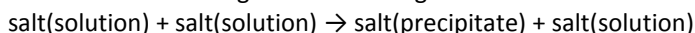


## ION ANALYSIS

### 1. 2014 BAZA (UMAN)

Barium carbonate is used in wastewater cleaning treatments, in manufacture of ceramics and glass. In school laboratory, it can be obtained according to the following scheme:



1) Using the table of solubility, write in the blank fields the chemical formula of:

a) soluble salt of barium .....

b) soluble carbonate of metal.....

2) Write the equation of obtaining barium carbonate, according to the proposed scheme, from substances chosen in molecular form (ME), complete ionic equation (CIE) and net ionic equation (NIE)

.....(ME)

.....(CIE)

.....(NIE)

### 2. 2014 BAZA (REAL)

An individual enterprise offers people who buy solutions prepared for floral lawns, indicating in their composition the following ions:  $\text{Fe}^{3+}$ ,  $\text{K}^+$ ,  $\text{Cl}^-$ ,  $\text{NO}_3^-$ ,  $\text{NH}_4^+$ ,  $\text{Ca}^{2+}$ .

The intern laborant performed a qualitative analysis, establishing the presence of three ions in these solutions.

A. Make up a possible option of results of performed analysis, filling in the blank spaces from the table

Identified ion	Chemical formula of identification reactive	Analytic signal
$\text{Ca}^{2+}$	.....	.....
.....	$\text{NaOH}$	.....
.....	.....	White-cheese precipitate

B. For one from the identified ions, propose the formula of a substance, which was used for the preparation of solutions for trimming lawns: ..... Write for this substance the identification reaction equation in molecular form (ME), complete ionic equation (CIE) and net ionic equation (NIE) ionic and reduced ionic form, using the reactive indicated in the table.

..... (ME)

..... (CIE)

..... (NIE)

### 3. 2014 T1 (REAL)

Waste water of a plant was tested for the presence of these ions:  $\text{NH}_4^+$ ,  $\text{Na}^+$ ,  $\text{Cl}^-$ ,  $\text{CO}_3^{2-}$ ,  $\text{SO}_4^{2-}$ .

The analysis found exceeding the maximum allowable limits for three ions investigated.

A. Constitutes a qualitative analysis of possible alternative outcomes, filling in the blanks of the table:

<i>Ionul depistat</i>	<i>Formula chimică a reactivului de identificare</i>	<i>Semnalul analitic</i>
$\text{NH}_4^+$	.....	.....
.....	$\text{HNO}_3$	.....
.....	.....	Sediment alb

B. Using one of the ions detected, write the formula of a substance that may pollute wastewater of the plant:

.....

Write the reaction equation substance identification in molecular form (ME), complete ionic equation (CIE) and net ionic equation (NIE), using reagent indicated in the table.

..... (ME)

..... (CIE)  
 ..... (NIE)

**4. 2014 T1 (UMAN)**

Silver chloride AgCl, due to the light sensitivity is used to production of photographic film. The lab school it can be obtained under the scheme: salt(solution) + salt (solution) → salt (precipitate) + salt (solution)

1) Using the solubility table, write in the space reserved for the chemical formula:

- aa soluble salt of silver .....
- b) the soluble chloride salt .....

2) Write reaction equation to obtain silver chloride according to the scheme proposed the substances chosen molecular form (ME), complete ionic equation (CIE) and net ionic equation (NIE)

.....(ME)  
 .....(CIE)  
 .....(NIE)

**5. 2014 PRE (REAL)**

Waste water of an plant were tested for the presence of these ions:  $Pb^{2+}$ ,  $K^+$ ,  $NO_3^-$ ,  $Fe^{3+}$ ,  $NH_4^+$ . The analysis found exceeding the maximum allowable three ions investigated.

A. Constitutes a qualitative analysis of possible alternative outcomes, filling spaces off the table:

<i>Ionul depistat</i>	<i>Formula chimică a reactivului de identificare</i>	<i>Semnalul analitic</i>
$Fe^{3+}$	.....	.....
.....	HCl	.....
.....	.....	Gaz cu miros înțepător

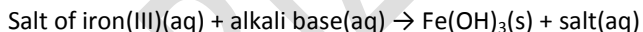
B. For one of the ions detected, proposes formula of a substance that may be contained in the waste water of this plant:

.....  
 Write the reaction equation substance identification in molecular form (ME), complete ionic equation (CIE) and net ionic equation (NIE) using reagent indicated in the table.

..... (ME)  
 ..... (CIE)  
 ..... (NIE)

**6. 2014 PRE (UMAN)**

School lab hydroxide Iron (III) can be obtained according to the scheme:



1) Using the solubility table, write in the space reserved for the chemical formula:

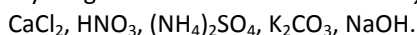
- a) a soluble salt of iron (III) .....
- b) an alkaline base .....

2) Write reaction equation for obtaining iron hydroxide (III) according to the proposed scheme, the materials chosen molecular form (ME), complete ionic equation (CIE) and net ionic equation (NIE)

.....(ME)  
 .....(CIE)  
 .....(NIE)

**7. 2013 PRE (REAL)**

A young chemist carried out *two analytical reactions*, having the following substances at his disposal:



In each case the analytical signal was *different*.

For each case, choose one pair of substances from the given sequence and write the corresponding identification reactions equations in molecular form (ME), complete ionic equation (CIE) and net ionic equation (NIE). Indicate the analytical signal for each reaction.

1) .....(ME)  
 .....(CIE)  
 ..... (NIE)

The analytical signal .....

2) ..... (ME)  
 .....(CIE)  
 .....(NIE)

The analytical signal .....

**8. 2013 PRE (UMAN)**

Barium sulfate BaSO<sub>4</sub> is used as the suspension and the paste for the radiological examination of the digestive tract.

1. Using the solubility table write in the space below the chemical formula:

a) of a soluble salt of barium.....

b) of a soluble salt of sulfate .....

2. Write the equation of the reaction for obtaining the barium sulfate from the selected substances in molecular form (ME), complete ionic equation (CIE) and net ionic equation (NIE)

.....(ME)

.....(CIE)

.....(NIE)

**9. 2012 BAZA (REAL)**

The chemical preparations used to keep the lawns provide both rapid grass growth and grass intense green colour as well as effective removal of lawn moss.

A. Fill in the free spaces of the table with two substances that are included in the similar preparation:

<i>Substance formula</i>	<i>Identification reagent</i>	<i>Analytical signal</i>
1. NH <sub>4</sub> Cl	a) for cation: ..... b) for anion: .....	a) ..... b) .....
2 .....	a) for cation: KCNS b) for anion: Ba(NO <sub>3</sub> ) <sub>2</sub>	a) colours solution to red intense (blood colour); b) white precipitate, insoluble in acids

B. Write the equation reaction, according to the notes given in the table notes, for one of the substances for cation or anion identification in molecular form (ME), complete ionic equation (CIE) and net ionic equation (NIE)

..... (ME)

..... (CIE)

..... (NIE)

**10. 2012 BAZA (UMAN)**

The silver nitrate AgNO<sub>3</sub> is used in medicine as antiseptic and astringent. With its help in chemical laboratory it is possible to identify the ion of PO<sub>4</sub><sup>3-</sup>.

1. Using the Table of solubility, please write in the reserved space the chemical formula of a soluble salt that contains the ion of PO<sub>4</sub><sup>3-</sup>: .....

2. Please write the equation of the reaction between the silver nitrate (I) and the salt written above, in molecular form (ME), complete ionic equation (CIE) and net ionic equation (NIE)

.....( ME)

.....( CIE)

.....(NIE)

**11. 2012 PRE (REAL)**

The salt, which in the 17th century high society ladies used it as a remedy for emotion excess, now, everybody has it in its cuisine, and is widely used as a food additive. About this substance it is known:

a) on treatment with sodium or potassium hydroxide a gas with pungent smell is being given off, which colors the phenolphthalein wet foil in pink.

b) On treatment with hydrochloric or sulfuric acid – a gas is being given off that muddles the water with lime.

A. Use the above information to determine the composition of this salt and write its formula:

.....

B. Write the identification equations reaction in molecular form (ME), complete ionic equation (CIE) and net ionic equation (NIE)

a) .....

.....

.....

b) .....

.....

.....

**12. 2012 PRE (UMAN)**

To increase gastric acidity using preparation "Maalox", the main component of which is magnesium hydroxide.

1. Using the table indicates the solubility of a pair of electrolyte which is formed from the interaction of the magnesium hydroxide: .....

2. Using the electrolytes selected write reaction equation to obtain magnesium hydroxide molecular form (ME), complete ionic equation (CIE) and net ionic equation (NIE)

.....(ME)

.....(CIE)

.....(NIE)

**13. 2015 BAZA (UMAN)**

Silver jewelry gets dark with time, due to the formation of silver sulfide of black colour.

1) Choose two electrolytes from the proposed row which at their interaction silver sulfide is formed and write their formulas in the space reserved:

AgNO<sub>3</sub>, Na<sub>3</sub>PO<sub>4</sub>, K<sub>2</sub>S, H<sub>2</sub>SiO<sub>3</sub>, Na<sub>2</sub>S

Electrolyte 1..... Electrolyte 2.....

2) Write a reaction equation of obtaining silver sulfide from the electrolytes chosen in molecular form (ME), completed ionic (CIE) and reduced ionic (RIE):

.....(ME)

.....(CIE)

.....(NIE)

**14. 2015 BAZA (REAL)**

The product "Ferix", used for removing the odors (smells) from wastewater contains one of the substances from the proposed row: NH<sub>4</sub>Cl, NaNO<sub>3</sub>, Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>, K<sub>2</sub>CO<sub>3</sub>.

As a result of researches it was noticed that:

1) identification of these substances can be achieved with solutions of NaOH and Ba(NO<sub>3</sub>)<sub>2</sub>;

2) the product "Ferix" contains the substance that interacts with both reagents.

I. Complete the table with chemical formulas and corresponding analytic signals.

Chemical formula of the identified substance	Identification	Analytic signal
.....	not with NaOH not with Ba(NO <sub>3</sub> ) <sub>2</sub>	—
.....	only with Ba(NO <sub>3</sub> ) <sub>2</sub>	.....
.....	only with NaOH	.....
.....	and with NaOH and with Ba(NO <sub>3</sub> ) <sub>2</sub>	..... .....

II. For the substance from the product "Ferix", write the identification reaction equation in molecular, complete ionic and reduced ionic form, with one of the used reagents indicated in the table.

.....(ME)  
 .....(CIE)  
 .....(NIE)

**15. 2016 BAZA (REAL)**

I. There are given for analysis, the solutions of the following substances:

*barium chloride, ammonium carbonate, iron (III) nitrate*

Make up a possible option of results of a qualitative analysis of the proposed solutions, filling in the blank spaces from the table:

Chemical formula of the analyzed substance	Identified ion	Chemical formula of identification ion	Analytical signal
$(\text{NH}_4)_2\text{CO}_3$			
		$\text{H}_2\text{SO}_4$	
			Reddish brown colored precipitate, soluble in acids

II. Write an equation of identification reaction in molecular form (ME), completed ionic (CIE) and reduced ionic (RIE) according with the data from the table.

..... (ME)  
 ..... (CIE)  
 ..... (RIE)

**16. 2016 BAZA (REAL)**

Silver phosphate  $\text{Ag}_3\text{PO}_4$  is used in manufacturing paper as a light sensitive agent.

1. Using the Solubility Table, indicate, in the space reserved, the chemical formulas of two electrolytes which at their interaction the silver phosphate is formed:

Electrolyte 1 \_\_\_\_\_ Electrolyte 2 \_\_\_\_\_

2. Write an equation of obtaining reaction of the silver phosphate from the electrolytes chosen in molecular form (ME), completed ionic (CIE) and reduced ionic (RIE):

\_\_\_\_\_ (ME)  
 \_\_\_\_\_ (CIE)  
 \_\_\_\_\_ (RIE)

**17. 2016 PRE (UMAN)**

7. By dispersing into the atmosphere lead (II) iodide rainfall can be produced within a radius of several kilometers.

1) Using solubility table, write in the reserved space, the chemical formulas of two electrolytes which form lead (II)iodide

electrolyte 1 \_\_\_\_\_ electrolyte 2 \_\_\_\_\_

2) Show formation of lead (II)iodide with molecular equation(ME), ionic equation(IE) and net ionic equation(NIE)

\_\_\_\_\_ (ME)  
 \_\_\_\_\_ (IE)  
 \_\_\_\_\_ (NIE)

**18. 2016 PRE (REAL)**

I. Analytical solutions are proposed for the following substances:

*calcium chloride, ammonium sulphate, lead (II)nitrate.*

For each solution choose an ion for identifying and complete the table

Formula of substance	identified ion	Formula of substance used for identification	analytical signal
		NaOH	

$\text{Pb}(\text{NO}_3)_2$			
			White –casein precipitate soluble in $\text{NH}_4\text{OH}$

II. Write a equation for identification reaction form molecular , ionic and net ionic equations

..... (ME)

..... (IE)

..... (NIE)

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