

Cells and Systems: From Cells to Body Systems

30 minutes, 3 stages

Every part of your body, from a single skin cell to your entire respiratory system, is organized in levels: cells build tissues, tissues build organs, and organs work together as systems ([Outcome](#), [Outcome](#)). Tonight you will practice moving between these levels and connect cell structure to how your body actually functions.

Stage 1: Warm-up (8 min)

Answer these in your notebook.

1. List three things a cell must do to stay alive (hint: think about what it needs to take in and what it needs to get rid of).
2. Fill in the blank chain, smallest to largest: cell !' ____ !' organ !' ____
3. Diffusion moves substances from an area of ____ concentration to an area of ____ concentration. Give one real example of diffusion happening in your own body right now ([Outcome](#)).
4. Name one structural difference between a plant cell and an animal cell ([Outcome](#)).

Answer key for Stage 1:

1. Possible answers: take in nutrients/food, take in oxygen, remove wastes/carbon dioxide, maintain energy, grow, respond to environment.
2. cell !' tissue !' organ !' system (or organism)
3. Diffusion moves substances from an area of **high** concentration to an area of **low** concentration. Examples: oxygen diffusing into your blood cells from your lungs, nutrients diffusing from your small intestine into your blood, or carbon dioxide diffusing out of your cells into your blood.
4. Possible answers: plant cells have a cell wall (animal cells do not); plant cells have chloroplasts (animal cells do not); plant cells have a large central vacuole (animal cells have small vacuoles or none).

Stage 2: Main task (17 min)

Part A: Cell comparison table (7 min)

Draw a two-column table labelled "Plant Cell" and "Animal Cell." Under each column, list at least three features. Include cell wall, cell membrane, and at least one other structure you remember from class. Circle any/all features found in plant cells but not animal cells ([Outcome](#)).

Part B: System matching (5 min)

Match each body system to its main job and one organ involved. Write your answers as full sentences.

- Respiratory system
- Circulatory system
- Digestive system
- Excretory system

Example sentence format: "The circulatory system moves blood throughout the body, and the heart is a key organ involved." Use this format for the other three systems ([Outcome](#)).

Part C: Stimulus and response (5 min)

Describe what happens inside your body in each of these two situations. Mention at least one system

and one change in function for each.

1. You start running to catch a bus.
2. You step outside on a cold winter day.

Example thought starter: heart rate, breathing rate, metabolism, and reflexes are all things that change in response to stimuli ([Outcome](#)).

Answer key for Stage 2:

Part A: Plant cells should have cell wall, cell membrane, chloroplasts, large central vacuole, nucleus, and other organelles. Animal cells should have cell membrane, nucleus, mitochondria, and other organelles (but no cell wall, chloroplasts, or large central vacuole). Students should circle cell wall, chloroplasts, and/or large central vacuole as features unique to plant cells.

Part B: Possible answers:

- The respiratory system brings oxygen into the body and removes carbon dioxide, and the lungs are a key organ involved.
- The circulatory system moves blood and nutrients throughout the body, and the heart is a key organ involved.
- The digestive system breaks down food into nutrients the body can use, and the stomach (or small intestine) is a key organ involved.
- The excretory system removes waste from the body, and the kidneys are a key organ involved.

Part C: Possible answers:

1. When you start running, your respiratory system increases breathing rate to take in more oxygen, and your circulatory system increases heart rate to pump blood faster to your muscles.
2. When you step outside on a cold day, your body increases metabolism to produce heat, and your nervous system triggers shivering as a reflex to generate warmth.

Stage 3: Consolidation (5 min)

Choose one organism that is NOT a human (an insect, a fish, a tree, an amoeba, anything you like) and answer:

1. How does this organism carry out one function that humans also need (such as gathering food, breathing, or moving materials in and out of cells)? Describe the structure it uses.
2. Is this organism single-celled or multicelled? Name one similarity and one difference between how it meets this function compared to how humans do ([Outcome](#), [Outcome](#)).

Write your answer in three to five sentences.

Exemplar response for Stage 3:

Example organism: Fish

A fish gathers oxygen from water using its gills, which are structures with many thin membranes that allow water to pass over them. The gills extract dissolved oxygen from the water, similar to how human lungs extract oxygen from air. Fish are multicelled organisms. Both fish and humans use a respiratory system to get oxygen into their bodies and remove carbon dioxide, but fish use gills while humans use lungs. Additionally, fish actively pump water over their gills by opening and closing their mouth and gill covers, while humans actively move air in and out of their lungs.

Self-check

1. Can you name the correct order of biological organization from cell to full organism (cell, tissue, organ, system, organism)?

2. Can you explain, in your own words, how diffusion works—that particles move randomly in all directions, but more particles move from where there are more of them to where there are fewer of them, resulting in a net movement from high to low concentration?
3. Can you describe one way your body's cells respond differently during exercise compared to rest?

If you answered "no" or "not sure" to any of these, reread your Stage 1 and Stage 2 answers before class tomorrow.