

Discipline designation	Biotechnology
Semester(s) in which the discipline is taught	4
Responsible teacher	Khamrayeva Nafisa Tirkashevna, Doctor of Philosophy (PhD) in Biological Sciences, Associate Professor To'lishev Jaloliddin Ashir oglu, teacher Ochilov Azizjon Shukhrat oglu, master's student in biology, intern teacher.
Teaching language	Uzbek
Connection to the curriculum	Elective subject
Academic workload (including contact hours, independent hours)	Total workload: 120 hours Contact hours – Lecture 20 h laboratory work 20 hours. Practical -20 h SsIW - 60 hours.
Credits	4
Prerequisites	Biology development, botany, biochemistry, inorganic chemistry and organic chemistry, plant physiology, microbiology, molecular biology.
The aims of the discipline	The aim of the discipline is to obtain products from biological objects or with their use, as well as to reproduce bioeffects not found in nature. Learning outcomes <ul style="list-style-type: none"> <li>- concept of biotechnology;</li> <li>- list the role of biotechnology in society and human life;</li> <li>- be able to grow cultures from plant cells and microorganisms;</li> <li>- know the processing technologies for cleaning strains;</li> <li>- choose to improve the soil reclamation condition;</li> <li>- assess and increase soil fertility;</li> <li>- be able to grow from cells and tissue in vitro;</li> <li>- know the organization of school experimental sites;</li> <li>- be able to organize the cultivation of seedlings;</li> <li>- know the definition of genome in living organisms.</li> </ul>
Contents of the lesson	Content <ol style="list-style-type: none"> <li>1. Purpose, objectives, history of development and methods of the science “Biotechnology”.</li> <li>2. Material basis of genetic engineering</li> <li>3. Genetic engineering enzymes.</li> <li>4. Technology for isolating recombinant DNA.</li> <li>5. Genetic engineering of plants</li> <li>6. Expression of genetic material in transgenic plants.</li> <li>7. Material basis of cell engineering</li> <li>8. Callus tissue cultures.</li> <li>9. Creation of chimeric animals.</li> <li>10. Animal cloning.</li> <li>11. Obtaining a protoplast culture</li> <li>12. Ecological situation with the help of biotechnology, preservation and protection of the environment.</li> <li>13. Water purification methods</li> <li>14. The role of plants and microorganisms in biological wastewater treatment.</li> <li>15. Use of microorganisms to obtain energy from biomass: bioenergy</li> </ol>
Form of exam	Written

Training examination requirements and	<p>Complete mastery of theoretical and methodological concepts in the subject, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control, and pass written work on the final control.</p> <p>When drawing up questions for the final control, deviations from the content of the discipline program are not allowed. The bank of final control questions for each subject is discussed at the meeting and approved by the head of the department.</p> <p>When compiling tickets for the final control, a bank of questions for the final control is used; the number (3-5 questions) of questions in the ticket should be in a 50/50 ratio, depending on the content of classroom and independent learning.</p> <p>No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the dean's office and opened 5 minutes before the start of the exam in the presence of students. The duration of the final control is 80 minutes. Answers to questions for the final control are recorded in notebooks with the seal of the dean's office. After completing the final control, the work is immediately encrypted by a representative of the dean's office, and the notebooks are handed over to the commission for verification. From the moment of completion of the final control, a period of 72 hours is given for checking and posting the results on the electronic platform.</p> <p>The teacher who taught the students in this subject is not involved in the process of conducting the exam and checking the students' answers.</p> <p>Student(s) who are dissatisfied with the results of the final control may submit a written or oral appeal within 24 hours from the date of publication of the results of the final control. Complaints submitted after 24 hours from the publication of the results of the final control will not be accepted.</p>
References	<ol style="list-style-type: none"> <li>1. Muzaffarov E.N. Biotechnology. Basics of Biology. Tutorial. Lan, 2022</li> <li>2. Chechina, O. N. General Biotechnology: the textbook for universities. — 3rd edition. - Moscow: Yurayt publishing house, 2024. - 266 p. — ISBN 978-5-534-13660-9.</li> <li>3. Q. Davranov, B.S. Alikulov. Biotechnology. Textbook, Tashkent, 2022. "Lesson press" printing house - 452 b.</li> </ol>
Scope of assessment criteria and procedure	<p><b>CURRENT CONTROL</b></p> <p><b>Purpose:</b> Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics.</p> <p><b>Instructions:</b> The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc.</p> <p><b>Current control form:</b></p> <ul style="list-style-type: none"> <li>Activity in lessons</li> <li>Preparing educational materials</li> <li>Working with sources within the subject</li> <li>Using educational technologies</li> <li>Working in a team</li> <li>Preparing presentations</li> <li>Working with projects</li> </ul> <p><b>INTERMEDIATE CONTROL</b></p>

**Purpose:** Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course.

**Form and procedure of intermediate control:** Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject.

**Independent learning:**

**Purpose:** Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students.

**Form and procedure of independent education:** Independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc.

Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher.

In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment.

The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module).

Independent work assignments account for 60% of the points allocated for current and intermediate control.

Independent learning task 1: Preparation of project work based on independent learning topics

Independent learning task 2: Preparing sample video lessons based on specialized subject topics.

Independent learning task 3: Preparation of open lesson plans in specialized subjects using interactive methods.

Independent learning task 4: Analysis of educational normative documents for specialized subjects and preparation of presentations.

**FINAL CONTROL**

**Purpose:** The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform.

**Requirements:** The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject.

A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type.

Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject.

A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor.

	<b>Final control form:</b> The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.					
Criteria for assessing student knowledge	<b>5 stars</b>	<b>100 points</b>		<b>Evaluation criteria</b>		
	5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject (subject), and have an idea about the subject (subject)		
	4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject (subject), and has an idea about the subject (subject)		
	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject (subject), and has an idea about the subject (subject)		
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the science (subject), and does not have an idea about the science (subject)		
Course evaluation criteria and procedure	<b>Control type</b>		<b>Total points allocated</b>	<b>Control (task) form</b>	<b>Distribution of points</b>	<b>Qualifying score</b>
	<b>Current control</b>		30 points	System tasks	20 points (divided by the number of tasks)	18 points
				Student activity (in seminars, practical, laboratory classes)	10 points	
	<b>Intermediate control</b>		20 points	Supervision: Written work	10 points	12 points
				System tasks	10 points (divided by the number of tasks)	

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