CELLS (Ch. 2)

1. CELL THEORY

cells - smallest unit of life, microscopic
- 60-100 trillion in human body, 200 different types

discovery - 1665 microscope (Hooke)
- 1838 plants, 1839 animals

(1) cells are fundamental unit of life

(2) all organisms are composed of cells

(3) cells can only arise from other cells

2. CELL STRUCTURE

cytoplasm - gelatinous fluid inside

cell membrane - surrounds cell

(cell wall) - in plant cells only
- cellulose outside cell membrane

organelles - structures inside cell

cilia - outside, many & short

flagellum - outside, single & long

3. NUCLEUS

nucleus - control center

nuclear membrane - surrounds nucleus

nucleoplasm - cytoplasm inside nucleus

nucleolus - produces ribosomes

chromosomes - genetic, total 46 in most human cells

4. OTHER ORGANELLES

mitochondria - releases energy

(chloroplast) - in plant cells only
- photosynthesis (capture sun energy)

ribosome - produces protein

endoplasmic reticulum (e.r.) - tubules for circulation

Golgi body - packages chemicals

vesicle - membrane sac from Golgi
- vacuole - water (esp. plants)
- lysosome - digestive chemicals

centrioles - in animal cells only
- help organize cell division

microtubules - hollow proteins

microfilaments - solid proteins

5. CELL SIZE

size - 10-30 micrometers (mm = 0.001 mm)

efficiency & specialization
- partition body for different functions

surface area to volume ratio
- volume^3 increase faster than surface area^2
- entire body remains near cell membrane

microscope - must magnify & resolve
- either light or electron

6. MEMBRANES

fluid mosaic model - 2 layers lipids embed with proteins
- cell membrane - 1 fmm
- nuclear membrane - 2 fmm

selectively permeable
- ability to dissolve thru cell membrane
- depends on solubility & size

if lipid-soluble - dissolve thru lipid layers

if water-soluble - thru protein pores if small enough

- generally not permeable if too large

7. CELL TRANSPORT

diffusion - passive & random
- from high to low concentration

facilitated diffusion - still from high to low concentration
- carrier molecules increase speed diffuse

active transport
- from low to high concentration (against conc)
- requires carrier molecules + energy

osmosis - diffusion of water thru cell membrane

endocytosis - vesicle enters cell

exocytosis - vesicle exits cell

8. CELL DIVISION

cell cycle - growth followed by division, etc.
- each cell divides into 2 daughter cells
- allows enlarge & replace dead cells

mitosis - produces most cells in body
- daughter cells identical to original
- each with a full set of chromosomes

meiosis - only in gonads (testes & ovaries)
- only for producing sperm & ova
- each with a half set of chromosomes

9. KINGDOMS

eukaryotic cell - with nucleus + many organelles

prokaryotic cell - primitive, contain few organelles

	Mo	**Pr**	**Pl**	**Fu**	**An**
cell type	pro	eu	eu	eu	eu
no. cells	uni	uni	multi	multi	multi
cell wall	+	+/–	+	+	–
centrioles	–	+/–	–	–	+
chloroplast	–	+/–	+	–	–

10. EVOLUTION OF CELLS

organelles - prokaryotic to eukaryotic

endosymbiosis - mitochondria & chloroplasts
- originally separate & parasitic

trophism - heterotrophic to photosynthetic

cell numbers - unicellular to multicellular

reproduction - asexual (mitosis) to sexual (meiosis)