VITAMINS & MINERALS

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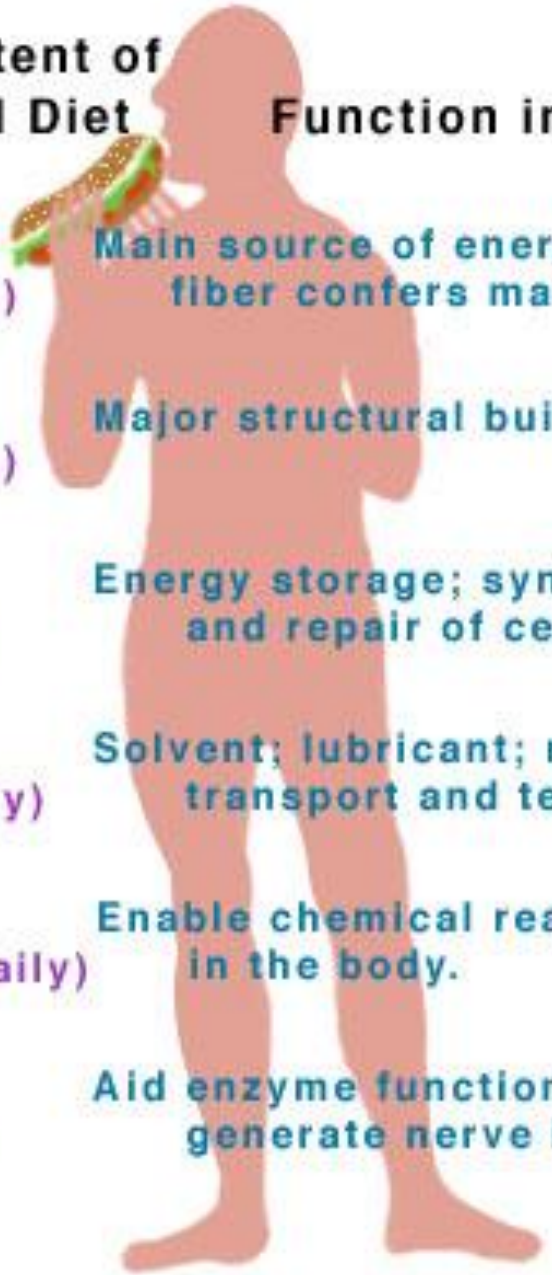
Nutritional Content of a Well-Balanced Diet	Function in the Body
Carbohydrates (330 g daily)	Main source of energy; fiber confers many health benefits.
Protein (100 g daily)	Major structural building blocks.
Fat (75 g daily)	Energy storage; synthesis and repair of cell parts.
Water (2000 g daily)	Solvent; lubricant; medium for transport and temperature regulation.
Vitamins (<300 mg daily)	Enable chemical reactions in the body.
Minerals (5-10 g daily)	Aid enzyme function; electrical balance; generate nerve impulses; bone structure.



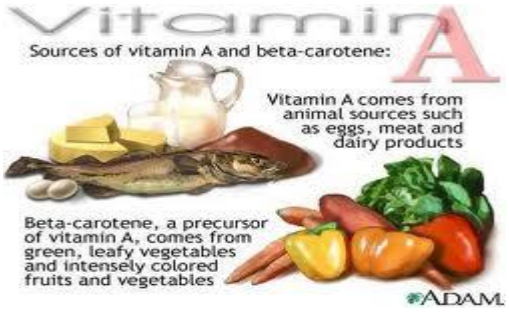
VITAMINS
Definition

- An organic chemical compound (or related set of compounds) is called a vitamin when it cannot be synthesized in sufficient quantities by an organism, and must be obtained from the diet.
- Thirteen vitamins are presently universally recognized.

VITAMINS
Functions

- Hormone like functions as regulators of mineral metabolism (e.g., vitamin D)
- Regulators of cell and tissue growth and differentiation (e.g., some forms of vitamin A)
- Antioxidants (e.g., vitamin E and sometimes vitamin C).
- Precursors for enzyme cofactors, that help enzymes in their work as catalysts in metabolism.
- Bound to enzyme catalysts as coenzymes, detachable molecules that function to carry chemical groups or electrons between molecules.

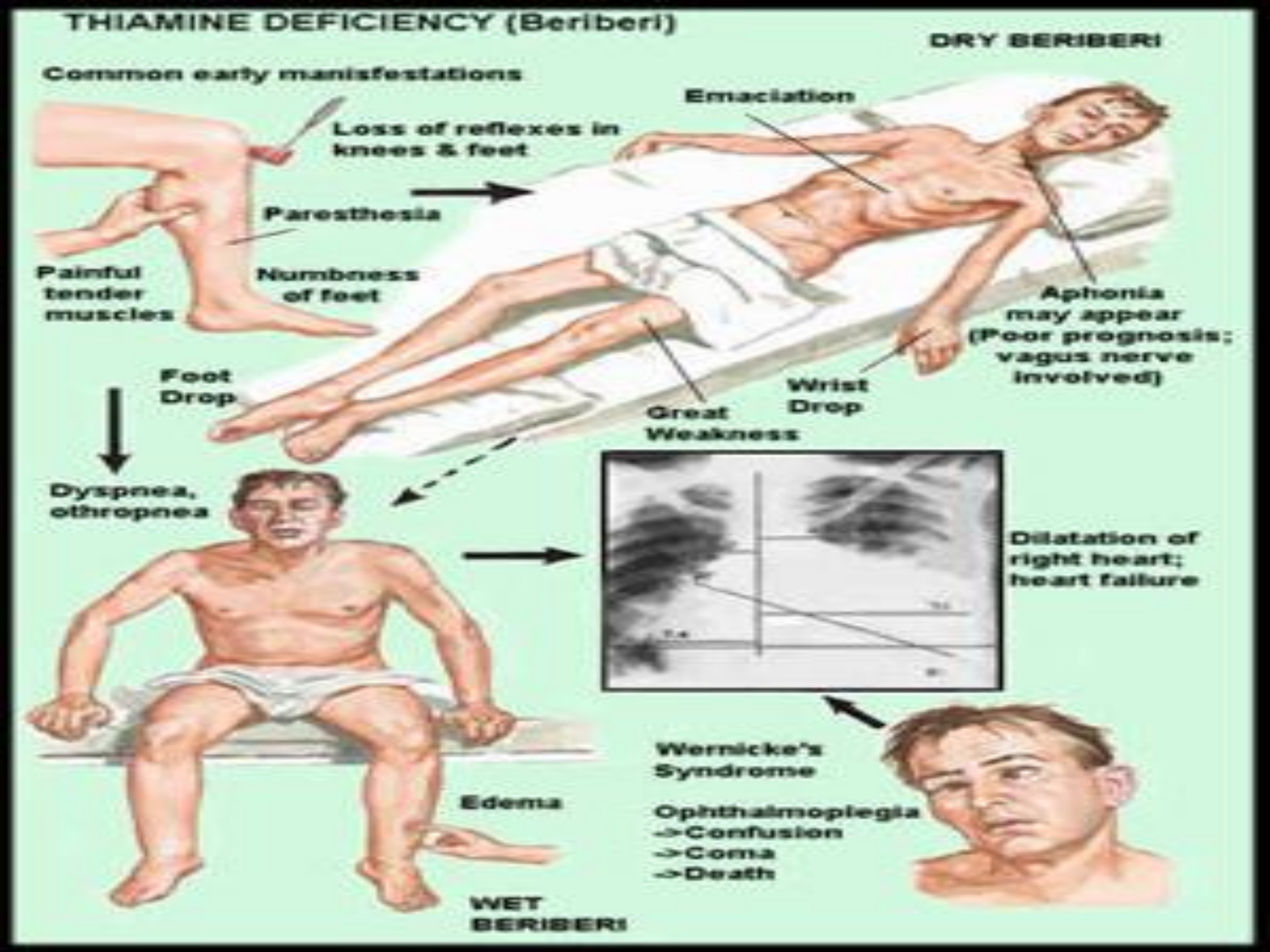
VITAMIN A



Chemical name/s (list not complete)	Solubility	R.D.A. (male, age 19–70)	Deficiency disease	Upper Intake Level (UL/day)	Overdose disease
Retinol, retinal, and four carotenoids including beta carotene	Fat	900 µg	Night-blindness, Hyper-keratosis, Kerato-malacia[1]	3,000 µg	Hyper-vitaminosis A[2]

[1] Eye disorder characterised by a dry cornea.

[2] Birth defects, liver problems, reduced bone mineral density that may result in osteoporosis, coarse bone growths, skin discoloration, hair loss, excessive skin dryness/peeling (desquamation), angular cheilitis, intracranial hypertension.


THIAMINE DEFICIENCY (Beriberi)
DRY BERIBERI
Common early manisfestations
Loss of reflexes in knees & feet
Paresthesia
Painful tender muscles
Numbness of feet
Emaciation
Aphonia may appear (Poor prognosis; vagus nerve involved)
Foot Drop
Wrist Drop
Great Weakness
Dyspnea, othropnea
Dilatation of right heart; heart failure
Wernicke's Syndrome
Ophthalmoplegia
->Confusion
->Coma
->Death
Edema
WET BERIBERI

VITAMIN B2

Chemical name/s (list not complete)	Solubility	R.D.A. (male, age 19–70)	Deficiency disease	Upper Intake Level (UL/day)	Overdose disease
Riboflavin	Water	1.7 mg	Aribo-flavinosis	N/D	

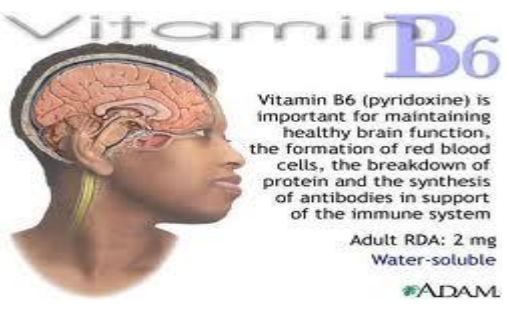
VITAMIN B3

Chemical name/s (list not complete)	Solubility	R.D.A. (male, age 19–70)	Deficiency disease	Upper Intake Level (UL/day)	Overdose disease
Niacin, niacin-amide	Water	16.0 mg	Pellagra	35.0 mg	Liver damage (doses > 2g/day)[22] and other problems

VITAMIN B5

Chemical name/s (list not complete)	Solubility	R.D.A. (male, age 19–70)	Deficiency disease	Upper Intake Level (UL/day)	Overdose disease
Pantothenic acid	Water	5.0 mg	para-esthesia	N/D	Diarrhea; possibly nausea and heartburn

VITAMIN B6

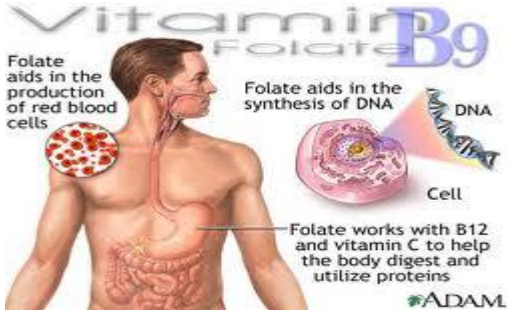


Chemical name/s (list not complete)	**Solubility**	**R.D.A. (male, age 19–70)**	**Deficiency disease**	**Upper Intake Level (UL/day)**	**Overdose disease**
Pyridoxine, pyridox-amine, pyridoxal	Water	1.3-1.7 mg	Anemia, peripheral neuropathy.	100 mg	Impairment of proprio-ception, nerve damage (doses > 100 mg/day)

VITAMIN B7

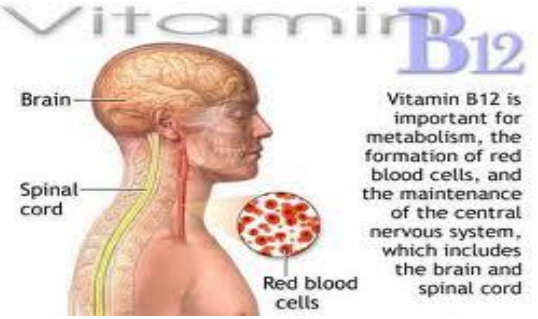
Chemical name/s (list not complete)	Solubility	R.D.A. (male, age 19–70)	Deficiency disease	Upper Intake Level (UL/day)	Overdose disease
Biotin	Water	30 µg	Dermatitis, enteritis	N/D	

VITAMIN B9



Chemical name/s (list not complete)	**Solubility**	**R.D.A. (male, age 19–70)**	**Deficiency disease**	**Upper Intake Level (UL/day)**	**Overdose disease**
Folic acid, folinic acid	Water	400 µg	Megaloblast and Deficiency during pregnancy is associated with birth defects, such as neural tube defects	1,000 µg	May mask symptoms of vitamin B12 deficiency

VITAMIN B12

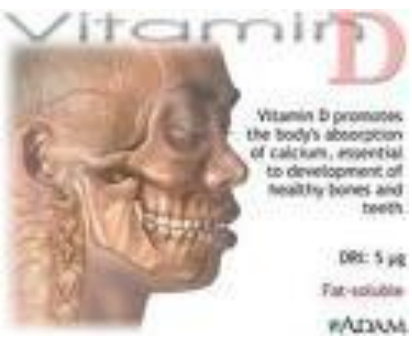


Chemical name/s (list not complete)	**Solubility**	**R.D.A. (male, age 19–70)**	**Deficiency disease**	**Upper Intake Level (UL/day)**	**Overdose disease**
Cyano-cobalamin Hydroxy-cobalamin Methyl-cobalamin	Water	2.4 µg	Megalo-blastic anaemia	N/D	Acne-like rash [causality is not conclusive]

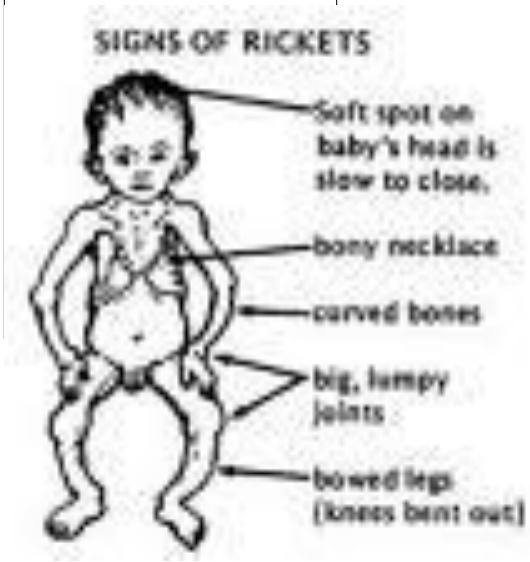
VITAMIN C

Chemical name/s (list not complete)	Solubility	R.D.A. (male, age 19–70)	Deficiency disease	Upper Intake Level (UL/day)	Overdose disease
Ascorbic acid	Water	90 mg	Scurvy	2,000 mg	Vitamin C megadosage

VITAMIN D



Chemical name/s (list not complete)	Solubility	R.D.A. (male, age 19–70)	Deficiency disease	Upper Intake Level (UL/day)	Overdose disease
Ergocalciferol Cholecalciferol	Fat	5.0-10.0 µg	Rickets Osteomalacia	50 µg	Hyper-vitaminosis D



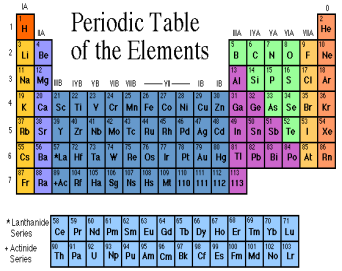
VITAMIN E

Chemical name/s (list not complete)	Solubility	R.D.A. (male, age 19–70)	Deficiency disease	Upper Intake Level (UL/day)	Overdose disease
Tocopherols Tocotrienols	Fat	15.0 mg	Deficiency is very rare; mild haemolytic anaemia in newborn infants.	1,000 mg	Increased congestive heart failure seen in one large randomized study.

VITAMIN K

Chemical name/s (list not complete)	Solubility	R.D.A. (male, age 19–70)	Deficiency disease	Upper Intake Level (UL/day)	Overdose disease
Phyllo-quinone Mena-quinones  	Fat	120 µg	Bleeding diathesis 	N/D	Increases coagulation in patients taking warfarin.

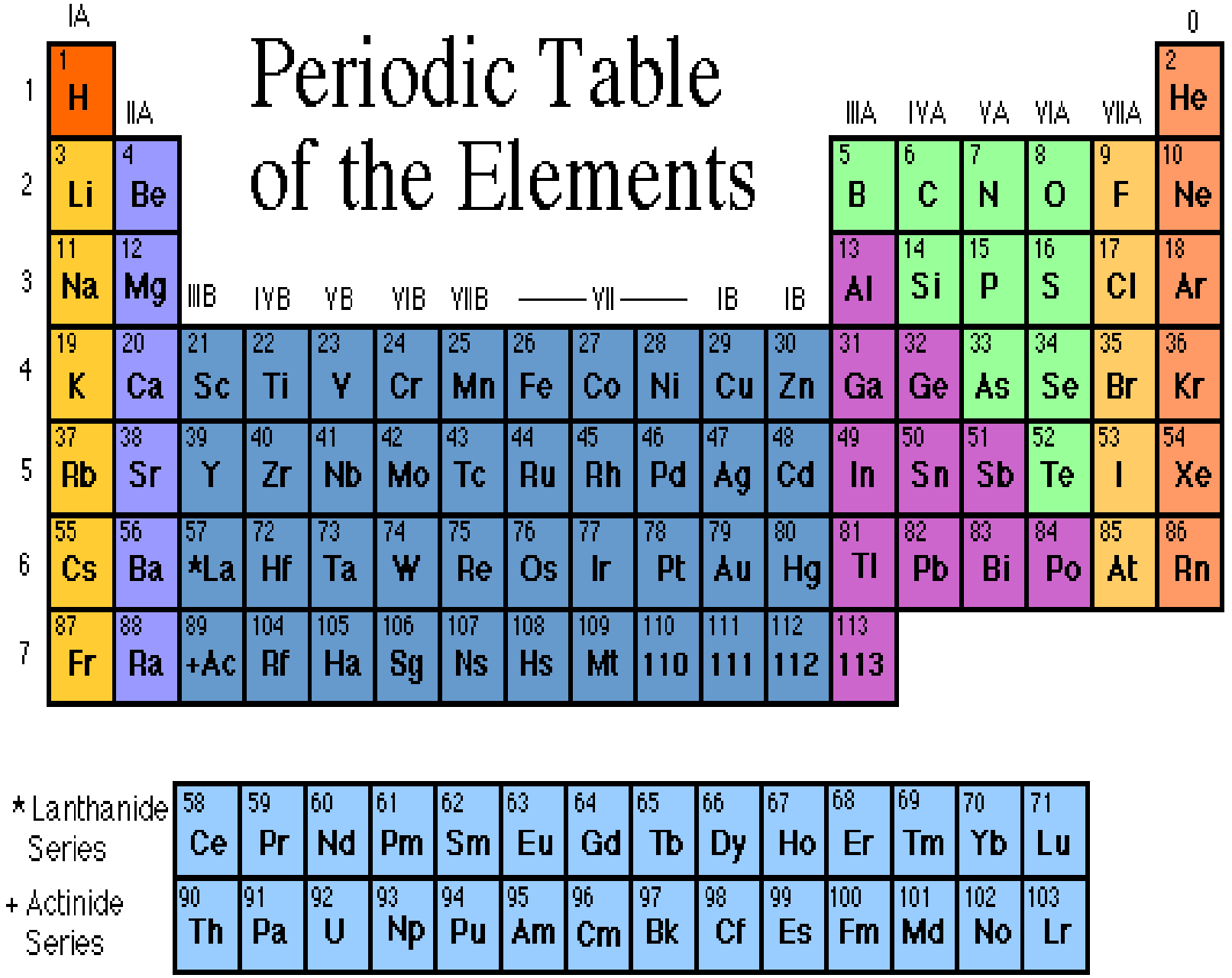
DIETARY MINERALS
Definition



The chemical elements required by living organisms, other than the four elements carbon, hydrogen, nitrogen, and oxygen present in common organic molecules.

The term "mineral" is archaic, since the intent of the definition is to describe chemical elements, not chemical compounds or actual minerals. Examples include calcium, magnesium, potassium, sodium, zinc, and iodine.

Periodic Table of the Elements



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

POTASSIUM (K)

R.D.A.: 4700 mg

Is a systemic electrolyte and is essential in co-regulating ATP with sodium.

Dietary sources include legumes, potato skin, tomatoes, and bananas.

CHLORINE (Cl)

R.D.A.: 2300 mg

Is needed for production of hydrochloric acid in the stomach and in cellular pump functions.

Table salt (sodium chloride) is the main dietary source.

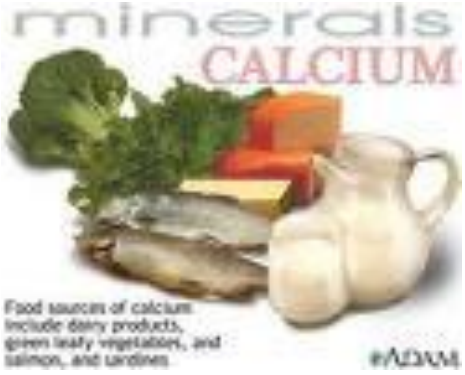
SODIUM (Na)

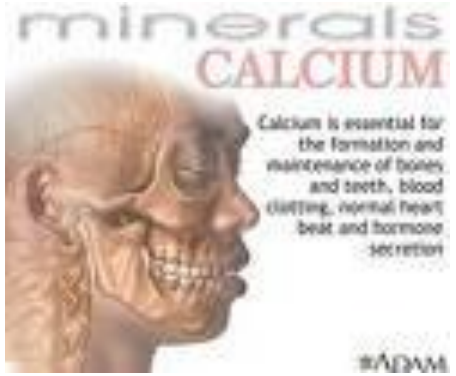
R.D.A.: 1500 mg

Is a systemic electrolyte and is essential in co-regulating ATP with potassium.

Dietary sources include table salt (sodium chloride, the main source), sea vegetables, milk, and spinach.

CALCIUM (Ca)





R.D.A.: 1000 mg

Is needed for muscle, heart and digestive system health, builds bone, supports synthesis and function of blood cells.

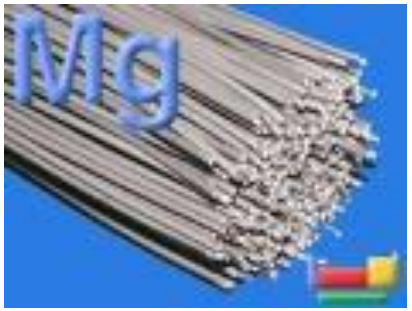
Dietary sources of calcium include dairy products, canned fish with bones (salmon, sardines), green leafy vegetables, nuts and seeds.

PHOSPHORUS (P)

R.D.A.: 700 mg

Is a component of bones, cells, in energy processing and many other functions. In biological contexts, usually seen as phosphate.

MAGNESIUM (Mg)



R.D.A.: 420 mg

Is required for processing ATP and for bones.

Dietary sources include nuts, soy beans, and cocoa mass.

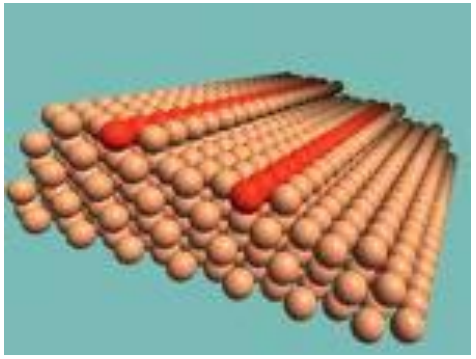
ZINC (Zn)

R.D.A.: 11 mg

Trace amounts needed

Is pervasive and required for several enzymes such as carboxypeptidase, liver alcohol dehydrogenase, and carbonic anhydrase. It is important for wound healing.

IRON (Fe)



R.D.A.: 8 mg

Trace amounts needed

Is required for many proteins and enzymes, notably haemoglobin to prevent anaemia.

Dietary sources include red meat, leafy green vegetables, fish (tuna, salmon), eggs, dried fruits, beans, whole grains, and enriched grains.

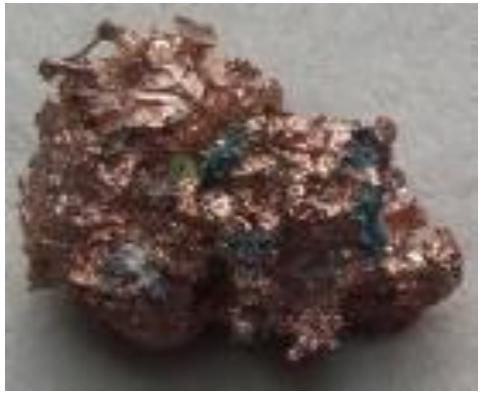
MANGANESE (Mn)

R.D.A.: 2.3 mg

Trace amounts needed

Is a cofactor in enzyme functions.

COPPER (Cu)



R.D.A.: 900 μg

Trace amounts needed

Is required component of many redox enzymes, including cytochrome-c-oxidase.

IODINE (I)

R.D.A.: 150 μg

Trace amounts needed

Is required not only for the synthesis of thyroid hormones, thyroxine and triiodothyronine and to prevent goitre, but also, probably as an antioxidant, for extrathyroidal organs as mammary and salivary glands and for gastric mucosa and immune system (thymus).

SELENIUM (Se)

R.D.A.: 55 μg

Trace amounts needed

A cofactor essential to activity of antioxidant enzymes like glutathione peroxidase. Protects against lung, colon and prostate cancer inhibiting cell proliferation.