Exercise:

1. **establish and balance reaction equations (index, factor, state of matter)**

REVISION

Revision 1: demonstrate

find the chemical formula for the ionic compound:

a) calcium fluoride

b) potassium nitrite

Revision 1: solve

find the chemical formula for the ionic compound:

a) aluminium fluoride

b) potassium nitrate

c) calcium sulfate

Example 1.1: demonstrate

balance the following equations:

a) $P_2O_{3\,(s)} + H_2O_{\,(l)} \rightarrow H_3PO_{3\,(aq)}$

b) $Al_{(s)} + S_{8\,(s)} \rightarrow Al_2S_{3\,(s)}$

Example 1.2: solve

balance the following equations:

a) $Mg_2C_{3\,(s)} + H_2O_{\,(l)} \rightarrow Mg(OH)_{2\,(l)} + C_3H_{4\,(g)}$

b) $Pb(NO_3)_{2\,(aq)} + NaCl_{\,(aq)} \rightarrow PbCl_{2\,(s)} + NaNO_{3\,(aq)}$

Example 2.1: demonstrate

Nitrogen in air reacts to nitrogen monoxide and nitrogen dioxide

a) specify reactants and products

b) establish reaction equation with stoichiometric factors

c) specify state of matter

Example 2.2: solve
Methane burns and produces water and carbon monoxide

a) specify reactants and products

d) establish reaction equation with stoichiometric factors

e) specify state of matter

2. Reaction Yield

Example 3.1: solve

In a first step, lead sulfide PbS is roasted and converted into PbO to produce lead. This produces sulfur dioxide. Write down the reaction equation! How many tons of lead oxide do you get by roasting 18 tons of lead sulfide?

Example 3.2: solve

Nitrogen gas and water are formed when ammonium nitrite NH_4NO_2 is carefully heated. How many grams of NH_4NO_2 must be thermally decomposed to obtain 35 g of N_2?

Example 4.1: demonstrate

80,00 g aluminium react with oxygen and form aluminium oxide

a) determine the theoretical yield.

b) Calculate the percentual yield when the reaction produces 140 g Al_2O_3 .

Example 4.2: solve

Iron(II) sulphide was produced from iron and sulphur. Write down the reaction equation. How many grams of Fe and how many grams of S are needed stoichiometrically for 200,0 g of FeS?

3. Reaction Yield and limiting component

Example 6.1: demonstrate

A mixture of 7,50 g H_2 and 27 g O_2 reacts and forms water as a reaction product.

a) establish reaction equation

b) what compound reacts? What stays left over? how much is formed? (H_2, O_2, und H_2O)

Example 5.2: solve

A mixture of 10 g CH_4 and 50 g O_2 reacts and forms water and carbon dioxide.

a) Establish the reaction equation

b) which mass of CH_4, O_2, CO_2 and H_2O remains after the reaction stops?

Example 6.1: demonstrate

A strip of zinc metal weighing 2,00 grams is placed in an aqueous solution of 2,50 grams of silver nitrate. The following reaction takes place: $Zn + 2\ AgNO_3 \rightarrow Zn(NO_3)_2 + 2\ Ag$

a) which reagent is limiting?

Example 6.2: solve

Consider the reaction of aluminum with elemental chlorine to form aluminum chloride. A mixture of 4,00 mol Al and 10,0 mol Cl_2 is brought to reaction.

a) establish the reaction equation.

b) which substance is limiting?