

Use the Lewis dot structures for atoms to answer questions 1 through 4.

1. What do the dots around each chemical symbol represent?
   1. Total number of electrons in the atom
   2. **Total number of valence electrons**
   3. Number of electrons in the highest energy subshell (example: if 2s and 2p are both occupied, only the electrons in 2p are shown)
   4. The number of bonds the atom can form
2. Which atom will not gain electrons?
   1. Carbon
   2. Nitrogen
   3. Oxygen
   4. Fluorine
   5. **Neon**
3. Which atom will form four bonds in covalent compounds?
   1. **Carbon**
   2. Nitrogen
   3. Oxygen
   4. Fluorine
   5. Neon
4. Which atom will typically form two bonds in covalent compounds?
   1. Carbon
   2. Nitrogen
   3. **Oxygen**
   4. Fluorine
   5. Neon
5. Which statement is true about drawing Lewis structures? Select all that apply.
   1. **The least electronegative atom is the central atom**.
   2. **Lone pairs are drawn on the most electronegative atoms first.**
   3. Lone pairs are never drawn on the central atom.
   4. All atoms in a Lewis structure must have eight electrons.
   5. Central atoms from periods 2 – 7 can expand their octets.
6. How many total valence electrons are drawn in the structure for NH3?
   1. 2
   2. 6
   3. **8**
   4. 14
7. What types of molecules violate the octet rule?
   1. Odd-electron molecules
   2. Electron deficient molecules
   3. Expanded valence shells
   4. **All of the above**
   5. None of the above
8. What is the formal charge on sulfur in the structure for SO3 that follows the octet rule?
   1. **2+**
   2. 1+
   3. 0
   4. 1-
   5. 2-
9. What is the formal charge of sulfur in the structure for SO3 that violates the octet rule?
   1. 2+
   2. 1+
   3. **0**
   4. 1-
   5. 2-
10. How many bonds and lone pairs are connected to the **central** atom in SO2?
    1. Two double bonds, no lone pairs
    2. **One double bond, one single bond, and one lone pair**
    3. One double bond, one single bond, and no lone pairs
    4. Two single bonds and two lone pairs
11. How many bonds and lone pairs are connected to the **central** atom in PF5?
    1. One double bond and four single bonds
    2. **Five single bonds**
    3. Five single bonds and one lone pair
    4. Two double bonds and three single bonds
    5. One double bond, four single bonds, and one lone pair



1. What is wrong with the Lewis structure for SF6?
   1. There should be a lone pair on the central atom.
   2. Sulfur can’t expand its octet.
   3. It contains too few electrons.
   4. **There should not be a double bond to fluorine.**

A chemical structure with black letters

Description automatically generated

1. What is wrong with the Lewis structure for the molecule in the picture?
   1. The carbon-oxygen bond should be a double bond.
   2. The carbon-carbon bond should be a double bond.
   3. The oxygen is missing one lone pair of electrons.
   4. **The oxygen is missing two lone pairs of electrons.**
   5. Nothing is wrong with the structure.
2. In the Lewis structure below, A represents an unknown element. What is the most reasonable identity of element A?
   1. P
   2. S
   3. Cl
   4. **Si**
   5. Not enough information to tell

In an alternate universe, atoms follow the septet rule, which means they need seven valence electrons to be stable instead of eight. Use this information to answer questions 15 – 18.

1. Which group on our universe’s periodic table would be unreactive?
   1. 15
   2. 16
   3. **17**
   4. 18
2. Which group on our universe’s periodic table would form 1+ ions?
   1. 16
   2. **18**
   3. 1
   4. 2
   5. 3
3. Draw the Lewis structure for nitrogen dioxide in the alternate universe. What type of bond connects the nitrogen to each oxygen atom?
   1. **Single**
   2. Double
   3. Triple
   4. A single and a double
4. Which statement is true about the nitrogen dioxide structure in question 17?
   1. More total electrons must be drawn than using our universe’s rules.
   2. **Each atom contains an unpaired electron.**
   3. Only the central atom contains an unpaired electron.
   4. The Lewis structure for nitrogen dioxide can’t be drawn without violating the septet rule.