

Chemistry Topics

- 1) elements**
- 2) inorganic compounds**
- 3) organic compounds**

Elements

Element/atom = basic building blocks of matter

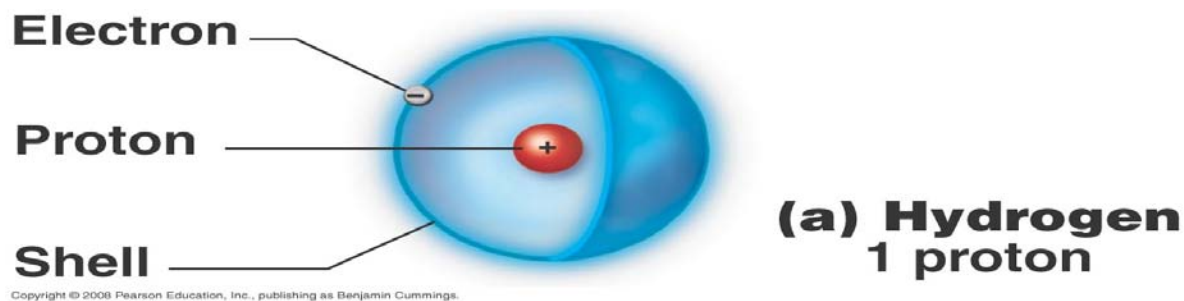
1) each element:

a) same number of subatomic particles (e^- , p^+ , n)

b) atomic structure of nucleus and energy orbitals (shells)

2) periodic table: table of elements

- each column has similar chemical reactions (periodicity)



Isotopes

normal atoms: same number of protons and neutrons

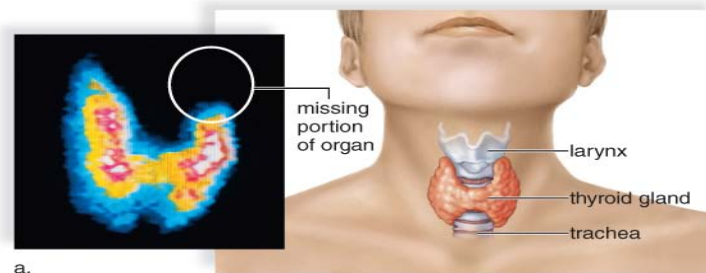
- stable, does not break down, stays the same

isotopes: same number of protons, diff. number of neutrons

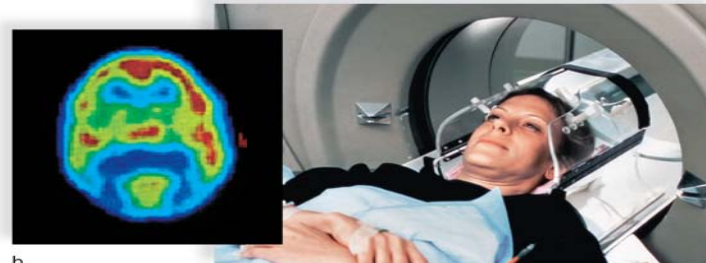
- unstable, breaks down, releases energy and subatomic particles

use: tracers to detect cell changes, eg tumours

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a.



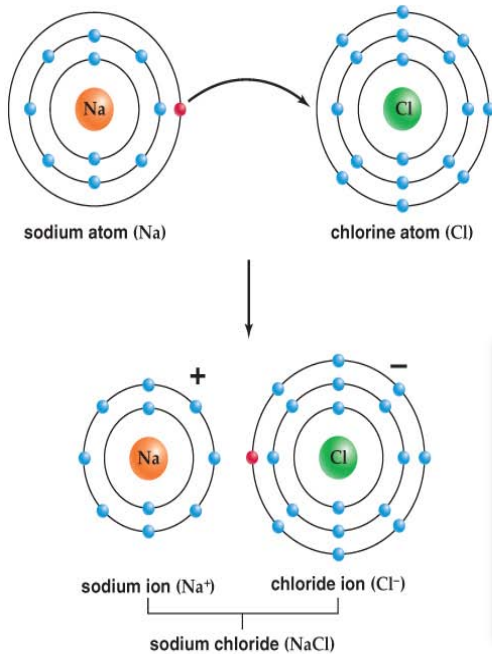
b.

© Biomed Commun./Custom Medical Stock Photo; b (patient): Courtesy National Institutes of Health; b (brain scan): © Mazzlota et al./Photo Researchers

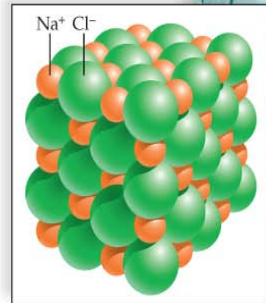
Molecules

molecules: atoms bonded to other atoms
3 types of bonds: covalent, ionic, and hydrogen

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a.



b. (crystals, shaker): © Evelyn Jo Johnson



ionic bonds
bond of charged atoms

table salt (NaCl)
atoms gain
or lose electrons

2nd strongest bond

Matter & Energy

matter

- molecules made of bonded atoms
 - bonds: covalent, ionic, hydrogen bonds
 - atoms: nucleus (protons & neutrons) + shell (electrons)
- eg salt = NaCl; sodium + chlorine
(Na, 11) (ionic bond) (Cl, 17)

energy

- power to change bonds, therefore matter
- eg metabolism = creating new matter from old matter
- catabolism: break bonds; release energy
- anabolism: form bonds, use energy
- types: potential (stored), kinetic (in motion)

Inorganic Compounds

non-carbon containing compounds

1) water:

- 60-80% by weight of living organism**
- metabolic - regulate life processes**
- hydrogen bonds in water**
(ice and liquid)

2) salts - ion source

3) acids & bases - pH level

Water Properties

- 1) high heat capacity**
 - water absorbs heat, reg. body temp.

- 2) high heat of evaporation**
 - water releases heat, reg. body temp.

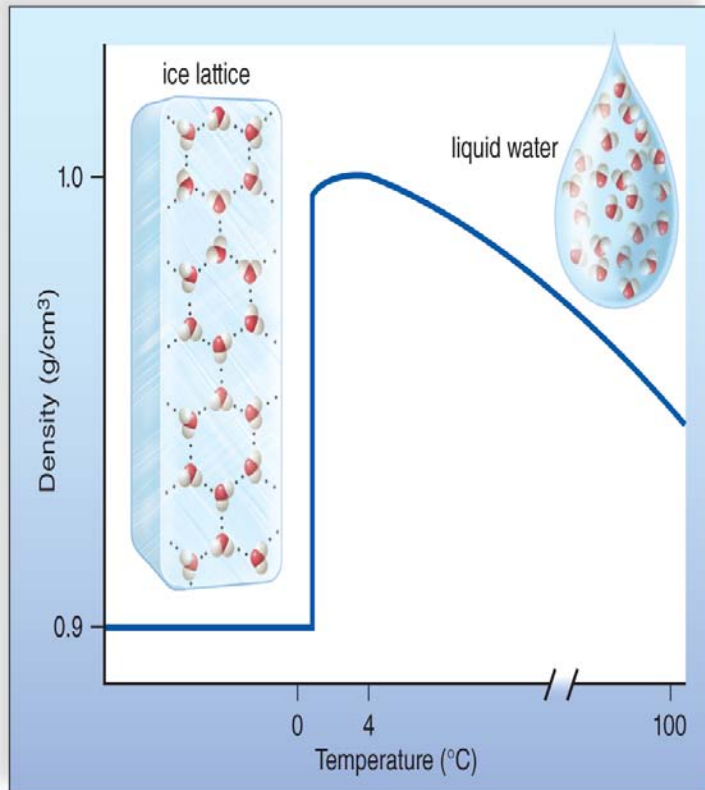
- 3) solvent**
 - water has hydrogen bonds, which dissociates polar compounds, eg NaCl

- 4) cohesive & adhesive molecules**
 - water has hydrogen bonds, which "sticks" to other molecules

- 5) ice is lighter than liquid water**
 - water has hydrogen bonds, which expands & becomes lighter when frozen constricts & becomes heavier when heated

Ice & Liquid Water

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ice

- H bonds forms lattice,
becomes lighter, less dense

liquid water

- H bonds closer,
becomes heavier, more dense

Q: ice float or sink?

Acid-base Imbalance

acidosis (pH < 7):

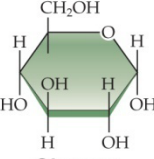
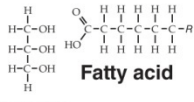
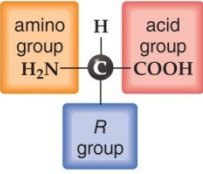
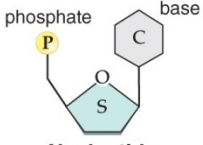
- 1) **respiratory acidosis:**
 - hypoventilation (excess CO₂ in body)**
- 2) **metabolic acidosis:**
 - a) **excess alcohol**
 - b) **diarrhea**
 - c) **excess diet/starvation**
 - d) **excess exercise**
 - e) **kidney failure**

alkalosis (pH > 7):

- 1) **respiratory alkalosis:**
 - hyperventilation (insuff. CO₂ in body)**
- 2) **metabolic alkalosis:**
 - a) **vomit**
 - b) **excess antacids consumption**
 - c) **constipation**

Organic Compounds

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Organic molecules	Examples	Monomers	Functions
Carbohydrates	Monosaccharides, disaccharides, polysaccharides	 <p>Glucose</p>	Immediate energy and stored energy; structural molecules
Lipids	Fats, oils, phospholipids, steroids	 <p>Fatty acid Glycerol</p>	Long-term energy storage; membrane components
Proteins	Structural, enzymatic, carrier, hormonal, contractile	 <p>Amino acid</p>	Support, metabolic, transport, regulation, motion
Nucleic acids	DNA, RNA	 <p>Nucleotide</p>	Storage of genetic information

definition:

organic = carbon containing

types

1) **carbohydrates**

2) **lipid**

3) **protein**

4) **nucleic acid**

food

bread

chocolate

meat

yolk

Carbohydrates

basic unit: saccharides (sugar)

function: energy, structural material

types:

1) sugar

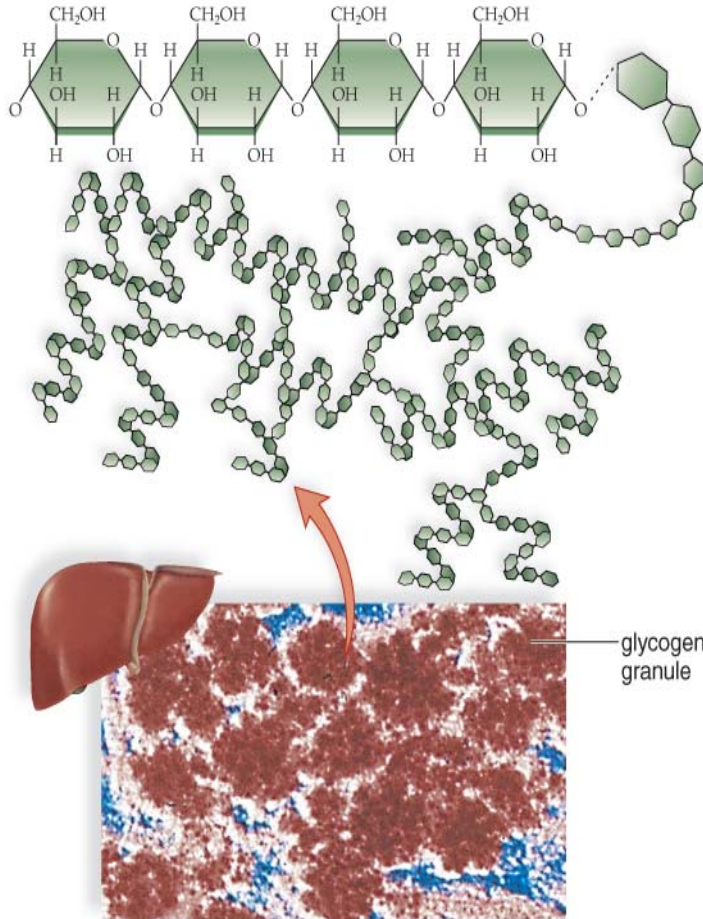
- energy, eg glucose (blood sugar)

2) starch

- stored energy, eg glycogen (liver & muscles)

Glucose & Glycogen

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liver cells

© Don W. Fawcett/Photo Researchers

glucose

- cell energy

glycogen

- stored animal energy
(muscles & liver only)

***starch**

- stored plant energy

- bread, rice, bananas

Lipids

basic unit: glycerol, fatty acid

function: stored energy, structural material

types:

1) insoluble

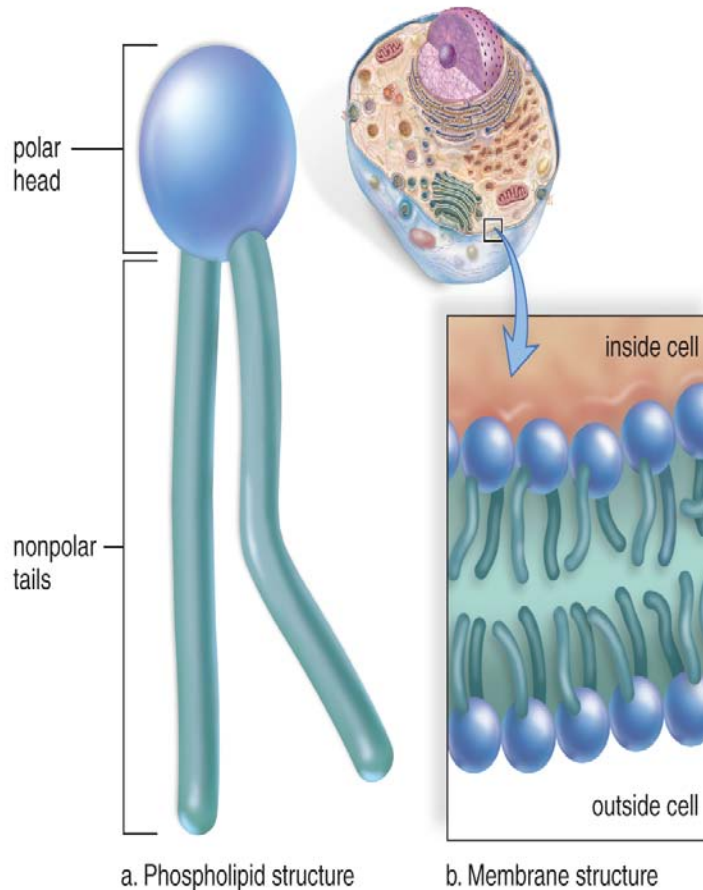
- protection & stored energy
- eg phospholipids (cell membrane), fat

2) soluble

- regulate metabolism:
- eg steroids (cholesterol, estrogen, testosterone)

Phospholipids

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**component of
animal cell membranes**

**function of
phospho-lipid bilayer?**

**orientation of
head & tail?**

**hydro-philic &
hydro-phobic
properties?**

Protein

basic unit: amino acids (20+)

**function: energy, structural material, defence (WBC),
metabolism (enzymes), movement (muscles)**

types:

1) fibrous proteins

- long fibers, tough, strength
- eg collagen (bones), myosin (muscles)

2) globular proteins

- round, portable, reg. metabolism
- eg hemoglobin, enzyme

Nucleic Acids

basic unit: nucleotides

function: instructions for all cell processes

types:

1) nucleotide

- cell energy, eg ATP

2) nucleic acid

- synthesize protein, eg RNA

- store heredity information, eg DNA,