Grade 8 Science

Cells

Class 3

Classifying Organisms

Figure 1 A diatom is an example of a unicellular organism.

- **Organisms** – a living system with parts that work together to carry out the processes of life
- **Unicellular Organism** – an organism made up of only one cell
- **Multicellular Organism** – an organism made up of more than one cell

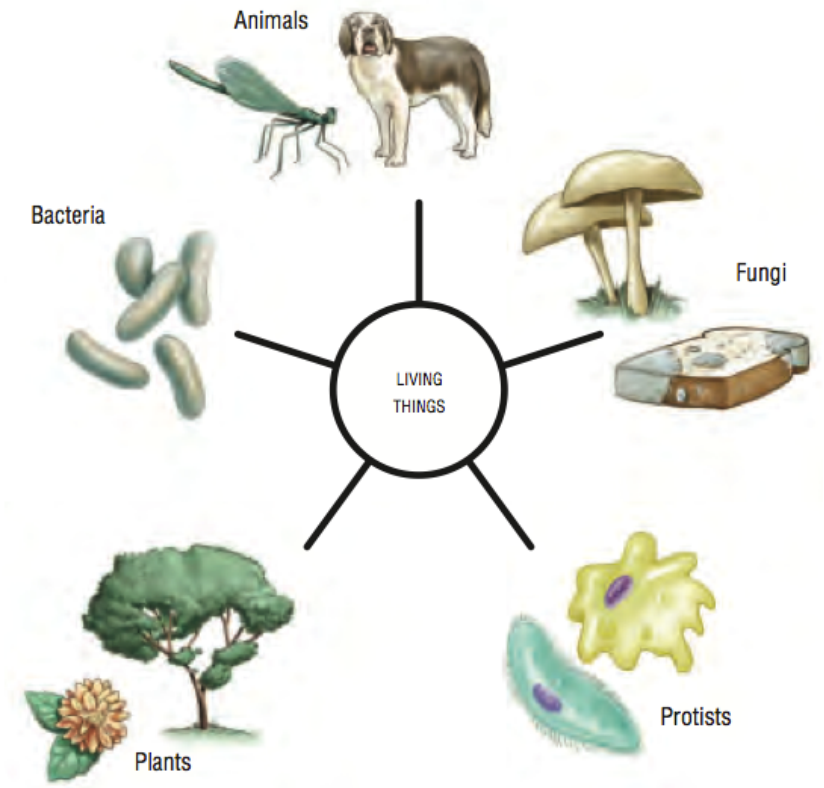


Figure 7 All organisms can be placed into one of these five groups.

Plants

Plants

- Multicellular organisms
- Autotrophs – make their own food using photosynthesis
- Able to live on land or in water

Animals

Animals

- Multicellular Organisms
- Divided into:
  - Vertebrates – animals with a backbone
  - Invertebrates – animals without a backbone

Figure 2 A blue jay has a backbone and is therefore a vertebrate.

Figure 3 A snail does not have a backbone. It is an invertebrate.

Fungi

Fungi

- Most are multicellular; some are unicellular
- Obtain nutrients from dead or decaying matter
- Cannot carry out photosynthesis

Figure 4 (a) Field mushrooms are multicellular fungi that are used as food by people all over the world. (b) Baker's yeast is a unicellular fungus that is used in the bread-making industry. The yeast produces bubbles of carbon dioxide gas, which cause the bread to rise.

Protists

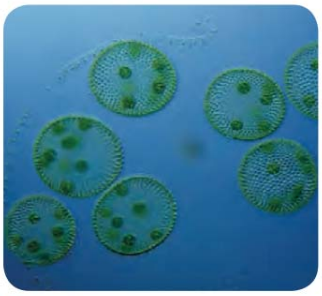
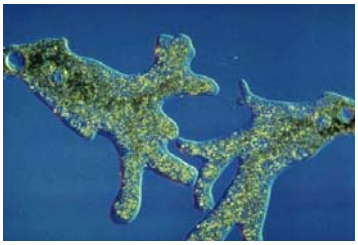


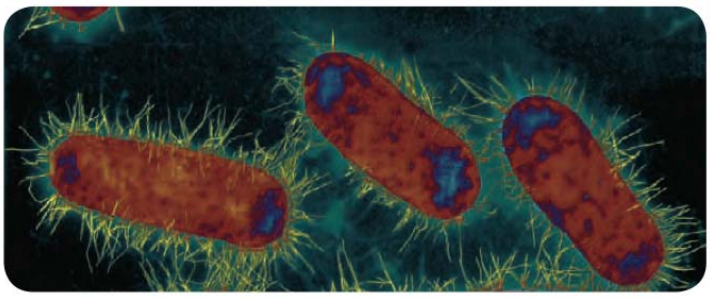
Figure 5 *Volvox* is a common plant-like protist found in ponds.

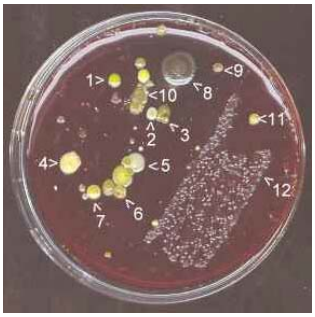


- Both multicellular and unicellular
- Commonly found in wet or moist environments such as ponds, rivers and mud
- Some act like plants and can undergo photosynthesis
- Some act like animals and do not perform photosynthesis

Bacteria

- Unicellular without a nucleus
- Simplest and most abundant unicellular organisms on Earth
- Forms groups called bacterial colonies





Unicellular Organisms

Figure 1 *Euglena* have chloroplasts, which allow them to make food by photosynthesis, and a flagellum for locomotion.

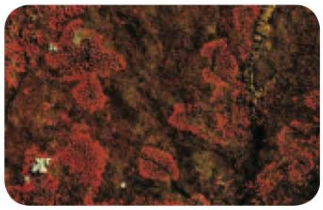


Figure 2 The algae in this lichen make food for the fungus, which provides protection in return.

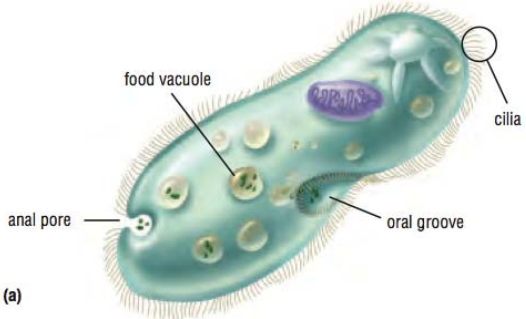
Also called micro-organisms

Nutrients

- Live in in bodies of water and move around to find food
- Some use photosynthesis to obtain food
- Some interact with other organisms to obtain nutrients

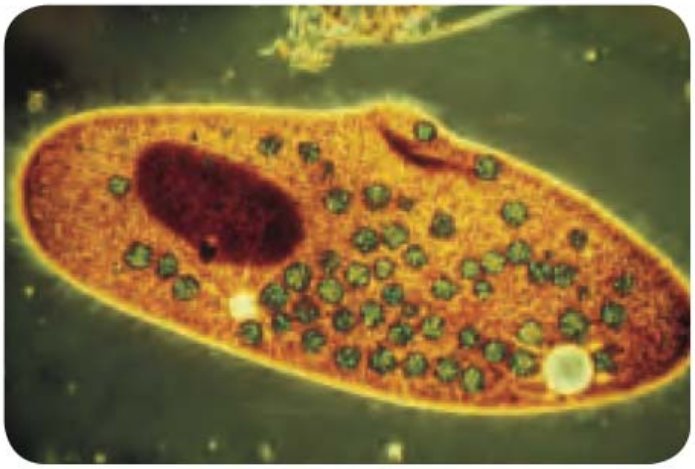
Paramecia

- Unicellular organisms (protist) found in aquatic environments
- Covered with cilia that create water currents to move the paramecium toward a food source



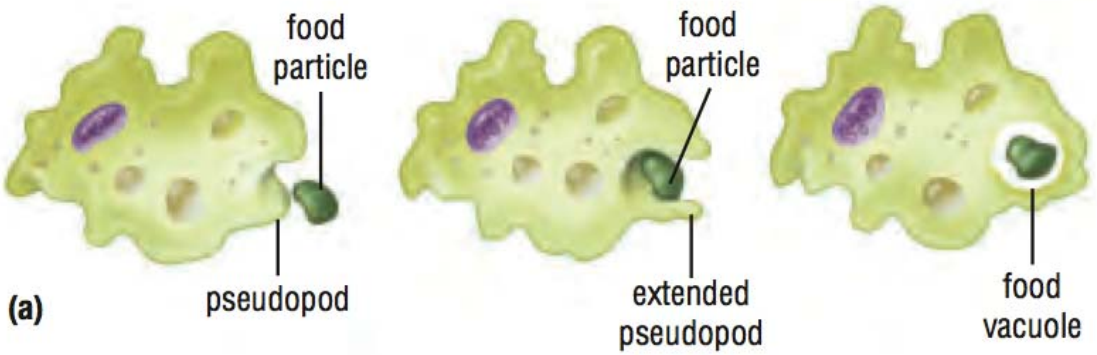
- Food that enters the oral groove is enclosed in a vacuole where it is slowly digested

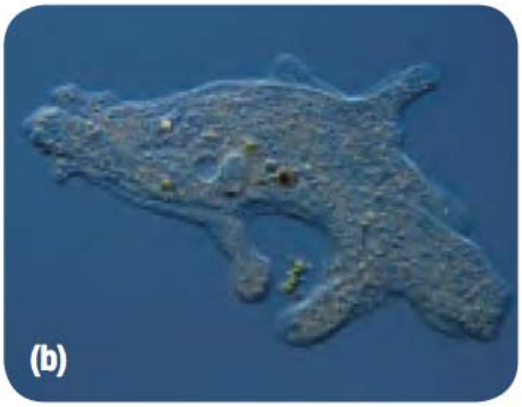
- Nutrients diffuse through the vacuole's membrane into the cytoplasm
- Any remaining waste materials are eliminated through an anal pore



Amoeba

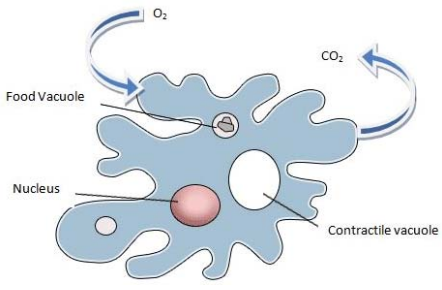
- Amoeba (protist) uses phagocytosis to feed on organisms
- Pseudopods extend around the food material and form a food vacuole
- Food particles diffuse through vacuole membrane into the cytoplasm
- Wastes are released out of the cell by exocytosis





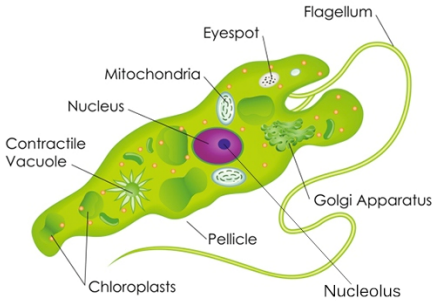
Gas Exchange

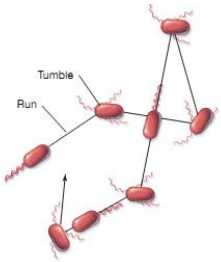
- Most organisms need oxygen to survive
- In unicellular organisms, oxygen diffuses across the cell membrane into the cell while carbon dioxide diffuses out
- Some microorganisms such as yeast can survive without oxygen

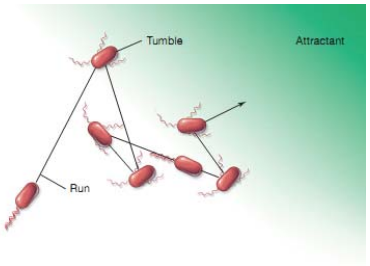


Responding to the Environment

- Unicellular organisms can detect chemicals such as sugars in their environment and move toward them; chemotaxis
- Photosynthetic protists like *Euglena* can detect light using special sensors







Movement and Locomotion

Figure 5 A disease-fighting cell in the human body uses pseudopods to trap infecting bacteria.

Figure 6 A bacterium uses its flagella for locomotion.

- **Movement** – enables an organisms to change its form or shape using pseudopods
- **Locomotion** – enables an organism to change its position in the environment using cilia and flagella
  - Create currents in the surrounding environment

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Multicellular Organisms

- All multicellular organisms start as a single cell
- Cell divides and as the number of cell increases, each cell becomes better able to perform a function
- Groups of cells are specialized to do one job very well

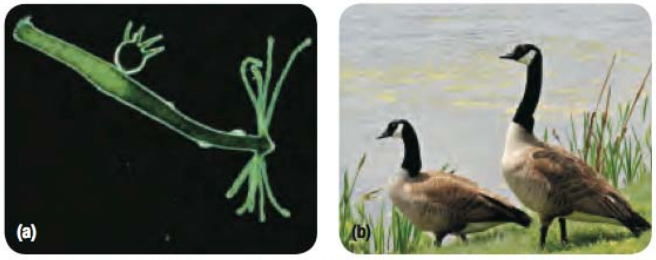


Figure 2 This tiny *Hydra* (a) is made up of several thousand cells, whereas a Canada goose (b) is made up of trillions of cells.

Cell Specialization and Differentiation

- Cell specialization takes place early in the development of a multicellular organism
- **Cellular differentiation** – the process by which a cell becomes specialized to perform a specific function

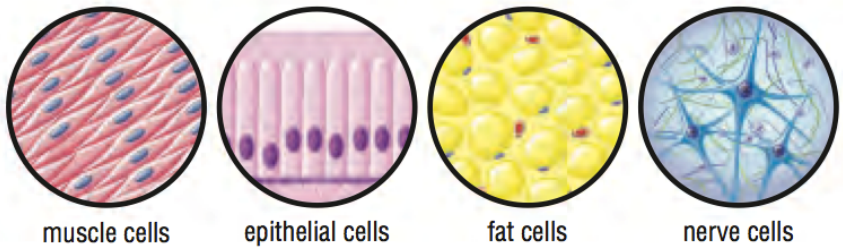
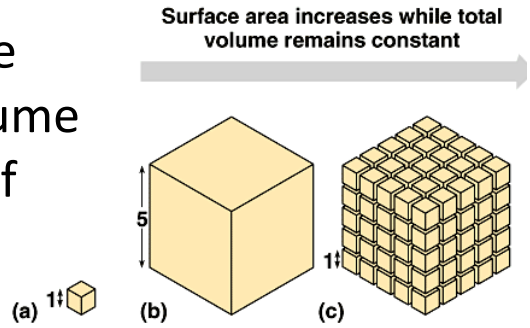


Figure 3 Human cells are differentiated.

Purpose of Differentiation

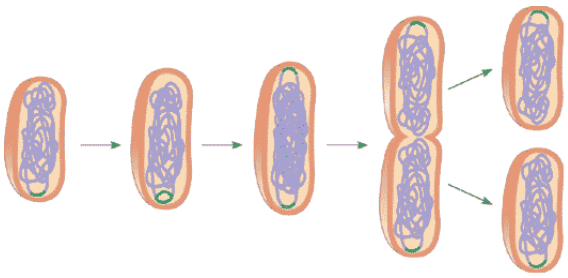
- Cells divide to maximize the surface area to volume ratio for the diffusion of nutrients and wastes

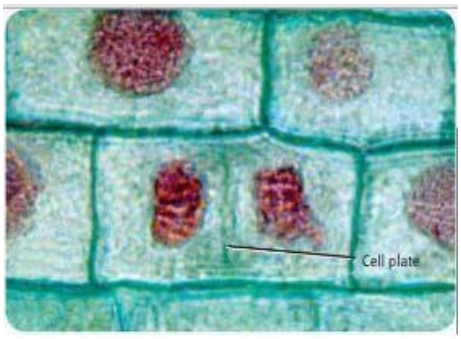


Total surface area (height × width × number of sides × number of boxes)	6	150	750
Total volume (height × width × length × number of boxes)	1	125	125
Surface-to-volume ratio (area ÷ volume)	6	1.2	6

Cell Division

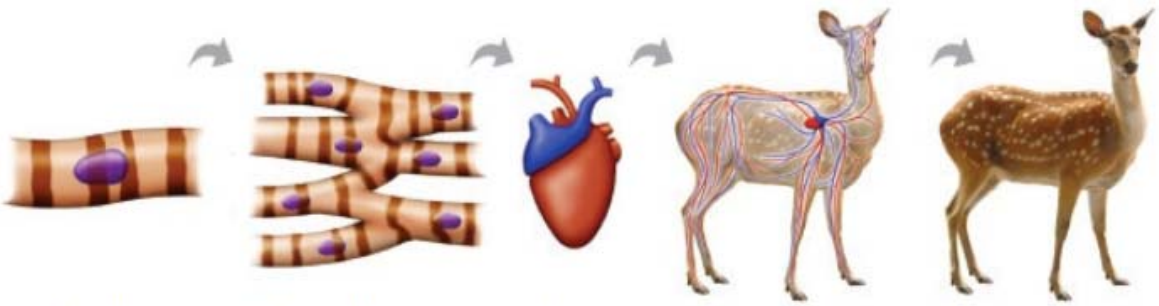
- During cell division, cells split in half to form two smaller identical cells
- For plants, a new cell plate develops to form a cell wall between the two nuclei





Hierarchy of an Organism

Cell → Tissue → Organ → System → Organism



(a) Cellular level heart muscle cell

(b) Tissue level heart muscle tissue

(c) Organ level heart

(d) Organ system level circulatory system

(e) Organism level deer

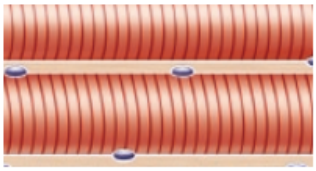
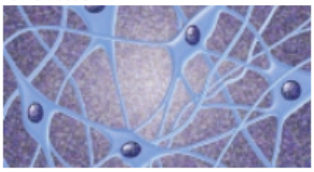
Definitions

- **Cell –** the smallest functioning unit of an organism
- **Tissue –** a group of cells that perform a similar, limited function
- **Organ** – a structure composed of different tissues to perform a complex function
- **Organ System** – a system of one or more organs that work together to perform a vital bodily function

Animal Tissues

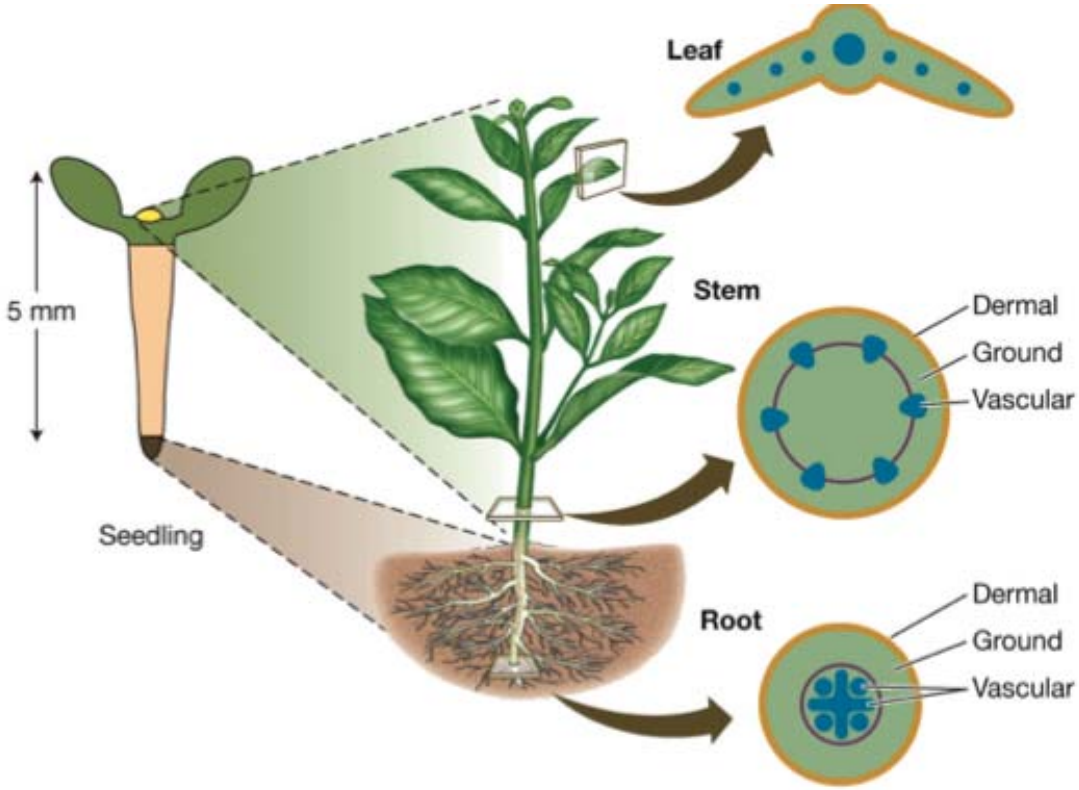
- Types:
  1. **Epithelial Tissue** – thin sheet that covers body surfaces and lines internal organs
  2. **Connective Tissue** – specialized tissue that provides support and protection
  3. **Muscle Tissue** – specialized tissue containing proteins that can contract and move
  4. **Nerve Tissue** – specialized tissue that conducts electrical signals from one part of the body to another

Table 1 Animal Tissue Types

Type	Example	Description	Function
epithelial tissue 	• skin • lining of the digestive system	• thin sheets of tightly packed cells covering surfaces and lining internal organs	• protection from dehydration • low-friction surfaces
connective tissue 	• bone • tendons • blood	• various types of cells and fibres held together by a liquid, a solid, or a gel, known as a matrix	• support • insulation
muscle tissue 	• muscles that make bones move • muscles surrounding the digestive tract • heart	• bundles of long cells called muscle fibres that contain specialized proteins capable of shortening or contracting	• movement
nerve tissue 	• brain • nerves in sensory organs	• long, thin cells with fine branches at the ends capable of conducting electrical impulses	• sensory • communication within the body • coordination of body functions

Plant Tissues

- Types:
  1. **Protective (Dermal)** –prevents water loss and protects the plants
  2. **Transport (Vascular)** – contains hollow, tube-like cells that move food and water through the plant
  3. **Photosynthetic (Ground)** – filler tissue that helps to transform the Sun's energy into sugar


Leaf
Stem
Dermal
Ground
Vascular
5 mm
Seedling
Root
Dermal
Ground
Vascular