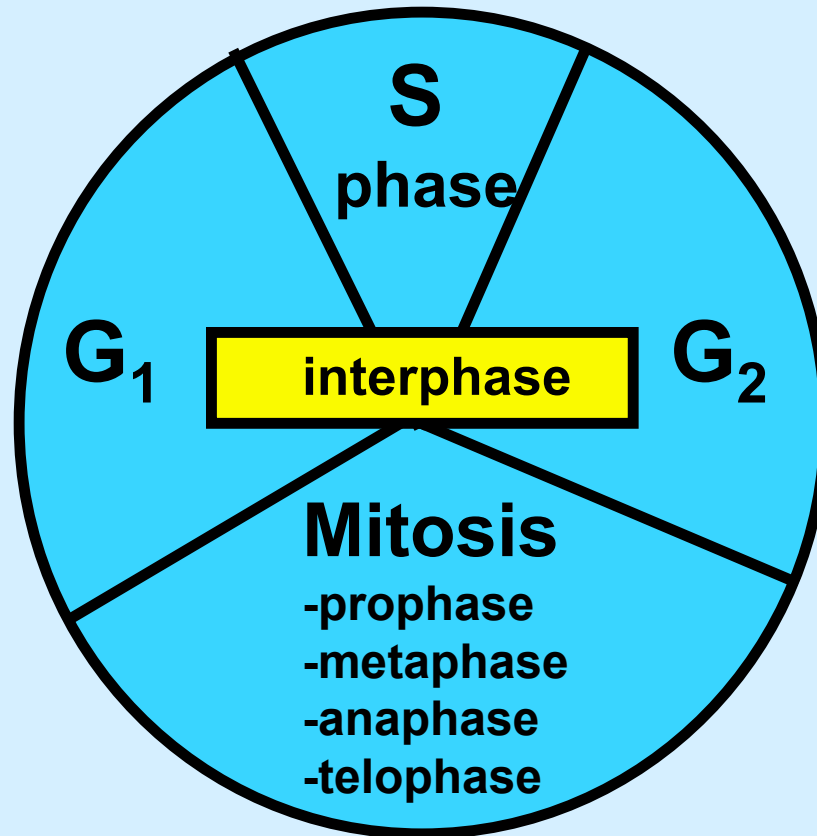


Cell Cycle

- The **dividing** and **non-dividing** stages in the life of a cell.
- **Phases:**
 1. **Interphase:** growth and DNA replication
 2. **Prophase**
 3. **Metaphase**
 4. **Anaphase**
 5. **Telophase**

Mitotic division

Cell Cycle



Interphase

1. G₁ (gap) phase:

- a. protein synthesis and metabolic activities.

2. S phase:

- a. **DNA replication** takes place.

3. G₂ (gap) phase:

- a. Cellular growth and preparation for **M phase**.

Mitotic Phase

- **Mitosis**
 - a. **nuclear** division of **genetic material**.
 - b. **prophase-metaphase-anaphase-telophase**
- **Cytokinesis**
 - a. **cytoplasmic division**.
 - b. Indicator of telophase.

Prophase

- **Longest phase**
- Nucleolus disappears
- Chromatin material condenses into **chromosomes**, consisting of two **sister chromatids**.

Prophase

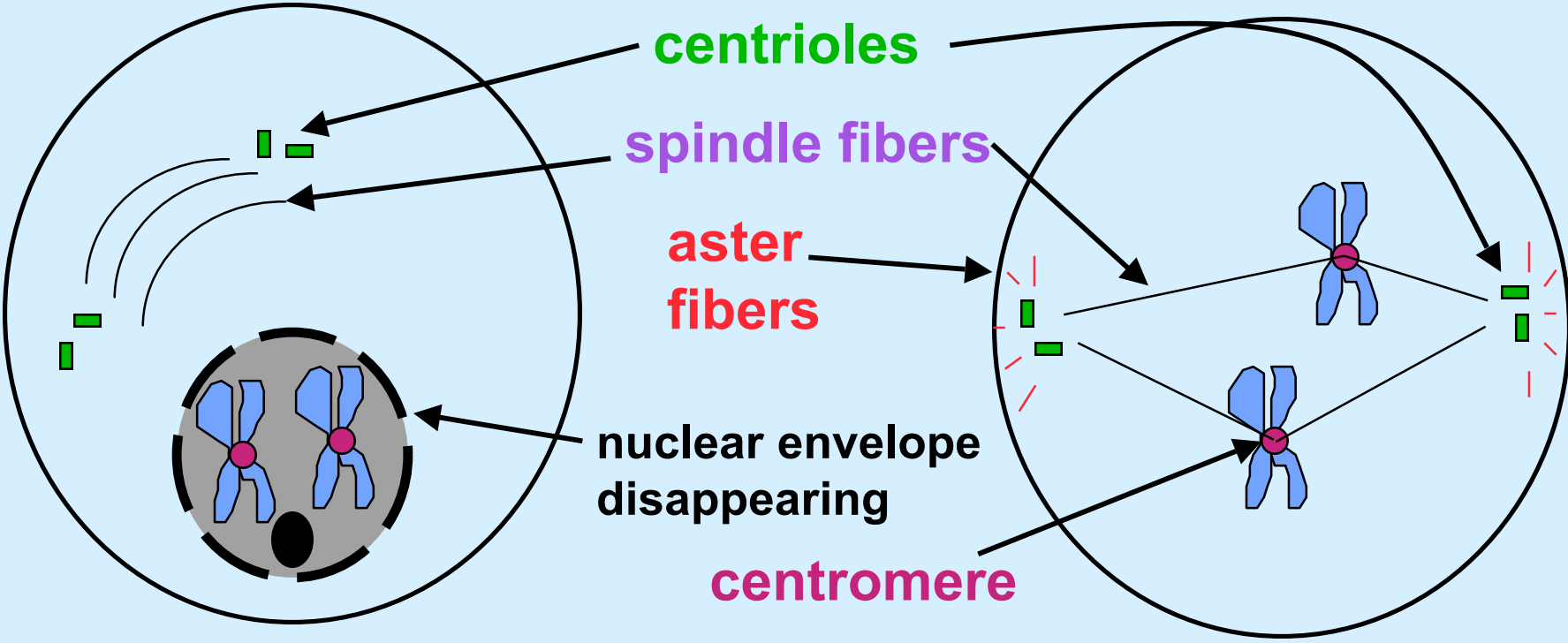
- **Centrioles** move apart (not found in plants).
- **Spindle fibers** form and attach from **centrioles** to **centromeres by kinetochores**.
- Nuclear envelope fragments and disappears.

Prophase

early prophase



late prophase



centrioles

spindle fibers

aster
fibers

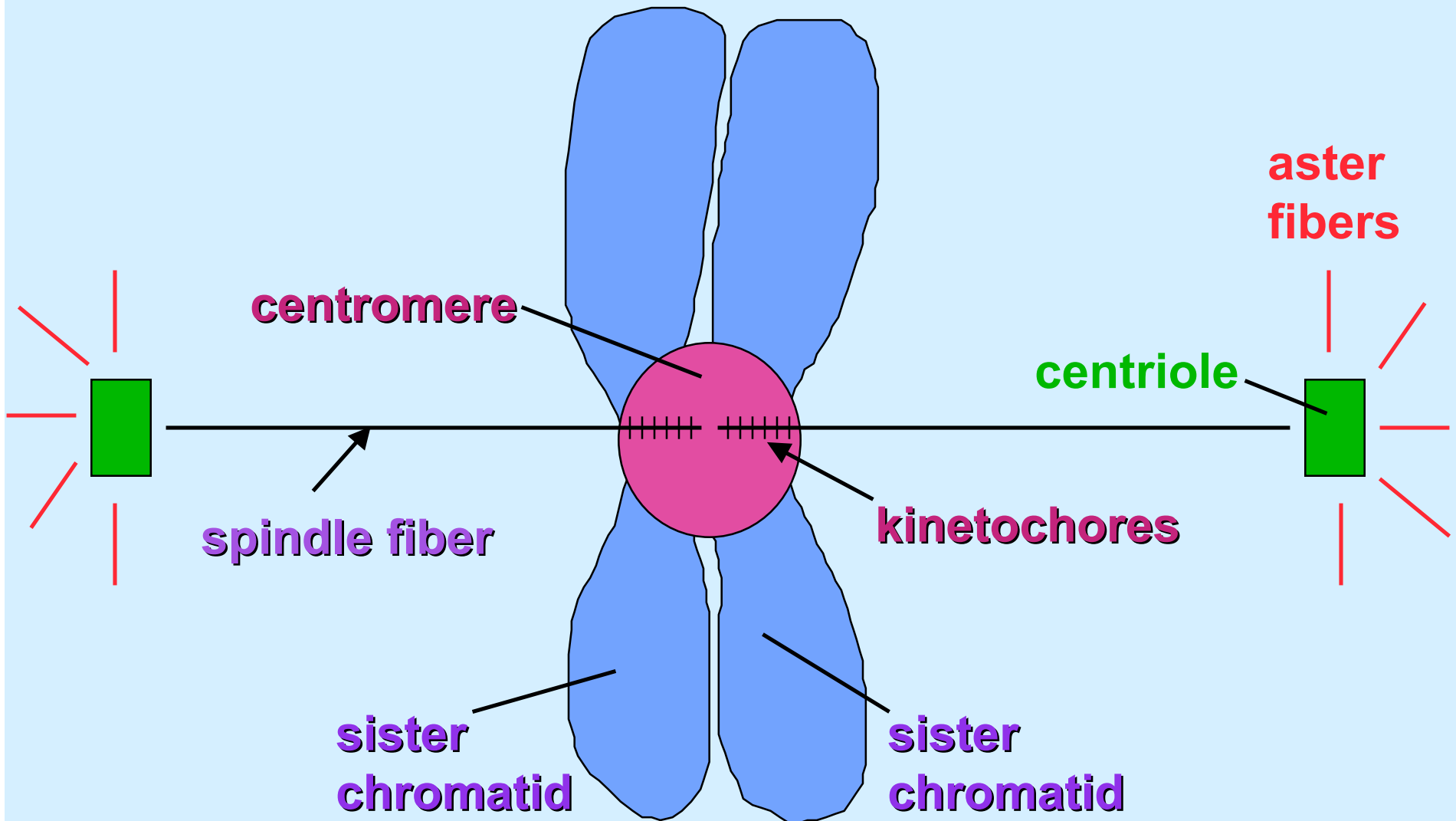
nuclear envelope
disappearing

centromere

Question:

- What attaches the spindle fibers to the centromeres?

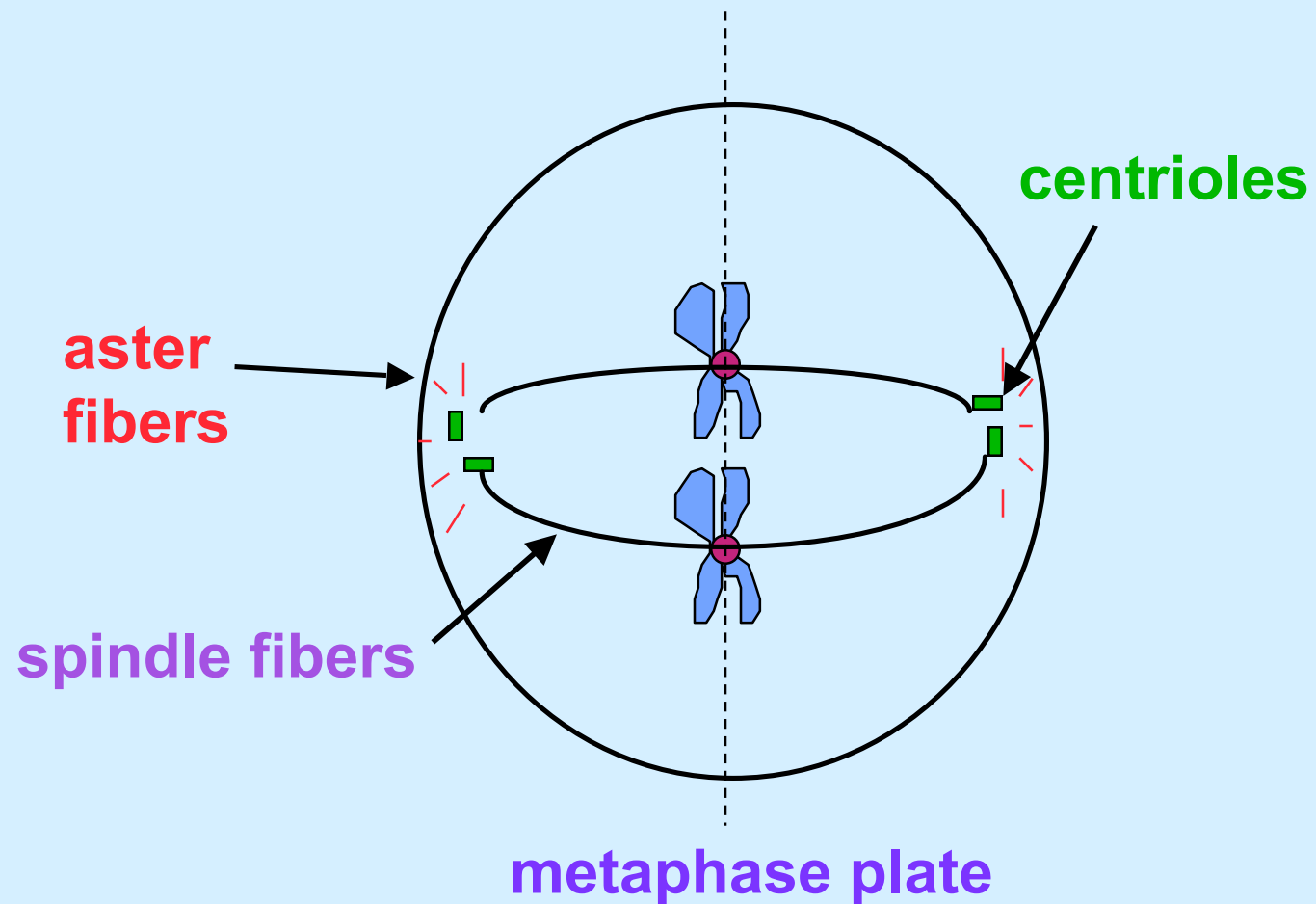
Answer: Kinetochores



Metaphase

- **Shortest phase**
- **Centrioles** are at opposite ends of the cell and attached with **aster fibers**.
- **Chromosomes** move to the **metaphase plate** (**equatorial plate** - center of cell).

Metaphase



Anaphase

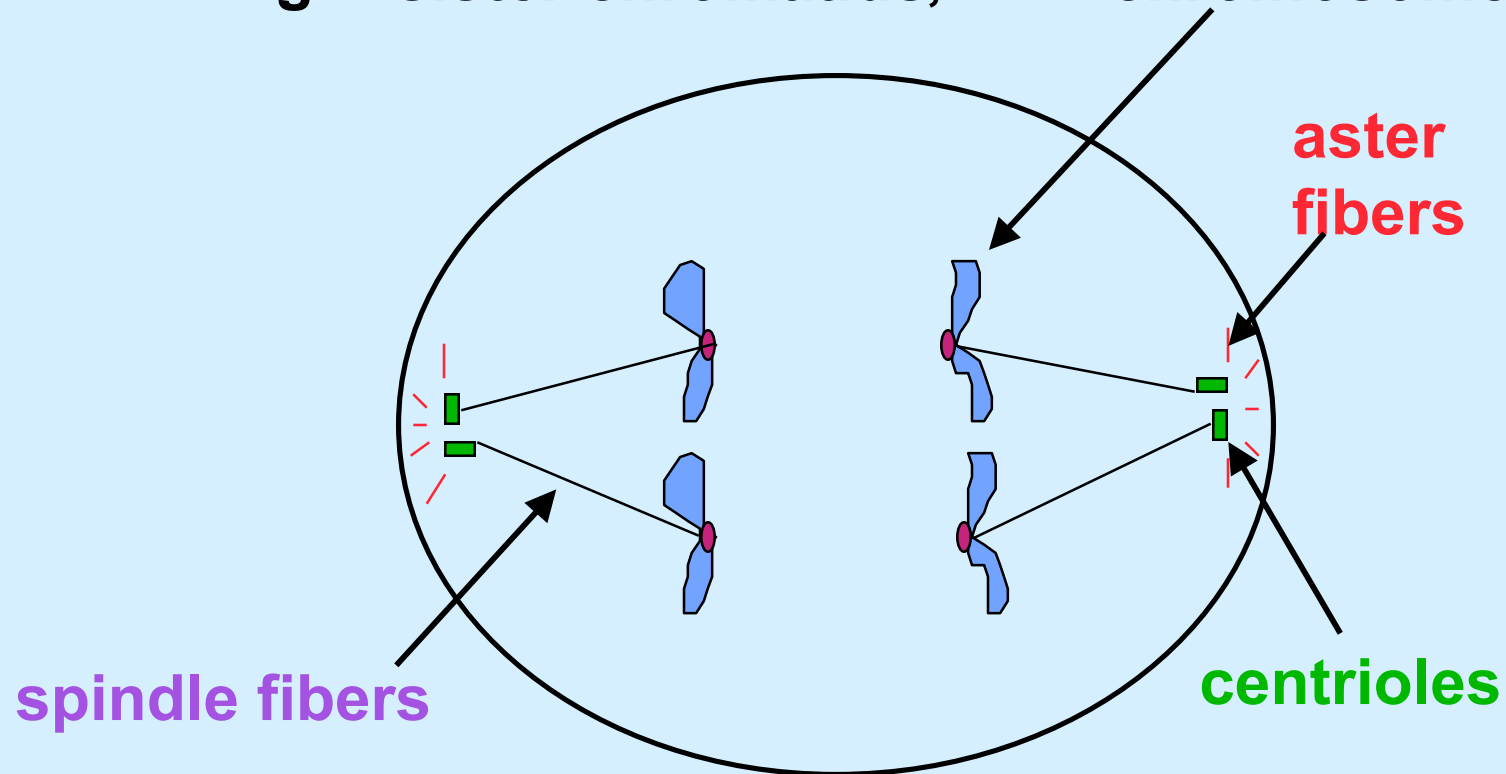
- **Centromeres** uncouple and **spindle fibers** shorten.
- **Sister chromatids** separate and move apart.
- After separation, **chromatids** are now considered **chromosomes**.

Anaphase

- During this phase, the cell contains twice the normal number of **chromosomes**.
- Cell begins to **elongate**.
- At the end, there are equal numbers of **chromosomes** at the poles.

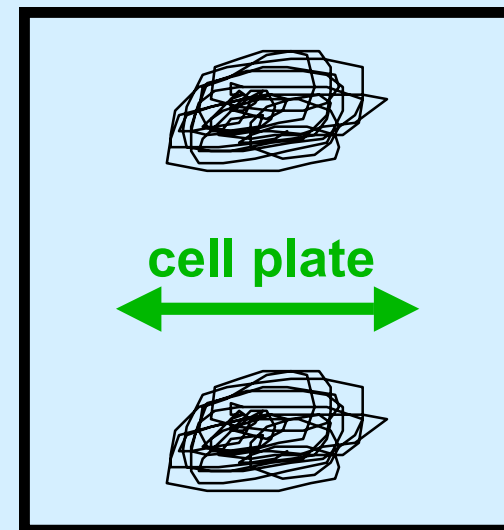
Anaphase

No longer **sister chromatids**, now **chromosomes**



Telophase

- Cleavage **furrow** develops in animal cells (**Cytokinesis** begins).
- **Cell plate** develops in **plants** (no cleavage furrows in plants).
- Nucleolus reappears.

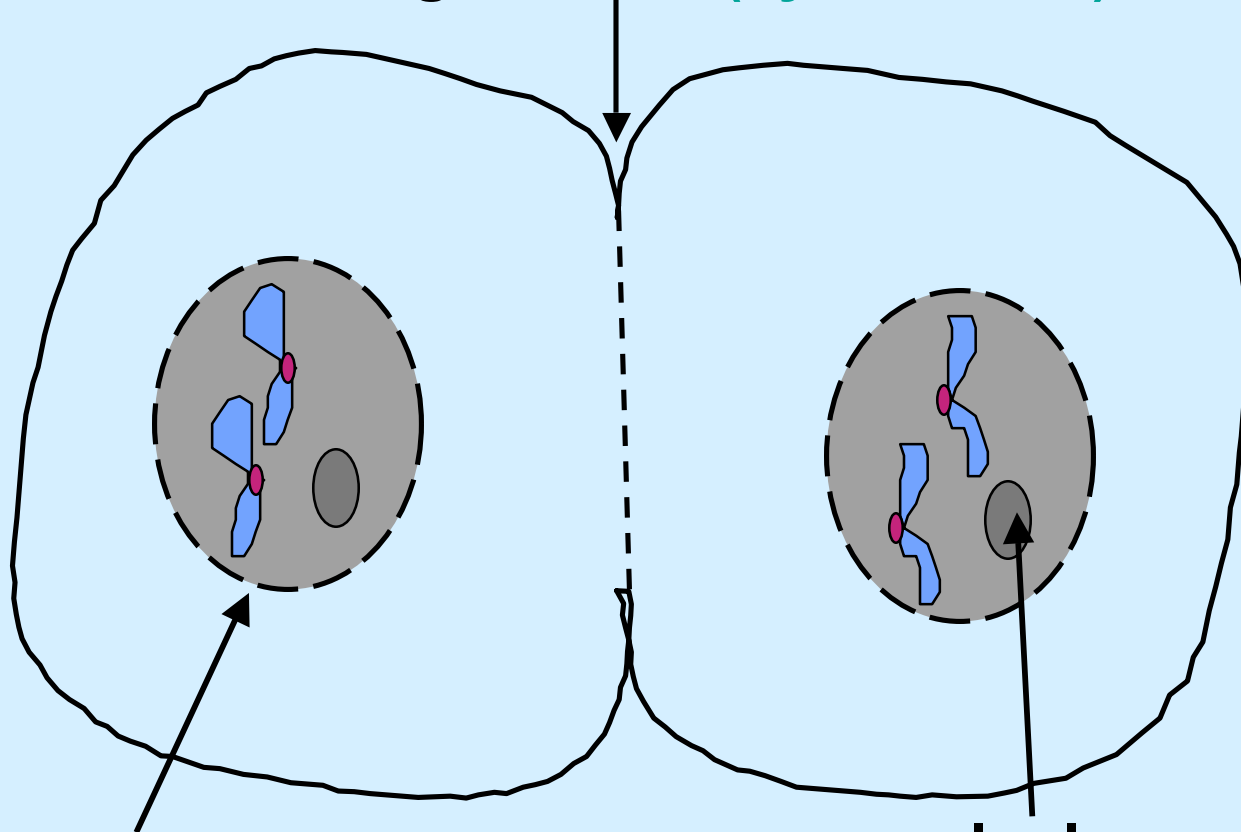


Telophase

- Nuclear membrane reappears.
- **Chromosomes** uncoil.
- In the end, two genetically identical nuclei are present.

Telophase

cleavage furrow (cytokinesis)



nuclear membrane reforming

nucleolus reappears

Cytokinesis

- **Cytoplasmic division**
- **Cell plate forms in plants**

Question:

- A cell containing **20 chromosomes** at the beginning of mitosis would, at its completion, produce cells containing how many **chromosomes each**?

Answer:

- **20 chromosomes**

Question:

- A cell containing **40 chromatids** at the beginning of mitosis would, at its completion, produce cells containing how many **chromosomes each**?

Answer:

- **20 chromosomes**