

**McGraw-Hill Ryerson**

# **BC Science CONNECTIONS**



**BC Science Connections 9**

**Unit 1: The continuity of life depends on cells being  
derived from cells**

## Topic 1.2: What are different ways that living things reproduce asexually?

- Bacteria reproduce by binary fission.
- All eukaryotic cells reproduce by the cell cycle.
- Yeasts reproduce by budding.
- Moulds reproduce using spores.
- Plants have many ways to reproduce asexually.



# Concept 1: Bacteria reproduce by binary fission.

Bacteria: Micro-organisms that exist as single prokaryotic cells

- Reproduce asexually by a process called **binary fission**



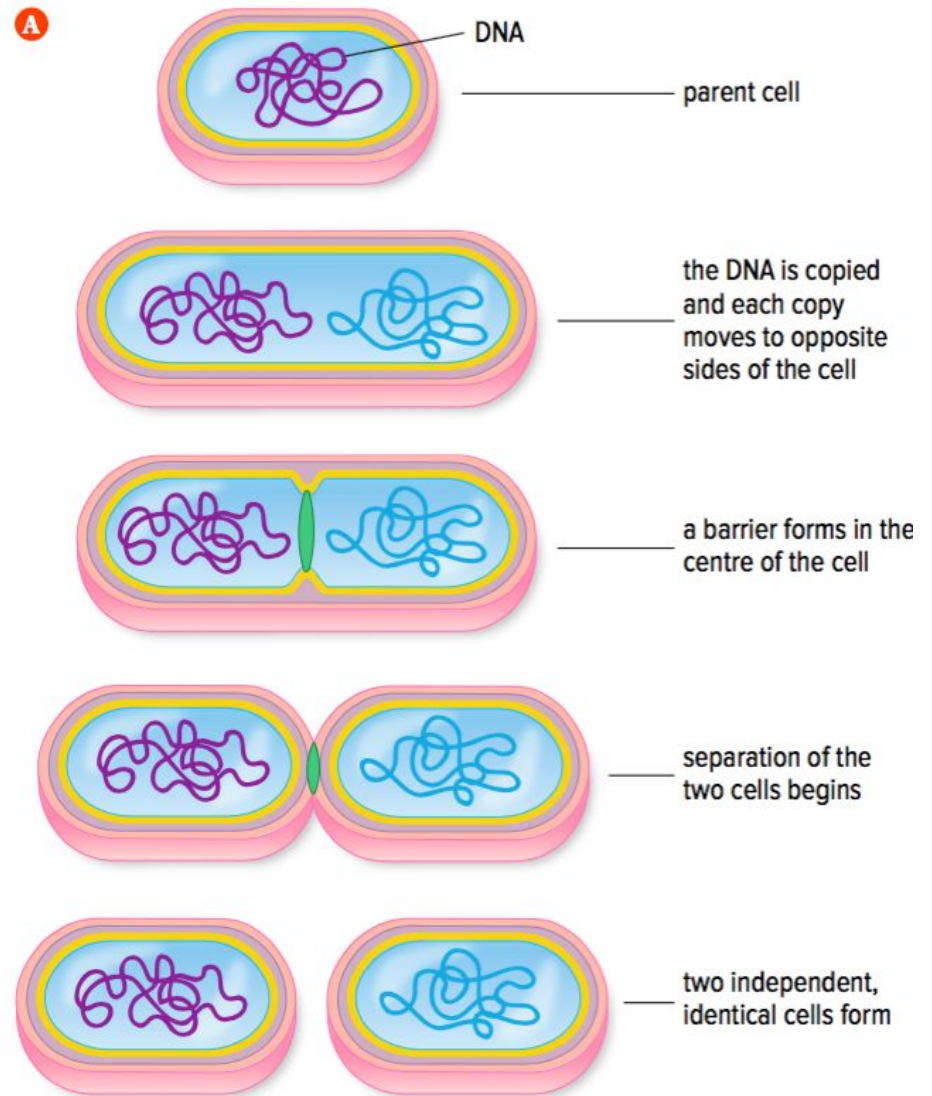
Figure 1.6: Bacteria are in, on, and all around us. Bacteria is used in food production (left) and can cause disease, such as strep throat (right).

## Reproduction by Binary Fission

### Binary fission

- Type of asexual reproduction
- A parent cell splits into two individual, identical cells (daughter cells)
- Daughter cells have identical genetic information (DNA)

Figure 1.7: Binary fission





# Reproduction by Binary Fission (continued)

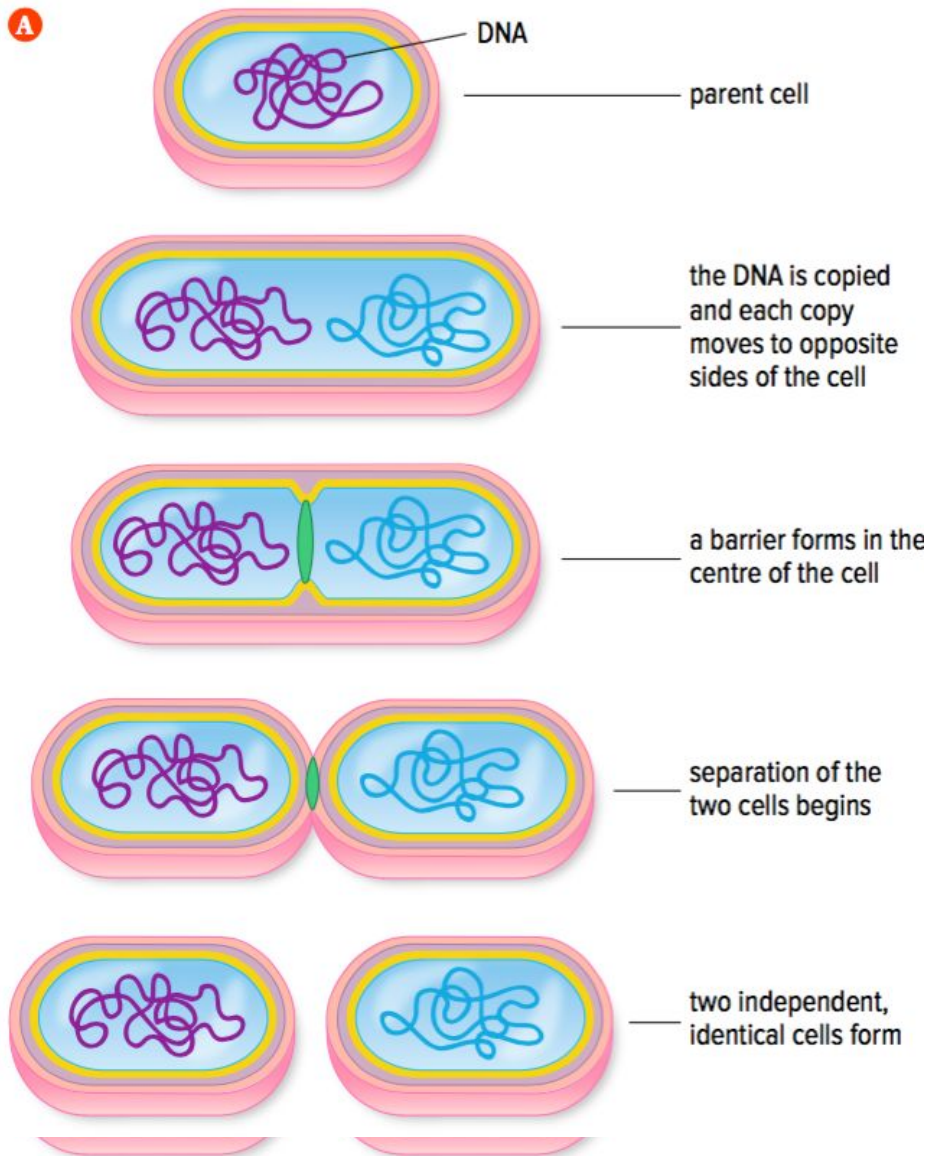


Figure 1.7: (A) Binary fission. (B) Many types of bacteria are found as chains and clusters.

## Discussion Questions

1. What key piece of evidence tells you that bacteria reproduce asexually?

## Concept 2: All eukaryotic cells reproduce by the cell cycle.

Functions of eukaryotic cell reproduction:

- Replace older cells
- Replace damaged cells
- Produce new offspring in single-celled organisms (amoebas)



Figure 1.8: A scab forms as some of the remaining skin cells beneath the wound reproduce repeatedly to form a new skin layer to replace what was scraped away.

# Reproduction and the Cell Cycle

- Eukaryotic cells reproduce by a series of events called the **cell cycle**
- The cell cycle has two stages with different events:
  - **Growth and development**
    - Interphase
  - **Cell division**
    - Mitosis
    - Cytokinesis

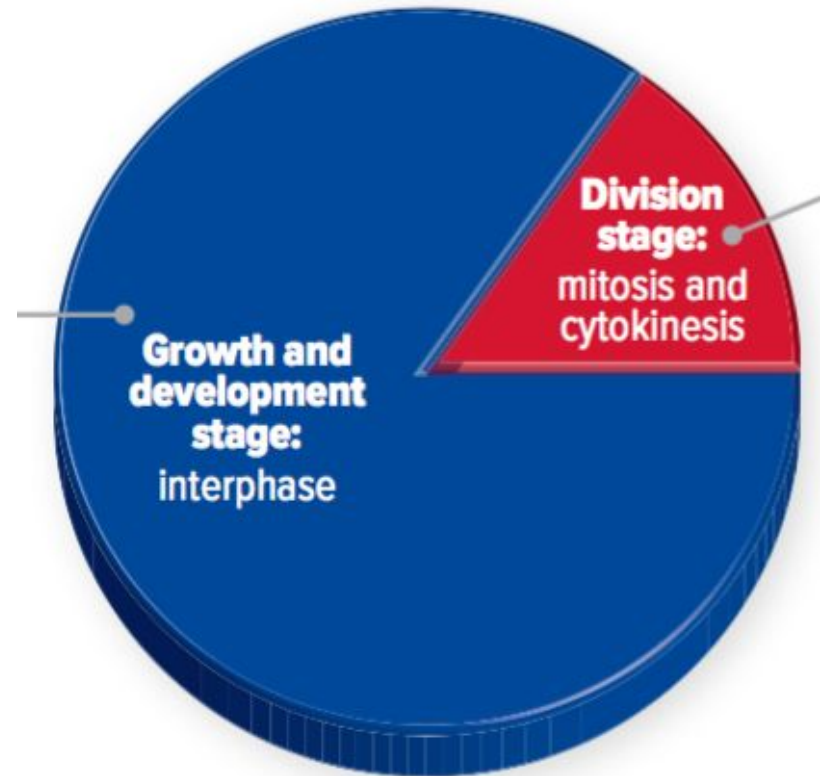
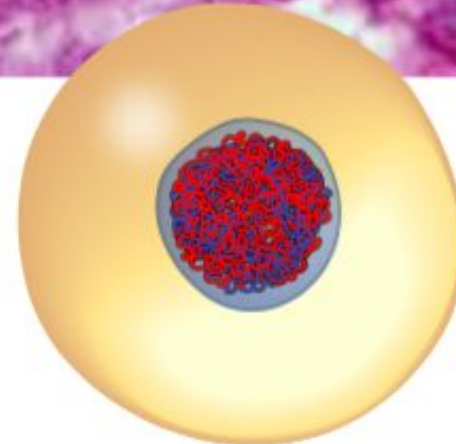
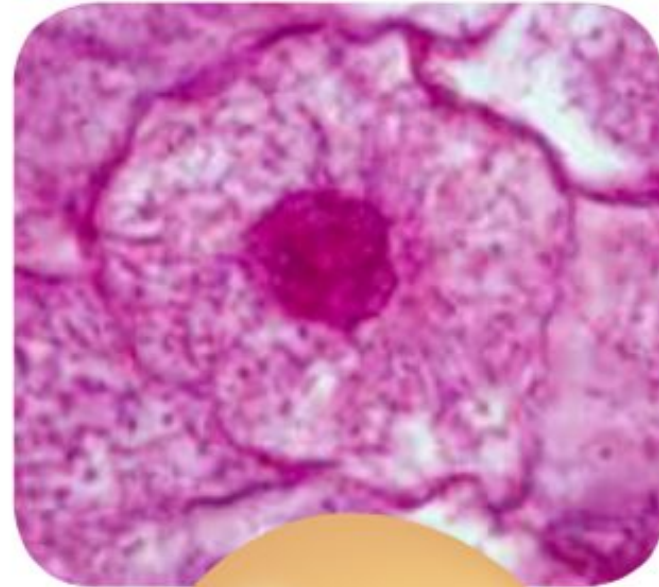


Figure 1.10: The cell cycle.



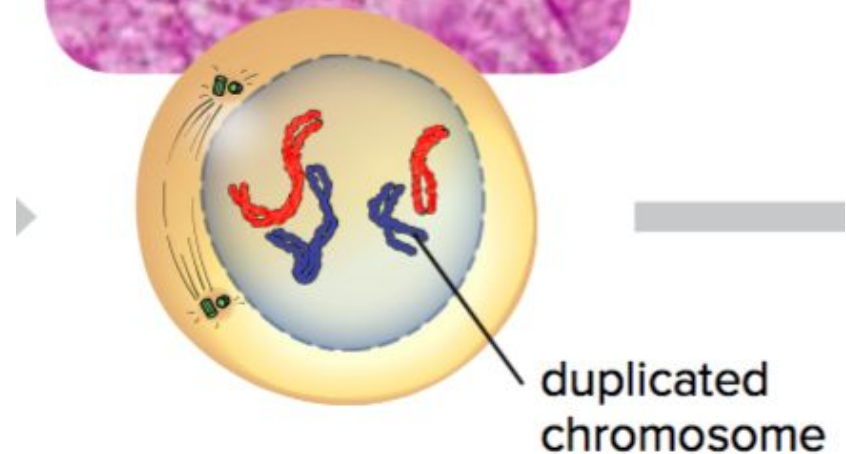
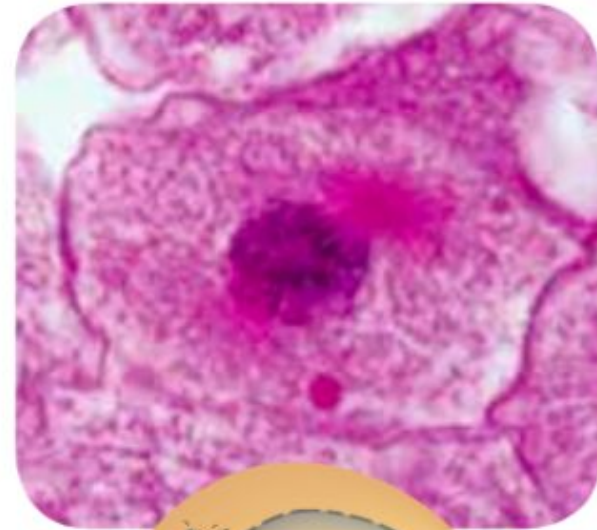
## Growth and Development: Interphase

- The cell grows and the number of organelles increases
- DNA in the nucleus is copied



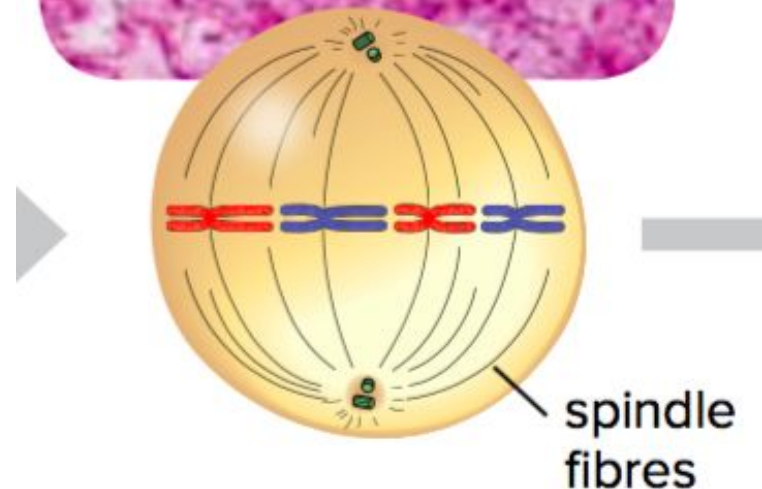
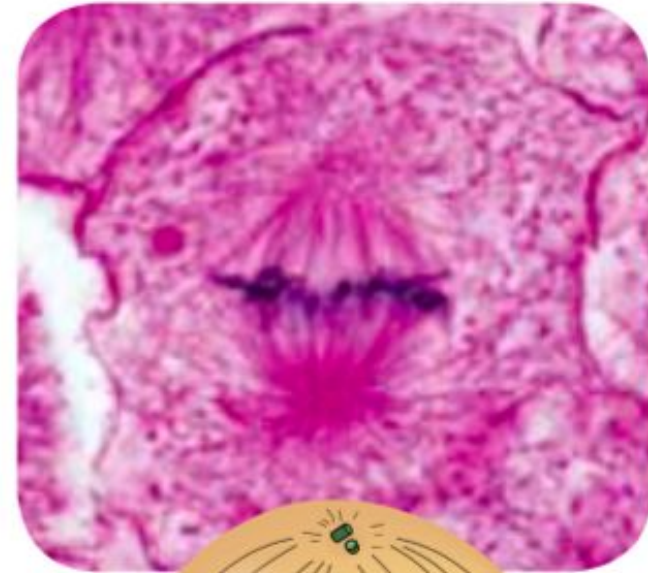
# Cell Division: Phase 1 of Mitosis (Prophase)

- Nuclear membrane begins to disappear
- DNA condenses into duplicated chromosomes
  - Each chromosome contains two copies of the same DNA



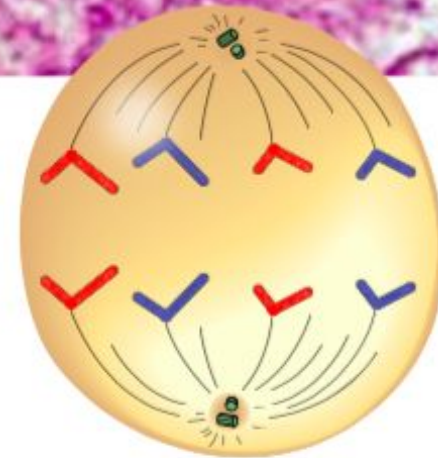
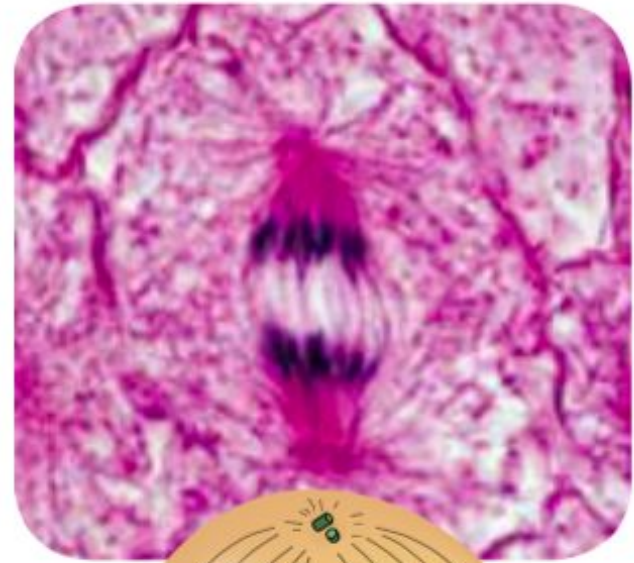
## Cell Division: Phase 2 of Mitosis (Metaphase)

- Structures called spindle fibres guide chromosome movement
- Chromosomes line up along the middle of the cell



## Cell Division: Phase 3 of Mitosis (Anaphase)

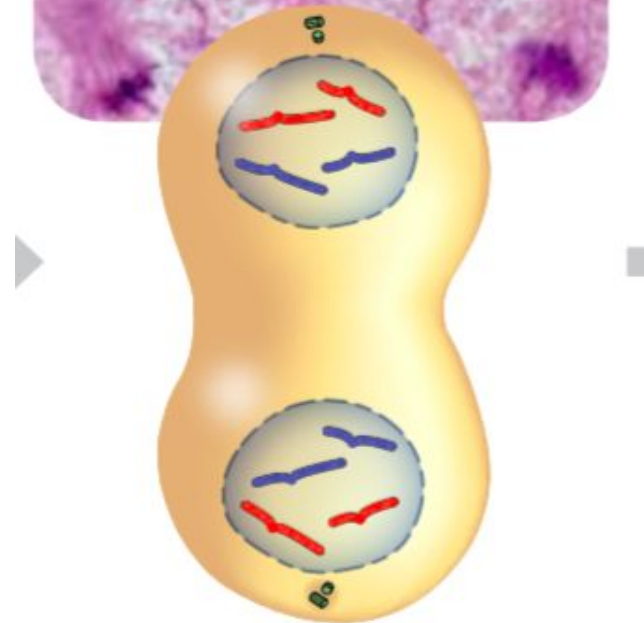
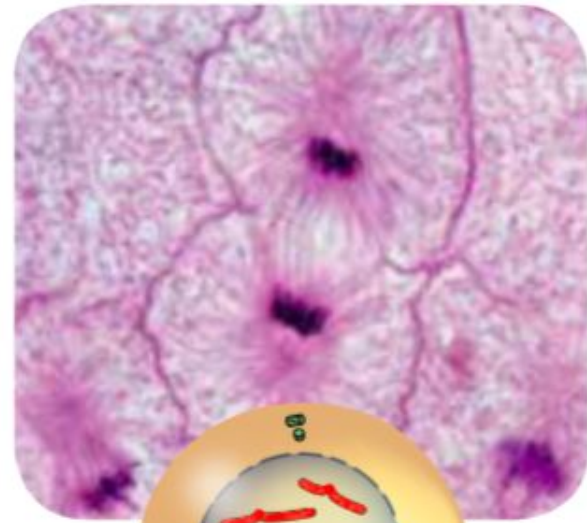
- Copies of DNA are separated and go to each end of the cell





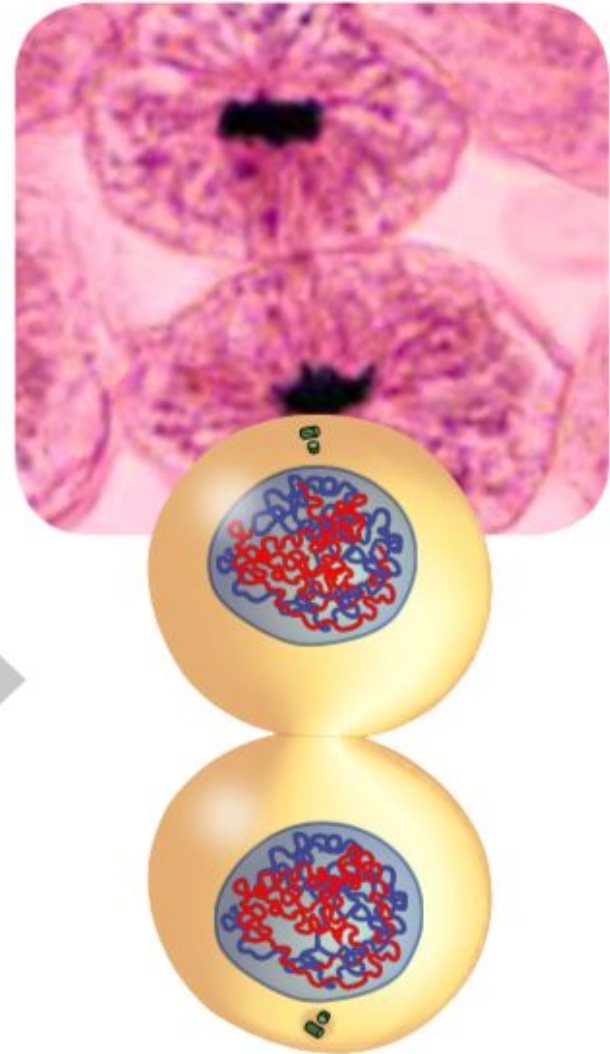
## Cell Division: Phase 4 of Mitosis (Telophase)

- Two nuclei form
- Each nucleus contains a complete copy of the cell's DNA



## Cell Division: Cytokinesis

- Cytoplasm and organelles are divided
- Two separate cells form
- The cells then begin interphase



# Mitosis: Summary

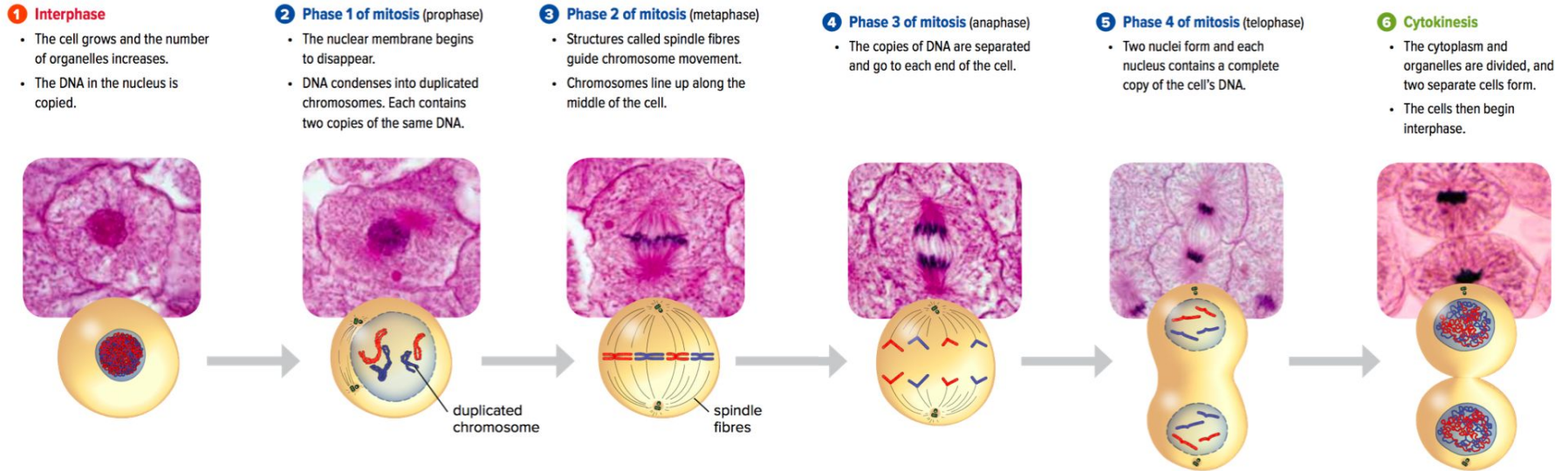


Figure 1.9: Cell reproduction by mitosis results in daughter cells that are genetically identical to each other and to the parent cell.

## Discussion Questions

1. What happens to the DNA in a cell during interphase? Why is this step important for the reproduction process?
2. In two or three sentences, describe what the cell cycle is.



## Concept 3: Yeasts reproduce by budding.

Yeasts are unicellular eukaryotic micro-organisms, in the kingdom of Fungi (not plants or animals)

- Commonly used to make dough, bread, pretzels, soy sauce, cheese, vinegar
- Reproduce by asexual reproduction: **budding**

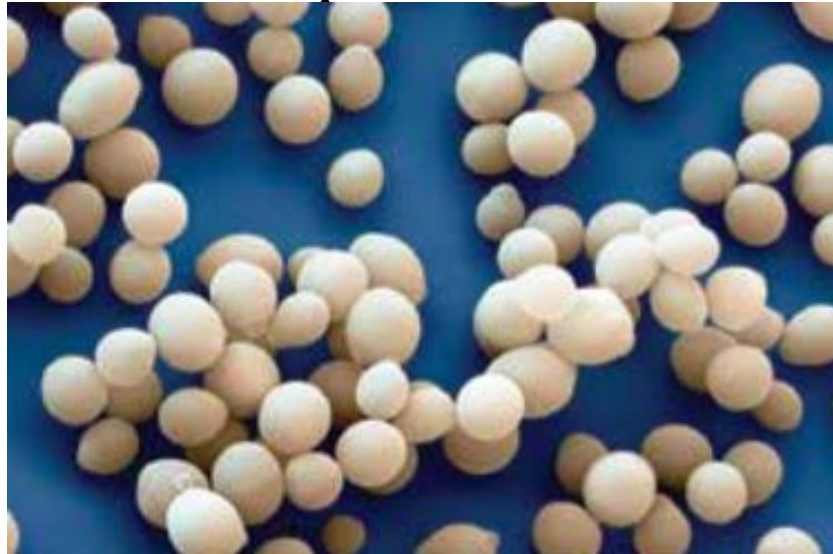


Figure 1.11: Yeast

# Asexual Reproduction in Yeast: Budding

## Budding:

- Yeast cell grows a bud that pinches off to become a separate cell
- New cell is smaller than original cell at first
  - Eventually grows to the same size as other yeast cells

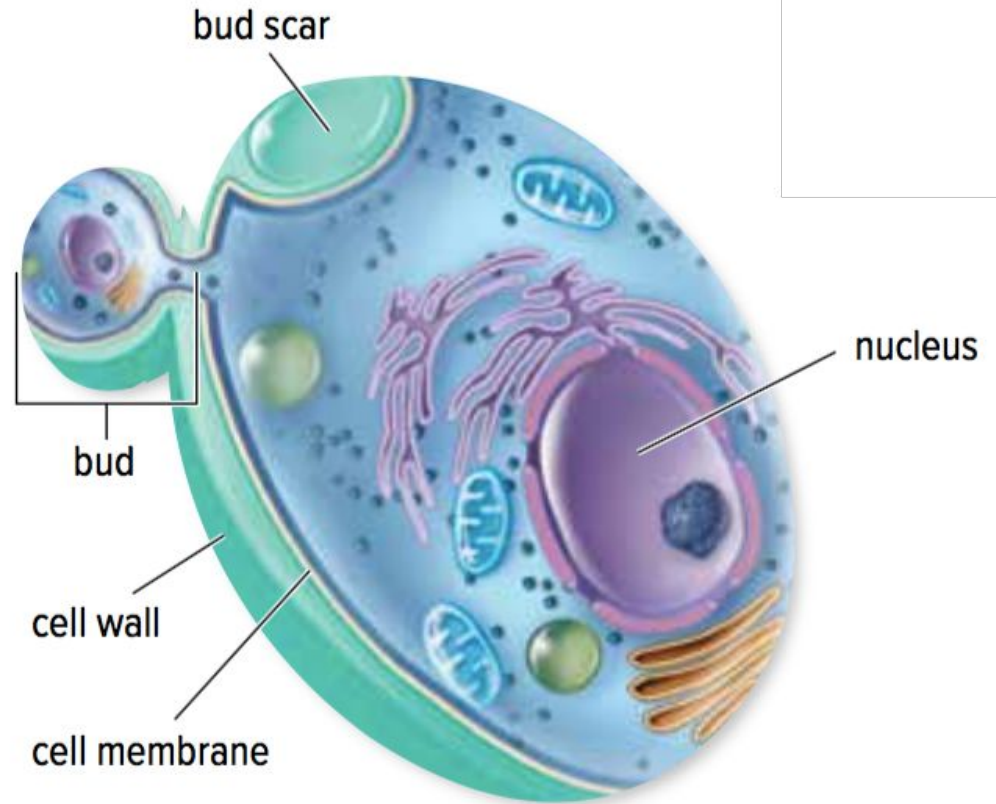


Figure 1.11: Yeasts reproduce asexually by budding.

## Discussion Questions

1. In what ways is reproduction in yeasts and bacteria similar? In what ways is it different?
2. Why is a daughter yeast cell identical to the parent cell?

## Concept 4: Moulds reproduce using spores.

Moulds are multicellular eukaryotic fungi

- Reproduce by asexual reproduction using **spores**

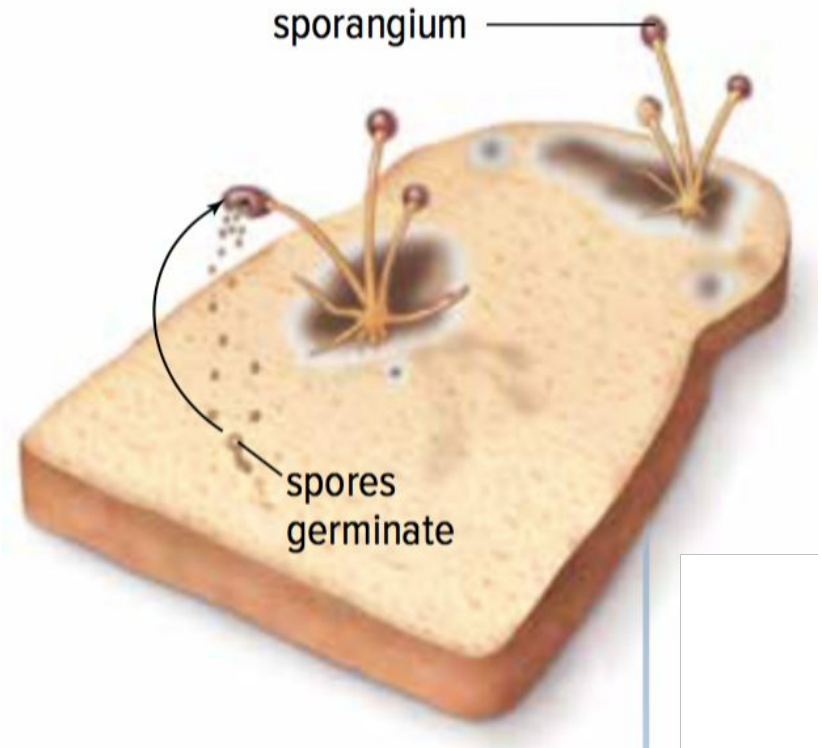


Figure 1.12: Moulds reproduce using spores.



## Asexual Reproduction in Moulds: Spores

- Moulds form spores that are genetically identical to the mould cells they come from
  - Spores are released into the air from a structure called a *sporangium*
  - When a spore lands in a favourable environment (warm, moist), it grows and divides by mitosis and cytokinesis

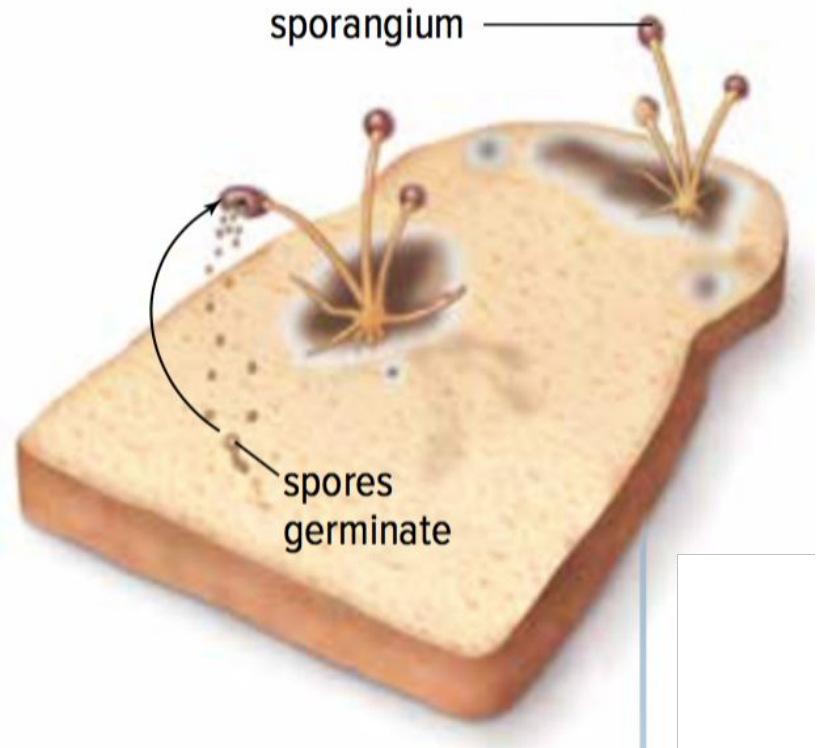


Figure 1.12: Moulds reproduce using spores.

## Discussion Questions

1. What role do spores play in the asexual reproduction of moulds?

## Concept 5: Plants have many ways to reproduce asexually.

Plants reproduce sexually and asexually

- Asexual reproduction: **Vegetative propagation**
  - New plants grow from a portion of the roots, stems, or leaves from an existing plant
  - New plants are **clones** (copies) of the parent plant



Figure 1.13: If you look closely at a field of strawberry plants, you will see smaller plants growing near a larger plant. These smaller plants are new plants that grow along runners. Runners are like stems that grow horizontally, above the ground, from a full-grown plant. Eventually runners die, leaving independent, identical plants.

## Vegetative Propagation: Example

Potatoes:

- New roots and shoots grow from the eyes of a potato
- If you plant a potato with this new growth, a potato plant will develop
- The new plant will be identical to the parent plant



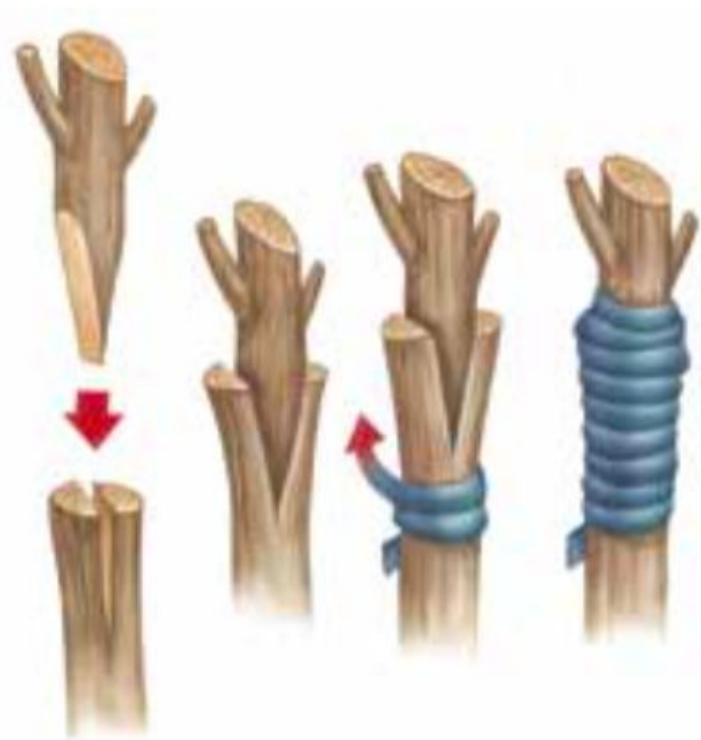
Figure 1.13

## Artificial Vegetative Propagation

Artificial vegetative propagation uses techniques to produce plants with specific characteristics

- Example: **Grafting**

- A bud, stem, or root is cut from one plant and joined to another
- Used to produce trees with high-quality fruit or resistance to disease





## Discussion Questions

1. Describe an example of vegetative propagation.
2. Why are new strawberry plants that form from runners identical to the parent plant?

## Topic 1.2 Summary: What are different ways that living things reproduce asexually?

- Bacteria reproduce by binary fission.
- All eukaryotic cells reproduce by the cell cycle.
- Yeasts reproduce by budding.
- Moulds reproduce using spores.
- Plants have many ways to reproduce asexually.

