

2. Exercise General Chemistry

04.11.2022

WS 2022/23

2.1

How many electrons can be in the shell with the main quantum number $n = 6$? What atomic number would an element have, in which all shells up to and including $n = 6$ are fully occupied and there are no electrons in higher shells? Give reasons why such an element does not exist.

2.2

The first ionization energy of potassium, K, is 419 kJ/mol. What is the minimum frequency of light required to ionize gaseous potassium atoms?

2.3

Write down the electronic states of the following ions:

Br^- , K^+ , S^{2-} und Ga^{3+}

2.4

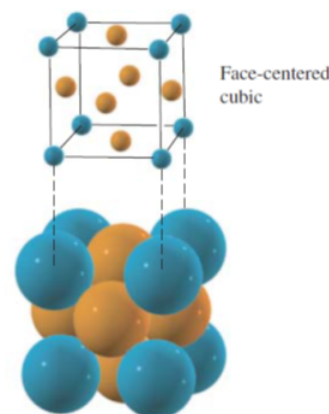
Complete the following table:

Element	Z	MZ	Np	Nn	Ne
	31	69			31
	53	127			54
Ba^{2+}		138			
			13	14	10
Cl				18	

Z : atomic (ordinal) number, MZ : mass number, Np : number of protons, Nn : n. o. neutrons, Ne : n. o. electrons

2.5

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



2.6

Give the Lewis formulas including lone pairs of electrons for the following molecules or ions: BaSO_4 , CH_3OH , CH_3CHO , PO_4^{3-} and P_4O_{10} . Write down mesomeric structures, if there.

2.7

What are the dipole moments of CH_4 , CH_3Cl , CH_2Cl_2 , CHCl_3 , $\text{CHCl}=\text{CCl}_2$, $\text{ClC}\equiv\text{C}-\text{CClH}_2$, $\begin{smallmatrix} \text{Cl} & & \text{Cl} \\ | & & | \\ \text{H}-\text{C}=\text{C}-\text{H} \end{smallmatrix}$, $\begin{smallmatrix} \text{Cl} & & \text{H} \\ | & & | \\ \text{H}-\text{C}=\text{C}-\text{Cl} \end{smallmatrix}$ 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.