

General Chemistry: Part Inorganic Chemistry

Exercises chapter 3: „Atoms and Molecules”

- 1) Aluminum is obtained from Al_2O_3 by electrolysis. How much aluminum oxide (Al_2O_3) is needed to produce 1.8 tons of aluminum (Al)?
- 2) Calculate the molar masses of the following compounds!
 - a) NH_4F
 - b) $\text{Ge}(\text{OH})_4$
 - c) $\text{CH}_3\text{OCH}_2\text{COOH}$
- 3) Calculate the percentage of each element in the compounds in percent by weight
 - a) $\text{CH}_3\text{CHNH}_2\text{COOH}$
 - b) NaH_2PO_4
- 4) What is the maximum amount of lime (CaCO_3) that can be excreted from 15 liters of water at 24 °fH (10 °fH = 1 mmol CaCO_3 /l)?
- 5) In a closed room ($V = 21 \text{ m}^3$) 1.5 liters of hexane ($\rho_{\text{Hexan}} = 659 \text{ kg/m}^3$) evaporate overnight. The explosion range of hexane is between 1.15 and 6.3 % by volume. Should you expect the hexane/air mixture to explode when you switch on the light? Hexan: C_6H_{14}
- 6a) How many liters of oxygen (O_2) are needed to burn 10 kg of kerosene ($\text{C}_{27}\text{H}_{56}$)?
6b) How many grams of water are formed?
6c) How many liters of CO_2 are formed?
- 7) How many moles of Fe_2O_3 molecules are in: 800 kg Fe_2O_3 ?
- 8) What is the amount of carbon (C-12) in one gram?
- 9) What is the amount of substance in 1 g NaCl?
- 10) Dissolving sodium hydroxide (NaOH) in water produces caustic soda. How many grams of sodium hydroxide must a chemist dissolve in one liter of water to obtain a 1-molar solution?
- 11) What is the molar concentration of hydrogen chloride in 37% hydrochloric acid? Hints: Hydrochloric acid is a solution of hydrogen chloride gas (HCl) in water. The density of 37% hydrochloric acid is 1.19 g/cm^3 ?
- 12) What is the empirical formula of the compounds with the following composition?
 - a) 31,29% Ca 18,75% C 49,96% O
 - b) 75,88% C 6,42% H 17,81% N
 - c) 37,02% C 2,22% H 18,50% N 42,26% O