

Biology Midterm 1 Review

Phospholipids

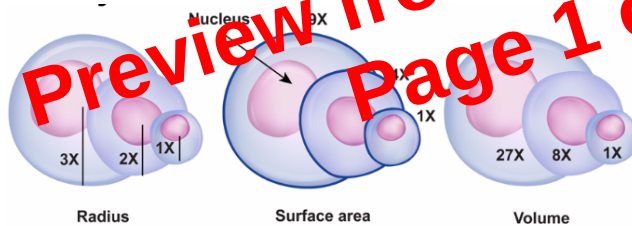
- Amphipathic (having both hydrophilic and hydrophobic parts)
- Polar head → hydrophilic
- 2 Non-polar hydrocarbon tails → hydrophobic

Module 13: Cells

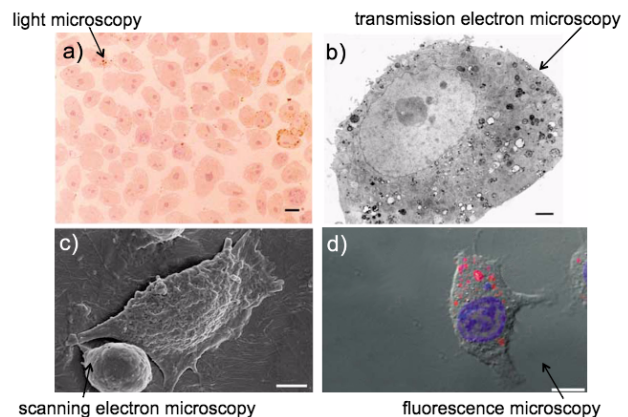
- Cells compose organisms or can be organisms
 - Unicellular organisms consist of a single cell
 - Multicellular organisms can have specialized cells for different functions but cells have same basic structure
- **Cell Theory**
 - 1. All organisms are composed of one or more cells
 - 2. Cells are the basic structural and functional unit of life
 - 3. Cells come from other pre-existing cells

Why are cells so Small?

- Large cells have less surface area per unit volume.
- Large cells are less capable of transporting materials across plasma membrane
- The **volume** of a cell determines the **biochemical capacity** of that cell
- Increase radius by **2x**, increases surface area by **4x**, increases volume by **8x**



- Exceptions to the rule: egg cells mostly metabolically inactive, need few nutrients and produce little waste.
- Most plant and animal cells are about 10 to 100 microns across and therefore invisible to the human eye.
- Most bacterial cells range from about 1 to 10 microns long.
- Today we have powerful **light microscopes** with which we can see very small cells, using **electron microscopes** scientists can see these cells in greater detail.
- *Resolution and magnification* maximizes are ability to see cells clearly.



- Hydrothermal vents in the deep sea provide an environment favourable to the development of organic molecules.

*****plasmodesmata*****

How Did Macromolecules Assemble from Organic Molecules?

- How does a simple, single celled organism survive and reproduce?
- It needs macromolecules like DNA and RNA to make proteins, it needs proteins, such as enzymes, to make DNA and RNA. How were the first molecules made if there were no enzymes?
- **Was RNA the first genetic material?**
 - Some types of RNA catalyze reactions, like enzymes. Thomas Cech called these RNA catalysts “ribozymes”.
 - Ribozymes also produce nucleotide sequences that directly complement a piece of RNA, and some ribozymes replicate themselves.
- **How did self-replicating protocells develop?**
 - The DNA double helix unwinds and separates into two strands, and proteins stabilize each strand while several enzymes work to create first an RNA primer, then new DNA strands that preserve the information contained in the genome.
 - How could a cell replicate without proteins or enzymes?
 - How could cell membranes have developed?
 - Adding lipids or other organic molecules to water results in the creation of vesicles or fluid-filled sacs.
 - Vesicle self-assembly is much more likely when montmorillonite, a type of clay created by weathering volcanic ash, is added along with organic molecules to the water.
 - The organic molecules cluster on the surface of the clay.
 - The molecules enclosing a vesicle will arrange themselves into a bilayer, shielding their hydrophobic ends like the lipid bilayer of a cell membrane.
 - **Nucleic polymerization is catalyzed by clay particles.**

