



Sodium

© 2011 Pearson Education, Inc.

+



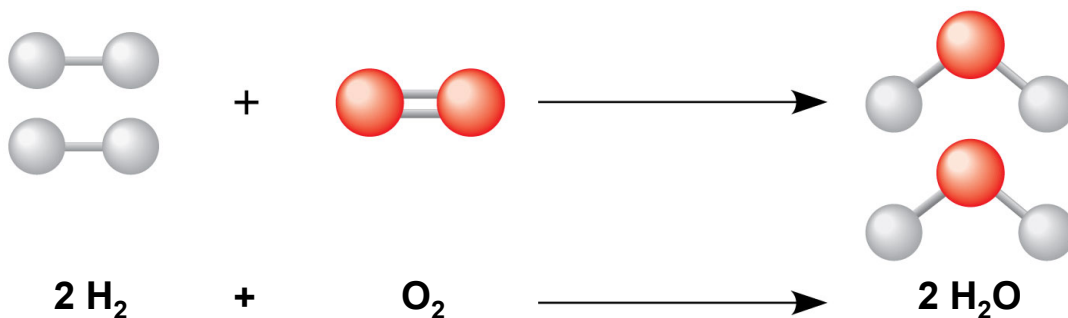
Chlorine

→



Sodium chloride

1



2 H₂

+

O₂

→

2 H₂O

Reactants

Reaction

Products

© 2011 Pearson Education, Inc.

2

Table 2.1 Elements in the Human Body

Element	Symbol	Percentage of Body Mass (including water)	
Oxygen	O	65.0%	} 96.3%
Carbon	C	18.5%	
Hydrogen	H	9.5%	
Nitrogen	N	3.3%	
Calcium	Ca	1.5%	} 3.7%
Phosphorus	P	1.0%	
Potassium	K	0.4%	
Sulfur	S	0.3%	
Sodium	Na	0.2%	
Chlorine	Cl	0.2%	
Magnesium	Mg	0.1%	
Trace elements (less than 0.01% of mass): Boron (B), chromium (Cr), cobalt (Co), copper (Cu), fluorine (F), iodine (I), iron (Fe), manganese (Mn), molybdenum (Mo), selenium (Se), silicon (Si), tin (Sn), vanadium (V), zinc (Zn)			

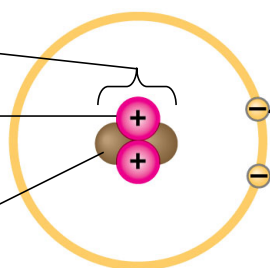
© 2011 Pearson Education, Inc.

3

Nucleus

Protons (+ charge)
determine element

Neutrons (no charge)
determine isotope

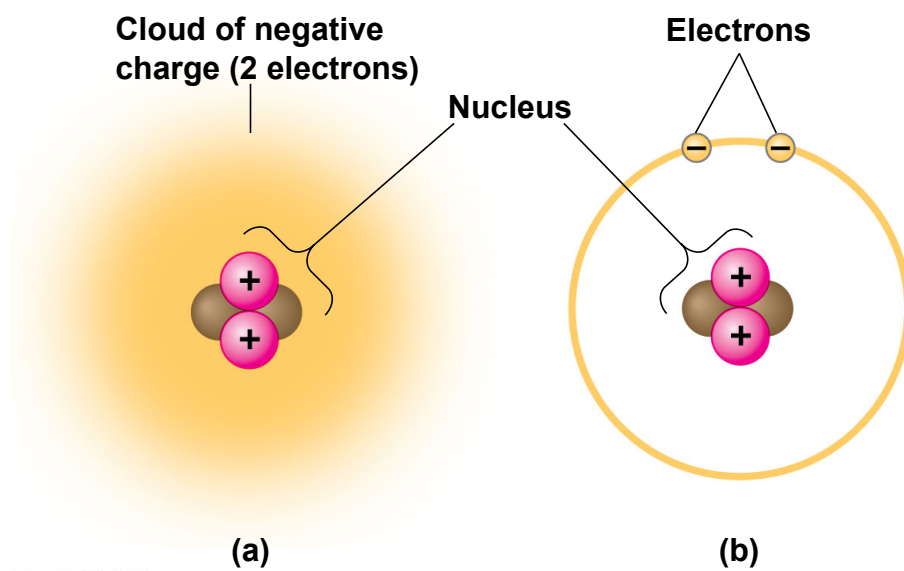


Atom

Electrons (– charge)
form negative cloud
and determine
chemical behavior

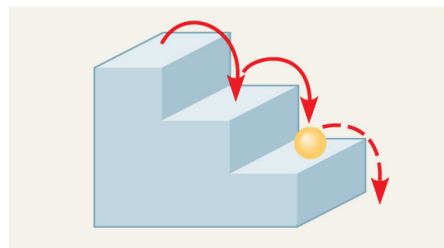
© 2011 Pearson Education, Inc.

4



5

(a) A ball bouncing down a flight of stairs provides an analogy for energy levels of electrons.



Third shell (highest energy level in this model)

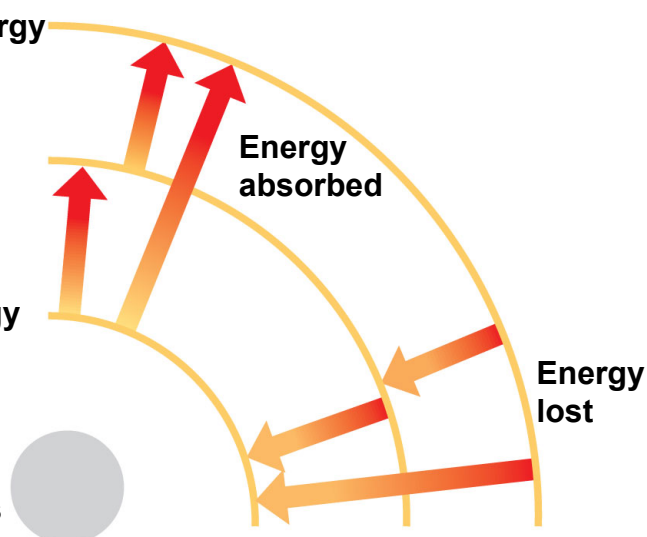
Second shell (higher energy level)

First shell (lowest energy level)

Atomic nucleus

(b)

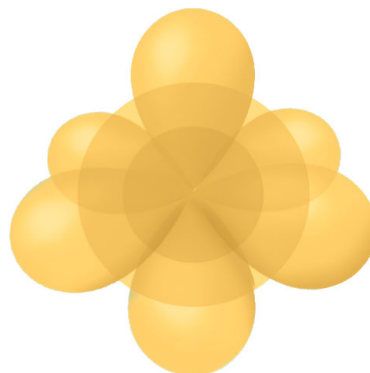
© 2011 Pearson Education, Inc.



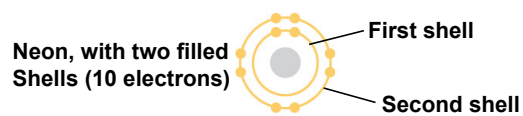
6

Electron orbitals

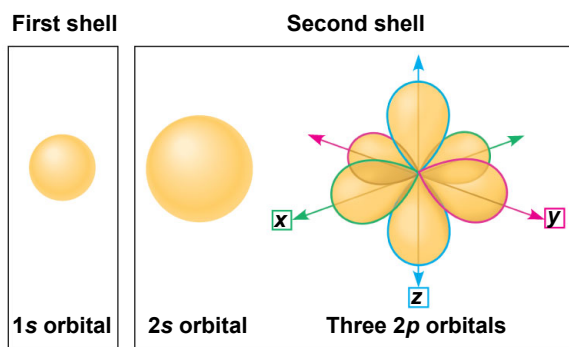
© 2011 Pearson Education, Inc.



7

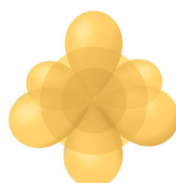


(a) Electron distribution diagram



(b) Separate electron orbitals














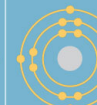
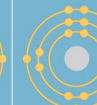
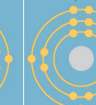
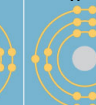
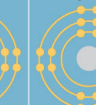
1s, 2s, and
2p orbitals



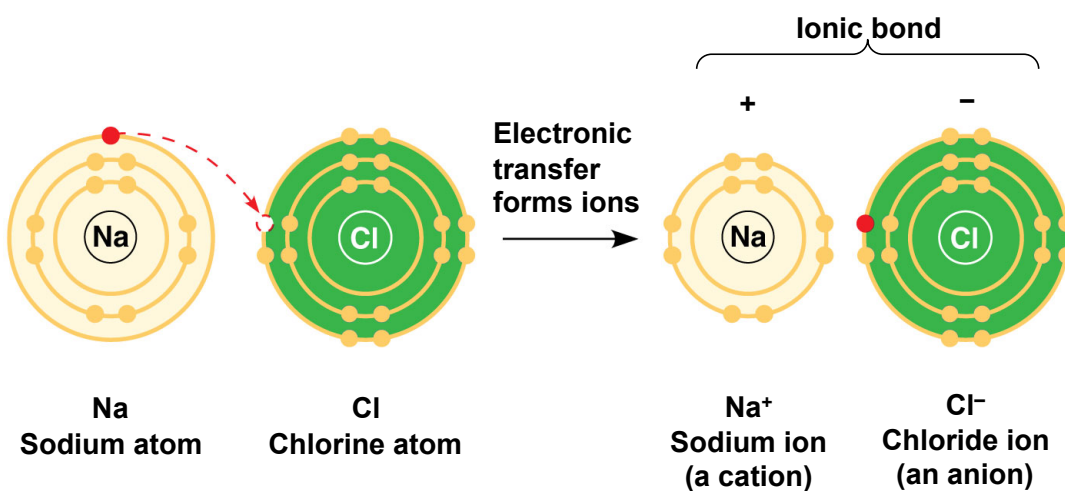
(c) Superimposed electron orbitals

© 2011 Pearson Education, Inc.

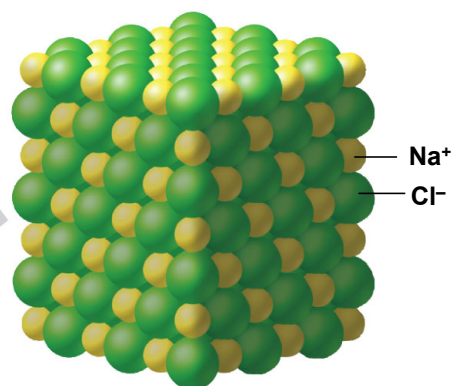
8

First shell	<div>Hydrogen ${}_1\text{H}$</div> <div></div>	<div><div><div>2</div><div>He</div><div>4.00</div></div><div><div>Atomic number</div><div>Element symbol</div><div>Mass number</div></div></div> <div><div>Helium ${}_2\text{He}$</div><div></div></div> <div>Electron distribution diagram</div>						
Second shell	<div>Lithium ${}_3\text{Li}$</div> <div></div>	<div>Beryllium ${}_4\text{Be}$</div> <div></div>	<div>Boron ${}_5\text{B}$</div> <div></div>	<div>Carbon ${}_6\text{C}$</div> <div></div>	<div>Nitrogen ${}_7\text{N}$</div> <div></div>	<div>Oxygen ${}_8\text{O}$</div> <div></div>	<div>Fluorine ${}_9\text{F}$</div> <div></div>	<div>Neon ${}_{10}\text{Ne}$</div> <div></div>
Third shell	<div>Sodium ${}_{11}\text{Na}$</div> <div></div>	<div>Magnesium ${}_{12}\text{Mg}$</div> <div></div>	<div>Aluminum ${}_{13}\text{Al}$</div> <div></div>	<div>Silicon ${}_{14}\text{Si}$</div> <div></div>	<div>Phosphorus ${}_{15}\text{P}$</div> <div></div>	<div>Sulfur ${}_{16}\text{S}$</div> <div></div>	<div>Chlorine ${}_{17}\text{Cl}$</div> <div></div>	<div>Argon ${}_{18}\text{Ar}$</div> <div></div>

© 2011 Pearson Education, Inc.



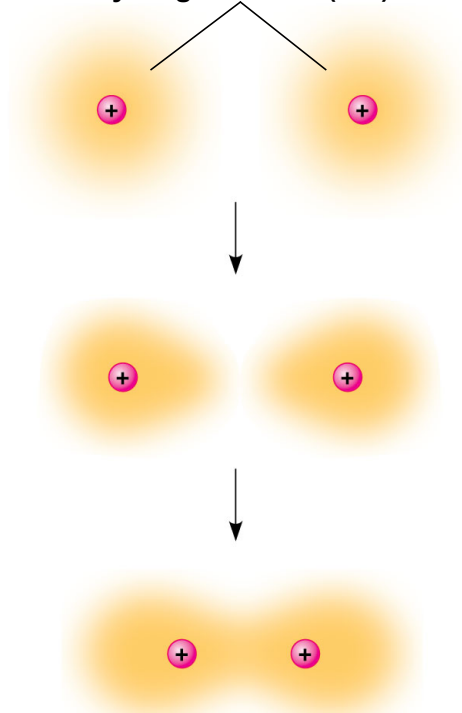
© 2011 Pearson Education, Inc.



© 2011 Pearson Education, Inc.

11

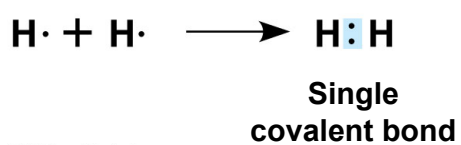
Hydrogen atoms (2 H)



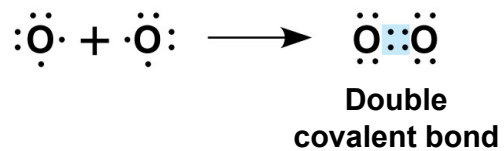
Hydrogen molecule (H₂)

© 2011 Pearson Education, Inc.



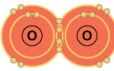

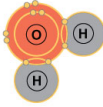

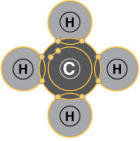

12



© 2011 Pearson Education, Inc.

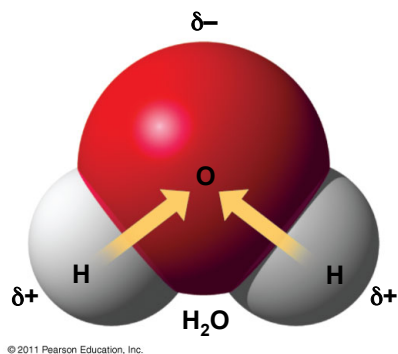


13

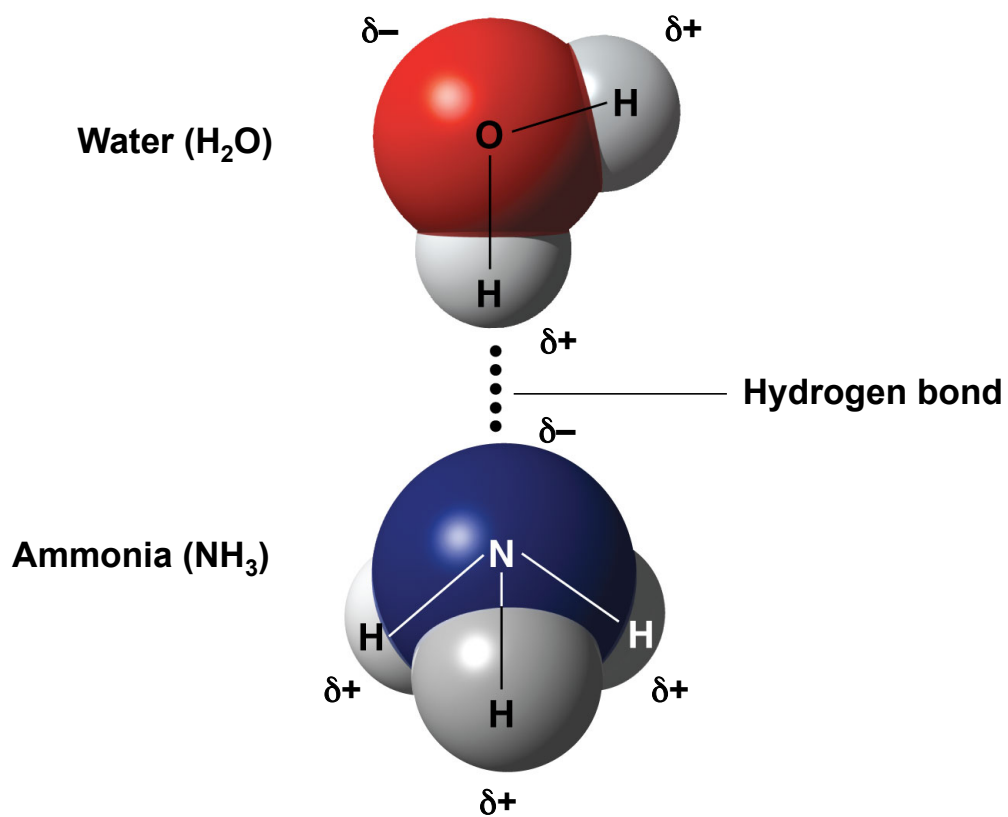
Name and Molecular Formula	Electron Distribution Diagram	Lewis Dot Structure and Structural Formula	Space-Filling Model
(a) Hydrogen (H ₂)		$\text{H}:\text{H}$ $\text{H}-\text{H}$	
(b) Oxygen (O ₂)		$\ddot{\text{O}}::\ddot{\text{O}}$ $\text{O}=\text{O}$	
(c) Water (H ₂ O)		$\begin{array}{c} \ddot{\text{O}}:\text{H} \\ \\ \text{H} \end{array}$ $\begin{array}{c} \text{O}-\text{H} \\ \\ \text{H} \end{array}$	
(d) Methane (CH ₄)		$\begin{array}{c} \text{H} \\ \\ \text{H}:\text{C}:\text{H} \\ \\ \text{H} \end{array}$ $\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$	

© 2011 Pearson Education, Inc.

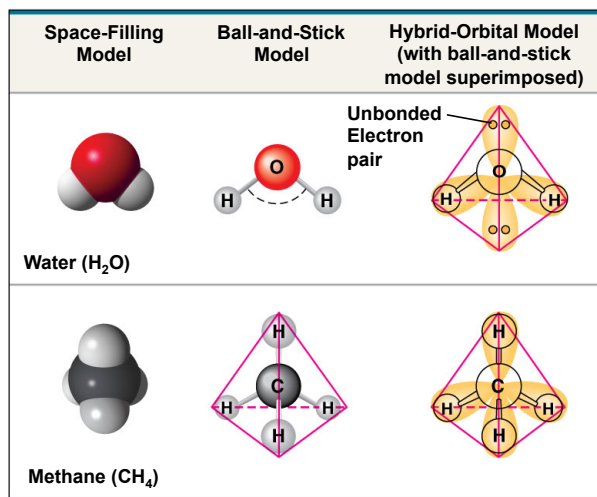
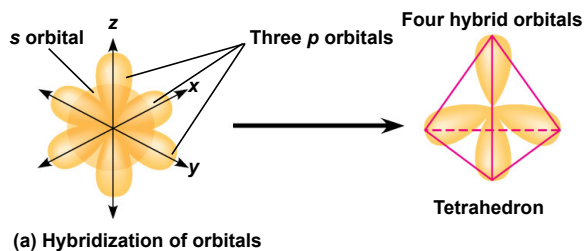
14



15



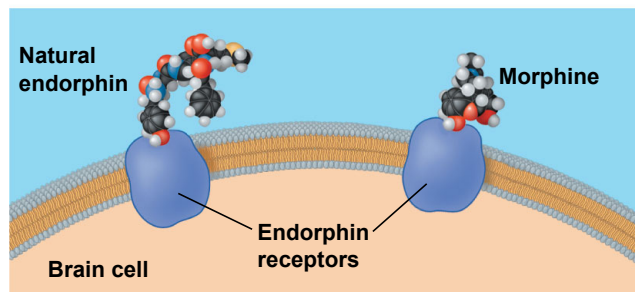
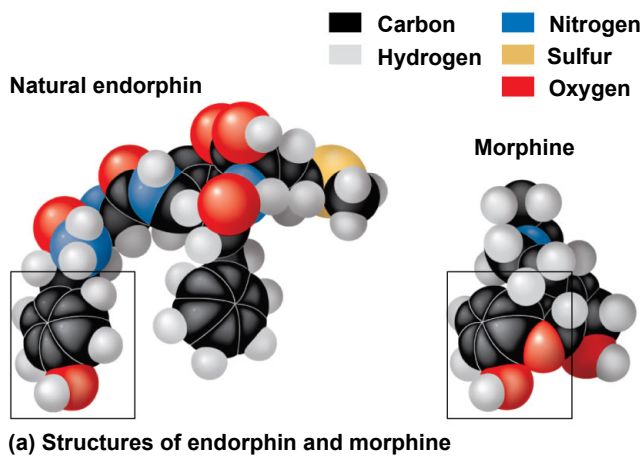
16



(b) Molecular-shape models

© 2011 Pearson Education, Inc.

17



© 2011 Pearson Education, Inc.

18