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PREPARING STUDENTS FOR AN EXPERIMENTAL TOUR ON QUALITATIVE DETERMINATION OF SUBSTANCES

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Аннотация. В настоящее время отсутствуют работы, в которых бы содержались результаты исследований по методическому сопровождению учащихся в олимпиадном движении по химии, направленного на развитие мышления, где была бы отражена система работы ученика при подготовке школьников к олимпиаде. Необходима универсальная методическая система, помогающая ученикам готовиться к экспериментальным турам олимпиад по химии. Процесс должен быть развивающим, нацеливающий учащихся на более совершенное мышление.

Ключевые слова: экспериментальный тур, мысленный эксперимент, таблица-матрица

Аннотация. Қазіргі уақытта оқушыларды олимпиадаға дайындау кезінде оқушының жұмыс жүйесі көрсетілген, ойлау қабілетін дамытуға бағытталған химия бойынша олимпиадалық қозғалыстағы оқушыларды әдістемелік сүйемелдеу бойынша зерттеу нәтижелері қамтылған жұмыстар жоқ. Оқушыларға химия пәнінен олимпиадалардың тәжірибелік турларына дайындалуға көмектесетін әмбебап әдістемелік жүйе қажет. Процесс дамытушы, оқушыларды неғұрлым жақсы ойлауға бағыттаушы болуы тиіс.

Түйін сөздер: эксперименталды тур,ойлау эксперименті,матрицалық кесте

Annotation. Currently, there are no works that contain the results of research on the methodological support of students in the Olympiad movement in chemistry, aimed at the development of thinking, which would reflect the system of work of the student in preparing students for the Olympics. A universal methodological system is needed to help students prepare for the experimental rounds of chemistry Olympiads. The process should be educational, targeting students in more sophisticated thinking.

Key words: experimental round, a thought experiment, the matrix table

Relevance.Among the variety of tasks offered to students at chemical Olympiads, an important place is occupied by tasks aimed at the qualitative determination of substances . To solve such problems, the participant is required not only to know various qualitative

reactions, but also to be observant, logical thinking, accuracy, and other very important qualities for an experimental chemist.

The purpose of this work: to Determine the main activities of schoolchildren in preparation for the experimental round of Olympiads.

This is especially important for the school stage of the Olympiad, the main goal of which is to identify the most talented students

Currently, when preparing students to participate in the subject Olympiad in chemistry, it is quite difficult for the teacher to navigate the materials.

Tasks for both the theoretical and practical rounds of Olympiads must meet certain requirements, among which the following criteria are usually highlighted:

Regardless of the discipline and round of the Olympiad, the tasks used in the Olympiad tasks must meet the following selection criteria [1]:

- the original formulation of the problem or the original idea of its solution for a specific composition of participants of the Olympiad;
- the text of the task condition should not contain terms and concepts that go beyond the subjects studied in the basic curriculum; in extreme cases, they should be defined or specified;- the task must be clearly defined, i.e. there should be no ambiguities in its formulation, so that the participant of the Olympiad solves exactly the task that the authors intended;
- the task should not require special knowledge for its solution (i.e. go beyond the level of the school curriculum; be a program of higher and secondary specialized educational institutions);
- the formulation of the problem should assume the presence of a formalization stage in its solution, i.e. the transition from informal to formal problem formulation;
- the task must be of reasonable complexity and labor intensity;
- the text of the problem must be written in a language that is accessible to students and takes into account their age characteristics.

An important feature of the tasks used during the school stage is their orientation to test the development of students ' algorithmic thinking, logic, as well as creative abilities and intuition. The proposed tasks should allow students to solve non-standard and new tasks without special knowledge. Each task should allow participants to make a small discovery and fully unlock their creative potential.

It is obvious that the higher the level of the Olympiad, the more difficult the proposed tasks and the greater the level of knowledge and skills required from participants. But it is completely wrong to assume that this complexity increases only due to programming.

Practical tours of city and regional Olympiads traditionally include two sections of analytical chemistry-qualitative and quantitative analysis.

Usually, only class 11 performs quantitative titration analysis, while the other classes perform qualitative recognition of unknown solutions. Depending on the class....

What do you need for preparation, a minimum of utensils and accessories?

What reagents can be used? For qualitative analysis that can be found in the school-home laboratory.

Quantitative determination by titration, for example? Several available substances, reactions to write

The solution of qualitative tasks for determining the substances contained in flasks without labels involves a number of operations, the results of which can determine what substance is in a particular flask. The first stage of the solution is a thought experiment, which is a plan of actions and their intended results. To record a thought experiment, a

special table is used. it shows the formulas of the substances to be determined horizontally and vertically. At the intersection of the formulas of interacting substances, the expected results of observations are recorded: gas release, precipitation, color changes, odors, or the absence of visible changes. If additional reagents can be used according to the task condition, it is better to write down the results of their use before compiling the table. the number of substances defined in the table can be reduced in this way[1]. The solution of the problem will therefore consist of the following stages:

- preliminary reflection of individual reactions and external characteristics of substances;
- write formulas and expected results of reactions to the table;
- conducting an experiment in accordance with the table (in the case of an experimental problem);
- analysis of reaction results and their correlation with specific substances;
- formulation of the problem response.

The solution of such problems should begin with the analysis of the physical properties of substances that can be specified in the task condition: color, smell, solubility.

To do this confidently, you need to study the characteristic colors of salts of various metals, at least the most common (Cr, Mn, Fe, Co, Ni, Cu). Characteristic odors can have a solution of ammonia and hydrogen sulfide water, a solution of iodine, acetic acid. Due to strong hydrolysis, solutions of sulfides and ammonium carbonate will also have a noticeable smell. Solubility will help to recognize substances, if they are given in a solid state, organic liquids. But, as a rule, recognizing substances only by their physical properties is not considered a complete solution to the problem. It is desirable to confirm it with characteristic chemical reactions. If any additional reagents are given in the task condition (among them may be water, indicators, solutions of certain substances), the possibility of their interaction with the recognized substances is analyzed [2].

It should be taken into account that the thought experiment and reality do not always completely coincide, since real reactions are performed at certain concentrations, temperatures, and lighting conditions (for example, AgCl and AgBr are identical in electric light).

A thought experiment often doesn't take into account many details. For example, Br2/aq is perfectly discolored with solutions of Na_2CO_3, Na_2SiO_3, CH_3COONa; the formation of Ag_3PO_4 precipitate does not occur in a strongly acidic medium, since the acid itself does not give this reaction; glycerol forms a complex with Si $(OH)_2$, but does not form with $(CuOH)_2SO_4$, if there is no excess of alkali, etc. The actual situation does not always agree with the theoretical forecast, and in this Chapter, the matrix tables of "ideal" and "reality" will sometimes differ. And to understand what is really happening, look for any opportunity to work with your hands experimentally in the classroom or elective (keep in mind the safety requirements) [3].

Example 1. Numbered flasks contain solutions of the following substances: silver nitrate, hydrochloric acid, silver sulfate, lead nitrate, ammonia, and sodium hydroxide. Without using other reagents, determine which flask contains the solution of which substance[4].

Decision. To solve the problem, we will create a matrix table, in which we will enter the data of observation of the results of merging substances from one test tube with another in the corresponding squares below the diagonal that intersects it. Observation of the results of successive infusion of the contents of one numbered test tubes to all others:

Table 1

Substances	1. $AgNO_3$	2. HCl	3. $Pb(NO_3)_2$	4. NH_4OH	5. NaOH
1. $AgNO_3$	X	$AgCl\downarrow$ white	—	the precipitate is dissolved	$Ag_2O\downarrow$ brown
2. HCl	$\downarrow$ white	X	$PbCl_2\downarrow$ white,	—	–
3. $Pb(NO_3)_2$	—	White $PbCl_2\downarrow$	X	$Pb(OH)_2\downarrow$ opacification	$Pb(OH)_2\downarrow$ white
4. NH_4OH	—	—	$\downarrow$ (opacification)	X	—
5. NaOH	$\downarrow$ brown	—	$\downarrow$ white	—	X

Observation of the results of successive pouring of the contents of one numbered test tubes to all others:

1 + 2-white sediment falls out;

1 + 3 — no visible changes observed;

1 + 4-depending on the order of draining solutions, a precipitate may fall out;

1 + 5-brown precipitate falls out;

2+3-white precipitate falls out;

2+4— no visible changes observed;

2+5 — no visible changes observed;

3+4-there is turbidity;

3+5-white precipitation falls out;

4+5-no visible changes are observed.

Write down further the equations of the reactions occurring in cases when changes are observed in the reaction system (gas release, precipitation, color change) and enter the formula of the observed substance and the corresponding square of the matrix table above the diagonal that intersects it:

Table 2

I. 1 + 2:	$AgNO_3 + HCl$	$AgCl\downarrow + HNO_3$;
II. 1 + 5:	$2AgNO_3 + 2NaOH$	$Ag_2O\downarrow + 2NaNO_3 + H_2O$;
		brown ($2AgOH \rightarrow Ag_2O + H_2O$)
III. 2 + 3:	$2HCl + Pb(NO_3)_2$	$PbCl_2\downarrow + 2HNO_3$;
		white
IV. 3 + 4:	$Pb(NO_3)_2 + 2NH_4OH$	$Pb(OH)_2\downarrow + 2NH_4NO_3$;
		opacification
V. 3 + 5:	$Pb(NO_3)_2 + 2NaOH$	$Pb(OH)_2\downarrow + 2NaNO_3$
		white

Thus, on the basis of five experiments, we distinguish substances that are in numbered test tubes. In conclusion, there is a weak technique for performing the experiment in students of all classes. We still face this problem today. Even the participants of the chemistry Olympiad with good theoretical training, the results of executing the experimental part, leave much to be desired. When preparing for Olympiads of various levels, due attention should be paid to teaching basic experimental skills at school. The ability to work directly with substances and chemical equipment is also very important for successful performance at the Olympics, and not only on the practical tour. For direct acquaintance with chemicals, such activities as systematization of reagents in the school chemical laboratory, updating labels, compiling collections, and preparing solutions will also be useful.

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СОЯ ДАҚЫЛЫ СОРТТАРЫНЫҢ ЕГІСТІК САПАСЫ МЕН ТҰҚЫМЫ САПАСЫН БАҒАЛАУ

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Аннотация: Қазақстанның негізгі астық егетін аймақтарынан алынған соя сорттарының химиялық құрамын ақуыз, крахмал және майлылығы бойынша зерттеу нәтижелері келтірілген. Ақуыздардың, ылғалдылықтың және майлылық деңгейі анықталды. Зерттеу нәтижелері дәнді дақылдардың тағамдық құндылығы жоғары сорттарын анықтауға мүмкіндік берді.

Түйінсөздер: Соя, сорттар, тұқым, вегетациялық кезеңі, өнімділік элементтері.

Аннотация: Приведены результаты исследования химического состава соевых сортов из основных зерносеющих регионов Казахстана по белку, крахмалу и жиру. Определялся уровень белков, влажности и жирности. Результаты исследования позволили выявить сорта с высокой пищевой ценностью зерновых культур.