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COMPARISON OF SOME EXACT SCIENCES HISTORY					
50-100 thousand years ago	**Mastering fire striking**		**(1799, J. Proust), the law of multiple relations**	1886	**Formulation of the law of osmotic**
5-7 thousand years ago	**Pottery (clay firing)**		**(1803, J. Dalton, 1808, Th. Thomson),**		**pressure – S. A. Arrhenius**
3-5 thousand years ago	**Copper metallurgy**		**the law of volumetric relations (1811,**	1887	**Discovery of the laws governing**
VII-V century BC	**The science of the four simple substances**		**J. L. Gay-Lussac)**		**liquid solutions – F. M. Raoult**
VI – IV century BC	**Primordial atomism**	1803-1810	**Formulation of the atomistic theory,**	1889	**Explanation of the formation**
500 BC	**First letter ever written - Queen Atossa of Persia**		**according to which each type of atoms**		**of the electrode potential – W. H. Nernst**
360-350 BC	**The writings of Aristotle, who recognized**		**and molecules is characterized**	1898	**Discovery of some radioactive elements**
	simple substances as carriers of the basic		**by a specific relative mass (atomic,**		**– M. Sklodowska-Curie, P. Curie**
	properties of bodies		**particle) – J. Dalton**	1913	**Discovery of the hydrogen atom – N. Bohr**
about 1 thousand years ago	**Ferrous metallurgy**	1806	**Isolating asparagine, the first amino acid**	XX century	**Development of laser methods allowing**
IV century AD	**Appearance of the name "chemistry"**		**– L.-N. Vauquelin and P. J. Robiquet**		**to study the course and mechanism**
	in the writings of Zosimos	1811	**Putting forward the hypothesis**		**of chemical reactions in real time**
VII – VIII centuries AD	**The Arabs assimilate Greek science**		**of the existence of independent**		**(femtoseconds) – A. Zewail**
IX-XI centuries	**Arabic alchemical treatises**		**molecules composed of two**	1901	**Classification of the four blood types**
XII century	**Translations of Arabic alchemical treatises**		**identical atoms – A. Avogadro**		**– K. Landsteiner**
	into Latin	1812-1819	**Formulation of the dualistic hypothesis**	1916-1919	**The Emergence of the Theory of Chemical**
XIII-XIV centuries	**Treatises of European alchemists**		**concerning the electrochemical structure**		**Bonds – W. Kossel, G. N. Lewis, I. Langmuir**
1604	**Publication of the work Currus triumphalic**		**of chemical compounds – J. J. Berzelius**		**The first artificially induced nuclear**
	antimonii [triumphal chariot of antimony],	1813	**The concept of fatty acid ("*acide gras*")**		**transformation – E. Rutherford**
	attributed to Basilius Valentinus		**introduced by M. E. Chevreul**	1921	**Noticing that three water-soluble compounds,**
1604	**Novum lumen chymicum, the most widely**	1814	**Proposing the designation of roots using**		**acetone, β-hydroxybutyrate and acetoacetate**
	spread work of M. Sędziwoj, Polish		**letter symbols (used to this day)**		**(together called ketone bodies) were produced**
	alchemist		**– J. J. Berzelius**		**by the liver as a result of starvation or if man**
1648	**Discovery of sodium sulfate (also known as**	1828	**Undermining the theory of the life force**		**followed a diet rich in fat and low in carbohydrates**
	Glauber's salt) - J. Glauber		**as a result of obtaining urea (then**		**- endocrinologist Rollin Woodyatt**
1661	**R. Boyle's publication of Sceptical Chymist,**		**considered an organic compound) from**	1923	**Presentation of the theory of strong**
	in which he defined a simple substance		**an inorganic compound – F. Wohler**		**electrolytes – P. Debye, E. Huckel**
	(element) as the end of chemical analysis	1833-34	**Formulation of the laws of electrolysis**	1927	**Introduction of quantum techniques**
1665	**The first blood transfusion in recorded history**		**– M. Faraday**		**to chemistry – E. U. Condon,**
1665	**The discovery of the cell – Robert Hooke**	1840	**Formulation of the laws**		**W. Heitler, F. London**
1667-1703	**Formulation of the phlogiston theory – G. Stahl**		**of thermochemistry – G. Hess**	1929	**The discovery of vitamins – F. G. Hopkins**
1718	**Summary (in the form of a table)**	1847	**Discovery of fructose – A.-P. Dubrunfaut**	1931	**Discovery of the role of glucose**
	of chemical affinities of various substances	1853-56	**Formulation of the unitary theory**		**in the fermentation of cancer cells – O. Warburg**
	in relation to each other – E. F. Geoffroy		**of the structure of organic compounds**	1932	**Development of a proton-neutron**
1747	**Isolation of glucose from raisins - chemist**		**– Ch. Gerhardt**		**model of the atomic nucleus**
	A. Marggraf	1855	**The discovery of glycogen – Claude Bernard**		**– J. Chadwick, W. Heisenberg, D. Iwanienko**
1756-1774	**Discovery of gases emitted during certain**	1857	**Discovery of mitochondria, often referred to**	1935	**Formulation of the transition state**
	chemical reactions		**as the "powerhouses of the cell"**		**theory – H. Eyring, M. Polanyi**
1777	**Proving that combustion consists**		**- physiologist Albert von Kölliker**	1939	**Nuclear fission – F. Strassmann,**
	of combining a substance with one	1858	**Proving the validity of Avogardo's**		**O. Hahn, L. Meitner**
	of the components of air – A. L. Lavoisier;		**hypothesis – S. Canizzaro**	1949	**Development of the flash photolysis**
	Lavoisier mistakenly considered this component	1861	**Demonstration that chemical properties**		**technique – R. Norrish, G. Porter**
	to be the carrier of acidic properties and called		**depend on the structure of molecules**	1953	**Discovery of DNA – Crick, Watson**
	oxygene (acidobear, now oxygen)		**– A. Butlerov**	1965	**Giving the rules for the course**
1784	**Identification of the composition of water**	1865	**Giving the structure of the benzene**		**of the so-called concerted reactions**
	– H. Cavendish		**molecule, explaining the aromatic**		**– R. B. Woodward, R. Hofmann**
1787	**Specifying by French chemists,**		**properties of benzene and its derivatives**	1967-87	**Development of stereoselective**
	grouped around A. L. Lavoisier, which		**– F. A. Kekule**		**synthesis methods – J. M. Lehn, Ch. J. Pedersen**
	substances should be considered elements	1867	**The Formulation of the Law of Action**		**Application of the supersonic beam method**
	(including metals) and giving the rules for		**of the Masses – C. M. Guldberg**		**to the study of reaction kinetics**
	naming inorganic compounds, which they use		**and P. Waage**		**– D. Herschabach, Y. Lee, J. Polanyi**
	to this day	1869	**Periodic table of elements – D. Mendeleev**	2005	**Discovery of grid cells in the brain – E. Moser,**
1789	**A. L. Lavoisier's formulation of the law**	1869	**The first telephone patent - Alexander G. Bell**		**M.-B. Moser**
	of conservation of mass of individual elements	1872	**The first analogue computer – W. Thomson**	2010	**Discovery of the role of glutamine, along**
	during chemical and physical transformations		**(L. Kelvin)**		**with glucose, in the fermentation**
	(in "Traite elementaire de chimie")	1882	**Discovery of platelets by Giulio Bizzozero**		**of cancer cells – T. Seyfried**
1792-1811	**Formulation of the basic laws of chemistry:**	1883	**Discovery of glutamine - E. Schulze, E. Bosshard**	2016	**Nobel Prize in Physiology or Medicine**
	the law of stoichiometric connections (1792,	1884	**Discovery of the rule of contrariness**		**for discovery of autophagy - Y. Ohsumi**
	J. B. Richter), the law of constant relations		**– H. L. L. Le Chatelier**	2024	**Discovery of water on Mars**

COMPARISON OF SOME HUMAN BODY FLUIDS COMPONENTS

Blood components

Neutrocytes
- also known as neutrophils, heterophils or polymorphonuclear leukocytes
- form of the most abundant type of granulocytes
- make up 40% to 70% of all white blood cells in humans
- formed from stem cells in the bone marrow
- highly mobile
- can enter parts of tissue where other cells/molecules cannot
- differentiated into subpopulations of neutrophil-killers and neutrophil-cagers
- along with eosinophils and basophils, constitute a group of white blood cells known as granulocytes

Lymphocytes
- a type of white blood cell (leukocyte) in the immune system
- make up between 18% and 42% of circulating white blood cells
- formed in lymphopoiesis process
- determine the specificity of the immune response
- originate from stem cells in the bone marrow
- able to bind antigens through receptor molecules on their surfaces
- part of the immune response to foreign substances in the body
- have a nucleus that occupies most of the cell
- found in large numbers in the lymph nodes, spleen, thymus, tonsils and lymphoid tissue of the gastrointestinal tract
- enter the circulation through lymphatic channels
- regulate or participate in the acquired immunity to foreign cells and antigens

Monocytes
- the largest type of leukocyte in blood
- produced by the bone marrow from precursors called monoblasts
- migrate from blood to an inflammatory site to perform their functions
- make up about 7 percent of the leukocytes
- actively motile and phagocytic
- have relatively big nucleus
- tend to be indented or folded rather than multilobed

Eosinocytes
- responsible for combating multicellular parasites and certain infections
- type of white blood cell
- produced in the bone marrow
- involved in defense against parasites
- actively motile and phagocytic
- participate in hypersensitivity and inflammatory reactions
- migrate into the tissues
- also known as eosinophils

Basocytes
- the least common type of granulocyte
- represent about 0.5% of circulating white blood cells
- the largest type of granulocyte
- discovered in 1879 by German physician Paul Ehrlich
- also known as basophils
- responsible for inflammatory reactions during immune response
- synthesize and store histamine, a natural modulator of the inflammatory response
- incite immediate hypersensitivity reactions in association with platelets, macrophages and neutrophils

Platelets (PLT)
- also known as thrombocytes
- colourless, nonnucleated blood component
- found only in the blood of mammals
- store and transport several chemicals, including serotonin, epinephrine, histamine and thromboxane
- the smallest cells of the blood
- incapable of cell division
- formed in the bone marrow by segmentation of the cytoplasm of megakaryocyte cells
- occur in higher concentration in the spleen than in the peripheral blood

Bilirubin
- secreted by the liver in vertebrates
- produced in bone marrow
- has no known function other than that of a colouring agent
- not present in the blood of dogs, sheep and rats

Red blood cells (RBC)
- also known as erythrocytes
- stay for around 45% of blood volume
- give the blood its characteristic colour
- contain hemoglobin
- small, round, and biconcave
- appear dumbbell-shaped in profile
- covered with a membrane composed of lipids and proteins
- lack a nucleus
- is being developing in bone marrow in several stages
- carry oxygen from the lungs to the tissues
- carry carbon dioxide, a waste product of metabolism, to the lungs, where it is excreted
- allow oxygen exchange at a constant rate over the largest possible area
- give a number of around 5.2 million red cells per cubic millimetre of human blood in the adult human
- developed in the erythropoiesis process
- developed from the precursor known as nucleated red blood cell

Hemoglobin (HGB)
- facilitates the transport of oxygen in red blood cells
- iron-containing protein in the blood of many animals
- forms a bond with oxygen
- linked with the Bohr effect
- enables aerobic respiration, which powers the animal's metabolism
- makes up about 96% of a red blood cell's dry weight (excluding water)
- increases the total blood oxygen capacity seventy-fold

Fibrinogen
- glycoprotein complex, produced in the liver
- described in 1905 by Paul Morawitz
- converted to fibrin, which helps to form a stable blood clot
- bivalent molecule with two symmetrical halves
- can bind simultaneously to two platelets
- links platelets together (aggregation) through the glycoprotein IIb–IIIa complex that serves as the fibrinogen receptor

Other potential components
- serotonin
- sodium
- potassium
- ammonia
- calcium
- phosphorus
- globulins
- albumins
- oxygen
- glucose
- fructose
- carbon dioxide
- omega-3 fatty acids
- water
- omega-6 fatty acids
- ketones
- lipoproteins
- stem cells
- many other components

Other

Synovial fluid
- also called synovia
- viscous, non-Newtonian fluid found in the cavities of synovial joints
- reduce friction between the articular cartilage of synovial joints during movement
- contains hyaluronan secreted by fibroblast-like cells of a synovial membrane
- contains lubricin (proteoglycan 4; PRG4) secreted by the surface chondrocytes of the articular cartilage
- possesses rheopectic properties

Aqueous humour
- transparent water-like fluid similar to blood plasma
- secreted by the ciliary body, a body supporting the lens of the eyeball
- continually produced by the ciliary processes
- prevents eye dryness
- maintains the intraocular pressure and inflates the globe of the eye
- provides nutrition for the posterior cornea, trabecular meshwork, lens and anterior vitreous

Cytosol
- part of the cytoplasm
- is where some chemical reactions of metabolism take place
- contains more than 10 000 different kinds of molecules that are involved in cellular biosynthesis
- contains an organized framework of fibrous molecules that constitute the cytoskeleton, which gives a cell its shape, enables organelles to move within the cell, and provides a mechanism, by which the cell itself can move

Vitreous body
- is a transparent, colorless, gelatinous mass
- fills the space in the eye between the lens and the retina
- surrounded by a layer of collagen called the vitreous membrane (or hyaloid membrane or vitreous cortex)
- makes up four-fifths of the volume of the eyeball
- fluid-like near the centre
- gel-like near the edges

Amniotic fluid
- protective liquid contained by the amniotic sac of a gravid amniote
- serves to facilitate the exchange of nutrients, water, and biochemical products between mother and fetus
- present from the formation of the gestational sac
- generated from maternal plasma
- passes through the fetal membranes by osmotic and hydrostatic forces
- is absorbed through the fetal tissue and skin
- may contain proteins, carbohydrates, lipids and phospholipids, urea and extracellular matrix (ECM) components including collagens and glycosaminoglycans, including hyaluronic acid and chondroitin sulfate

Umbilical blood
- is blood that remains in the placenta and in the attached umbilical cord after childbirth
- contains various types of stem and progenitor cells, mostly hematopoietic stem cells

Cytoplasm
- contains all of the organelles
- contains the mitochondria, which are the sites of energy production through ATP (adenosine triphosphate) synthesis
- the endoplasmic reticulum, the site of lipid and protein synthesis
- contains Golgi apparatus, the site where proteins are modified, packaged, and sorted for transport to their cellular destinations
- contains lysosomes and peroxisomes

Serous fluid
- typically pale yellow or transparent and of a benign nature
- fills the inside of body cavities
- originates from serous glands, with secretions enriched with proteins and water
- as a fluid plays a role in assisting digestion, excretion and respiration

Cerebrospinal fluid
- clear, colourless liquid
- fills and surrounds the brain and the spinal cord
- provides a mechanical barrier against shock
- formed primarily in the ventricles of the brain
- supports the brain and provides lubrication between surrounding bones and the brain and spinal cord
- helps to maintain pressure within the cranium at a constant level
- transports metabolic waste products, antibodies, chemicals, and pathological products of disease away from the brain and spinal-cord tissue into the bloodstream
- is slightly alkaline
- is about 99 percent water
- probably filtered through the nervous-system membranes (ependyma)
- is continually produced
- is affected by the downward pull of gravity, the continual process of secretion and absorption, blood pulsations in contingent tissue respiration, pressure from the veins and head and body movements
- may diagnose a number of diseases
- is being produced by specialised ependymal cells in the choroid plexus of the ventricles of the brain, and absorbed in the arachnoid granulations
- occupies the subarachnoid space (between the arachnoid mater and the pia mater) and the ventricular system around and inside the brain and spinal cord
- nearly protein-free compared with plasma
- has a lower chloride level than plasma
- has a higher sodium level than plasma
- is normally free of red blood cells and at most contains fewer than 5 white blood cells per cubic milimetre
- creates neutral buoyancy for the brain
- allows for the homeostatic regulation of the distribution of substances between cells of the brain and neuroendocrine factors
- has a composition slightly different from blood plasma
- described by Hippocrates as "water surrounding the brain"
- rediscovered by Emanuel Swedenborg between 1741 and 1744
- used in treatment by W. Essex Wynter in 1891
- turns over at a rate of three to four times a day

Other

COMPARISON OF SOME OF THE CHEMICAL ELEMENTS

Calcium
- discovered by H.B. Davy in 1808
- soft, very chemically active metal
- present in calcite, apatite, anhydrite, dolomite and other minerals
- present in bones and body fluids
- present in the amount of around 1 kg in the human body (70 kg)
- used as reductor in metalurgy
- used as alloy additive

Phosphorus
- extracted in 1669 by H. Brand
- nonmetal
- present in the ammount of around 780 g in the human body (70 kg)
- present in nucleic acids
- present in ATP
- present in teeth and bones

Sodium
- obtained in 1807 by H. B. Davy
- very soft metal
- very chemically active
- has a melting point of 97 *C
- present in sea water
- used in sodium lamps
- essential for proper functioning of muscles
- essential for proper functioning of nerves

Iodine
- discovered in 1811 by B. Courtois
- nonmetal
- present in sea water
- present in thyroid gland
- used as radioactive isotope in thyroid gland diagnostic

Hydrogen
- discovered in 1766 by H. Cavendish
- the lightest element
- present in petroleum, natural gas and other fossil fuels
- ingredient of water
- ingredient of nucleic acids and proteins

Lawrencium
- artificially obtained in 1961 by A. Ghiorso, T. Sikkeland, and A. E. Larsch
- metal
- radioactive element
- not present in nature

Xenon
- discovered in 1898 by W. Ramsay and M. W. Travers
- present in the air
- noble gas
- used as a fluorescent lamp filler
- biological function not found

Iron
- known since antiquity
- malleable metal
- rusts in humid air
- passivates in dry air
- ferromagnetic
- main component of Earth's core
- present in hematite, magnetite, pyrite and siderite
- present in hemoglobin and myoglobin

Oxygen
- obtained in 1722 by K. W. Scheele and independently in 1774 by J. Priestley
- colourless and odourless gas
- present in air and minerals
- present in the amount of around 43 kg in the human body (70 kg)
- used in respiration process
- present in water

Selenium
- discovered in 1817 by J. J. Berzelius
- nonmetal
- present in small amounts in sulfur deposits
- used for rubber vulcanization
- present in around 14 mg in the human body
- potentially teratogenic

Argon
- discovered in 1894 by W. Ramsay and Lord Rayleigh
- nonmetal
- chemically inert
- nobel gas
- present in the air
- used to fill light bulbs
- can cause suffocation

Indium
- discovered in 1863 by F. Reich and T. Richter
- very soft metal
- unknown biological function

Rhodium
- discovered in 1803 by W. H. Wollaston
- unknown biological function
- present in the form of alloys along with platinum
- used as a catalyst

Carbon
- known since the earliest times
- present in the amount of around 13 kg in the human body (70 kg)
- present in natural gas
- present in petroleum

Nitrogen
- discovered in 1772 by D. Rutherford
- nonmetal
- colourless and odourless gas
- present in the air
- used for nitriding
- present in the amount of around 2 kg in the human body (70 kg)
- present in nucleic acids

Copper
- known since antiquity
- soft, malleable metal
- present in chalcopyrite, bornite, covelin, chalcosite, cuprite, malachite and other minerals
- used for production of electrical wires

Einstein
- discovered in 1952 by A. Ghiorso in radioactive ash after hydrogen bomb eruption on Enewetak Atoll
- metal
- radioactive element
- not present in nature

Titanium
- discovered in 1791 by W. Gregor
- hard metal
- corrosion-resistant
- present in rutile, ilmenite and titanomagnetite

Fluorine
- obtained in 1886 by H. F. F. Moissan
- nonmetal
- present in fluorite, cryolite and fluorine apatite
- present in human body in amount of around 2,6 g

Tantalum
- discovered in 1802 by A. G. Ekeberg
- hard, ductile, chemically inert metal
- biological function not found

Neon
- discovered in 1898 by W. Ramsay and M.W. Travers
- present in the air

Gold
- one of the earliest known metal
- soft, ductile, malleable nobel metal
- used in jewelry and electronics industry
- biological function not found

Sulphur
- known since antiquity
- nonmetal
- present in the amount of around 150 g in the human body (70 kg)
- used for production of matches

Silica
- discovered in 1882 by J. J. Berzelius
- nonmetal
- present in Earth's crust as alumino-, silicate and silicon dioxide

Tin
- used since antiquity as alloy with copper
- used for tinning of steel plate

Vanadium
- discovered in 1801 by A. M. del Rio and again in 1830 by N. G. Sefström
- hard, malleable, ductile metal
- present in vanadinite and carnotite
- present in petroleum and hard coal
- linked with cholesterol metabolism

Promet
- isolated in 1945 by C. E. Coryell, J. A. Marinsky and L. E. Glendenin
- radioactive metal

Helium
- discovered in 1868 by P. J. Janssen and J. N. Lockyer
- colorless, odorless gas

Cobalt
- known since antiquity
- ferromagnetic
- present in B_{12} vitamin
- present in smaltine

Yttrium
- discovered in 1794 by J. Gadolin
- ignites in the air when powdered

Silver
- one of the oldest known metal
- soft, ductile, malleable nobel metal
- used for production of coins and jewelry
- biological function not found

Potassium
- obtained in 1807 by H. B. Davy
- present in sanidine, orthoclase, adular, microline
- participates in the conduction of electrochemical impulses in the cell

Chlorine
- discovered in 1774 by K. W. Scheele
- nonmetal
- has a boiling point of -34,6*C
- used for bleaching
- used for production of hydrochloric acid

Chromium
- discovered in 1797 by N. L. Vauquelin
- hard metal
- passivates in the air
- amphoteric
- used for protective and decorative coatings

Zinc
- known since antiquity
- passivates in the air
- amphoteric
- plays a role in enzymatic processes

Nickel
- discovered in 1751 by A. F. Cronstedt
- ferromagnetic
- present in meteorites
- used for nickel plating
- present in plant tissues

Tellur
- discovered in 1782 by F. J. Müller von Reichenstein
- brittle, chemically active metal

Curium
- artificially obtained in 1944 by G. Th. Seaborg, R. A. James and A. Ghiorso
- metal
- radioactive element
- chemically active
- not present in nature
- accumulates in the bones
- dangerous to health

Cadmium
- discovered in 1817 by F. Stromeyer
- poisonous as fume and compound
- carcinogenic
- teratogenic

Mercury
- known since antiquity
- has a melting point of -38,87*C
- used for thermometer filling
- teratogenic

Lead
- known since antiquity
- causes diseases of the nervous system
- may accumulate in the body
- may cause blood and blood vessels damage

Aluminium
- discovered in 1825 by H. Ch. Ørsted
- light, malleable metal
- used for production of foils and electric wires

Roentgen
- artificially obtained in 1994 in Helmholtz Centre for Heavy Ion Research
- radioactive element

Uranium
- discovered in 1791 by M. H. Klaproth
- chemically active metal
- used as a fuel for nuclear reactors
- poisonous as soluble salt

Osmium
- discovered in 1804 by S. Tennant
- very hard metal
- vapors of very volatile oxides are highly poisonous

Plutonium
- discovered in 1940 by G. Th. Seaborg
- biological function not found
- metal, highly poisonous

COMPARISON OF UNITS AND REFERENCE RANGE OF SOME BLOOD TESTS

Blood marker	Unit	Reference range*	Blood marker	Unit	Reference range*	Blood marker	Unit	Reference range*
White blood cells (WBC)	cells/µL	4500 - 11000	Vitamin B12	pg/mL	160-950	Total protein	g/dL	6,0-8,3
Red blood cells (RBC)	cells/mcL	4.7 - 6.1 million	Folic acid	nmol/L	6,12 – 38,52	Fibrinogen	mg/dL	200-400
Hemoglobin (HGB)	g/dL	14,0-18,0	Ferritin	ng/mL	24-307	D-dimer (DD)	ng/mL	0-500
Hematocrit (HCT)	%	40,0-54,0	Transferrin	mg/dL	204-360	Chloride	mEq/L	96 - 106
Mean corpuscular volume (MCV)	fL	80,0-97,0	Immunoglobulin E (IgE)	u/mL	1,53-114	Antthrombin III	%	80 - 120
Aluminum	µg/L	0-15	Glucose/ketone Index (GKI)	-	>0	PF4	U/dL	< 400
Mean corpuscular hemoglobin concentration (MCHC)	g/dL	32,0 – 36,0	Acid-base balance	pH	7,35-7,45	Total platelet nucleotide content	nmol/10^8	5.5 – 9.6
			Erythropoietin (EPO)	mU/mL	2,6-18,5	ATP content of platelets	nmol/10^8	0,6-8,5
Adrenocorticotropic hormone (ACTH)	pg/mL	7,2-63,3	Choline	mcmol/L	7-20	Copper	µg/dL	70-140
			Lead	mcg/dL	0-10	ADP content of platelets	nmol/10^8	1.9 – 3.8
Platelets (PLT)	platellets/µL	150,000 - 450,000	Apolipoprotein B	mg/dL	0-90	Plasminogen activator inhibitor-1	AU/mL	0-10
Platelet count (PCT)	%	0,12-0,36	5-nucleotidase	IU/L	2-17	Antistreptolysin O (ASO)	U/mL	2-15
Cadmium	ng/mL	<5.0	Phospholipids	mg/dL	150-250	Strontium	µg/L	20–31
Mean platellet volume (MPV)	fL	6,1-11,0	Rubella IgG	IU/ml	0-7	Thyroid-stimulating hormone (TSH)	mU/L	0,45-4,12
Billirubin	mg/dl	0,2-1,2	Gastrin	pg/mL	0-180			
Neutrocytes (NEU%)	%	45,0-70,0	Tryptophan	µmol/dL	3,10-8,30	Selenium	ng/mL	70-150
Lymphocytes (LYMPH%)	%	20,0-45,0	Fructosamine	umol/L	200-285	Total iron-binding capacity (TIBC)	µg/dL	240-450
Monocytes (MON%)	%	3,0-8,0	Candida albicans	IU	0-3,49			
Eosinocytes (EOS%)	%	1,0-5,0	Serotonin	ng/mL	50-200	Erythrocyte sedimentation rate (ERC)	mm/h	0-15
Basocytes (BASO%)	%	0,0-1,0	Myoglobin	ng/mL	25-72			
Atypical lymphocytes (ALY%)	%	0,0-1,5	Tryptase	ng/mL	0-11,4	CA-50	mg/dl	~`0
Large immature cells (LIC%)	%	0,0-1,5	Apolipoprotein A-1	mg/dl	101-205	CA-125	mg/dl	~`0
Neutrocytes (NEU)	neutrocytes/µL	2500 – 6000	Factor V	%	50-150	Chromogranin A	ng/mL	<36,4
Lymphocytes (LYMPH)	cells/µL	4400 – 11000	Plasma osmolality	mOsm/kg	285-295	Collagen 1A1 polymorphism	-	-
Monocytes (MON)	monocytes/µL	200-800	Thallium	ng/mL	<2	Collagen S100	µg/L	<0,2
Eosinocytes (EOS)	cells/µL	0-500	Arsenic	ng/dL	0-10	Vitamin E	µg/mL	5.5-17
Basocytes (BASO)	basocytes/µL	0-300	Mercury	ng/mL	0-10	Vitamin K2 MK7	ng/mL	0.2-3.2
Atypical lymphocytes (ALY)	%	0-1	Carbon dioxide	mEq/L	23-30	Vitamin B6	nmol/L	40-100
Large immature cells (LIC)	%	1-2	Derivatives-Reactive Oxygen Metabolites	Carratelli Units	250-300	Vitamin B1	µg/dL	2.5-7.5
Sodium	mmol/L	136-146				Vitamin B2	µg/L	1-19
Potassium	mmol/L	3,5-5,1	Cytomegalowirus (CMV) IgG	U/mL	0-0,59	Waller-Rose test	IU/L	0-14
Blood urea nitrogen (BUN)	mg/dL	10,0-50,0	Folate	ng/mL	1,8-9,0	CA-72-4	U/ml	0-7
Creatinine	mg/dL	0,7-1,2	Antinuclear antibodies (ANA)	U	0-1	CA-19.9	U/mL	0-37
Silicon	µmol/L	10-11.1	Thyroxine-binding globulin	µg/mL	12-27	CA-15.3	U/mL	<30
Total cholesterol (TC)	mmol/L	0-5,2	Amylase	U/L	25-125	NSE	ug/L	<17
High-density lipoprotein (HDL)	mmol/L	>1,45	Creatine kinase	U/L	30-135	BTA	mmol/L	0.4-0.5
Low-density lipoprotein (LDL)	mmol/L	0-2,59	Platelet distribution width (PDW)	%	11,0-18,0	Glial fibrillary acidic protein	pg/mL	0.0–87.1
Triglycerides (TG)	mmol/L	0-1,7				Ubiquitin-C-terminal-hydrolase-L1	pg/mL	<327
Glucose	mmol/L	3,33-5,89	Cardiolipin antibodies IgG	GPLU/mL	0-10	ROMA	-	0.74-1.31
Aspartate aminotransferase (AST)	units/L	8-36	Anti-cyclic citrullinated peptide (Anti-CCP)	EU/mL	0-20	SCCAG	pg/mL	9–52
Homocysteine (HCY)	mcmol/L	5-15				Bence Jones protein	^oC	56
Alkaline phosphatase (ALP)	units/L	30-130	Mercury	ng/mL	<10	Zinc	mcg/mL	0.60-1.20
Gamma-glutamyl transpeptidase (GGT)	units/L	0-50	Prostate-specific antigen (PSA)	ng/mL	0-4	Insulin	uIU/ml	2.6 - 24.9
			Dehydroepiandrosterone (DHEA)	ng/mL	0.14-2.76	Activated partial thromboplastin time (APTT)	s	21-35
Chromium	µg/L	<1.4	Dehydroepiandrosterone sulfate (DHEA-S04)	mcg/dL	71.6 - 375.4			
Lipase	units/L	14-72				Alanine transaminase (ALT)	units/L	4-36
Uric acid	mg/dL	1,5-6,0	Ammonia	µ/dL	15-45	Red blood cells distribution width (RDW)	%	11,0-15,0
Vitamin A	mg/dL	25-43	Ceruloplasmin	µg/dL	40-70			
Creatine phosphokinase (CPK)	units/L	30-135	17-hydroxyprogesterone (17-OHP)	ng/dL	0-200	Follicle-stimulating hormone (FSH)	mIU/mL	1.5 to 12.4
Magnesium	mg/dL	1,8-2,6						
Phosphate	mg/dL	2,8-4,5	Partial pressure of carbon dioxide	µmol/dL	37,20-87,60	Glutamine	µg/dL	32,5-78,0
Iron	µg/dL	40-155				Anti-Müllerian hormone (AMH)	ng/mL	1,0-3,0
Albumin	g/dL	3,4-5,4	Bicarbonate	mmHg	35-45			
Anti-thyroglobulin (Anti-TG)	U/mL	0-116	Mean corpuscular hemoglobin (MCH)	pg	27,0-34,0	Carcinoembryonic antigen (CEA)	mEq/L	23-26
Seruloplasmin	mg/dL	20-50						
Free tyroxine (FT 4)	ng/dL	0,8-2,8	Androstenedione	ng/mL	0-2,5	Manganese	nmol/L	73 – 210
Free triiodothyronine (FT 3)	pg/mL	2,0-4,4	Sex hormone binding globulin (SHBG)	nmol/L	18-144	Nickel	ng/dL	7–20
Thyroglobulin (TG)	ng/mL	1,50-38,50				Total iron-binding capacity (TIBC)	µg/dL	240-450
TSH Receptor Antibodies (TRAb)	U/L	0,0-1,75	Antithrombin	u/dl	80-120			
			Luteinizing hormone (LH)	u/L	1,24-7,8	Cholinesterase (ChE)	IU/L	5320-12,920
Calcitonin	pg/mL	0,0-5,1	Ketones	mmol/dL	0-5	Thyroid peroxidase antibody (Anti-TPO)	U/mL	0-34
Osteocalcin	ng/mL	5,8-14	Leucine	µmol/L	74-196			
25-hydroxy vitamin D	ng/mL	20-40	Alpha fetoprotein (AFP)	ng/mL	0,6-8,5	Human epididymis protein 4 (HE-4)	pmol/l	85
Hemoglobin A1C (HbA1c)	%	4,0-5,6	Total testosterone	ng/dL	265-923			
Calcium	mg/dL	8,6-10,2	C-reactive protein (CRP)	mg/dL	0-10	Nicotine	ng/dL	<3
Prolactin	ng/mL	4-23	Antistreptolysin O (ASO)	U/mL	0-200	Cotinine	ng/dL	<3
Lactate dehydrogenase (LDH)	u/L	140-280	R-factor (RF)	u/mL	0-15	Oxygen saturation	%	95-100

COMPARISON OF PURE WATERS EFFECTS AND CONTAMINATED WATER					
PURE WATERS H_2O				Contaminated water	Dehydration
Archaea	- improve coffee scent	- help with brain inflammation	- reduce virulance of pathogens	- contains pathogenic bacterias	- causes thirst
- help prevent from uncontrolled	- nourish organisms properly	in sheep	- reduce toxicity of chemical	- contains viruses	- causes dry lips
spread of archaeas population	- maintain paper properties	- help with neurodegeneration	compounds	- contains parasites	- causes dry tongue
- play a role in nutrient cycling	- improve furniture quality	in goats	- reduce time of treatment	- contains parasitic worms	- badly affects the brain
- play a role in carbon cycling	- improve flora	- help with synaptic disfunction	- reduce mining polllution	- causes bacterias spread	- causes fewer than six wet
- play a role in sulphur cycling	- improve leaves quality	in mink	- reduce raw resource	in humans	diapers per day in infants
- promote plant growing	- improve roots quality	- help with neuronal loss in cervids	manufacturing pollution	- causes viruses spread to humans	- causes no wet diapers or
attributes	- improve symbiosis	- help with spongiform	- reduce the leather and textile	- causes parasites spread to	urination for eight hours in
- promote further research	- help liquids flow	encephalopathy in cattle	industry pollution	humans	toddlers
on archaea	- reduces dryness of plant organisms	- help with neurodegenerative	- reduce the electronics industry	- causes parasitic worms detection	- causes sunken soft spot on
		disorders in felines	pollution	- causes hepatitis	infant's head
Prions	Animals	- help with prion diseases in	- reduce the pharmaceutical	- contributes to water retention	- causes sunken eyes
- help to promote	- prevent lethal seizures	ungulates	industry pollution	- contributes to edemas	- causes dry skin
controlled spread of prions	- support healthy stomachs	- forbid prematured death	- reduce the energy production	- consists toxic hexavalent	- causes wrinkled skin
population	- help with heart disease		industry pollution	chromium	- causes deep breathing
- bring relief with potentially	- help methemoglobinemia	Humans	- reduce the chemical industry	- consists toxic cyonide	- causes rapid breathing
prions-caused	- help with acute bloody diarrhea	- help with deposits of	pollution	- causes trypanosomiasis	- causes cool hands
Creutzfeldt–Jakob disease	- bring relief to convulsions	cholesterol	- promote well being	- causes chagas disease	- causes blotchy hands
- help with deeper insight in prions	- preserve endangered species	- unclog deposits of cholesterol	- help with inorganic pollutants	- causes giardiasis	- causes cool feet
since discovered in 1997	- improve skin problems	- unclog deposits of salts	- help with pathogens	- causes abdominal pain	- causes blotchy feet
- help to maintain equilibrium	- help managing waterborne diseases	- normalize circulatory system	- help with suspended solids	- causes fever	- causes confusion
	- improve meat quality	- increase dissolved oxygen	- reduce intoxication of	- causes malaria	- causes headache
Protists	- support sight health	level	human body	- causes joint pain	- causes tiredness
- may support photosynthesis	- support healthy hearts	- stop bacteria development	- reduce agriculture pollution	- causes anaemia	- causes fatigue
of protists	- support healthy brains	- enhance urine production	- reduce microbiological	- causes amoebic dysentery	- causes dizziness
- help in nutrients recycling	- help with mycotoxins-induced death	- improve glycemic	contamination	- causes trypanosomiasis	- causes weakness
- promote planctonic algae	- support healthy livers	responses in diabetics	- help with breathing	- causes leishmaniasis	- causes lightheadedness
nutritional values	- help with lyme disease in animals	- improve insulinemic responses	difficulties	- causes toxoplasmosis	- causes dry mouth
- help build tropical reefs	- support mitochondria	in diabetics	- help with extended-spectrum	- causes cryptosporodiosis	- causes dry cough
- have industrial uses	- help in fishing outcome	- improve blood lipid profile	betalactamase producing	- causes vomiting	- causes high heart rate
- could serve as medicine	- help fishes to grow	- improve semen quality	bacterias	- contains physical contaminants	- causes flushed skin
- form the base of aquatic	- support healthy instincts	- improve antioxidant	- reduce cyanobacterial	- contains chemical	- causes swollen feet
food chains	- improve fauna	status in human	blooms	contaminants	- causes muscle cramps
	- improve eggs nutritional value	- help with harmful effects	- prevent water-based diseases	- contains biological	- causes heat intolerance
Viruses	- reduce markers of oxidative stress	of drugs on humans	- prevent Guinea worm disease	contaminants	- causes constipation
- help prevent from dangerous	- help to detoxify the organism	- boost human body systems	- regulate blood pressure	- contains radiological	- causes loss of fluids in the body
subviral agents population	- improve nutrients	- help with harmful	- prevent leptospirosis	contaminants	- causes electolyte imbalances
counts	digestibility	effects of toxins	- prevent water-related	- contains bisphenol A	- causes heat-related illnesses
- help managing transmission of	- help with digestive issues	on humans	insect-borne diseases	- increases risk of infection by prions	- causes heatstroke
viruses in water	- help with urinary problems	- help with harmful	- prevent dengue fever	- causes protists infections	- causes kidney issues
	- supports healthy offspring	effects of environmental	- prevent chikungunya	- causes fungal infections	- causes kidney stones
Bacterias	- prevent early death	pollutants on humans	- prevent zika	- causes body aches	- causes kidney failure
- prevent bacterias in drinking	- act in principles with	- improve biochemical	- prevent river blindness	- causes muscle aches	- causes coma
water	Warburg theory	parameters of humans	- prevent yellow fever	- causes respiratory illness	- causes cells death
- play a role in ecology system	- help fighting diseases	- help with nervous problems	- prevent flariasis	- causes nervous disorders	- causes rapid pulse
- help to reduce harmful effects	- easier to drink	- help with ailments	- help with endocrine	- causes unknown organs disease	- causes lack of sweating
of bacterias on humans	- unclog the arteries	- help with mastitis	system disruption	- causes digestive system disease	- causes slurred speech
	- unclog the vains	- reduce pain	- decrease health risks	- causes respiratory system	- causes fainting in animals
Plants	- increase rate of growth	- reduce swellings	- enhance human health	disease	- causes low blood volume shock
- help in forests mapping	- may prevent pathogenic	- reduce painful urination	- help with air	- causes brain problem	- causes hypovolemic shock
- improve SOC sequestration	microorganisms	- help with alleviating colds	contamination	- causes body disease	- causes listlessness
- help managing soil organic	- improve solids dissolving	- help with coughs	- improve water management	- causes damage to human	- causes irritability
carbon stocks	- improve conductivity	- help with bronchitis	infrastructure	- causes cholera	- may cause nerve disactivities
- help in lining human intestines	- improve salinity	- help with all types of fever	- unblock water-management	- causes typhoid	- disregulates muscle activities
- promote healthy food	- enhance gels toxins-binding	- help with arthritis pain	regulators in the body	- causes gastroenteritis	- impacts muscle contractility
or animals	properties	- regulate blood pressure	- help with disease wectors	- causes salmonellosis	- impacts nerve impulses
- increase remediation process rate	- improve digestion	- help to recover from stroke	- help with insects pollutants	- causes typhoid fever	transmission
- stop chemical imbalance	- regulate appetite	- regulate women's menses	- reduce humans susceptibility	- causes paratyphoid fever	- doesn't help with blood
in plants	- vital for growth of different	- help breaking up kidney stones	to pollution	- causes bacillary dysentery	coagulation
- reduce chemicals cost	organs	- help breaking up galbladder	- reduce the transport industry	- causes encephalitis	- doesn't help with bones
- help in managing bacteria	- mitigate environmental	stones in small particles	pollution	- causes meningitis	- doesn't help with teeth
levels	impact in livestock	- help with organic pollutants	- make food healthier	- causes myocarditis	- doesn't help to store the
- help managing fungus level	- increase milk production	- help with waste compounds	- regulate anthro-, anato-,	- causes cancer	oxygen in the body
- help reestablish beneficial	- improve hatchability	thresholds	arthro-, bio-, chemo-scienced	- contains enterotoxigenic bacterias	- causes threat to the metabolic
properties	in turkey	- help with agriculture pollutants	parameters	- contains enteropathogenic	processes
- revitalize forests habitats	- improve blood profile	- help with thermal pollutants	- may limit glucose intake	bacterias	- disregulates blood pH
- clean up inland waters	- raise antioxidant status	- help with radioactive pollutants	- promote healthy bathing	- contains enterohemorrhagic	- doesn't help immune system
- improve liquid plant oils	- increase mutton production	- help to prevent atherosclerosis	- allow healthy swimming	bacterias	fighting against
constitution	- increase wool in sheep	in humans	- reduce risk of parasitic	- contains enteroinvasive	parasites
- help implement proper grounding	- help weight gain in geese	- help treat atherosclerosis	diseases	bacterias	- doesn't help immune system
- increase water holding	- increase antioxidant	in humans	- often used with therapies	- causes alteration of animal	fighting against
capacities	status in animals	- help in weight control	for multitude of infectious	metabolism	bacterias
- support reforestations	- increase milk yield in ewes	- improve metabolic activity	diseases and other	- reduces oxygen supply	- doesn't promote puryfying
- linked to eutrophicaton	- vital for growth of different	- help burning up	health issues	- harms endangered species	response of the human
- improve recuperation	organs	excessive fatty tissue	- help to have healthy	- affects the ability of kidneys to filter	body
- support aquaponic respiration	- help with harmful	- improve nutrient	cell in the whole body	around 1700 litres of blood per day	- practically doesn't deal with
- improve liquid proteins profile	effects of drugs	digestibility	- help with free radicals	in total	water-driven health
- support fiber values	on animals	- save water consumption	- help with endocrine	- causes disruption of food	issues
- improve nutritional value	- help with harmful	- vital for growth of different	system disruption	chains	- causes cellular dehydration in
of fruits	effects of toxins	organelles	- help with macroelements	- damages animals immune	plants
- improve nutritional values	on animals	- decrease blood pressure	- help with microelements	system	- may lead to severe dehydration
of vegetables	- help with harmful	- reduce methane production	- regulate heart work	- contains adenoviruses	- may lead to extreme desiccation
- improve nutritional values	effects of environmental	- help with heartburn	- participate in	- contains astroviruses	- decreases cell membrane
of herbs	pollutants on animals	- help with flatulence	thermoregulation	- contains rota- and noraviruses	permeability
- improve wood quality	- accelerate ordinary	- prevent further formation of	- help to control the water-mineral	- contains caliciviruses	- accelerates aging
- move through xylem	diffusion of water	stones in kidneys	balance	- contains enteroviruses	- causes fatigue
- support healing actions	- accelerate ordinary	- prevent further formation of	- help immune system	- contains polioviruses	- badly affects growth of different
- improve medical value	diffusion of water	galbladder stones	fight prions	- contains coxsackieviruses	organs
- improve healing properties	- increase milk yield in cows	- help when magnetized	- help immune system	- causes amoebiasis	- worsens drivers of several
- help with plant development	- improve milk components	- support recreation	fight protists	- increases risk of infection	health issues at the same time
- link plants and animals kingdoms	- help treat atherosclerosis	- help with water-associated	- help immune system	by archeons	- worsens pressures of several
- preserve the oldest trees on Earth	in animals	communicable diseases	fight viruses	- influences nerve conduction	health issues at the same time
- improve plant milk values	- vital for growth of different	- help with water-associated	- break up kidney stones	- influences prions in water	- worsens impacts of several
- influence harvests	organelles	non-communicable diseases	- help immune system	- causes infertility in women	health issues at the same time
- improve fat content in plants	- optimize rumen fermentation	- free from plastic debris	fight archaea	- kills animals	- worsens state of several health
- reduce costs of refining	parameters	- allow healthy drinking	- vital for growth of different	- causes harm during embryonic	issues at the same time
- help with flower composition	- positively impact animal health	- support healthy food production	organelles	development	- lethal if left untreated

COMPARISON OF PURE AIR AND CONTAMINATED AIR					
PURE AIR				Contaminated air	Hypoxia
Biosphere	- prevents from headaches	in unborn babies	- helps to distribute heat around	- increases mortality	- may cause cell death
- prevents from aspergillus	- prevents from dizziness	- prevents from strokes	the globe	- increases morbidity	- causes cancer
- prevents from penicillium	- prevents from fatigue		- prevents raising concentration of	- disproportionately impacts	- causes IBD
- prevents from phialophora	- prevents from cold	Litosphere	methane due to human acitivities	women	- causes cardiac disease
- prevents from geotrichium	- prevents from cough	- prevents from additional methane		- disproportionately impacts	- causes brain damage
- prevents from bacteria	- prevents from the irritation	release	Stratosphere	children	- causes lung disease
- prevents from yeasts	of the eyes	- prevents limestone dissolving	- protects living things from	- negatively impacts economy	- causes kidney disease
- prevents from mycobacterium	- prevents irritation	- prevents soil acidification	ultraviolet radiation from the sun	- classified as carcinogenic	- causes liver disease
tuberculosis	of the nose	- prevents increased loss of plant	at 32 km above	- violates the human right	- causes angiogenesis
- prevents from influenza virus	- prevents irritation of	nutrients	- vital to life on Earth	to live in a clean environment	- may cause tissue hipoxia
- prevents from a. fumigates	the throat	- prevents accelerated weathering	- prevents from catalytic destruction	- violates the human right	- may affect a specific area
- prevents from candida albicans	- prevents intestinal disorders in cattle	of mineral components	from a long list of chemical	to live in a healthy environment	of the body
- prevents from fungal genera	- prevents fluorosis in deer	- prevents decreased rates of	substances	- violates the human right to	- may affect the whole body
- plays an important role in	- prevents from allergies	organic matter decay	- consists ozone layer	live in a sustainable environment	- may cause generalized hypoxia
maintaining mood	- prevents productivity impairment	- prevents changes in soil organism	- very dry	- requires urgent research	- gradually leads to chronic
- plays an important role in	- prevents mercury poisoning	populations	- doesn't consist to many clouds	- increases the risk of preterm	hypoxia
maintaining mental health	- prevents arsenic posioning	- prevents mobilization of aluminum	- prevents from water-insoluble	births	- affects mitochondrion
- enhances the bacteria-killing	- prevents chromium poisoning	ions	substances pollution	- adversely affects fertility	- affects cytoplasm
ability of white blood cells	- prevents nickel poisoning	- prevents reduction in cation		- lowers antral follicle count	- prevents normoxia
- reduces edema	- prevents manganese poisoning	exchange capacity	Ionosphere	- leads to a higher incidence of	- could be harmful to heart
- allows new blood vessels	- prevents other heavy metals		- plays an important role in	infant mortality	tissue
to grow	poisoning	Hydrosphere	atmospheric electricity	- leads to a higher incidence of	- can lead to heart failure
- improves oxygen saturation	- prevents acid gases poisoning	- prevents the increase of water	- forms the inner edge of the	maternal mortality	- found around solid tumors
of the blood	- prevents hydrocarbons poisoning	evaporation	magnetosphere	- leads to a higher incidence of	- found around bladder tumors
- helps in faster recovery	- prevents uranium poisoning	- prevents the acceleration of the	- influences radio propagation	birth defects	- found around brain tumors
- helps to gain appetite	- prevents thorium poisoning	hydrologic cycle	- affects GPS signals	- leads to a higher incidence of	- found around breast tumors
- improves sense of	- positively affects nervous system	- prevents sea-level rise	- partially ionized	breast cancer	- found around colon tumors
well-being	- positively affects muscles and joints	- restores fish health	- contains plasma	- disproportionately impacts	- found around esophagus tumors
- helps with normalization	- positively affects kidney	- prevents impairment to fish		all-class workers	- found around head tumors
of liver function	- positively affects nervous system	respiration	Mesosphere	- disproportionately impacts	- found around neck tumors
- improves cognitive function	- positively affects lungs and	- prevents microplastics from	- begins at the stratopause	effectiveness of all sectors	- found around liver tumors
- protects against cell death	respiratory system	altering fish behavior	- ends at the coldest part	- disproportionately impacts	- found around lung tumors
- increases neurogenesis	- positively affects brain	- prevents accumulation of	of Earth's atmosphere	all kind of people	- found around pancreas tumors
- increases blood supply to	- positively affects heart	pollutants in fish tissue	- carries noctilucent clouds	- has significant consequences	- found around skin tumors
the brain	- positively affects reproductive	- prevents metals in pollution	- linked withs red sprites	for maternal health	- found around stomach tumors
- increases muscle blood flow	system	from impairing fish	- linked with blue jets	- has significant consequences	- found around uterus cancer
- reduces pain	- positively affects skin and blood	reproduction	- linked with density shears	for neonatal health	- found around acute lymphocytic
- improves functionality	- positively affects all parts of	- prevents from polycyclic	- linked with falling meteor apart	- modifies the natural	- found around myeloid leukemias
- crucial for optimal health	the body	aromatic hydrocarbons	- requires pressure suit	characteristics of the	- may play a role in multiple
- beneficial in cardiovascular	- protects from acid's rain impact on			atmosphere	sclerosis
health	urban infrastructure	Kryosphere	Termosphere	- increases the risk of developing	- found in white matter stroke
- beneficial for immunity	- protects from acid's rain impact on	- prevents polyester fibers in Mount	- may affect degradation of the	lung cancer	- causes inflammatory
- provides nourishment for the	forests	Everest	primary photoelectrons	- increases the risk of developing	microenvironment in myeloid
maintenance of life and for	- protects from acid's rain impact on	- prevents polyurethane in Tibetan	- maintains safe nitric oxide ions	cardiovascular diseases	cells
growth	waterbodies	glacier snow	level	- increases the risk of developing	- affects lung tissue at the fetal
- fundamental to aerobic	- protects from acid's rain impact on	- prevents propylene carbon in	- maintains safe atomic	respiratory diseases	level
organisms	aquatic life	alpine snowpit	nitrogen concentration level	- attributable mainly to man-made	- may reduce fetal oxygen supply
- prevents premature human	- prevents corrosion	- prevents polyvinyl chloride	- plays a role in production and	sources	- decreases uterine blood flow
deaths	- prevents erosion	in alpine snowpit	destruction of nitrogen atoms	- contains methane	in the fetus
- prevents child respiratory	- prevents from benzene poisoning	- prevents distribution of floating	- plays a role in transport process	- contains bacteria	- leads to pulmonary
Illnesses	- prevents from toluene poisoning	microplastic particles	- plays a role in removal process	- contains viruses	hypertension in the fetus
- prevents chronic bronchitis	- prevents from reduced mental	- may play a role in a carbon cycle	- contains high energy particles	- contains unicellular organisms	- may cause abnormally small
- prevents asthma attacks	abilities and growth in children	- may influence heat exchange	heated up by the sun	- contains fungi	lungs in babies
- prevents cardiovascular	- prevents bleeding	- may influence ice-atmosphere	- allows orbiting of satellites	- contains mites	- causes sudden infant death
hospitalization	- prevents poison by ethylbenzene	interaction	- takes care of International Space	- contains insect debris	syndrome
- prevents heart disease	- prevents xylene poisoning	- may influence ice-ocean	Station	- contains PM2.5	- increases the thickness of the
- prevents death of cattle	- prevents from carcinogens	coupling		- contains PM10	airway walls
- prevents blinding of cattle	- prevents from neurotoxins	- preserves high albedo for solar	Exosphere	- contains nitrogen oxide	- causes bronchopulmonary
- prevents death of fallow deer	- improves health and productivity	radiation	- contains hydrogen and helium	- contains sulfur dioxide	dysplasia
- prevents widespread sickness	of crops	- preserves low thermal	- contains carbon dioxide	- contains carbon monoxide	- can induce endothelial lesions
of horses	- improves ability to sequester carbon	conductivity	- contains atomic oxygen	- contains carbon dioxide	- linked with pneumonia
- prevents the death of large	- improves photosynthesis	- preserves large thermal inertia	- shares exobase	- accounts for the productivity loss	- linked with pulmonary edema
number of birds	- prevents damaged airways and		- consists of a particles which don't	- accounts for the loss of	- linked with hyperinflated lungs
- prevents death of cattle	lung tissues	Atmosphere	move very much	biodiversity	- causes lung endothelial
from respiratory failure	- prevents from dioxins	- shapes Earth's climate	- contains exospheric neutrals	- may cause to experience greatest	cell dysfunction
- prevents stomach and	- prevents mental retardation	- shapes weather patterns	- plays a role in solar	harm	- causes changes in gene
intestinal disorders in cattle	- prevents brain damage	- makes regions habitable	wind–magnetosphere interaction	- causes neonathal deaths	expression

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COMPARISON OF PURE SOIL EFFECTS AND CONTAMINATED SOIL

PURE SOIL

Inner core
- primarily solid ball
- innermost layer of the Earth
- affects other parts of the planet
- has a radius relating to 70% of the Moon's radius
- has a radius relating to 20% of the Earth's radius
- believed to be made of an iron–nickel alloy with some other elements
- has a temperature, which is about the temperature at the surface of the Sun
- has a heat that flows out of it
- is not ferromagnetic
- affects planet's geometry
- affects Earth's mass
- affects Earth's gravitational field
- affects angular Earth's inertia
- is thought to be slowly growing
- may rotate slightly more quickly or slowly than the rest of Earth
- affects the dynamic motions of liquid in the outer core
- may help fix the magnetic field
- measures 2440 km (1516 miles) across
- not rigidly connected to the Earth's solid mantle
- is really hot
- may have no radioactive elements
- reaches temperature of about 5430 °C (5700 K)
- the center of this planet
- the central part of the planet
- has a radius of about 1220 km
- the most enigmatic part of our planet
- is predicted to have very high thermal conductivity
- is predicted to have very high electrical conductivity
- has a nonspherical shape
- likely to be the result of chemical stratification
- responsible for powering the geodynamo
- may be essential for the existence of the magnetic field
- may be essential for the polarity reversals

Outer core
- fluid layer
- barely influences soil
- hellish fire
- composed of mostly iron and nickel
- principal source of Earth's magnetic field
- convects turbulently
- is a low-viscosity fluid
- has a radius of around 3483 km
- seems to be of a partially stratified composition
- ends at 3200 miles (5150 km) beneath the surface
- starts at around 1800 miles (2900 kilometers) deep
- has a temperature of around 4,000 to 6,000°C
- supplies heat to the mantle
- contains light elements
- the only entirely liquid layer within the Earth

Lower mantle
- represents approximately 56% of Earth's total volume
- contains three major phases of bridgmanite, ferropericlase and calcium-silicate perovskite
- may contain water
- the largest portion of our planet
- heterogeneous in its composition
- contains carbonates
- contains halides
- contains fluorides
- contains phosphates
- contains sulfates
- contains oxides
- contains silicates
- contains sulfides
- contains native elements
- is a key component controlling mantle dynamics
- ranges from 660 km to 2890 km depth

Upper mantle
- very thick layer of rock
- causes the tectonic plates to move
- reaches up to 930 degrees Celsius (1700 degrees Fahrenheit)
- touches the transition zone
- contains a pressure up to 136 GPa (1,340,000 atm)
- up to 670 km below the Earth's surface

- drives plate tectonics
- redistributes heat
- cycles chemical species
- generates dynamic topography at the Earth's surface

Astenosphere
- almost solid
- involved in plate tectonic movement
- involved in isostatic adjustments
- composed of peridotite
- called the low-velocity zone
- has a high seismic attenuation
- most important source of magma on Earth
- pushes magma upward through volcanic vents
- the repository for older and denser parts of the lithosphere
- stays malleable due to heat from deep within Earth
- is believed to be hot

Continental crust
- the most uppermost part of the lithosphere
- has felsic, intermediate-to-felsic and mafic composition
- makes up the planet's continents
- makes up the continental shelves
- formed near subduction zones
- formed near plate boundaries
- formed between continental and oceanic tectonic plates
- linked with geothermal gradient
- has an average thickness of around 35 km
- also known as sial
- shapes the surface and interior of our planet
- much thicker than the oceanic crust
- creates the Grand Canyon
- witnessed burned libraries
- supports plants growth
- acts as home to a range of microorganisms
- affects soil structure
- linked to proper waste management
- linked to remediation techniques
- helps with crop rotation
- helps with integrated pest management
- helps with aquaponics
- takes care of the Hanging Gardens of Babylon
- mentioned in TAS classification
- currently has about 1.7 billion cubic miles
- has a rift zones
- contains magma chambers
- broadly granitic
- begins just under the floor
- has convergent boundaries
- plays a role in isostatic equilibrium
- extends vertically from the surface
- contains complex river systems
- soil faunas account for 23% of known animal species
- affects population density
- affects community composition
- may support instrument's wood quality
- may affect distribution patterns
- has a number of continents
- different from oceanic crust
- the Earth's living skin
- kind of a captivating segment of our planet
- causes continents not to be static
- causes continents to gradually shift position over time
- holds Earth's seven main divisions of land
- affects average height of the sea surface
- may allow proper liver functions
- hosts the most populated continents in the world
- helps to cherish the sunrise
- affects seismology
- supports ketones formation
- influences distribution of mineral resources
- causes earth to regenerate
- helps with biofuel for electric plants
- affects human sleep cycle
- may have influence on some people
- involved in dynamic geological forces
- home to the Sahara, world's largest desert
- tectonically active
- withstands the ambient temperatures
- has been around long time ago
- shares the ground with plants
- may help with grounding
- creates hills around Piramid of Lahun

- promotes energy metabolism

Oceanic crust
- may carry a large amount of chemically bound water
- affects the atmosphere
- affects oceanic trenches
- makes earthquake-causing tectonic movements
- helps with pollution
- makes ocean salty
- supports marine world heritage
- habitable by microbial life
- linked with hydrology
- partially mentioned in religion
- may be linked with glucose
- did support Omayyad dynasty
- may affect fishes
- may affect orogenic changes
- takes part in a water cycle
- supports one ocean
- plays a role in freshwater
- affects agnatha
- affects chondrichthyes
- affects osteichthyes
- supports ocean circulation
- contains pillow lavas
- contains dike complex
- the outer solid layer of the Earth beneath the oceans
- has something to do with water on Earth
- helps with cycling of dissolved components in seawater
- stays close to a lot of ocean species
- supports Arctic Ocean
- supports Atlantic Ocean
- supports Pacific Ocean
- supports Indian Ocean
- supports Southern Ocean
- found under the oceans
- formed at spreading centres on oceanic ridges
- is about 6 km (4 miles) thick
- composed of several layers
- differs from continental crust
- is destroyed in subduction zones
- contains basalt
- contains sheet flows
- contains pillow lavas
- contains gabbro layers
- may contain magma chambers
- contains iron
- contains silica
- contains magnesium
- contains olivine
- contains ophiolites
- relatively ephemeral
- contains plagioclase
- contains pyroxene
- linked with hydrothermal circulation
- stays close to sting rays
- stays close to corals
- stays close to starfish
- stays close to anemones
- stays close to jellyfish
- stays close to sea turtles
- stays close to sharks
- stays close to octopus
- stays close to mussels
- stays close to clams
- stays close to barnacles
- stays close to lobsters
- stays close to crabs
- stays close to manatees
- stays close to walrus
- stays close to seals
- stays close to dolphins
- stays close to whales
- may affect hadalpelagic zone
- may affect abyssopelagic zone
- may affect bathypelagic zone
- may affect mesopelagic zone
- may affect epipelagic zone
- plays a role in low tide zone
- plays a role in middle tide zone
- plays a role in high tide zone
- plays a role in spray zone
- plays a role in aphotic zone
- plays a role in photic zone
- may contain biotite
- may include basalt
- contains hydrous minerals
- helps with proper hydration
- remembers ocean life in the time of dinosaurs
- helps with biofuel for electric plants
- helps to understand the ocean genome
- may affect hardness of drinking water
- is close to seafloor
- may affects ocean fauna
- may influence krill
- affects the ocean system
- witnessed first ocean
- supports energy needs
- linked with ocean health index
- helps with proper amniotic fluid
- supports solar-hydropower energy
- helps to make water limpid

Contaminated soil

- contains lidane
- contains terbufos
- contains diazinon
- contains cis-1,2-dichloroethene
- contains trans-1,2-dichloroethene
- contains 1,1,1-trichloroethane
- contains 1,1,2-trichloroethane
- affects molluscs
- affects echinoderms
- contains 4-nonylphenol
- contains 17a-ethynyl estradiol
- causes nephritis
- causes nephrosis
- can affect the unborn child
- causes dermatisis
- contains chlorophenols
- decreases absolute brain weight
- causes immunotoxicity
- contains nitrilotriacetic acid
- contains nitrogen anions
- affects zooplankton
- influences aquatic biota
- affects physiochemistry
- affects chondrichthyes
- may be collected by trees
- contains trichloramine
- contains dichloramine
- contains chlorine dioxide
- contains acrylamide
- contains flocculants
- has effects on thyroid gland function in bottle-fed infants
- can cause dehydration
- contains thorium-232
- contains thorium-228
- contains thorium-230
- contains polonium-210
- contains uranium-234
- contains uranium-238
- contains radium-228
- contains radium-226
- causes circulatory problems
- causes irreversible neurological symptoms
- may accumulate in the kidneys
- causes chronic pain to bones
- causes chronic dental fluorosis in humans
- causes chronic skeletal fluorosis in humans
- causes deformed bones structure
- causes calcification of ligaments
- causes osteosclerosis
- causes skeletal fluorosis
- causes skin cancers
- causes bladder cancers
- causes muscle cramping
- results in acidification
- may cause enlarged liver
- inhibits synthesis of thyroid hormone
- causes skin changes
- causes nerve damage
- contains polychlorinated biphenyls
- impact thyroid functions
- negatively impacts the male reproductive system
- interacts directly with DNA
- can cause vomiting
- supports tumor formation in animals
- can cause nausea
- accelerates erosion
- responsible for acute toxicity in humans
- promotes lung tumors
- causes anemia
- associated with soft tissue sarcoma
- associated with non-Hodgkin lymphoma
- contains fenoprop
- contains diclofop-methyl
- contains dichloroprop
- contains isoproturon
- contains molinate
- contains paraquat
- contains diquat
- contains chlorotoluron
- contains diuron
- contains fungicides
- contains organic chemicals
- contains inorganic contaminants
- contains perfluoroalkane sulfonic acid
- might affect colostrum
- contains perfluorooctanoic acid
- affects coral reefs
- linked with xenobiotic chemicals
- may contain naphthalene
- may contain solvents
- may contain microplastics
- contains petroleum derivatives
- may contain electronic waste
- affects fish products
- may affect liver
- may affect lungs
- may cause kidney damage
- touches the continental-margin

- can be carcinogenic
- contains bromoxynil
- supports cataract formation
- linked with hepatocellular cancer
- linked to impaired energy metabolism
- causes impaired cellular function
- may cause throat infection
- linked with coastal dumpsite erosion
- affects endemic amphipod fauna
- contains non-biodegradable wastes
- interferes with oncology scoring
- causes cancer in fishes
- pollutes beaches
- influences the morphological status of plants
- contains beryllium
- influences the physiological status of plants
- influences the biochemical status of plants
- interrupts photosynthesis
- contains hepatadecafluoro-1-octanesulphonic acid
- may move through the subsurface
- contains glyphosate
- contains 1,4-dioxane
- contains perfluorooctylsulfonic acid
- contains perfluorooctane sulphonate
- causes blue-baby syndrome
- causes shortness of breath in babies
- reduces body weight of offspring
- causes nasal cavity tumours
- contains pendimethalin
- contains terbuthylazine
- contains hydroxyatrazine
- contains simazine
- contains atrazine
- contains pitolachlor
- contains alachlor
- contains picloram
- contains dicamba
- contains endothall
- reduces bone growth
- contains arsenic
- linked with geogenic contaminated groundwaters
- might negatively affect foraminifera
- poses a widespread issue
- affects abiotic stress factors
- affects biotic stress factors
- has already harmed food safety
- alters the global cycle of nitrogen
- affects sunflower
- affects morphogenetic processes of plants
- poses a serious hazard to human health
- contaminates the food
- causes magnetite nanoparticles in the human brains
- affects wildlife
- affects tropical agriculture
- may affect the brain
- causes respiratory health issue
- might not support polychaeta
- may cause lead poisoning
- contains ammonia
- contains petroleum hydrocarbon
- may be linked to acid rain
- contains herbicides
- contains insecticides
- causes cancers in animals
- affects Australia
- may contain polynuclear aromatic hydrocarbons
- could had affect few civilisations before
- can cause neuromuscular obstruction
- affects Kuril-Kamchatka Trench at 10 km depth
- requires phytoremediation
- requires bioremediation
- requires soil vapor extraction
- requires soil washing
- require electrokinetic remediation
- can cause death
- contains heavy metals
- may cause damage to the mitochondria
- linked to impaired mitochondrial function
- contains perfluoroalkyl carboxylic acid
- affects beekeepers
- affects porifera
- causes non-neoplastics lesions
- contains malathion
- may cause birth defects
- increases blood cholesterol
- may be toxic
- may cause skin rash
- may cause nausea
- may cause peripheral nervous system damage
- acts as tumor promotor
- affect brain function

- genocidal character
- toxifies chlorellas
- affects oxygen level
- may disturb sleep cycle
- doesn't support children's performance
- affects yellow algae
- stands against sustainable development rules
- multiplies on Scandinavian coasts
- contains hexachlorobutadiene
- contains epichlorohydrin
- contains cyanide
- contains perchloryte
- contains beryllium
- contains thallium
- causes thymus gland problems
- causes immune deficiencies
- induces tumors
- causes bone marrow changes
- contains toluene
- contains monochlorobenzene
- contains styrene
- contains 1,2-dichloropropane
- contains 1,1-dochloroethene
- contains halogenated hydrocarbons
- contains vinyl chloride
- contains 1,2-dibromoethane
- contains hexacholorocyclopentadiene
- causes tooth decay
- may cause developmental malformations in fetuses
- may cause testicular lesions
- may cause partial or total paralysis
- affects heart rhytm
- causes histological changes
- causes changes in clinical parameters
- causes cancer in humans
- may cause organ damage
- '- may cause developmental disorders
- causes threat to child
- contains carbon tetrachloride
- contains dinoseb
- causes reproductive difficulties
- causes spleen damage
- contains cyclodiene insecticides
- contains aldrin
- contains carbamate insecticides
- contains aldicarb
- contains carbofuran
- contains carbaryl
- may cause neurological disorders
- may increase the risk of cancer
- may badly affect individuals with compromised immune systems
- may badly affect children growth
- may badly affect pregnant women
- contains oxaryl
- may affect decay of natural radioactive nuclides
- may affect the liver
- may cause health consequences
- affects crustacea
- affects copepoda
- affects cirripedia
- affects ostracods
- affects mysidacea
- affects cumacea
- affects tanaidacea
- affects isopoda
- affects amphipods
- affects decapoda
- affects acariformes
- affects pantopoda
- affects cnidaria
- reaches Karmadec Trench at 9.9 km
- touches Mount Cho Oyu at 8,188m
- touches Mount Dhaulagiri I at 8,167m
- touches Mount Manaslu at 8,163m
- affects Mariana Trench at 10.9 km down
- might influence nematode
- causes toxic water
- affects Mount Everest at 8,848.86m
- affects Mount K2 at 8,611m
- affects Mount Kangchenjunga at 8,598m above
- affects Mount Lhotse at 8,516m above
- affects Mount Makalu at 8,485m above
- linked with Parkinson's disease
- affects Annapurna at 8,091m above
- affects Philippine Trench at 10.5 km below
- touches Mariana Trench at 10 911 meters below
- may affect Mount Nanga Parbat at 8,126m above

COMPARISON OF METABOLIC THERAPY AND CANCERS

METABOLIC THERAPY

Respiratory system
- improves lung function
- improves symptoms in asthma
- reduces pathogenic monocytes in the lungs
- decreases levels of expired CO_2
- acutely improves gas exchange
- acutely improves sleep apnoea
- reduces inflammation of the respiratory tract

Circulatory system
- gives cardioprotective effect
- protects against cardiovascular disease
- reduces risk of coronary heart disease
- reduces effects of type II diabetes
- helps with HDL markers
- improves energy reserves of the heart
- improves skin conditions
- reduces the risk of heart disease
- helps boost oxygen levels in the blood
- protects against obese-related cardiovascular disease
- improves the transduction of oxygen consumption

Digestive system
- helps the intestine to maintain a large pool of adult stem cells
- reduces glucose availability for cancer cells
- reduces glutamine availability for cancer cells
- helps to manage obesity
- normalizes anthropometric parameters
- normalizes body composition parameters
- increases beneficial gut microbiota
- improves digestion
- helps with ischemia
- helps with symptoms of nonalcoholic fatty liver disease
- reduces glucose availability for bacterias
- adds positive changes in hunger hormones
- reduces lipogenesis
- allows to produce greater amount of ATP

- improves metabolic profile
- increases fat breakdown
- improves lipid profiles
- improves overall adiposity
- reduces visceral fat
- increases ratio of *Bacteriodetes* to *Firmicultes*

Lymphatic system
- stimulates the growth of lymphatic vessels
- increases repair of the lymphatic system
- reduces lymphatic swelling
- reduces the synthesis of reactive oxygen
- regulates total body water
- decreases free radical damage
- regulates intracellular body water
- helps reduce the stiffness of arteries
- improves recovery
- reduces the risk of enlarged spleen
- helps with phosphofructokinase deficiency symptoms
- makes favorable impacts on cellular metabolism in many tissues

Immune system
- enhances human immunity
- supports the immune system in combat different disease conditions
- decreases chronic inflammation
- exerts anti-steatogenic effects in the liver
- exerts insulin-sensitizing effects in the liver
- delays tumor growth
- delays angiogenesis
- delays vascularization of tumor environment
- promotes the death of tumor cells through pro-apoptotic mechanism
- reduces the tumor size
- reduces the production of oxidative stress markers
- promotes autophagy
- increases susceptibility to chemotherapy while protecting healthy cells
- increases susceptibility to radiation
- reduces cell proliferation signals

- reduces the need for medication
- helps control infections
- enhances antioxidant capacity

Endocrine system
- improves hormone level among women with polycystic ovary syndrome
- improves control of mitochondrial protection
- enhances mitochondrial development
- increases mitochondrial respiration
- improves hormonal imbalance
- improves mitochondrial function
- improves mitochondrial metabolism
- lowers insulin levels in the blood
- suppresses angiogenesis
- reduces tumor development
- enhances anticancer therapy
- starves cancer cells of their prime fermentable fuels
- helps with pyruvate dehydrogenase complex deficiency
- reduces metabolic disorders
- improves absorption of vitamins
- improves absorption of minerals
- reduces insulin requirements
- reverses insulin resistance
- helps with congenital hyperinsulinizm
- helps with glucose transporter type 1 deficiency
- elevates ketones levels

Reproductive system
- improves the menstrual cycle in women
- improves men fertility
- increases fertility outcomes
- improves pregnancy outcomes
- significantly reduces the ejaculatory pain
- significantly reduces the ejaculatory discomfort
- improves prostatic hyperplasia
- improves sexual dysfunction
- improves your energy levels

Nervous system
- acts as neuroprotector
- reduces effects of Parkinson's disease
- improves mitochondria functions
- improves synaptic connections
- improves cognitive functions
- lowers the effects of Parkinson's disease
- reduces negative effects of amyotrophic lateral sclerosis
- reduces symptoms of angelman syndrome
- reduces effects of infractable epilepsy
- may extend lifespan
- reduces the effects of myoclonic-astatic epilepsy
- improves defense and development of the nervous system
- significantly improves emotional and social functions
- improves sleep quality
- enhances brain vascular function
- gains to cognitive function
- improves language endurance
- improves physical endurance
- protects the brain from cell loss
- decreases neurotoxins levels
- improves short-term memory
- improves long-term memory
- improves synapse function
- lowers levels of anxious behaviour
- helps reduce Lennox-Gastaut syndrome
- lowers levels of mood-disturbed behaviour
- lowers seizure frequency
- improves neurotransmitter function
- increases neural network stability
- reduces the symptoms of amyotrophic lateral sclerosis
- reduces the effects of narcolepsy
- helps with autism
- helps with autism spectrum disorder
- improves cerebral function

- helps to recover from trauma
- improves nonmotor symptoms
- improves verbal memory performance
- improves daily function
- helps with bipolar disorder
- helps with migraine
- helps with schizophrenia
- benefits for cognitive/memory scores

Skeletal system
- improves motor activity
- improves muscle strength
- improves muscle function
- prevents muscle mass loss
- helps in higher locomotor activity
- prevents muscle deterioration
- restores muscle function
- increases the number of mitochondria in muscles
- gains to daily motor activity
- increases aerobic capacity
- improves aerobic exercise endurance
- benefits for knee osteoarthrisis
- improves neuromuscular functions
- improves motor functions
- increases hindlimb grip strength
- increases all limb grip strength
- preserves lean body muscle mass
- improves dental health
- improves skeletal muscle aerobic capacity

Urinary system
- significantly reduces urine leakage
- helps with cystic kidneys
- significantly reduces the severity of the urinary symptoms
- gives no side effects in terms of chronic disesase
- may save live
- saved lives

Cancers

- cause anorexia
- cause malabsorption
- cause body loss
- cause anemia
- cause fatigue
- increase the risk of sepsis
- increase the risk of cardiovascular disease
- cause chronic subclinical skeletal muscle toxicity
- cause dehydration
- cause electrolyte imbalance
- cause cognitive impairments
- cause depression
- cause ataxia
- cause insomnia
- cause peripheral neuropathy
- cause marrow suppression
- cause liver toxicity
- cause damage to cells in the body
- cause damage to cells in the kidneys
- cause damage to cells in the bladder
- cause damage to cells in the lungs
- cause damage to cells in the nervous system
- cause fertility problems
- cause hair loss
- cause easy bruising
- cause easy bleeding
- cause constipation
- cause diarrhea
- cause problems with mouth
- cause problems with tongue
- cause problem with throat
- cause sores
- cause pain with swallowing
- cause nerve problems
- cause numbness
- cause tingling
- cause pain
- cause skin changes
- cause nails chenges
- cause dry skin
- cause urine changes
- cause bladder changes
- cause kidney problems
- cause weight changes
- cause chemo brain
- affect concentration
- affect focus
- affect writing
- affect reading
- affect speaking
- affect thinking
- affect social life
- change mood
- change libido
- change sexual function
- cause fertility problems
- cause organ dysfunction
- cause organ failure
- cause myelosuppression
- cause mucositis
- cause headaches
- take away loved ones
- cause memory problems
- increase risk of metastasis
- may spread

COMPARISON OF BREASTMILK COMPOUNDS AND FORMULA

BREASTMILK

Water

Proteins
- whey
- alpha-lactalbumin
- HAMLET
- lactoferrin
- many antimacrob factors
- casein
- serum albumin

Minerals
- calcium
- sodium
- potassium
- iron
- zinc
- chloride
- phosphorus
- magnesium
- copper
- manganese
- iodine
- selenium
- choline
- sulphur
- chromium
- cobalt
- fluorine
- nickel

Vitamins
- vitamin A
- beta-carotene
- vitamin B6
- vitamin B8 (inositol)
- vitamin B12
- vitamin C
- vitamin D
- vitamin E
- a-tokoferol
- vitamin K
- thiamine
- riboflavin
- niacin
- folic acid
- panthotenic acid
- biotin

Phospholipids
- phosphatidylcholine
- lisophosphatidylathanolamine
- phopshatidylathanolamina
- lisophosphatidylcholine
- phosphatidylinositol
- plasmalogens

Amino acids
- alanine
- arginine
- aspartate
- glycine
- cystine
- glutamate
- histidine
- isoleucine
- leucine
- lycine
- methionine
- phenylalanine
- proline
- serine
- taurine
- theronine
- tryptophan
- tyrosine
- valine
- carnitine

Sphingolipids
- sphingomyelin
- gangliosides
- GM1
- GM2
- GM3
- glucosylceramide
- glucosphingolipids
- galactosylceramide
- lactosylceramide
- globotriaosylceramide (GB3)
- globoside (GB4)

Sterols
- squalene
- lanosterol
- dimethylsterol
- methosterol
- lathosterol
- desmosterol
- triacylglycerol
- cholesterol
- 7-dehydrocholesterol
- stigmasterol
- campesterol
- 7-ketocholesterol
- sitosterol
- β-lathosterol
- vitamin D metabolites

Steroid hormones

Antiproteases
- a-1-antitrypsin
- a-1-antichymotrypsin

Cytokines
- interleukin 1-β (IL-1β)
- IL-2
- IL-4
- IL-6
- IL-8
- IL-10
- granulocyte-colony stimulating factor (G-CSF)
- macrophage-colony stimulating factor (M-CSF)
- platelet derived growth factors (PDGF)
- vascular endothelial growth factor (VEGF)
- hepatocyte growth factor - α (HGF-α)
- HGF-β
- tumor necrosis factor - α
- interferon-ɣ
- epithelial growth factor (EGF)
- transforming growth factor - α (TGF-α)
- TGF β1
- TGF β2
- insulin-like growth factor - I (IGF-I)
- insulin-like growth factor - II
- nerve growth factor (NGF)
- erythropoietin

Nucleotides
- 5'-adenosine monophosphate (5'-AMP)
- 3':5'-cyclic adenosine monophosphate (3':5'-cyclic AMP)
- 5'-citidine monophosphate (5'-CMP)
- citidine diphopshate choline (CDP choline)
- guanosine diphosphate (UDP)
- guanosine diphopshate-mannose
- 3'-uridine monophosphate (3'-UMP)
- 5'-uridine monophosphate (5'-UMP)
- uridine diphosphate (UDP)
- uridine diphosphate hexose (UDPH)
- uridine diphosphate-N-acetyl-hexosamine (UDPAH)
- uridine diposphoglucuronic acid (UDPGA)
- several more novel nucleotides of the UDP type

Oligosaccharides
(more than 200 different kinds)

Carbohydrates
- lactose

Hormones
- cortisol
- triiodothyronine (T3)
- thyroxine (T4)
- thyroid stimulating hormone
- thyroid releasing hormone
- prolactin
- oxytocin
- insulin
- corticosterone
- thrombopoietin
- gonadotropin-releasing hormone (GnRH)
- feedback inhibitor of lactation (FIL)
- GRH
- leptin
- adiponectin
- eicosanoids
- prostaglandins
- PG-E1
- PG-E2
- PG-F2
- leukotrienes
- thromboxanes
- prostacyclins

Non-protein nitrogens
- creatine
- creatinine
- urea
- uric acid
- peptides

Peptides
- HMGF I (growth factor)
- HMGF II
- HMGF III
- cholecystokinin (CCK)
- β-endorfine
- parathyroid hormone (PTH)
- β-defensin-1
- calcitonin
- parathyroid hormone-related peptide (PTHrP)
- gastrin
- motilin
- bombesin
- neurotensin
- somatostatin

Fats
- triglicerides
- long-chain polyunsaturated fatty acids
- docosahexaenoid acid (DHA)
- arachidonic acid (AHA)
- linoleic acid
- alpha-linoleic acid (ALA)
- eicosopentahenoic acid (EPA)
- conjugated linoleic acid (rumenic acid)

Enzymes
- amylase
- arysulfatase
- catalase
- histaminase
- lipase
- lysozyme
- PAF-acetylhydrolase
- phosphatase
- xanthine oxidase

Antimicrobial factors
- leukocytes (white blood cells)
- phagocytes
- basophils
- neutrophils
- eosinophils
- macrophages
- lymphocytes
- B-lymphocytes
- T-lymphocytes
- (sigA) secretory immunoglobulin A
- IgA2
- IgG
- IgD
- IgM
- IgE
- complement C1
- complement C2
- complement C3
- complement C4
- complement C5
- complement C6
- complement C7
- complement C8
- complement C9
- glycoproteins mucins
- lactadherin
- alpha-lactoglobulin
- alpha-2 macroglobulin
- lewis antigens
- ribonuclease
- heamagglutinin inhibitor
- bifidus factor
- lactoferrin
- lactoperoxidase
- B12 binding protein
- fibronectin

Saturated fatty acids
- stearic
- palmitic acid
- lauric acid
- myristic acid

Monounsaturated fatty acids
- oleic acid
- palmitoleic acid
- heptadecenoic acid

Formula

Water

Minerals
- potassium citrate
- potassium phosphate
- calcium chloride
- tricalcium phosphate
- sodium citrate
- magnesium chloride
- ferrous sulphate
- zinc sulphate
- sodium chloride
- copper sulphate
- potassium iodide
- manganese sulphate
- sodium selenate

Proteins
- whey protein concentrate

Fats
- palm oil
- soybean oil
- coconut oil
- high oleic safflower oil (or sunflower oil)
- M. alpina oil (fungal DHA)
- C. cohnii oil (algal ARA)

Enzymes
- trypsin

Amino acids
- taurine
- l-carnitine

Carbohydrates
- lactose
- corn maltodextrin

Vitamins
- sodium ascorbate
- inositol
- choline bitartrate
- alpha-tocopheryl acetate
- niacinamide
- calcium panthotenate
- riboflavin
- vitamin A acetate
- pyridoxine hydrochloride
- thiamine mononitrate
- folic acid
- phylloquinone
- biotin
- vitamin D3
- vitamin B12

Nucleotydes
- cytidine 5-monophosphate
- disodium uridine 5-monophosphate
- adenosine 5-monophosphate
- disodium guanosine 5-monophosphate

NON-COMPARISON

... Galileo Galilei (15.02.1564-8.01.1642)

Nicolas Tesla (9/10.07.1856-7.01.1943) James Dorsey (31.10.1848-04.01.1895)

Louis Nicolas Vauquelin (16.05.1763-14..11.1829) E. Bosshard (1860-1937)

Roy Jay Glauber (1.09.1925-26.12.2018) Damascius (462-538 AD)

Edward Bach (1886-1936) Justus von Liebig (12.05.1803-18.04.1873)

Alois Alzheimer (14.06.1864-19.12.1915) August Comte (19.01.1798-30.09.1857)

Franz Meyer (1882, Mannheim-1975) Luke Howard (28.11.1772-21.03.1864)

Gabriel Farenheit (24.05.1686-16.09.1736) Frans Ferdinand Blom (9.08.1893-23.06.1963)

Jean Paul II (18.05.1920-2.04.2005) Claude-Joseph-Désiré Charnay (2.05.1828-10.1915)

Friedrich Miescher (13.08.1844-26.08.1895) Claude Lévi-Strauss (28.11.1908-30.10.2009)

John Dalton (6.09.1766-27.07.1844) Pierre Montet (27.06.1885-19.06.1966)

Jöns Jacob Berzelius (20.08.1779-7.08.1848) Leo Frobenius (29.06.1873-08.1938)

Antoine-Laurent Lavoisier (26.08.1743-8.05.1794) Wilhelm Koppers (08.02.1886-23.01.1961)

Robert Boyle (25.01.1627-31.12.1691) Spyridon Marinatos (4.11.1901-1.10.1974)

Frederick Sanger (13.08.1918-19.11.2013) Jean Price Mars (15.10.1876-2.03.1969)

Rachel Carson (27.05.1907-14.04.1964) Rodolfo Amadeo Lanciani (1.01.1847-21.05.1929)

Marek Witold Kozak (16.11.1955-30.04.2021) W. Lloyd Warner (26.10.1898-23.05.1970)

Hans Christian Ørsted (14.08.1777-9.03.1851) Vladimir Ilich Jochelson (14.01.1855-1.11.1937)

Christopher Latham Sholes (14.02.1819-17.02.1890) George Andrew Reisner (5.11.1867-6.06.1942)

Enrico Fermi (29.09.1901-28.11.1954) Edward Sapir (26.01.1884-4.02.1939)

Bart G. Barrell (1944-2023) Henry Rowe Schoolcraft (28.03.1793-10.12.1864)

Aleksandr M. Prokhorov (11.07.1916-8.01.2002) Frank Gouldsmith Speck (8.11.1881-6.02.1950)

Leon Battista Alberti (18.02.1404-25.04.1472) Julian Steward (31.01.1902-6.02.1972)

Charles Weissmann (14.10.1931) William Duncan Strong (30.06.1899-29.01.1962)

Stephen Harrod Buhner (1952-2022) Leslie A. White (19.01.1900-31.03.1975)

Robert Norton Noyce (12.12.1927-3.06.1990) Sol Tax (30.10.1907-4.01.1995)

Michael Sendivogius (2.02.1566-1636) Francis James Gillen (28.10.1855-5.06.1912)

Friedrich Stromeyer (2.08.1776-18.08.1835) Franz Cumont (3.01.1868-25.08.1947)

Sir Joseph John Thomson (18.12.1856-30.08.1940) Anthony Arkell (29.07.1898-26.02.1980)

Joseph Louis Proust (26.09.1754-5.07.1826) Thomas Huxley (4.05.1825-29.06.1895)

Georg Ernst Stahl (22.10.1659-24.05.1734) Gregory Bateson (9.05.1904-24.07.1980)

Eunapius (IV-V c.) John Bulwer (16.05.1606-16.10.1656)

Eric Fawcett (23.08.1927-2.09.2000) R.H. Codrington (15.09.1830-11.09.1922)

Frank Whittle (1.06.1907-8.08.1996) Robert Bruce Foote (1834-1912)

Har Gobind Khorana (9.01.1922-9.11.2011) Sir James George Frazer (1.01.1854-7.05.1941)

Nathan Rotschild (16.09.1777-28.07.1836) Maurice Freedman (11.12.1920-14.07.1975)

Antonie van Leeuwenhoek (24.10.1632-26.08.1723) Marvin Harris (18.08.1927-25.10.2001)

Albert C. Chibnall (28.01.1894-10.01.1988) Henri Frankfort (24.02.1897-16.07.1954)

Eudoxus of Cnidus (390-340 BC) Joseph H. Greenberg (28.05.1915-7.05.2001)

Max Perutz (19.05.1914-6.02.2002) Alexander Goldenweiser (29.01.1880-6.07.1940)

Grace Murray Hopper (9.12.1906-1.01.1992) Paul Farmer (26.10.1959-21.02.2022)

Richard Buckminster Fuller (12.07.1895-1.07.1983) Andrew Ellicott Douglass (5.07.1867-20.03.1962)

Alexander III of Macedon (20/21.07.356-10/11.06.323 BC) James Henry Breasted (27.08.1865-2.12.1935)

Benjamin Franklin (17.01.1706-17.04.1790) Franz Boas (9.07.1858-22.12.1942)

Douglas Engelbart (30.01.1925-2.07.2013) Mao Zedong (26.12.1893-9.09.1976)

John Kendrew (24.03.1917-23.08.1997) Bronisław Malinowski (7.04.1884-16.05.1942)

César Milstein (8.10.1927-24.03.2002) Sir John Hubert Marshall (19.03.1876-17.08.1958)

Junipero Serra (24.11.1713-28.08.1784) Robert R. Marett (13.06.1866-18.02.1943)

Albert Neuberger (15.04.1908-14.08.1996) Bedřich Hrozný (6.05.1879-18.12.1952)

Vladimir Kosma Zworykin (29.07.1888-29.07.1982) Fernando Ortiz (16.07.1881-10.04.1969)

Charlotte Brontë (21.04.1816-31.03.1855) Billy Graham (7.11.1918-21.02.2018)

Clarence Birdseye (9.12.1886-7.10.1956) Joseph-Marie Jacquard (7.07.1752-7.08.1834)

Robert Hutchings Goddard (5.10.1882-10.08.1945) Louis-Jacques-Mandé Daguerre (18.11.1787-10.07.1851)

Lee De Forest (26.08.1873-30.06.1961) William Cullen (15.04.1710-5.02.1790)

Toni Morrison (18.02.1931-5.08.2019) Alessandro Volta (18.02.1745-5.03.1827)

Niels Bohr (7.10.1885-18.11.1962) John von Neumann (28.12.1903-8.02.1957)

Theodore H. Maiman (11.07.1927-5.05.2007) Felix Wankel (13.08.1902-9.10.1988)

Richard the Lionheart (8.09.1157-06.04.1199) Manly P.Hall (18.03.1901-29.08.1990)

Reginald Aubrey Fessenden (6.10.1866-22.07.1932) Rodney Porter (8.10.1917-6.09.1985)

Christiaan Huygens (14.04.1629-8.07.1695) Napoleon (15.08.1769-5.05.1821)

Giuseppe Antonio Anastasio Volta (18.02.1745-5.03.1827) Nikola Tesla (10.07.1856)

Heron of Alexandria (60 AD) Wilhelm Conrad Röntgen (27.03.1845-10.02.1923)

William Shockley (13.02.1910-12.08.1989)

Willis Carrier (26.11.1876-7.10.1950) Wilbur Wright (19.08.1871-30.01.1948)

John Logie Baird (13.08.1888-14.06.1946) Joseph Priestley (24.03.1733-6.02.1804)

Samuel Morse (27.04.1791-2.04.1872) Humphry Bartholomew Davy (17.12.1778-29.05.1829)

Jeremias Benjamin Richter (10.03.1762-4.05.1807) Johann Tobias Lowitz (25.04.1757-7.12.1804)

André-Louis Debiern (14.07.1874-31.08.1949) Daniel Rutherford (3.11.1749-15.11.1819)

Ejnar Hertzsprung (8.10.1873-21.10.1967) Tenzing Norgay (15.05.1914-09.05.1986) Raphael Mechoulam (5.11.1930-9.03.2023)

Henry Russell (1834-1909) Axel Fredrik Cronstedt (23.12.1722-19.08.1765)

Therkel Mathiassen (5.09.1892-1967) Christian Jürgensen Thomsen (29.12.1788-21.05)

Jules Quicherat (13.10.1814-8.04.1882) Eugène Dubois (28.01.1858-16.12.1940)

Karl Humann (4.01.1839-12.04.1896) Bertram Schrieke (1890-12.1945)

Wilhelm Adolf Becker (1796-30.10.1846) Edward Westermarck (20.11.1862-3.09.1939)

Yigael Yadin (21.03.1917-28.06.1984) Marcellin Boule (1.01.1861-4.07.1942)

Richard Lepsius (23.12.1810-1884) Paul Broca (28.06.1824-9.07.1880)

Manolis Andronicos (23.10.1919-30.03.1992) Andriej Sacharow (21.05.1921-14.12.1989) Henri Breuil (28.02.1877-14.08.1961)

Sándor Bálint (1.08.1904-10.05.1980) Jacques Boucher de Perthes (10.09.1788-5.08.1868)

Paulus Cua (1834-1907) Jean-François Champollion (23.12.1790-4.03.1832)

Edward Herbert Thompson (28.09.1856-11.05.1935) John Reed Swanton (19.02.1873-2.05.1958)

William W. Howells (27.11.1908-20.12.2005) William Henry Holmes (1.12.1846-20.04.1933)

... Gertrude Belle Elion (23.01.1918-21.02.1999)

Yellapragada Subba Rao (12.01.1895-8.08.1948) Imhotep (664-30 BC)

Ruth Benedict (5.06.1887-17.09.1948) Calamity Jane (1.05.1852-1.08.1903) Queen Victoria (24.05.1819-22.01.1901)

Rosalind Franklin (25.07.1920-16.04.1958) Erma Bombeck (21.02.1927-22.04.1996)

Mary Queen of Scots (8.12.1542-8.02.1587) Elizabeth Blackwell (3.02.1821-31.05.1910)

Laura Jane Addams (6.09.1860-21.05.1935) Isadora Duncan (27.05.1878-14.09.1927)

Hiram Bingham (19.11.1875-6.06.1956) Marie Curie (7.11.1867-4.07.1934)

Zora Neale Hurston (7.01.1891-28.01.1960) Molly Pitcher (06.1778)

Rosalind Elsie Franklin (25.07.1920-16.04.1958) Eudora Welty (13.04.1909-23.07.2001)

Frances Densmore (21.05.1867, Red Wing, Minn., U.S.-05.06.1957) Louisa May Alcott (29.11.1832-6.03.1888)

Queen Isabella (22.04.1451-26.11.1504) Marie Antoinette (2.11.1755-16.10.1793)

Colette (28.01.1873-3.08.1954) Emmeline Pankhurst (15.07.1858-14.06.1928)

Hatshepsut (1507-1458 BC) Elizabeth Cady Stanton (12.11.1815-26.10.1902)

Margaret Mead (16.12.1901-15.11.1978) Anais Nin (21.02.1903-14.01.1977) Betsy Ross (1.01.1752-30.01.1836)

Margaret Thatcher (13.10.1925-8.04.2013) Maria Montessori (31.08.1870-6.05.1952)

Ida Minerva Tarbell (5.11.1857-6.01.1944) Elisha Graves Otis (3.08.1811-8.04.1861)

Artemisia I of Caria (V c. BC) Eve (2000 BC)

Virginia Apgar (1909-1974) Nefertiti (1370-1330 BC)

Quinn Elisabeth II (21.04.1926-8.09.2022) Lena Horne (30.06.1917-9.05.2010)

Margaret Sanger (14.09.1879-6.09.1966) Annie Oakley (13.08.1860-3.11.1926)

Claude-Étienne Minié (13.02.1804-14.12.1879) Zelia Maria Magdalena Nuttall (6.09.1857-12.04.1933)

Emily Post (27.10.1872-25.09.1960) Kirstie Alley (12.01.1951-5.12.2022) Gertrude Stein (3.02.1874-27.07.1946)

Queen Isabella (22.04.1451-26.11.1504) Mary Cassatt (22.05.1844-14.06.1926)

Golda Meir (3.05.1898-8.12.1978) Stephanie Louise Kwolek (31.07.1923-18.06.2014)

Eli Whitney (8.12.1765-8.01.1825) Hypatia (350/370-415)

Shirley Temple (1928-2014) ...

Paul Radin (02.04.1883-21.02.1959) Adolph Bandelier (6.08.1840-18.03.1914)

Sir Max Mallowan (6.05.1904-19.08.1978) Alfred Cort Haddon (24.05.1855-20.04.1940)

William Pengelly (12.01.1812-16.03.1894) Humfry Payne (19.02.1902-9.05.1936)

Fei Xiaotong (2.11.1910-24.04.2005) Claudius James Rich (28.03.1787-5.10.1821)

C.G. Seligman (24.12.1873-19.09.1940) Leonard Cohen (21.09.1934-7.11.2016) Presper Eckert (9.04.1919-3.06.1995)

John Wesley Powell (24.03.1834-23.09.1902) Harold Urey (29.04.1893-5.01.1981)

Francis Crick (8.06.1916-28.07.2004) Ludwig Karl Martin Leonhard Albrecht Kossel (1853-1927)

James A. Naismith (6.11.1861-28.11.1939) Hiram Stevens Maxim (5.02.1840-24.11.1916)

James Theodore Bent (30.03.1852-5.05.1897) Salvino D'Armati (1258-1312)

Gottlieb Wilhelm Daimler (17.03.1834-6.03.1900) Leonardo di ser Piero da Vinci (15.04.1452-2.05.1519)

Peter Henlein (1485-08.1542) Henry Ford (30.07.1863-4.1947) Nicéphore Niépce (7.03.1765-5.07.1833)

Maon Kurosaki (13.01.1988-16.02.2023) Stanley Lloyd Miller (7.03.1930-20.05.2007)

Edward Osborne Wilson (1929-2021) Charles Hard Townes (28.07.1915-27.01.2015)

Étienne François Geoffroy (13.02.1672-6.01.1731) Hennig Brand (1630-1692)

Keith Campbell (23.05.1954-5.10.2012) Paul Berg (30.06.1926-15.02.2023)

Peter Mansfield (9.10.1933-8.02.2017) Samuel Finley Breese Morse (27.04.1791-2.04.1872)

Sir Ian Wilmut (7.07.1944-10.09.2023) Christopher Columbus (31.10.1451-20.05.1506)

King George VI (14.12.1895-6.02.1952) William Bryan (19.03.1860-26.07.1925)

Karol Linneus (1707-1778) Euclid (300 BC)

Pitagoras (570-495 BC), Willard Marriott (17.09.1900-13.08.1985) Richard Owen (20.07.1804-12.1892)

Karl Lohmann (1929-1953) Andreas Marggraf (3.03.1709-7.08.1782)

Trofim Denisowicz Łysenko (29.09.1898-20.11.1976) John Bardeen (23.05.1908-30.01.1991)

Ernst Schulze (22.03.1789-29.06.1817) Clarence Leonidas Fender (10.08.1909-21.03.1991)

Franz Beckenbauer (11.10.1945-7.01.2024) John Mauchly (30.08.1907-8.01.1980)

Robert Hooke (18.07.1635-3.03.1703) Jean Baptiste Dumas (14.07.1800-10.04.1884)

Gallus Anonimus (XI c.-1116) Luis Leakey (7.08.1903-1.10.1972)

Antonie van Leeuwenhoek (24.10.1632-26.08.1723) John Dalton (1766-1844)

George Carlin (12.05.1937-22.06.2008) James Clerk Maxwell (13.06.1831-5.11.1879)

Benedictus XVI (16.04.1927-31.12.2022) Hennig Brand (1630-1710)

Ernest Rutherford (30.08.1871-19.10.1937) Li Chi (12.07.1896-1.08.1979) Gaspard de Coriolis (1792-1843)

John Vincent Atanasoff (4.10.1903-15.06.1995) Francis Crick (8.06.1916-28.07.2004)

Glenn Theodore Seaborg (19.04.1912-25.02.1999) Ptolemy (367-01.282 BC)

Joseph Louis Gay-Lussac (6.12.1778-9.05.1850) Richard Jordan Gatling (12.09.1818-26.02.1903)

Basil Valentine (XV c.) Alexander Graham Bell (3.03.1847-2.08.1922)

Ernst Schulze (31.07.1840-15.06.1912) Henry Patrick Marie (18.05.1736-6.06.1799)

George Frideric Handel (1685-1759) Dmitri Mendeleev (1834-1907)

Heinrich Rohrer (6.06.1933-16.05.2013) Heinrich Hertz (22.02.1857-1.01.1894)

Maurice Wilkins (15.12.1916-5.10.2004) Cyrus Hartwell Fiske (1890-1978)

Jöns Jacob Berzelius (20.08.1779-7.08.1848) Hans Christian Oersted (1777-1851)

Carl Wilhelm Scheele (9.12.1742-21.05.1786) Christian Doppler (1803-1853)

Matteo Realdo Colombo (1515-1559) Thomas Young (1773-1829)

Paul Hermann Müller (12.01.1899-13.10.1965) Thomas Newcomen (1664-05.08.1729)

Sir William Preece (15.02.1834-6.11.1913) Blaise Pascal (19.06.1623-19.08.1662)

Guglielmo Marconi (25.04.1874-20.07.1937) Edwin Howard Armstrong (18.12.1890-1.02.1954)

Charles Babbage (26.12.1791-18.10.1871) Martin King Jr. (15.01.1929-4.04.1968)

Ernest Rutherford (30.08.1871-19.10.1937) James D. Watson (6.04.1928)

Karl Benz (25.11.1844-4.04.1929) Marshall Nirenberg (10.04.1927-15.01.2010)

Copernicus (19.02.1473-24.05.1543) Thomas Edison (11.01.1847-18.10.1931)

Kenjiro Takayanagi (1899-23.07.1990) Johannes Longinus (1415-19.05.1480)

Robert Fulton (14.11.1765-24.02.1815) Johann Schweigger (8.04.1779-6.09.1857)

Charles Babbage (26.12.1791-18.10.1871) Arthur Guinness (24.09.1725-23.01.1803)

Plutarch (46-after 119) Isaac Newton (4.01.1643-31.03.1727)

René-Théophile-Hyacinthe Laënnec (17.07.1781-13.08.1826) John Smith (6.01.1580-21.06.1631)

Thales Milesios (VII/VI c. BC) Henryk Goldszmit (22.07.1878/1879-08.1942)

Charles Darwin (12.02.1809-19.04.1882) Leonidas I (11.08.480 BC)

Alfred Nobel (21.10.1833-10.12.1896) Albert Einstein (14.03.1879-18.04.1955)

Eudoxus of Cnidus (390-340 BC) Alexander Goldenweiser (29.01.1880-6.07.1940) Paul Christian Lauterbur (6.05.1929-27.03.2007) Paracelsus (10.11.1493-24.09.1541)

Ronald Valentine Toomer (31.05.1930-26.09.2011) John Bardeen (23.05.1908-30.01.1991)

Joseph Priestley (24.03.1733-6.02.1804) Walter Brattain (10.02.1902-13.10.1987)

Carl Blegen (27.01.1887-24.08.1971) Pythagoras (570-495 BC) Edwin Herbert Land (7.05.1909-1.03.1991)

Francis Bacon (22.01.1561-04.1626) Willard Frank Libby (17.12.1908-8.09.1980)

Igor Strawinsky (06.04.1882-6.04.1971) Michael Ellis DeBakey (7.09.1908-11.07.2008)

Ernő Jendrássik (7.06.1858-21.12.1921) Otto Lilienthal (23.05.1848-10.08.1896)

Max Schultze (25.03.1825-16.01.1874) Wilhelm Röntgen (27.03.1845-10.02.1923)

Oscar Schindler (28.04.1908-9.10.1974) Michael Faraday (22.09.1791-25.08.1867)

John Deere (7.02.1804) Wernher von Braun (23.03.1912-06.1977)

Charles Lindbergh (4.02.1902-26.08.1974) Lorenzo Romano Avogadro (9.08.1776-9.07.1856)

Georges Leclanché (9.10.1839-14.09.1882) Adolf August Heinrich (8.07.1838-8.03.1917)

Adolph Bandelier (6.08.1840-18.03.1914) Henry Cavendish (10.10.1731-24.02.1810)

Oscar Montelius (9.09.1843-4.12.1921) Louis Braille (4.01.1809-6.01.1852)

Gustav VI Adolf (11.11.1882-15.09.1973) Mark Twain (30.11.1835-21.04.1910)

Okot p'Bitek (1931-19.07.1982) Cyrus Hall McCormick (15.02.1809-13.05.1884)

John Wesley Hyatt (28.11.1837-10.05.1920) Charles Goodyear (29.12.1800-1.07.1860)

Rowland Hill (3.12.1795-27.09.1879) Simplicius (480-540 AD)

Bone (2.06.1906-13.01.1991) Robert Gehlmann Archimedes (287-212 BC)

Tom Kilburn (11.08.1921-17.01.2001) Henry Bessemer (19.01.1813-15.03.1898)

William Buckland (12.03.1784-14.08.1856) Gregor Mendel (20.07.1822-6.01.1884)

Herbert Spencer (27.04.1820-8.12.1903) Lynn Margulis (5.03.1938-22.12.2011)

Otto Warburg (8.10.1883-1.08.1970) Johaness Gutenberg (1406-3.02.1468)

Inge Lehmann (13.05.1888-21.02.1993) Us.