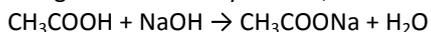


CHEMICAL CALCULATIONS

1. 2014 BAZA (SOCIAL)

Sodium acetate is used in the food industry with the role to preserve- E262 in order to extend the expiration date of food products.

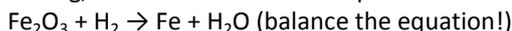
Solve the problem. Calculate the weight of sodium acetate which is obtained by the interaction of acetic acid with a weight of 120 g with sodium hydroxide, if the chemical reaction proceeds according to the following equation:



2. 2014 BAZA (SOCIAL)

Annually it is registered a global consumption of over 500 billion cubic meters of hydrogen. One of the domains in which hydrogen is used is the reduction of metals from oxides.

Solve the problem. Calculate the volume of hydrogen (STP), necessary for the reduction of iron from iron oxide (III) with weight of 16 g, if the chemical reaction proceeds according to the following scheme:



3. 2014 BAZA (REAL)

Natural deodorants contain sodium carbonate which absorbs efficiently sweat and zincum oxide which has antiseptical properties. For sensitive skin it is recommended to use deodorants in which the level of zincum oxide is at least twice higher than the one of sodium carbonate.

Solve the problem.

A mixture of zincum oxide and sodium carbonate with the mass of 200 g was treated with a high level of hydrochloric acid. As a result it was obtained a gas with volume of 11,2 l (STP).

- 1) Calculate the mass part of each component from the mixture.
- 2) Considering the calculated mass parts, determine if the deodorant obtained from this mixture is adequate for sensitive skin.

4. 2014 T1 (REAL)

Calcium chloride is added to the brine to preserving tomatoes and vegetables to avoid deformation as a result of thermal processing.

Solve the problem. As a result of the interaction of a sample of hydrochloric acid with lime stone. with a mass of 80 g, was removed carbon dioxide (IV) with a volume of 15.68 L (at STP).

- 1) Calculate the mass of calcium carbonate in the sample;
- 2) Calculează, dacă clorură de calciu obținută este suficientă pentru prepararea a 75 kg de marinadă, cu partea de masă a CaCl_2 în ea de 0,1%.

5. 2014 T1 (SOCIAL)

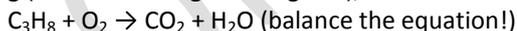
Used as acidulant in the food industry, phosphoric acid causes loss of calcium, making bones more fragile skeleton. Solve the problem. Calculated mass of calcium phosphate is formed by the reaction of calcium with phosphoric acid with the mass of 19.6g, if a chemical reaction takes place according to the equation:



6. 2014 T1 (SOCIAL)

Propane has a low emission combustion of toxic substances to the environment, so it is used as an energy source independent multiple uses.

Solve the problem. Calculate the amount of carbon dioxide (at STP), which will be released by complete combustion of propane 4.4 g (content of a cigarette lighter), where the chemical reaction takes place according to the scheme:



7. 2014 PRE (REAL)

The beneficial effect of bath salt has been known since antiquity. Sodium chloride removes fatigue and magnesium sulfate has therapeutic action, relieve rheumatic pains. The predominance of either saline mixture components determine the effect of bath received.

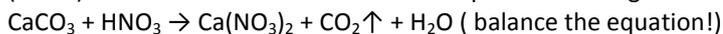
Solve the problem. A sample of the salt bath in " VitaSAL" with a mass of 300 g, consisting of sodium chloride, and magnesium sulfate was dissolved in water and the solution treated with an excess of barium nitrate. The resulting white precipitate was obtained weighing 466 g

- 1) Calculate the mass of each salt in the mixture.
- 2) Given the calculated mass parties, determine whether the product "Vitas" could be recommended as therapeutic bath salts.

8. 2014 PRE (SOCIAL)

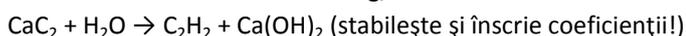
The process of breathing for 24 hours a person is able to remove up to 1 kg of carbon dioxide. In the laboratory, carbon dioxide is produced by exchange reaction of strong acids and carbonates.

Solve the problem. Calculated mass of calcium carbonate is necessary in order to obtain the carbon dioxide volume 4.48 l (atSTP) where the chemical reaction takes place according to the equation:



9. 2014 PRE (SOCIAL)

Acetylene is used as a source of white light, bright lamps autonomous caving, which is obtained by the interaction of calcium carbide with water. Solve the problem. Calculate the volume of acetylene (STP), which is obtained from the interaction of water with calcium carbide mass of 6.4 g, where the chemical reaction takes place according to the scheme



10. 2013 PRE (REAL)

Barium sulfate suspension is used in medicine for gastric roentgenography. On average 115 g of barium sulfate is being consumed for an investigation. Solve the problem. A sample of technical barium carbonate weighing 492,5 g and containing 20% impurities was treated with a solution of sulfuric acid with the volume of 2 liters and having the acid molar concentration of 1,5 mol/l.

Calculate how many investigations can be carried out, using the obtained barium sulfate.

11. 2013 PRE (SOCIAL)

The slaked lime ($\text{Ca}(\text{OH})_2$) kept in the air interacts with the oxide of carbon (IV) and loses its properties, transforming into calcium carbonate (CaCO_3), insoluble in water. Solve the problem. Calculate the quantity of substance and the mass of calcium carbonate, which forms out of the calcium hydroxide with a mass of 148 g.

12. 2013 PRE (SOCIAL)

Solve the problem. Usually for preparing the dough one tablespoon of vinegar with 1,8 g of acetic acid is poured on a teaspoon of baking soda. Please calculate the volume of the carbon dioxide formed at STP, if the reaction follows the scheme:



13. 2012 BAZA (REAL)

The iron with a high degree of purity, applied in a very thin layer on a glass surface, is giving thermo reflecting properties, reducing therefore the heat loss. The pure chemical metal can be obtained by reduction with hydrogen.

Solve the problem.

1) Calculate, if the hydrogen with the volume of 224 l at STP is sufficient to reduce completely the iron from oxide of iron (III), obtained from the decomposition of the hidroxide iron (III) weighing 428 g.

2) Determine the weight of the iron.

14. 2012 BAZA (SOCIAL)

In fighting with forestry fires the chemical inhibitors of burning are widely used and one of them is the diluted solution of magnesium chloride. Solve the problem. Count the quantity of substance and the mass of magnesium chloride, that is formed at the interaction of hydrochloric acid with the mass of 7,3 g with the oxide of magnesium

15. 2012 PRE (REAL)

One of the actual ecological issues is the reduction of the current level of carbon oxide (IV) in the air. A solution would be its chemical elimination, using alkali metal oxids (principle used to refresh the air in the offices).

Solve the problem. The carbon oxide (IV), obtained from burning methane with volume of 11,2 l (c. n.), was absorbed by the lithium oxide weighing 45 g.

a) Calculate the volume of oxygen (c. n.) used to burn the methan.

b) Provide arguments with calculations if the lithium oxid was sufficient for the full absorbtion of the carbon oxide (IV).

16. 2012 PRE (SOCIAL)

Copper(II) oxide is used in the manufacture of glass and ceramics in order to give blue color
Rezolvã problema. Calculate mass of copper oxide (II) may be reacted with 12.6 g nitric acid mass

17. 2015 BAZA UMAN

Potassium nitrate inhibits the growth of bacteria that causes botulism, that is used as a preservative in food industry.
Solve the problem:

Calculate the weight of potassium nitrate, obtained by the interaction of potassium carbonate with nitric acid solution with a weight of 630 g and the mass percent of HNO₃ of 10%, if the chemical reaction proceeds according to the following equation:
 $K_2CO_3 + 2HNO_3 \rightarrow 2KNO_3 + CO_2\uparrow + H_2O$

18. 2015 BAZA REAL

Zinc oxide effectively screens out UVA rays. Cosmetic creams which contain 20-25% of this compound have a maximum protection factor, indicated by SPF 50.

Solve the problem:

The precipitate obtained at the interaction of the sodium carbonate solution with the volume of 300 ml and molar concentration of Na₂CO₃ of 1.5 mol/l with a solution of zinc chloride with the mass of 272 g and mass percent of ZnCl₂ of 10% was subject to decomposition reaction.

- 1) Calculate the mass of zinc oxide obtained.
- 2) Determine if the cream with the mass of 80 g which contains this amount of the zinc oxide corresponds to the category SPF 50.

19.2016 BAZA (REAL)

A dietary supplement "Zinkit" contains zinc sulphate - an essential biocatalyst that stimulates skin revival, health and growth of hair and nails.

Solve the problem. Calculate:

- a) the mass of the technical zinc oxide (with the purity 80%) necessary for the interaction with the sulfuric acid solution with the volume of 4 l and molar concentration of acid of 0.1 mol/l;
- b) the mass of the zinc sulfate obtained as a result of this reaction;
- c) for how many hours will be assured the production of the preparation "Zinkit" at a pharmaceutical enterprise that uses 805 g of zinc sulfate solution with the mass percent of ZnSO₄ of 2% / per hour.

It is given:

Solution:

.....
.....

Answers: a)..... ; b)..... ; c)

20.2016 PRE (UMAN)

Aluminum nitrate is used as a corrosion inhibitor.

Solve the problem. Calculates mass of aluminum nitrate formed from the reaction of 10.2 g aluminum oxide with enough nitric acid,



20.2016 PRE (REAL)

Magnesium nitrate used as a fertilizer for the stimulation of the photosynthesis is obtained from the interaction of magnesium carbonate with nitric acid.

Solve the problem:

For the fertilization of tomatoes in a greenhouse requires a solution of 29.6 kg magnesium nitrate with the concentration 0.1% by mass. Calculate mass of magnesium carbonate containing 20% technical impurities and the volume of the nitric acid solution with a molar concentration of 0.1 mol/L necessary to produce this amount of fertilizer