Membrane Composition (1)

1) membrane
   - function: barrier, boundary
   - material: phospholipid (bilayer)
     - a) aqueous surfaces (outer, inner)
       =hydrophilic phosphate heads
     - b) non-aqueous center
       =hydrophobic lipid tails
2) receptors
   - function: sense external cell activities
     neg. charged - keeps RBC apart
   - material: carbohydrates
     - glyco-calyx, -protein, -lipid

Membrane Composition (2)

3) fillers

function: fills up spaces between phospholipids (firms up cell membrane)

material: cholesterol

4) channels

function: structural support (firms up membrane)
transport
enzymes (reg. chem. reactions)
receptors for hormones
antigen markers for blood & tissues
basis for "fluid mosaic model" name (proteins move around phospholipids)

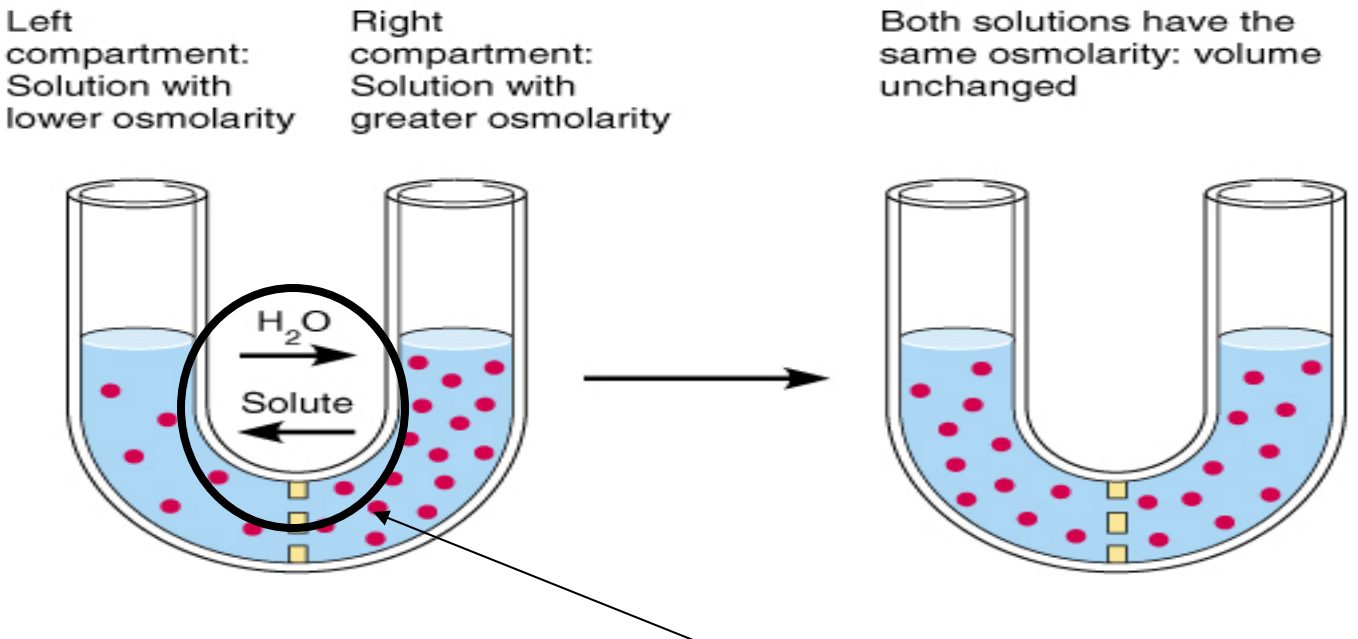
material: protein

Passive Transport Criteria

1) **energy (ATP): not needed**
2) **membranes: none or permeable (with pores)**
3) **concentration gradient: present**
4) **movement direction: [↑] -> [↓] (with gradient)**
5) **material movement:**
    a) **solute & solvent:**
        diffusion (simple, facilitated)
        dialysis
    b) **solvent:**
        osmosis (water)

Dialysis

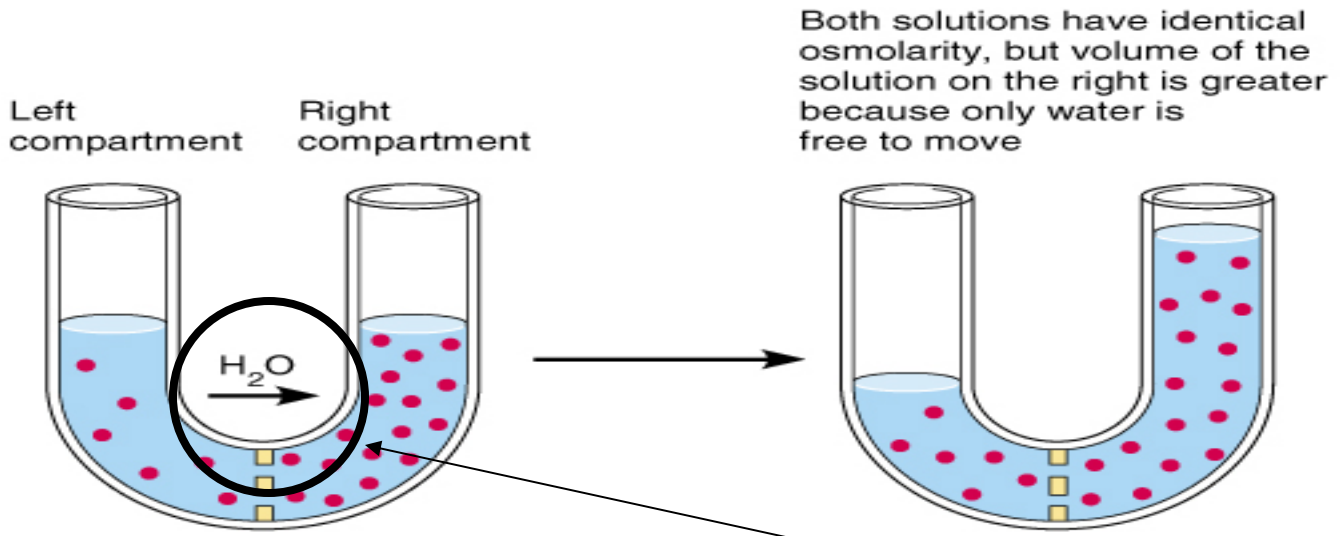
- perm. memb. (water, small solutes); conc. grad. present
- solvent and small solute mvmt. thru dialysis membrane
- solute size range: water < salt < glucose < starch/sucrose



both solute & water moves
-> same osmolarity & volume

Osmosis

- membrane perm. to water only; conc. gradient present
- solvent movement thru filter
- filter pore size: only water passes, solutes do not pass



(b) Membrane impermeable to solute molecules, permeable to water

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only water moves -> same osmolarity, but different volumes

Osmosis - RBC

- membrane only permeable to water
- ↑ water entry into container → ↑ osmotic pressure

eg RBC in salt solutions experiment
- ↑ tonicity (salt conc) → ↓ water entry → ↓ RBC size
Δ

salt%:	**1.5+%**	**0.9%**	**water**
tonicity:	**hypertonic**	**isotonic**	**hypotonic**
RBC size:	**shrink (crenate)**	**same -**	**swell (hemolysis)**
water mvmt.:	**leave**	**no Δ**	**enter**

Filtration

- membrane permeable to solutes by size
- gravity → hydrostatic pressure
- pressure gradient (↑ pressure → ↓ pressure)

eg: charcoal powder filtration experiment
size: charcoal > starch > $CuSO_4$ > water
passage: $CuSO_4$, water due to gravity
and membrane pore size

eg: blood filtration in kidney tubules
size: blood cells > urea > glucose > salts > water
passage: salts, water due to blood pressure
and renal capillary pore size

Active Transport

criteria:

1) **energy (ATP): needed**
2) **membranes: present**
   - **permeable (with pores)**
3) **concentration gradient: present**
4) **movement direction: [↑] <- [↓]**
   - **movement against gradient**
5) **material:**
   - **large solutes**

Bulk Transport

- results from cell membrane adaptations

Type:

1) exocytosis

- vesicles fuse around foreign objects, eject outside

- adds to cell membrane surface

2) endocytosis

- vesicles fuse around foreign objects, pinch off inside

eg: 1) bulk phase endocytosis: liquids w/ protein, fat

2) phagocytosis: WBC, lysosomes

3) pinocytosis: urinary bladder cells

4) receptor-mediated endocytosis: arterial cells

Somatic Cells

= cell div. of somatic cells (all cells except sex cells)

somatic cell cycle:

1) **interphase (46 → 92)**
   → **mitosis (2 x 46), 2 diploid (2n) cells**
2) **mitosis: 4 phases - P, M, A,T**

somatic cell makeup:

1) **diploid (2n)**
2) **46 chromosomes**
   - **22 pairs autosomes, homologous**
   - **2 sex chromosomes, not nec. homolog.**

Interphase

growth / interphase: (75% - 95% cell cycle time)

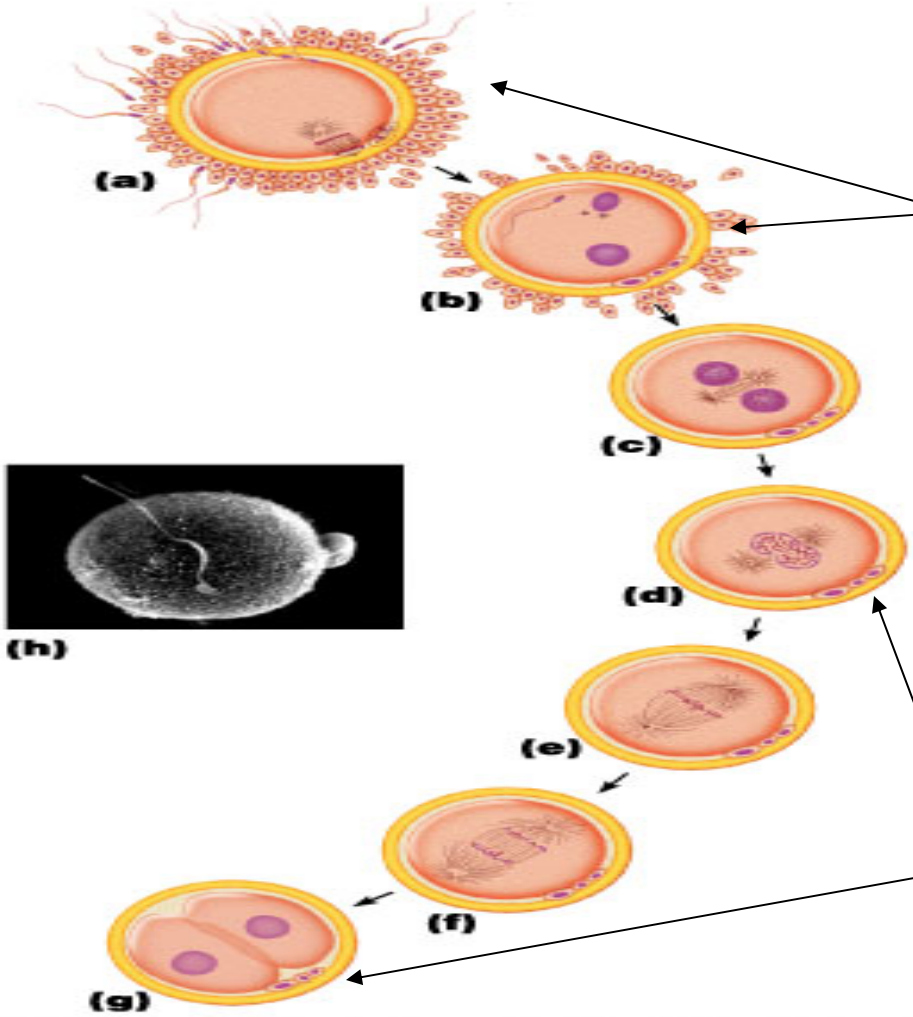
3 phases:

1) G_1: 1st growth phase
- **cell contents increase & size doubles**
- **cytoplasm, organelles except genes**
- **neurons & skeletal muscle cells stay at G_1**

2) S: synthesis
- **genes double (46 -> 92)**

3) G_2: complete growth process

Meiosis & Mitosis



meiosis
2° oocyte (M_2) divides into 4 haploid cells (ovum & 3 polar bodies

mitosis
fertilized egg divides into 2 daughter cells

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