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Abai Kazakh National Pedagogical University, «Institute of Natural Sciences and
Geography», Almaty, Kazakhstan
E-mail: nurzhanar.galymova@gmail.com

CONCEPTUAL FOUNDATIONS FOR PREPARING CHEMISTRY TEACHERS TO IMPLEMENT SOCIO-HUMANITARIAN SECURITY

Galymova Nurzhanar Gaissatkyz — doctoral student KazNPU named after Abai, Almaty, Kazakhstan E-mail: nurzhanar.galymova@gmail.com, <https://orsid.org/0009-0000-5887-2483>;

Orazbayeva Meruyert — candidate of chemical sciences, senior lecturer, Almaty, Kazakhstan
E-mail: orazbayeva1979@mail.ru, <https://orsid.org/0000-0003-2667-5447>;

Zhussupbekova Nursulu Sarsenovna — Candidate of Chemical Sciences, senior lecturer, Almaty, Kazakhstan
E-mail: nursulusarjus@mail.ru, <https://orsid.org/0000-0003-4221-9863>.

Abstract. The article talks about the concepts of training chemistry teachers to implement the competency-based approach as a factor of social and human security. Defining the quality of education as a multi-element structure, it is noted that the most important indicator of the effectiveness of education is the academic achievements of students. This position is confirmed by an analysis of international studies of the quality of education, where the main indicator of the effectiveness of education is the level of training of students, their value orientations and information about the product of self-realization. At the same time, experts note that it is important not only to track students' educational achievements, but also to take into account any progress in their development. In this regard, special importance is attached to the objectivity of the assessment based on the measurement of diagnosed indicators. This approach leads to the need to comply with the main stages of organizing the teacher's control and assessment activities. To achieve maximum results in the training of future chemistry teachers, it is necessary to develop and implement an educational model aimed at preparing them to implement a competency-based approach to teaching as a factor of social and humanitarian security in the context of "natural resource management." The "person-society" system. At the present stage and level of development of society and personality, a person is constantly faced with many threats (explicit, open, hidden and indirect). Taking into account the constant development and self-improvement of society, as well as its socialization and interaction, the areas of social and humanitarian security become its component, passed on to the next generation.

Keywords: social and humanitarian security, competence, scientific literacy, task

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Абай атындағы Қазақ Ұлттық педагогикалық университеті, Алматы, Қазақстан.

E-mail: nurzhanar.galymova@gmail.com

ХИМИЯ МҰҒАЛІМДЕРІН ДАЯРЛАУДА ӘЛЕУМЕТТІК-ГУМАНИТАРЛЫҚ ҚАУІПСІЗДІКТІ ЖҮЗЕГЕ АСЫРУДЫҢ ТҰЖЫРЫМДАМАЛЫҚ НЕГІЗДЕРІ

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E-mail: nurzhanar.galymova@gmail.com, <https://orsid.org/0009-0000-5887-2483>;

Оразбаева Меруерт — химия ғылымдарының кандидаты, аға оқытушы, Алматы, Қазақстан

E-mail: orazbayeva1979@mail.ru, <https://orsid.org/0000-0003-2667-5447>;

Жусупбекова Нурсулу Сарсеновна — химия ғылымдарының кандидаты, аға оқытушы, Алматы, Қазақстан

E-mail: nursulusarjus@mail.ru, <https://orsid.org/0000-0003-4221-9863>.

Аннотация. Мақалада элеуметтік-гуманитарлық қауіпсіздік факторы ретінде химия мұғалімдерін құзыреттілік тәсілді жүзеге асыруға дайындық тұжырымдамалары туралы айтылған. Білім сапасын көп элементті құрылым ретінде анықтай отырып, білім беру тиімділігінің ең маңызды көрсеткіші оқушылардың оқу жетістіктері екенін атап өтеді. Бұл ұстаным білім беру тиімділігінің негізгі көрсеткіші білім алушылардың дайындық деңгейі, олардың құндылық бағдарлары және өнімді өзін-өзі жүзеге асыру туралы ақпарат болып табылатын білім беру сапасының халықаралық зерттеулерін талдаумен расталады. Бұл ретте мамандар оқушылардың білім саласындағы жетістіктерін қадағалап қана қоймай, олардың дамуындағы кез келген ілгерілеушілікті ескеру маңызды екенін атап өтеді. Осыған байланысты диагностикаланған көрсеткіштерді өлшеу негізінде бағалаудың объективтілігіне ерекше мән беріледі. Бұл тәсіл мұғалімнің бақылау және бағалау қызметін ұйымдастырудың негізгі кезеңдерін сақтау қажеттілігіне әкеледі. Болашақ химия мұғалімдерін даярлауда барынша нәтижеге жету үшін «табиғат-адам-қоғам» жүйесінде элеуметтік-гуманитарлық қауіпсіздік факторы ретінде оқитудың құзыреттілікке негізделген тәсілін жүзеге асыруға дайындауға бағытталған білім беру моделін әзірлеу және енгізу керек. Қоғам мен жеке тұлғаның қазіргі даму сатысы мен деңгейінде адам үнемі көптеген қауіп-қатерлерге (айқын да, ашық та, жасырын және жанама да) тап болуда. Қоғамның үнемі дамуы мен өзін-өзі жетілдіруін, сондай-ақ оның элеуметтенуі мен өзара әрекетін ескере отырып, элеуметтік-гуманитарлық қауіпсіздіктің бағыттары кейінгі ұрпаққа берілетін оның құрамдас бөлігіне айналады.

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Казахский национальный педагогический университет им. Абая, Алматы, Казахстан.

E-mail: nurzhanar.galymova@gmail.com

КОНЦЕПТУАЛЬНЫЕ ОСНОВЫ ПОДГОТОВКИ УЧИТЕЛЕЙ ХИМИИ К РЕАЛИЗАЦИИ СОЦИОГУМАНИТАРНОЙ БЕЗОПАСНОСТИ

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E-mail: nurzhanar.galymova@gmail.com, <https://orsid.org/0009-0000-5887-2483>;

Оразбаева Меруерт — кандидат химических наук, старший преподаватель, Алматы, Казахстан

E-mail: orazbayeva1979@mail.ru, <https://orsid.org/0000-0003-2667-5447>;

Жусупбекова Нурсулу Сарсеновна — кандидат химических наук, старший преподаватель, Алматы, Казахстан

E-mail: nursulusarjus@mail.ru, <https://orsid.org/0000-0003-4221-9863>.

Аннотация. В статье говорится о концепциях подготовки учителей химии к реализации компетентного подхода как фактора социальной и гуманитарной безопасности. Определяя качество образования как многоэлементную структуру, отмечается, что важнейшим показателем эффективности образования являются академические достижения обучающихся. Эту позицию подтверждает анализ международных исследований качества образования, где основным показателем эффективности образования является уровень подготовки студентов, их ценностные ориентации и информация о продукте самореализации. При этом эксперты отмечают, что важно не только отслеживать достижения учащихся в сфере образования, но и учитывать любой прогресс в их развитии. В связи с этим особое значение придается объективности оценки, основанной на измерении диагностируемых показателей. Такой подход приводит к необходимости соблюдать основные этапы организации контрольно-оценочной деятельности учителя. Для достижения максимальных результатов в подготовке будущих учителей химии необходимо разработать и реализовать образовательную модель, направленную на подготовку их к реализации компетентного подхода в обучении как фактора социально-гуманитарной безопасности в условиях «природопользования». Система «человек-общество». На современном этапе и уровне развития общества и личности человек постоянно сталкивается со множеством угроз (явных, открытых, скрытых и косвенных). Учитывая постоянное развитие и самосовершенствование общества, а также его социализацию и взаимодействие, направления социальной и гуманитарной безопасности становятся его составляющей, передаваемой следующему поколению.

Ключевые слова: социально-гуманитарная безопасность, компетентность, научная грамотность, задача

Introduction

Modern conditions of life and activity have identified the need to develop in students such personal qualities that will contribute to their professional and social mobility in a dynamically developing society. However, the level of preparedness of school and university graduates does not meet these requirements. The importance of solving this problem is confirmed by the results of international studies of the quality of school education.

The first PISA study was conducted in 2000, with 32 countries participating, followed by 43 in 2003, 57 in 2006, and 65 in 2009.

The PISA 2012 study covered about 510 thousand students from 65 countries. More than 70 countries decided to participate in the PISA test in 2015 (Kultumanova et al., 2013).

The study of students' educational achievements in this international program is carried out in three main areas: "reading literacy", "mathematical literacy" and "science literacy". Particular attention is paid to assessing students' mastery of general academic and intellectual skills.

Methods and materials

Kazakhstan took part in the international PISA study twice: in 2009 and in 2012.

In 2012, as in previous years, students of Kazakhstani schools participating in the PISA study demonstrated a very low level of both natural science and mathematical literacy. The main goal of the study was to determine in students the amount of knowledge and skills that they need for a full life in society. At the same time, special attention was paid to assessing the ability of students to apply existing knowledge and skills in various situations that may arise in life and activity. The results of our schoolchildren, unfortunately, are deteriorating every year, which indicates the presence of serious problems in the general secondary education system. Approximately the same situation is observed in higher education, since often the knowledge acquired during training becomes outdated faster than the graduate receives a diploma. The concept of "quality" is also important in the context of the implementation of the basic principles of the Bologna Declaration, as it determines the basis for the formation of a pan-European education system. Among the main principles of its construction the following are considered: - orientation towards the external consumer, who will determine the social order;

- taking into account the needs of the education system;
- minimizing the system of indicators, while simultaneously increasing their diagnosticity;
- instrumentality and manufacturability of the indicators used;
- comparability of the proposed system of indicators with international analogues.

To develop scientifically based indicators, it is important to determine what is meant by the quality of the educational results of schoolchildren and students of pedagogical universities.

An analysis of numerous sources showed that there is no unambiguous understanding in determining the quality of education. Some experts believe that the quality of education is the compliance of the level of preparedness of students and schoolchildren with the requirements contained in state educational standards. Others characterize quality as a system that includes the content of education, requirements for the level of training of applicants, teaching staff, information and methodological support, material and technical base, the system of educational technologies used, the field of scientific activity of students and teachers.

The International Organization for Standardization considers quality as a set of properties and characteristics of an educational service that give it the ability to satisfy conditional or expected needs. Based on this, the quality of education can be defined as a characteristic that reflects the level of educational services provided to the population by the education system, taking into account the interests of the individual, society and the state (Shishov, 2000).

In the first of them, quality is considered from the standpoint of meeting the needs of a person, society, and state. The second includes those that relate this concept to the pur-

pose and results of education. By. In the author's opinion, the first group characterizes the motivational approach, the second - the target one.

Having summarized the research on this issue, A.I. Subetto identified the main quality indicators: - quality as a set of properties (property indicator);

- quality as a hierarchical system of qualities of parts of an object or process (an indicator of structure);

- quality as a dynamic system of properties (dynamic indicator);

- quality as the essential certainty of an object or process, an internal moment expressed in the natural connection of its constituent parts, elements (certainty indicator);

- quality as a double conditionality, revealed through a system of signs: property, structure, system, boundary, integrity, variability, quantity (conditionality indicator);

- quality as the uniqueness of an object, its integrity, orderliness and stability (indicator of specificity);

- quality as a characteristic of value created by a person, which determines the suitability of an object and its suitability for fulfilling the set goals, objectives, conditions put forward by a person (suitability indicator) (Subetto, 2006)

Based on research in the field of education quality management, the following quality characteristics have been identified:

-*multidimensionality* - the quality of the final result and the potential of educational systems that ensure their achievement; quality of educational and training results; creative and reproductive, knowledge and activity components;

-*multi-level* - the quality of training of graduates at different levels of the educational system (schools, colleges, universities);

-*multi-subjectivity* - assessment of the quality of education carried out by many subjects: students, university graduates, their parents, employers and government bodies, society as a whole;

-*multi-criteria* - the quality of education assessed by a set of criteria;

-*polychronicity* - a combination of current, tactical and strategic aspects of quality, which are perceived differently by the same subjects at different times (graduates overestimate the quality of their education, the value of individual disciplines and teachers throughout their lives and working lives; society and the state in depending on the level of their development, they revise the requirements for quality, etc.);

- *invariance and variability* - invariant, general quality indicators are identified for all graduates of a certain level of training and specific ones, characteristic of a given set of individuals.

Defining the quality of education as a multi-element structure, we note that the most important indicator of educational effectiveness is the educational achievements of students. This position is confirmed by an analysis of international studies of the quality of education, which determined the main indicator of the effectiveness of education is the level of preparedness of students, their value orientations and information about productive self-realization. At the same time, experts note that it is important to monitor not only the achievements of students in the field of education, but also to take into account any progress in their development. In this regard, special importance is attached to the objectivity of assessment based on the measurement of diagnosed indicators. This approach leads to the need to comply with the main stages of organizing the teacher's control and evaluation activities. These include:

- operationalization;
- selection of indicators (measured values);
- establishing criteria by which to judge the achievement of quality;
- data collection and evaluation;
- taking appropriate measures based on the control results.

The quality of the results of educational activities of students is described by teachers using a set of functional parameters such as:

- a set of knowledge, skills and abilities that, on the one hand, must meet the requirements specified in the state educational standard, and on the other hand, characterize the graduate's readiness for further activities with the required quality indicators;

- a set of professionally important and personal qualities that create a psychological portrait of a student and in the professional education system meet the requirements of a specialist's qualification characteristics;

- readiness and need for professional and personal development, which is expressed in the student's desire for self-improvement, increasing the level of his professional skills.

An analysis of pedagogical literature shows that among specialists there is also no common understanding of what to consider as indicators of the quality of educational achievements. Some are inclined to believe that this is the level of training, and offer appropriate methods for determining it (Sevruk, 2004). Others note that qualitative results are characterized by consistency (Simonov, 1997). Still others emphasize that high-quality knowledge is one that has specificity, awareness, strength and logic of presentation (Ivanov et al., 2005).

Results

In order to consistently and systematically train future teachers of geography, biology and chemistry in order to implement the components of socio-humanitarian safety in their future professional activities, in our opinion, it is necessary:

- 1) to determine the place and role of the components of socio-humanitarian safety in the natural science education of future teachers of biology, geography, chemistry in order to focus methods on the versatile and high-quality training of specialists;

- 2) to develop a conceptual framework for the training of teachers of natural sciences to implement the competence approach as a factor of socio-humanitarian safety of man and society;

- 3) update the content of teaching methods of natural sciences;

- 4) modernize the forms and methods of training teachers of natural sciences, taking into account modern requirements and trends of the education system;

- 5) to improve the scientific and methodological support of the process of training future teachers of geography, biology and chemistry;

- 6) develop diagnostic support for the process of training future teachers.

Various aspects of the problem of practice-oriented education are touched upon in the works of modern scientists.

The analysis of chemistry textbooks from the standpoint of compliance of the educational material contained in them with the tasks of international comparative studies was carried out by filling in technological monitoring maps. As an example, the technological map (Table 1) of the analysis of a chemistry textbook for grade 9 is given below.

Table 1. Measurement and evaluation data of the formed volume of content of chemical competencies of students of 9th grade №12 lyceum-school in Almaty (2023–2024 academic year)

№	Full name of students	Result of assessment using traditional means	Results of contextual tasks		The results of the competence-oriented test	
			Number of points	Quality mark	Number of points	Quality mark
1	Abdulla Symbat	5	34	3	34	4
2	Azizova Madina	5	21	2	22	3
3	Alkenova Meruert	5	32	3	32	4
4	Akhmetova Aiana	5	49	3	39	5
5	Batembayeva Nazerke	4	15	2	28	3
6	Dauletov Yerasyl	4	15	2	12	2
7	Demeukhanova Nuraiym	5	27	3	22	3
8	Abilgazy Shakarim	4	16	2	20	3
9	Zhakupbekova Adelya	4	21	2	20	3
10	Zhakupkhanova Togzhan	4	15	2	14	3
11	Zhalmukhanov Isatai	5	41	3	29	4
12	Zhumabek Arailym	3	9	2	7	2
13	Zhumagali Khauaz	3	28	3	30	4
14	Zhylqybek Zhansaya	4	23	3	22	3
15	Zakeriya Nurai	3	12	2	13	2
16	Ibragimkyzy Moldir	4	27	3	30	4

In general, the analysis of chemistry textbooks showed that due to the extreme insufficiency of tasks aimed at developing natural science literacy and tasks aimed at meaningful integration of school subjects, they do not fully contribute to successful and effective preparation for Kazakhstan's participation in international comparative studies TIMSS , RISA. The Republic of Kazakhstan, as you know, has been starting to update the content of secondary education since 2015, taking into account the experience of Nazarbayev Intellectual Schools JSC.

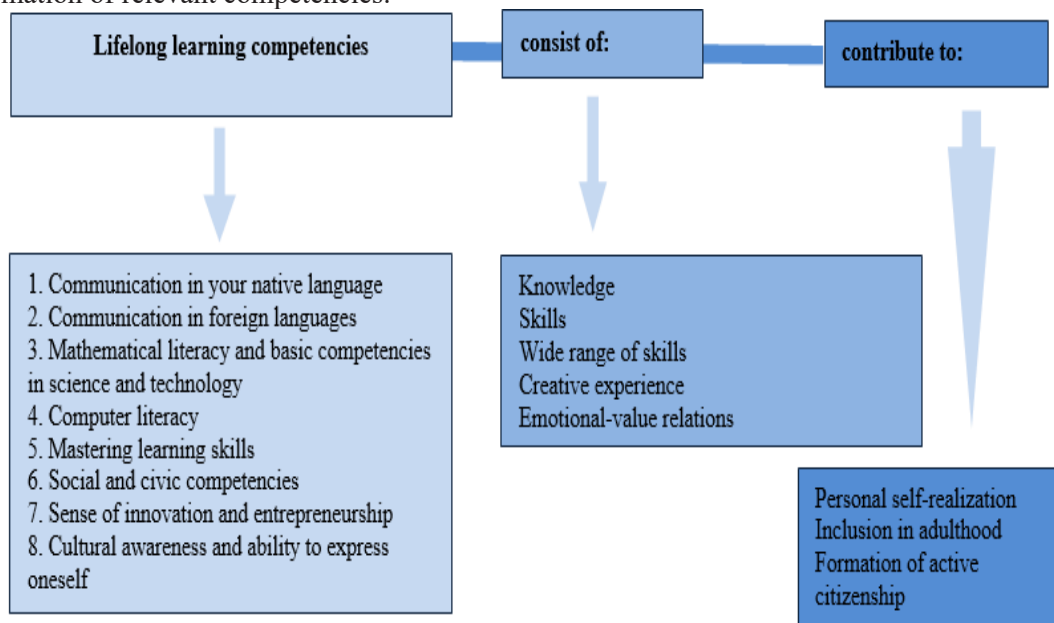
In measures to update the content of domestic secondary education, central attention is paid to skills that have a wide range of applications in modern life. Based on universal human and ethnocultural values, these skills allow the student to solve problems of both an educational and life nature. "Broad spectrum skills" consist of the following activities:

- creative application of knowledge;
- critical thinking;
- performing research work;
- Use of ICT;
- application of methods of communicative communication, including language skills;
- ability to work in a group and individually.

These skills as results at the "exit" from school, using A. Einstein's statement about the essence of education, can be considered as *"what remains after everything that we were taught at school is forgotten."*

As shown in Figure 1, educational results in the form of knowledge, wide-ranging skills, creative experience and emotional-value relationships serve as the basis for the for-

mation of relevant competencies.



Picture 1. Connection of competencies with subject results in the updated content of secondary education

The goal-setting mechanism is B. Bloom’s taxonomy of the cognitive sphere, which is considered the most widespread, accurate and meets the requirements of the modern educational paradigm. Thanks to the use of the stages of cognitive activity identified and described by B. Bloom, the system of goals of the updated State Educational Standards and curricula is categorically correlated with the system of TIMSS and PISA research criteria.

The cognitive, or competence, criteria of both studies are combined into three blocks:

- 1) knowledge (reproductive activity, knowledge of facts and ordinary, simple questions);
- 2) application (establishing connections, using concepts);
- 3) reasoning (reflection).

The problem of assessing the quality of education is actively discussed both in Kazakhstan and abroad. With a significant coincidence of positions, the task of improving the control and evaluation activities of a teacher seems much more complex and less studied to foreign colleagues than to domestic researchers. This is probably the reason that foreign experts (A. Anastasi, A. Binet, F. Galton, J. Cattell, G. Rush, T. Simon, etc.) are at the origins of the theory of pedagogical measurements. At the same time, everyone is unanimous in the opinion that the most important task is to increase the objectivity of assessment.

In England, the National Assessment program is being implemented, which provides for external control (using centrally developed tests) and internal control, conducted by a teacher (teacher assessment). The following requirements are met:

- openness of the results obtained to all consumers;
- the possibility of establishing educational standards for different territories;
- creating conditions for the comprehensive development of students during training

and monitoring achieved success;

- assessing the dynamics of student development as the main indicator of quality.

In the USA, not only educational achievements are assessed, but also readiness to make important decisions regarding professional self-determination or life principles. For this purpose, they are developing tests of “minimum competence”.

The main task of monitoring learning outcomes in all countries is to establish the correspondence of the volume of knowledge, skills and abilities of students with the required indicators, to identify the level of development of their personal qualities. At the same time, experts note that a reliable assessment of the effectiveness of education can be obtained with the correct organization of pedagogical diagnostics.

The functions of pedagogical diagnostics are considered in different aspects. Some authors identify it with the ability to use the most effective methods of monitoring results (V.V. Voronov, V.I. Kagan, N.A. Sychenikov, etc.), others note that the essence of pedagogical diagnostics is revealed through its functions. The German teacher K. Ingemcap in his work “Pedagogical Diagnostics” (1991) emphasizes that pedagogical diagnostics is aimed at solving a triune task: “1) optimize the process of individual learning; 2) ... ensure the correct definition of learning outcomes; 3) minimize the error ... when choosing a specialization of training.” Still others argue that diagnostics is a system that includes control, verification, evaluation of results, accumulation of statistical data, and their analysis (I.P. Podlasy). Conducting pedagogical diagnostics allows you to obtain information about the state of development of a particular object and determine the most effective ways of its functioning. Based on this, the object of pedagogical diagnostics can be the state of the educational process, the achieved results of educational activities, the study of their dynamics and patterns of development.

The tasks that pedagogical diagnostics are designed to solve are:

- in identifying the theoretical, practical and psychological readiness of students for further education, professional and social activities;
- in the study of motivational and value attitudes of students;
- in obtaining information about the level and nature of cognitive actions of students;
- in determining the performance indicators of the subjects of the educational process in accordance with the developed criteria and quality requirements of the final intellectual product (Afanasyev, 2005).

The methods used are varied and are determined depending on the goals, age and individual characteristics of the students. Currently the following methods are used in the education system:

- oral control: survey, conversation, map reading, test, exam, etc.;
- written control: essays, abstracts, independent and control work, coursework, individual assignments, tests, etc.;
- practical assessment: solving experimental problems, micro-research, laboratory workshop, pedagogical and industrial practice, etc.

Depending on the place in the educational process and the volume of content being tested, current, midterm and final control are distinguished.

Practice-oriented tasks. Task 1. *Shortage of water*

Akzhol and Sultan go on a two-day hiking trip. They decide to set up camp in the forest, but they have a problem. There is no water in the forest, they brought a liter of water

with them in the canteen.

They bought salad for dinner. Lettuce should be washed because it is sandy. The water used for washing the salad is stored in the kettle. The next day they want to make a drink with this water for breakfast, with a little sand in it.

Akjol and Sultan can make coffee or tea, but they don't want sand.

The way they prepare coffee and tea is shown below:



Picture 2. Making coffee and tea

1. Does the sand in the water not interfere with making coffee or tea? Explain your answer.

2. Which of the following methods of separation is used in the preparation of coffee and tea?

- A. adsorption
- B. driving
- C. extraction
- D. evaporation

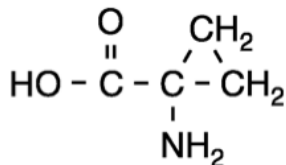
Task 2. *Bananas*

Bananas are harvested when they are still green. After being transported to Europe, green bananas are stored in a special ripening room. The following section, taken from the comic, explains what happens in the maturation chamber.

Combining the two pieces of information from the comic, we can conclude that to achieve perfect ripening, the air in the ripening chamber must be cooled.

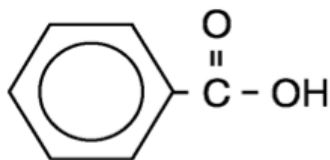
1. Provide these two pieces of information. The starch conversion described in Figure 2 is a hydrolysis reaction.

2. Show the reaction equation of this transformation. Molecular use of formulas; Molecular formula of starch: $(C_6H_{10}O_5)_n$. Banana contains substance A.



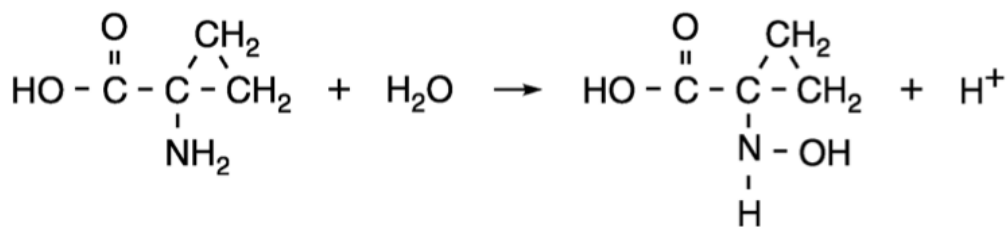
substance A

Compounds with a ring structure and a $-\text{COOH}$ group as a side group in their molecules, such as substance A, have a $-\text{carboxylic acid}$ as a suffix to their base name, for example, benzoic (benzenecarboxylic) acid:



3. Give the systematic name of substance A.

The formation of ethylene during the ripening of bananas occurs in two stages. In the first stage, substance A reacts with an oxidizing agent. Substance B is one of the substances formed in this oxidation-reduction reaction. The reductant half-reaction equation is given here incompletely:



substance A

substance B

Only electrons (e^-) and coefficients are missing from this equation.

4. Copy this incomplete equation, put e^- in the correct place and add the coefficients.

In the second stage, substance B reacts with water, which is also present in the banana, in a 1:1 molar ratio. This reaction produces ethylene, methanoic acid, carbon dioxide and other substances.

5. Explain what the molecular formula of this other substance should be. Use the molecular formulas of the substances involved in the second step in your explanation.

When the bananas are almost yellow, they are brought to the store. The shopkeeper must ensure that further ripening is as slow as possible; otherwise the bananas will turn

brown. One measure he can take is to keep the temperature low, such as displaying bananas in the cooler section of his store. By taking another measure, the store owner can ensure that the ethylene concentration around the banana is as low as possible.

Conclusions

Noting the variety of forms and methods of pedagogical control, with the help of which the level of preparedness of students is determined, we add that the assigned pedagogical assessment is not the result of measurement, therefore it is formal in content. The quality of control tasks is set arbitrarily by the teacher, without analyzing their diagnostic value and not assessing the reliability of the results obtained. Often, the assessment of the assimilation of the educational content of a topic or section occurs by checking individual, sometimes minor elements; the systematic nature of knowledge is not controlled, which does not allow one to draw a conclusion about the degree of assimilation of the required volume of knowledge and skills. In addition, there is a lack of systematic conduct, irrationality in the use of selected methods and forms, and subjectivity of assessment. Teachers and university professors sometimes forget that the main thing when assessing the results of the educational activities of students is not the control of the formed knowledge, but the identification of the dynamics of the student's development, the disclosure of his abilities, and the satisfaction of his educational needs.

In this regard, it is necessary to improve the existing system of monitoring the results of educational activities of students, increasing its diagnostic significance and objectivity. The mark given to the student hides the object of assessment, and without a qualitative analysis of it, it is impossible to objectively judge the level of preparedness of the graduate.

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