

CHEMISTRY AWARENESS

Basic General Knowledge of Chemistry PDF

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What is chemistry?

- When you hear the word 'chemistry,' there are likely certain images that come to mind - molecules, test tubes, the periodic table, maybe even some cool explosions in a movie.
- But chemistry is so much more than these things! In fact, chemistry is known as the central science because it touches all other natural sciences, like biology, physics, geology, and more.
- Chemistry is a physical science, and it is the study of the properties of and interactions between matter and energy.
- In other words, chemistry is a way to study the properties, characteristics, and physical and chemical changes of matter.
- The matter is pretty important because it's anything that has mass and takes up space - basically, all of the 'stuff' that makes up our world.
- Chemists study atoms, which are the basic building blocks of matter, as well interactions between atoms.

Branches of Chemistry

Chemistry exists whether we define it or not. And because an understanding of chemistry is so vital in so many other scientific fields, there are several different branches of chemistry that exist. In fact, chemistry is often studied so that scientists can better understand their own field.

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There are five main branches of chemistry, each of which has many areas of study.

Analytical chemistry

- Analytical chemistry uses qualitative and quantitative observation to identify and measure the physical and chemical properties of substances. In a sense, all chemistry is analytical.

Physical chemistry

- The Physical chemistry combines chemistry with physics.
- Physical chemists study how matter and energy interact.
- Thermodynamics and quantum mechanics are two of the important branches of physical chemistry.

Organic chemistry

- Organic chemistry specifically studies compounds that contain the element carbon.
- Carbon has many unique properties that allow it to form complex chemical bonds and very large molecules.
- Organic chemistry is known as the “Chemistry of Life” because all of the molecules that make up living tissue have carbon as part of their makeup.

Inorganic chemistry

- Inorganic chemistry studies materials such as metals and gases that do not have carbon as part of their makeup.

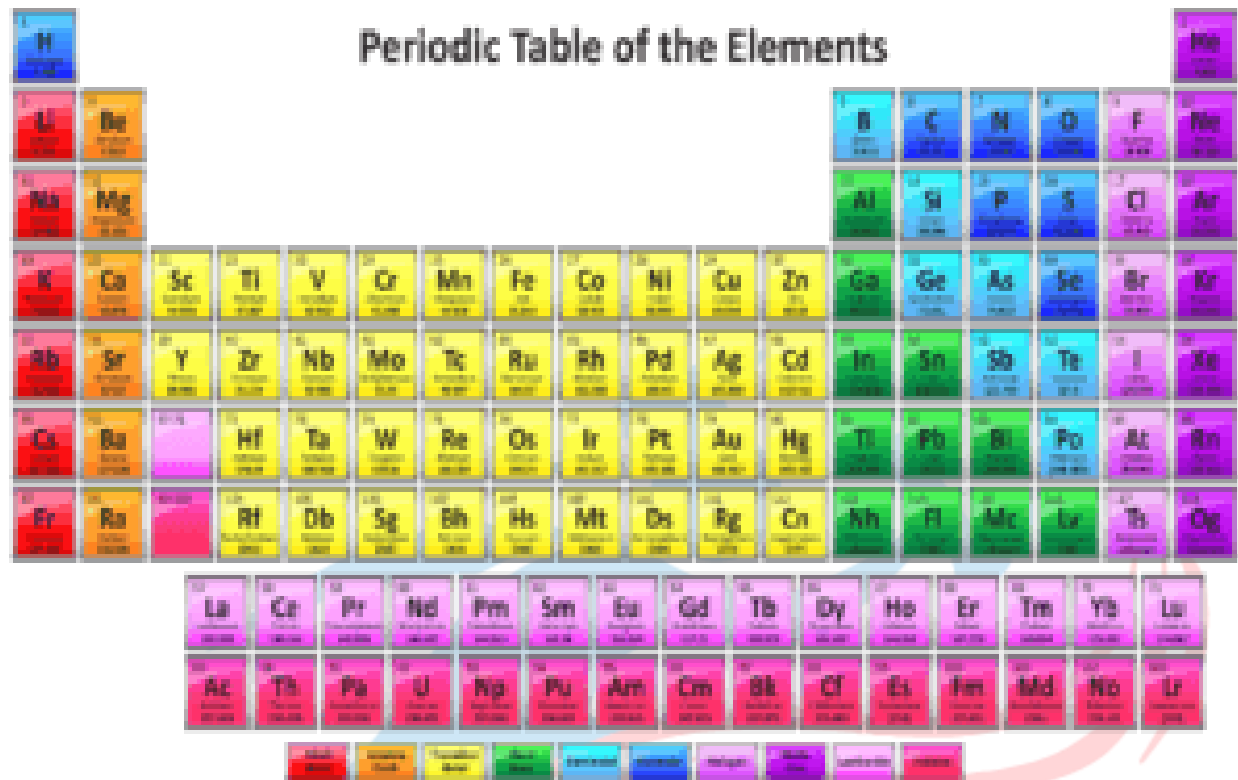
Biochemistry

- Biochemistry is the study of chemical processes that occur within living organisms.

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Periodic Table

Periodic Table of the Elements



1																	18																																				
2	3											10	11	12	13	14	15	16	17	18																																	
19	20											21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36																										
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118																										

■ s-block
■ p-block
■ d-block
■ f-block
■ transition metals
■ noble gases
■ lanthanides
■ actinides

s, p, d, f, g block Elements

General Configuration of elements

s-block : ns^{1-2} where $n = 2$ to 7

p-block : ns^2, ns^{1-6} where $n = 2$ to 6

d-block : $(n - 1)d^{1-10}ns^{0-2}$ where $n = 4$ to 7

f-block : $(n - 2)f^{1-14}(n - 1)d^{0-1}ns^2$
where $n = 6$ to 7

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s Block elements

- s-block elements included the elements of group 1 and group 2 of the periodic table.
- s block elements are metals.
- The elements of group I & II receive their last electron in s-orbital. So they are called as s – block elements.
- Most s-block elements are highly reactive metals due to the ease with which their outer s-orbital electrons interact to form compounds
- The metals Lithium (Li), sodium (Na), potassium (K), rubidium (Rb), caesium (Cs) and francium (Fr) which have one electron in their outermost shell belongs to group I.

<i>Element</i>	<i>Symbol</i>	<i>Electronic configuration</i>
Beryllium	Be	$1s^2 2s^2$
Magnesium	Mg	$1s^2 2s^2 2p^6 3s^2$
Calcium	Ca	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
Strontium	Sr	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$ $4s^2 4p^6 5s^2$
Barium	Ba	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2$ $4p^6 4d^{10} 5s^2 5p^6 6s^2$ or [Xe]6s ²
Radium	Ra	[Rn]7s ²

- They are called as alkali metals as they react with water to form hydroxides which are strong bases or alkalies.
- Hydrogen is highly chemically reactive, like the other s-block elements, but helium is a virtually unreactive noble gas.

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p Block elements

- The p – block elements include the elements of group 13, 14, 15, 16, 17 and 18.
- p block elements are mainly non-metals.
- p-block metals have classic metal characteristics: they are shiny, they are good conductors of heat and electricity, and they lose electrons easily.

IUPAC numbering		Group	1	2	13	14	15	16	17	18
Mendeléeiev numbering		Group	I	II	III	IV	V	VI	VII	VIII
			s	s ²	s ² p ¹	s ² p ²	s ² p ³	s ² p ⁴	s ² p ⁵	s ² or s ² p ⁶
Period	1									2 He
2		3 Li	4 Be	5 B	6 C	7 N	8 O	9 F	10 Ne	
3		11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
4		19 K	20 Ca	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
5		37 Rb	38 Sr	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	
6		55 Cs	56 Ba	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn	
7		87 Fr	88 Ra							

- Of the p-block metals, several have fascinating properties.
- Gallium, in the 3rd row of column 13, is a metal that can melt in the palm of a hand.
- Tin, in the fourth row of column 14, is an abundant, flexible, and extremely useful metal.

d block elements

- The d-block is in the middle of the periodic table and includes elements from columns 3 through 12.
- These elements are also known as the transition metals because they show a transitivity in their properties.



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Element	Symbol	Z	Electronic Configuration
Scandium	Sc	21	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^1 4s^2$
Titanium	Ti	22	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4s^2$
Vanadium	V	23	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$
Chromium	Cr	24	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$
Manganese	Mn	25	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$
Iron	Fe	26	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$
Cobalt	Co	27	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^7 4s^2$
Nickel	Ni	28	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$
Copper	Cu	29	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$
Zinc	Zn	30	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2$

- The d-block elements are all metals which exhibit two or more ways of forming chemical bonds.
- The d-orbitals can contain up to five pairs of electrons.
- d-orbitals can contain up to five pairs of electrons

f block elements

- The f-block is in the centre-left of a 32-column periodic table but in the footnoted appendage of 18-column tables.
- These elements are not generally considered as part of any group.
- They are often called inner transition metals because they provide a transition between the s-block and d-block in the 6th and 7th row.

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Element	Symbol	Z	Electronic configuration
Lanthanum	La	57	$[\text{Xe}]4f^05d^16s^2$
Cerium	Ce	58	$[\text{Xe}]4f^26s^2$
Praseodymium	Pr	59	$[\text{Xe}]4f^36s^2$
Neodymium	Nd	60	$[\text{Xe}]4f^46s^2$
Promethium	Pm	61	$[\text{Xe}]4f^56s^2$
Samarium	Sm	62	$[\text{Xe}]4f^66s^2$
Europium	Eu	63	$[\text{Xe}]4f^76s^2$
Gadolinium	Gd	64	$[\text{Xe}]4f^75d^16s^2$
Terbium	Tb	65	$[\text{Xe}]4f^96s^2$
Dysprosium	Dy	66	$[\text{Xe}]4f^{10}6s^2$
Holmium	Ho	67	$[\text{Xe}]4f^{11}6s^2$
Erbium	Er	68	$[\text{Xe}]4f^{12}6s^2$
Thulium	Tm	69	$[\text{Xe}]4f^{13}6s^2$
Ytterbium	Yb	70	$[\text{Xe}]4f^{14}6s^2$
Lutetium	Lu	71	$[\text{Xe}]4f^{14}5d^16s^2$

- The known f-block elements come in two series, the lanthanides of period 6 and the radioactive actinides of period 7.
- The f-orbitals can contain up to seven pairs of electrons.

g block elements

- The g-block is a hypothetical block of elements in the extended periodic table.
- The outermost electrons are posited to have one or more g-orbital electrons.
- The elements do not have f-, d- or p-orbital electrons.

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Chemical Bonds

Why atoms form chemical bonds?

- The basic answer is that atoms are trying to reach the most stable (lowest-energy) state that they can.
- Many atoms become stable when their valence shell is filled with electrons.
- If atoms don't have this arrangement, they will reach it by gaining, losing, or sharing electrons via bonds.

Types of Bonds

They are 4 types of Bonds

- Ionic Bond
- Covalent Bond
- Polar Bond
- Hydrogen Bond

Ionic Bond

- Ionic bonding involves a transfer of an electron, so one atom gains an electron while one atom loses an electron.
- One of the resulting ions carries a negative charge (anion), and the other ion carries a positive charge (cation).
- Because opposite charges attract, the atoms bond together to form a molecule.

Covalent Bond

- The most common bond in organic molecules, a covalent bond involves the sharing of electrons between two atoms.
- The pair of shared electrons forms a new orbit that extends around the nuclei of both atoms, producing a molecule.
- here are two secondary types of covalent bonds that are relevant to biology known as polar bonds and hydrogen bonds.

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Polar Bond

- Polar bond forms when two atoms connected by a covalent bond may exert different attractions for the electrons in the bond, producing an unevenly distributed charge.
- Water is an example of a polar molecule.

Hydrogen Bond

- Two adjacent H₂O (water) molecules can form a linkage known as a hydrogen bond when they polarize.

Important Chemistry Chemical name and Formula

Chemical name	Chemical formula	Common name	Use
<i>Acetic acid</i>	$CH_3COOH + H_2O$	<i>5% Solution: White vinegar</i>	<i>White vinegar — 5% or "cleaning vinegar"—10%</i>
<i>Acetone</i>	CH_3COCH_3	<i>Acetone</i>	<i>Nail Polish Remover</i>
<i>Acetylsalicylic acid</i>	$C_9H_8O_4$	<i>Aspirin</i>	<i>Aspirin</i>
<i>Aluminum hydroxide</i>	$Al(OH)_3$	<i>alumina hydrate</i>	<i>antacid tablets</i>
<i>Ammonium bi-fluoride</i>	NH_4HF_2	<i>Ammonium hydrogen fluoride</i>	<i>Toilet bowl cleaner</i>



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<i>Ammonium bromide</i>	NH_4Br	—	<i>Photography store/Darkroom; "bleach bath" for photograph development</i>
<i>Ammonium phosphate</i>	$(NH_4)_3PO_4$	<i>Fertilizer</i>	<i>Garden/Agricultural supply; by name</i>
<i>Ammonium sulfate</i>	$(NH_4)_2SO_4$	—	<i>Garden/Agricultural supply; fertilizer or pH adjuster for soil</i>
<i>Amylose</i>	$(C_6H_9O_5)_n$	<i>Cornstarch</i>	<i>Cornstarch</i>
<i>Ascorbic acid</i>	$C_6H_8O_6$	<i>Vitamin C</i>	<i>Vitamin C tablets</i>
<i>barium sulfate</i>	$BaSO_4$	<i>Lithopone</i>	<i>radiocontrast agent for x-rays and CAT scans</i>
<i>bismuth subsalicylate</i>	$C_7H_5BiO_4$	<i>Pepto-Bismol</i>	<i>The active ingredient in Pepto-Bismol and Kaopectate.</i>
<i>boric acid</i>	H_3BO_3	<i>Ant/Roach Killer, boracic acid</i>	<i>Ant/Roach Killer.</i>
<i>bromthymol blue</i>	$C_{27}H_{28}Br_2O_5S$	<i>pH Test</i>	<i>Aquarium pH test kits</i>



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<i>butane</i>	C_4H_{10}	<i>Butane</i>	<i>The lighter fluid in hand-held fire starters or cigarette lighters is usually liquid butane.</i>
<i>caffeine</i>	$C_8H_{10}N_4O_2$	<i>No-Doz</i>	<i>Often in formulation with corn starch as a binder.</i>
<i>calcium carbonate</i>	$CaCO_3$	<i>Limestone, Carbonate of Lime</i>	<i>Chunks: Marble, limestone. Powder: Precipitated chalk.</i>
<i>calcium chloride</i>	$CaCl_2$	<i>Laundry Aid/Road Salt/De-Icer</i>	<i>used to de-ice roads in cold climates.</i> <i>Also available as a laundry aid; or as a room, moisture</i>
<i>calcium hydroxide</i>	$Ca(OH)_2$	<i>Slaked Lime, garden lime</i>	<i>used to reduce acidity in the soil.</i>
<i>calcium hypochlorite</i>	$Ca(ClO)_2$	—	<i>Bleaching powder and some swimming pool disinfectants.</i>



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<i>calcium sulphate, hemihydrate</i>	$\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$	<i>Plaster of Paris</i>	<i>Art & Craft</i>
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More Chemistry Formulas

Name	Formula	Common Name	Use
<i>camphor</i>	$\text{C}_{10}\text{H}_{16}\text{O}$	—	<i>Can be found as a flavour additive. Sometimes found in the drugstore as a cream or oral remedy. It feels cool like menthol on the skin.</i>
<i>carbon</i>	C	<i>Soot, Graphite, Graphene, Carbon nanotubes, Fullerenes, Diamond, Charcoal</i>	<i>used in cooking Activated charcoal used in fish tank filters and graphite used in pencil.</i>
<i>carbon dioxide</i>	CO_2	—	<i>Dry ice and ice cream. Used in air guns and in paintball.</i>



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<i>carbonic acid</i>	H_2CO_3	—	<i>Soda water is simply carbonated water, a dilute solution of carbonic acid.</i>
<i>carrageenan</i>	—	—	<i>food additive. Used in many commercial food preparations as a thickener and gelling agent.</i>
<i>chromium oxide</i>	Cr_2O_3	<i>Chrome Green</i>	<i>Used as a green pigment for fine art paints. Sold as 'Green Rouge' for polishing metal.</i>
<i>citric acid</i>	$C_6H_8O_7$	<i>Sour Salt</i>	<i>Sour Salt. Also, used for home soap making and also in photographic development.</i>
<i>copper</i>	Cu	—	<i>Electrical wire, copper pipe, and copper sheeting</i>



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<i>copper naphthenate</i>	$Cu(C_{11}H_{10}O_2)_2$	<i>cupric naphthenate</i>	<i>Used as a wood preservative to protect lumber from termites, ants, and other burrowing insects.</i>
<i>cyanuric acid</i>	$C_3H_3N_3O_3$	<i>isocyanuric acid</i>	<i>chlorine stabilizer.</i>
<i>dichloromethane</i>	CH_2Cl_2	<i>methylene chloride</i>	<i>Used as a solvent, degreaser and adhesive remover,</i>
<i>dimethyl sulfoxide</i>	$(CH_3)_2SO$	<i>DMSO</i>	<i>Available from health food and naturopathic supply stores for treating injuries.</i>
<i>ethanol/ethyl alcohol</i>	C_2H_5OH	<i>Everclear</i>	<i>Available as 95% pure ethanol and 5% water from liquor stores in most states. Also available in denatured form from hardware stores.</i>

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Basic Static GK

<u>Awards and Honors</u>	<u>Abbreviations (General)</u>	<u>Banking Awareness</u>
<u>Chemistry – General & Organic</u>	<u>Famous Books and Authors</u>	<u>Famous Personalities</u>
<u>Important Days & Years</u>	<u>General English</u>	<u>Physics Awareness</u>
<u>Science and Technology</u>	<u>Sports</u>	<u>Computer Awareness</u>

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recruitment.guru2017@gmail.com