2. Exercise General Chemistry 13.11.2023

WS 2023/24

2.1

Gold crystallizes in a face-centered cubic lattice with the edge length 4.070Å. The density is 19.3g/cm^3. Calculate the mass of a gold atom from this information.

2.2

Naturally occurring boron is a mixture of the two isotopes with the mass numbers 10 (mass of atom = $1.6624 \cdot 10^{-23}$ g) and 11 (m = $1.8279 \cdot 10^{-23}$ g), where the particle fraction of the first isotope is 19.78%. Calculate the average atomic mass of the naturally occurring boron.

2.3

What is the shortest wavelength light, that can be emitted by hydrogen when the final state has the quantum number 3? Specify the wavelength and frequency of the emitted light.

2.4

Answer the following questions for an electron with the main quantum number $n = 3$. Which azimutal quantum numbers ℓ are possible? Give the names with letters to these orbitals. What m-values are possible for the individual ℓ-values and how many electrons can be in the individual shells? How many electrons can the shell with the main quantum number 3 take in total? What is the first element in the periodic table that has an electron with the main quantum number $n = 3$ in the ground state?

2.5

Which ions or atoms have the electronic state $1s^2 2s^2 2p^6 3s^2 3p^6$?

2.6

How many eletrons will fit into the 4f-Orbitals? Why?

2.7

Examine formaldehyde (HCHO) for its bonding state. Is the molecule planar? What are the angles on the carbon? Which atomic orbitals are combined to form the molecular orbitals? Name the individual bonds. What is the number of lone electron pairs?