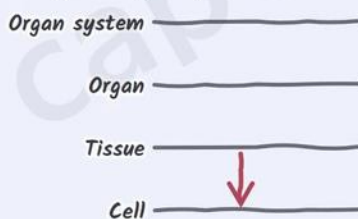


cell to tissue to organ to organ system, the cockroach included

Levels of organisation in animals

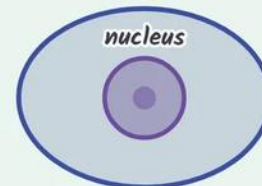
- cells are the basic structural and functional units; groups of similar cells performing a shared function form a tissue
- different tissues working together form an organ; different organs working together toward one broad function form an organ system
- an animal's body is built up through exactly this ladder: cell, tissue, organ, organ system



two steps of organisation stacked; cells build tissues, tissues build organs, organs build organ systems

The animal cell behind every tissue *

- an animal cell is eukaryotic and has no cell wall, so it stays flexible in shape, unlike a walled plant cell
- this flexibility is what lets animal cells pack tightly together and interlock into true tissues



plasma membrane

no wall at all, just a rounded plasma membrane around the nucleus

Four animal tissue types, one line each

Epithelial

covers surfaces and lines cavities, cells packed tightly with almost no gaps between them

Connective

binds and supports other tissues, cells scattered in an abundant matrix

Muscular

made of elongated, contractile fibres, responsible for movement

Nervous

made of neurons, specialised to generate and conduct electrical impulses

Epithelial tissue, by cell shape

- squamous**: flat, thin cells, forming a smooth lining wherever fast diffusion is needed, as in blood vessel walls
- cuboidal**: cube-shaped cells, common in kidney tubules and gland ducts, often secretory or absorptive
- columnar**: tall, column-shaped cells lining the gut, often bearing cilia that sweep material along, as in the respiratory tract
- epithelium can also be simple (a single layer) or stratified (multiple layers, as in the skin), depending on how much protection versus exchange it needs to balance

Connective tissue, the matrix decides the type

- areolar tissue**: loose packing tissue that fills the space between organs and beneath the skin
- adipose tissue**: stores fat, its cells swollen with fat droplets
- bone**: a hard matrix of calcium salts, forming the skeleton
- cartilage**: a flexible, uncalcified matrix, cushioning support at joints
- blood**: a fluid connective tissue, its matrix is the plasma, carrying cells and dissolved substances around the body