

3. Exercise General Chemistry

19.11.2023

WS 2023/24

3.1

Explain geometry, atomic and molecular orbitals and bonds of acetylene (C_2H_2)

3.2

Carbon monoxide has a covalent triple bond. Which atomic orbitals will combine to form the molecular orbitals? Draw the molecular orbitals. Name the individual bindings. What is the number of lone pairs of electrons?

3.3

Draw the structural formula of urea (NH_2CONH_2) including all lone electron pairs and formal charges. What are the bond angles. Where are single, double, σ and π bonds present? Indicate the hybridization state of the individual atoms.

3.4

Give the Lewis formulas including lone pairs of electrons for the following molecules or ions: CCl_4 , CH_2O , NO_3^- , N_2O_5 , NH_4Cl

3.5

What are the dipole moments of CH_4 , CH_3F , CH_2F_2 , CHF_3 , $CHF=CF_2$, $FC\equiv C-CFH_2$, $\begin{matrix} F & & F \\ | & & | \\ H-C=C-H & , & F-C=C-H \\ | & & | \\ H & & F \end{matrix}$ expressed in multiples of the dipole moment of a C-Cl group? Suppose that the C-H group has no dipole moment and that the C-Cl dipole moment is not altered by the other bonds in the molecule

3.6

What is the molar amount of 5 kg of hexane?

3.7

Calculate the mass fraction and mole fraction of all elements in $MgNH_4PO_4$.

3.8

A compound A with a molar mass of 100 g/mol is half dimerized to A_2 . How many particles are there in 50 g of the compound?

3.9

Calculate the mass fraction of water in copper sulphate pentahydrate.