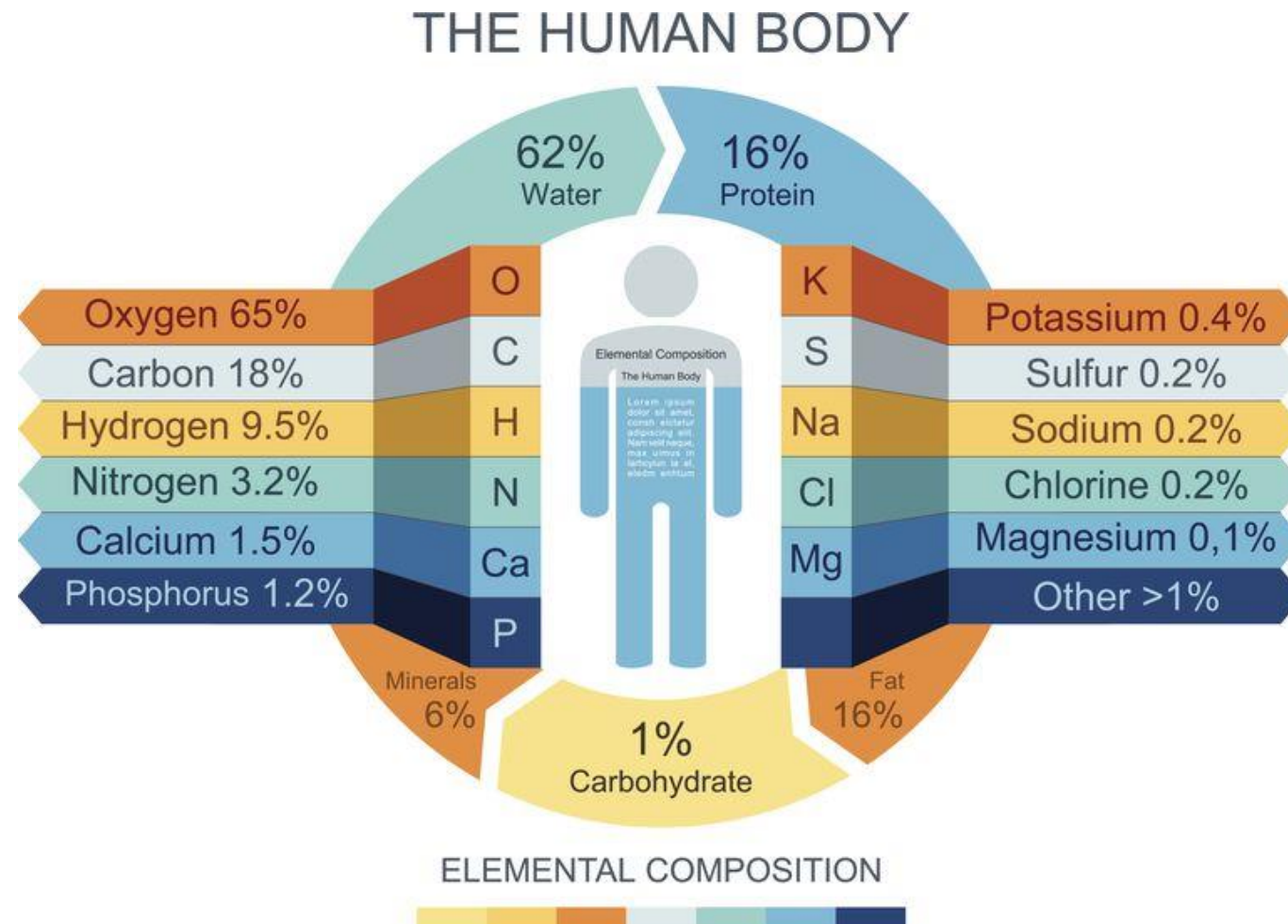


THE CHEMISTRY OF LIFE !!

ATOMS, MOLECULES, AND ELEMENTS IN OUR BODY



COMPILED BY HOWIE BAUM

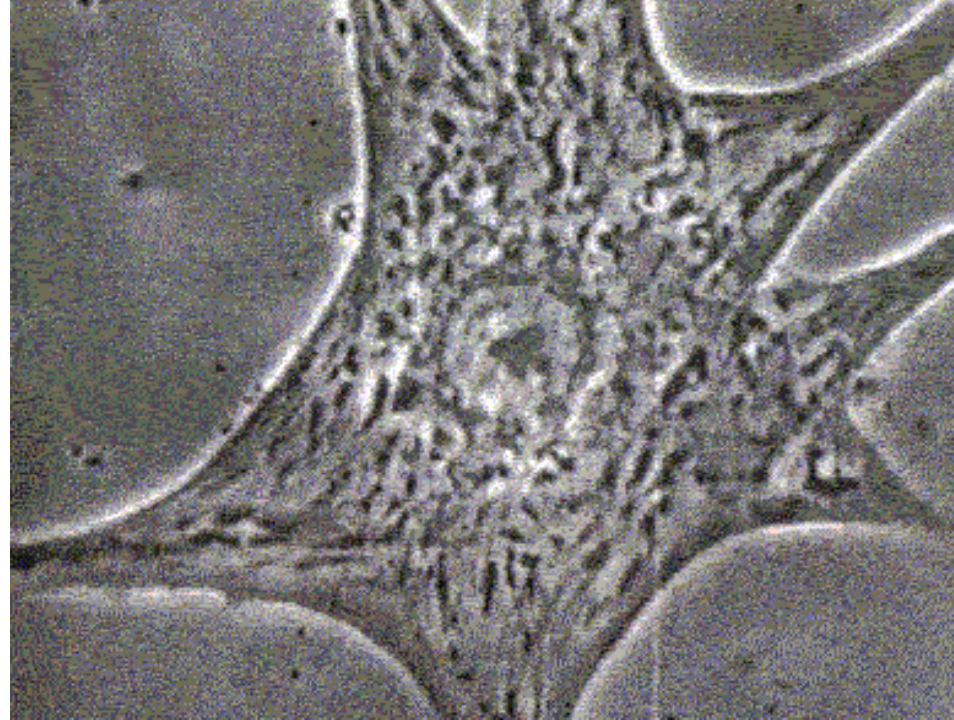
THE CHEMICAL LEVEL

Atoms are the smallest stable units of matter.

They can combine to form molecules with complex shapes.

The atomic components and unique three-dimensional shape of a particular molecule determine its function.

For example, complex protein molecules form filaments that produce the contractions of muscle cells in the heart.



WHY STUDY CHEMISTRY IN A CLASS ABOUT THE HUMAN BODY ?

Body functions depend on cellular functions

Cellular functions result from chemical changes

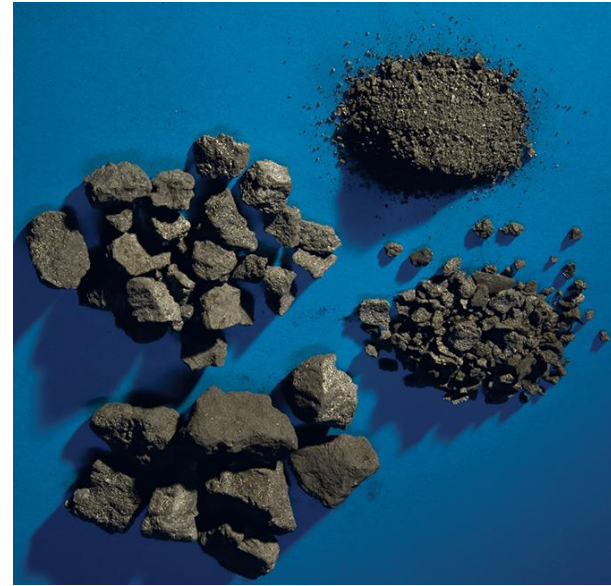
Elements are made of chemically identical atoms.

Matter is anything that has mass and takes up space. It is composed of elements.

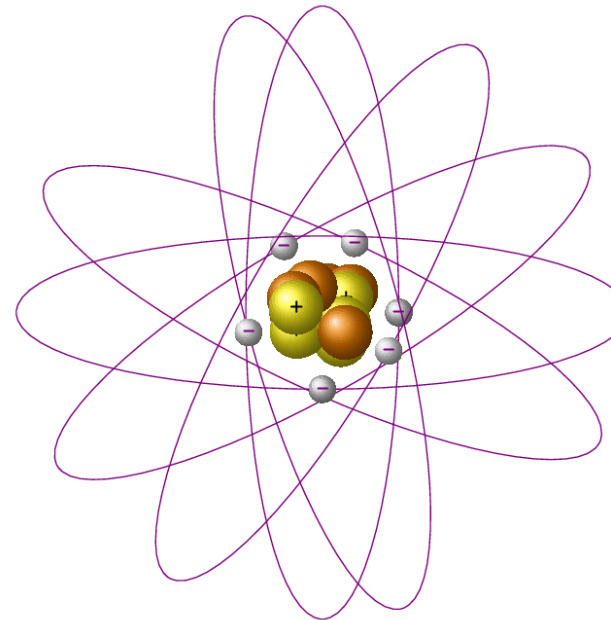
- **Bulk elements** – required by the body in large amounts
- **Trace elements** - required by the body in small amounts
- **Ultra-trace elements** – required by the body in very minute amounts

What is an **Atom**?

- An **atom** is the smallest particle that an element can be divided and still be that element.
- For example the smallest particle of carbon is a single atom of carbon. If you divide it, it is no longer carbon anymore.
- They can combine to form molecules with complex shapes.
- The atomic components and unique three-dimensional shape of a particular molecule, determine its function.



PIECES OF CARBON



CARBON ATOM

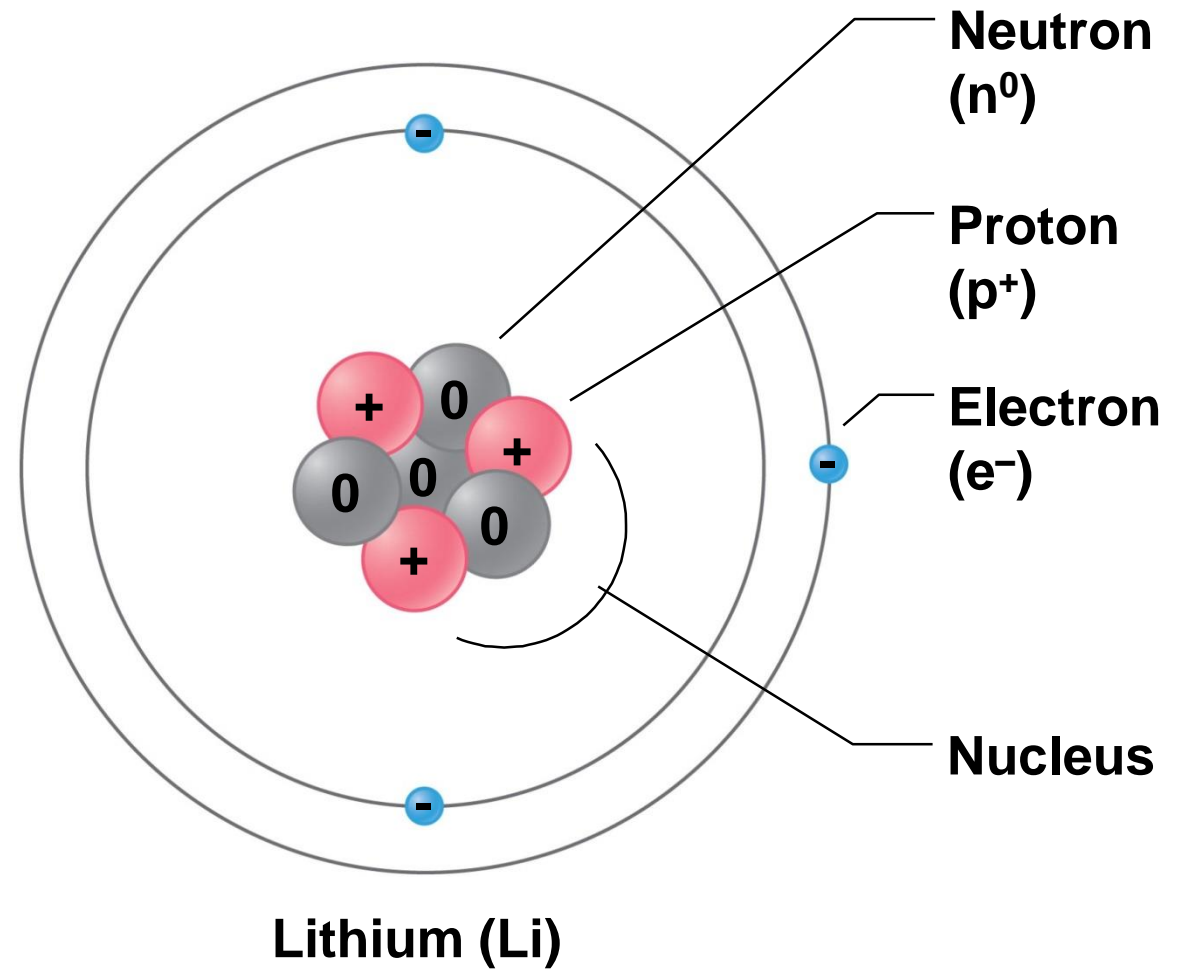
THE STRUCTURE OF AN ATOM

Atoms - composed of subatomic particles:

- **Proton** – carries a single **positive** charge
- **Neutron** – carries **no electrical charge**
- **Electron** – carries a single **negative** charge

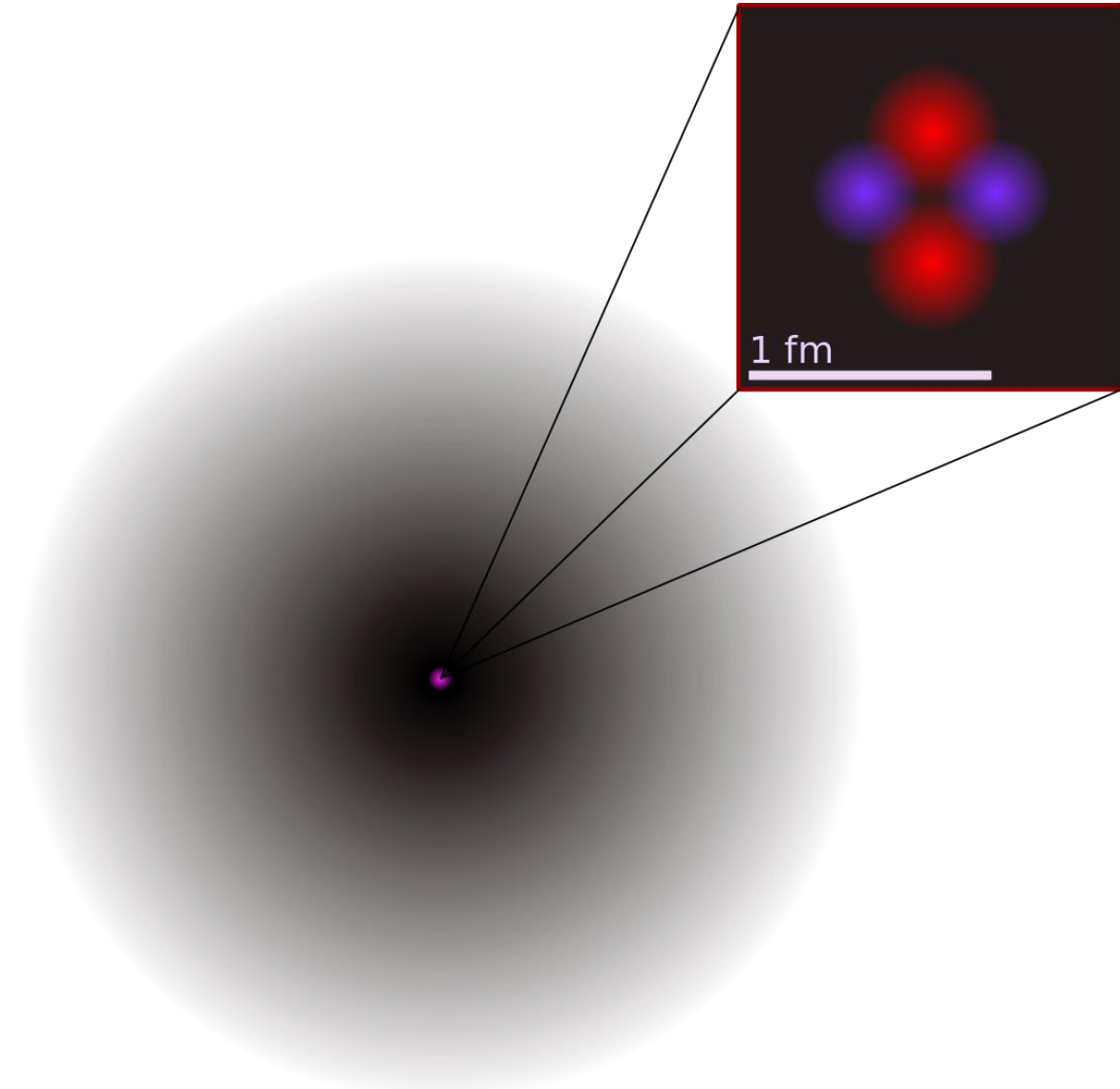
The Nucleus

- Central part of atom
- Composed of **protons and neutrons**
- Electrons move **around the nucleus**



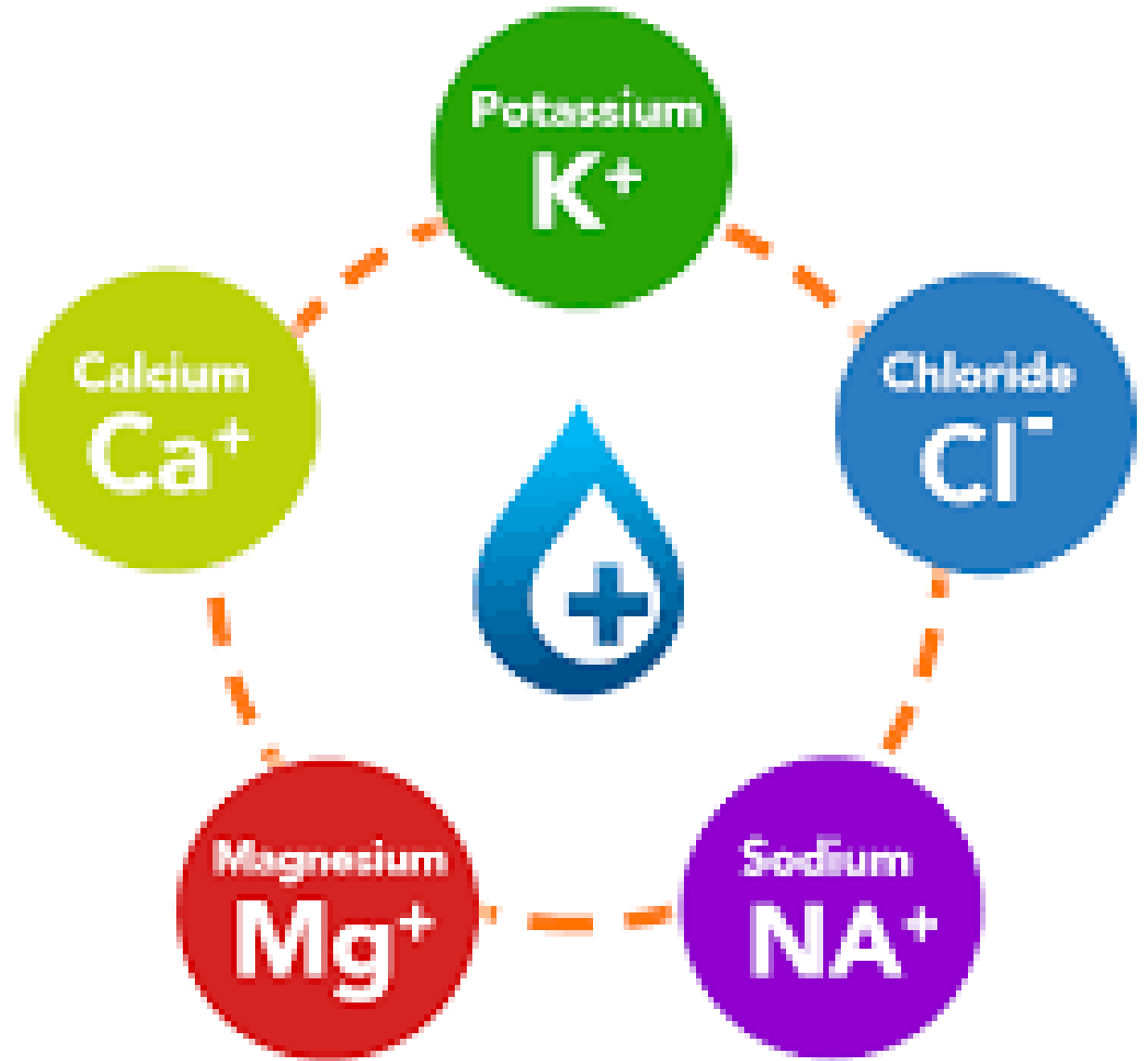
The nucleus of the atom

- The neutrons and protons are grouped together in the **nucleus**, which is at the center of the atom and make up most of the atom's mass.
- There is a huge amount of space between the outer moving electrons and the nucleus.
- **The electron cloud has a *radius* 10,000 times greater than *the* nucleus.**
- If the atom were the size of our classroom, the nucleus would be the size of a single grain of sand in the center of the room.
- If the nucleus were the size of a peanut, the atom would be about the size of a baseball stadium.
- **The diameter of the nucleus is about 1/10,000 the size of an atom but it contains more than 90% of it's mass !!**



IONS

- If an atom gains or loses one or more electrons, it acquires a net electric charge and becomes an ion.
- Hydrogen atoms and most mineral and trace element atoms readily form ions.
- Because of their charge, ions are able to conduct electricity when dissolved in water
- **The ionic forms of mineral elements are collectively referred to as electrolytes.**
- Its interesting that these are the ions we need in our body, to reduce leg and other types of cramping !!



ELECTROLYTES

- ❖ The proper concentration of electrolytes in your blood is essential to your health.
- ❖ Your cardiovascular and nervous systems, to name just two, require electrolytes to function well.
- ❖ Differences in the concentration of sodium and potassium inside and outside of cells allow your nerve and muscle fibers to send electrical impulses (which is how these cells communicate and get your body to react and move).
- ❖ **When you exercise or get hot and sweat, the sweat contains salts which are electrolytes and need to be replaced.**

10 FOODS TO NATURALLY REPLENISH YOUR LOST ELECTROLYTES



SPORTS DRINKS WITH ELECTROLYTES



IONIC BONDING

When we use salt in some of the foods we eat, the 2 atoms separate out in the watery conditions in our bodies and the cells in the stomach lining uses the chlorine atoms to make hydrochloric acid which it uses to digest our food !!

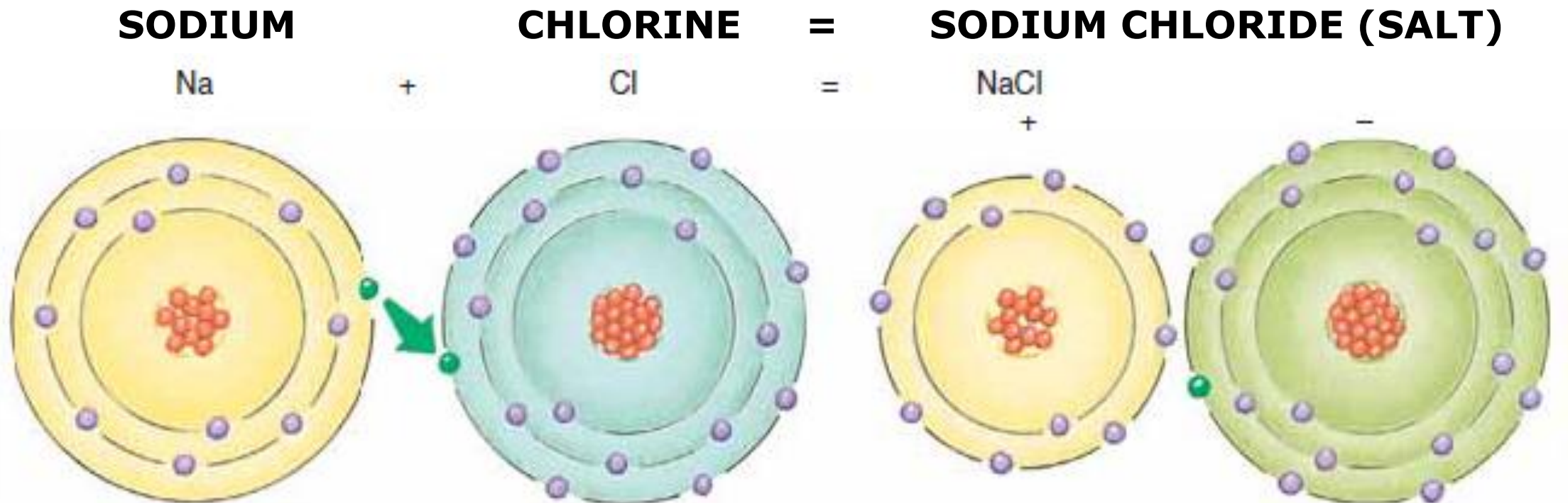
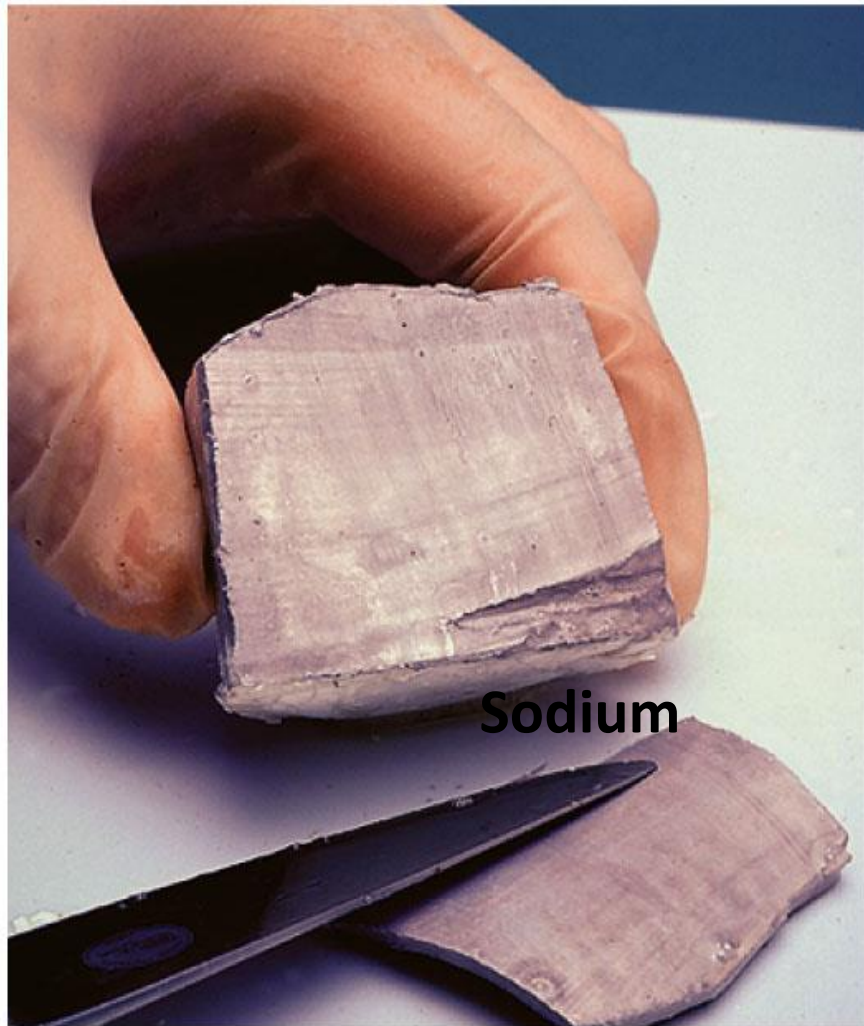


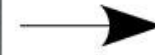
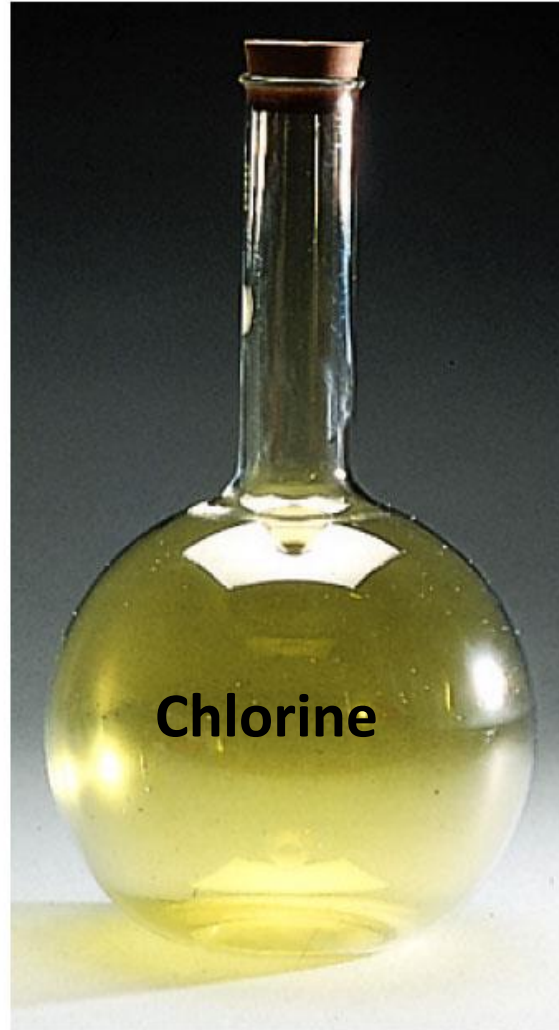
Figure 2-2. Formation of an ionic bond. An atom of sodium loses an electron to an atom of chlorine. The two ions formed have unlike charges, are attracted to one another, and form a molecule of sodium chloride.

Sodium is a highly reactive metal, especially when put in water.

Chlorine is a poisonous gas but when they are made into compounds and put into a water solution, the ions of the 2, highly different materials come together to make common table salt – Sodium Chloride or NaCl.



+



An ionic compound: NaCl

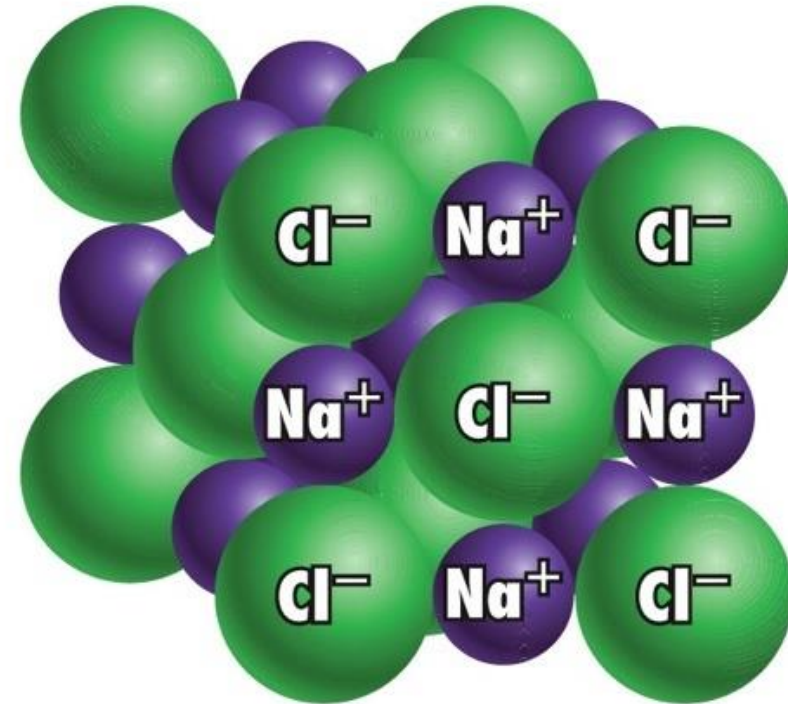


Figure 2-4c Biology: Life on Earth, 8/e
© 2008 Pearson Prentice Hall, Inc.

Ionic substances tend to form crystalline shapes rather than distinct molecules.

A second type of chemical bonding is covalent bonds, which is when 2 atoms share an electron . This is how the amazing process of 2 gases – 1 atom of Hydrogen and 2 atoms of Oxygen combine together, to make water !!

OXYGEN + 2 HYDROGEN ATOMS = WATER

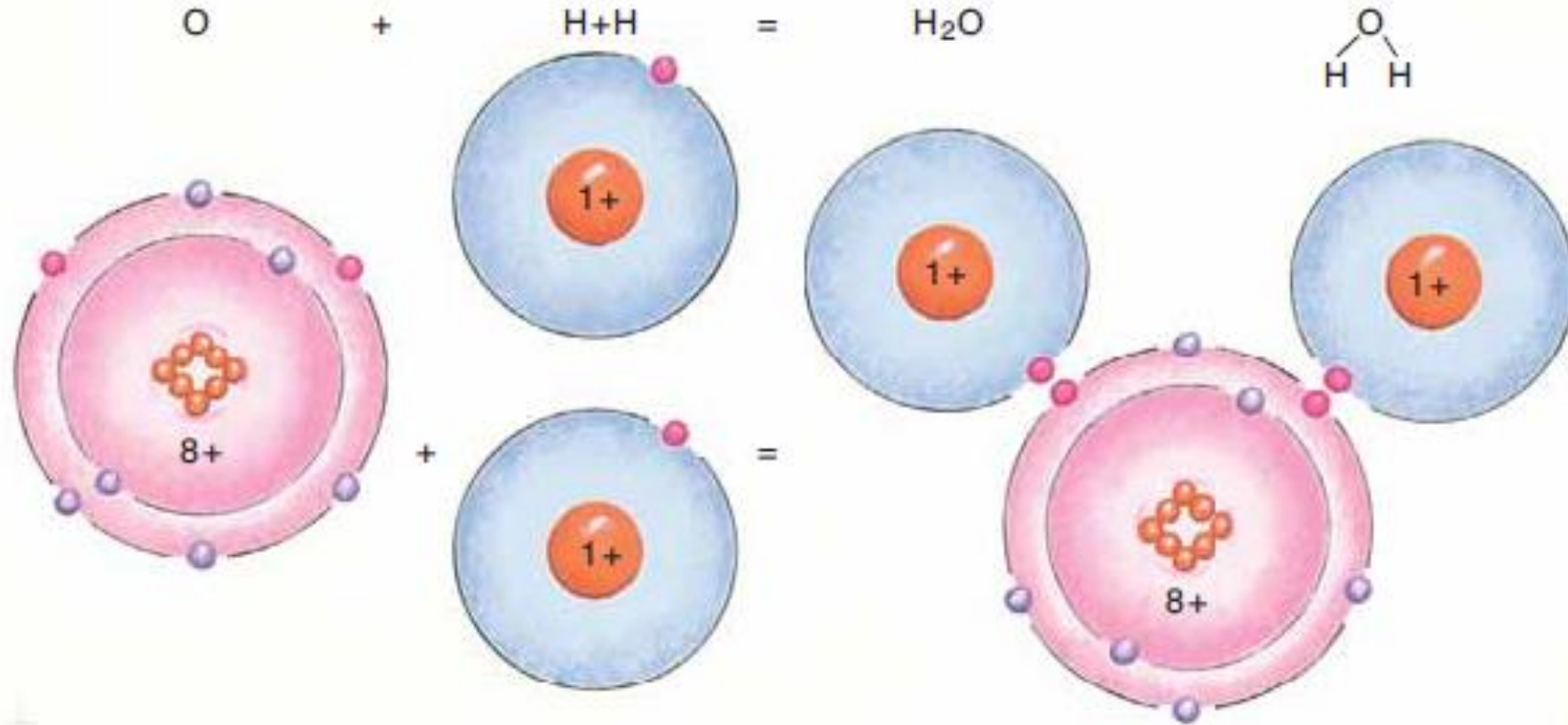


Figure 2-3. Formation of covalent bonds. (A) Two atoms of oxygen share two electrons each, forming a molecule of oxygen gas. (B) An atom of oxygen shares one electron with each of two hydrogen atoms, each sharing its electron. A molecule of water is formed.



*Honey, This Old
World Is Made Up Of*

*Protons,
Neutrons,
Electrons
and a Great
Big Heapin'
of Morons!*

An infographic with a light blue background featuring silhouettes of a man and a woman on the left and right. In the center, there is a glass of water with ice cubes and a water droplet. The text is arranged in a list format, showing the percentage of water in various body parts.

WATER IN THE HUMAN BODY

Brain	75%	Water
Blood	83%	Water
Heart	79%	Water
Bones	22%	Water
Muscles	75%	Water
Liver	86%	Water
Kidneys	83%	Water

HUMANS ARE 72 % WATER !!

An adult who weights 210 pounds, contains about 60 **liters** of **water**.

This is equal to 30, two-liter pop bottles of water, as shown below !!



PURE WATER

Really really pure water, the kind that is necessary to clean electronic chips used in devices like computers and smart phones is harmful to the human body.

Known as *Ultra Pure Water*, it is just normal water that has been through such a severe *cleaning* process, that only the H₂O molecules are left - That means that there are no specks of dirt, salts, minerals or even viruses present in the water.

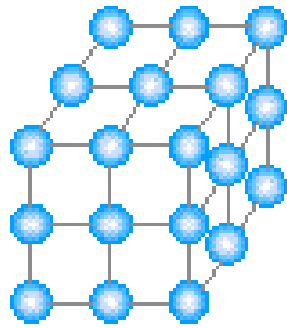
While great for semiconductors, this is exactly the property that makes it harmful for humans. If ingested, it gets right to work and starts to absorb all the valuable minerals present in the body.

Tests have shown that even as little as a glass of this liquid, could have a negative effect on the human body.

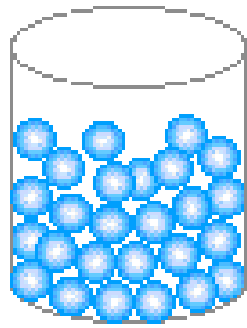
https://www.youtube.com/watch?v=3vKpF1D0E_U

SOLIDS, LIQUIDS, GASES, AND PLASMAS

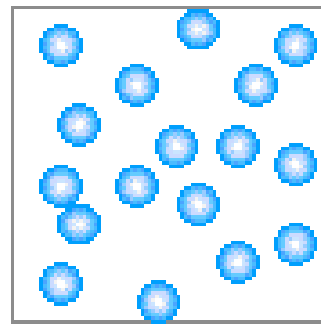
States of Matter



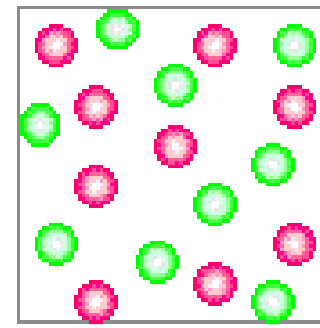
SOLID



LIQUID



GAS



PLASMA



WHAT IS THEIR DIFFERENT STRUCTURE BASED ON ?

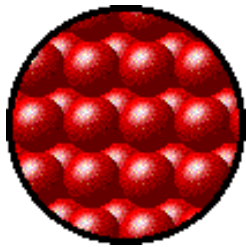
The Four States of Matter

Basis of Classification of the Four types:

Based upon particle arrangement

Based upon energy of particles

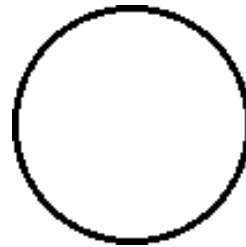
Based upon distance between particles



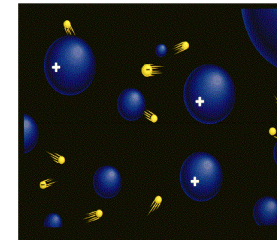
SOLIDS



LIQUIDS

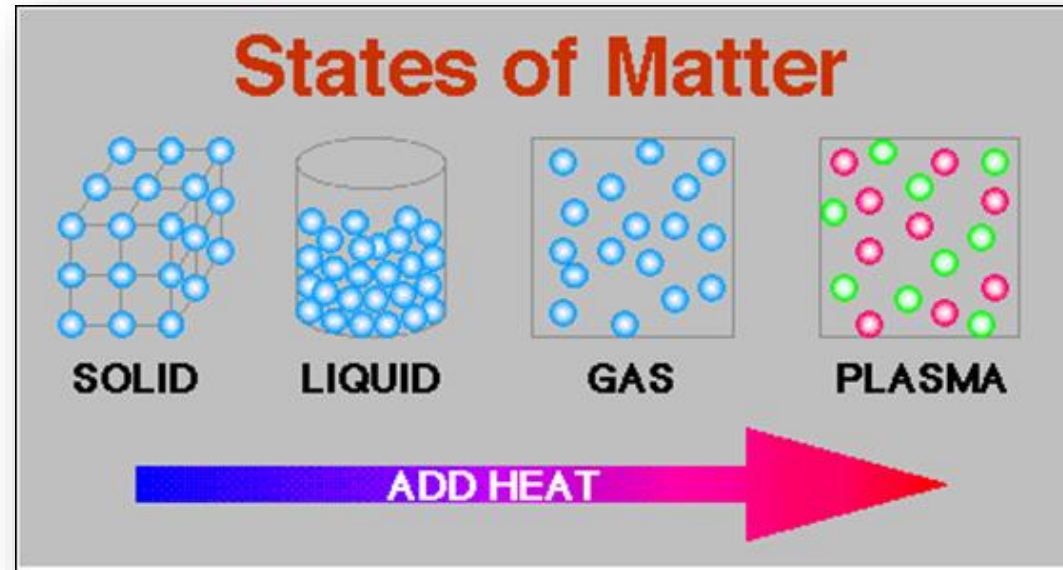


GASES



PLASMAS

Phase Differences



Solid – definite volume and shape; particles packed in fixed positions.

Liquid – definite volume but indefinite shape; particles close together but not in fixed positions

Gas – neither definite volume nor definite shape; particles are at great distances from one another

Plasma – high temperature, ionized phase of matter as found on the sun and in lightning.

SOLIDS

- Coal, sugar, ice, bone, and iron.
- Definite shape and volume.
- The shape doesn't depend on the shape of their container.
- The particles are packed tightly together and they are almost incompressible.
- Solids expand only a little, when heated

LIQUIDS

Particles of liquids are tightly packed, but are far enough apart to slide over one another.

Liquids have an indefinite shape and a definite volume.

They are not compressible

They will fill the shape of the container they are put in

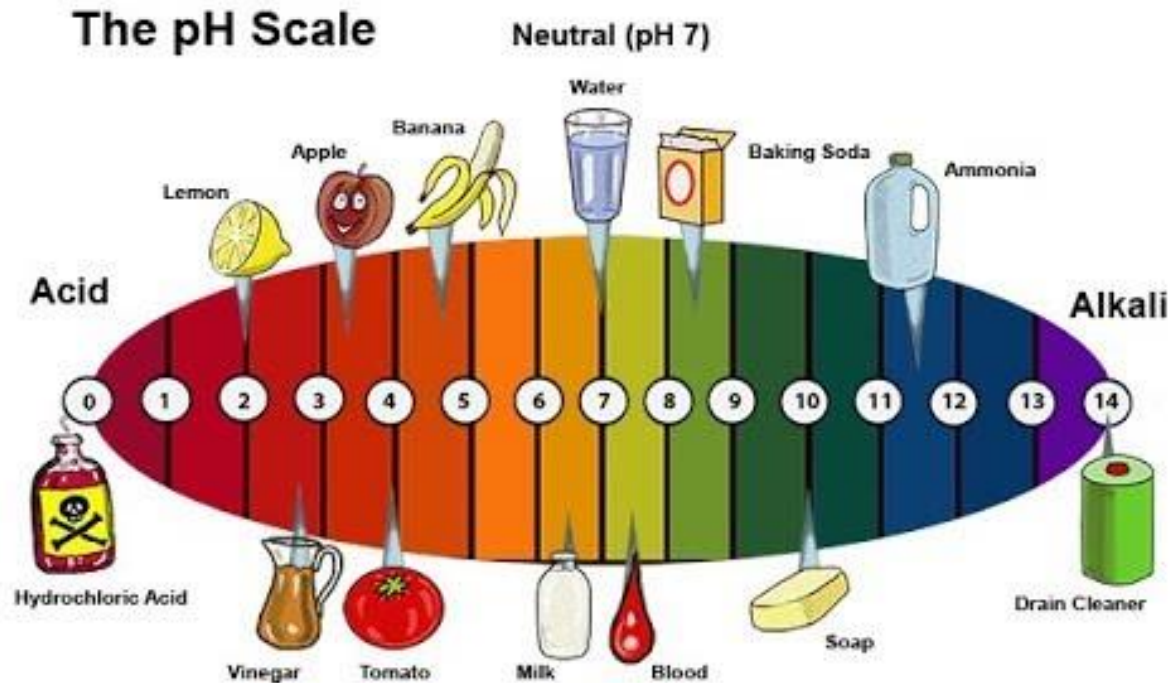


pH OF LIQUIDS (pH stands for the potential of Hydrogen)

Definition: A number value that expresses the acidity or alkalinity of a solution on which 7 is neutral, lower values are more acid and higher values more alkaline.

Normal rain has a pH of 5.6 – slightly acidic because of the carbon dioxide picked up in the earth's atmosphere by the rain.

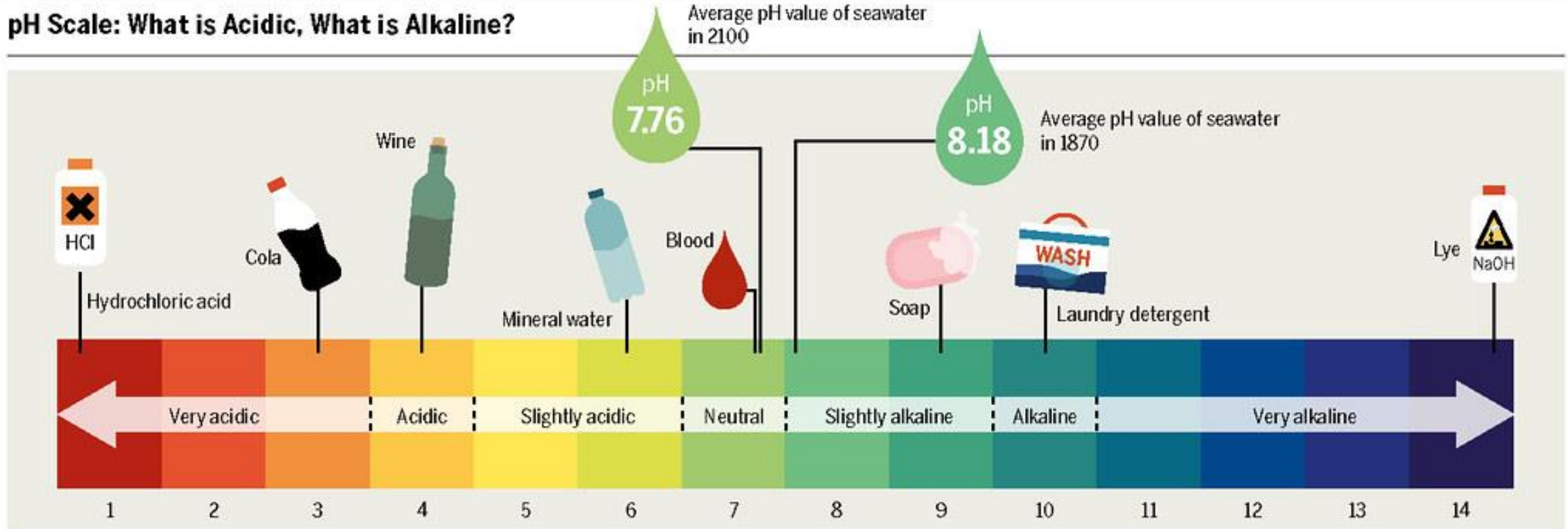
It is interesting to note that the pH range of seawater is normally 7.4 - 8.2, while in blood it's 7.35 - 7.45 (the body keeps this in a very tight range).



Blood pH

- Normal blood pH is 7.35 – 7.45
- **Alkalosis** occurs when blood pH rises to 7.5 – 7.8
- **Acidosis** occurs when blood pH drops to 7.0 – 7.3
- Homeostatic mechanisms help regulate pH
- Buffers are chemicals which act to resist pH changes

pH Scale: What is Acidic, What is Alkaline?



The difference may seem small, but the decline in the pH value from 1870 to 2100 would mean a 170 percent increase in acidity. Much smaller changes already pose problems for many sea creatures.

pH below 7.35

SYMPTOMS OF ACIDOSIS

Central Nervous System

- Headache
- Sleepiness
- Confusion
- Loss of consciousness
- Coma

Respiratory System

- Shortness of breath
- Coughing

Heart

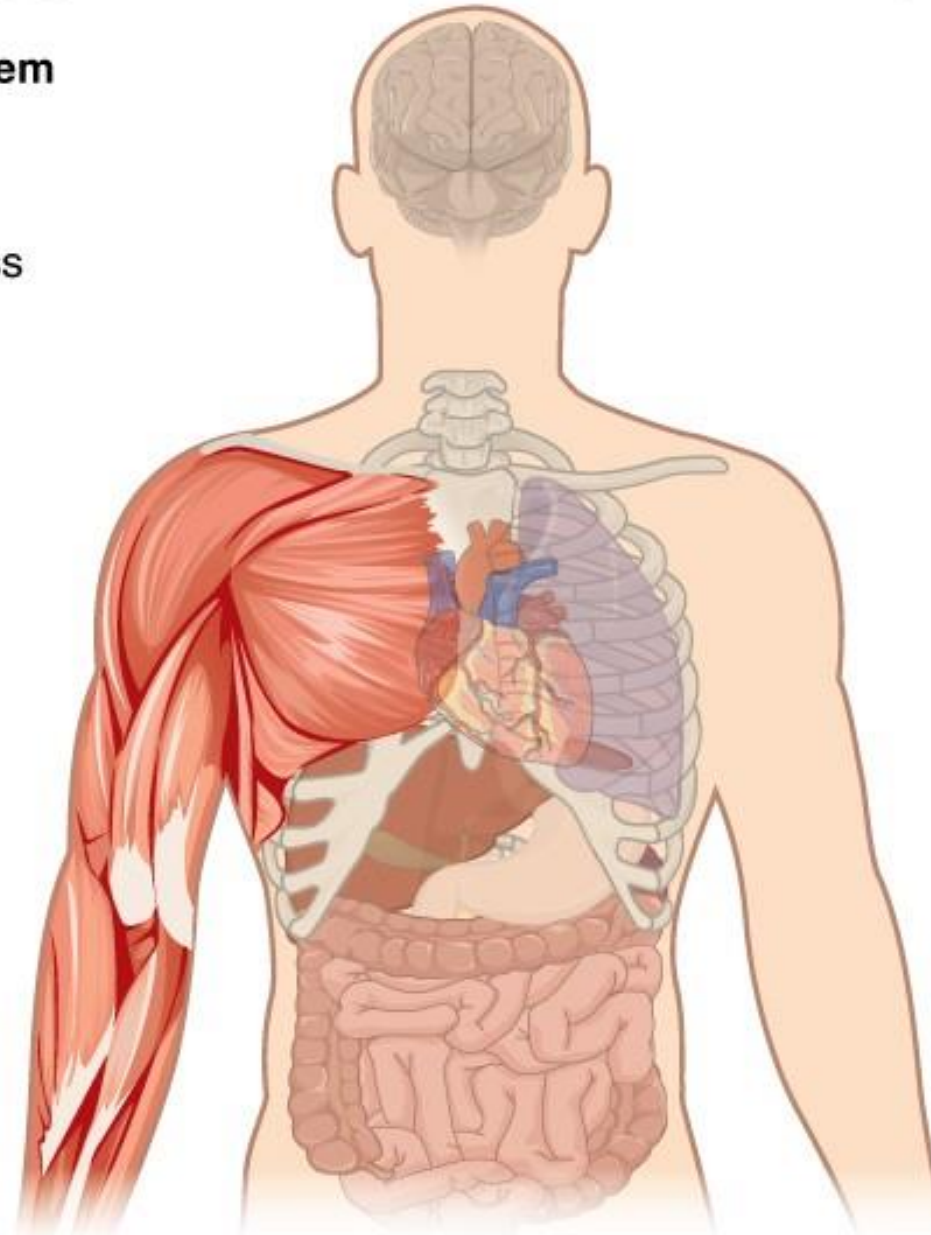
- Arrhythmia
- Increased heart rate

Muscular System

- Seizures
- Weakness

Digestive System

- Nausea
- Vomiting
- Diarrhea



pH above 7.45

SYMPTOMS OF ALKALOSIS

Central Nervous System

- Confusion
- Light-headedness
- Stupor
- Coma

Peripheral Nervous System

- Hand tremor
- Numbness or tingling in the face, hands, or feet

Muscular System

- Twitching
- Prolonged spasms

Digestive System

- Nausea
- Vomiting

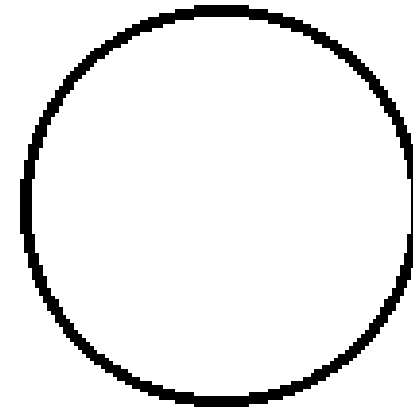
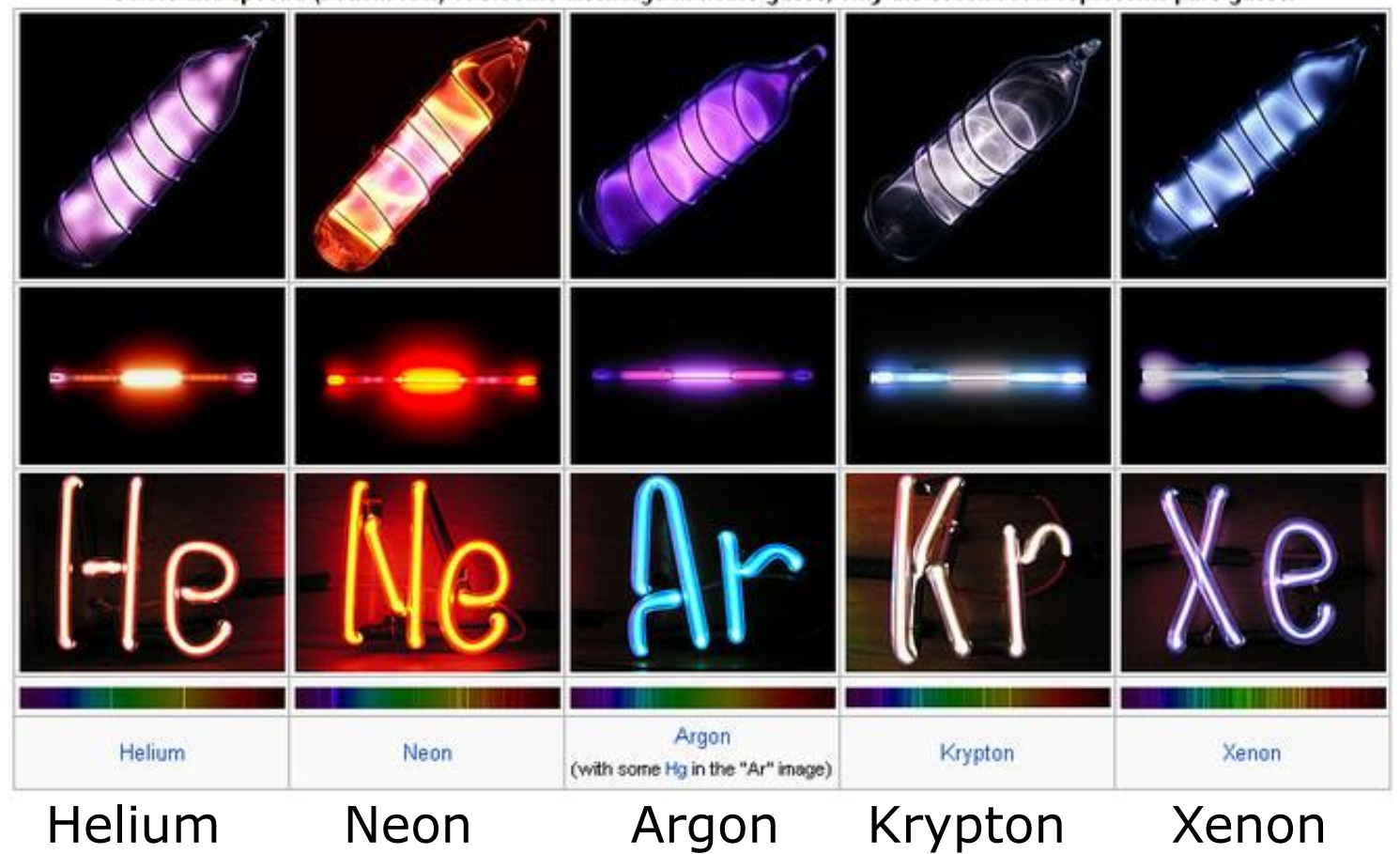
GASES

- They take the shape and form of their container (flowable).

- Particles are spaced far apart.

- Gases expand without limit to fill any space.

- Gases are easily compressed.



GAS AS STEAM VAPOR

- The gaseous state of a substance that is generally a liquid or solid at room temperature.
- Steam is referred to as a vapor because water is a liquid at room temperature.
- Moist air contains water vapor.
- **Evaporation of water** occurs when the surface of the liquid is exposed, allowing molecules to escape and form water vapor; this vapor can then rise up and form clouds.

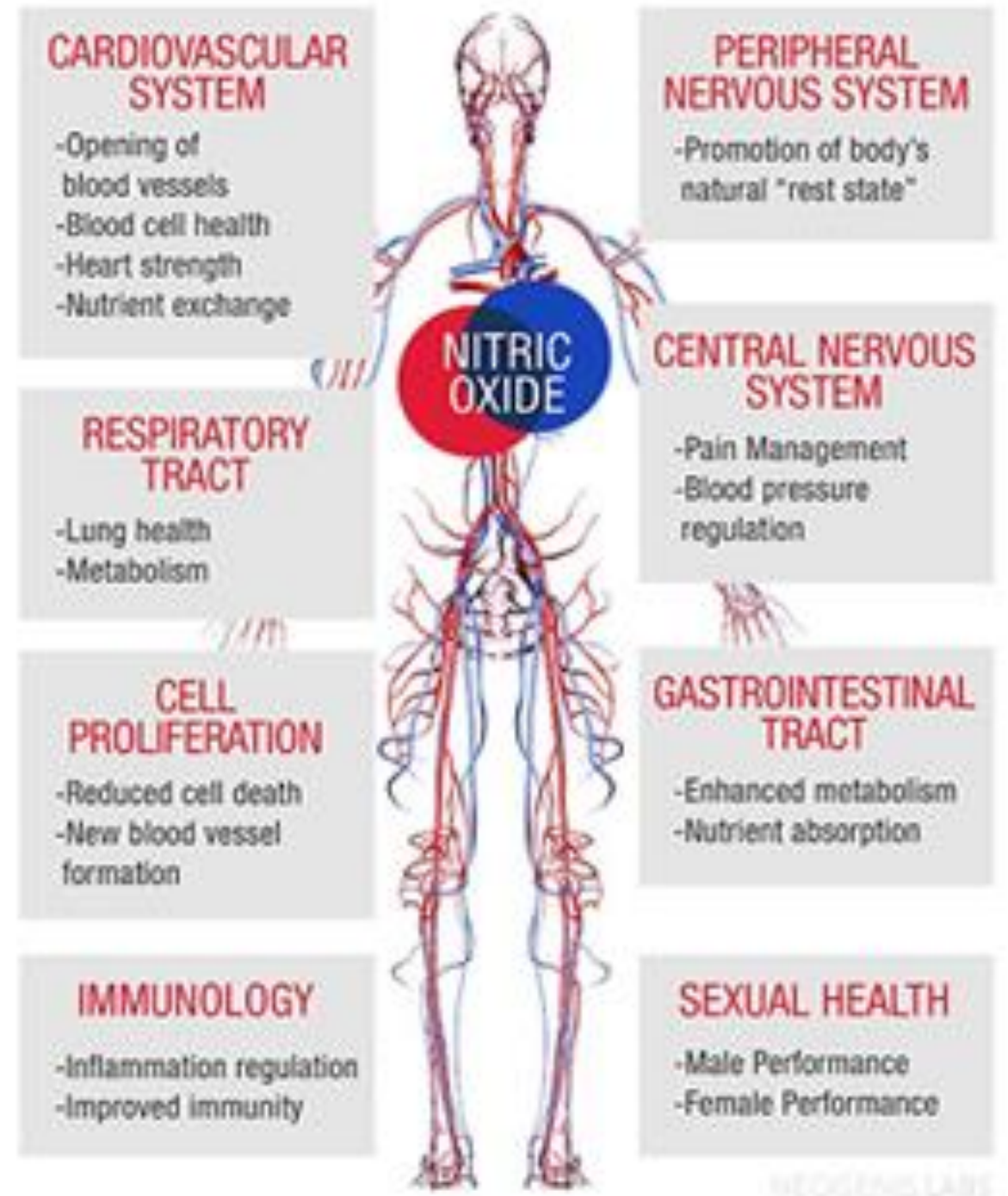


NITRIC OXIDE GAS

You have probably heard of it as a component of air pollution and cigarette smoke.

It is also synthesized by several human tissues, and this deceptively simple molecule has important functions, as shown on the picture.

Studies also show that nitric oxide **helps some premature babies breathe more easily and efficiently.**



PLASMA

Plasma is by far the most common form of matter.

It is in all the stars and in the tenuous space between them, which makes up over 99% of the visible universe and perhaps most of that which is not visible.

Plasma temperatures and densities range from relatively cool and tenuous (like aurora) to very hot and dense (like the central core of a star).

It is defined as an ionized (electrically charged) gas and has no defined shape or volume.



THE ELEMENTS

He

Ne

Ar

Kr

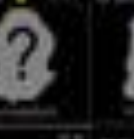
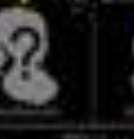
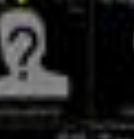
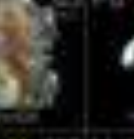
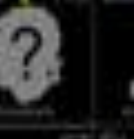
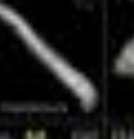
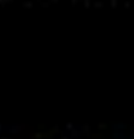
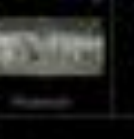
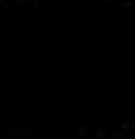
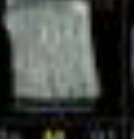
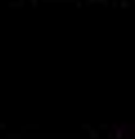
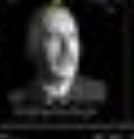
Xe

Rn

?

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?



PERIODICTABLE.COM

ELEMENTS - All matter, both living and not living, is made of elements, the simplest chemicals.

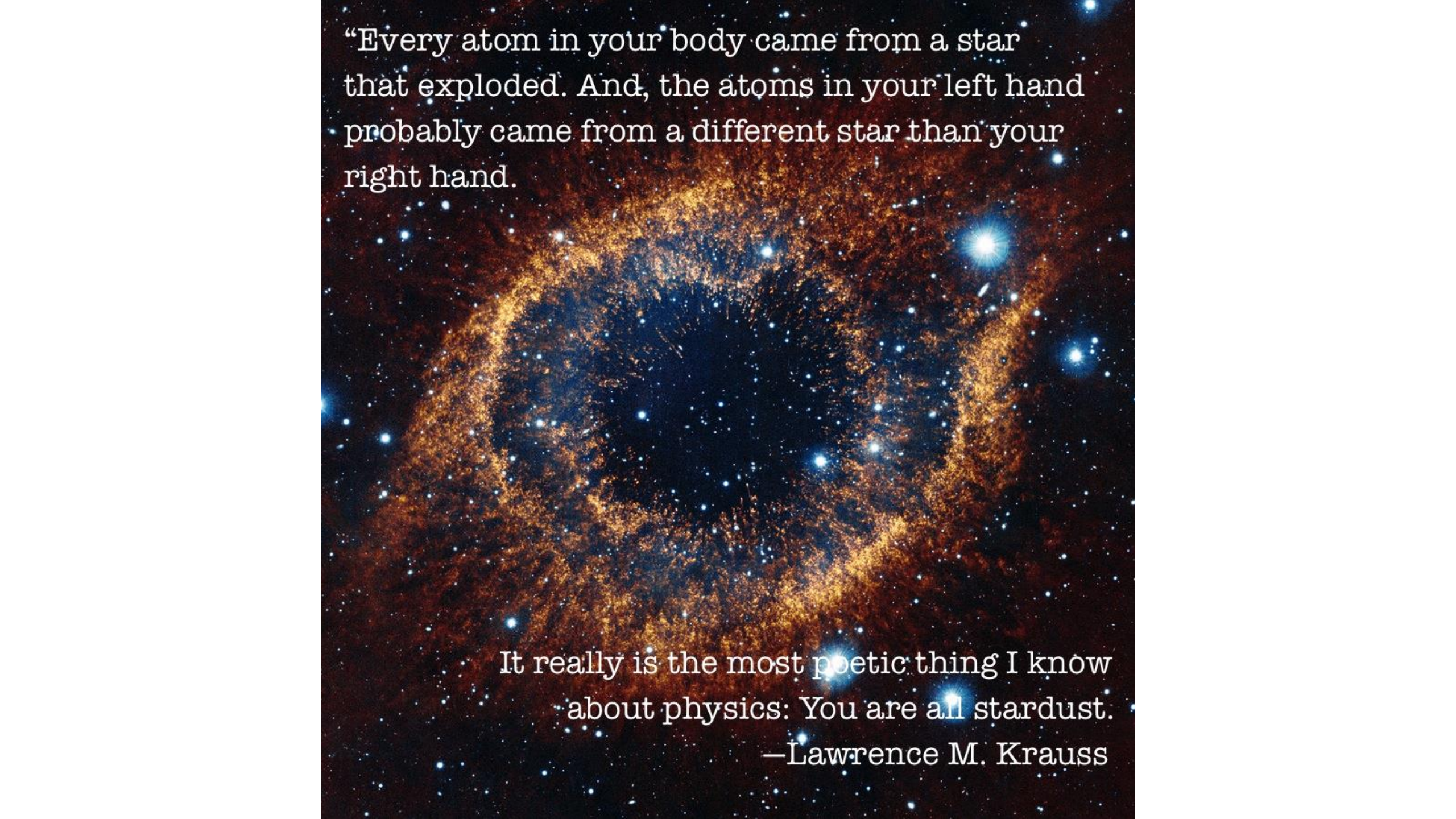
- **An element is a substance made of only one type of atom (therefore, an atom is the smallest part of an element).**
- **25 of the 92 naturally occurring elements are essential to life.**
- **The 5 elements carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur are found in all living things.**
- **IF CALCIUM IS INCLUDED, THESE SEVEN ELEMENTS MAKE UP APPROXIMATELY 99% OF THE HUMAN BODY (BY WEIGHT).**

TABLE 2.1		Elements of the Human Body	
Name		Symbol	Percentage of Body Weight
Major Elements (Total 98.5%)			
Oxygen		O	65.0
Carbon		C	18.0
Hydrogen		H	10.0
Nitrogen		N	3.0
Calcium		Ca	1.5
Phosphorus		P	1.0
Lesser Elements (Total 0.8%)			
Sulfur		S	0.25
Potassium		K	0.20
Sodium		Na	0.15
Chlorine		Cl	0.15
Magnesium		Mg	0.05
Iron		Fe	0.006
Trace Elements (Total 0.7%)			
Chromium	Cr	Molybdenum	Mo
Cobalt	Co	Selenium	Se
Copper	Cu	Silicon	Si
Fluorine	F	Tin	Sn
Iodine	I	Vanadium	V
Manganese	Mn	Zinc	Zn

A human body is made of 25 chemical elements and all of them except hydrogen were created in the super-hot, high-pressure interior of stars violently coming to the end of their lives.

Hydrogen gas was created when the "Big Bang" happened that created the Universe.





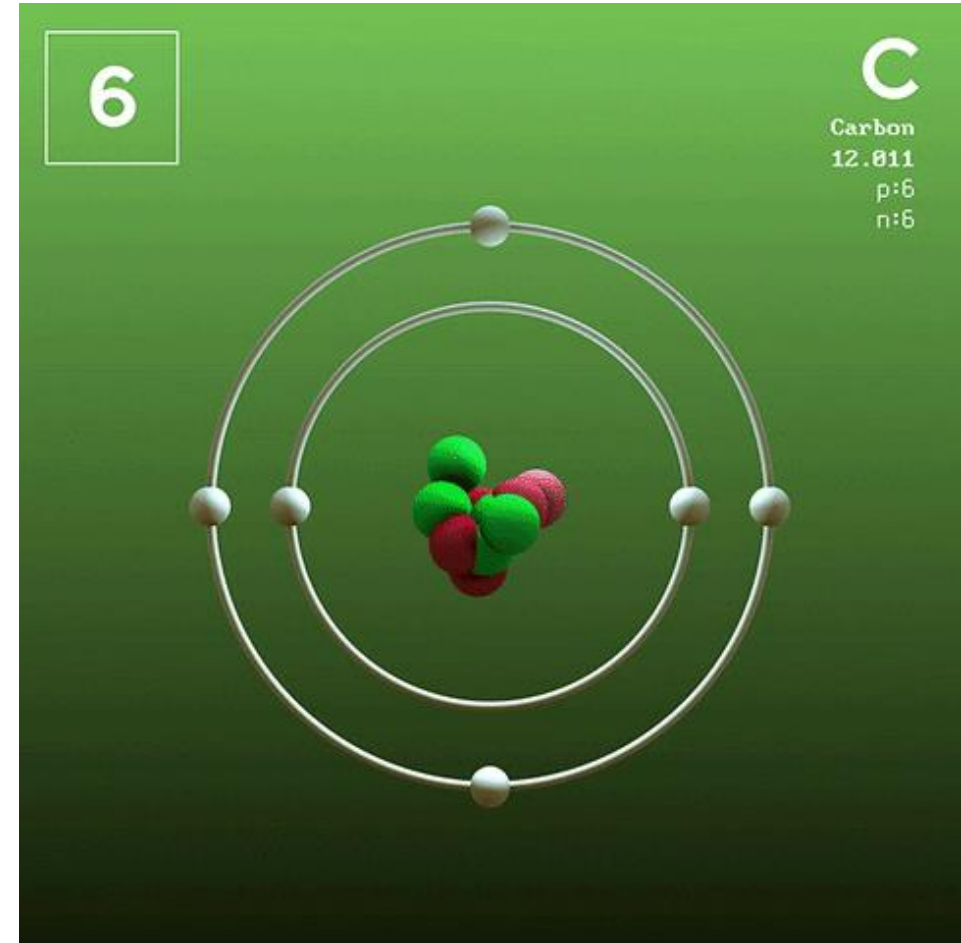
“Every atom in your body came from a star
that exploded. And, the atoms in your left hand
probably came from a different star than your
right hand.

It really is the most poetic thing I know
about physics: You are all stardust.

—Lawrence M. Krauss

CARBON - Humans can be considered to be a Carbon-Based life form !!

- Carbon is a key component of all known life on Earth, representing approximately 45-50% of all living things, such as animals and plants.
- Complex molecules are made up of carbon bonded with other elements, especially oxygen and hydrogen and frequently also with nitrogen, phosphorus and sulfur.
- It is also lightweight and relatively small in size, making it easier for enzymes to manipulate carbon molecules.
- It is frequently assumed in astrobiology that if life exists elsewhere in the universe, it will also be carbon-based.
- **In a 2018 study carbon was found to compose approximately 550 billion tons of all life on Earth.**



How are Elements Classified?

Four Regions: metals, nonmetals, metalloids, & inert gases. 75% or more of all of the elements are metals !!!

Legend:

- Metals (Pink)
- Nonmetals (Green)
- Metalloids (Orange)
- Noble Gases (Purple)

1 H																	Group 18 2 He
Group 2 3 Li	4 Be											Group 13 5 B	Group 14 6 C	Group 15 7 N	Group 16 8 O	Group 17 9 F	10 Ne
11 Na	12 Mg	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10	Group 11	Group 12	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt									

<https://www.ptable.com/>

<https://www.youtube.com/watch?v=zGM-wSKFBpo>

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

THE ESSENTIAL BODY ELEMENTS IN THE PERIODIC TABLE.

The 19 elements that are known to be essential for human life are shown in purple.

The 7 elements that are also suggested to be essential are shown in green.

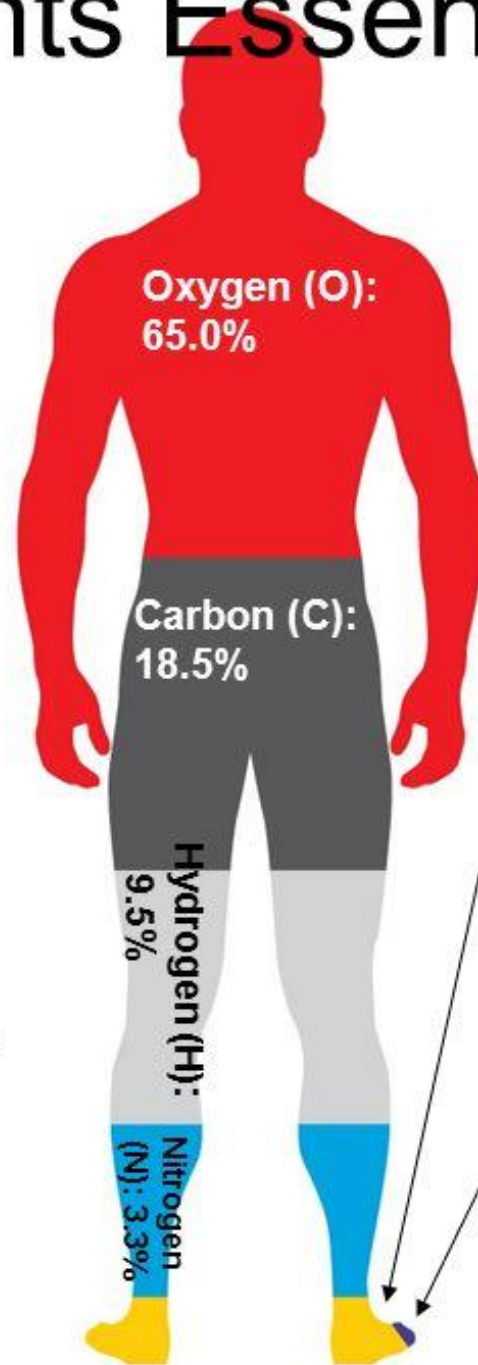
Legend:

- Essential for humans (Purple)
- Suggested to be essential for humans (Green)
- Nonessential for humans (Grey)

1	2																	18		
1																			2	
	3	4											5	6	7	8	9	10		
2	Li	Be											B	C	N	O	F	Ne		
3	11	12											13	14	15	16	17	18		
	Na	Mg											Al	Si	P	S	Cl	Ar		
			3	4	5	6	7	8	9	10	11	12								
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr		
5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54		
	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe		
6	55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86		
	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn		
7	87	88	89	104	105	106	107	108	109	110	111	112	113	114	115					
	Fr	Ra	Ac	Rf	Db	Sg	Rh	Hs	Mt	Ds	Rg	Uub	Uut	Uuq	Uur					

25 Elements Essential for Life

- 96% of living matter made of 4 elements.
 - Oxygen O
 - Carbon C
 - Hydrogen H
 - Nitrogen N
- Most of remaining 4% just 7 elements
- Remaining >0.1% are “**Trace Elements**”



Calcium (Ca): 1.5%
Phosphorus (P): 1.0%
Potassium (K): 0.4%
Sulfur (S): 0.3%
Sodium (Na): 0.2%
Chlorine (Cl): 0.2%
Magnesium (Mg): 0.1%

Trace elements: less than 0.01%

Boron (B)	Manganese (Mn)
Chromium (Cr)	Molybdenum (Mo)
Cobalt (Co)	Selenium (Se)
Copper (Cu)	Silicon (Si)
Fluorine (F)	Tin (Sn)
Iodine (I)	Vanadium (V)
Iron (Fe)	Zinc (Zn)

TRACE ELEMENTS

Trace elements are those that are needed by the body in very small amounts.

When they are present in food or nutritional supplements, we often call them minerals.

Although they may not be as abundant in the body as are carbon, hydrogen, or oxygen, they are still essential.

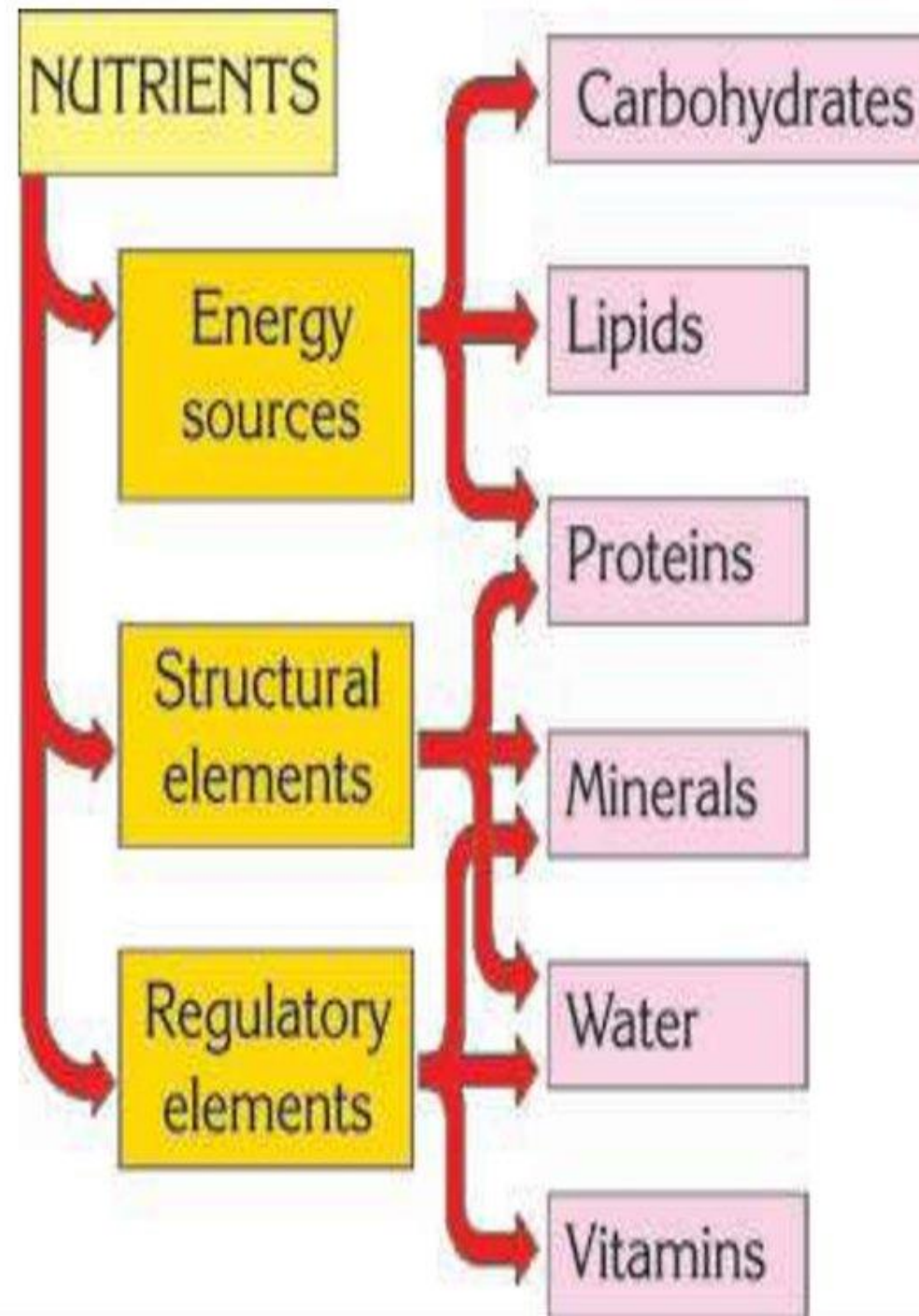
Table 2-2

TRACE ELEMENTS

Element	Function
Calcium	<ul style="list-style-type: none">• Provides strength in bones and teeth• Necessary for blood clotting• Necessary for muscle contraction
Phosphorus	<ul style="list-style-type: none">• Provides strength in bones and teeth• Part of DNA, RNA, and ATP• Part of cell membranes
Iron	<ul style="list-style-type: none">• Part of hemoglobin in red blood cells; transports oxygen• Part of myoglobin in muscles; stores oxygen• Necessary for cell respiration
Copper	<ul style="list-style-type: none">• Necessary for cell respiration• Necessary for hemoglobin synthesis
Sodium and potassium	<ul style="list-style-type: none">• Necessary for muscle contraction• Necessary for nerve impulse transmission
Sulfur	<ul style="list-style-type: none">• Part of some proteins such as insulin and keratin
Cobalt	<ul style="list-style-type: none">• Part of vitamin B12
Iodine	<ul style="list-style-type: none">• Part of thyroid hormones—thyroxine

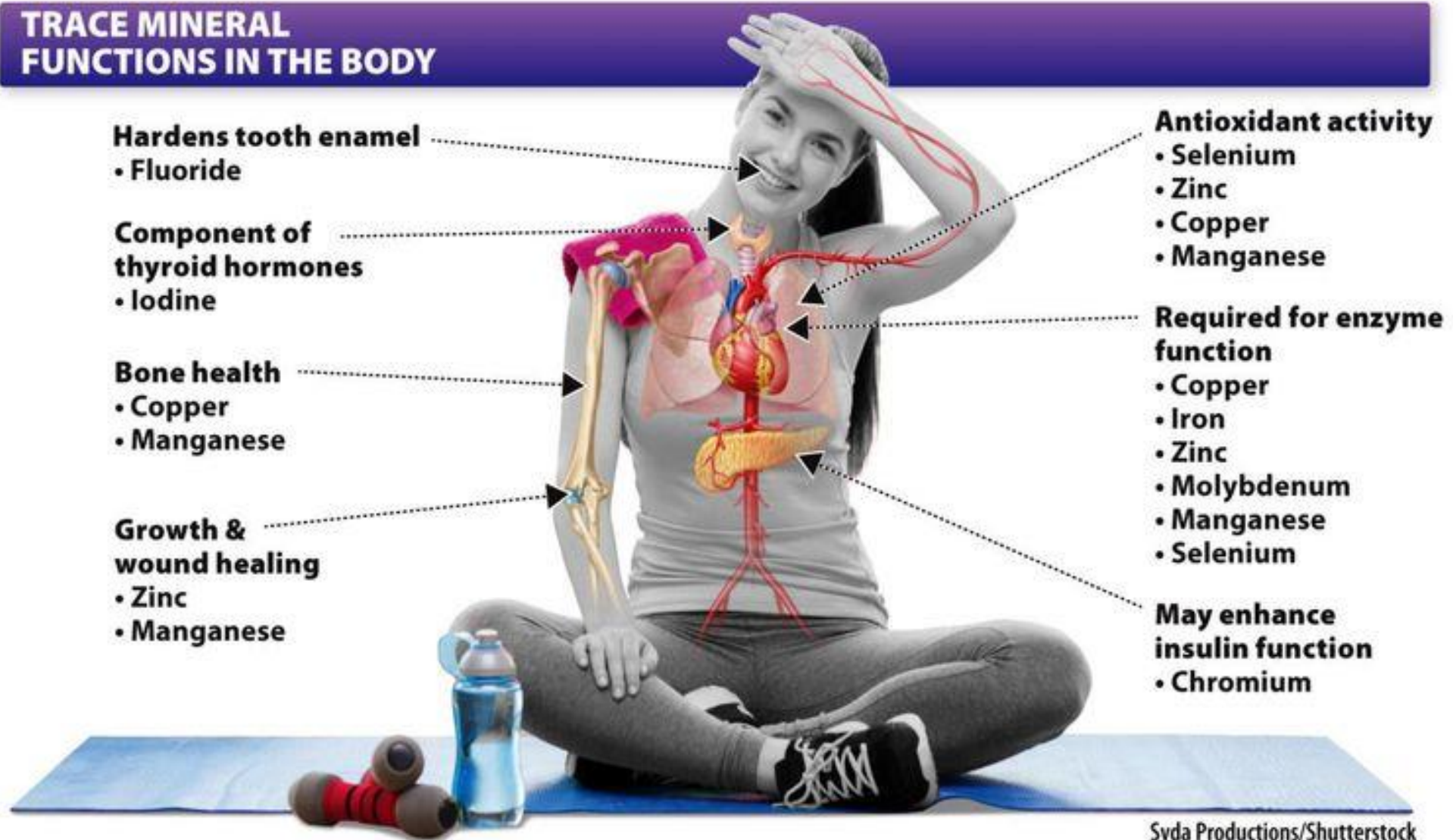
Nutrition

- **Nutrition** is the utilization of ingested substances by a healthy individual for life.
- Food can be divided into six groups:
 - - carbohydrates
 - - lipids
 - - proteins
 - - vitamins
 - - minerals
 - - water



Trace minerals have vital roles in the body,

TRACE MINERAL FUNCTIONS IN THE BODY



Syda Productions/Shutterstock

Infographic 14.1 part 2

Scientific American: Nutrition for a Changing World

© 2016 W. H. Freeman and Company

HEALTH BENEFITS OF MINERALS

Organic  Facts

Pottassium- Manages diabetes and boosts brain function

Iron- Aids in formation of hemoglobin and prevents anemia

Magnesium- Treats high blood pressure, lowers anxiety and stress

Phosphorous- Reduces muscle weakness and corrects sexual weakness

Zinc- Manages skin care, eczema, acne, heals wound and nights blindness

Calcium- Boosts bone health, relieves insomnia and improves dental health



13 PLANT FOODS HIGH IN IRON



Spinach



Lentils



Kidney beans



Potatoes



Figs



Oats



Quinoa



Soybeans



Pumpkin seeds



Almonds



Swiss chard



Peas



Chickpeas

Thirteen naturally rich sources of plant-based iron.

www.TheVeganJunction.com

13 ZINC RICH FOODS



Cereals



Wheat germ



Sesame seeds



Pumpkin Seeds



Meats



Shellfish



Squash Seeds



Fruits



Vegetables



Spinach



Mushroom



Dark Chocolate



Nuts



www.healthbeckon.com



kale



whole grains



cashew



prunes



mushrooms

food sources
of
Copper
(Cu)



tempeh



oysters



goat cheese



liver



sesame seeds



avocados



chickpeas



tea



spinach



bread



wheat germ



coffee

food sources
of
Manganese
(Mn)



pumpkin seeds



bass



hazelnuts



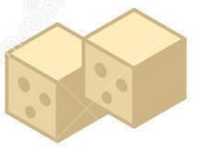
mussels



chocolate



lima beans



tofu

FOODS RICH IN IODINE

www.healthdigeZt.com

www.
HEALTH
DIGEST
.com



DRIED SEAWEED



COD FISH



YOGURT



BAKED POTATO



EGGS



TUNA



TURKEY



CRANBERRIES



STRAWBERRIES

twitter.com/healthdigezt [instagram.com/healthdigezt](https://www.instagram.com/healthdigezt)
[pinterest.com/healthdigezt](https://www.pinterest.com/healthdigezt) plus.google.com/+Healthdigezt

Foods with selenium



Brazil nuts



tuna



beef



brown rice



eggs



whole wheat bread



chicken



cottage cheese



baked beans



oatmeal

CHROMIUM RICH FOODS



Romaine Lettuce



Broccoli



Tomatoes



Oats



Black Pepper



Barley

FLUORIDE RICH FOODS



Banana



Avocado



Strawberries



Plums



Grapefruit



Cherries



Pears



Cantaloupe



Apple

MOLYBDENUM RICH FOODS



sunsahayal.com

Lentils



Garbanzo Beans



Lima Beans



sunsahayal.com

Soybeans



Kidney Beans



Oats



Black Beans



Pinto Beans



Cucumber



Tomatoes



Romaine Lettuce

VITAMINS : WHY YOU NEED THEM AND WHERE TO FIND THEM.

There are 13 essential vitamins (A, B, C, D, E, and K, with 8 vitamins in the B complex) and many minerals the body requires for optimal health.

Although they are all considered micronutrients, **vitamins and minerals differ in basic ways.**

Vitamins are organic and can be broken down by heat, air, or acid.

Minerals are inorganic and hold on to their chemical structure.

If you eat a balanced, healthy diet, you are probably already getting adequate amounts of the essential nutrients your body needs to function at its best level.

They cannot be synthesized in sufficient quantities by an organism and must be obtained from our diet or with supplements.

Health Benefits of Vitamins

Organic  Facts



Vitamin A

Beneficial in treating eye disorders, skin infections

Vitamin B9

Reduces risk of neural tube defects during pregnancy

Vitamin B12

Provides relief from symptoms of anemia, kidney and liver disorders

Vitamin C

Helps treat scurvy, cancer and common cold

Vitamin D

Aids in treating arthritis, tooth decay, diabetes and rickets

Vitamin E

Improves blood circulation and slows down aging process

Vitamin K

Reduces risk of menstrual pain and internal bleeding

Lipids are materials in the body that are made of compounds that are fats, oils, or waxes)

USES:

- Long-term energy storage
- Insulation
- Provide a waterproof covering
- Part of biological membranes
- Chemical messengers (steroids)
- They contain mostly carbon and hydrogen
- Generally not soluble in water



There are 2 types of Vitamins – those that are Lipid Soluble and those that are Water Soluble:

1) LIPID (FAT)-SOLUBLE VITAMINS ARE A, D, E AND K

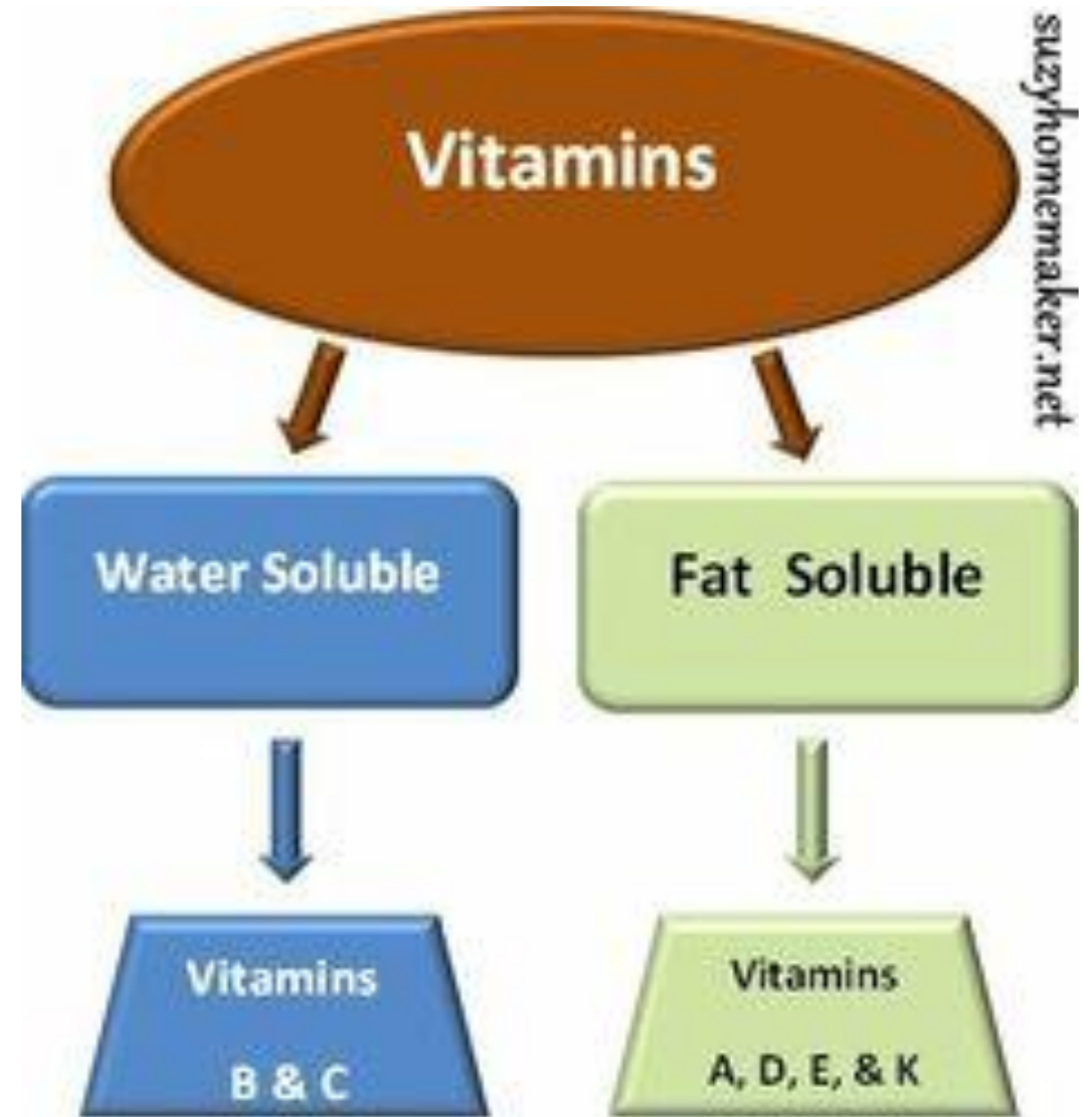
The vitamins are not dissolved in water but are absorbed efficiently with lipids.

2) WATER-SOLUBLE VITAMINS ARE THE 8 B VITAMINS AND VITAMIN C

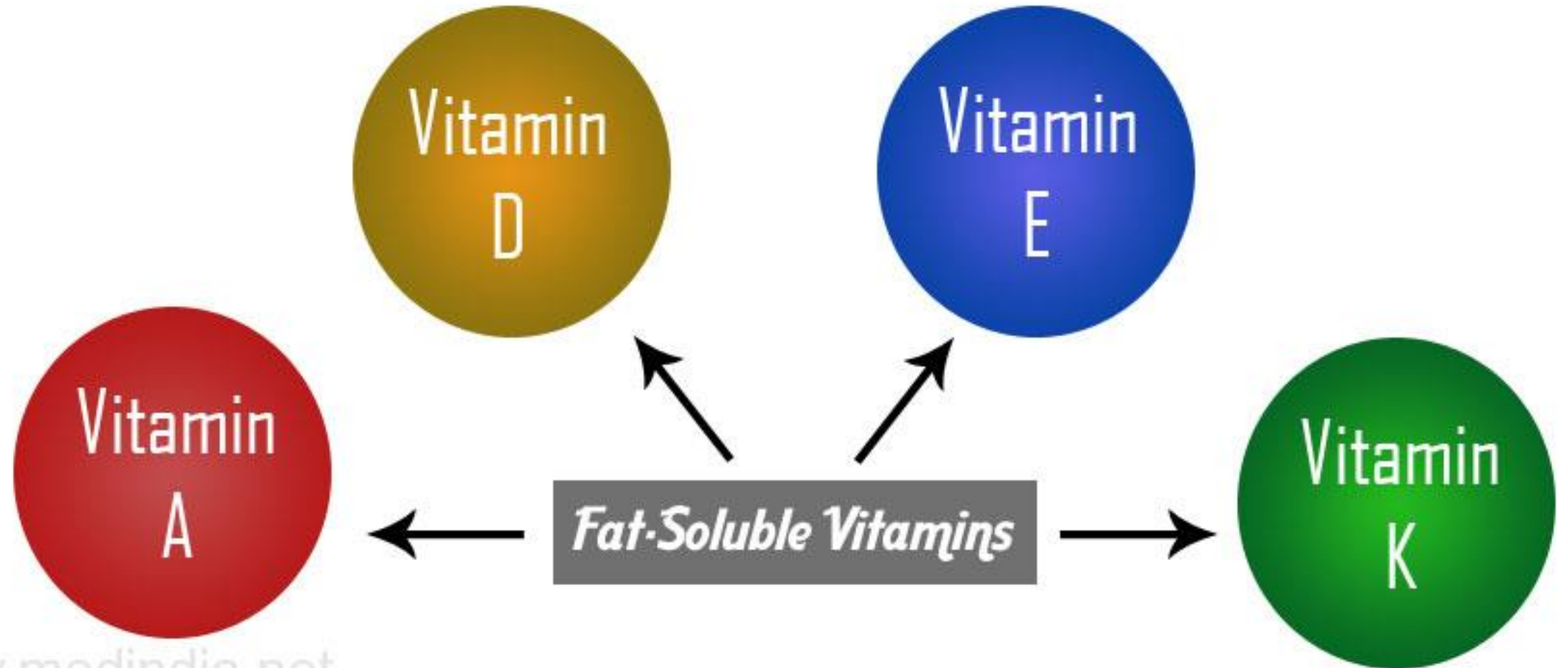
Function: mainly to maintain body enzymes

They are not readily stored in the body and after use, are excreted from the body

Their consistent daily intake is important.



INFORMATION ABOUT THE LIPID (FAT) SOLUBLE VITAMINS – A, D, E, AND K



Health Benefits of Vitamin A

Prevents cancer

Builds immune system

Supports bodily functions

Delays signs of Ageing

Improvement in vision

Makes the bones stronger

Prevents Urinary Stones

Promotes Muscle Growth

Reduces acne

Antioxidant Capabilities



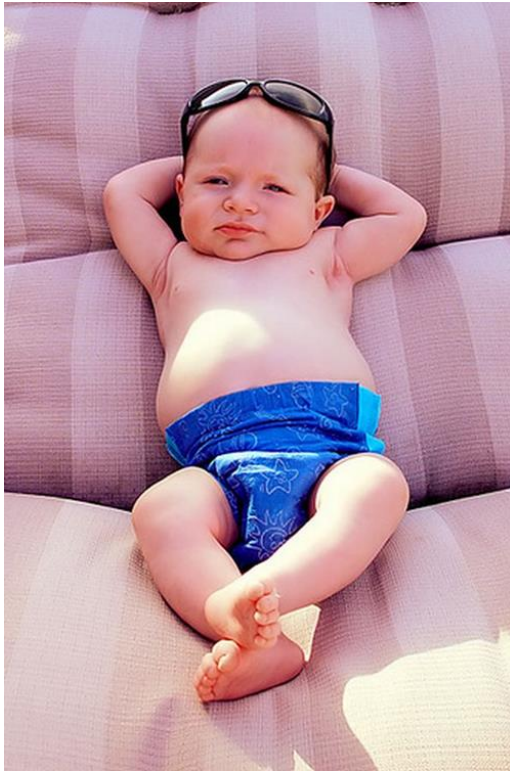
Sources of Vitamin A



Vitamin D properties - Its main function is absorption of calcium and phosphorus from food in the small intestine.

It is also believed to take part in the regulation of cell growth, metabolism and stimulation of some hormones synthesis and is very important for our immunity system.

You can also get it by doing at least 10 minutes of sunbathing a day !



Vitamin D sources:

- Cod liver oil
- Mushrooms
- Oily fish
- Caviar
- Cereals
- Tofu
- Dairy
- Pork
- Eggs
- Soy yogurt.

VITAMIN D

Sources

★ lovandy.com ★



Vitamin E is a group of natural compounds and is mostly tocopherol.

It has a huge role in metabolism, helping your circulatory system, liver and stomach work properly and is good for your skin.

Food sources of Vitamin E:

Spinach
Nuts
Sunflower seeds
Avocados
Shellfish
Trout
Olives
Broccoli
Squash and pumpkin

VITAMIN E

Sources

★ lovandy.com ★



Vitamin K

Its real name is Phylloquinone. This vitamin helps in bones metabolism and kidney's work; takes part in calcium absorption.

In addition, this nutrient provides better interaction of calcium and vitamin D.

Sources of Phylloquinone:

Herbs
Kale
Onions
Brussels sprouts
Chili powder
Asparagus
Pickles
Soybeans
Olive oil

VITAMIN K

Sources

★ lovandy.com ★



WATER SOLUBLE VITAMINS

- Vitamin B₁ (**thiamine**)
- Vitamin B₂ (**riboflavin**)
- Vitamin B₃ or Vitamin P or Vitamin PP (**niacin**)
- Vitamin B₅ (**panthotenic acid**)
- Vitamin B₆ (**pyridoxine** and **pyridoxamine**)
- Vitamin B₇ or Vitamin H (**biotin**)
- Vitamin B₉ or Vitamin M and Vitamin B-c (**folic acid**)
- Vitamin B₁₂ (**cobalamin**)



Vitamin B1 – It is also known as Thiamin.

It is one of the most important nutrients for metabolism of fats, proteins and carbohydrates.

It helps your body normalize growth processes and maintain proper functioning of the heart, nervous and digestive systems.

Sources of B1 vitamin:

Fish
Pork
Seeds of sunflower
Nuts (Macadamia)
Wheat bread
Green peas
Squash
Asparagus
Dry roasted soy beans
Other beans

VITAMIN B1

Sources

★ lovandy.com ★



Vitamin B2

It is known as riboflavin, one of the most important water-soluble vitamins.

Vitamin B2 is needed to form red blood cells and antibodies. In addition, it regulates some growth and reproductive functions and helps with skin, nails and hair health.

Sources of B2:

Cheese
Almonds
Beef and lamb
Oily fish
Eggs
Pork
Mushrooms
Sesame seeds
Seafood

VITAMIN B2

Sources

★ lovandy.com ★



Vitamin B5 - Its scientific name is Pantothenic acid.

This name in Greek means 'everywhere', as this nutrient is extremely widespread.

It helps with metabolism of fats, carbohydrates and amino acids and helps to maintain mucous membranes.

Where can you find it?

Mushrooms
Cheese
Fish
Avocados
Eggs
Lean pork
Beef and Veal
Chicken or turkey

VITAMIN B5

Sources

★ lovandy.com ★



Vitamin B6

B6 vitamin is a common name for nutrients that have a biological activity of pyridoxine.

Your body uses it in synthesis of serotonin, dopamine, epinephrine and norepinephrine.

It is also used in treatment of a large quantity of epidermis (skin) diseases.

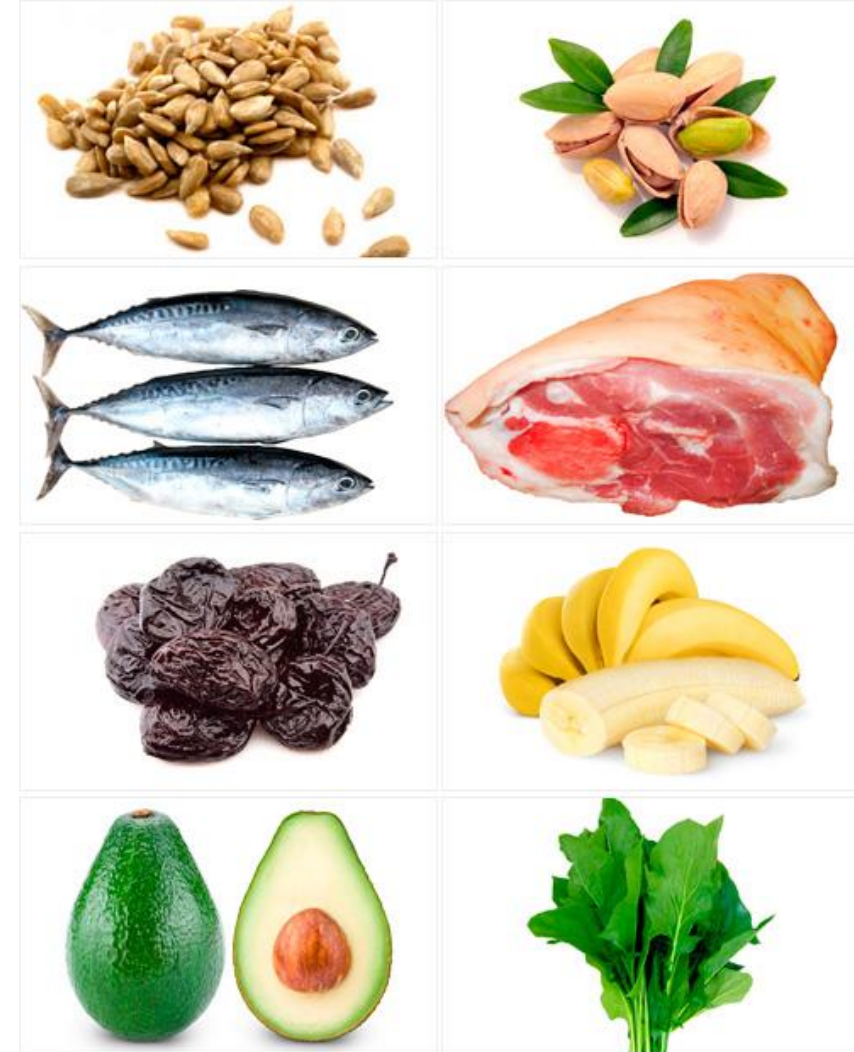
Sources of B6:

Sunflower seeds
Pistachio nuts
Tuna
Turkey
Pork
Prunes
Beef
Bananas
Avocados

VITAMIN B6

Sources

★ lovandy.com ★



see more on lovandy.com

Vitamin B9 – also known as folic acid, is essential for growth and development of the immune and circulatory systems.

This means that B9 is needed to create new cells and keep them healthy and gives good skin protection against harmful solar radiation.

B9 sources:

- Beans
- Lentils
- Spinach
- Asparagus
- Lettuce
- Avocado
- Broccoli
- Mangos
- Oranges
- Wheat bread

VITAMIN B9

Sources

★ lovandy.com ★



Vitamin B12

Its second name is Cyanocobalamin.

This nutrient provides different types of enzymatic reactions. This means, your body needs it for proper metabolism and for good food digestion.

It is also important for cell regeneration.

Natural sources of B12:

- Shellfish
- Liver
- Fish
- Crustaceans
- Tofu
- Bran;
- Red meat
- Dairy
- Cheese

VITAMIN B12

Sources

★ lovandy.com ★



VITAMIN B12

B12 rich foods



Fish



Oyster and Crab



Poultry



Milk



Eggs



Meat



Cheese



Nuts

B12 benefits

- ✔ Prevent Breast Cancer
- ✔ Alzheimer's Disease Treatment
- ✔ Against Body Fatigue and Weakness
- ✔ Prevents Anemia and helps formation of DNA
- ✔ Useful in Treating Sickle Cell Anemia
- ✔ Maintains Proper Functioning of Heart
- ✔ Helps to Maintain Strong Nervous System
- ✔ Helps in Formation and Maintenance of Red Blood Cells

VITAMIN C

- † Cure for the common cold
- † Protection against immune system deficiencies
- † Prevents cardiovascular disease
- † Maintains healthy skin & wrinkling
- † Important for eye health
- † Prevents cancer and stroke
- † Essential for the body to make collagen



Top 12 Vitamin C Foods

SkinKissable.com



1. Rosehip



2. Strawberries



3. Guava



4. Bell Peppers



5. Parsley



6. Papaya



7. Broccoli



8. Citrus Fruits



9. Kale



10. Brussel Sprouts



11. Pineapple



12. Kiwi

Vitamin P

This vitamin (known as the group of flavonoids) helps to reduce permeability and fragility of blood capillaries.

With a proper level of P vitamin in your body, the concentration of hyaluronic acid increases, which leads to increasing of capillaries' elasticity.

Furthermore, it has antioxidant properties and protects against oxidation of ascorbic acid.

Where to find flavonoids?

Seeds
Cheese
Salmon
Shellfish
Nuts
Pork
Beef
Dairy
Tofu

VITAMIN P

Sources

★ lovandy.com ★



Vitamin H

Its original name is biotin. This nutrient helps in metabolism of fatty acids and generates glucose.

In addition, biotin participates in production of enzymes.

Sources of Vitamin H:

Liver
Chicken
Seafood
Milk
Eggs
Cheese
Yeast
Tuna and salmon
Berries

VITAMIN H

Sources

★ lovandy.com ★



THE VITAMINS

*Vitamin A has a mission
To give to you strong bones and vision*

*Vitamin D is from the sun
And helps the mineral calcium*

*Vitamin E always goes zoom
To help your system stay immune*

*Vitamin K helps you clot
That way you won't bleed a lot*

*Vitamin C won't let you get sick
You'll pump iron more quick... ly*

*B Vitamins one, two, three; five, six, seven
Work to keep your engine revvin'*

*Folic acid is number nine
Keeps your DNA working fine*

*Twelve is needed you will see
For nerves and blood and energy*

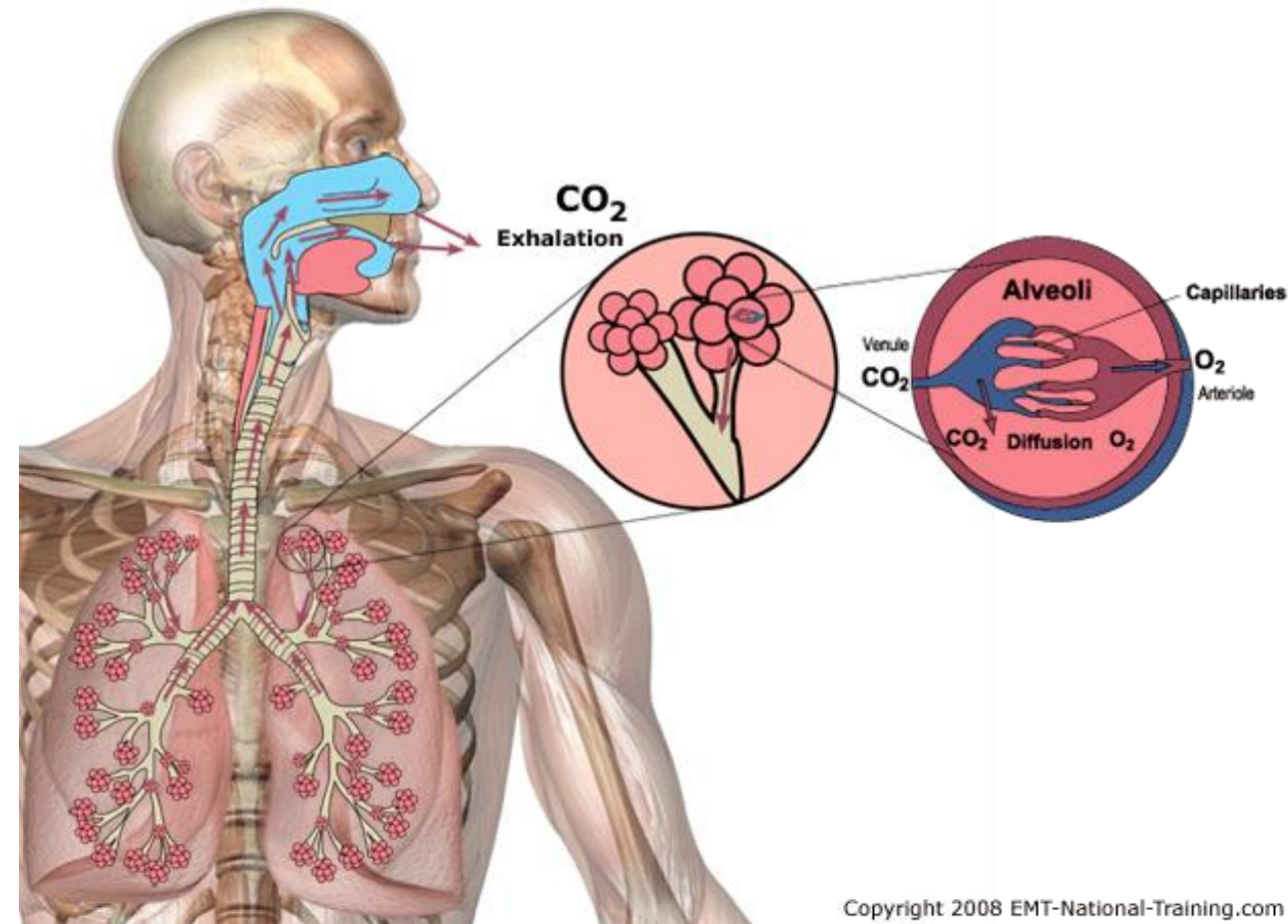
INORGANIC AND ORGANIC CHEMICALS IN THE BODY

There are two kinds of chemicals that make up the human body: **inorganic and organic chemicals**.

Although there are some exceptions, **inorganic** chemicals are primarily molecules that are made up of one or two elements that are not carbon.

Water (H_2O) and oxygen (O_2) are examples of inorganic chemicals that are important for the human body to function, as are iron (Fe), calcium (Ca), and sodium (Na).

One exception is carbon dioxide (CO_2)—even though this contains a gas that the body can't use and must be expelled from the lungs.



Classes of Organic Molecules

- **Carbohydrates (sugars)**

- Monosaccharides
- Disaccharide
- Polysaccharides

- **Lipids**

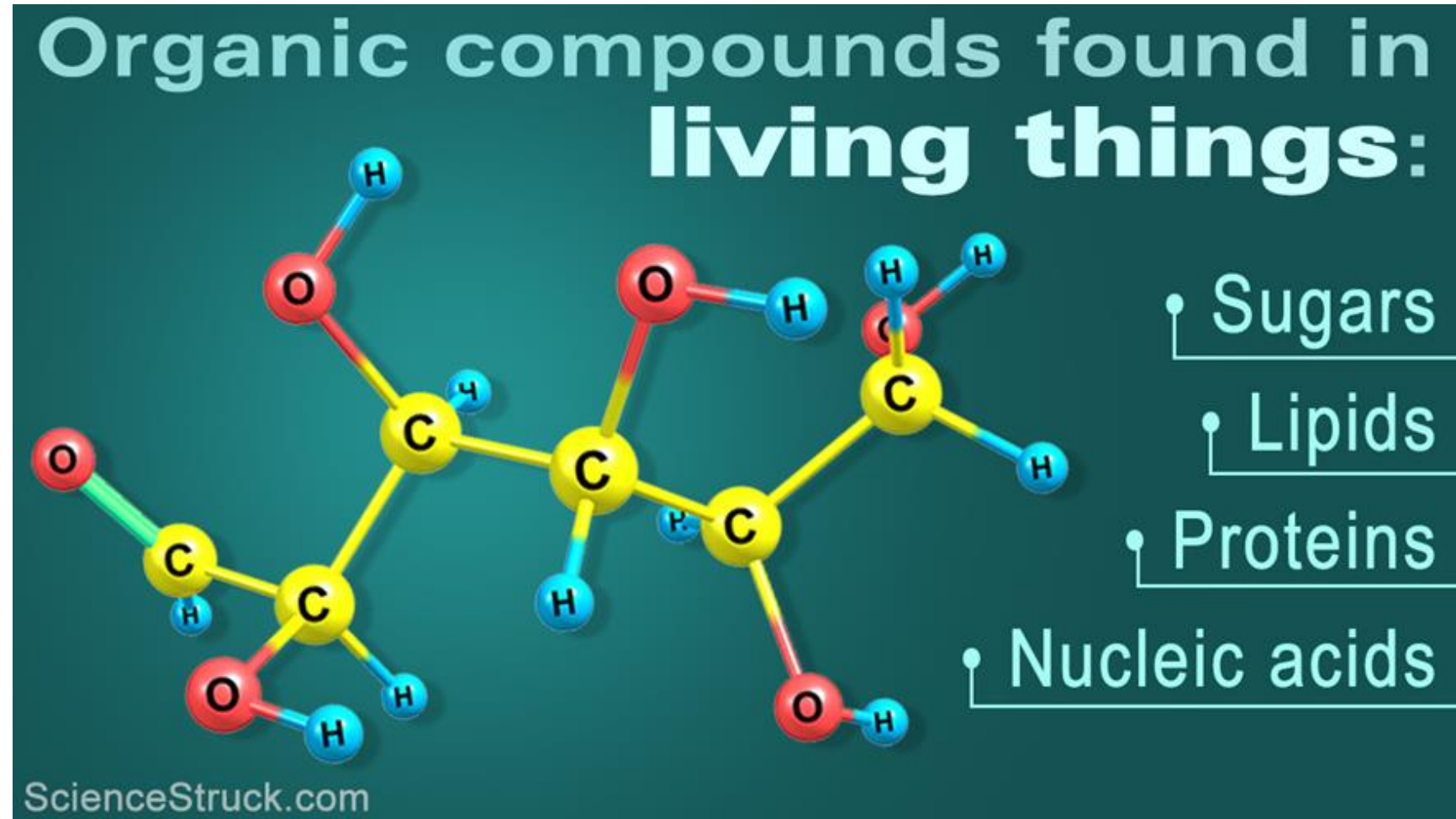
- *Fatty Acids*
- *Triglycerides*
- *Phospholipids*
- *Steroids*

- **Proteins**

- *Amino Acid Subunits*
- *Polypeptides*

- **Nucleic Acids**

- Deoxyribonucleic acid (DNA)
- Ribonucleic acid (RNA)



Carbohydrates (sugars)

- They are the main source of energy for organisms
- Made of Carbon, Hydrogen, and Oxygen
- The monomers of carbohydrates are called **monosaccharides**, like glucose, fructose (in fruits) and galactose (in milk).
- The breakdown of monosaccharides supplies immediate energy.
- They usually end in *-ose*, such as *Glucose*, *Sucrose*, *etc.*
- Extra sugar is stored as macro-molecules (groups of molecules) called **polysaccharides**.
- **Polysaccharides are made from monosaccharides.**

SOURCES OF SMART CARBOHYDRATES

For a full list of foods visit: www.sleekgeek.co.za/foodlist

STARCHY VEG

Butternut Squash
Potatoes
Pumpkin
Sweet Potatoes

LEGUMES

Beans
Chickpeas
Lentils
Peas and Pulses

(You can bump up your protein intake with legumes and whole grains.)

WHOLE GRAIN

Amaranth
Barley
Buckwheat
Oats
Quinoa
Rice
Sorghum
Spelt
Sprouted Grains

FRUIT

(Fresh, not dried)

Apples
Apricots
Bananas
Berries and Cherries
Figs
Grapefruit
Grapes
Guavas
Kiwifruit
Lemons and Limes

FRUIT *(continued)*

Mangoes
Melons
Nectarines
Oranges
Peaches
Pears
Persimmons
Pineapple
Plums
Pomegranates
Watermelon



USES OF POLYSACCHARIDES - GLYCOGEN

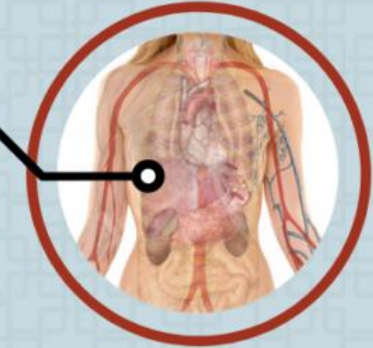
- Many animals store extra sugar as glycogen.
- Glycogen stored in your liver is released when glucose in your blood runs low.
- Glycogen stored in your muscle supplies energy for muscle contractions.

GLYCOGEN

A sugar or carbohydrate that acts as an important energy store for the body.

LIVER GLYCOGEN

Stores in the liver assist in regulating sugar-dependent functions of the entire body, such as blood-sugar levels.

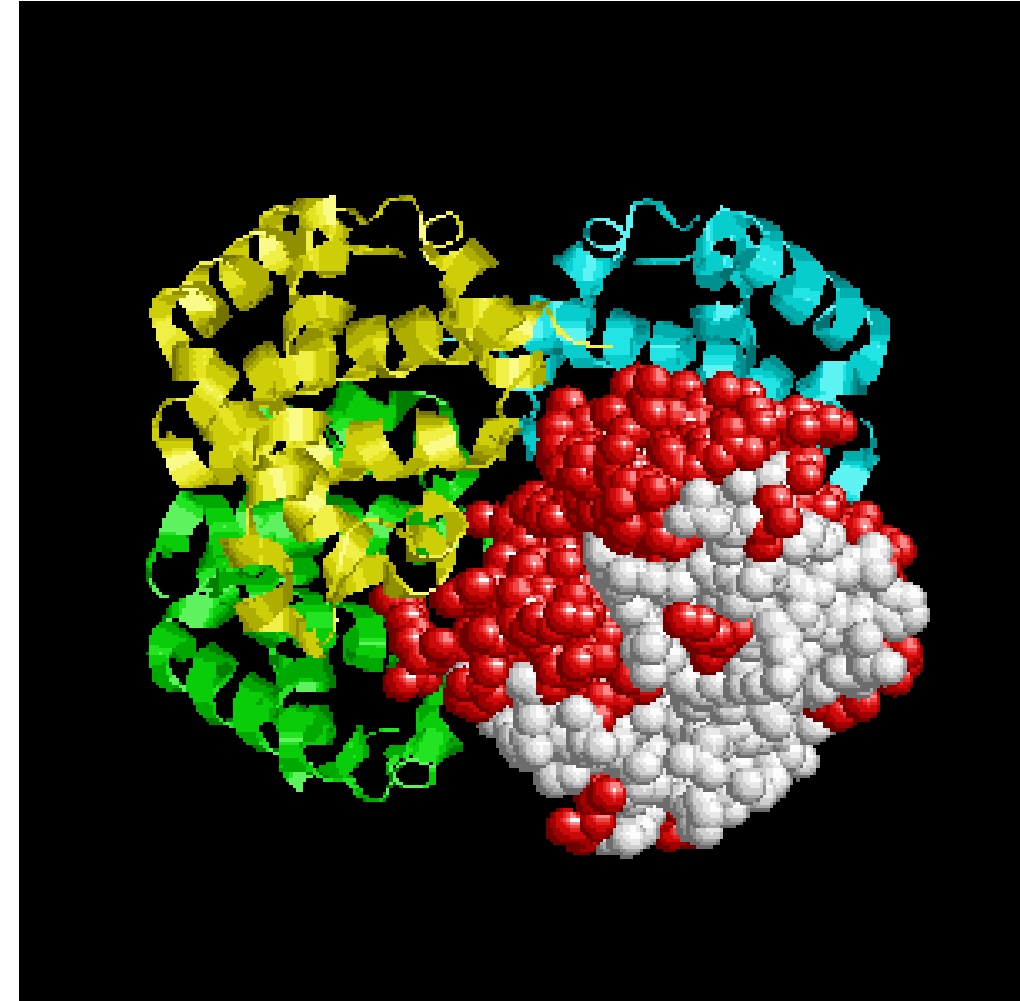


MUSCLE GLYCOGEN

In skeletal muscle, glycogen helps fuel and regulate physical activity, especially in high-intensity exercise and explosive movements.

AMINO ACIDS ARE SIMPLE ORGANIC COMPOUNDS THAT COMBINE TO FORM PROTEINS

- ❖ Proteins consist of long chains of organic molecules called amino acids and make up each body cell.
- ❖ Each gene encodes a single protein, although some complex proteins are encoded by more than one gene.
- ❖ Proteins have a wide range of vital functions in the body.
- ❖ They form structures such as skin or hair
- ❖ Carry signals around the body
- ❖ Fight off infectious agents such as bacteria.
- ❖ Perform the thousands of basic biochemical processes needed to sustain life.



PROTEINS

The body is made up of 20% Protein !!

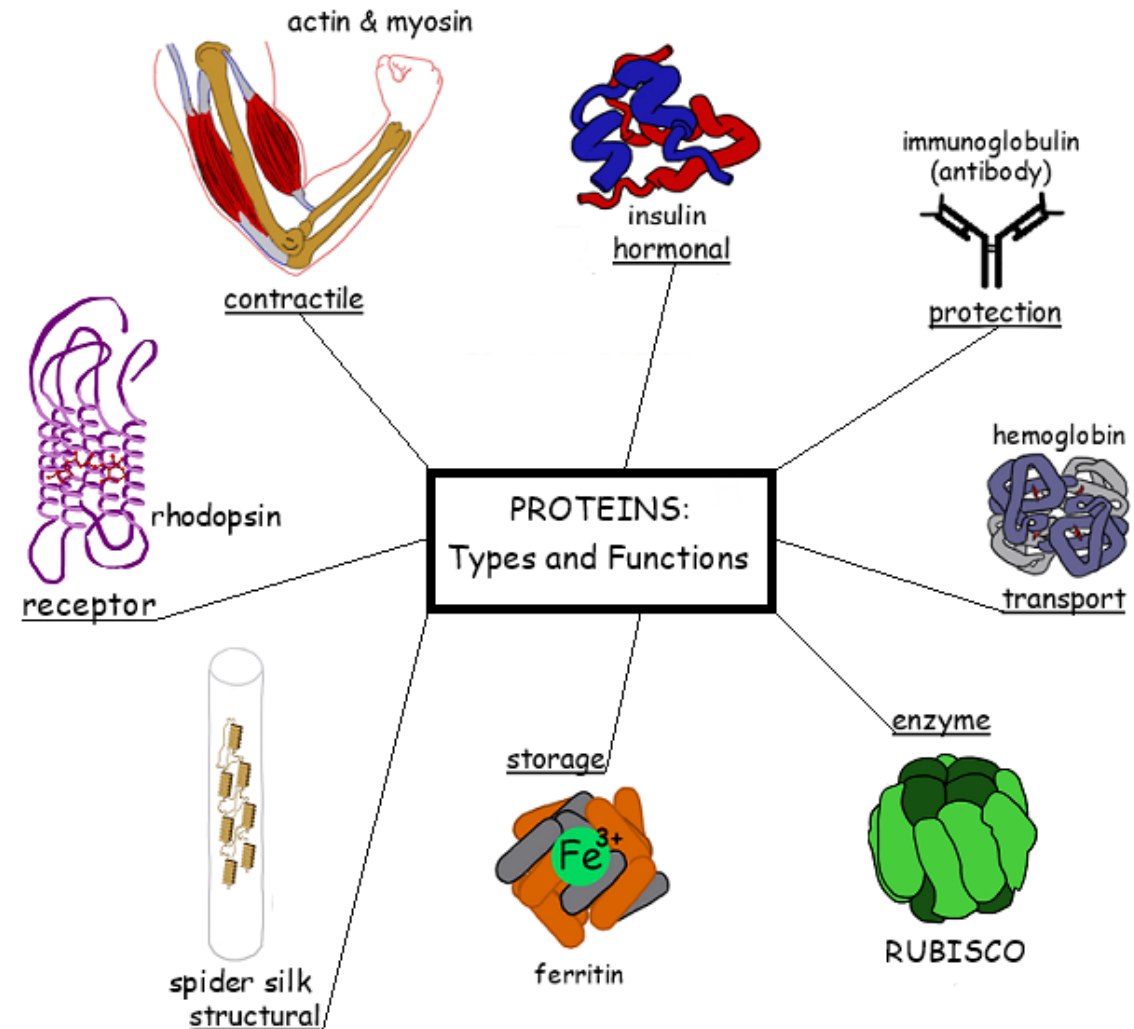
Proteins are large, complex molecules that play many critical roles in the body. They do most of the work in cells and are required for the structure, function, and regulation of the body's tissues and organs.

They are made up of hundreds or thousands of smaller units called amino acids, which are attached to one another in long chains.

There are 20 different types of amino acids that can be combined to make a protein.

The sequence of amino acids determines each protein's unique 3-dimensional structure and its specific function.

Proteins can be described according to their large range of functions in the body, listed in alphabetical order, as shown on the next page:



EXAMPLES OF PROTEIN FUNCTIONS

Function	Description	Example
Antibody	Antibodies bind to specific foreign particles, such as viruses and bacteria, to help protect the body.	<u>Immunoglobulin G (IgG)</u>
Enzyme	Enzymes carry out almost all of the thousands of chemical reactions that take place in cells. They also assist with the formation of new molecules by reading the genetic information stored in DNA.	<u>Phenylalanine hydroxylase</u>
Messenger	Messenger proteins, such as some types of hormones, transmit signals to coordinate biological processes between different cells, tissues, and organs.	<u>Growth hormone</u>
Structural component	These proteins provide structure and support for cells. On a larger scale, they also allow the body to move.	<u>Actin</u>
Transport/storage	These proteins bind and carry atoms and small molecules within cells and throughout the body.	<u>Ferritin</u>

Proteins in the Human Body

Proteins in the Immune System

- Antibodies - fight invaders
- Complement System - system of 20 protein molecules that are activated during infections



Signaling Proteins

- Cytokines - communicate with other cells



Proteins in the Muscle

- Actin and Myosin - interactions with each other for muscle movement
- Myoglobin - release oxygen to muscles
- Ferritin - stores and release oxygen



Proteins in the Blood

- Hemoglobin - transports oxygen
- Fibrinogen - clots blood
- Albumin - maintain proper amount of liquid in blood

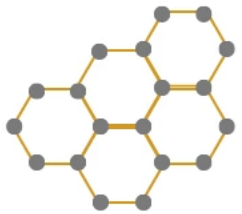
Enzymes

- Digestive Enzymes - helps break down food



Structural Proteins

- Cytoskeleton - network of protein filaments and tubules that maintain cell shape
- Keratin - found in skin, hair, and nails
- Collagen - provides strength
- Elastin - provides flexibility

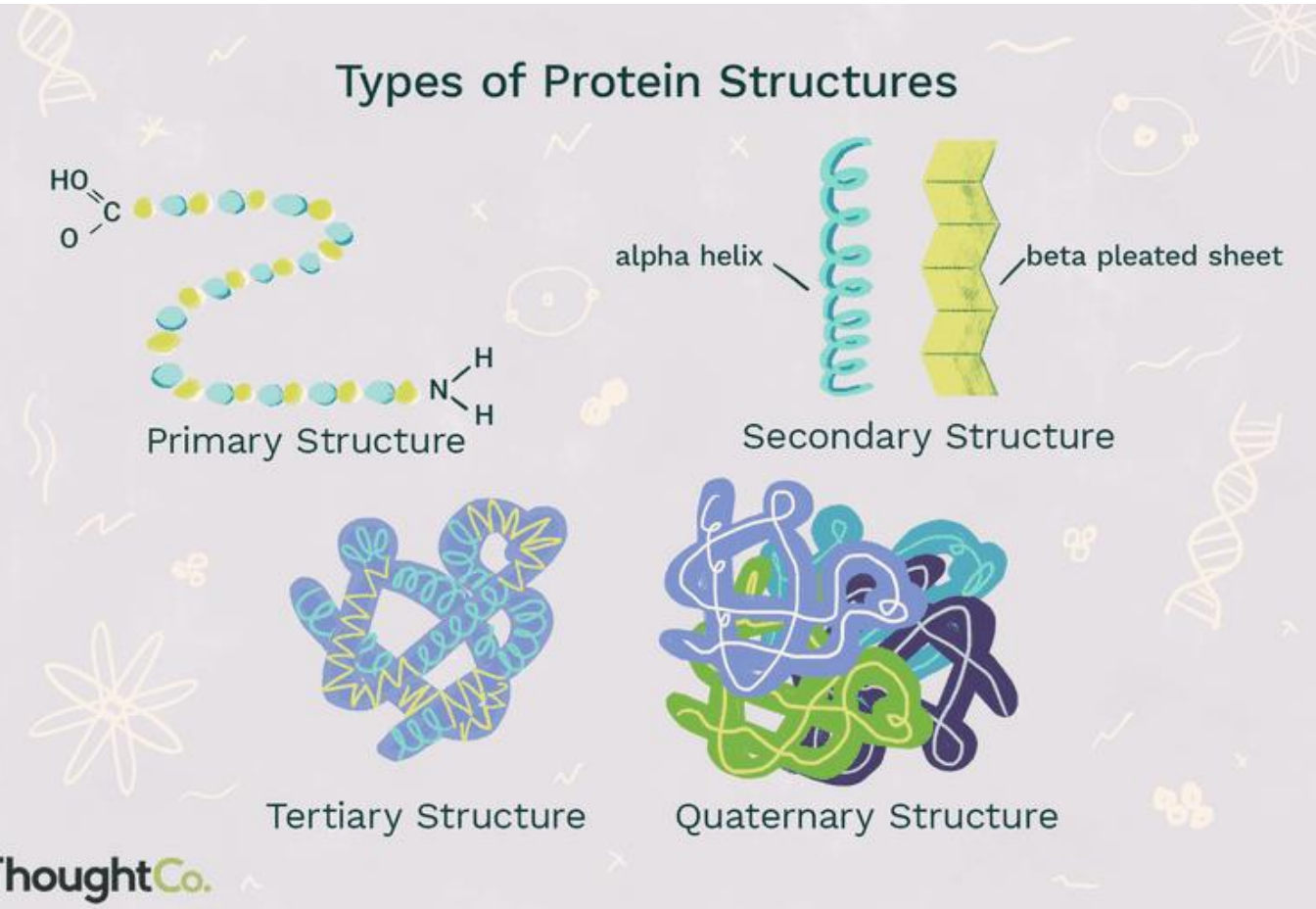


Cell Membrane

- Form channels for substances to move through membrane
- Act as enzymes
- Act as receptors
- Three types of proteins: peripheral protein, integral protein, and lipid-bound protein



Proteins have four levels of organization.

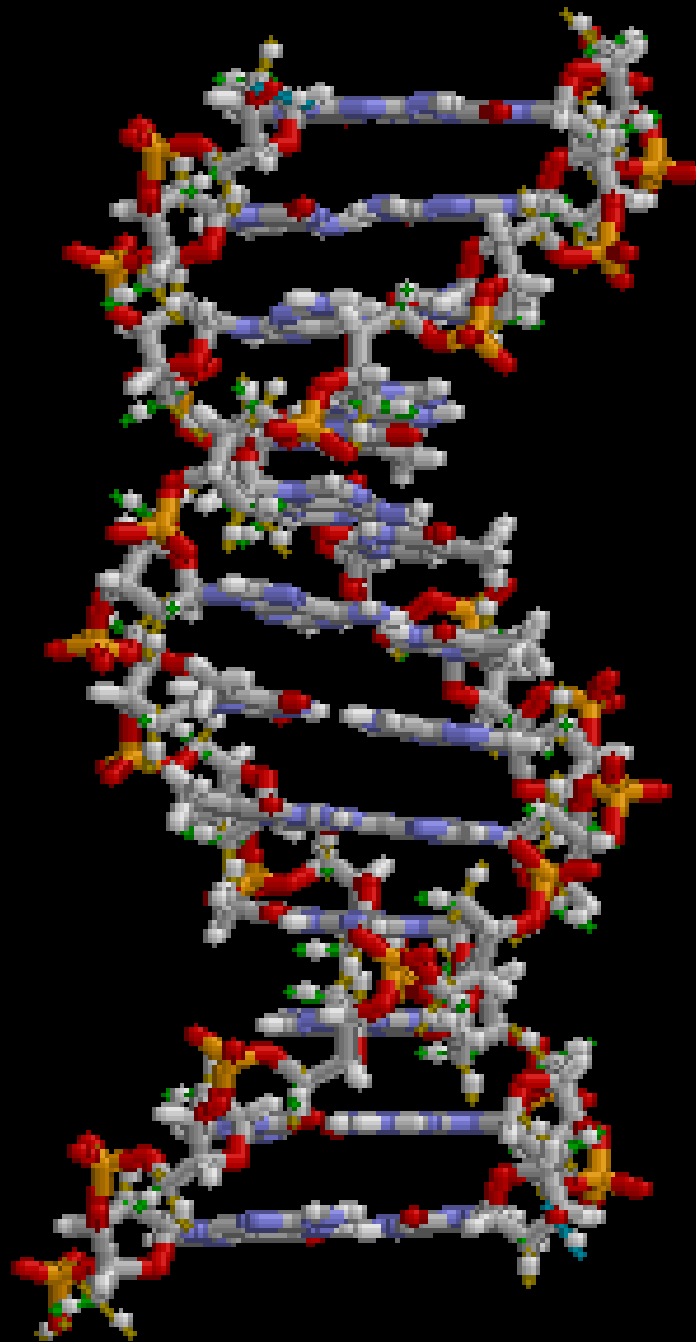


- This allows for the unique shape of proteins.
- Shape is very important; if a protein is not the right shape, it will not work.

DNA, or deoxyribonucleic acid, is the hereditary material in humans and almost all other organisms.

Nearly every cell in a person's body has the same DNA.

Most DNA is located in the cell nucleus but a small amount can also be found in the mitochondria which are structures within cells that convert the energy from food into a form that cells can use.



The information in DNA is stored as a code made up of four chemical bases:

Adenine (A)

Guanine (G)

Cytosine (C)

Thymine (T)

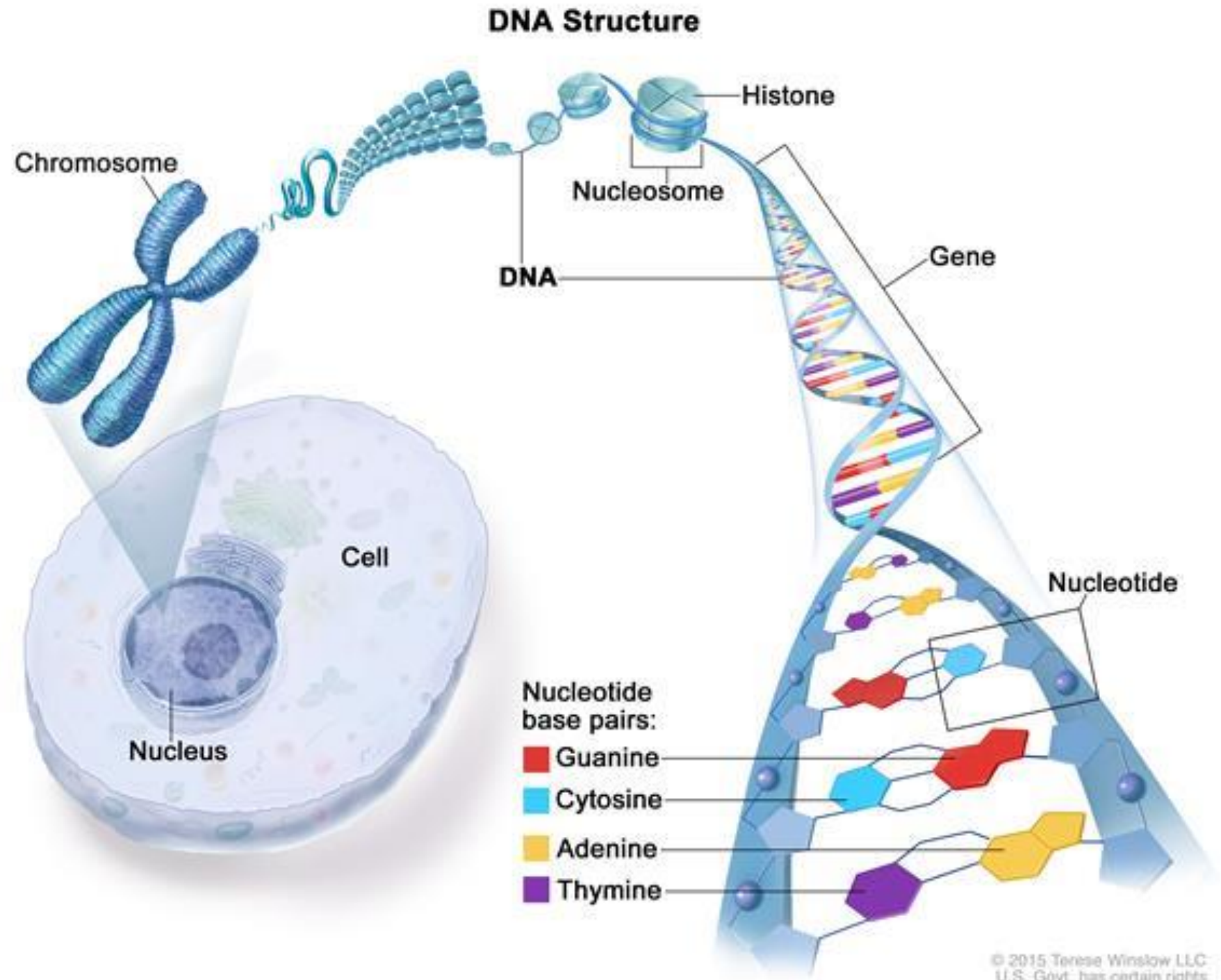
- ❖ Human DNA consists of about 3 billion bases, and more than 99 percent of those bases are the same in all people.
- ❖ The order, or sequence, of these bases determines the information available for building and maintaining an organism
- ❖ The process is similar to the way in which letters of the alphabet appear in a certain order to form words and sentences.



If you stretched each strand of the **DNA** in one cell all the way out, it would be about 2 meters (over 6 feet) **long**

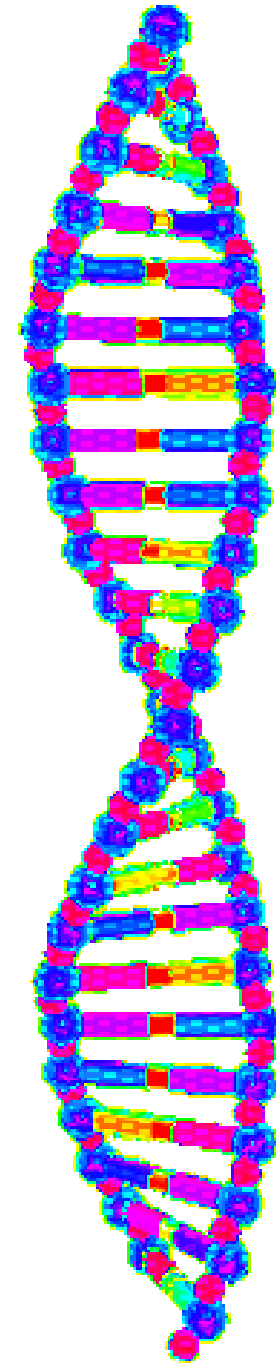
Using the process of extreme coiling, this allows the 3 billion base pairs in each cell to fit into a space just 6 microns (millionths of a meter) across.

If all of the DNA in all your cells were stretched out and put together end to end, they would be about twice the diameter of the Solar System !



Nucleic Acids

- They store and transmit hereditary, or genetic, information
- They contain hydrogen, carbon, nitrogen, oxygen, and phosphorus
- Nucleic acids are very large and complex molecules.
- **There are two types of nucleic acids: deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).**



4.8 minute good video -

<https://www.youtube.com/watch?v=zwibgNGe4a>



DNA

- Makes up the chromosomes within the cell's nucleus
- holds the genetic code
- controls heredity
- Determines which proteins will be synthesized in a cell and thus controls the cell's activity

RNA

- May be present in either the nucleus or the cytoplasm and **there are three types:**
 - **messenger R(mRNA)** carries genetic information from DNA
 - **transfer RNA (tRNA)** is involved in amino-acid activation during protein synthesis
 - **ribosomal RNA(rRNA)** is involved in ribosome structure.

The genetic similarity between a **human** and a **banana** is...

60%



BUSINESS INSIDER

SOURCE: National Human Genome Research Institute

The genetic similarity between a **human** and a **fruit fly** is...

61%



BUSINESS INSIDER

SOURCE: National Aeronautics Space Administration (NASA)

The genetic similarity between a **human** and a **cow** is...

80%



BUSINESS INSIDER

SOURCE: Science Magazine

The genetic similarity between a **human** and a **cat** is...

90%



BUSINESS INSIDER

SOURCE: Genome Research

The genetic similarity between a **human** and a **mouse** is...

85%



BUSINESS INSIDER

SOURCE: National Human Genome Research Institute

The genetic similarity between a **human** and a **chimpanzee** is...

96%



BUSINESS INSIDER

SOURCE: National Human Genome Research Institute

THE END