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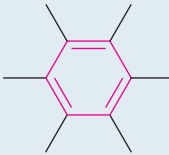

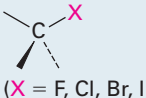
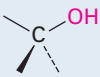
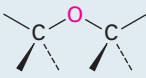
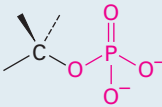
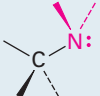
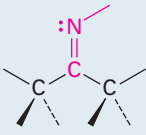
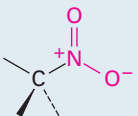
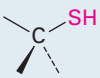
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Structures of Some Common Functional Groups

Name	Structure*	Name ending	Example
Alkene (double bond)		-ene	$\text{H}_2\text{C}=\text{CH}_2$ Ethene
Alkyne (triple bond)	$-\text{C}\equiv\text{C}-$	-yne	$\text{HC}\equiv\text{CH}$ Ethyne
Arene (aromatic ring)		None	 Benzene
Halide	 (X = F, Cl, Br, I)	None	CH_3Cl Chloromethane
Alcohol		-ol	CH_3OH Methanol
Ether		ether	CH_3OCH_3 Dimethyl ether
Monophosphate		phosphate	$\text{CH}_3\text{OPO}_3^{2-}$ Methyl phosphate
Amine		-amine	CH_3NH_2 Methylamine
Imine (Schiff base)		None	$\text{CH}_3\text{C}(\text{NH})\text{CH}_3$ Acetone imine
Nitrile	$-\text{C}\equiv\text{N}$	-nitrile	$\text{CH}_3\text{C}\equiv\text{N}$ Ethanenitrile
Nitro		None	CH_3NO_2 Nitromethane
Thiol		-thiol	CH_3SH Methanethiol

*The bonds whose connections aren't specified are assumed to be attached to carbon or hydrogen atoms in the rest of the molecule.

Name	Structure*	Name ending	Example
Sulfide		<i>sulfide</i>	CH ₃ SCH ₃ Dimethyl sulfide
Disulfide		<i>disulfide</i>	CH ₃ SSCH ₃ Dimethyl disulfide
Carbonyl			
Aldehyde		<i>-al</i>	 CH ₃ CH Ethanal
Ketone		<i>-one</i>	 CH ₃ CCH ₃ Propanone
Carboxylic acid		<i>-oic acid</i>	 CH ₃ COH Ethanoic acid
Ester		<i>-oate</i>	 CH ₃ COCH ₃ Methyl ethanoate
Amide		<i>-amide</i>	 CH ₃ CNH ₂ Ethanamide
Carboxylic acid anhydride		<i>-oic anhydride</i>	 CH ₃ COCCCH ₃ Ethanoic anhydride
Carboxylic acid chloride		<i>-oyl chloride</i>	 CH ₃ CCl Ethanoyl chloride

*The bonds whose connections aren't specified are assumed to be attached to carbon or hydrogen atoms in the rest of the molecule.

Periodic Table of the Elements

Key

79	Au	196.9665
Gold		

An element

Atomic number
Symbol
Name
Atomic mass

Metals
Semimetals
Nonmetals

Group number,
U.S. system
IUPAC system

1A
(1)

1	H Hydrogen 1.0079	1A (1)	8A (18)
2	Li Lithium 6.941	2A (2)	2 He Helium 4.0026
3	Na Sodium 22.9898	3B (3)	10 Ne Neon 20.1797
4	K Potassium 39.0983	4B (4)	18 Ar Argon 39.948
5	Rb Rubidium 85.4678	5B (5)	36 Kr Krypton 83.80
6	Cs Cesium 132.9054	6B (6)	54 Xe Xenon 131.29
7	Fr Francium (223)	7B (7)	86 Rn Radon (222)
8	Be Beryllium 9.0122	8B (8)	9 F Fluorine 18.9984
9	Mg Magnesium 24.3050	9B (9)	16 O Oxygen 15.9994
10	Ca Calcium 40.078	10B (10)	32 S Sulfur 32.066
11	K Potassium 39.0983	11B (11)	50 Se Selenium 78.96
12	Zn Zinc 65.39	12B (12)	84 Po Polonium (209)
13	B Boron 10.811	13B (13)	15 P Phosphorus 30.9738
14	Al Aluminum 26.9815	14B (14)	33 As Arsenic 74.9216
15	Ga Gallium 69.723	15B (15)	51 Sb Antimony 121.757
16	In Indium 114.82	16B (16)	83 Bi Bismuth 208.9804
17	Tl Thallium 204.3833	17B (17)	85 At Astatine (210)
18	Pb Lead 207.2	18B (18)	86 Rn Radon (222)
19	Sc Scandium 44.9559	3B (3)	88 Ra Radium 226.0254
20	Ca Calcium 40.078	4B (4)	90 Th Thorium 232.0377
21	Y Yttrium 88.9058	5B (5)	92 U Uranium 238.0289
22	Zr Zirconium 91.224	6B (6)	94 Pu Plutonium (244)
23	Nb Niobium 92.9064	7B (7)	96 Cm Curium (247)
24	Mo Molybdenum 95.94	8B (8)	98 Cf Californium (251)
25	Tc Technetium (98)	9B (9)	100 Fm Fermium (257)
26	Ru Ruthenium 101.07	10B (10)	102 No Nobelium (259)
27	Rh Rhodium 102.9055	11B (11)	104 Lr Lawrencium (260)
28	Pd Palladium 106.42	12B (12)	
29	Cu Copper 63.546	13B (13)	
30	Zn Zinc 65.39	14B (14)	
31	Ga Gallium 69.723	15B (15)	
32	Ge Germanium 72.61	16B (16)	
33	As Arsenic 74.9216	17B (17)	
34	Se Selenium 78.96	18B (18)	
35	Br Bromine 79.904	19B (19)	
36	Kr Krypton 83.80	20B (20)	
37	Rb Rubidium 85.4678	21B (21)	
38	Sr Strontium 87.62	22B (22)	
39	Y Yttrium 88.9058	23B (23)	
40	Zr Zirconium 91.224	24B (24)	
41	Nb Niobium 92.9064	25B (25)	
42	Mo Molybdenum 95.94	26B (26)	
43	Tc Technetium (98)	27B (27)	
44	Ru Ruthenium 101.07	28B (28)	
45	Rh Rhodium 102.9055	29B (29)	
46	Pd Palladium 106.42	30B (30)	
47	Ag Silver 107.8682	31B (31)	
48	Cd Cadmium 112.411	32B (32)	
49	In Indium 114.82	33B (33)	
50	Sn Tin 118.710	34B (34)	
51	Sb Antimony 121.757	35B (35)	
52	Te Tellurium 127.60	36B (36)	
53	I Iodine 126.9045	37B (37)	
54	Xe Xenon 131.29	38B (38)	
55	Cs Cesium 132.9054	39B (39)	
56	Ba Barium 137.327	40B (40)	
57	La Lanthanum 138.9055	41B (41)	
58	Ce Cerium 140.12	42B (42)	
59	Pr Praseodymium 140.9076	43B (43)	
60	Nd Neodymium 144.24	44B (44)	
61	Pm Promethium (145)	45B (45)	
62	Sm Samarium 150.36	46B (46)	
63	Eu Europium 151.965	47B (47)	
64	Gd Gadolinium 157.25	48B (48)	
65	Tb Terbium 158.9253	49B (49)	
66	Dy Dysprosium 162.50	50B (50)	
67	Ho Holmium 164.9303	51B (51)	
68	Er Erbium 167.26	52B (52)	
69	Tm Thulium 168.9342	53B (53)	
70	Yb Ytterbium 173.04	54B (54)	
71	Lu Lutetium 174.967	55B (55)	
72	Hf Hafnium 178.49	56B (56)	
73	Ta Tantalum 180.9479	57B (57)	
74	W Tungsten 183.85	58B (58)	
75	Re Rhenium 186.207	59B (59)	
76	Os Osmium 190.2	60B (60)	
77	Ir Iridium 192.22	61B (61)	
78	Pt Platinum 195.08	62B (62)	
79	Au Gold 196.9665	63B (63)	
80	Hg Mercury 200.59	64B (64)	
81	Tl Thallium 204.3833	65B (65)	
82	Pb Lead 207.2	66B (66)	
83	Bi Bismuth 208.9804	67B (67)	
84	Po Polonium (209)	68B (68)	
85	At Astatine (210)	69B (69)	
86	Rn Radon (222)	70B (70)	
87	Fr Francium (223)	71B (71)	
88	Ra Radium 226.0254	72B (72)	
89	Ac Actinium (227)	73B (73)	
90	Th Thorium 232.0377	74B (74)	
91	Pa Protactinium 231.0369	75B (75)	
92	U Uranium 238.0289	76B (76)	
93	Np Neptunium (237)	77B (77)	
94	Pu Plutonium (244)	78B (78)	
95	Am Americium (243)	79B (79)	
96	Cm Curium (247)	80B (80)	
97	Bk Berkelium (247)	81B (81)	
98	Cf Californium (251)	82B (82)	
99	Es Einsteinium (252)	83B (83)	
100	Fm Fermium (257)	84B (84)	
101	Md Mendelevium (258)	85B (85)	
102	No Nobelium (259)	86B (86)	
103	Lr Lawrencium (260)	87B (87)	

Lanthanides

Actinides

Numbers in parentheses
are mass numbers of
radioactive isotopes.

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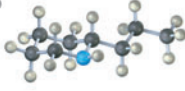
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- indicates problems assignable in Organic OWL.
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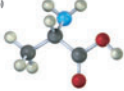
VISUALIZING CHEMISTRY

(Problems 1.1–1.17 appear within the chapter.)

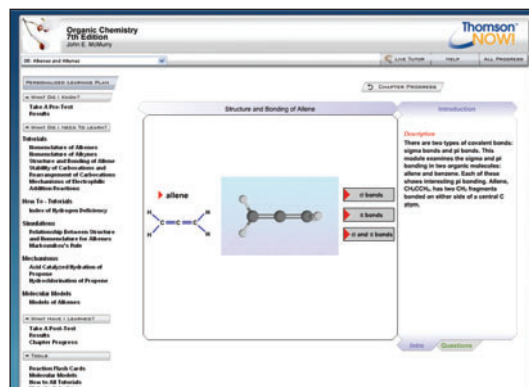
1.18 ■ Convert each of the following molecular models into a skeletal structure, and give the formula of each. Only the connections between atoms are shown; multiple bonds are not indicated (gray = C, red = O, blue = N, ivory = H).



Coniine (the toxic substance in poison hemlock)



Alanine (an amino acid)



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