

1. (28 points total) Circle the best answer to each of the following seven questions. Your answers need not be justified, and no partial credit will be awarded.

A. The geometry of the Cl-O-Cl molecule is best described as

- (a) tetrahedral (b) linear (c) trigonal planar
(d) trigonal pyramidal (e) bent

B. Which of the following statements about molecular structure is true?

- (a) The fact that NH_3 has a larger bond angle than H_2O can be explained by the difference in electronegativity of O and N.
(b) In $\text{SN}=5$ compounds, lone pairs and double bonds prefer to be axial.
(c) All molecules containing polar bonds experience intermolecular dipole-dipole attractions.
(d) Molecular orbital theory predicts that the noble gases are diatomic.
(e) Experiments indicate that O_2 is diamagnetic.

C. Which of the following statements about molecular structure is false?

- (a) In BeH_2 , the Be atom has two empty, unhybridized p orbitals.
(b) In CH_4 , sp^2 hybridization of C's atomic orbitals accounts for the experimental H-C-H bond angle.
(c) The pi bond in C_2H_4 keeps all the atoms in the molecule in one plane
(d) In conjugated molecules like 1,3-butadiene, pi electrons are delocalized among all sp^2 -hybridized atoms.
(e) The two double bonds in CO_2 are perpendicular to each other.

D. Which of the following species can function as a hydrogen bond acceptor?

- (a) H_2S (b) LiH (c) $\text{N}(\text{CH}_3)_3$ (d) BeH_2 (e) NH_4^+

E. Which of the following line formulas represents a carboxylic acid?

