

Atoms and the Periodic Table

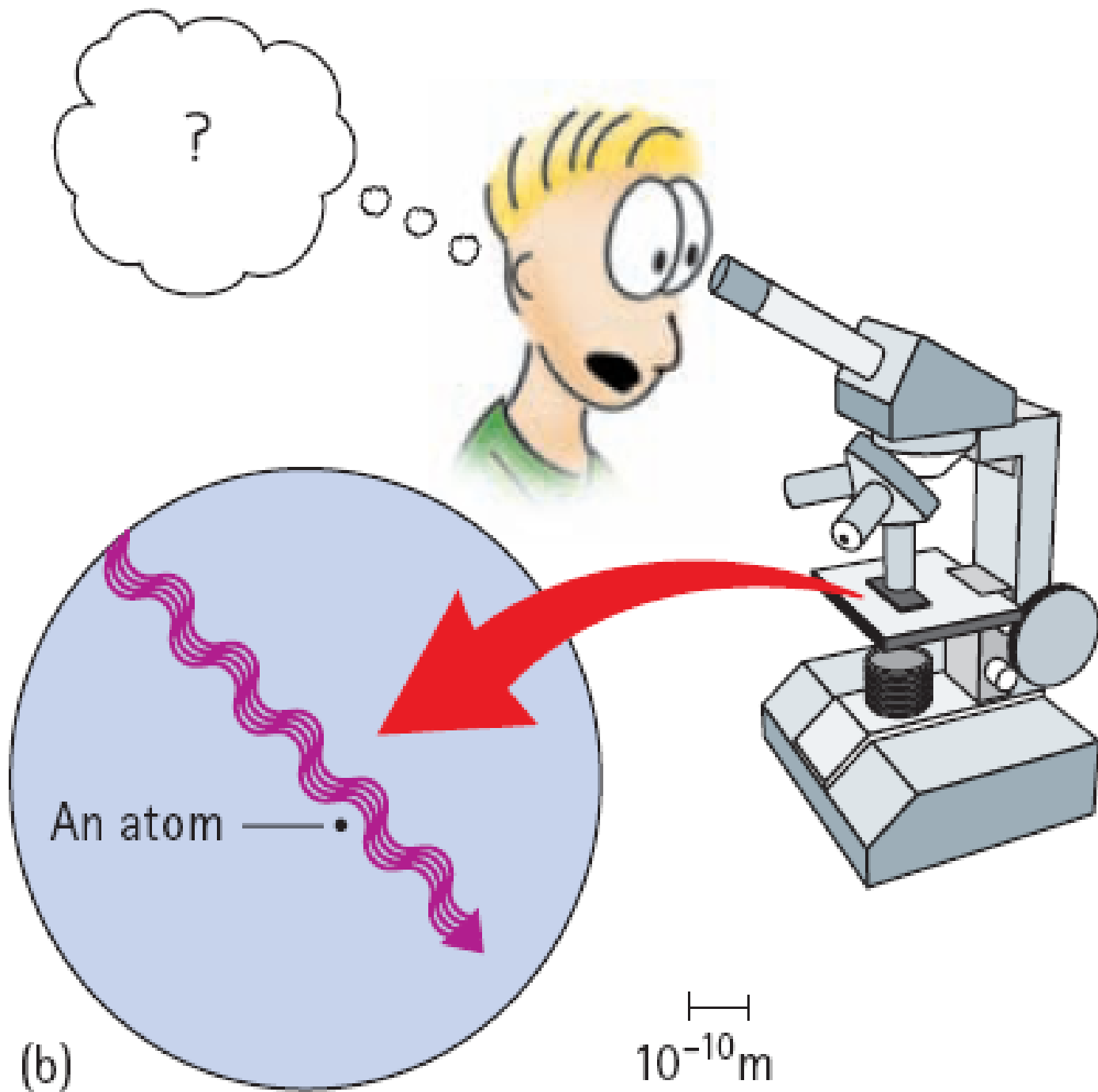
Chapter 12

Pages 285-305



Atoms in a baseball

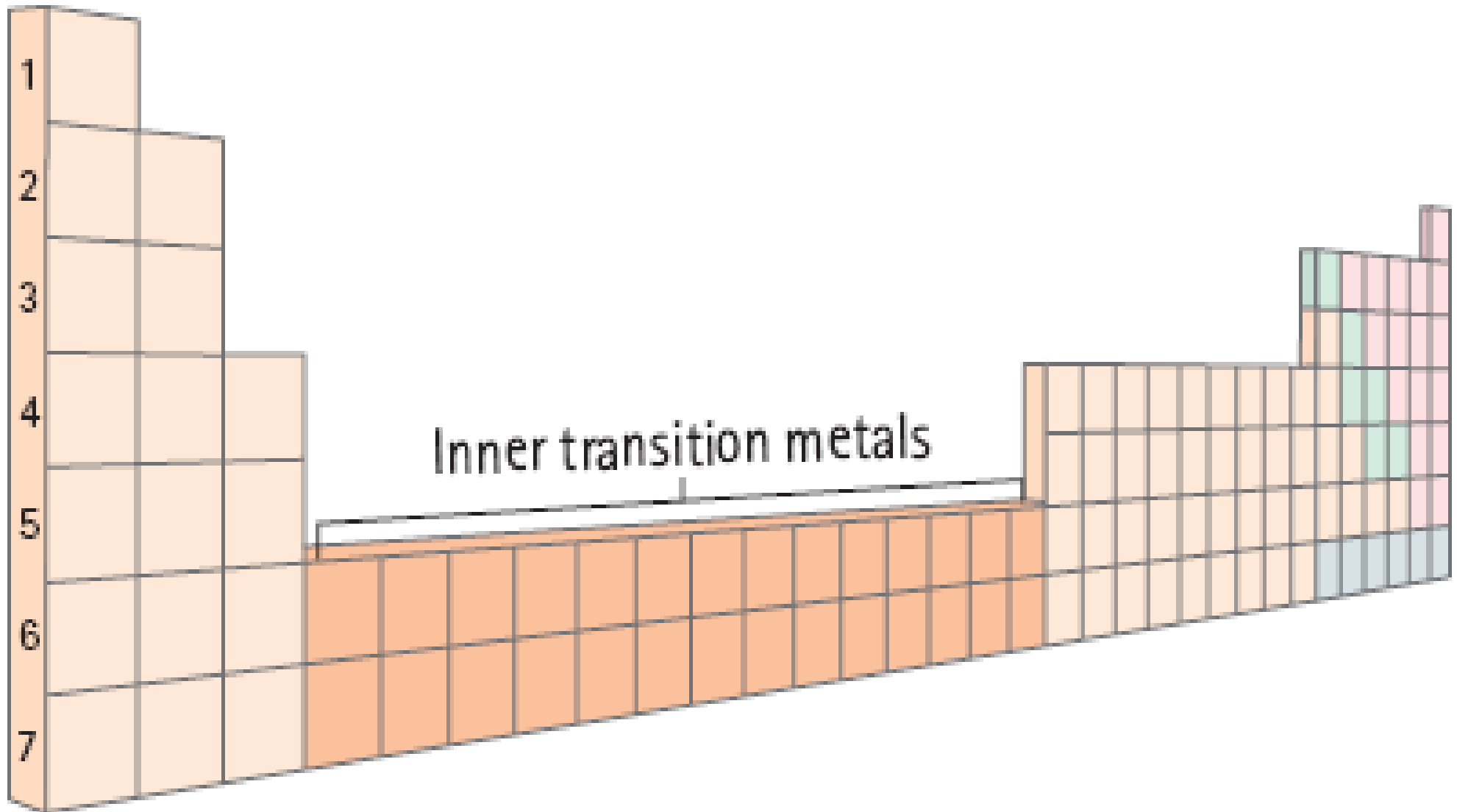
Ping-Pong balls in Earth



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

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

Actual arrangement doesn't fit on page very well



Periodic Table

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55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
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Na

Atomic symbol

Only first letter is capital

CO is not cobalt (Co)

Electron cloud



Nucleus

Atomic Structure

- Protons
- Neutrons
- Electrons

Atomic Structure--Protons

- Electrical charge +1
 - Equal number of negative electrons
 - Balance to zero charge
- Atomic number is # of protons
- Mass = 1 atomic mass unit (amu)

Atomic Structure--**Neutrons**

- Electrical charge = 0
- Mass = 1 atomic mass unit (amu)
- Number of neutrons is not set for an atom of an element

Atomic Structure--Nucleus

- Protons--set number, determines the element
- Neutrons—no set number, can be different for same element

Make up the NUCLEUS

NEW KLEE US

Nucleons—have mass

NEW KLEE ONS

Atomic Structure-- **Electrons**

- Electrical charge -1
- Mass = almost nothing
(1/1837 of a proton)





<http://www.joesentell.com/panther/panther.htm>



http://www.skynet.ie/~ceason/cormac/stuff/housefly_anim.gif



<http://web.ics.purdue.edu/~drhodes/hort410/vgsd13.htm>

Isotope notation



Stable Isotope of Sodium

Atomic number is protons: 11

Mass #: 23 nucleons is isotope

Periodic Table coding

- Metals, metalloids and nonmetals

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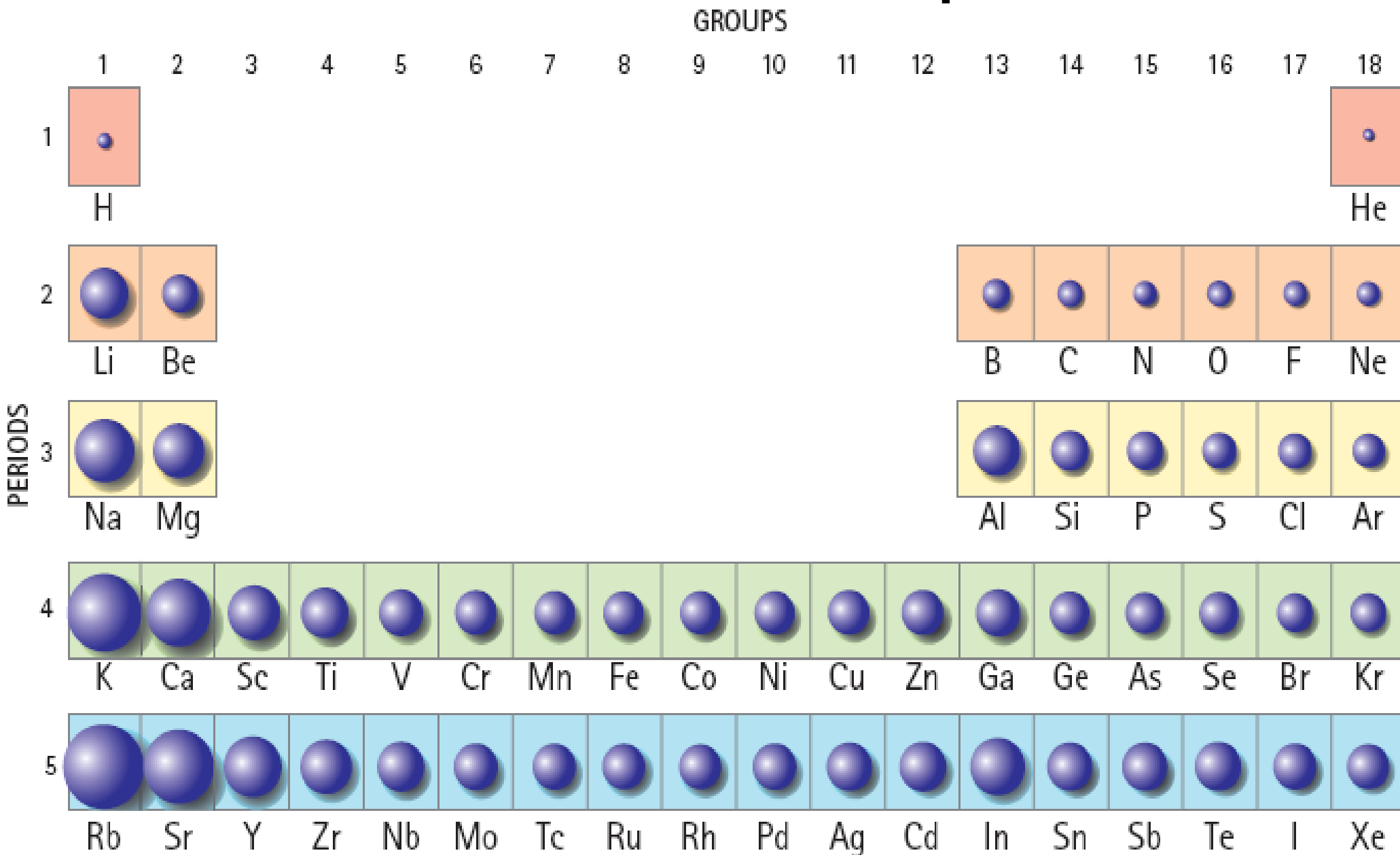
Periods and Groups

GROUPS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1 →	1 H																	2 He	
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6th-period subset →	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
7th-period subset →	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

Atomic size across periods



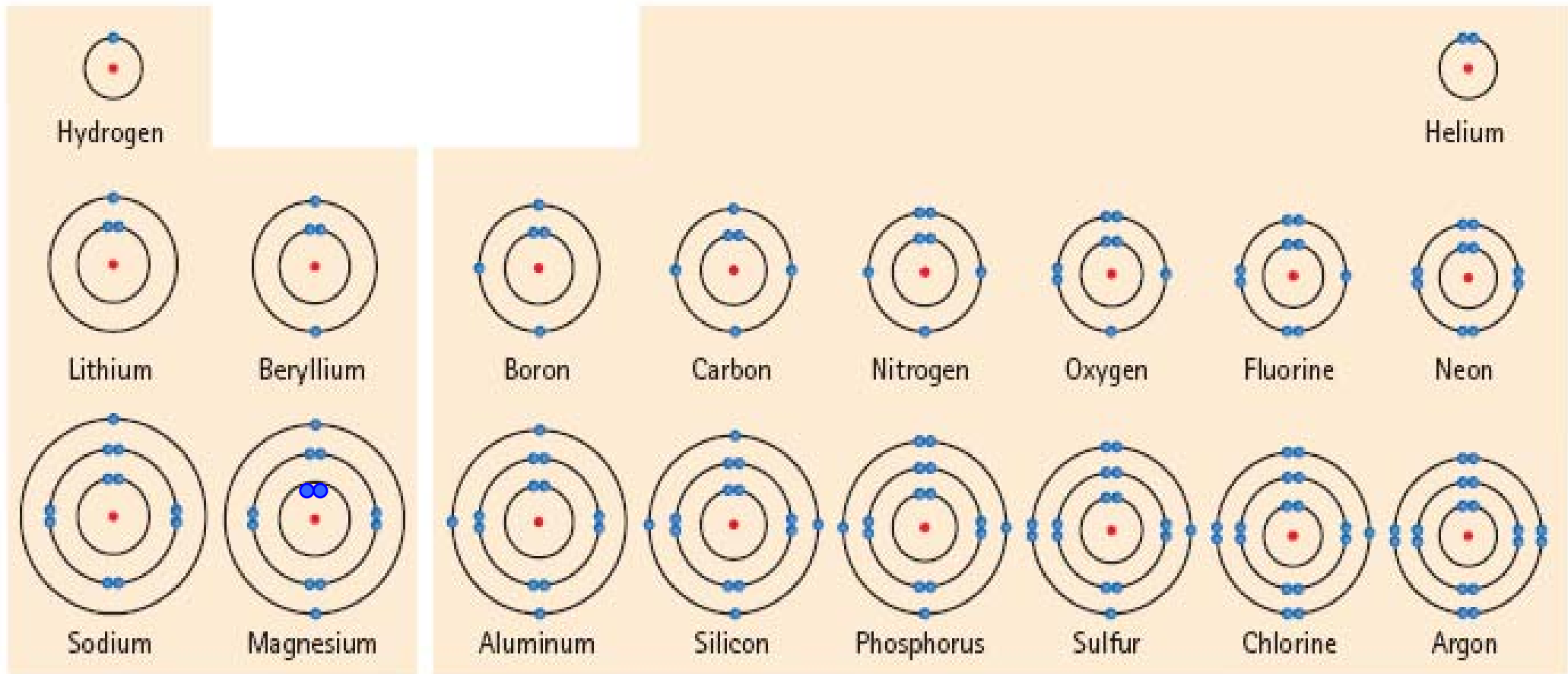
Groups (families)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Alkali metals	Alkaline-earth metals	Transition metals										B	C	N	O	Halogens	Noble gases
		Al	Si	P	Chalcogens												
		Ga	Ge	As	Chalcogens												
		In	Sn	Sb	Chalcogens												
		Tl	Pb	Bi	Po												

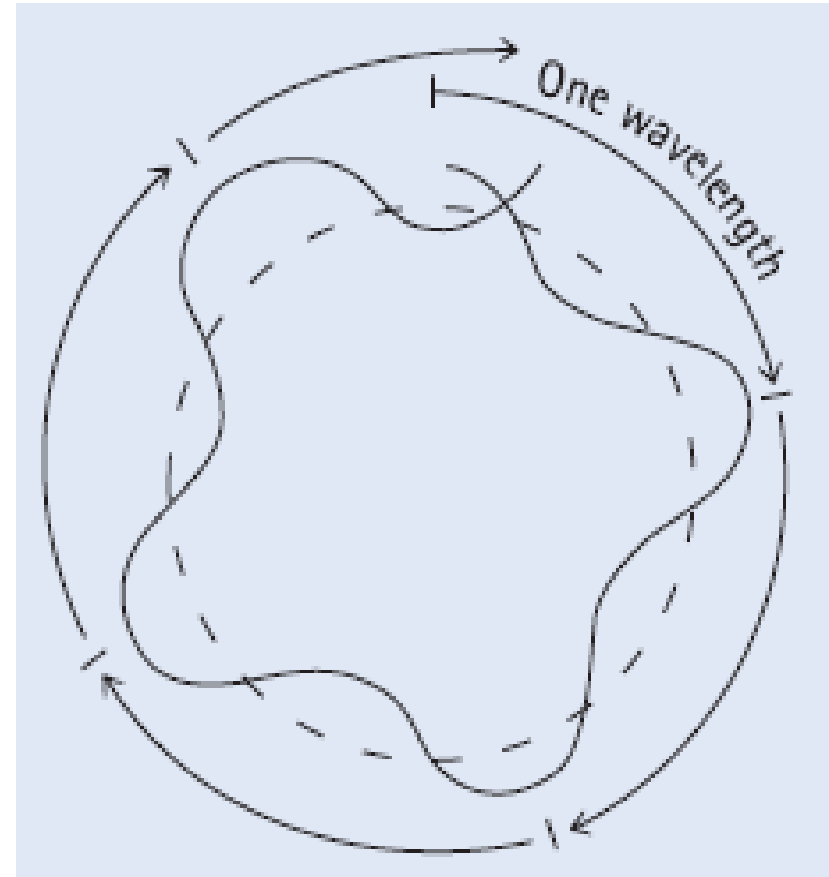
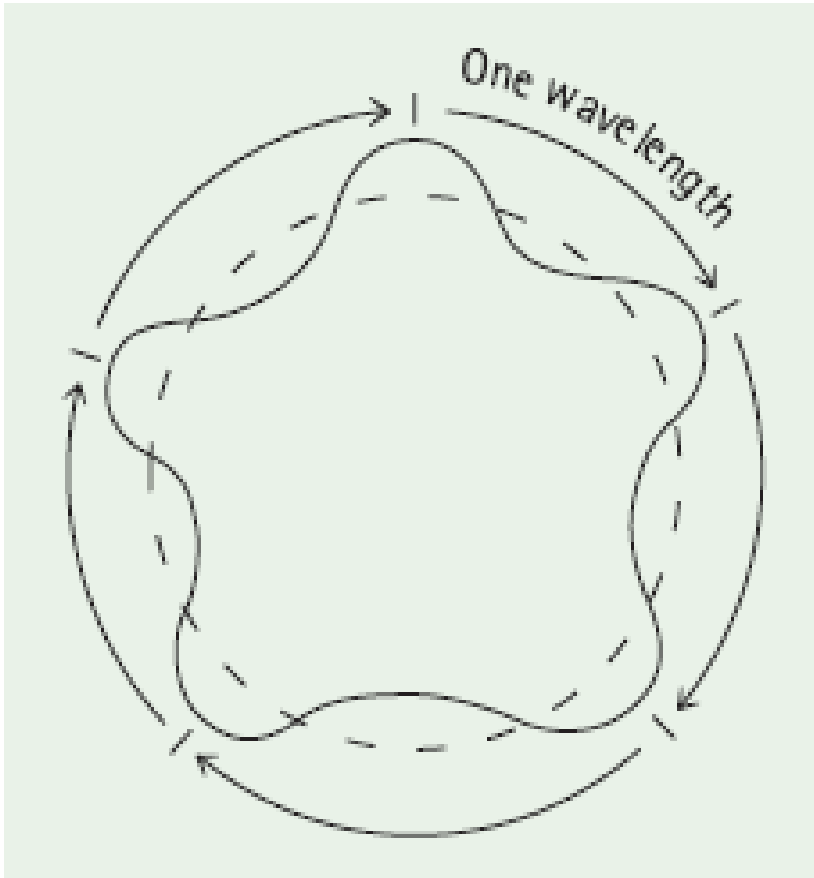


Electrons shells in periodic table

- First three periods



Electron waves



- Certain energy and location function of wavelength—right diagram is not sustainable

Atomic Structure--**Electrons**

Modeled in energy shells

- First shell 2 electrons
- Second shell 8 electrons
- Third shell 8 electrons



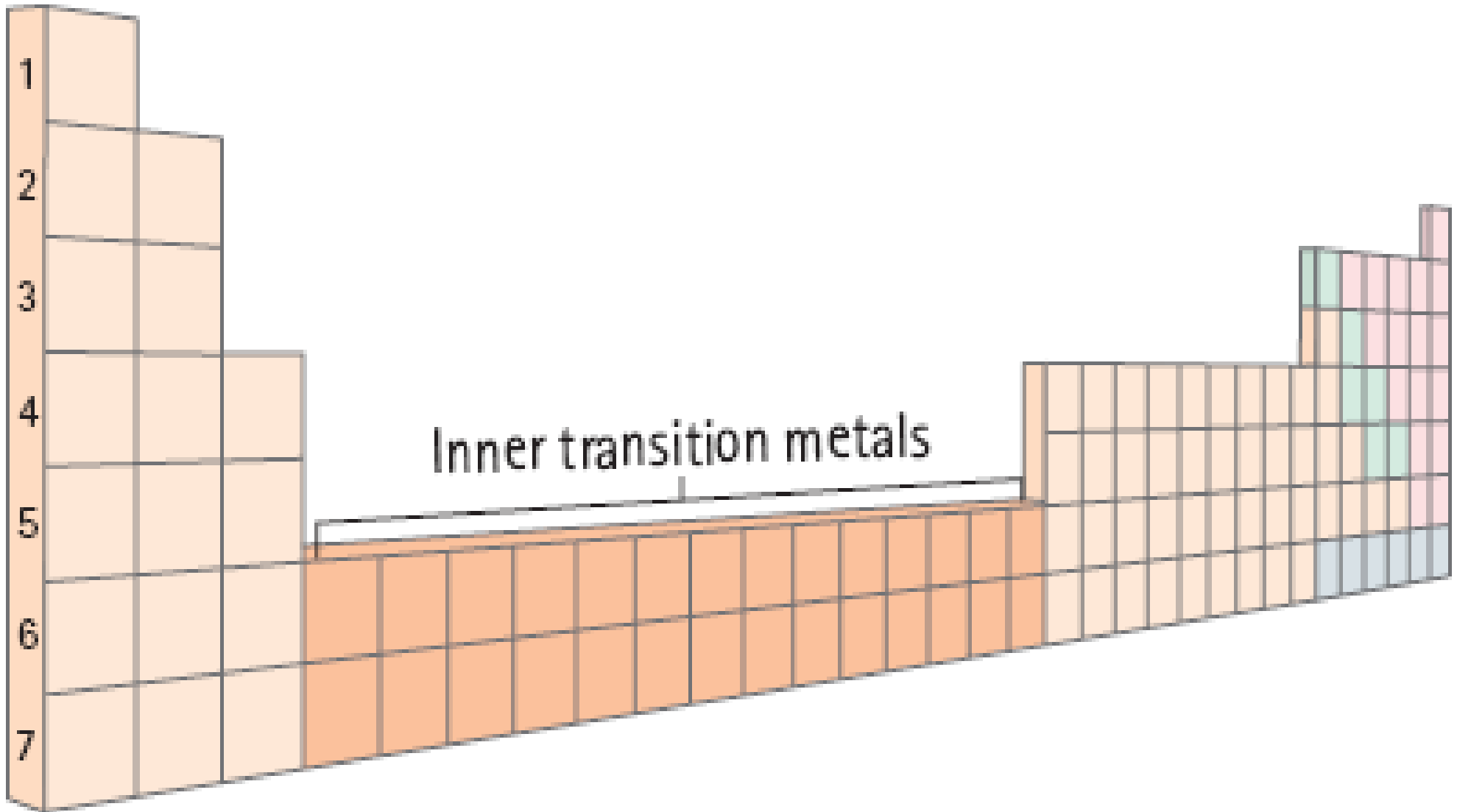
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Inner transition metals





<http://www.joesentell.com/panther/panther.htm>



http://www.skynet.ie/~ceason/cormac/stuff/housefly_anim.gif



<http://web.ics.purdue.edu/~drhodes/hort410/vgsd13.htm>