The Earth’s Chemistry

Most Abundant Elements

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Presentation by:
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Learning Objectives

At the end of this module, you should be able to:

- Recognize composition differences in the Earth's atmosphere, oceans, crust, and core.
- List several common elements abundantly associated with Earth.

Most Common Elements

Atmosphere	N O Ar	Nitrogen; Oxygen
Oceans	O H Cl Na Mg S	Water; Ions
Crust	O Si Al Fe Mg Ca K Na	Quartz; Feldspar
Core	Fe Ni	Iron; Nickel

Most Common Elements

Earth's Atmosphere

N O Ar

1												13	14	15	16	17	18
1 H 1.008	2																2 He 4.0026
3 Li 6.94	4 Be 9.0122											5 B 10.81	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305	3	4	5	6	7	8	9	10	11	12	13 Al 26.982	14 Si 28.085	15 P 30.974	16 S 32.06	17 Cl 35.45	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.38	31 Ga 69.723	32 Ge 72.630	33 As 74.922	34 Se 78.97	35 Br 79.904	36 Kr 83.798
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.95	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57-71 *	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89-103 #	104 Rf (265)	105 Db (268)	106 Sg (271)	107 Bh (270)	108 Hs (277)	109 Mt (276)	110 Ds (281)	111 Rg (280)	112 Cn (285)	113 Nh (286)	114 Fl (289)	115 Mc (289)	116 Lv (293)	117 Ts (294)	118 Og (294)

* Lanthanide series	57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.05	71 Lu 174.97
# Actinide series	89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

Nitrogen accounts for 78% of the atmosphere, oxygen 21% and argon 0.9%.

Most Common Elements

Earth's Oceans

O H

Cl Na Mg S

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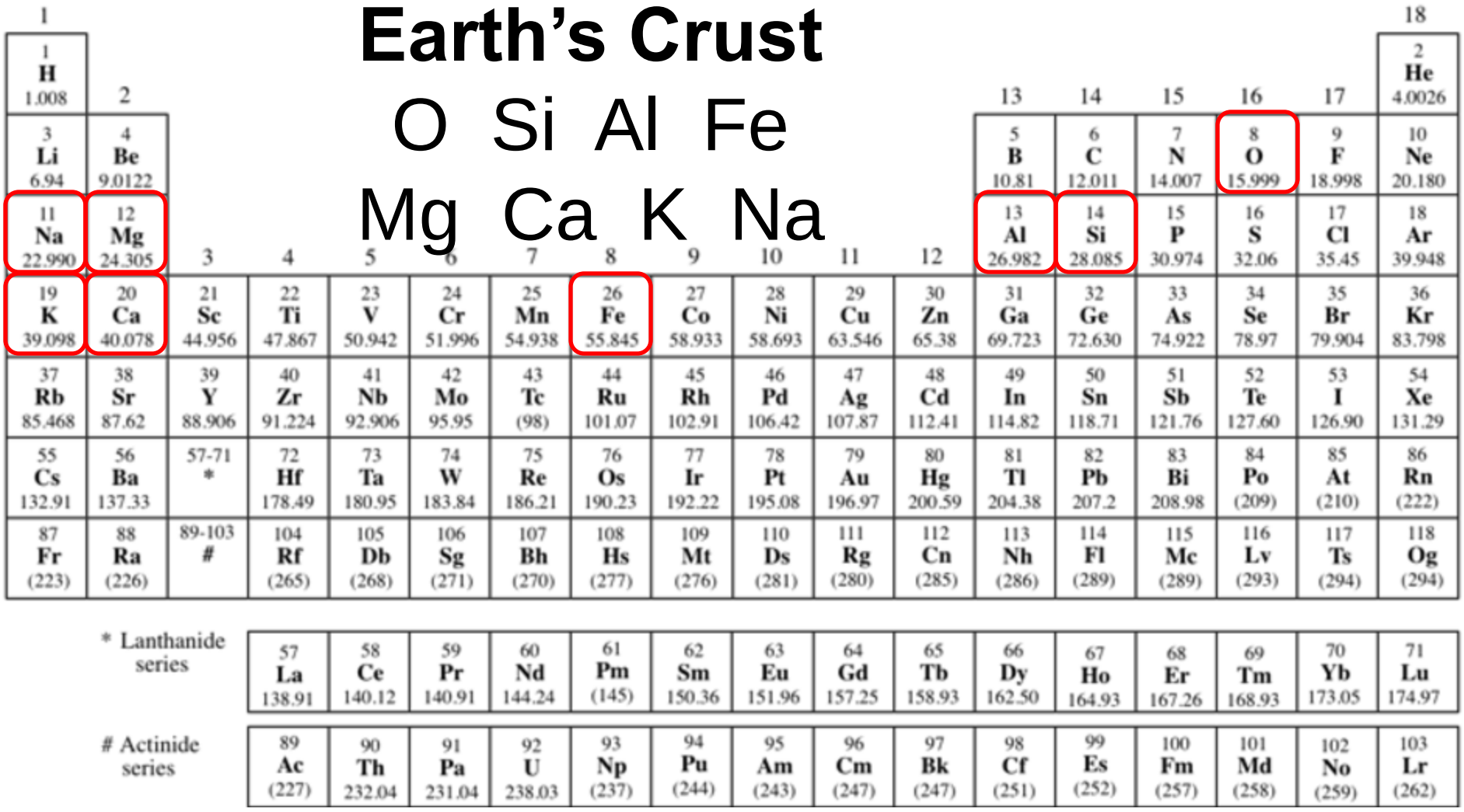
Aside from H_20, seawater's most abundant elements (as dissolved ions) are sodium, chloride, magnesium, sulfate and calcium.

Most Common Elements



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Earth's crust is made up of: oxygen 47%; silicon 27% ; aluminum 8%; iron 5%; calcium 4%; magnesium, potassium and sodium 2%.

Most Common Elements

Earth's Core
Iron and Nickel

1												13	14	15	16	17	18
1 H 1.008	2																2 He 4.0026
3 Li 6.94	4 Be 9.0122											5 B 10.81	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
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The solid, inner core of iron has a radius of about 760 miles (about 1,220 km). It is surrounded by a liquid, outer core composed of a nickel-iron alloy.

Major Element

Atmosphere
Oceans YES
Crust
Core

1

H

Hydrogen

Major Element

Atmosphere YES
Oceans
Crust
Core

7

N

Nitrogen

Major Element

Atmosphere	YES
Oceans	YES
Crust	YES
Core	

8

O

Oxygen

Major Element

Atmosphere
Oceans YES
Crust YES
Core

11

Na

Sodium

Major Element

Atmosphere
Oceans YES
Crust YES
Core

12

Mg

Magnesium

Major Element

Atmosphere	
Oceans	
Crust	YES
Core	

13

Al

Aluminum

Major Element

Atmosphere	
Oceans	
Crust	YES
Core	

14

Si

Silicon

Major Element

Atmosphere
Oceans YES
Crust
Core

16

S

Sulphur

Major Element

Atmosphere YES
Oceans
Crust
Core

18

Ar

Argon

Major Element

Atmosphere
Oceans
Crust YES
Core

19

K

Potassium

Major Element

Atmosphere
Oceans YES
Crust YES
Core

20

Ca

Calcium

Major Element

Atmosphere
Oceans
Crust YES
Core YES

26

Fe

Iron

Major Element

Atmosphere
Oceans
Crust
Core YES

28

Ni

Nickel

Earth’s Common Elements

H	N	O	Na	Mg	Al	Si	S	Ar	K	Ca	Fe	Ni
Atmosphere	Atmosphere YES	Atmosphere YES	Atmosphere	Atmosphere	Atmosphere	Atmosphere	Atmosphere	Atmosphere YES	Atmosphere	Atmosphere	Atmosphere	Atmosphere
Oceans YES	Oceans	Oceans YES	Oceans YES	Oceans YES	Oceans	Oceans	Oceans YES	Oceans	Oceans	Oceans YES	Oceans	Oceans
Crust	Crust	Crust YES	Crust YES	Crust YES	Crust YES	Crust YES	Crust	Crust	Crust YES	Crust YES	Crust YES	Crust
Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core	Core YES	Core YES

Major Take-Away

While there are dozens of naturally occurring elements in the Earth, only a few elements represent the majority of the Earth's composition.

- Oxygen (O) is a major component of the atmosphere, oceans, & crust.
- Iron (Fe) is a major component of the crust, and the core.

Primary Sources:
- Wikipedia.com
- Space.com
- climate.ncsu.edu
- Britannica.com

Search Expressions:
- Chemical composition of Earth's core
- Chemical composition of Earth's crust
- Chemical composition of Earth's oceans
- Chemical composition of Earth's atmosphere