Cell Processes

Chapter 3

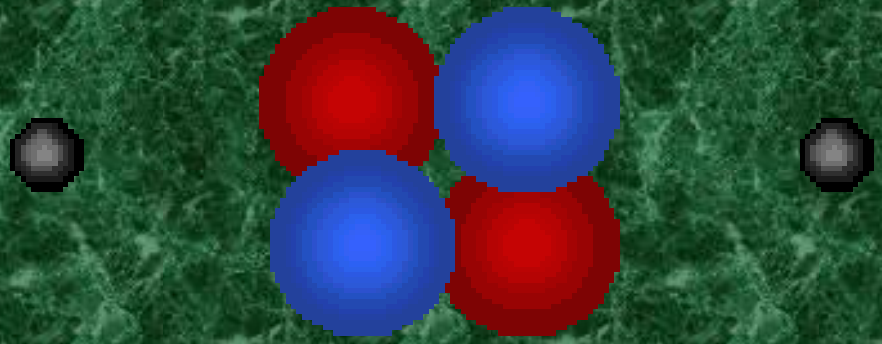
Chemistry of living things

- Living things are made of matter
- Matter is any thing that has mass and takes up space

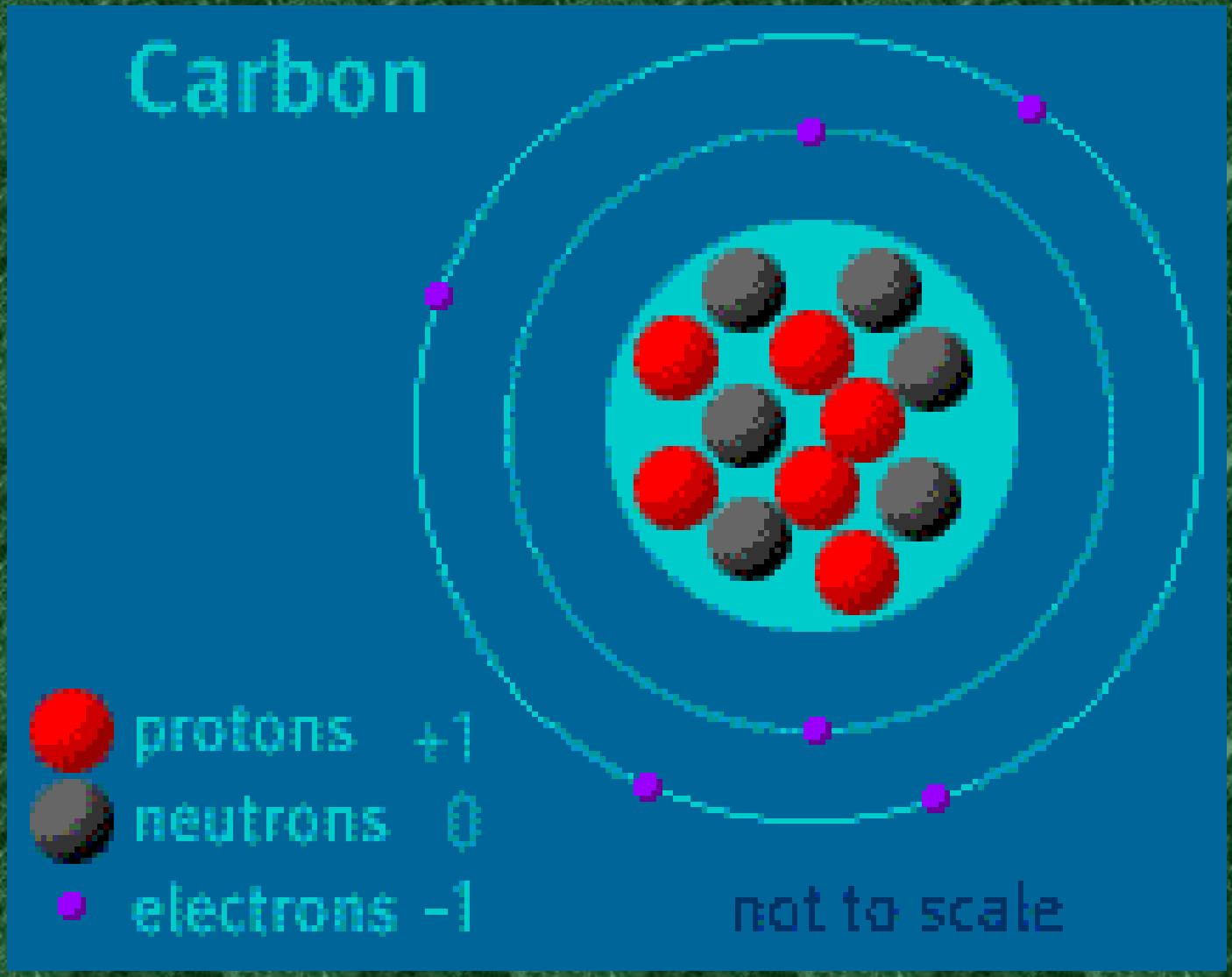
What matter is made of

- **Atom is the smallest unit of matter**
- **Center nucleus of the atom**
  - **Proton - particle that has a positive charge**
  - **Neutron – particle that has no charge**
    - **Electron cloud – area around the nucleus**
  - **Electron – negatively charged particle that moves around the nucleus at the speed of light**

Model of the Atom



Model of Atom



Atomic Particle Table

	Mass	Charge
Protons	1 AMU	Positive
Neutrons	1 AMU	None
Electrons	O AMU	Negative

- **Energy is release by atoms being rearranged or broken apart in a chemical reaction.**
  - **Element – only one type of atom present in a substance**
  - **Elements can’t be broken down any further by simple chemical processes**
  - **Each element has its own symbol**

Compounds – is the result of atoms combining

- Atoms combine in two ways
  - Atoms share their outer most electrons in a covalent bond
  - Atoms become electrically charged because one loses an electron and another one gains an electron and so they combine to form an ionic bond.

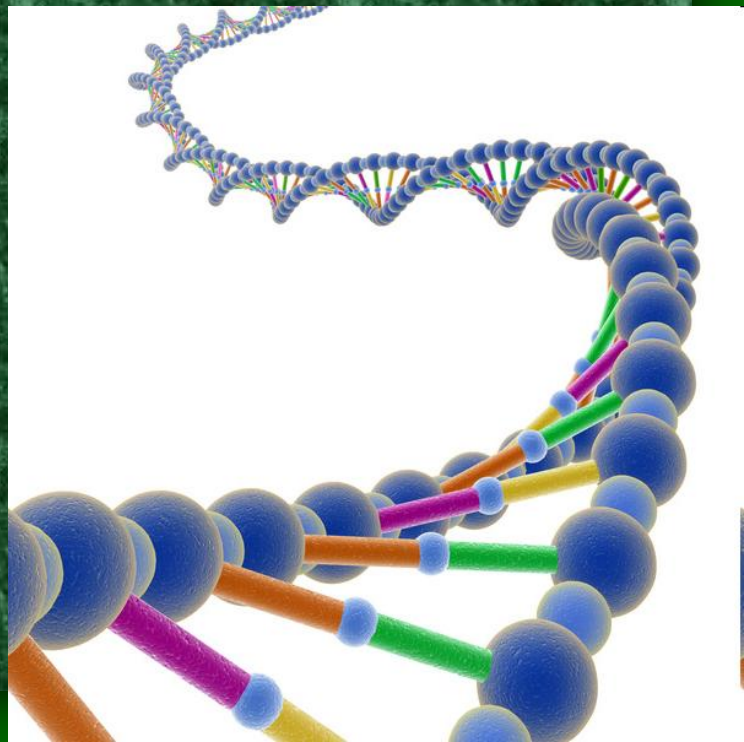
Mixtures –

combination of substances in which the individual substances retain their own properties

- Solution – a mixture in which one or more substances mix evenly with other substances. Particles do not settle out (salt water)
- Suspension – A mixture in which substances are evenly spread throughout a liquid or gas. Particles in a suspension settle out over time (paint)

Compounds in living organisms

- Organic – contain carbon
- Inorganic – not ever living
- Organic compounds that make up all living things are
  - Carbohydrates
    - Sugars and starches
  - Lipids
    - Fats, oils and waxes
  - Proteins
    - Made up of amino acids
    - Building blocks
  - Nucleic acids
    - DNA
    - RNA



Inorganic Compounds – made of elements other than carbon

1. Water
2. Carbon Dioxide
3. Oxygen

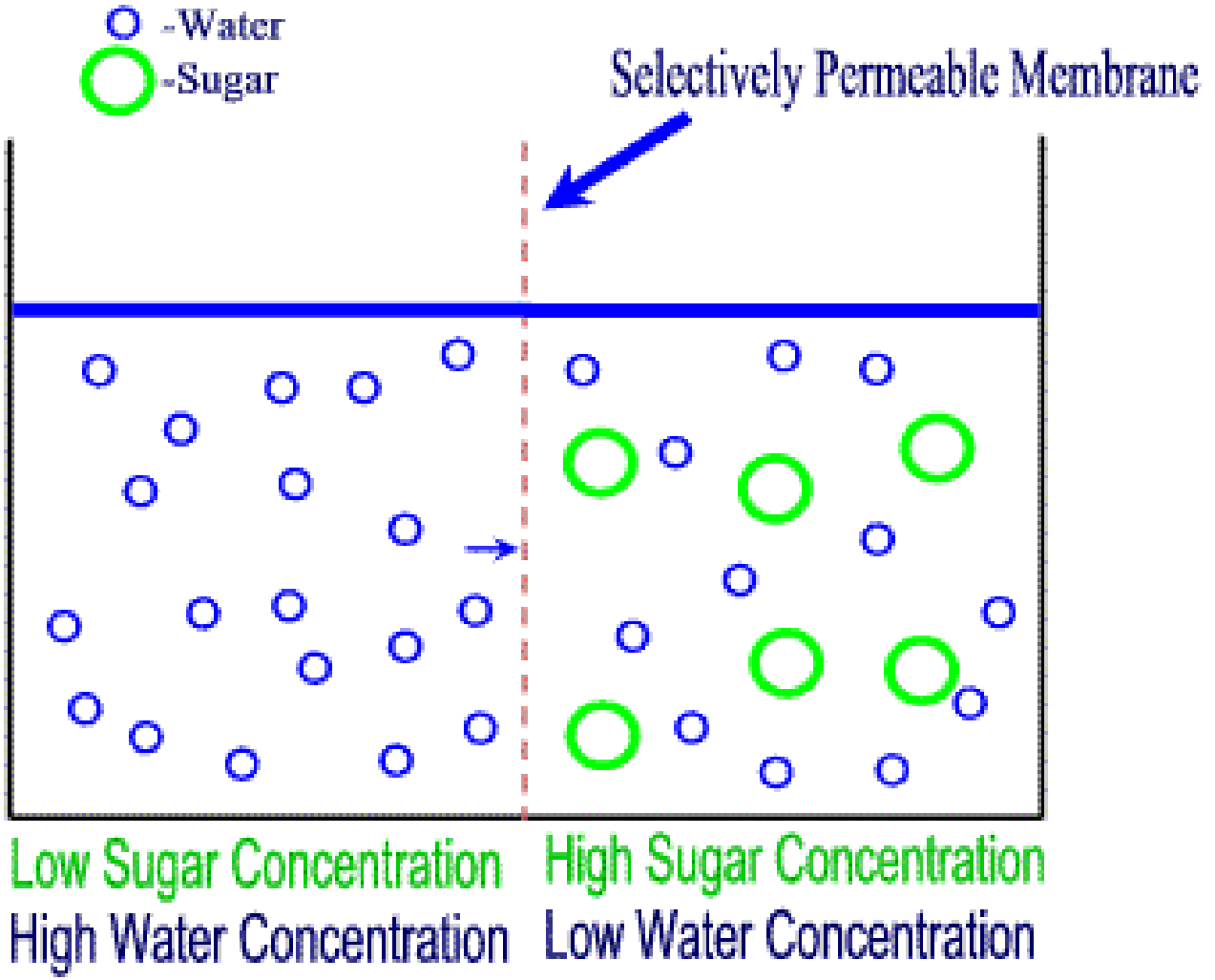
Water

- Living things are composed of more than 50% H_2O
- Water is polar
- Polar means that it has a positive end and a negative end
- This is why water washes things off you and helps move things through us
- This is why ice makes 6 sided snow flakes and make it float on liquid H_2O

Cell Membrane

- allows certain material to pass through it while preventing others. This is called selective permeability.
- Cells obtain food, oxygen, etc. from their environment and release waste into the environment
- Small molecules and ions move randomly across the membrane from high to low concentration.
  - This is called diffusion – moving from high to low
  - Equilibrium – when the molecules of a substance are spread evenly throughout a space
  - Osmosis – is the diffusion of water.

Osmosis


-Water
-Sugar
Selectively Permeable Membrane
Low Sugar Concentration
High Water Concentration
High Sugar Concentration
Low Water Concentration

Transport – is the movement of substances across the cell membrane

Passive transport

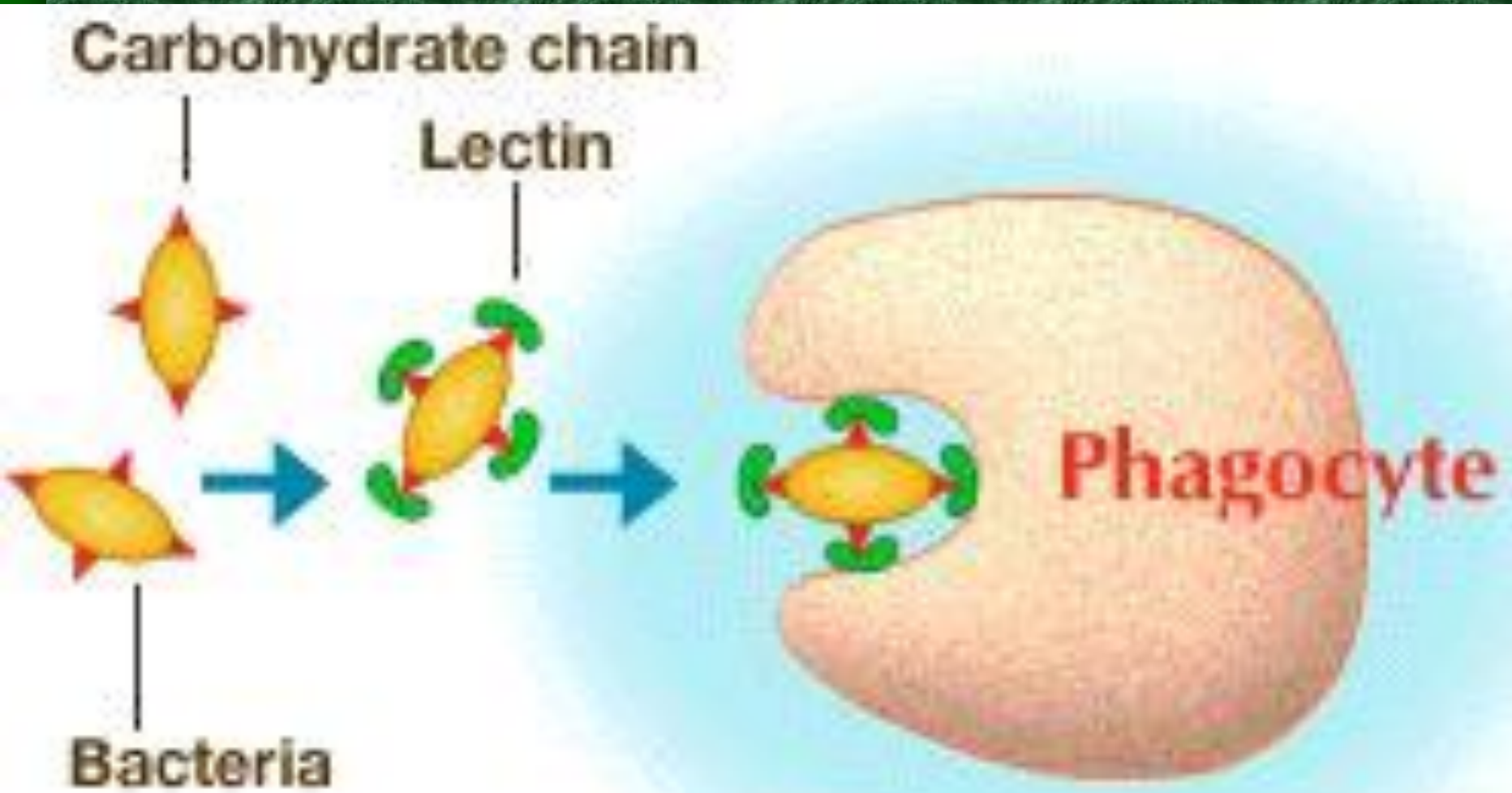
- is a transport that requires no energy from the cell to move materials
  - Example: osmosis and diffusion
- Facilitated diffusion – diffusion where the transport protein molecules in cell membrane help in the transport of materials across the cell membrane

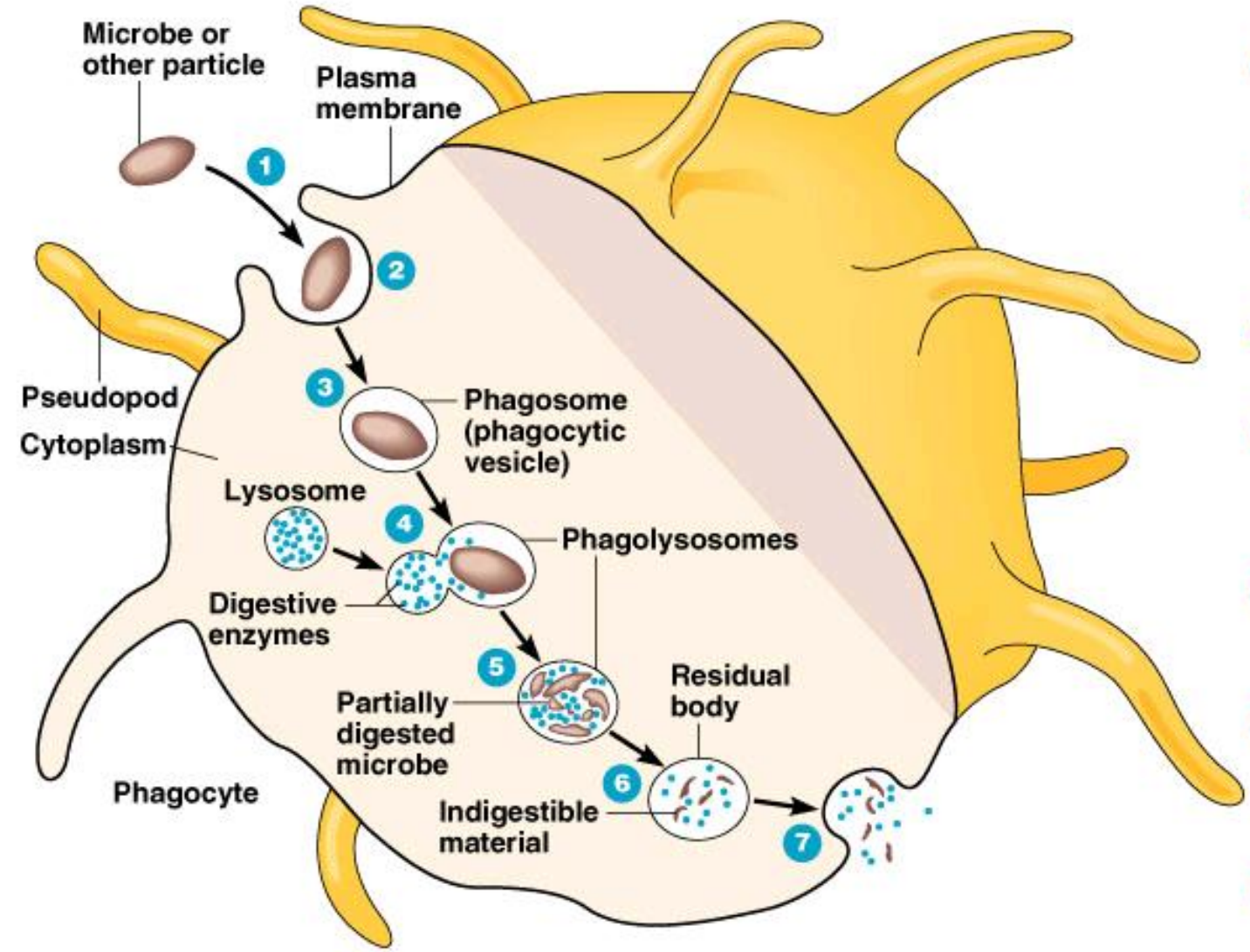
Active transport

- When energy is required to move through the cell membrane. Transport proteins are used here also.
  - This is when substances are moved from low concentration to high concentration.
    - The cells energy is required for this process
    - Example: plant roots taking minerals from the soil

Endocytosis

- capture things too big to pass through membrane, surround the particle and form a vacuole
  - Phagocytosis- large particles moved into the cell
  - Pinocytosis – fluids moved into the cell
  - Exocytosis – opposite of endocytosis, cells move waste vacuoles or protein packages from golgi bodies out of the cell. This can also so be for waste removal.


Carbohydrate chain
Lectin
Phagocyte
Bacteria



1. Chemotaxis and adherence of microbe to phagocyte.
2. Ingestion of microbe by phagocyte.
3. Formation of a phagosome.
4. Fusion of the phagosome with a lysosome to form a phagolysosome.
5. Digestion of ingested microbe by enzymes.
6. Formation of residual body containing indigestible material.
7. Discharge of waste materials.

(a) Phases of phagocytosis

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Metabolism – total of all chemical activities of an organism (to stay alive, grow, reproduce)

Producers

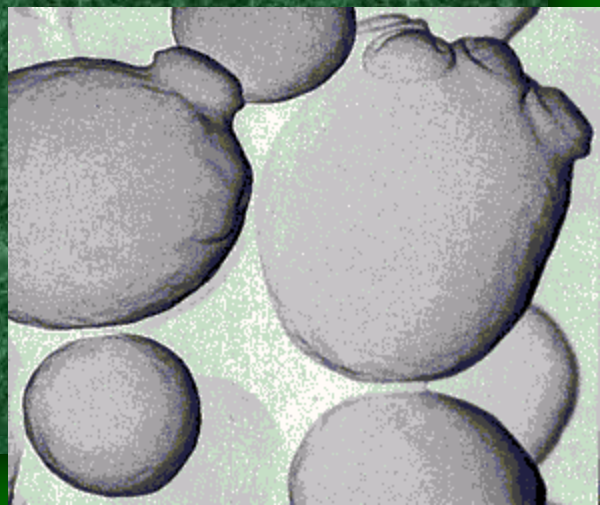
- make their own food in the chloroplasts by a process called photosynthesis
- Photosynthesis – changes light energy into chemical energy
  - $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
  - carbon dioxide + water and sun's energy yield sugar + oxygen
  - the sun's energy is stored in the sugar molecule

Consumers

- require another organism to assemble their food for them
- Cellular Respiration releases the energy from the sugar molecule to do cell processes
  - $C_6H_{12}O_6 + O_2 \rightarrow 6CO_2 + 6H_2O$
  - Respiration is the opposite of photosynthesis
  - Respiration takes place in the mitochondria.

Fermentation

- A form of respiration that produces energy when oxygen is insufficient
  - Does not produce as much energy as regular respiration
  - Lactic acid fermentation Produces a by product – lactic acid
  - Alcoholic fermentation produces a by product – alcohol



Quiz

- 1. Write out the chemical equation for photosynthesis
- 2. Write out the chemical equation for respiration.
- 3. What is respiration without oxygen called?
- 4. What are two types of endocytosis?
- 5. What is an element?
- 6. What are the four organic compounds that make up living things?