

Chapter 1 Question Bank

The Basics

Bonding and Molecular Structure

1.1 Atomic Structure

Practice problem 1.2 How many valence electrons does each of the following atoms have?

- (a) Na
- (b) Cl
- (c) Si
- (d) B
- (e) Ne
- (f) N

1.2 Chemical Bonds: The Octet Rule

Practice problem 1.3 Using the periodic table, which element in each pair is more electronegative?

- (a) Si, O
- (b) N, C
- (c) Cl, Br
- (d) S, P

Practice problem 1.4 Consider the following compounds and decide whether the bond in them would be ionic or covalent.

- (a) KCl
- (b) F₂
- (c) PH₃
- (d) CBr₄

1.3 Lewis Structures

Practice problem 1.5 Write the Lewis structure of

- (a) CH_2F_2 (difluoromethane)
- (b) CHCl_3 (chloroform).

Practice problem 1.6 Write the Lewis structure of CH_3OH .

Practice problem 1.7 Write a dash structural formula showing all valence electrons for CH_3CHO (acetaldehyde).

Practice problem 1.8 Write a Lewis structure for each of the following:

- (a) HF
- (b) F_2
- (c) CH_3F
- (d) HNO_2
- (e) H_2SO_3
- (f) BH_4^-
- (g) H_3PO_4
- (h) H_2CO_3

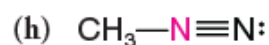
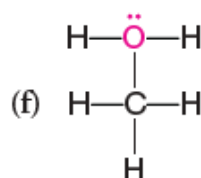
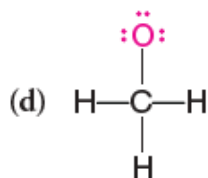
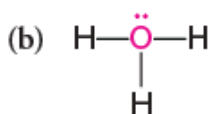
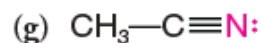
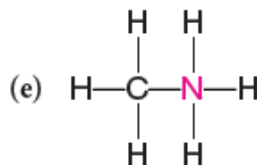
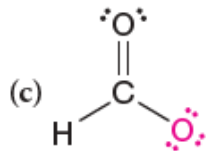
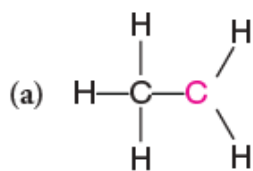
Practice problem 1.9 Write a Lewis structure for the phosphate ion (PO_4^{3-}).

Practice problem 1.10 Write a Lewis structure for each of the following negative ions, and assign the formal negative charge to the correct atom:

- (a) H_3CO^-
- (b) NH_2^-
- (c) CN^-
- (d) HCO_2^-
- (e) HCO_3^-
- (f) HC_2^-

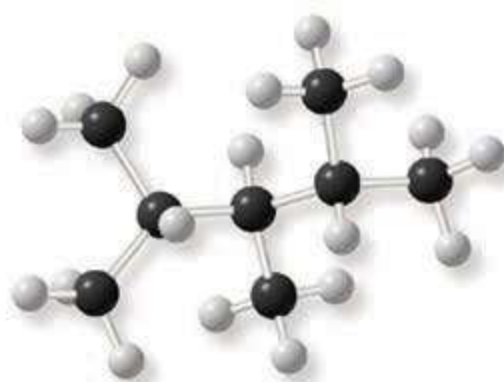
1.4 Formal Charge

Practice problem 1.11 Assign the proper formal charge to the colored atom in each of the following structures:

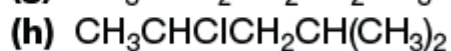
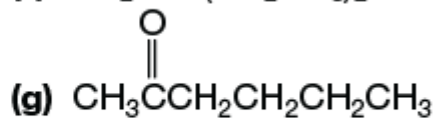
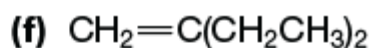
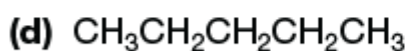
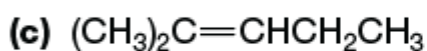
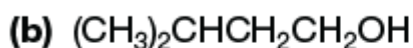
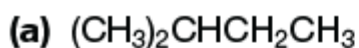


1.6 How to Write and Interpret Structural Formulas

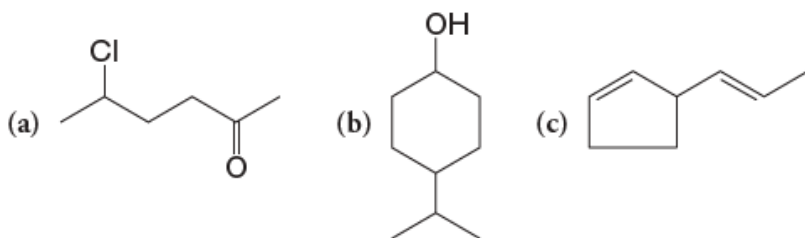
Practice problem 1.13 Write a condensed structural formula for the following compound.



Practice problem 1.14 Write each of the following condensed structural formulas as a bond-line formula:



Practice problem 1.16 Write a dash formula for each of the following bond-line formulas:



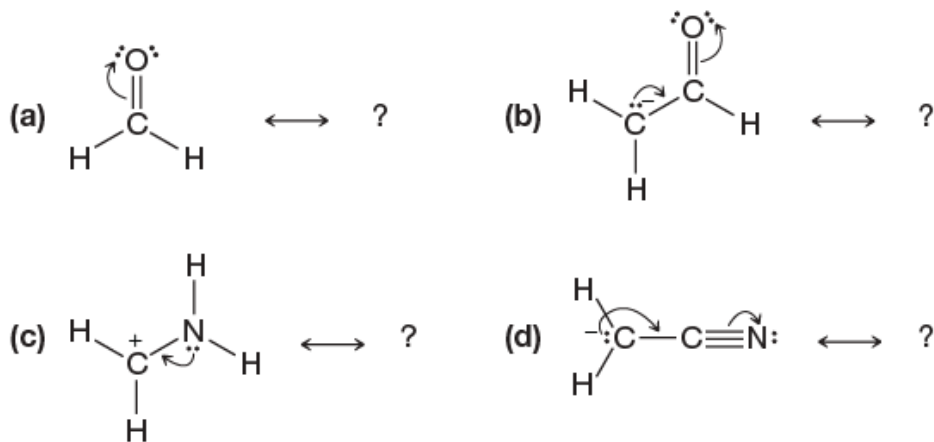
Practice problem 1.17 Write three-dimensional (wedge-dashed wedge-line) representations for each of the following:



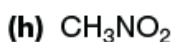
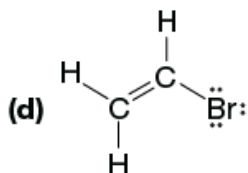
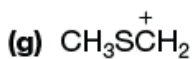
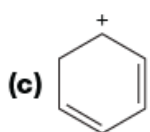
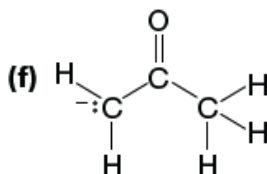
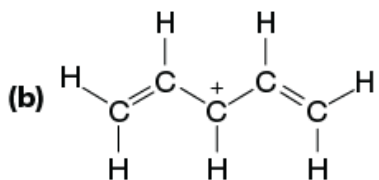
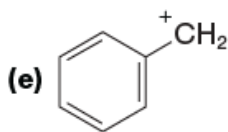
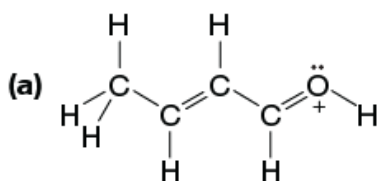
1.7 Resonance Theory

Practice problem 1.18 (a) Write two resonance structures for the formate ion HCO_2^- . (*Note:* The hydrogen and oxygen atoms are bonded to the carbon.) (b) Explain what these structures predict for the carbon–oxygen bond lengths of the formate ion, and (c), for the electrical charge on the oxygen atoms.

Practice problem 1.19 Write the resonance structure that would result from moving the electrons as the curved arrows indicate. Be sure to include formal charges if needed.



Practice problem 1.20 Add any missing unshared electron pairs (if any), then, using curved arrows to show the shifts in electrons, write the contributing resonance structures and resonance hybrid for each of the following:



Practice problem 1.21 For each set of resonance structures that follow, add a curved arrow that shows how electrons in the left formula shift to become the right formula, and designate the formula that would contribute most to the hybrid. Explain your choice:

