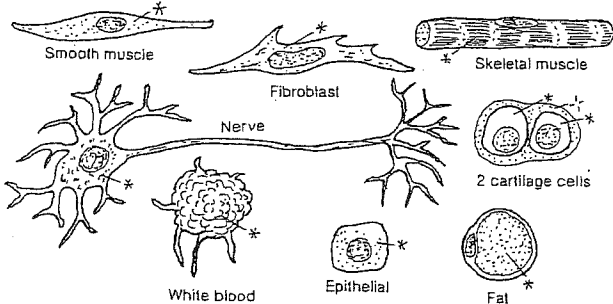


THE GENERALIZED CELL

CN: Color gray the variety of cell shapes at upper left. Use lightest colors for A, C, D, F and G. (1) Small circles representing ribosomes (H) are found throughout the cytoplasm (F) and on the rough endoplasmic reticulum (G¹); color those larger areas, including the ribosomes, first, and then color over the ribosomes again with a darker color. Each organelle shown is just one of many found in the living cell.

CELL SHAPES *



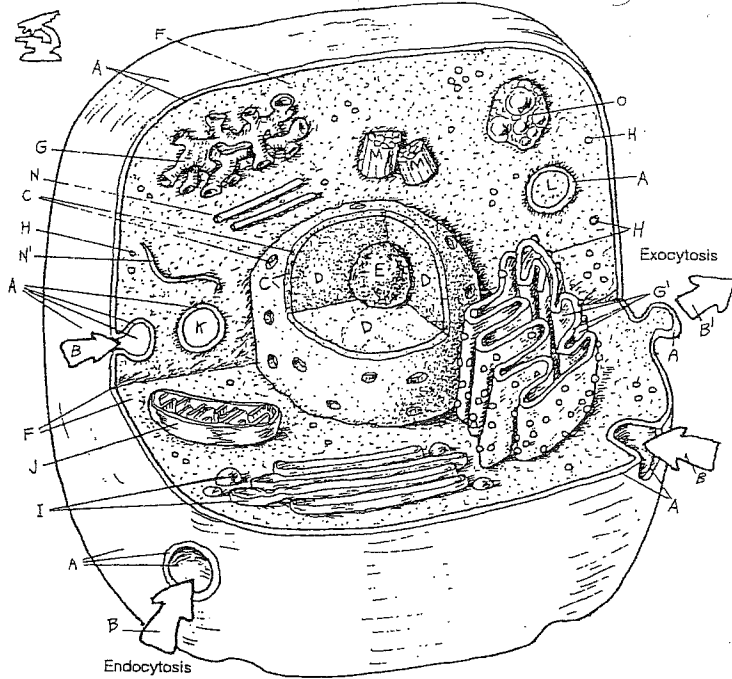
ORGANELLES -

- CELL MEMBRANE_A
- ENDOCYTOSIS_B / EXOCYTOSIS_{B'}
- NUCLEAR MEMBRANE_C
- NUCLEOPLASM_D
- NUCLEOLUS_E
- CYTOPLASM_F
- ENDOPLASMIC RETICULUM_G
- SMOOTH_G / ROUGH_{G'}
- RIBOSOME_H
- GOLGI COMPLEX_I
- MITOCHONDRION_J
- VACUOLE_K
- LYSOSOME_L
- CENTRIOLE_M
- MICROTUBULE_N
- MICROFILAMENT_{N'}
- CELL INCLUSION_O

The cell is the basic structural and functional unit of all living things. Living things are characterized by the ability to reproduce and grow, metabolize (transform or produce/consume of energy), and adapt to limited changes in their internal and external environment. Body structure lacking these characteristics, such as connective tissue fibers, is not considered to be "alive." Body structure more complex than a cell consists of a collection of cells and their products.

The activities of cells constitute the life process; they include ingestion, assimilation, and digestion of nutrients and excretion of the residue; respiration; synthesis and degradation of materials; movement; and excitability or response to stimuli. The impairment or cessation of these activities in normal cells, whether caused by trauma, infection, tumors, degeneration, or congenital defects, is the basis of a disordered or disease process.

By volume, the generalized cell is 80% water; by weight, it is composed of proteins (about 15%), lipids (3%), carbohydrates (1%), and nucleic acids and minerals (1%). These materials may be integrated into structural working units (organelles), form a more mobile functional unit (e.g., messenger RNA, globular protein-based enzymes), or form products of the cell. The basic function of a cell is to produce protein, which is essential to the acquisition and use of cell energy, formation and repair of structure, and cell activities (e.g., synthesis, secretion, absorption, contraction).



Cell membrane: the limiting lipoprotein membrane of the cell; retains internal structure; permits exportation and importation of materials. Infolding/outfolding of the cell membrane permits the introduction of material into the cell (endocytosis) or its expulsion (exocytosis) from the cell.

Nuclear membrane: porous, limiting, lipoprotein membrane; regulates passage of molecules.

Nucleoplasm: the nuclear substance containing chromatin (chromosomes during cell division) and RNA.

Nucleolus: a mass of largely RNA, it forms ribosomal RNA (rRNA) that passes into cytoplasm and becomes the site of protein synthesis.

Cytoplasm: the ground substance of the cell less the nucleus. Contains organelles and inclusions listed below.

Smooth/rough endoplasmic reticulum (ER): membrane-lined tubules to which ribosomes may be attached (rough ER; flattened tubules) or not (smooth ER; rounded tubules). Rough ER is concerned with transport of protein synthesized at the ribosomes. Smooth ER synthesizes complex molecules called steroids in some cells; stores calcium ions in muscle; breaks down toxins in liver.

Ribosome: the site of protein synthesis where amino acids are strung in sequence as directed by messenger RNA from the nucleus.

Golgi complex: flattened membrane-lined sacs that bud off small vesicles from the edges; collect secretory products and package them for export or cell use, e.g., lysosomes.

Mitochondrion: membranous, oblong structure in which the inner membrane is convoluted like a maze. Energy for cell operations is generated here through a complex series of reactions between oxygen and products of digestion (oxidative reactions).

Vacuoles: membrane-lined containers that can merge with one another or other membrane-lined structure, such as the cell membrane. They function as transport vehicles.

Lysosome: membrane-lined container of enzymes with great capacity to break down structure, e.g., microorganisms, damaged cell parts, and ingested nutrients.

Centriole: bundle of microtubules in the shape of a short barrel; usually seen paired, perpendicular to one another. They give rise to spindles used by migrating chromatids during cell division.

Microtubules: formed of protein; provide structural support for the cell and/or its parts.

Microfilaments: are support structures formed of protein different from that of microtubules. In skeletal muscle, the proteins actin and myosin are examples of thin and thick microfilaments.

Cell inclusion: aggregation of material within the cell that is not a functional part (organelle) of the cell—e.g., glycogen, lipid.