

Atoms and the Periodic Table

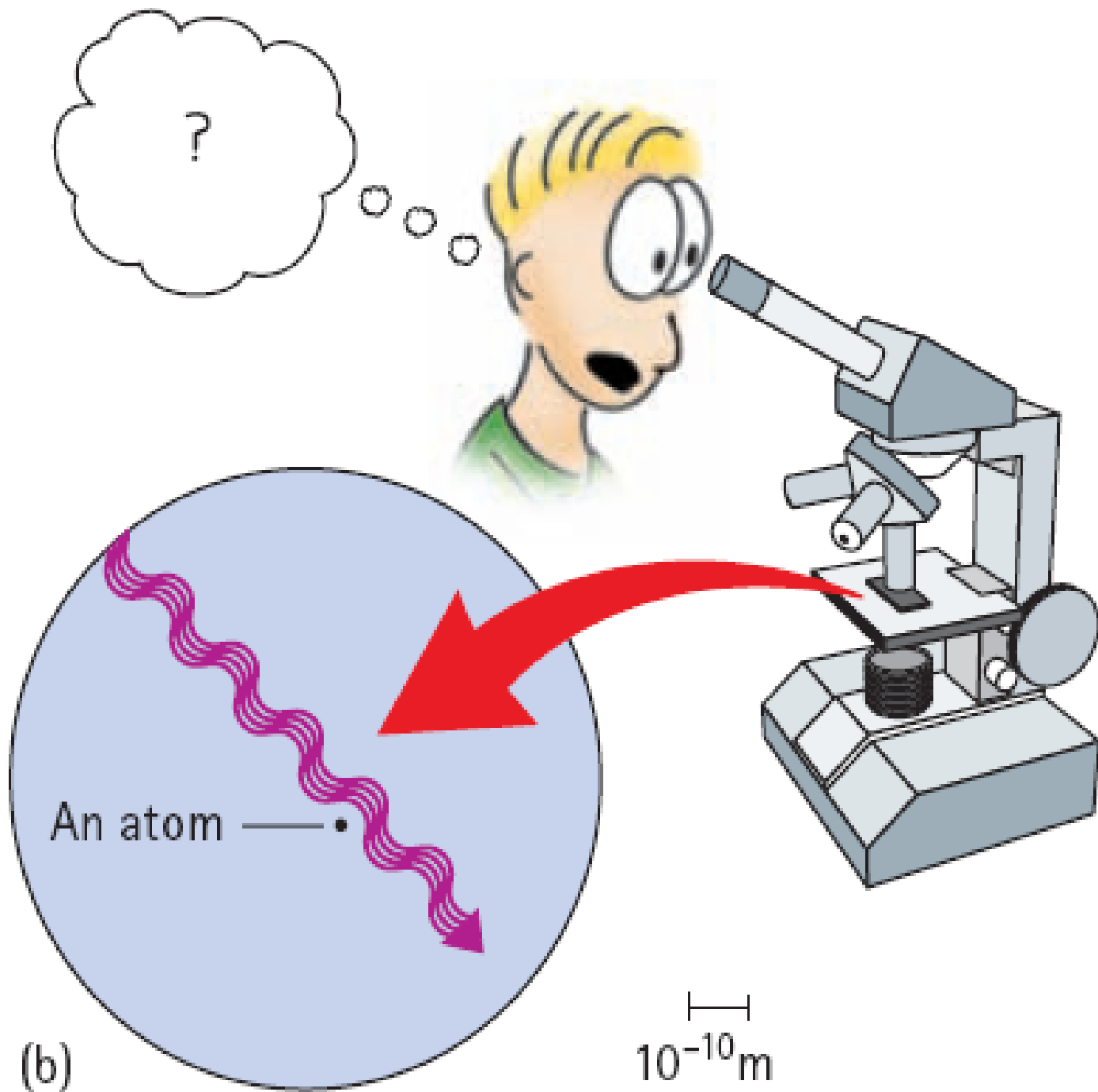
Chapter 12

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

Atomic Structure

- Protons
- Neutrons
- Electrons

Electron cloud



Nucleus





<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>

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)

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 (u)

Atomic Structure-- **Electrons**

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

Atomic Structure--**Neutrons**

- Electrical charge 0
- Mass = 1 atomic unit

Atomic Structure--Nucleus

- Protons
- Neutrons

Make up the NUCLEUS

NEW KLEE US

Nucleons—have mass

NEW KLEE ONS

- Electrons—minimal mass

Isotope notation



Stable Isotope of Sodium

Atomic number is protons,

Mass number of nucleons is isotope

Periodic Table coding

- Metals, nonmetals and metalloids

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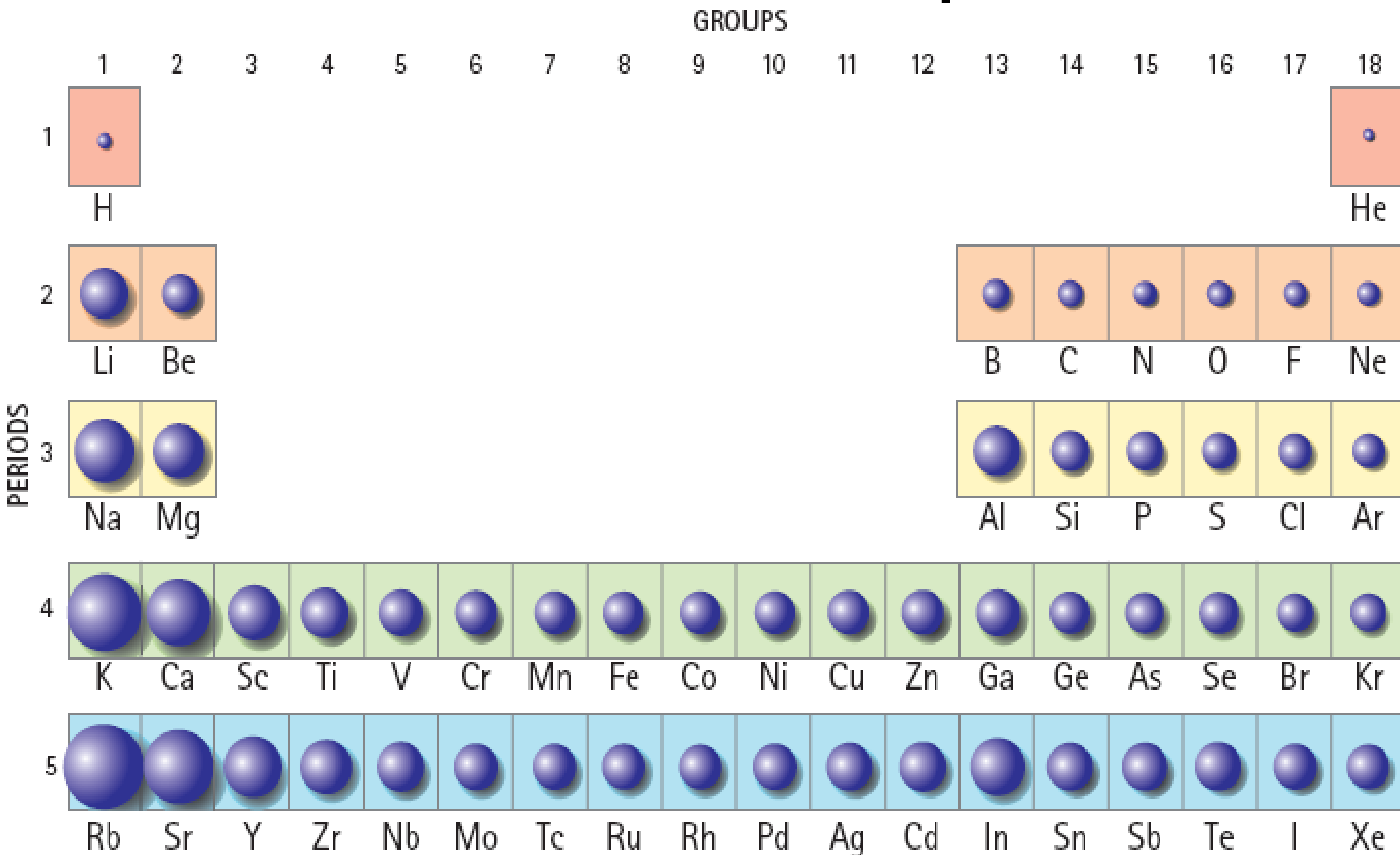
Periods and Groups

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

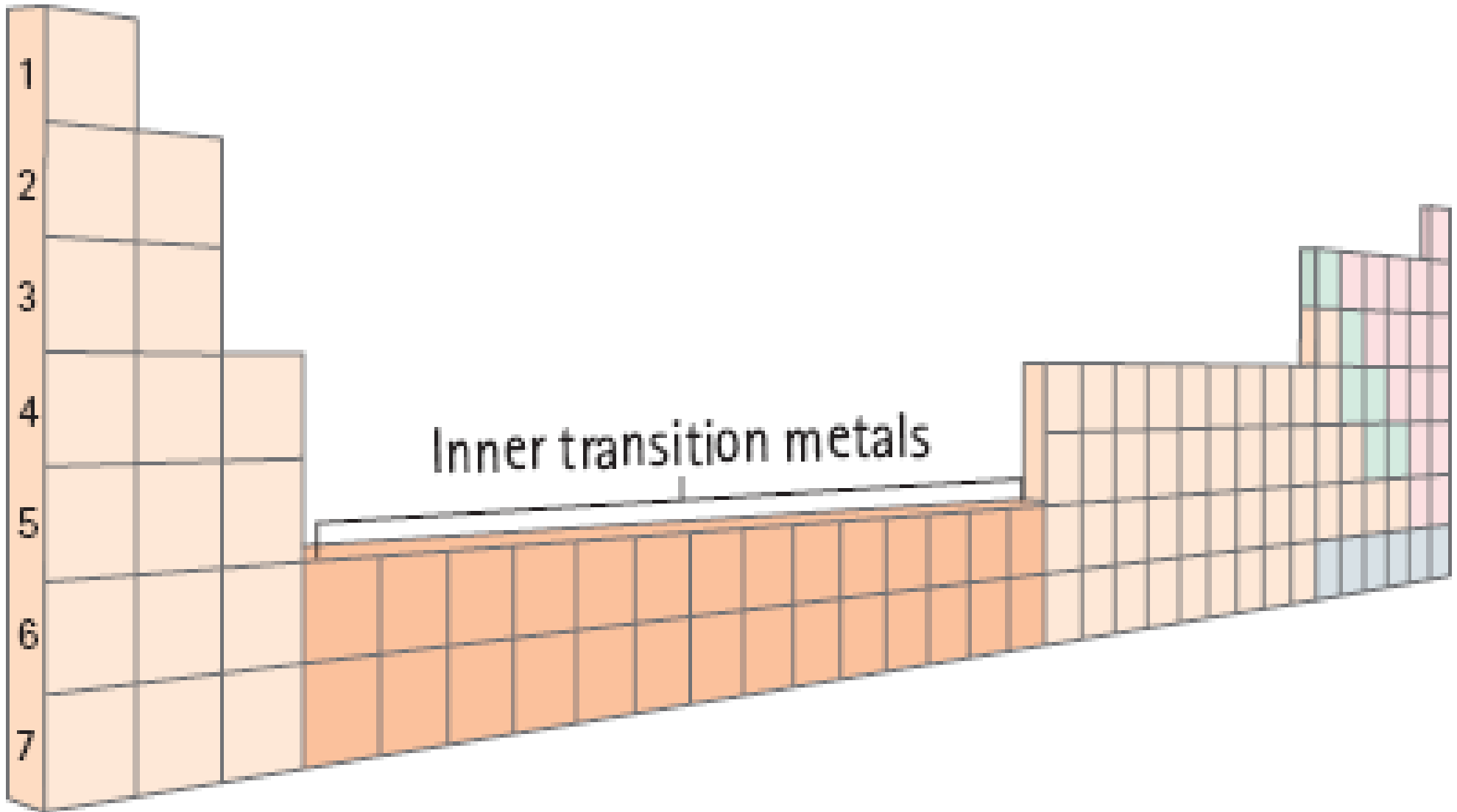


Groups (families)

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				
												In	Sn	Sb				
												Tl	Pb	Bi				Po

common names

Inner transition metals



Periodic Table

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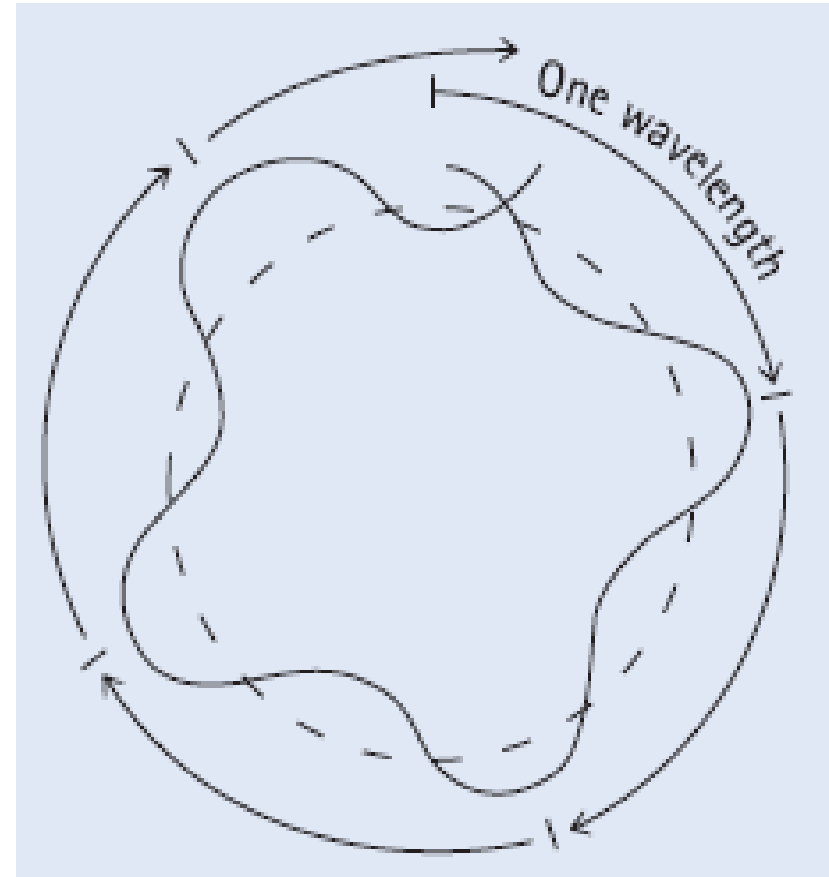
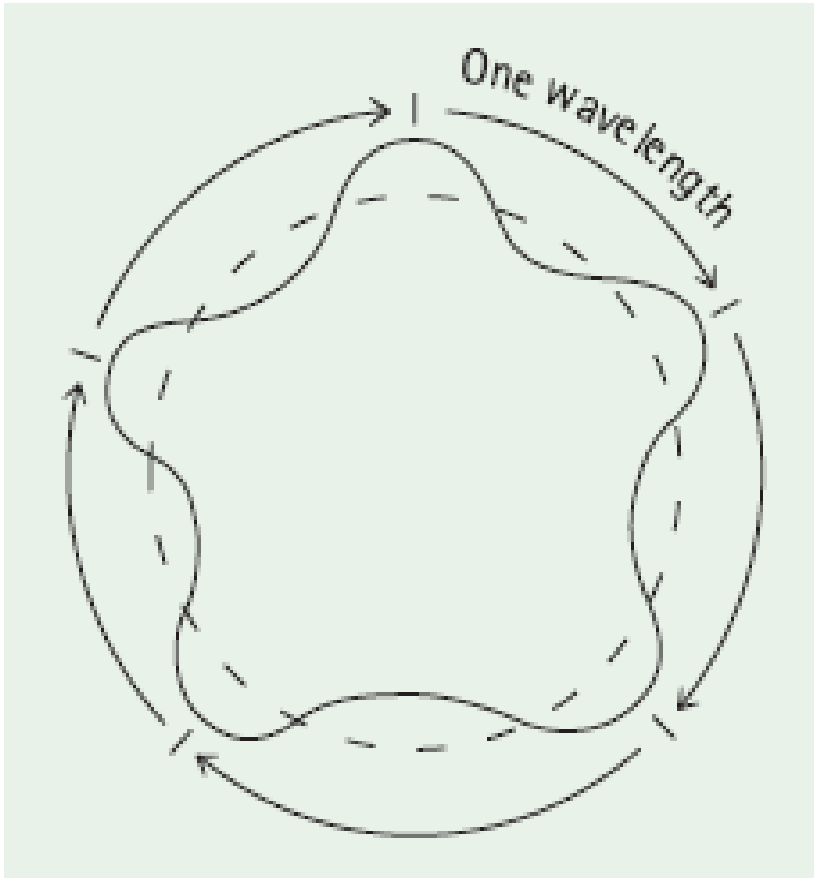


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Electron waves



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



Atomic Structure--**Electrons**

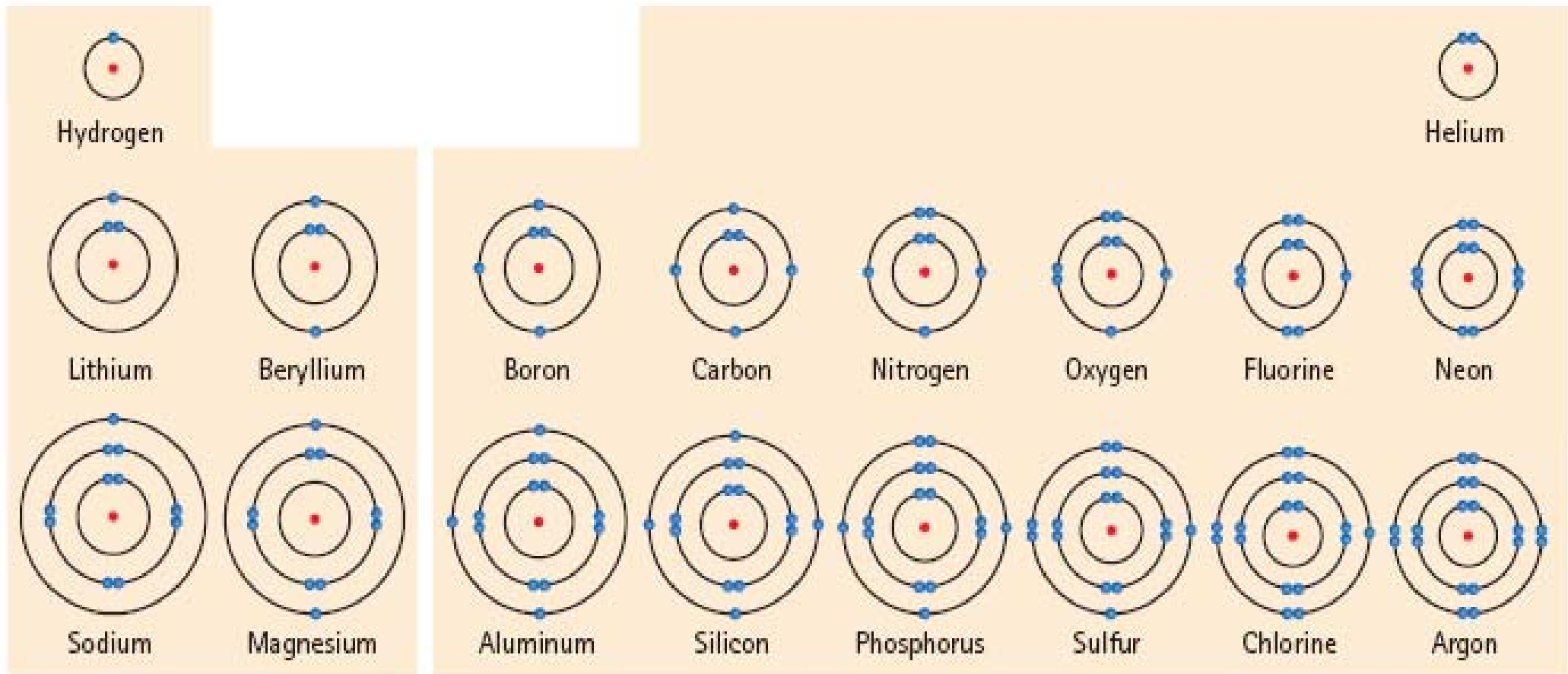
Modeled in energy shells

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



Electrons shells in periodic table

- First three periods



Atomic Structure

Atomic Number = number of protons

- Controls properties of elements
- Constant number for all atoms of the same element

Atoms of the same substance may have different numbers of neutrons

- ISOTOPES of the same element described by mass number
- Atomic mass of element is average mass of isotopes that occur in nature

Electrons have negligible mass and are present in a cloud surrounding the nucleus—modeled with shells, but actually random locations