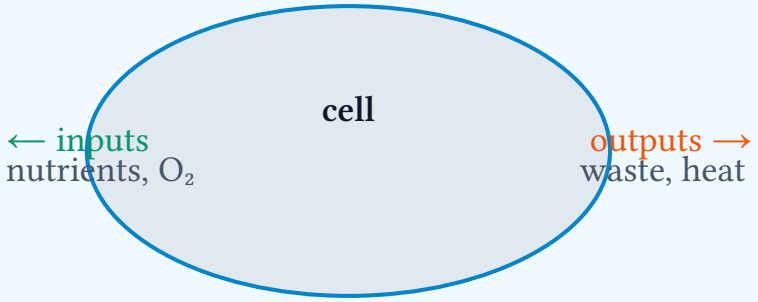
Science 10

## Unit C: Cycling of matter in living systems

# The cell as an open system

# Exchange and cell survival

- Cells require continuing inputs such as water, nutrients, and gases.
- Cells release products such as carbon dioxide, wastes, and thermal energy.



# Boundaries of an open cell

- The membrane selectively regulates exchange; open refers to matter and energy crossing the boundary.
- Matter and energy cross the cell boundary while internal processes transform them.
- Model cells as open systems that exchange matter and energy with their surroundings.

# Key terms

**open system**

A system that exchanges matter and energy with its surroundings.

**input**

Matter or energy entering a chosen system.

**output**

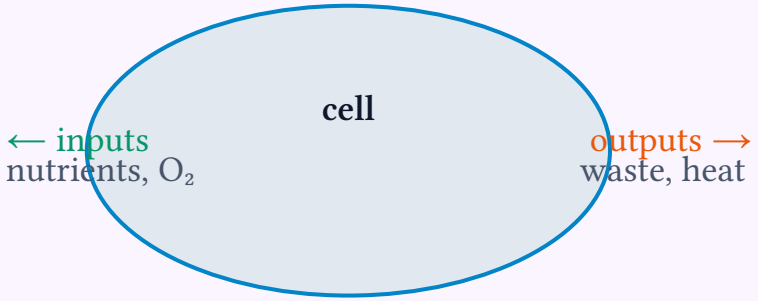
Matter or energy leaving a chosen system.

**cell membrane**

The selectively permeable boundary that regulates exchange with the environment.

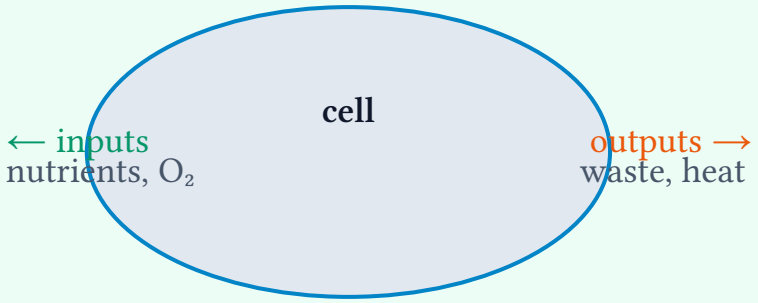
# Open systems

- Nutrients, water, and gases can enter a cell. Wastes and thermal energy can leave.
- Both matter and energy cross the membrane.
- Draw the membrane as the boundary. It selects what crosses. It works like a gate that chooses what gets through.



# Cell boundary audit

- Classify listed substances and energy transfers as inputs, outputs, or internal transformations.
- A complete answer shows the direction across the membrane and names the system boundary.



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