

МИНОБРНАУКИ РОССИИ

**Федеральное государственное бюджетное образовательное
учреждение высшего образования "Пермский
государственный национальный исследовательский
университет"**

**Кафедра неорганической химии, химической технологии и техносферной
безопасности**

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Рабочая программа дисциплины

FOOD ANALYSIS

Код УМК 98772

Утверждено
Протокол №4
от «19» марта 2020 г.

Пермь, 2020

1. Наименование дисциплины

Food analysis

2. Место дисциплины в структуре образовательной программы

Дисциплина входит в вариативную часть Блока « С.1 » образовательной программы по направлениям подготовки (специальностям):

Специальность: **33.05.01** Фармация

направленность Программа широкого профиля (для иностранных граждан)

3. Планируемые результаты обучения по дисциплине

В результате освоения дисциплины **Food analysis** у обучающегося должны быть сформированы следующие компетенции:

33.05.01 Фармация (направленность : Программа широкого профиля (для иностранных граждан))

ОПК.1 Владеет базовыми знаниями о современной научной картине мира на основе положений, законов и методов математических и естественных наук

Индикаторы

ОПК.1.1 Имеет представление о научной картине мира на основе положений, законов и закономерностей естественных наук

4. Объем и содержание дисциплины

Направления подготовки	33.05.01 Фармация (направленность: Программа широкого профиля (для иностранных граждан))
форма обучения	очная
№№ триместров, выделенных для изучения дисциплины	8
Объем дисциплины (з.е.)	3
Объем дисциплины (ак.час.)	108
Контактная работа с преподавателем (ак.час.), в том числе:	42
Проведение лекционных занятий	14
Проведение лабораторных работ, занятий по иностранному языку	28
Самостоятельная работа (ак.час.)	66
Формы текущего контроля	Входное тестирование (1) Защищаемое контрольное мероприятие (1) Письменное контрольное мероприятие (4)
Формы промежуточной аттестации	Зачет (8 триместр)

5. Аннотированное описание содержания разделов и тем дисциплины

Food analysis

Nutrition is one of the basic conditions for human existence. Quantity, quality, range of food products consumed, timeliness and regularity of food intake have a decisive influence on human life in all its manifestations.

Proper nutrition is the most important factor in health, it has a positive effect on a person's working capacity and his life activity and to a large extent determines the length of life, delaying the onset of old age.

Among the environmental conditions that constantly affect the human body, nutrition undoubtedly has the largest share. However, food has a fundamental difference from all other environmental factors - in the process of nutrition, it turns from an external into an internal factor, and moreover, its elements are transformed into the energy of physiological functions and structural elements of human organs and tissues.

That is why nutrition is the main factor in ensuring the normal growth and development of the human body, its ability to work, adaptation to the effects of various environmental agents, and in the end, we can assume that the nutrition factor has a decisive influence on life expectancy and human activity.

The course examines material on the chemistry of both nutrients and substances that contaminate food products and food raw materials. In addition, research methods are outlined that make it possible to control the quality and safety of the resulting food products.

Input control

The entrance control allows you to establish the readiness of the student to study the discipline and plan the educational track.

Introduction. The role of analytical chemistry in food safety control

No records exist who first began to think about why we eat or about various effects of foods, but ancient Greek philosophers and doctors commented these lines. Socrates said the purpose of food is to replace the water lost through the skin and the loss of heat from the body. Lavoisier thought that the combustion that produces body heat should occur in the lungs.

Understanding of what happens to food from the time it is eaten until it is oxidized to produce heat and mechanical energy, could not be learned until the chemical nature of foods was discovered. They knew that all animals inhale oxygen, combine it with the food to produce carbon dioxide, heat, and the energy with which they could move. The chemistry of that time could not tell more.

Foods are composed of organic substances too complex to be understood from the state of chemistry as it was in the first half of the nineteenth century. Modern work on digestion and nutrition began about a century ago. Now we know that we should eat to have energy. When a nutritionist uses the word «energy» he means the capacity to do work. To him «work» is movement; the more a person moves, the more energy he requires. Even when a man is asleep he is still partly in motion because his heart, lungs and most of the other organs are working.

Food chemicals. The main criteria determining the choice of the method of determination

The course covers methods for determining the main chemical components of food products (proteins, fats, carbohydrates, vitamins, minerals), as well as harmful substances (radionuclides, toxic metals, nitrogen-containing compounds, polycyclic aromatic compounds, veterinary drugs, pesticides, mycotoxins). Food chemicals are widely discussed. We study the main criteria determining the choice of the method of determination. Advantages and disadvantages of main methods and techniques in foodstuff analysis.

Classification of food analysis methods

Food analysis is a prerequisite for ascertaining product quality, implementing regulatory enforcements, checking compliance with national and international food standards, contracting specifications and nutrient labeling requirements. Food additives which include preservatives, antioxidants, sweeteners, colors etc are primarily used to enhance the safety and quality characteristics. The instrumental analysis of foods is an important step in

food processing and manufacturing companies because of the presence and interactions of various compounds in foods during storage and processing. While traditional methods are still used, most analysis involves the use of different instruments. This chapter is structured to provide a description of the information each technique can provide, a simple explanation of how it works and examples of its application, and facilitates comparison of techniques. The focus of this chapter is on spectroscopic, chromatographic and electrophoretic methods, including specific examples of instruments such as capillary electrophoresis, high-performance liquid chromatography (HPLC), nuclear magnetic resonance (NMR), atomic absorption, emission and inductively coupled plasma, fluorescence spectroscopies, gel electrophoresis, etc., among many others.

Instrumental methods of analysis

The key methods are discussed.

Physical and chemical methods of analysis

The key methods are discussed

Biological methods of analysis

The key methods are discussed

Stages of food analysis

Food analysis and quality control have many attributes and most of them have been mentioned in this chapter. Different food analysis methods are discussed, that is physicochemical, phytochemical and packaging methods. Instrumental methods are also discussed in this chapter. Different types of quality control methods are also discussed to mentioned the quality of the food products. Food analysis and quality control process are compulsory for all type of food industry.

The main stages of food analysis are discussed in this part. Includes: General principles of food sampling. Sampling of bulk, liquid, monolithic food products. Decomposition ways of food samples, including extraction, concentration and separation of defined components.

Food sampling. General principles

Food sampling is a process used to check that a food is safe and that it does not contain harmful contaminants, or that it contains only permitted additives at acceptable levels, or that it contains the right levels of key ingredients and its label declarations are correct, or to know the levels of nutrients present. A food sample is carried out by subjecting the product to physical analysis. Analysis may be undertaken by or on behalf of a manufacturer regarding their own product, or for official food law enforcement or control purposes, or for research or public information.

Sampling of bulk, liquid, food, monolithic products

Sampling involves the selection of a certain portion, number of container and product units from a particular lot of the same food. It must be as representative.

Samples are usually collected from a lot of food for random surveillance, collection of data for a specific purpose, or monitoring/and to determine the conformity to product standards specified in the regulation .

Decomposition of food samples. Extraction of defined components, concentration and separation

Extraction or separation of food components is used to prepare products such as fruit juices, cream or cooking oils, to produce sugar or gelatin for use as ingredients in other processes, or to retrieve high-value compounds, including essential oils and enzymes. This chapter describes the theory and equipment that are used for physical separation of food components by centrifugation, filtration, expression, solvent extraction and membrane separation.

Control on the topic "Steps of food analysis"

Workshop on sampling and preparation of food samples

Students are encouraged to take a workshop on the selection and preparation of food samples. To study the principles of laboratory work, develop approaches to analysis and test the knowledge gained in practice.

Analysis of various classes of food products

The latest developments in analytical and bioanalytical techniques and the most innovative applications and issues in food analysis. The lessons are about sampling technique, from basic one to the most recent advances, which is still a food challenge because is responsible of the quality and assurance of the analysis, and on data analysis and chemometrics are followed by a review of the most recently applied techniques in process (on-line) control and in laboratories for the analysis of major or minor compounds of food. These techniques ranged from the non-invasive and non-destructive ones, such as infrared spectroscopy, magnetic resonance and ultrasounds, to emerging areas as nanotechnology, biosensors and electronic noses and tongues, including those already well-established in food analysis, such as chromatographic and electrophoretic techniques. This chapter also include two important tools for solving problems in chemical and biological analysis such as mass spectrometry and molecular-based techniques.

Classification of food products

On the basis of purpose, all food products are divided into four categories:

Food products for mass consumption.

Treatment-dietary and therapeutic-prophylactic products.

Goods intended for children's nutrition.

Functional food products: fortified foods; physiologically functional food ingredients; probiotic foods; probiotics; prebiotics; Synbiotics.

Analysis of dairy products, including determination of the acidity, lactose and fat content of milk

Dairy products are major components of daily diet and the association between consumption of dairy products and public health issues has captured great attention. The main principles of dairy products analysis are discussed, including determination of the acidity, lactose and fat content of milk.

Analysis of meat products

Meat, fish and their products are important components of diet of a large majority of people. Their nutritive value and palatability are widely appreciated. Standards for meat and meat products and fish and fish products are discussed.

Determination of phenol in smoked sausage

Phenolic derivatives are very important compounds in smoked products. The determination of phenol and its derivative compounds are important for the health because these substances are toxic and are a result of various processes. Ingestion of phenol and cresol causes intense burning of mouth and throat, followed by marked abdominal pain and distress.

Determination of calcium and magnesium in meat

Calcium is an important component of a healthy diet and a mineral necessary for life.

- It is a mineral that people need to build and maintain strong bones and teeth.
- It is also very important for other physical functions, such as muscle control and blood circulation.

So determination of calcium and magnesium in meat is important part of food analysis.

Analysis of bread and confectionery products

Bread and confectionery products as main sources of carbohydrates and analysis of them are discussed.

Determination of acidity of bakery products

Many baking processes and overall baked products characteristics are directly related to the pH of the dough and/or the final products. Important functional aspects include:

Physical state of the gluten: effect on viscosity build up and gluten degree of dissolution.

Growth and activity of the yeast which impacts fermentation as well as amylolytic activity.

Preservation and microbial safety: Many pathogenic and spoilage microorganisms cannot survive in acidic environments. For example, bread rope caused by *Bacillus* spp. cannot grow at pH below 5.5.

In baked goods, there are different ways to influence pH:

By adding acids to the dough, such as fumaric, malic, citric or acetic. This is a very precise and practical method.

Via fermentation (alcoholic and/or lactic), as in the case of sourdoughs and preferments. This process increases dough acidity (lowering pH) based on beneficial microbial growth.

So determination of acidity of bakery products is important aspect of food analysis.

Determination of total sugar in confectionery

The analytical methods applied for the determination of sucrose contained in confectionery, such as sugar confectionary, bakery products, chocolates. and other products containing cocoa, and boiled red beans are discussed.

Analysis of alcoholic and non-alcoholic drinks

The drinks are the primary requirement beings in the world. Without drinking water, the creature will die and extinct. The drinks have variety types. Generally, drinks are divided into two categories: non-alcoholic beverages and alcohol. So Analysis of drinks is key theme for this part.

Determining the bitterness of beer

Beer can be bitter due to poor production technology (sourness), too high strength (alcohol content) and the use of special roasted malts, but in the vast majority of cases, the bitterness of beer depends on the hops used (one or more varieties). At the moment, the most popular calculation method is the International Bitterness Units (IBU), which is relevant for both professional and amateur brewing.

Analysis of fats and oils

Oils and fats are important parts of human diet and more than 90 per cent of the world production from vegetable, animal and marine sources is used as food or

as an ingredient in food products. Oils and fats are a rich source of dietary energy and contain more than twice the caloric value of equivalent amount of sugar. Their functional and textural characteristics contribute to the flavour and palatability of natural and prepared foods. They contain certain fatty acids which play an important role in nutrition and are also carriers of fat soluble vitamins.

Determination of the acid number of oils and fats

The acid value is defined as the number of milligrams of Potassium hydroxide required to neutralize the free fatty acids present in one gram of fat. It is a relative measure of rancidity as free fatty acids are normally formed during decomposition of triglycerides. The value is also expressed as per cent of free fatty acids calculated as oleic acid, lauric, ricinoleic and palmitic acids.

Intermediate control

Methods for calculating the determined indicators in the control of food quality

The chapter provides a brief description of analytical methods for assessing the quality and consumer properties of food products. The importance of the concepts of quality and food safety is noted. Depending on the means of

analysis and measurement the indices of quality of food goods are determined by organoleptic, by instrument (laboratory), and also expert, measuring, registration, calculated or sociological methods. Methods for calculating the determined indicators in the control of food quality are discussed.

Statistical processing of analysis results

The part considers and discusses current topics related to the statistical processing of the results of quantitative analysis, which the authors propose to integrate into the course of the basics of chemical metrology and in the course of computer modeling in pharmacy. This will ensure the smoothness and efficiency of the formation of the competence of pharmacists for statistical analysis of the results of a chemical experiment.

Final control

6. Методические указания для обучающихся по освоению дисциплины

Освоение дисциплины требует систематического изучения всех тем в той последовательности, в какой они указаны в рабочей программе.

Основными видами учебной работы являются аудиторские занятия. Их цель - расширить базовые знания обучающихся по осваиваемой дисциплине и систему теоретических ориентиров для последующего более глубокого освоения программного материала в ходе самостоятельной работы. Обучающемуся важно помнить, что контактная работа с преподавателем эффективно помогает ему овладеть программным материалом благодаря расстановке необходимых акцентов и удержанию внимания интонационными модуляциями голоса, а также подключением аудио-визуального механизма восприятия информации.

Самостоятельная работа преследует следующие цели:

- закрепление и совершенствование теоретических знаний, полученных на лекционных занятиях;
- формирование навыков подготовки текстовой составляющей информации учебного и научного назначения для размещения в различных информационных системах;
- совершенствование навыков поиска научных публикаций и образовательных ресурсов, размещенных в сети Интернет;
- самоконтроль освоения программного материала.

Обучающемуся необходимо помнить, что результаты самостоятельной работы контролируются преподавателем во время проведения мероприятий текущего контроля и учитываются при промежуточной аттестации.

Обучающимся с ОВЗ и инвалидов предоставляется возможность выбора форм проведения мероприятий текущего контроля, альтернативных формам, предусмотренным рабочей программой дисциплины. Предусматривается возможность увеличения в пределах 1 академического часа времени, отводимого на выполнение контрольных мероприятий.

Процедура оценивания результатов обучения инвалидов и лиц с ограниченными возможностями здоровья по дисциплине предусматривает предоставление информации в формах, адаптированных к ограничениям их здоровья и восприятия информации.

При проведении текущего контроля применяются оценочные средства, обеспечивающие передачу информации, от обучающегося к преподавателю, с учетом психофизиологических особенностей здоровья обучающихся.

7. Перечень учебно-методического обеспечения для самостоятельной работы обучающихся по дисциплине

При самостоятельной работе обучающимся следует использовать:

- конспекты лекций;
- литературу из перечня основной и дополнительной учебной литературы, необходимой для освоения дисциплины (модуля);
- текст лекций на электронных носителях;
- ресурсы информационно-телекоммуникационной сети "Интернет", необходимые для освоения дисциплины;
- лицензионное и свободно распространяемое программное обеспечение из перечня информационных технологий, используемых при осуществлении образовательного процесса по дисциплине;
- методические указания для обучающихся по освоению дисциплины.

8. Перечень основной и дополнительной учебной литературы

Основная:

1. A. Douglas Kinghorn. Progress in the Chemistry of Organic Natural Products 112 / A. Douglas Kinghorn, Heinz Falk, Simon Gibbons, Jun'ichi Kobayashi, Yoshinori Asakawa, Ji-Kai Liu // Publisher Name: Springer, Cham. — 2020. — 206 p. — ISBN 978-3-030-52966-6. — Текст : электронный // Электронно-библиотечная система SpringerLink : [сайт]. <https://link.springer.com/book/10.1007/978-3-030-52966-6>
2. Timberlake, K. General, Organic, and Biological Chemistry. Structures of life/Timberlake, K..-San Francisco [etc.]:Pearson,2003, ISBN 0-8053-8914-8.-851.

Дополнительная:

1. Кабанова, О. В. Food Industry : методические указания по английскому языку / О. В. Кабанова. — Оренбург : Оренбургский государственный университет, ЭБС АСВ, 2005. — 47 с. — ISBN 2227-8397. — Текст : электронный // Электронно-библиотечная система IPR BOOKS : [сайт]. <http://www.iprbookshop.ru/50016>
2. Timberlake, K. General, Organic, and Biological Chemistry. Structures of life/Timberlake, K..-San Francisco [etc.]:Pearson,2003, ISBN 0-8053-8914-8.-851.
3. Григорьева, О. Н. Food and Its Constituents. Пища и её влияние на организм человека : учебное пособие / О. Н. Григорьева, Э. И. Галиуллина. — Казань : Казанский национальный исследовательский технологический университет, 2010. — 111 с. — ISBN 978-5-7882-1223-4. — Текст : электронный // Электронно-библиотечная система IPR BOOKS : [сайт]. <http://www.iprbookshop.ru/61948>
4. G. Marriott Norman, Gravani Robert B. Principles of Food Sanitation. Boston: Springer Science+Business Media, Inc., 2006. Online ISBN 978-0-387-25085-4. Текст электронный: // <https://link.springer.com/book/10.1007/b106753> <https://link.springer.com/book/10.1007/b106753>

9. Перечень ресурсов сети Интернет, необходимых для освоения дисциплины

При освоении дисциплины использование ресурсов сети Интернет не предусмотрено.

10. Перечень информационных технологий, используемых при осуществлении образовательного процесса по дисциплине

Образовательный процесс по дисциплине **Food analysis** предполагает использование следующего программного обеспечения и информационных справочных систем:

Educational and scientific literature on the course, access to online databases and knowledge bases, electronic libraries.

Video recordings related to the course program, computer demonstrations, technical capabilities for viewing and listening to them.

Free access to the Internet, availability of general-purpose computer programs, as well as special chemical programs - ACD, ChemOffice. Operating systems: Windows family (not below Windows XP) or Linux.

При освоении материала и выполнения заданий по дисциплине рекомендуется использование материалов, размещенных в Личных кабинетах обучающихся ЕТИС ПГНИУ (**student.psu.ru**).

При организации дистанционной работы и проведении занятий в режиме онлайн могут использоваться:

система видеоконференцсвязи на основе платформы BigBlueButton (<https://bigbluebutton.org/>).

система LMS Moodle (<http://e-learn.psu.ru/>), которая поддерживает возможность использования текстовых материалов и презентаций, аудио- и видеоконтент, а так же тесты, проверяемые задания, задания для совместной работы.

система тестирования Indigo (<https://indigotech.ru/>).

11. Описание материально-технической базы, необходимой для осуществления образовательного процесса по дисциплине

For lectures, a lecture room with a multimedia projector.

For practical classes, an classroom of 30 seats with a board is needed

For laboratory studies, a room in which there are laboratory tables with summed up with electricity, water and sewage, fume hoods, chemical glassware and chemical reagents

Помещения научной библиотеки ПГНИУ для обеспечения самостоятельной работы обучающихся:

1. Научно-библиографический отдел, корп.1, ауд. 142. Оборудован 3 персональными компьютера с доступом к локальной и глобальной компьютерным сетям.

2. Читальный зал гуманитарной литературы, корп. 2, ауд. 418. Оборудован 7 персональными компьютерами с доступом к локальной и глобальной компьютерным сетям.

3. Читальный зал естественной литературы, корп.6, ауд. 107а. Оборудован 5 персональными компьютерами с доступом к локальной и глобальной компьютерным сетям.

4. Отдел иностранной литературы, корп.2 ауд. 207. Оборудован 1 персональным компьютером с доступом к локальной и глобальной компьютерным сетям.

5. Библиотека юридического факультета, корп.9, ауд. 4. Оборудована 11 персональными компьютерами с доступом к локальной и глобальной компьютерным сетям.

6. Читальный зал географического факультета, корп.8, ауд. 419. Оборудован 6 персональными компьютерами с доступом к локальной и глобальной компьютерным сетям.

Все компьютеры, установленные в помещениях научной библиотеки, оснащены следующим программным обеспечением:

Операционная система ALT Linux;

Офисный пакет Libreoffice.

Справочно-правовая система «КонсультантПлюс»

**Фонды оценочных средств для аттестации по дисциплине
Food analysis**

**Планируемые результаты обучения по дисциплине для формирования компетенции.
Индикаторы и критерии их оценивания**

ОПК.1

Владеет базовыми знаниями о современной научной картине мира на основе положений, законов и методов математических и естественных наук

Компетенция (индикатор)	Планируемые результаты обучения	Критерии оценивания результатов обучения
<p>ОПК.1.1 Имеет представление о научной картине мира на основе положений, законов и закономерностей естественных наук</p>	<p>The student has an idea of the scientific picture of the world based on the provisions, laws and regularities of the natural sciences Student knows: - methods of sampling food products; - methods of sample preparation; - modern instrumental methods of analysis. Student is able to - carry out all stages of the analysis of various food products; - process the results of the analysis based on the received analytical signals; - use normative documentation on methods of analysis. Student has skills: - laboratory skills, methods of sampling and sample preparation - food analysis skills</p>	<p align="center">Неудовлетворител</p> <p>Student doesn't know: - methods of sampling food products; - methods of sample preparation; - modern instrumental methods of analysis. Student is not able to - carry out all stages of the analysis of various food products; - process the results of the analysis based on the received analytical signals; - use normative documentation on methods of analysis. Student doesn't have skills: - laboratory skills, methods of sampling and sample preparation - food analysis skills</p> <p align="center">Удовлетворительн</p> <p>Student knows: - methods of sampling food products; - methods of sample preparation; - modern instrumental methods of analysis. Student is not able to - carry out all stages of the analysis of various food products; - process the results of the analysis based on the received analytical signals; - use normative documentation on methods of analysis. Student doesn't have skills: - laboratory skills, methods of sampling and sample preparation - food analysis skills</p> <p align="center">Хорошо</p> <p>Student knows: - methods of sampling food products;</p>

Компетенция (индикатор)	Планируемые результаты обучения	Критерии оценивания результатов обучения
		<p style="text-align: center;">Хорошо</p> <ul style="list-style-type: none"> - methods of sample preparation; - modern instrumental methods of analysis. <p>Student is able to</p> <ul style="list-style-type: none"> - carry out all stages of the analysis of various food products; - process the results of the analysis based on the received analytical signals; - use normative documentation on methods of analysis. <p>Student doesn't have skills:</p> <ul style="list-style-type: none"> - laboratory skills, methods of sampling and sample preparation - food analysis skills <p style="text-align: center;">Отлично</p> <p>The student has an idea of the scientific picture of the world based on the provisions, laws and regularities of the natural sciences</p> <p>Student knows:</p> <ul style="list-style-type: none"> - methods of sampling food products; - methods of sample preparation; - modern instrumental methods of analysis. <p>Student is able to</p> <ul style="list-style-type: none"> - carry out all stages of the analysis of various food products; - process the results of the analysis based on the received analytical signals; - use normative documentation on methods of analysis. <p>Student has skills:</p> <ul style="list-style-type: none"> - laboratory skills, methods of sampling and sample preparation - food analysis skills

Оценочные средства текущего контроля и промежуточной аттестации

Схема доставки : Базовая

Вид мероприятия промежуточной аттестации : Зачет

Способ проведения мероприятия промежуточной аттестации : Оценка по дисциплине в рамках промежуточной аттестации определяется на основе баллов, набранных обучающимся на контрольных мероприятиях, проводимых в течение учебного периода.

Максимальное количество баллов : 100

Конвертация баллов в отметки

«отлично» - от 81 до 100

«хорошо» - от 61 до 80

«удовлетворительно» - от 50 до 60

«неудовлетворительно» / «незачтено» менее 50 балла

Компетенция (индикатор)	Мероприятие текущего контроля	Контролируемые элементы результатов обучения
Входной контроль ОПК.1.1 Имеет представление о научной картине мира на основе положений, законов и закономерностей естественных наук	Input control Входное тестирование	Fundamentals of general, analytic, inorganic and organic chemistry
ОПК.1.1 Имеет представление о научной картине мира на основе положений, законов и закономерностей естественных наук	Biological methods of analysis Письменное контрольное мероприятие	Introduction. The role of analytical chemistry in food safety control. Food chemicals. The main criteria determining the choice of the method of determination. Instrumental methods of analysis. Chemical methods of analysis. Biological methods of analysis
ОПК.1.1 Имеет представление о научной картине мира на основе положений, законов и закономерностей естественных наук	Control on the topic "Steps of food analysis" Письменное контрольное мероприятие	Fundamentals of food analysis. The relationship of general, analytical, inorganic and bioorganic chemistry with food analysis. Stages of food analysis. Food sampling. General principles. Sampling of bulk food products. Sampling of liquid food products. Sampling of monolithic food products. Decomposition of food samples. Extraction of defined components. concentration and separation.

Компетенция (индикатор)	Мероприятие текущего контроля	Контролируемые элементы результатов обучения
<p>ОПК.1.1 Имеет представление о научной картине мира на основе положений, законов и закономерностей естественных наук</p>	<p>Intermediate control Письменное контрольное мероприятие</p>	<p>The student has an idea of the scientific picture of the world based on the provisions, laws and regularities of the natural sciences. Check-list:</p> <p>Fundamentals of bioorganic chemistry. Basic terms and definitions. Certification and declaration. Food labeling Food identification. Scheme of chemical analysis</p> <p>Classification of compounds present in foods. organic and mineral substances. Chemistry and methods for determining nutrients. Proteins. Classification of proteins. The biological value of protein. Methods for determining the content of protein and amino acids Fats. Classification of fats. The biological value of fats. Methods for determination of fats. Food spoilage of fats Carbohydrates. Classification of carbohydrates. Nutritional and biological value of carbohydrates. Methods for determining carbohydrates Minerals. Classification of minerals. Determination of minerals Vitamins. fat soluble vitamins. Water Soluble Vitamins Toxic and pollutants. Student knows: - methods of sampling food products; - methods of sample preparation; - modern instrumental methods of analysis. Student is able to - carry out all stages of the analysis of various food products; - process the results of the analysis based on the received analytical signals; - use normative documentation on methods of analysis. Student has skills: - laboratory skills, methods of sampling and sample preparation - food analysis skills</p>

Компетенция (индикатор)	Мероприятие текущего контроля	Контролируемые элементы результатов обучения
<p>ОПК.1.1 Имеет представление о научной картине мира на основе положений, законов и закономерностей естественных наук</p>	<p>Intermediate control Защищаемое контрольное мероприятие</p>	<p>The student has an idea of the scientific picture of the world based on the provisions, laws and regularities of the natural sciences. Check-list: Fundamentals of bioorganic chemistry. Basic terms and definitions. Certification and declaration. Food labeling Food identification. Scheme of chemical analysis Classification of compounds present in foods. organic and mineral substances. Chemistry and methods for determining nutrients. Proteins. Classification of proteins. The biological value of protein. Methods for determining the content of protein and amino acids Fats. Classification of fats. The biological value of fats. Methods for determination of fats. Food spoilage of fats Carbohydrates. Classification of carbohydrates. Nutritional and biological value of carbohydrates. Methods for determining carbohydrates Minerals. Classification of minerals. Determination of minerals Vitamins. fat soluble vitamins. Water Soluble Vitamins Toxic and pollutants. Student knows: - methods of sampling food products; - methods of sample preparation; - modern instrumental methods of analysis. Student is able to - carry out all stages of the analysis of various food products; - process the results of the analysis based on the received analytical signals; - use normative documentation on methods of analysis. Student has skills: - laboratory skills, methods of sampling and sample preparation - food analysis skills</p>

Компетенция (индикатор)	Мероприятие текущего контроля	Контролируемые элементы результатов обучения
ОПК.1.1 Имеет представление о научной картине мира на основе положений, законов и закономерностей естественных наук	Final control Письменное контрольное мероприятие	The student has an idea of the scientific picture of the world based on the provisions, laws and regularities of the natural sciences Student knows: - methods of sampling food products; - methods of sample preparation; - modern instrumental methods of analysis. Student is able to - carry out all stages of the analysis of various food products; - process the results of the analysis based on the received analytical signals; - use normative documentation on methods of analysis. Student has skills: - laboratory skills, methods of sampling and sample preparation - food analysis skills

Спецификация мероприятий текущего контроля

Input control

Продолжительность проведения мероприятия промежуточной аттестации: **1 часа**

Условия проведения мероприятия: **в часы аудиторной работы**

Максимальный балл, выставляемый за мероприятие промежуточной аттестации: **0**

Проходной балл: **0**

Показатели оценивания	Баллы
Fundamentals of general chemistry	25
Fundamentals of organic chemistry	25
Fundamentals of inorganic chemistry	25
Fundamentals of analytic chemistry	25

Biological methods of analysis

Продолжительность проведения мероприятия промежуточной аттестации: **2 часа**

Условия проведения мероприятия: **в часы самостоятельной работы**

Максимальный балл, выставляемый за мероприятие промежуточной аттестации: **20**

Проходной балл: **10**

Показатели оценивания	Баллы
The role of analytical chemistry in food safety control. Food chemicals. The main criteria determining the choice of the method of determination	5

Biological methods of analysis	5
Chemical methods of analysis	5
Instrumental methods of analysis	5

Control on the topic "Steps of food analysis"

Продолжительность проведения мероприятия промежуточной аттестации: **1 часа**

Условия проведения мероприятия: **в часы аудиторной работы**

Максимальный балл, выставляемый за мероприятие промежуточной аттестации: **20**

Проходной балл: **10**

Показатели оценивания	Баллы
Fundamentals of food analysis. The relationship of general, analytical, inorganic and bioorganic chemistry with food analysis.	5
Decomposition of food samples. Extraction of defined components. Concentration and separation.	5
Sampling of bulk food products. Sampling of liquid food products. Sampling of monolithic food products.	5
Stages of food analysis. Food sampling. General principles.	5

Intermediate control

Продолжительность проведения мероприятия промежуточной аттестации: **2 часа**

Условия проведения мероприятия: **в часы самостоятельной работы**

Максимальный балл, выставляемый за мероприятие промежуточной аттестации: **20**

Проходной балл: **10**

Показатели оценивания	Баллы
Fundamentals of bioorganic chemistry. Food identification. Scheme of chemical analysis. Classification of compounds present in foods.	5
Toxic compounds and pollutants. Safety rules and principles of food analysis.	5
Proteins. Fats. Carbohydrates. Minerals. Vitamins.	5
Organic and mineral substances. Chemistry and methods for determining nutrients	5

Intermediate control

Продолжительность проведения мероприятия промежуточной аттестации: **2 часа**

Условия проведения мероприятия: **в часы аудиторной работы**

Максимальный балл, выставляемый за мероприятие промежуточной аттестации: **20**

Проходной балл: **10**

Показатели оценивания	Баллы
Fundamentals of bioorganic chemistry. Food identification. Scheme of chemical analysis. Classification of compounds present in foods.	5
Toxic compounds and pollutants. Safety rules and principles of food analysis.	5
Proteins. Fats. Carbohydrates. Minerals. Vitamins.	5
Organic and mineral substances. Chemistry and methods for determining nutrients.	5

Final control

Продолжительность проведения мероприятия промежуточной аттестации: **4 часа**

Условия проведения мероприятия: **в часы самостоятельной работы**

Максимальный балл, выставляемый за мероприятие промежуточной аттестации: **20**

Проходной балл: **10**

Показатели оценивания	Баллы
Student knows: - methods of sampling food products; - methods of sample preparation; - modern instrumental methods of analysis.	5
Student knows fundamentals of general, analytic, inorganic and organic chemistry in application to food analysis	5
Student has skills: - laboratory skills, methods of sampling and sample preparation - food analysis skills	5
Student is able to - carry out all stages of the analysis of various food products; - process the results of the analysis based on the received analytical signals; - use normative documentation on methods of analysis.	5