CHAPTER 0

ELECTRON-DOT STRUCTURES OF MOLECULES

0.1 Draw electron-dot structures for the following diatomic molecules that obey the octet rule: (a) F_2 (b) Cl_2

0.2 Draw electron-dot structures for the following diatomic molecules that obey the octet rule: (a) HF (b) HCl

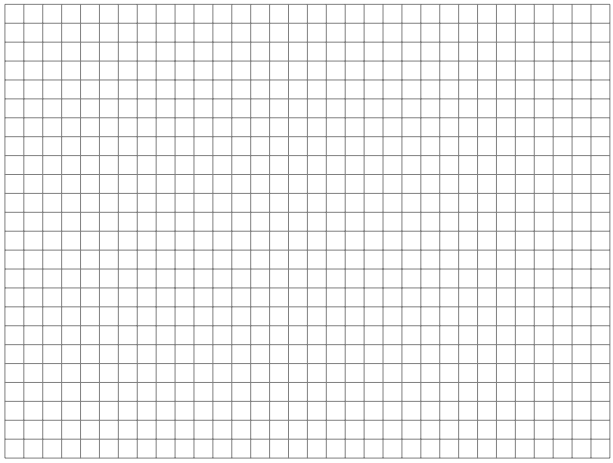
0.3 Draw electron-dot structures for the following diatomic molecules that obey the octet rule: (a) ICl (b) HI

0.4 Draw electron-dot structures for the following diatomic molecules: (a) CO (b) N_2 (c) O_2

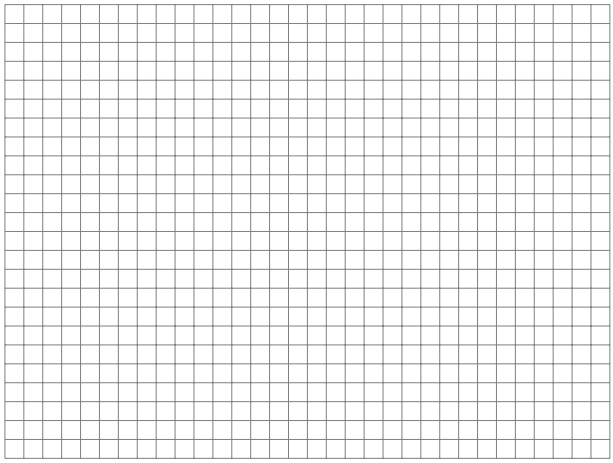
0.5 Draw electron-dot structures for the following molecules that obey the octet rule, given that the first atom listed is the central atom: (a) CHN (b) CO_2

0.6 Draw electron-dot structures for the following molecules that obey the octet rule, given that the first atom listed is the central atom: (a) CH_4 (b) CH_3Cl (c) OH_2

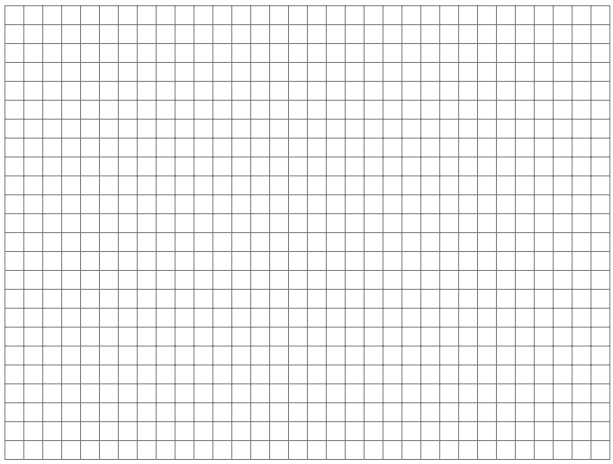
0.7 Draw electron-dot structures for the following molecules that obey the octet rule, given that the first atom listed is the central atom: (a) NH_3 (b) NCl_3



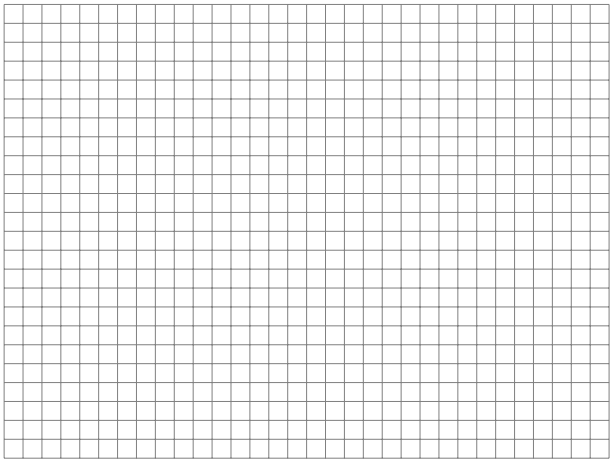
0.8 Draw electron-dot structures for the following molecules that obey the octet rule, given that the first atom listed is the central atom: (a) $SeCl_2$ (b) CH_2O



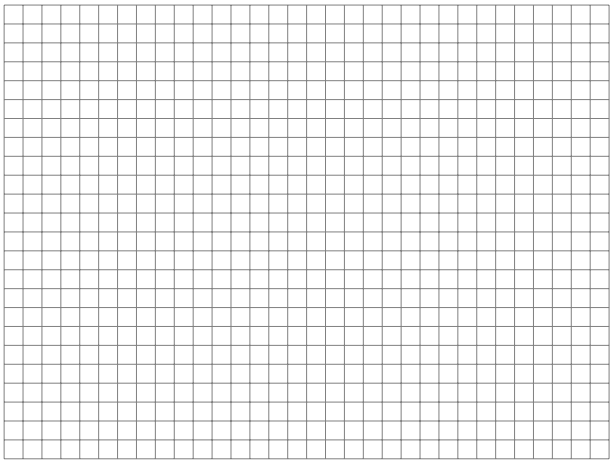
0.9 Draw electron-dot structures for the following molecules given that the first atom listed is the central atom. Some of the atoms might not obey the octet rule. If the species has a charge indicate the location of the charge: (a) BH_3 (b) BH_2F (c) $POCl_3$ (d) ClO_4^-



0.10 Draw electron-dot structures for the following molecules given that the first atom listed is the central atom. Some of the atoms might not obey the octet rule. If the species has a charge indicate the location of the charge: (a) BeH_2 (b) PCl_5 (c) SF_4 (d) ClF_3

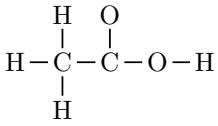


0.11 Draw electron-dot structures for the following molecules given that the first atom listed is the central atom. Some of the atoms might not obey the octet rule. If the species has a charge indicate the location of the charge: (a) I_3^- (b) Br_3^- (c) SF_6

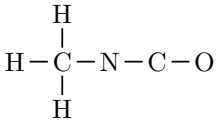


0.12 Draw electron-dot structures for the following molecules given that the first atom listed is the central atom. Some of the atoms might not obey the octet rule. If the species has a charge indicate the location of the charge: (a) ClF_5 (b) XeF_4

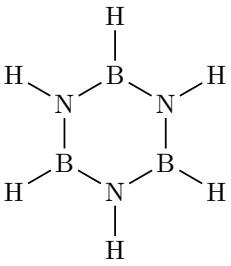
0.13 Given the skeletal structure below, draw the lewis structure of the molecule:



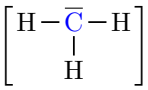
0.14 Given the skeletal structure below, draw the lewis structure of the molecule:

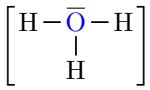


0.15 Given the skeletal structure below, draw the lewis structure of the molecule:

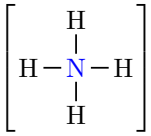


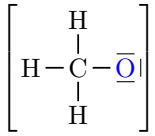
0.16 Indicate the charge of the atom marked blue in the following electron-dot structure:

(a) 

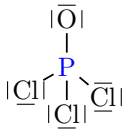
(b) 

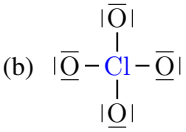
0.17 Indicate the charge of the atom marked blue in the following electron-dot structure:

(a) 

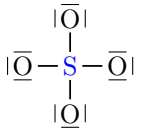
(b) 

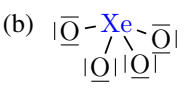
0.18 Indicate the charge of the atom marked blue in the following electron-dot structure that follow the octet rule:

(a) 

(b) 

0.19 Indicate the charge of the atom marked blue in the following electron-dot structure that follow the octet rule:

(a) 

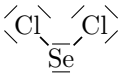
(b) 

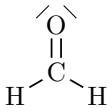
MOLECULAR SHAPE

0.20 Identify the molecular shape of the molecules: (a) NH_3 (b) CH_4

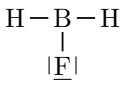
0.21 Identify the molecular shape of the molecules: (a) H_2 (b) $BeCl_2$ (c) BF_3

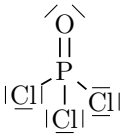
0.22 Given the following Lewis structures, predict the molecular geometry and angles:

(a) 

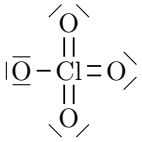
(b) 

0.23 Given the following Lewis structures, predict the molecular geometry and angles:

(a) 

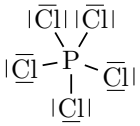
(b) 

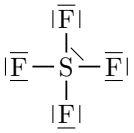
0.24 Given the following Lewis structures, predict the molecular geometry and angles:

(a) 

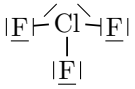
(b) 

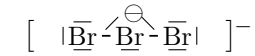
0.25 Given the following Lewis structures, predict the molecular geometry and angles:

(a) 

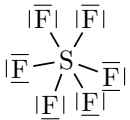
(b) 

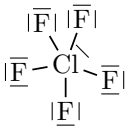
0.26 Given the following Lewis structures, predict the molecular geometry and angles:

(a) 

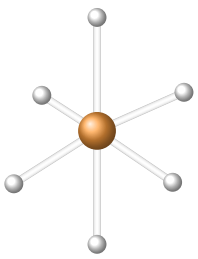
(b) 

0.27 Given the following Lewis structures, predict the molecular geometry and angles:

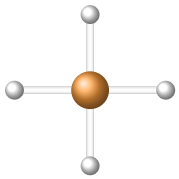
(a) 

(b) 

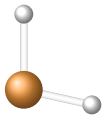
0.28 Identify the name of the following molecular structure:



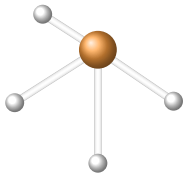
0.29 Identify the name of the following molecular structure:



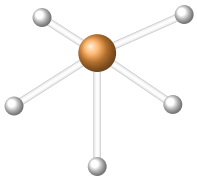
0.30 Identify the name of the following molecular structure:



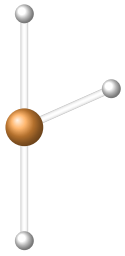
0.31 Identify the name of the following molecular structure:



0.32 Identify the name of the following molecular structure:



0.33 Identify the name of the following molecular structure:



POLARITY

0.34 Indicate the polarity or non-polarity for the following molecules: (a) H_2O (b) HCl (c) H_2

0.35 Indicate the polarity or non-polarity for the following molecules: (a) NH_3 (b) CO_2

HYBRID ORBITALS

0.36 Indicate the hybridization of: (a) NH_3 (b) CH_4 (c) H_2O

0.37 Indicate the hybridization of: (a) NH_3 (b) CH_4 (c) H_2O

MOLECULAR ORBITAL THEORY

0.38 Using the MO order provided below

$$\sigma_{2s}\sigma^*_{2s}\pi_{2p}\sigma_{2p}\pi^*_{2p}\sigma^*_{2p}$$

obtain the MO configuration for: (a) B_2 (b) C_2

0.39 Using the MO order provided below

$$\sigma_{2s}\sigma^*_{2s}\pi_{2p}\sigma_{2p}\pi^*_{2p}\sigma^*_{2p}$$

obtain the MO configuration for: (a) O_2 (b) $F_2{}^+$

0.40 Indicate the magnetic (paramagnetic or diamagnegtic) configuration of the molecule with MO configuration: $\sigma^2_{2s}\sigma^{2*}_{2s}\sigma^2_{2p}\pi^4_{2p}\pi^{3*}_{2p}$

0.41 Indicate the magnetic (paramagnetic or diamagnegtic) configuration of the molecule with MO configuration: $\sigma^2_{2s}\sigma^{2*}_{2s}\sigma^2_{2p}\pi^4_{2p}\pi^{2*}_{2p}$

Answers

0.1 (a)  (b) **0.2** (a)  (b) **0.3** (a)  (b)

0.4 (a)  (b) (c) **0.5** (a)  (b) **0.6** (a) (b)

(c)  **0.7** (a) (b) **0.8** (a)  (b)  **0.9** (a) 

(b)  (c) (d)  **0.10** (a) (b)  (c)  (d)

0.11 (a)  (b)  (c)  **0.12** (a) (b) 

0.13  **0.14**  **0.15** **0.16** (a) -2 (b) +1 **0.17** (a) +1 (b) -1

0.18 (a) +1 (b) +3 **0.19** (a) +2 (b) +4 **0.20** (a) NH_3 (Trigonal pyramidal) (b) CH_4 (Tetrahedral) **0.21** (a) H_2 (Linear) (b) $BeCl_2$ (Linear) (c) BF_3 (Trigonal planar) **0.22** (a) AB_2E_2; bent; 109° (b) AB_2E_2; bent; 109° ABE_3; planar trigonal; 120° **0.23** (a) ABE_3; planar trigonal; 120° (b) AB_4; tetrahedral; 109.5° **0.24** (a) AB_4; tetrahedral; 109.5° (b) AB_2; linear; 180° **0.25** (a) AB_5; trigonal bipyramidal; 120° and 90° (b) AB_4E; see-saw; 120° and 90° **0.26** (a) AB_3E_2; T-shaped; 180° and 90° (b) AB_2E_3; linear; 180° **0.27** (a) AB_6; octahedral; 180° and 90° (b) AB_5E; square pyramidal; 90° **0.28** Octahedral **0.29** square planar **0.30** bent **0.31** see-saw **0.32** square pyramidal **0.33** t-shaped **0.34** (a) H_2O (b) HCl (c) H_2 **0.35** (a) NH_3 (b) CO_2 **0.36** (a) NH_3 (sp^3) (b) CH_4 (sp^3) (c) H_2O (sp^3) **0.37** (a) NH_3 (sp^3) (b) CH_4 (sp^3) (c) H_2O (sp^3) **0.38** (a) B_2 ($\sigma_{2s}^2\sigma_{2s}^{*2}\pi_{2p}^2$) (b) C_2 ($\sigma_{2s}^2\sigma_{2s}^{*2}\pi_{2p}^4$) **0.39** (a) O_2 ($\sigma_{2s}^2\sigma_{2s}^{2*}\sigma_{2p}^2\pi_{2p}^4\pi_{2p}^{2*}$) (b) F_2^+ ($\sigma_{2s}^2\sigma_{2s}^{2*}\sigma_{2p}^2\pi_{2p}^4\pi_{2p}^{3*}$) **0.40** paramagnetic **0.41** paramagnetic