

Preparatory chemistry course, Practical worksheets,

PSE, chemical bonds

1. Determine the constitution of the compounds with the following molecular formulas:

- CH₄O
- CH₃Cl
- C₂H₆
- CH₅N

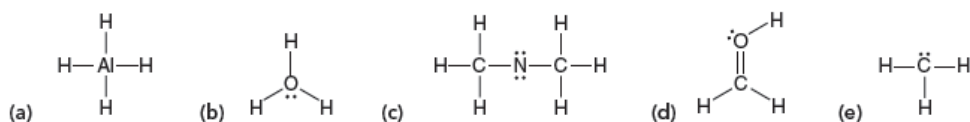
2. Draw structures for all constitutional isomers with the following molecular formulas:

- C₄H₁₀
- C₅H₁₂
- C₆H₁₄
- C₂H₃Cl₃

3. Draw a Lewis dot structure for each of the following atoms:

- Carbon
- Oxygen
- Fluorine
- Hydrogen
- Bromine
- Sulfur
- Chlorine
- Iodine

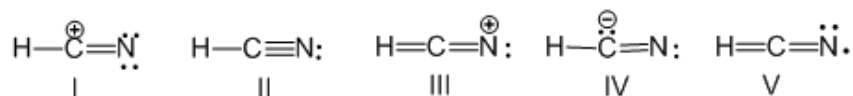
4. Identify any formal charges in the structures below:



5. For each compound below, identify any polar covalent bonds and indicate the direction of the dipole moment using the symbols $\delta+$ and $\delta-$.



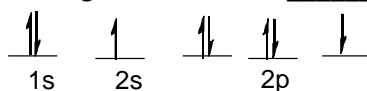
6. What is the correct Lewis structure for hydrocyanic acid, HCN, including the formal charges, if any?



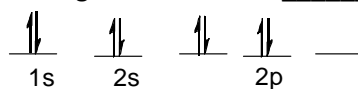
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7. The electronegativity of elements on the periodic table tends to increase_____.
- from left to right, top to bottom
 - from right to left, bottom to top
 - from left to right, bottom to top
 - from right to left, top to bottom
 - from upper right to lower left
8. Which of the following series has the correct order of elements in increasing electronegativity?
- $C < N < B < Br$
 - $P < N < As < F$
 - $Li < B < N < F$
 - $Cl < Cs < C < Co$
9. Draw the shape of an s-orbital and the shapes of a p_z -orbital and a d_{xy} -orbital.
10. Provide the configuration for phosphorous, nitrogen, chlorine, and for the magnesium ion.
11. Ar, K^+ , and Cl^- have equal numbers of electrons, and are considered isoelectronic. Provide the ground state electron configuration for them.
12. Arrange the following orbitals in order of increasing energy: 1s, 3s, 4p, 3d, 3p, 4s, 2p
13. The following ground state electron configuration violates _____.



- The Aufbau principle
 - The Pauli Exclusion principle
 - Hund's Rule
 - None of these
14. The following ground state electron configuration violates _____.



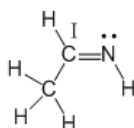
- The Aufbau principle
- The Pauli Exclusion principle
- Hund's Rule
- None of these

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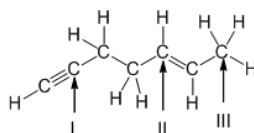
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15. Fill in the blanks. According to molecular orbital theory the highest energy molecular orbital that is occupied with an electron is referred to as _____. The lowest energy molecular orbital that is unoccupied with an electron is referred to as _____.

16. What is the hybridization state of the carbon (I) atom in the following compound?

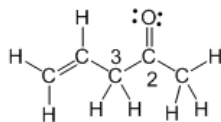


17. What is the correct order of hybridization state for the numbered carbon atoms in the following compound:

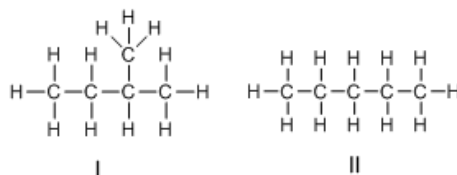


Answer: C(I) _____, C (II) _____, C (III) _____

18. The C₂-C₃ bond in the following compound results from the overlap of which orbitals?



19. Which of the following compounds has a higher boiling point? Explain.



20. Which of the following compounds is most soluble in butane, CH₃CH₂CH₂CH₃?

