Cell division
Mitosis and the cell cycle

Key Knowledge

Cell replication

Mitosis and cytokinesis

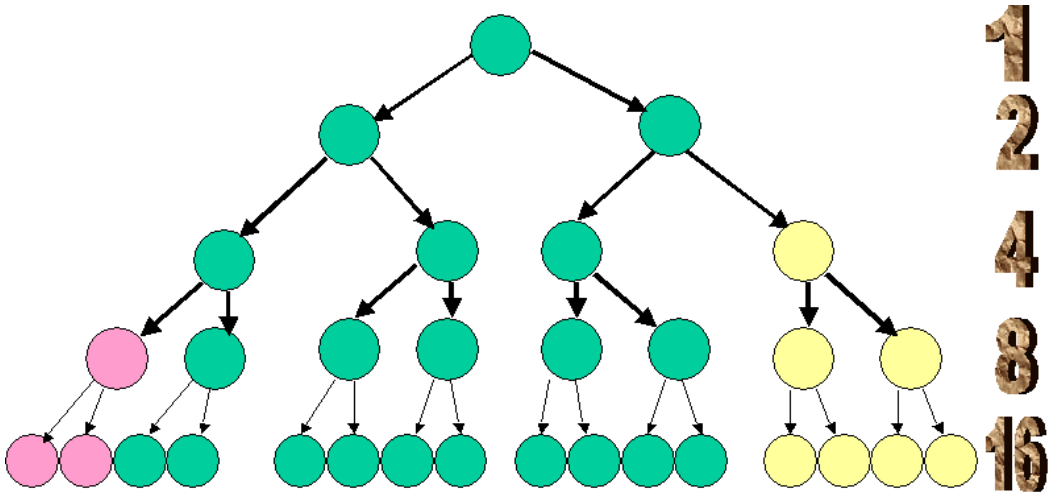
Cell growth

Cell division

Cell Replication

This refers to the process of producing new cells from old ones.

How many cells would be formed from 1 cell after 6 replication?



Cell Replication
Cell Replication

Why do cells need to replicate?

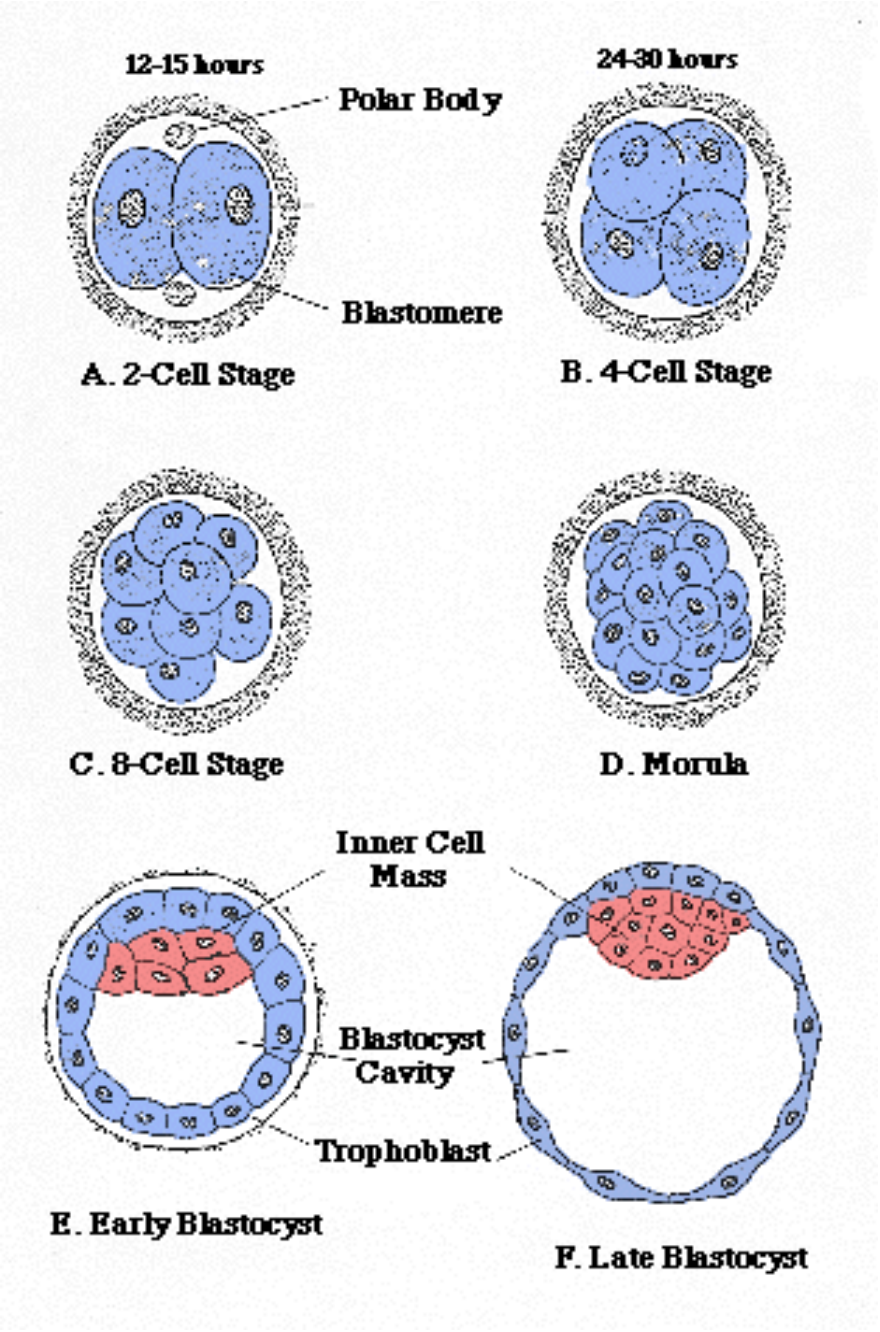
- **Nucleus to cytoplasm ratio** – as sell matures this ratio gets larger i.e. nucleus gets smaller compared to size of cell.

- **Growth** – needed for multicellular organisms to increase in size

- **Development** – the ability of *undifferentiated* cells to become *specialised.*

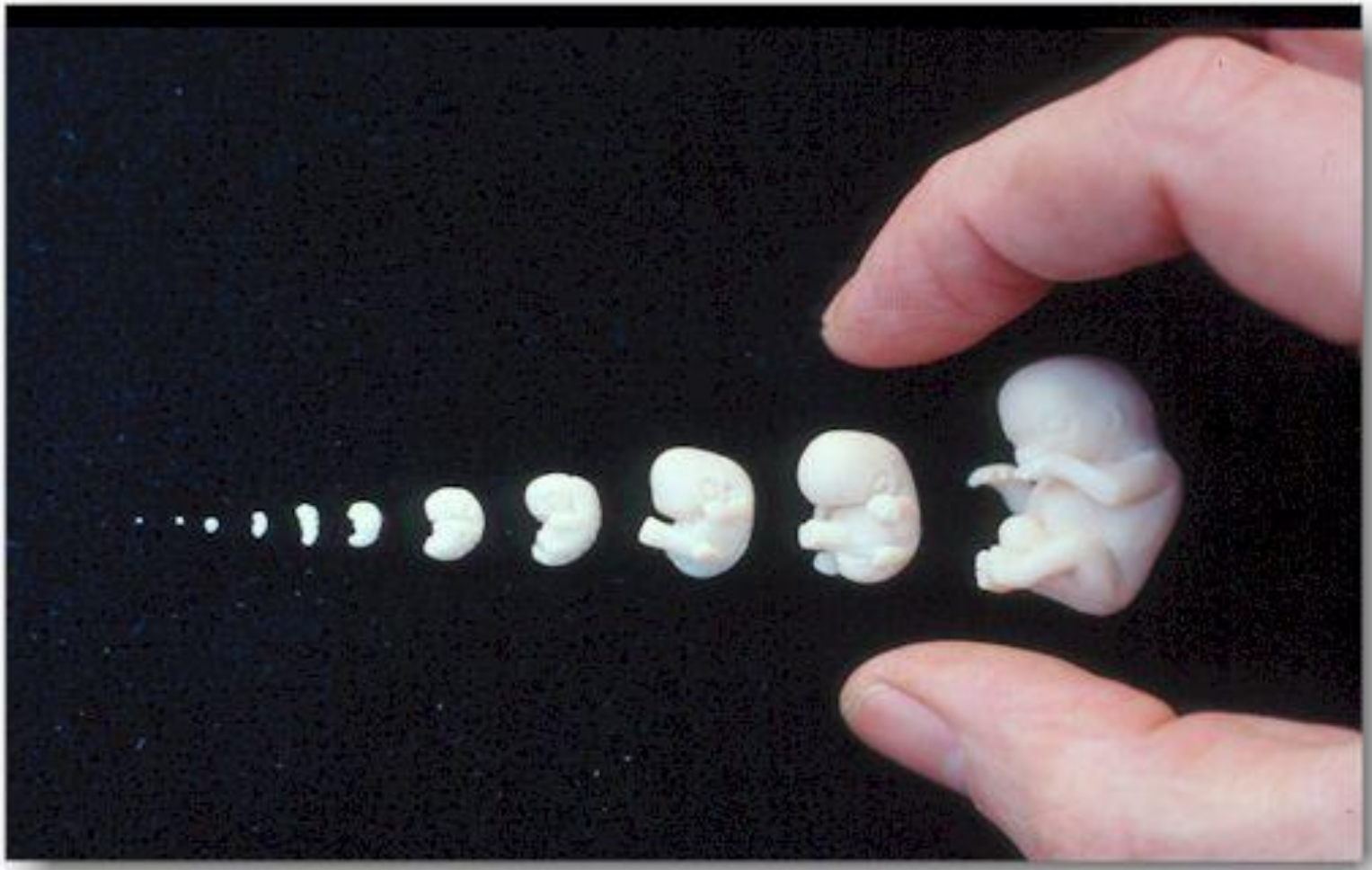
- **Maintenance and repair** – replacement of those cells that have been damaged or lost

Development of cells



Zygote – initial stage when a male gamete(sperm fertilises the female gamete (ovum)

Embryo – a multicellular eukaryote in the early stages of development



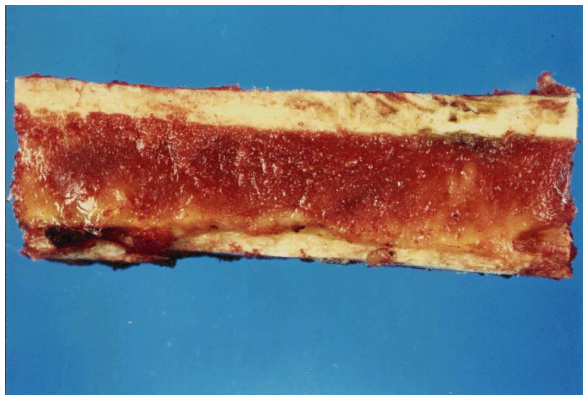
Foetus – a developing animal when it starts looking like the adult form

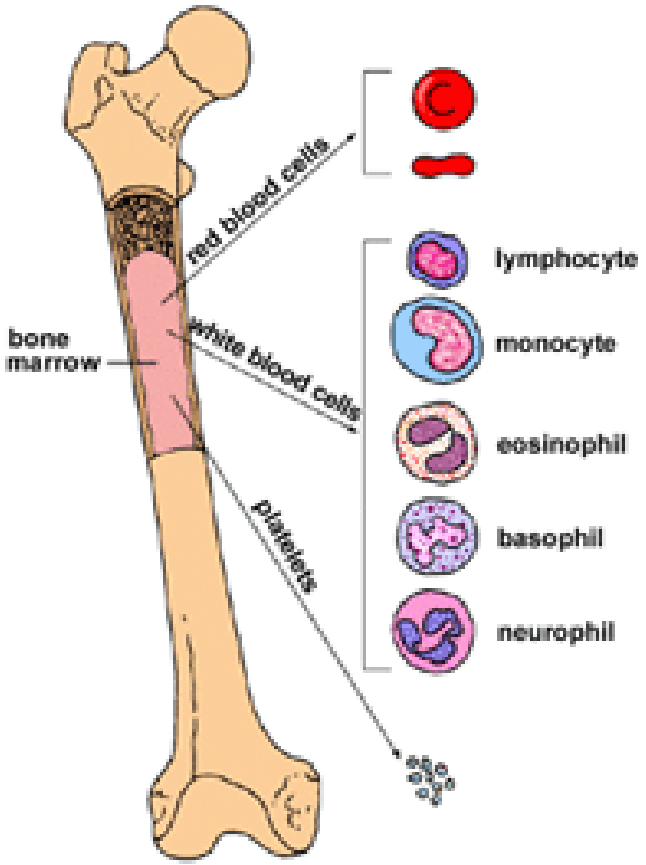
Maintenance and Repair

In adult organisms, many cells need to be replaced.

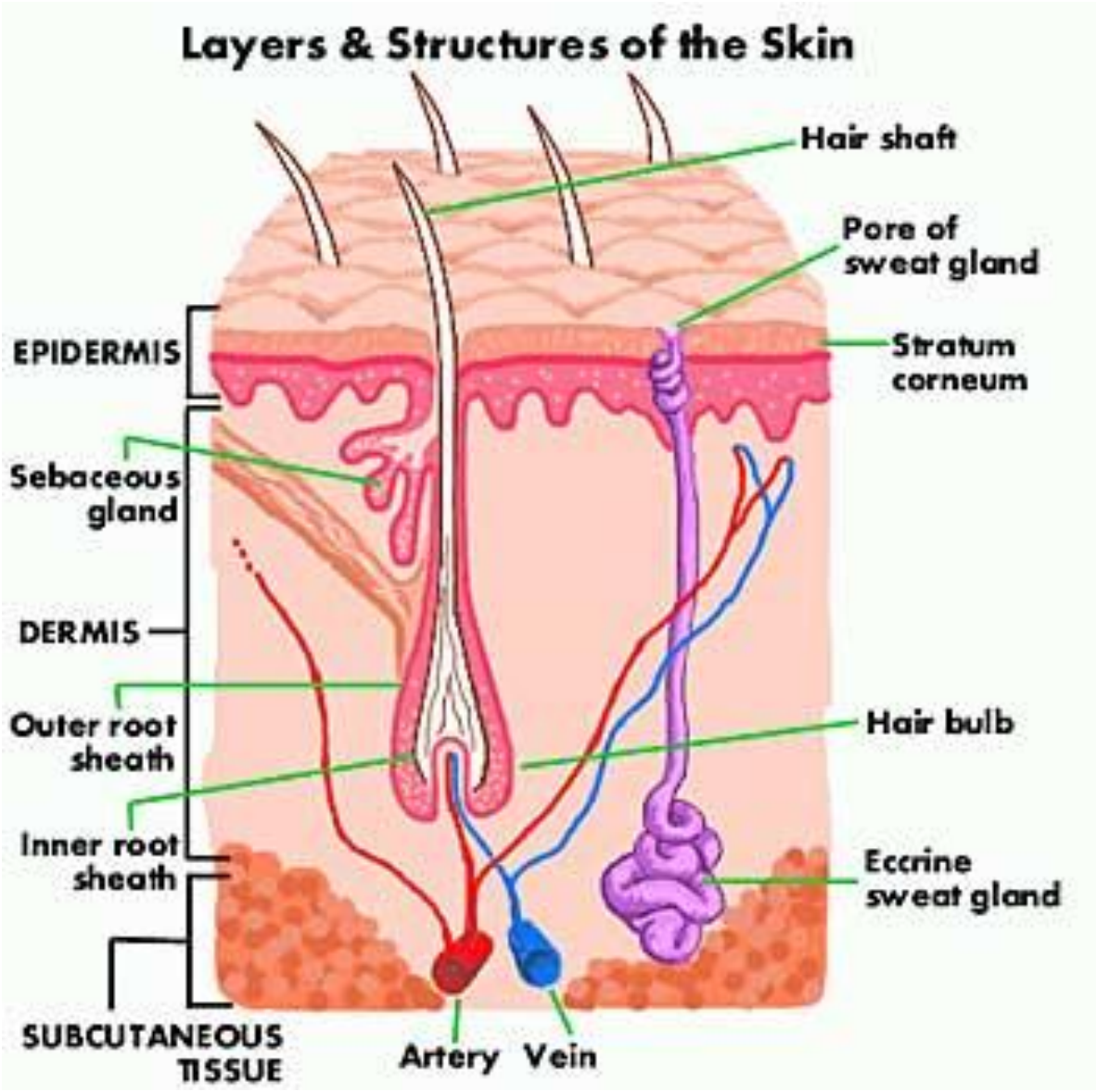
Some examples are……

New red and white blood cells are formed in the bone marrow

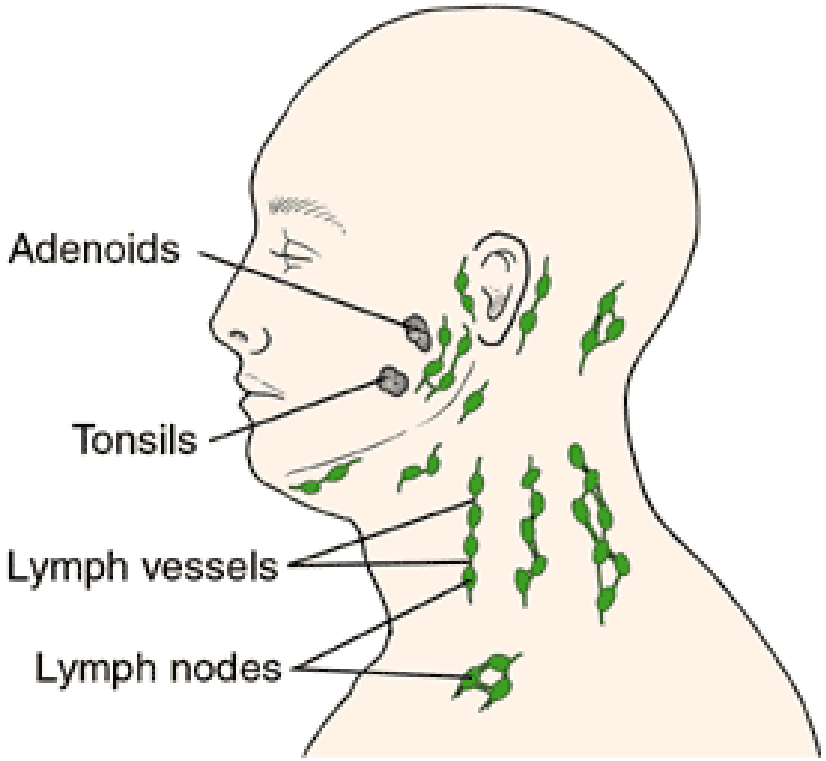




Skin

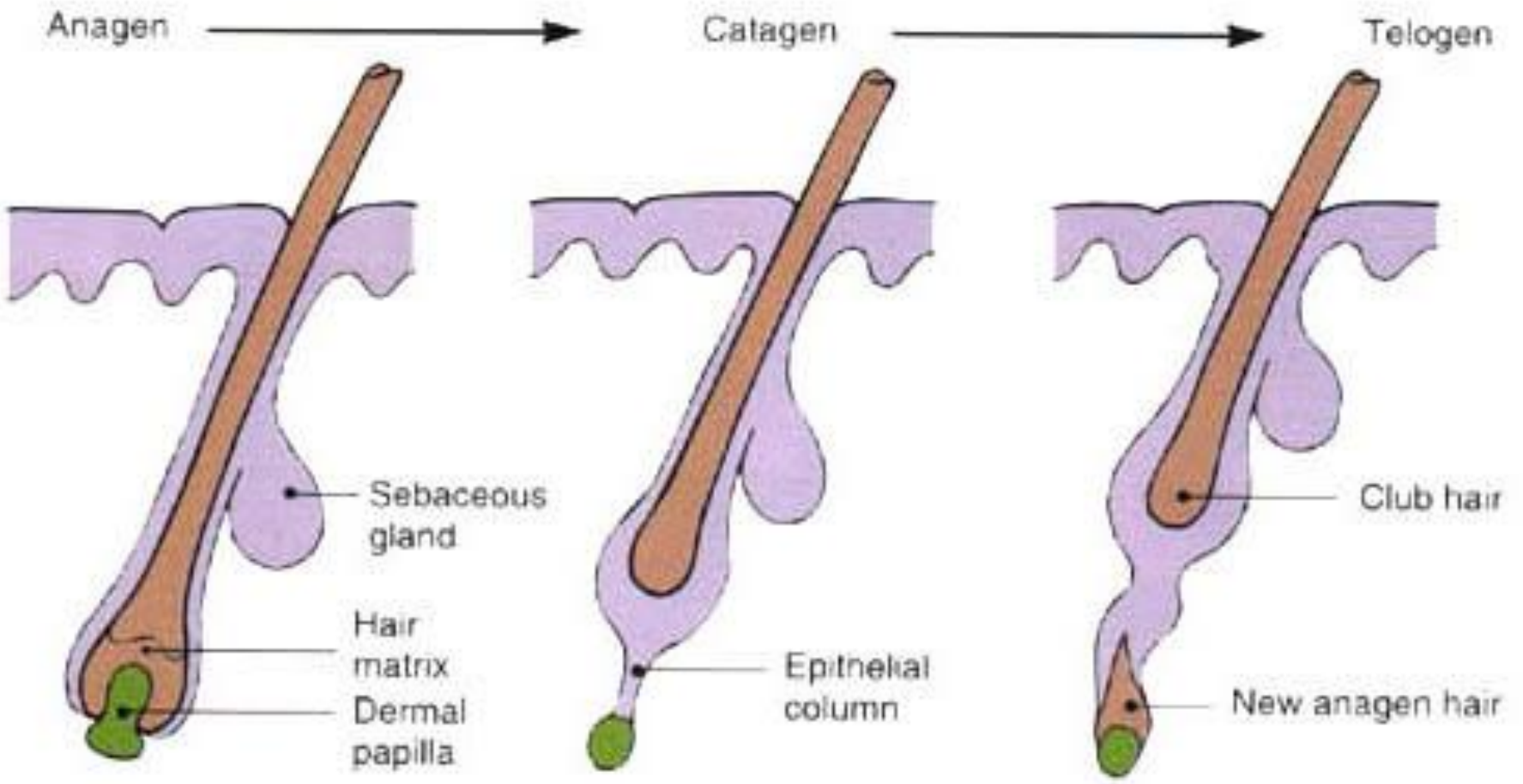

Layers & Structures of the Skin
Hair shaft
Pore of sweat gland
Stratum corneum
EPIDERMIS
Sebaceous gland
DERMIS
Outer root sheath
Hair bulb
Inner root sheath
Eccrine sweat gland
SUBCUTANEOUS TISSUE
Artery
Vein

Production of white blood cells during an infection



Lymph nodes of the throat and neck

4. Growth of Hair

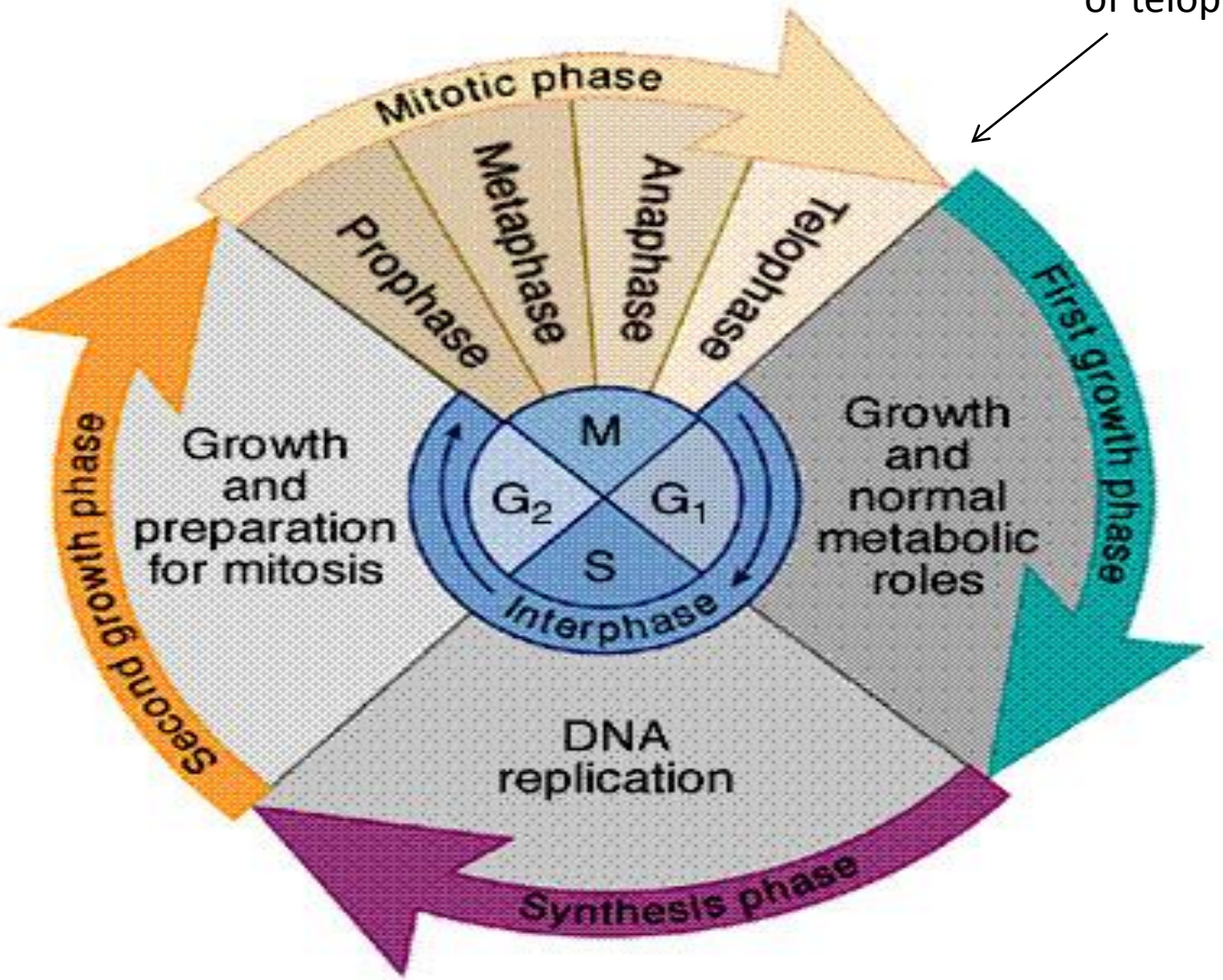


Stages of cell replication

1. Interphase
2. Mitosis
3. Cytokinesis

The cell cycle

Cytokinesis happens at end of telophase



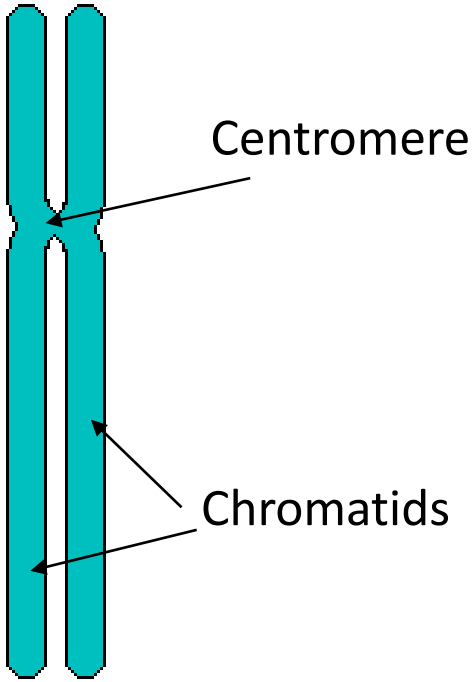
1. Interphase

Divided into three stages

1. **G1** : pre-DNA synthesis

2. **S** : DNA synthesis
- Chromosomes become double stranded. Each strand is called a chromatid

3. **G2** : 'gap'



2. MITosis
-Makes Itself Two-

- Nuclear division to make two new identical daughter cells
- Distinguished by the appearance of chromosomes in the cells
- It is a continuous process but to make it easier to study if we divide it into stages

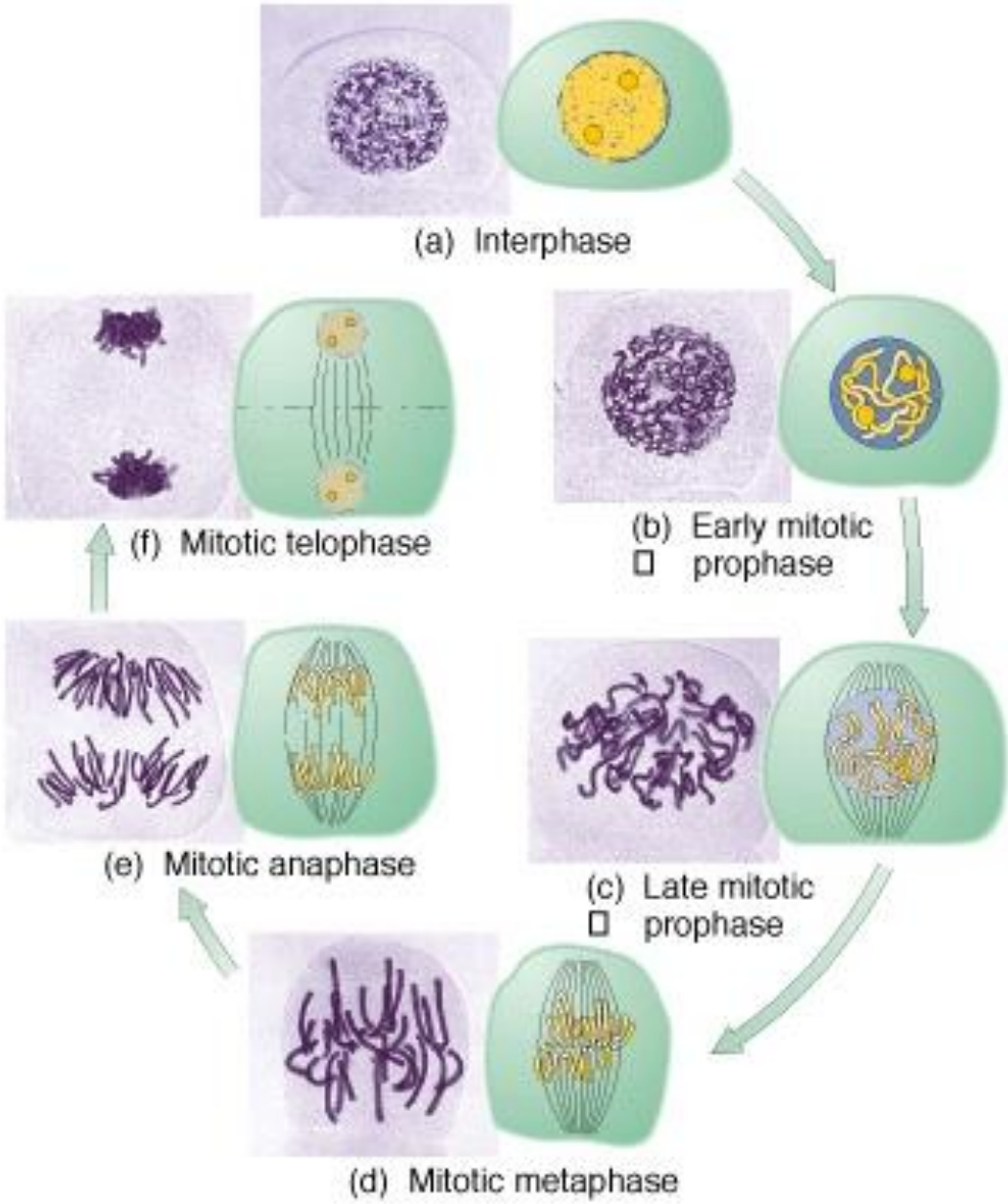
There are 4 stages of Mitosis

1. **Prophase**
   - Chromosomes condense and become visible
   - each chromosome can be seen as 2 **chromatids** held together by a **centromere.**

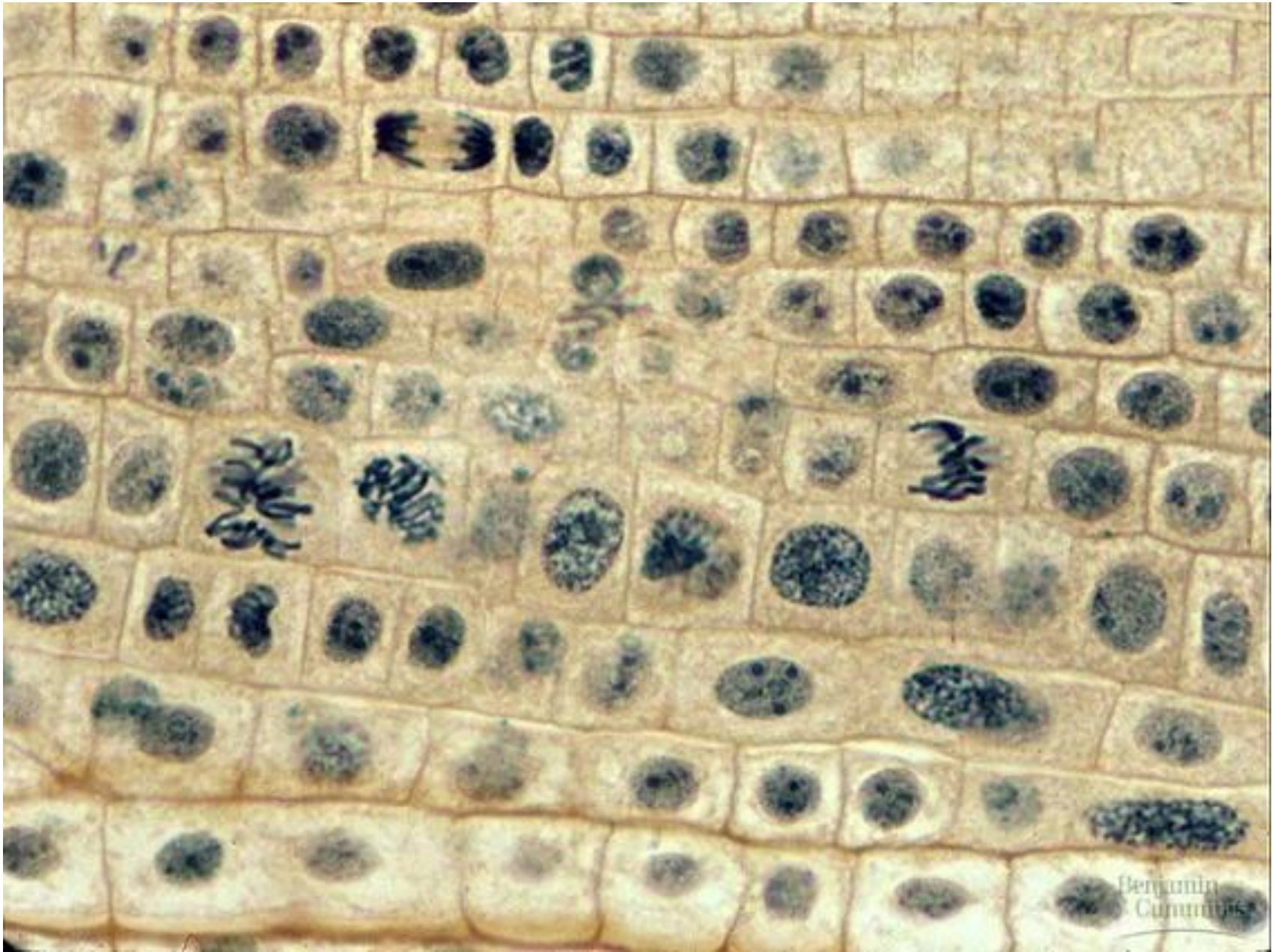
2. **Metaphase**
   - Chromosomes line up in middle of cell

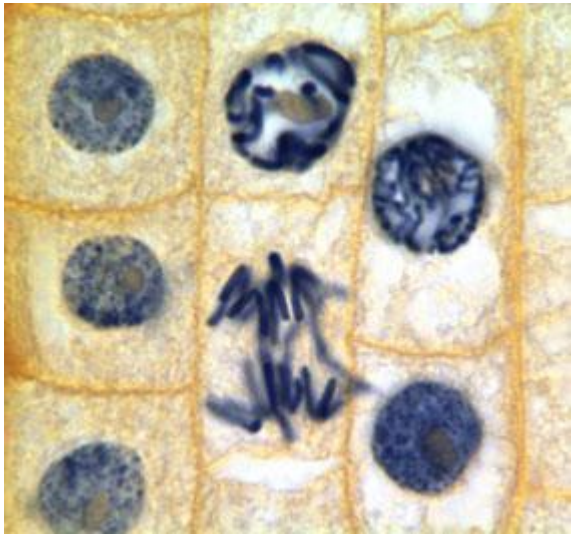
3. **Anaphase**
   - Centromere is pulled in 2 directions and the chromatids separate into single-stranded chromosomes

4. **Telophase**
   - New nuclear membranes form around chromosomes
   - Chromosomes become longer and thinner


(a) Interphase
(b) Early mitotic prophase
(c) Late mitotic prophase
(d) Mitotic metaphase
(e) Mitotic anaphase
(f) Mitotic telophase

Mitosis: Onion Root Tip

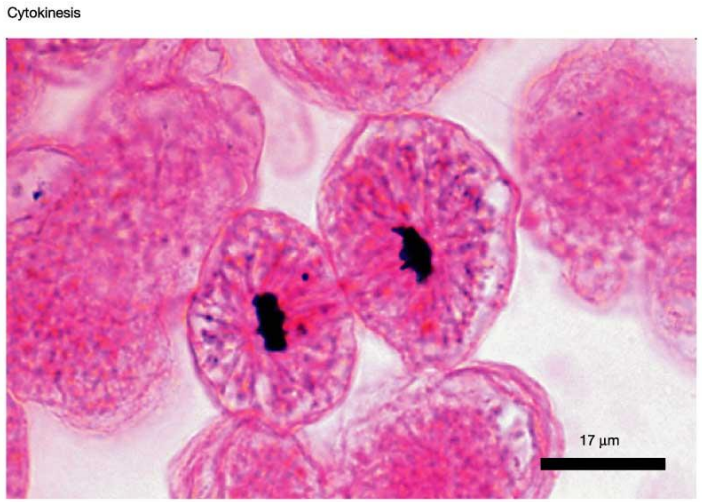




Mitosis in Animal Cells (developing fish embryos)

3. Cytokinesis

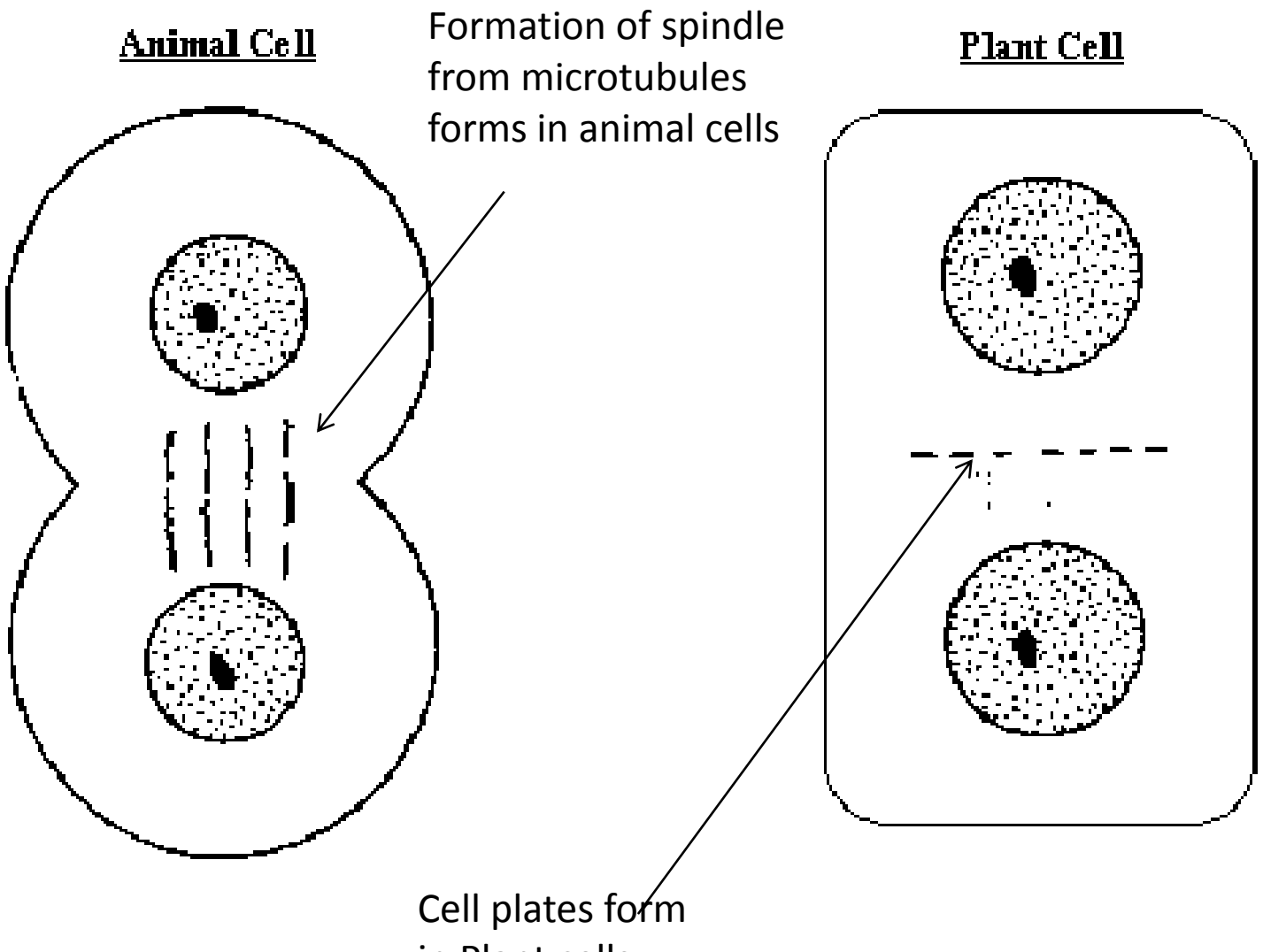
Cytokinesis is known as the division of the cytoplasm. It usually accompanies telophase of mitosis



Animal Cell

Plant Cell

Cytokinesis



Products of Mitosis

From one original cell, two cells are produced that are genetically identical to the parent cell.

M akes
I tself
T wo
O
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S

http://www.youtube.com/watch?v=VlN7K1-9QB0

http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter2/animation__how_the_cell_cycle_works.html