Міністерсто освіти та науки України
Національний університет водного господарства та природокористування

Кафедра іноземних мов

06-09-109М

МЕТОДИЧНІ ВКАЗІВКИ

та навчальні завдання
до практичних занять і самостійної роботи
з навчальної дисципліни
«Іноземна мова (за професійним спрямуванням) (англійська)»
для здобувачів вищої освіти першого (бакалаврського) рівня
за освітньо-професійною програмою «Біотехнології, біоробототехніка та біоенергетика»
спеціальності 162 «Біотехнологія та біоінженерія»
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Методичні вказівки та навчальні завдання до практичних занять і самостійної роботи з навчальної дисципліни «Іноземна мова (за професійним спрямуванням) (англійська)» для здобувачів вищої освіти першого (бакалаврського) рівня за освітньо-професійною програмою «Біотехнології, біоробототехніка та біоенергетика» спеціальності 162 «Біотехнологія та біоінженерія» денної форми навчання. [Електронне видання] / Тарасюк Н. М. – Рівне : НУВГП, 2025. – 71 с.

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ЗМІСТ

Передмова

Методичні вказівки та навчальні завдання до практичних занять і самостійної роботи з навчальної дисципліни «Іноземна мова (за професійним спрямуванням) (англійська)» для здобувачів вищої освіти ступеня «бакалавр» за освітньо-професійною програмою «Біотехнології, біоробототехніка та біоенергетика» спеціальності 162 «Біотехнологія та біоінженерія» денної форми навчання мають на меті допомогти студентові у його практичній та самостійній роботі над розвитком професійної комунікативної компетентності.

Для досягнення зазначеної мети передбачається виконання таких завдань:

- оволодіння найбільш уживаною лексикою у межах даної біотехнологічної тематики;
- отримання уявлення про оволодіння основними граматичними категоріями англійської мови, яка вивчається відповідно до інженерної тематики; розпізнавання відомого лексичного і граматичного матеріалу під час читання і застосування його у процесі усного спілкування та письма;

У результаті вивчення навчальної дисципліни студент повинен

знати: граматичні структури, що є необхідними для гнучкого передання відповідних понять, а також для розуміння професійної інформації; лексичні одиниці для інженерного тезаурусу .

вміти:

-*аудіювання:* розуміти обговорення проблем професійно-орієнтованого характеру в групі та в парах;

-*читання*: розуміти автентичні тексти, пов'язані з напрямом інженерії; розуміти головні ідеї та знаходити необхідну інформацію в неадаптованій технічній

літературі за фахом; здійснювати ознайомлювальне та пошукове читання неадаптованих технічних текстів для отримання інформації;

- *говоріння*: реагувати на основні ідеї та розпізнавати суттєво важливу інформацію під час обговорень, що пов'язані з особливостями професії; залучатися до обговорень професійно-орієнтованих тем в межах логічно зв’язаних усномовленнєвих форм спілкування на смислово-синтаксичному рівні.

-*письмо*: оволодіти професійними вміннями письмового мовлення (есе, презентація, висновок);

Кожен урок починається з завдання для вдосконалення глосарію спеціальних термінів. Тексти для читання дають можливість практичного застосування даних термінів. Післятекстові вправи дозволяють перевірити розуміння прочитаного за допомогою запитань для загального розуміння та критичного аналізу. Деякі завдання поєднуються з використанням інструментів штучного інтелекту Deep Dream Generator, Runway ML, Pixray, Designify, DeepAI, ChatGPT, Gencraft AI, Quillbot; веб сайтів візуальних зображень Pixabay, Unsplash, Storyblocks, Pexels, Videvo, Getty Images, Shuttestoc; інтерактивних платформ таких як Wordart, Mindmeister, Mindmomo, Piktochart, Mentimeter, Miro, Kialo, Twinery; платформою текстового аналізу UClassify для покращення мовленнєвих навичок студентів та створення більш привабливого навчального середовище. Їх інтеграція до завдань сприяє ефективнішому та цікавішому процесу вивчення англійської мови за професійним спрямуванням. Кожен урок закінчується вправами для вдосконалення навичок та вмінь коретного оформлення писемного висловлювання.

Тема 1. Self-management, psychophysical, self-analysis for management of biotechnological processes

Speaking. *Task 1.*

ln pairs, discuss the following questions

Which personality traits are crucial for personal and professional growth in control and management of biotechnological processes?

Why is self-analysis essential for teamwork in the organization of biotechnological production?

Vocabulary Focus. *Task 2.*

Match each word with its corresponding definition.

1. Integral	a. The process of improving or developing something, especially by careful attention, training, and effort.
2. Self-management	b. Something that is essential or necessary for completeness.
3. Pivotal	c. The state of being comfortable, healthy, or happy.
4. Psychophysical	d. The act of making something as effective or functional as possible.
5. Optimization	e. The state or quality of being advanced.
6. Cultivation	f. The complex combination of psychological and physical aspects.
7. Well-being	g. The action of managing or

	regulating oneself or one's activities.
8. Advancements	h. Extremely complex or detailed.
9. Intricate	i. A crucial point or central importance in a situation.
10. Pursuit	j. The action of following or chasing something

Grammar Focus. *Task 3.*

Read the sentences below and choose the correct verb form to fill in the blanks. The sentences focus on the key terms: Integral, Self-management, Pivotal, Psychophysical, Optimization, Cultivation, Well-being, Advancements, Intricate, and Pursuit.

1. Biotechnological processes _____ an essential role in various industries.

a. played

b. plays

c. are playing

d. has played

2. Effective self-management techniques _____ crucial for personal and professional growth.

a. is

b. are

c. were

d. have been

3. Setting achievable goals is _____ to success in self-management.

a. pivotal

b. pivots

c. pivot

d. has pivoted

4. Professionals in the field of biotechnology _____ on psychophysical data for insights.

a. rely

b. relies

c. are relying

d. has relied

5. Understanding one's cognitive and physical limits _____ individuals to make informed decisions.

a. enable

b. enables

c. enabling

d. has enabled

6. Time management strategies, such as setting realistic deadlines, _____ productivity.

a. enhances

b. enhance

c. are enhancing

d. has enhanced

7. The integration of psychophysical data _____ in the decision-making process.

a. plays

b. play

c. are playing

d. has played

8. Personal and professional growth _____ the pursuit of excellence.

a. is

b. are

c. were

d. have been

9. The intricate mechanisms involved in biotechnological processes _____ to be thoroughly understood.

a. need

b. needs

c. are needing

d. has needed

10. The constant advancements in technology _____ our approach to complex tasks.

a. revolutionized

b. revolutionize

c. are revolutionizing

d. have revolutionized

Reading Comprehension. *Task 4.*

Read the following text and answer the questions below: «The Crucial Role of Self-Management and Psychophysical Data in Biotechnological Processes»

Biotechnological processes have become an integral part of various industries, revolutionizing the way we approach complex tasks. However, amidst the advancements in technology, the significance of personal and professional growth through effective self-management techniques should not be overlooked. Self-management refers to the ability to

prioritize tasks, set achievable goals, and maintain a balance between work and personal life. This skill is pivotal for individuals involved in the control and management of biotechnological processes, as it ensures productivity and efficiency.

Moreover, the utilization of psychophysical data plays a key role in understanding the intricate mechanisms involved in biotechnological processes. By analyzing psychophysical data, professionals can gain valuable insights into the psychological and physical aspects that impact their performance. Understanding one's cognitive and physical limits enables individuals to make informed decisions, leading to better management of biotechnological processes.

In the pursuit of personal and professional growth, individuals must develop a keen understanding of self-management principles and the significance of psychophysical data. By incorporating effective time management strategies, such as setting realistic deadlines and prioritizing tasks, professionals can enhance their productivity and maintain a healthy work-life balance. Additionally, the integration of psychophysical data in the decision-making process can facilitate the optimization of biotechnological processes, leading to improved outcomes and increased efficiency.

In conclusion, the successful control and management of biotechnological processes heavily rely on the cultivation of self-management skills and the utilization of psychophysical data. By prioritizing personal and professional growth and recognizing the importance of balancing psychological and physical well-being, individuals can contribute to the

advancement of biotechnological practices while achieving their full potential.

Answer the questions:

1. What role do biotechnological processes play in various industries, according to the text?
2. How does effective self-management contribute to the control and management of biotechnological processes?
3. What does the term self-management refer to, as described in the text? Why is it crucial in biotechnological processes?
4. How does the analysis of psychophysical data benefit professionals involved in biotechnological processes?
5. What insights can individuals gain from understanding their cognitive and physical limits in the context of biotechnological processes?
6. According to the text, what strategies can professionals incorporate to enhance their productivity and maintain a healthy work-life balance?
7. How does the integration of psychophysical data facilitate the optimization of biotechnological processes, as discussed in the text?
8. What is the relationship between personal and professional growth, and the successful control and management of biotechnological processes, according to the text?
9. Why is it important for individuals to prioritize both psychological and physical well-being in the context of biotechnological practices, as emphasized in the text?
10. Do you agree with the idea that the cultivation of self-management skills and the utilization of psychophysical data

are essential for the successful control and management of biotechnological processes? Why or why not?

Writing activity. *Task 5.*

Write a short paragraph (100-150 words) about a specific scenario in which a biotechnologist's critical thinking skills were crucial in solving a complex issue during a biotechnological process. Highlight the importance of this trait in the field.

Speaking Activity. *Task 6.*

Discuss the following questions with a partner:

1. How can effective time management improve the efficiency of biotechnological processes?
2. What specific skills are crucial for individuals to possess when working in a team in the context of biotechnological production?
3. What common challenges that individuals may encounter when working in a team in the organization of biotechnological production, and how can they be effectively addressed?
4. What specific skills are crucial for individuals to possess when working in a team in the context of biotechnological production?

Speaking Activity. *Task 7.*

Use for the following links for critical analysis and content discussion in the group.

https://link.springer.com/article/10.1057/jcb.2009.19
https://ceoworld.biz/2022/07/07/3-traits-every-biotech-ceo-and-leader-should-have/
https://www.mccormick.northwestern.edu/biotechnology/inside-our-program/stories/2019/the-power-of-critical-thinking.html

Тема 2. Ecological biotechnology

Speaking. *Task 1.*

ln pairs, discuss the following questions

What is the link between biotechnology and the environment?

What does ecological biotechnology involve?

What is the role of biotechnology in environmental sustainability?

Vocabulary Focus. *Task 2.*

Match each word with its corresponding definition.

1. Environmental Challenges	a. The use of scientific and technological knowledge in manufacturing and other processes for commercial or industrial purposes
2. Industrial Application	b. The various issues and problems posed by human activities and natural processes that negatively impact the environment, such as pollution, climate change, and habitat destruction.
3. To restore ecosystems	c. Microorganisms that play crucial roles in various ecological processes.
4. Bacteria and Fungi	d. The process of bringing a damaged or degraded ecosystem back to a more natural and functional state
5. Biofertilizer	e. The variety of life on Earth
6. Biodiversity	f. Fertilizer that consists of living microorganisms, such as bacteria or fungi
7. Photosynthesis	g. The process by which green

	plants, algae, and some bacteria convert light energy into chemical energy in the form of glucose.

Grammar Focus. *Task 3.*
Read theoretical information about passive voice https://grammarway.com/ua/passive-voice
Rewrite the following sentences in the passive voice:
1. Scientists can engineer microorganisms to break down contaminants in the environment.
2. The process of bioremediation involves using beneficial bacteria to clean up polluted sites.
3. Biomimicry inspires scientists to design technologies based on the efficiency of natural processes.
4. Sustainable agriculture practices enhance soil fertility and reduce the reliance on chemical fertilizers.
5. Genetic engineering may contribute to the conservation of endangered species.
6. Researchers have discovered new possibilities for ecological conservation through genetic engineering.
7. The application of ecological biotechnology should address various environmental challenges.
8. Nature provides valuable insights that guide the development of sustainable technologies.
9. Humans should minimize their ecological impact to preserve the delicate balance of the planet.
10. Environmentalists are promoting the use of ecological biotechnology to address pollution.

Reading Comprehension. *Task 4.*

Read the following text and answer the questions below: **«Ecological Biotechnology: Harnessing Nature for a Sustainable Future»**

In recent years, ecological biotechnology has emerged as a powerful tool in addressing environmental challenges and promoting sustainability. This field combines principles of biology and technology to develop innovative solutions for environmental problems. Let's explore the key aspects of ecological biotechnology and its impact on the environment.

1. Understanding Ecological Biotechnology:
Ecological biotechnology involves applying biological principles to solve environmental issues. Unlike traditional biotechnology, which may focus on industrial applications, ecological biotechnology emphasizes harmony with nature. It seeks to harness the capabilities of living organisms to restore ecosystems, mitigate pollution, and promote sustainable practices.

2. Bioremediation:
One prominent application of ecological biotechnology is bioremediation, a process that uses microorganisms to clean up pollutants in the environment. Bacteria and fungi can be engineered to break down contaminants, such as oil spills or industrial waste, into harmless byproducts. This approach minimizes the ecological impact of human activities and facilitates the recovery of damaged ecosystems.

3. Sustainable Agriculture:
Ecological biotechnology plays a crucial role in sustainable agriculture by promoting eco-friendly farming practices. Biofertilizers, for example, use beneficial microorganisms to enhance soil fertility and nutrient availability, reducing the

reliance on chemical fertilizers. This not only improves crop yields but also preserves the health of the soil and surrounding ecosystems.

4. Genetic Engineering for Conservation:

Advancements in genetic engineering have opened new possibilities for ecological conservation. Scientists can modify the genes of endangered species to enhance their resilience to environmental challenges. This approach, known as genetic rescue, aims to preserve biodiversity and protect vulnerable ecosystems in the face of climate change and habitat loss.

5. Biomimicry:

Another fascinating aspect of ecological biotechnology is biomimicry, where researchers draw inspiration from nature to design sustainable technologies. By mimicking the efficiency of natural processes, such as photosynthesis or nutrient cycling, scientists develop innovative solutions that reduce environmental impact and promote resource efficiency.

Ecological biotechnology represents a promising avenue for addressing environmental concerns and building a sustainable future. As students, exploring this field offers not only a glimpse into cutting-edge scientific advancements but also an understanding of our role in preserving the delicate balance of ur planet. By harnessing the power of nature, ecological biotechnology provides hope for a harmonious coexistence between human activities and the environment.

Answer the questions:

1. What is the main focus of ecological biotechnology, and how does it differ from traditional biotechnology?
2. How does ecological biotechnology contribute to sustainable agriculture?

3. Why is it important for students to learn about ecological biotechnology in the context of environmental conservation and sustainability?
4. What concerns or considerations should scientists take into account when applying this technology?

Writing activity. *Task 5.*

Read about essay structure https://www.port.ac.uk/student-life/help-and-advice/study-skills/written-assignments/basic-essay-structure and write an essay «Sustainable biotechnological approaches in addressing environmental challenges».

Speaking Activity. *Task 6.*

Discuss the following questions with a partner:
1. Imagine you are a scientist working on a project related to ecological biotechnology. What specific environmental issue would you address, and how would you use ecological biotechnology to solve it?
2. If you were to design a technology inspired by biomimicry, what natural process would you choose, and how might it contribute to sustainability?

Speaking Activity. *Task 7.*

Use for the following links for critical analysis and content discussion in the group. Research and provide additional examples of real-world applications of ecological biotechnology that are not mentioned in the text.

https://www.studysmarter.co.uk/explanations/biology/ecology/environmental-biotechnology/
https://www.nature.com/subjects/environmental-biotechnology
https://www.mdpi.com/topics/AEB_AEB

Тема 3. Practical skills in biotechnology

Speaking. *Task 1.*
ln pairs, discuss the following questions
How might scientists organize and understand data from experiments?
Can you think of a simple way to analyze results in a biotechnological study?
Vocabulary Focus. *Task 2.*
Match each word with its corresponding definition.

1. Microscope	a. A microscopic living organism, such as bacteria, viruses, fungi
2. Microorganism	b. A visual representation of data or information
3. Chart	c. A scientific instrument that magnifies and enables the observation of extremely small objects or details that are not visible to the naked eye.
4. Safety	d. The surroundings or conditions in which an organism, individual, or community exists and interacts.
5. Cell	e. The condition of being free from danger, harm, or risk.
6. Environment	f. The basic structural and functional unit of all living organisms.

Grammar Focus. *Task 3.*

Read theoretical information about conditionals https://learnenglish.britishcouncil.org/grammar/b1-b2-grammar/conditionals-zero-first-second and do grammar tests here https://www.ego4u.com/en/cram-up/tests/conditional-sentences-3,https://www.perfect-english-grammar.com/conditionals.html

Reading Comprehension. Task 4.

Read the following text and answer the questions below:

"Discovering Practical Skills in Biotechnology"

Welcome to the world of biotechnology, where practical skills are the key to unlocking the mysteries of life. Let's delve into some essential aspects for beginners.

Doing Experiments:

Biotechnologists often work in laboratories, doing experiments to learn more about living things. They follow specific steps to make sure their experiments are accurate and reliable.

Using Tools:

Imagine using special tools like microscopes to see things that are too tiny for our eyes. Biotechnologists also use machines that help them study and understand the secrets hidden in cells.

Growing Microorganisms:

Have you ever seen tiny living things under a microscope? In biotechnology, scientists grow these tiny beings, called microorganisms, to study how they behave and to help with important tasks.

Changing Genes:

Genetic engineering is like changing the recipe of a living thing. Scientists may change the genes of plants or animals to make them stronger or better suited to certain environments.

Understanding Data:

After all the experiments, there is a lot of information to understand. Biotechnologists use simple ways to organize this

data, like putting it into charts or graphs. This helps them make sense of what they've learned.

Staying Safe:

Safety is very important in biotechnology labs. Scientists wear special clothes and follow rules to make sure everyone is protected. It's like wearing armor to explore the amazing world of cells.

These are just the basics, like learning the ABCs of biotechnology. As you continue your journey, you'll discover more about how these practical skills help scientists uncover the incredible stories written in the language of life.

Answer the questions:

1. What is emphasized as the key to unlocking the mysteries of life in the world of biotechnology?
2. Where do biotechnologists often conduct their work, and what is the purpose of their experiments?
3. Why do biotechnologists follow specific steps in their experiments?
4. What tools do biotechnologists use, and how are these tools helpful in their work?

Speaking Activity. *Task 5.*

Discuss the following questions with a partner:

1. Imagine you are a biotechnologist conducting an experiment. What steps would you take to ensure the accuracy and reliability of your results?
2. If you were given the task of studying the behavior of microorganisms, what methods could you use, and why is this information valuable in biotechnology?
3. Consider a scenario where you need to change the genes of a plant to make it more resistant to pests. How would you approach this genetic engineering process?
4. As a biotechnologist, you have gathered a significant amount of data from your experiments. How would you organize this

data using charts or graphs, and why is this organization important?

Speaking Activity. *Task 6.*
Use the following links for critical analysis and content discussion in the group.
https://www.aeseducation.com/blog/what-are-21st-century-skills
https://scstemacademy.org/what-are-21st-century-skills/
https://gla.ac.in/blog/skills-required-to-find-the-best-career-scope-in-biotechnology/
Writing and speaking activity. *Task 7.*
Read about the structure of the presentation here https://pennstatelearning.psu.edu/istudy_tutorials/oralpresentations/oralpresentations3.html and make up the presentation with the following topic "Practical skills in biotechnology".

Тема 4. Professions in biotechnology.Spheres in biotechnology

Topic Focus 1

Speaking. *Task 1.*
ln pairs, discuss the following questions
Can you describe some of the tasks that a biotechnologist might perform on a daily basis?
Besides working in a laboratory, what other career opportunities are there in biotechnology?

Vocabulary focus. *Task 2.*
Match each word with its corresponding definition.

1. Testing conditions	a. Small portions or examples taken for analysis or testing.
2. Samples	b. Specific circumstances under which experiments or tests are conducted.
3. Lab reports	c. Problems or challenges related to the functioning of equipment or processes.
4. Operational issues	d. Documents summarizing the results and findings of laboratory
5. Technical specifications	e. Detailed descriptions of the technical requirements and features of the equipment.
6. Software updates	f. Revisions or improvements made to computer programs.
7. Hardware adjustments	g. Planned routines for keeping equipment or systems in good working condition.
8. Maintenance schedules	h. Changes made to the physical components of machines or devices.
9. Emergency repair requests	i. The effect of human activities on the environment and ecosystems
10. Environmental impact	j. Urgent calls for immediate repairs in response to unforeseen issues.

Grammar Focus. *Task 3.*
Read theoretical information about adjectives and adverbs
https://grammarway.com/ua/adjectives
https://grammarway.com/ua/adverbs
https://dictionary.cambridge.org/grammar/british-grammar/comparison-adjectives-bigger-biggest-more-interesting
Nouns
https://grammarway.com/ua/nouns

Complete multiple-choice test for nouns and adjectives
1. Clinical technicians work in _____ environments to collect and process research and medical specimens.
a. laboratories
b. laboratory's
c. lab's
d. labs

2. Biomedical equipment technicians are responsible for overseeing the operation of _____ machines and tools.
a. biomedical
b. biomedicals
c. biomedicine
d. biometric

3. Pharmaceutical manufacturers produce medications, chemical compounds, and other _____ products.
a. pharmaceutical
b. pharmaceutical's
c. pharmacist
d. pharmacy

4. Scientists conduct experiments to learn more about _____ theories and practices.
a. scientific
b. scientist's
c. science
d. sciences

5. DNA analysts collect DNA samples and conduct tests to gather _____ information.
a. genetics
b. genetic's
c. gene
d. genes

6. Business development managers guide the strategic plan for large _____.
a. companies
b. company's
c. companys'
d. company

7. Product managers are responsible for developing specific consumer products from design to _____.
a. distribute
b. distribution
c. distributed
d. distributing

8. Bioprocess engineers supervise the production processes for biotechnological products and _____ like biofuels.
a. equipments
b. equipment's
c. equip

d. equipment

9. Environmental health and safety officers uphold federal and industry regulations related to workplace _____.
a. hazards
b. hazard's
c. hazardous
d. hazard

10. Pharmaceutical consultants give advice to medical manufacturers, pharmacists, and other healthcare organizations about how to source and distribute _____ products.
a. pharmaceutical's
b. pharmaceutical
c. pharmacist
d. pharmacies

11. Biostatisticians collect and analyze data related to living _____.
a. organisms
b. organism's
c. organ
d. organic

Reading Comprehension. *Task 4.*
Read the following text and answer the questions below: «Top biotechnology careers to consider» https://www.indeed.com/career-advice/finding-a-job/biotechnology-careers

Answer the questions:
1. What is the primary duty of a clinical technician, and what are the educational requirements for this profession?

2. What is the role of a biomedical equipment technician, and what tasks do they perform in their daily responsibilities?

3. What are the primary duties of a pharmaceutical manufacturer, and what qualifications do they typically hold for this position?

4. Describe the responsibilities of a scientist in the biotechnology field. What educational background is usually required for scientists specializing in biotechnology?

5. What does a biostatistician do, and what level of education is typically necessary for a career in this field?

Speaking Activity. *Task 5.*
Discuss the following questions with a partner:
1. As a product manager in the biotechnology industry, how would you go about developing a new medical device from design to distribution?
2. If you were a DNA analyst, explain how you would conduct tests to gather genetic information and collaborate with law enforcement in a criminal trial.
3. Imagine you are a bioprocess engineer. How would you supervise the production processes for biotechnological products, such as pharmaceuticals or biofuels?
4. Which professions in biotechnology does NUWEE prepare to? What are eligibility requirements to apply for these jobs?

Speaking Activity. *Task 6.*
Use for the following links for critical analysis and content discussion in the group.

https://aimst.edu.my/event-news/jobs-require-bachelor-biotechnology/
https://www.reva.edu.in/blog/5-major-spheres-of-biotechnology-that-offer-great-career-opportunities

Writing activity. *Task 7.*

Write summaries for texts in the links above. Exchange them with your groupmates, assess each other's summaries by the following criteria:

1. Vocabulary mistakes;
2. grammar mistakes;
3. content appropriateness;
4. structure of summary.

Topic Focus 2

Speaking. *Task 8.*

ln pairs, discuss the following questions

Have you ever met anyone working in the biotechnology field? What did they do?

What products do you use daily that might involve biotechnology?

Which sphere of biotechnology do you find the most interesting and why?

Vocabulary focus. *Task 9.1.*

Match each word with its corresponding definition.

1.Biopharmaceutical	a. A facility that performs scientific tests for legal investigations.
2.Forensic Laboratory	b. A product developed using living organisms to treat or prevent diseases.
3. Biopesticide	c. A scientist specializing in

	the study of microorganisms, including bacteria, viruses, and fungi.
4. Microbiologist	d. A biological agent used as a pest control method, reducing the need for chemical pesticides.
5. Tissue Culture	e. A professional who develops medical devices and technologies by combining biology and engineering principles.
6. Biomedical Engineer	f. The process of growing cells or tissues in a nutrient medium under controlled conditions.
7. Vaccine	g. A substance used to stimulate the production of antibodies to provide immunity against diseases.
8. Biofertilizer	h. A person who develops new plant varieties with improved traits, such as higher yield or resistance to pests.
9. Plant Breeder	i. A substance containing living microorganisms that enhance soil fertility by supplying essential nutrients.
10. Insulin	j. A scientific field that studies the structure, function, and mapping of genomes.

11. Genomics	k. A hormone used to regulate blood sugar levels, commonly produced using recombinant DNA technology.
12. Entrepreneurship	i. The business of starting and managing new ventures, often involving innovative products or services.

Task 9.2.

How to Create the Mind Map:

Step 1: Open Wordart, Mindmeister, Mindmomo.

Step 2: Create the central node labeled **Relevant Professions, Skills Required in Biotechnology Professions.**

Step 3: Branch out into the main areas of biotechnology, such as Healthcare & Medicine, Agricultural Biotechnology, Industrial Biotechnology, and Environmental Biotechnology.

Step 4: Under each category, add specific professions or areas of work, including relevant new terms like Biomedical Engineer and Plant Breeder.

Step 5: Add connections between terms, showing how they relate to each other. For example, link Biomedical engineering to Healthcare & Medicine.

Step 6: Add definitions or explanations for new words such as Genomics, and Microbiologist to explain their relevance to the biotechnology field.

Reading Comprehension. *Task 10.*

Read the following article "Career options and future prospects in Biotechnology" and answer the questions below:

https://www.researchgate.net/publication/349882104_Career_Options_and_Future_Prospects_in_Biotechnology

1. Comprehension Questions

What is biotechnology, and how does it combine different sciences?

Name three industries where biotechnology is widely applied.

According to the article, what are some key skills necessary for a career in biotechnology?

What is the role of a biomedical engineer in the biotechnology sector?

Which company developed the first vaccine for the Zika virus, as mentioned in the article?

2. Multiple Choice Questions

2.1. What does the term "tissue culture" refer to?

a) Genetic modification of plants

b) Growing cells in a controlled environment

c) Designing laboratory equipment

d) Studying microorganisms

2.2. Which biotechnology startup focuses on converting photosynthetic biomass into fuel?

a) Biocon

b) GANIT Labs

c) Sea6 Energy

d) MedGenomes

2.3. What is the primary focus of bioinformatics?

a) Analyzing data related to genomes and biological processes

b) Developing vaccines

c) Researching soil fertilizers

d) Designing pharmaceutical drugs

3. Critical Thinking Questions

How can biotechnology balance the need for innovation with ethical concerns in genetic engineering and medicine?

The article highlights the importance of interdisciplinary skills in biotechnology. Why do you think working across multiple fields is crucial for this industry?
Biotechnology is used in industries such as agriculture, medicine, and environmental conservation. Which application do you think will have the most significant impact on society, and why?
The article mentions various startups and successful companies in biotechnology. What strategies or factors contribute to the success of these companies?

Tech-savvy tasks for reading comprehension. *Task 11.1.*
Create an infographic using Piktochart summarizing the article "Career options and future prospects in biotechnology".
Instructions:
Highlight the main findings, methodology, and significance of the research.
Organize the infographic into sections (e.g., Introduction, Methods, Results, Conclusion).
Use charts, icons, and color coding to make the data more available and clear.
Task 11.2. Use Piktochart templates https://create.piktochart.com/teams/33677367/report?source=template%20categories and create *Biotechnologist engagement strategy guide* or *Biotechnologist satisfaction template* using information from "Career options and future prospects in biotechnology".

Task 11.3.
Generate images for the article and compare them. To produce images for the article "Career options and future prospects in biotechnology," select from the following free AI tools: Canva (Free Plan), Deep Dream Generator, Runway ML (Free Plan),

Pixray, Designify, and DeepAI. Next, opt for an appropriate image for the article above from one of the following visual content resources: Pixabay, Unsplash, Storyblocks, Pexels, Videvo, Getty Images, or Shutterstock. Explain them and contrast the relevancy and quality of the AI-generated images with the ones you selected. Assess them using the following standards for stock and AI-generated photos.

Write the assessment synopsis for the selected AI-generated tool and stock photos.

Assessment Template Example:

AI Tool Selected: Deep Dream Generator

Stock images website selected: Pixabay

Relevance to Article: *The generated image depicts futuristic biotechnology settings, with lab equipment and scientists working together on cutting-edge research, aligning with the article's themes of career opportunities and technological advances.*

Quality of Visual Representation: The image is creative and detailed but appears somewhat abstract due to the tool's artistic rendering style.

Creativity and Originality: The image showcases innovative visual elements that go beyond typical biotech representations.

Accuracy and Precision: Some elements, such as the technology depicted, are slightly exaggerated, not quite matching real-world biotech settings.

Visual Appeal and Design: The colors and composition are eye-catching, though the surreal elements may not suit the formal tone of the article.

Suitability for Article Tone and Audience: The image is imaginative and forward-looking but may be more abstract for a technical article.

Stock Image Resource: Unsplash

Relevance to Article: A stock photo of a laboratory with biotechnology professionals is highly relevant to the article's content.
Quality of Visual Representation: The image is clear, high-resolution, and professional.
Creativity and Originality: The image is realistic, but it may not be as creatively distinctive as the AI-generated one.
Accuracy and Precision: The image accurately portrays biotechnology professionals in a lab setting.
Visual Appeal and Design: The image is well-composed, with good lighting and a professional feel.
Suitability for Article Tone and Audience: This image fits the tone of the article well, appealing to both students and professionals in the biotechnology field.

1. Relevance to Article Content
AI-Generated Images:
Does the image reflect the key themes of biotechnology, career options, and prospects in the field?
Are the visuals related to biotechnology (e.g., lab settings, professionals, technologies)?
Stock Images:
Are the images sourced from stock photo websites aligned with the article's theme (e.g., professional biotechnology workers, future-oriented images)?
Do the stock images portray biotechnology careers in a realistic or aspirational way?
2. Quality of Visual Representation
AI-Generated Images:
Does the image look professional, polished, and clear?
Is the image resolution high enough for professional or academic use?

Is the visual detail sufficient to accurately depict biotechnology-related themes?

Stock Images:

Are the images high-resolution and of professional quality?

Do the images meet the standards for clarity, sharpness, and aesthetic appeal?

How well does the image composition fit the article's tone and style?

3. Creativity and Originality

AI-Generated Images:

Are the generated images unique and creative, capturing novel visual aspects of biotechnology and its future?

How well do the AI-generated images push beyond conventional or typical representations of the topic?

Stock Images:

Are the stock images generic, or do they offer creative representations that feel distinct and fresh?

Do the stock photos present an innovative take on biotechnology careers, or are they too conventional?

4. Accuracy and Precision

AI-Generated Images:

Does the image accurately represent the technological and scientific aspects of biotechnology (e.g., lab equipment, scientists, research)?

Are there any inaccuracies or misrepresentations in the AI-generated image (e.g., outdated technologies, unrealistic depictions)?

Stock Images:

Are the stock photos accurate in their portrayal of biotechnology careers (e.g., real-life lab settings, professionals, diverse biotechnology fields)?

Do the stock images portray biotechnology with precision, avoiding clichés or inaccuracies?

5. Visual Appeal and Design

AI-Generated Images:

Does the AI-generated image have an engaging and visually appealing design (e.g., color scheme, focus, layout)?

Is the design of the image suitable for the purpose of professional and academic content?

Stock Images:

Do the stock images have good composition, balance, and aesthetics?

Is the use of color, lighting, and framing conducive to making the article visually appealing?

6. Suitability for Article Tone and Audience

AI-Generated Images:

Does the AI-generated image align with the tone of the article (e.g., professional, educational, forward-looking)?

Is the image suitable for a diverse audience, particularly in an academic or professional context?

Stock Images:

Do the stock images fit the intended audience of biotechnology students and professionals?

Are the images formal or casual enough to match the tone of the article?

7 Time Efficiency

AI-Generated Images:

How long does it take to generate the image using the chosen AI tool?

Is the AI tool user-friendly and quick to provide results, or is there a lengthy waiting time or complexity in adjusting prompts for the desired image?

Stock Images:

How quickly can you find and download the images from the stock photo websites?

Are stock images easily searchable and readily available, or is it time-consuming to find the most suitable ones?

Task 11.4.

Choose from a variety of free AI tools, such as Deep Dream Generator, Runway ML (Free Plan), Pixray, Designify, and DeepAI, to create images for the selected text that is related to biotechnology careers or visual content resources, such as Pixabay, Unsplash, Storyblocks, Pexels, Videvo, Getty Images, and Shutterstock, and share them in a common Telegram group. Another student must interpret the visuals and make educated guesses about the article's specifics. The student who generated images must check to see if the description provided by his group members matches the content of the text.

Task 11.4.

Find several deepfake images of biological specimens or connected with biotechnology professionals.

Assign them to score the images on a scale from 1 to 5 for scientific accuracy and visual coherence. Provide written rationales for your scores. Use vocabulary and examples of scores for rationales that have been given below.

Vocabulary

Pipette Grip Technique: The correct way to hold and operate a pipette to minimize errors in liquid handling.

Refraction: The bending of light as it passes through a medium, used to judge the realism of liquid in a pipette tip.

Visual Coherence: The consistency and realism of visual elements in an image.

Personal Protective Equipment (PPE): Safety gear worn to protect against hazards, including gloves, goggles, and lab coats.

Ergonomics: The design and arrangement of equipment to reduce strain and improve comfort.

Polymerase Chain Reaction (PCR): A technique used to amplify DNA segments.
Lighting Artifacts: Visual elements related to shadows and reflections that enhance realism.
Example 1: Deepfake Image of a Laboratory Technician Pipetting Samples
Score: 5 (Excellent)
Rationale:
The image demonstrates precise scientific practices, with the technician holding the pipette at the correct angle (approximately 45 degrees), using proper grip technique, and employing a tip-ejecting motion consistent with standard lab protocol. The liquid in the pipette tip shows appropriate refraction, and the microcentrifuge tubes are labeled correctly. Shadows and reflections on the equipment are coherent with a typical laboratory lighting setup.
Example 2: Deepfake Image of a Researcher Working in a Biosafety Cabinet
Score: 4 (Good)
Rationale:
The researcher is shown wearing personal protective equipment (PPE) including gloves, a lab coat, and safety goggles, which meets safety standards. However, there is a minor flaw in the image — the placement of the hands suggests potential contamination risk, as one hand touches the outer surface of the cabinet. The airflow system and sterile technique are not visually evident, slightly compromising scientific accuracy. Visual coherence, including the lighting and reflections on the glass, is well-executed.
Example 3: Deepfake Image of a DNA Electrophoresis Setup
Score: 3 (Moderate)
Rationale:

The image depicts an electrophoresis gel box with loading wells and visible lanes. While the gel placement and buffer solution level seems reasonable, the power supply wires appear to be incorrectly connected (switched polarity), which would affect the experimental results. Additionally, the bands on the gel are too uniform, lacking the natural variations typically observed. Lighting and shadowing are realistic, but the scientific inaccuracy lowers the score.

Example 4: Deepfake Image of a Biotechnology Professional Analyzing Data on a Computer

Score: 2 (Poor)

Rationale:

The image shows a researcher reviewing a genetic sequencing analysis. However, the graph on the screen displays mismatched axes — a labeling error that would confuse interpretation. The screen's resolution looks overly smooth, and text elements are blurry. The posture of the professional, leaning too close to the screen, also indicates poor ergonomic practice. The image composition is visually coherent but scientifically flawed.

Example 5: Deepfake Image of a PCR Machine with an Open Lid

Score: 1 (Very Poor)

Rationale:

The image depicts a polymerase chain reaction (PCR) machine, but significant errors compromise scientific validity. The thermal cycler is open during the reaction cycle, which is not possible due to heat sensitivity. Additionally, condensation droplets inside the machine defy physical reality. The placement of tubes appears inconsistent with standard configurations. Visual coherence suffers from inconsistent lighting, and reflections on metallic surfaces are missing.

Task 12.

Review the following vocabulary to understand and discuss the text on https://www.labiotech.eu/expert-advice/is-biotechnology-a-good-career/

Healthcare: The maintenance and improvement of physical and mental health.

Sustainability: The ability to maintain or continue a process over the long term without harming the environment.

Regulatory Approval: Official approval by authorities for new products or technologies.

Career Growth: The advancement in one's professional position.

Read the article about the pros and cons of a career in biotechnology at **https://www.labiotech.eu/expert-advice/is-biotechnology-a-good-career/**

Task 13.

Create options for questions survey for your groupmates based on the text https://www.labiotech.eu/expert-advice/is-biotechnology-a-good-career / by using Mentimeter for collaborative brainstorming.

Sample Questions

What do you think is the most attractive reason to choose a career in biotechnology?

What do you think is the biggest challenge when working in biotechnology?

After the students submit their answers and see the results, have a discussion about which pros and cons of biotechnology profession.

A pro (e.g., meaningful impact) and explain how biotechnology professionals contribute to society.

A con (e.g., regulatory hurdles) and discuss the challenges of navigating regulations in the industry.

Writing activity. *Task 14.*
Write the essay on the topic "The pros and cons of careers in biotechnology". Use linking words from https://english4real.com/resource_writing_phrases.html and Quillbot for paraphrasing some sentences. Explain your choice of paraphrased sentences (which parts of sentences are paraphrased and how, and which words are changed).

Тема 5. Modern achievements in biotechnology

Topic Focus 1

Speaking. *Task 1.*
ln pairs, discuss the following questions
What are some recent breakthroughs in biotechnology?
How are biotechnological innovations contributing to sustainable agriculture and addressing global food security challenges?

Vocabulary focus. *Task 2.*
Match each word with its corresponding definition.

1. Biosensors	a. An enhanced view of the real world overlaid with computer-generated information, applied in medical contexts.
2. Exponential Growth	b. Devices or technologies designed to detect and monitor biological signals or substances, often used in medical applications.
3. Augmented Reality	c. Rapid and increasing growth at an accelerating rate.

4. CRISPR Therapeutics	d. A biotech company specializing in genetic engineering and gene therapy.
5. Disruptive Tech	e. Technologies that significantly alter or revolutionize established industries or practices.

Grammar Focus. *Task 3.*
Read theoretical information about infinitives and gerunds
https://grammarway.com/ua/infinitive
https://grammarway.com/ru/gerund
Fill in the blanks with either the gerund ("-ing" form) or the infinitive ("to" + base form of the verb) of the verbs in the following sentences.

1. Devices or technologies designed (detect) and (monitor) biological signals or substances, often (use) in medical applications.

2. Rapid and increasing growth at an accelerating rate can be challenging (understand) without (apply) advanced mathematical models.

3. (Develop) technology to create an enhanced view of the real world, (overlay) with computer-generated information, has greatly (impact) medical contexts.

4. Innovators aim (create) technologies that have the potential (significantly alter) or (revolutionize) established industries or practices.

5. Researchers are constantly (explore) new ways (apply) CRISPR technology in genetic engineering and gene therapy to (treat) various genetic disorders.

Reading Comprehension. *Task 4.*
Read the following text and answer the questions below: "Biotech innovation"
https://www.hult.edu/blog/biotech-innovation-6-exciting-developments/
Answer the questions:
1. How does the author describe the pace of technological progression in the field of biotechnology over the past century?
2. What is the focus of the text?
3. Which innovation in biotech is the most exciting for you? Why?
4. Which biotech breakthrough is connected with what you have already studied in biotechnology?

Speaking Activity. *Task 5.*
Discuss the following questions with a partner:

1. In your opinion, which biotech innovation mentioned in the article has the most significant impact on society? Justify your choice.

2. How might the development of bioplastics and biofuels contribute to addressing environmental challenges on a global scale?

3. Evaluate the role of virtual and augmented reality (VR & AR) in biotech innovation. How might these technologies enhance medical training and patient care?

4. Reflect on the statement that "the future for biotechnology and biotech innovation is already shaping up to be a very tumultuous time". What challenges and opportunities might this tumult bring to the field of biotechnology?

Speaking Activity. *Task 6.*
Use the following links for critical analysis and content discussion in the group.
https://www.efsa.europa.eu/en/topics/topic/new-advances-biotechnology
https://in-part.com/blog/top-biotechnology-innovations/

Writing activity. *Task 7.*
Write the essay on the topic "The best modern achievements in biotechnology from my viewpoint".

Topic Focus 2

Speaking. *Task 8.*
How do modern biotechnology advancements impact everyday life? Can you provide examples?
What areas of biotechnology research do you think will have the biggest influence on society in the future? Why?
Do you think biotechnology should be used to extend human life expectancy? What are the potential consequences of this?

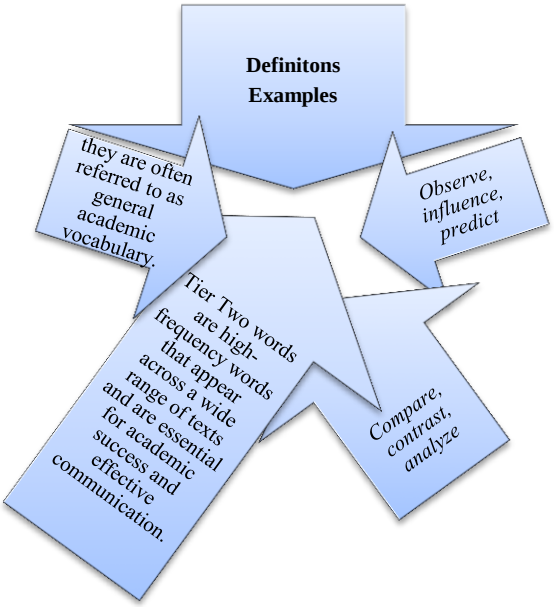
Vocabulary focus. *Task 9.*
Match each word with its corresponding definition.

1.Gene Editing	a. Laboratory-produced molecules engineered to serve as substitute antibodies that can restore, enhance, or mimic the immune system's attack

	on harmful cells.
2. Monoclonal Antibody	b. A set of technologies that allow scientists to alter DNA at specific locations in an organism's genome, with CRISPR-Cas9 being the most prominent tool.
3. RNA Vaccine	c. A type of vaccine that uses a copy of a molecule called messenger RNA (mRNA) to produce an immune response in the body.
4. Transgenic Animal	d. A technique used to amplify small segments of DNA to generate millions of copies, making it easier to analyze genetic material.
5. PCR (Polymerase Chain Reaction)	e. An animal that has had a foreign gene deliberately inserted into its genome for research or industrial purposes.
6. DNA Microarray	f. An analytical device that combines a biological component with a physicochemical detector to measure the presence of chemicals or other biological substances.
7. Biosensor	g. A technology used to detect the expression of thousands of genes simultaneously by hybridizing DNA samples to a

	grid of known DNA sequences.
8. Micropropagation	h. A technique in agricultural biotechnology for multiplying plants using tissue culture methods

Task 10.1.
Read the following article https://www.researchgate.net/publication/350642963_Biotechnology_Recent_Developments_Emerging_Trends_and_Implications_for_Business and find words for the following categories
Recent Developments
Emerging trends
Implications for business
Which words can be categorized as Tier Two words?
Which of the Tier Two words are most necessary for comprehension?



Task 10.2.
Use https://miro.com/app/board/uXjVLw3JMUs=/ to create the collaborative mind map for a topic with words from the article within the topic. Be ready to explain the meaning of new words and their connection with the topic.
Task 10.3. Read the following article https://www.researchgate.net/publication/350642963_Biotechnology_Recent_Developments_Emerging_Trends_and_Implications_for_Business again and answer the questions below.

1. Comprehension Questions

What are the main applications of biotechnology in medicine? Provide at least three examples mentioned in the article.
How does gene therapy differ from traditional treatments for hereditary diseases?
Explain the role of bioinformatics in biotechnology research.

What are the advantages of RNA vaccines compared to DNA vaccines, as described in the article?
Define bioleaching and explain how it is used in industrial biotechnology.
What is CRISPR-Cas9, and why is it considered a revolutionary tool in genetic engineering?
List and briefly describe two examples of how biotechnology is applied in agriculture.
What ethical and regulatory challenges are associated with the use of genetically modified organisms (GMOs)?

2. Critical Thinking Questions

The article discusses various medical applications of biotechnology, including personalized medicine. What are some potential societal benefits and risks of this approach?
Biotechnology is used to develop both genetically modified crops and biofuels. In your opinion, how can the balance between food security and energy production be managed?
Environmental biotechnology offers solutions for reducing pollution, but it also presents risks such as bioterrorism. How should governments balance innovation and safety in this field?
Discuss how the principles of bioethics should be applied when designing genetic modifications in humans and animals.
Given the rapid advancements in biotechnology, what do you think the future holds for regenerative medicine and artificial organ development?
The article suggests that biotechnology could significantly increase human life expectancy by 2040. What might be some societal and economic impacts of extended human longevity?
Compare the risks and benefits of using stem cell therapy for medical treatments. Do you think the benefits outweigh the potential ethical concerns?

With CRISPR-Cas9 making genetic engineering more accessible, should there be stricter international regulations on its usage? Why or why not?

Task 10.4.

Carry out text analyses of chosen by you passages from the article above on https://www.uclassify.com/browse by the following criteria:

1. Positive and negative meaning https://www.uclassify.com/browse/uclassify/sentiment. This classifier determines if a text is positive or negative. Define which sentences and words make up negative and positive meanings.

2. This classifier tries to estimate to which age group the text belongs. https://www.uclassify.com/browse/uclassify/ageanalyzer?input=Text Discuss why these age groups dominate specifically for this article.

3. This classifier tries to estimate the state of mind of the writer – upset or happy. https://www.uclassify.com/browse/prfekt/mood?input=Text Discuss why the good or bad mood of the author is prevalent in the text.

4. This classifier categorizes a text into a society topic. Use the parent classifier Topics to find out if a text belongs in this category. https://www.uclassify.com/browse/uclassify/society-topics?input=Text Define which sentences determine dominant categories for this article like Future, Philosophy, and so on.

Tech-savvy tasks for reading comprehension.

Task 11.1.

Create an infographic using Piktochart summarizing the article "Biotechnology: Recent Developments, Emerging Trends, and Implications for Business". Discuss its components with other students.

https://www.researchgate.net/publication/350642963_Biotechnology_Recent_Developments_Emerging_Trends_and_Implications_for_Business.

Task 11.2.

Generate realistic and 3D images on https://gencraft.com/generate by Gencraft AI for 3 chosen original and paraphrased passages by Quillbot from the article "Biotechnology: Recent Developments, Emerging Trends, and Implications for Business". Compare vocabulary and grammar changes by Quillbot (changed words, grammar structures). Compare the relevancy and quality of realistic and 3D AI-generated images. Assess them using the following standards for AI-generated photos. Write the assessment synopsis for the selected AI-generated photos.

Task 12. Using the **survey** option in the common Telegram group create possible responses for questions in the survey for your groupmates. Use vocabulary from the article "Biotechnology: Recent Developments, Emerging Trends, and Implications for Business".

Example: What area of biotechnology do you find most promising for future advancements?

a) Medicine (e.g., gene therapy, personalized medicine)
b) Agriculture (e.g., GM crops, drought-resistant plants)
c) Industry (e.g., biofuels, bioplastics)
d) Environmental solutions (e.g., bioremediation)
e) Other

Sample of survey questions

1. Which biotechnology-based solution do you think has had the greatest impact on human health?
2. What do you believe is the main benefit of using biotechnology in industrial processes?
3. What do you think is the most pressing challenge facing biotechnology today?
4. In which area do you think biotechnology can most significantly improve global sustainability?
5. What is the most critical skill for students pursuing a career in biotechnology?

After answering the survey see the results, and discuss the chosen options by answering the questions below.

Were there any surprising results in the survey responses?

How do your personal views align or differ from the overall survey results?

Based on the survey and discussion, what recommendations would you make for the future of biotechnology research, education, or policy?

Task 13.

Prepare 5 slides for the topic "Modern achievements in biotechnology" and your groupmates have to deliver impromptu presentations using slides they have never seen before like presenting information from random slides without previous preparation on https://www.powerpointkaraoke.com/. You should have your presentation of them and discuss how their presentation aligns with yours.

Demands for presentation

1. Use vocabulary from the article on https://www.researchgate.net/publication/350642963_Biotechnology_Recent_Developments_Emerging_Trends_and_Implications_for_Business.

2. Use phrases for presentation from https://www.londonschool.com/blog/30-useful-phrases-presentations-english/
3. Follow the time limit of 10 minutes.

Task 14.
Find several deepfake images connected with modern achievements in biotechnology.
Assign them to score the images on a scale from 1 to 5 for scientific accuracy and visual coherence. Provide written rationales for your scores.
Writing activity. Task 15.
Write the essay on the topic "Pros and cons of recent developments, emerging trends in Biotechnology". Use linking words from https://english4real.com/resource_writing_phrases.html and Quillbot for paraphrasing some sentences. Explain your choice of paraphrased sentences (which parts of sentences are paraphrased and how, and which words are changed).

Тема 6. Biotechnology and society
Topic Focus 1

Speaking. *Task 1.*
ln pairs, discuss the following questions
How do you think the general public perceives biotechnological advancements?
What steps can be taken to improve public understanding and acceptance of biotechnology?

Vocabulary focus. *Task 2.*
Match each word with its corresponding definition.

1. Bioethics	a. An advantage, profit, or positive outcome gained from a particular action, decision, or situation.
2. A thinking toolkit	b. To produce a change or influence something. In the context of biotechnology, it may refer to the impact or influence that biotechnological developments have on individuals, societies, or the environment.
3. Benefit	c. A set of cognitive tools, strategies, or techniques designed to facilitate critical thinking, problem-solving, and decision-making.
4. Affect	d. The study of ethical issues and moral implications arising from biological and medical sciences.

Grammar Focus*. Task 3.*
Read theoretical information about modal verbs
https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/modal-verbs
Do the following tests
https://test-english.com/grammar-points/b1/modal-verbs-of-deduction/
https://agendaweb.org/verbs/modals-exercises.html

Grammar Focus. *Task 4.*
Fill in the blanks with appropriate modal verbs (can, needs, must, should).
1. People's different needs and values _____ play a crucial role in shaping public perception of biotechnological advancements and affect it greatly.
2. Ethical considerations _____ be carefully addressed in the development of thinking toolkit about implementation of biotechnologies.
3. It is highly recommended that regulations and guidelines _____ be established to minimize risks associated with biotechnological research and applications.
4. Public awareness _____ be raised to foster a better understanding of the benefits and potential risks of biotechnological innovations.

Reading Comprehension. *Task 5.*
Read the following text and answer the questions below: "Impacts of biotechnology on society"
https://www.sciencelearn.org.nz/resources/1209-impacts-of-biotechnology-on-society
Answer the questions:
1. What played a key role in the rapid increase in the number and range of biotechnologies in the last century?
2. What are biotechnologies developed for, as mentioned in the text?
3. What factors are highlighted in the text as influencing the impacts of biotechnologies on society?

Speaking Activity*. Task 6.*
Discuss the following questions with a partner:
1. How might differing views on biotechnological practices based on cultural or religious beliefs influence the progress and availability of certain biotechnologies?

2. In your opinion, why do biotechnology developments often become controversial, and how does public debate contribute to shaping societal views?
3. How might society's acceptance of cutting-edge biotechnologies change over time?

Speaking Activity. *Task 7.*

Use for the following links for critical analysis and content discussion in the group.

https://blog.peli.com/areas-of-interest/it-science/how-does-biotechnology-benefit-humanity

https://carnegieendowment.org/2020/11/20/blessing-and-curse-of-biotechnology-primer-on-biosafety-and-biosecurity-pub-83252

Writing activity. *Task 8.*

Prepare presentation for the topic "Biotechnology and society". Assess your groupmates' presentations by the following criteria:

1. Grammar and vocabulary mistakes
2. Content mistakes
3. Structure of presentation

Topic Focus 2

Speaking. *Task 9.*

In your opinion, what are the biggest benefits biotechnology brings to society?

How has biotechnology changed the way society approaches health and medicine?

Vocabulary focus. *Task 9.1.*

Match each word with its corresponding definition.

1. Biotech Treatments	a. legal right granting the holder exclusive control over an invention, including genetically engineered organisms, for a certain period.
2. Patent	b. medical procedures where damaged or missing organs or tissues are replaced with healthy ones from a donor or created using biotechnology.
3. Transplants	c. medical therapies developed using biotechnology, often involving living cells or biological processes to treat diseases.
4. Living Organisms	d. biological entities such as plants, animals, bacteria, or fungi that are used in biotechnology to produce useful products or perform specific functions.
5. Modified Bacteria	e. a genetic disorder that affects the lungs and digestive system, potentially treatable using gene therapy.
6. Cystic Fibrosis	f. bacteria that have been genetically altered to produce substances such as medicines, enzymes, or biofuels.

7. Pest Resistance	g. a trait in genetically modified crops that allows them to grow with limited water supply.
8. Drought Tolerance	h. a change in the sensitivity of a pest population to a pesticide, resulting in the failure of a correct application of the pesticide to control the pest.
9. Renewable Materials	i. a metaphor used to describe tools like CRISPR in gene editing, which cut and modify DNA sequences precisely.
10. Oil Spill	j. natural resources that can be replenished over time, such as plant-based materials used in bioplastics.
11. Molecular Scissors	k. an accidental release of petroleum into the environment, often cleaned using bioremediation techniques.
12. Designer Babies	l. a term describing babies whose genetic traits are selected or altered using genetic engineering before birth.

Task 10.1. Read the text and answer the questions below.

Biotechnology and society

Imagine a future where scientists can create custom-made organs for transplants, grow crops that never fail, or even clean polluted oceans using living organisms. This isn't science fiction — it's biotechnology, a cutting-edge field that is already transforming society. By harnessing the power of biology, biotechnology offers solutions to some of humanity's greatest challenges. Let's explore how it is shaping our world.

One of the most groundbreaking impacts of biotechnology on society is in healthcare. Did you know that the first synthetic human insulin, developed in 1978, was one of biotechnology's earliest triumphs? Before that, insulin came from pigs and cows. Today, thanks to genetic engineering, insulin is produced quickly and cheaply using modified bacteria. Another fascinating development is gene therapy, where faulty genes are replaced or fixed to cure diseases. Imagine a future where conditions like cancer or cystic fibrosis are eliminated before they even start — biotechnology could make that possible.

Food security is another area where biotechnology is making waves. Have you ever eaten genetically modified (GM) food without knowing it? Many common products, like corn, soybeans, and tomatoes, have been genetically enhanced to grow faster, resist pests, or survive droughts. This helps farmers feed more people using fewer resources. However, society remains divided on GMOs. Some people worry about their long-term safety, while others argue they are essential for fighting hunger. What do you think?

Biotechnology isn't just about health and food — it's also tackling environmental problems. One of the most exciting innovations is bioplastics, made from renewable materials like corn starch instead of oil. Imagine a world without mountains

of plastic waste! In addition, biotechnology offers bioremediation, where microorganisms digest oil spills or toxic waste. In the Gulf of Mexico oil spill disaster of 2010, bacteria played a key role in cleaning up millions of liters of oil. This shows how biotechnology can work with nature to protect the planet.

Despite its promises, biotechnology comes with complex ethical dilemmas. Should society allow parents to use genetic technology to choose their baby's physical traits? Is it fair that life-saving biotech treatments are often expensive and out of reach for many? And should companies be allowed to patent living organisms? These questions challenge us to think deeply about the relationship between science, business, and human rights.

In conclusion, biotechnology has already changed society in ways we might take for granted — from medicines that save millions of lives to crops that feed growing populations. As we move forward, the choices we make about how to use it will shape the future of our planet and humanity. The question is: How can we balance innovation with responsibility? It's up to us to decide.

1. Comprehension Questions

Imagine your future self using biotechnology in everyday life. What kinds of products or services do you think you might use, based on the examples in the text?

What was revolutionary about the way insulin began to be produced in 1978? How did it change the treatment of diabetes?

If you could ask a scientist about the future of gene therapy, what would you want to know?

How do genetically modified crops help address global food challenges, and what trade-offs do they present?

Why is bioremediation considered a powerful environmental solution? Share an example from the text that demonstrates its impact.
What ethical issues arise when biotechnology intersects with human rights and economics? Provide two examples from the text.
Which example from the text do you find the most surprising or inspiring? Why?

2. Critical Thinking Questions
The text presents biotechnology as both a promise and a dilemma. Which aspect do you think poses the greatest challenge to society, and how should it be addressed?
Imagine you are a policy advisor. What guidelines would you propose to balance the benefits of genetically modifying crops with public concerns about safety?
How might cultural beliefs influence people's attitudes toward genetically modified foods or gene editing? Provide examples of how different societies might respond.
In a future where personalized genetic engineering is common, how might concepts of beauty or intelligence evolve? What risks could this create for social equality?
What would a world without plastic waste look like if bioplastics became the global standard? Describe both environmental and economic impacts.
If you could design a new biotechnological innovation, what global problem would you solve, and how would your invention work?
Discuss how the role of biotechnology in disaster recovery (like oil spill cleanups) compares to more traditional methods. Which approach do you find more sustainable? Why?

Task 11.

Participate in a debate on GMOs or gene editing. Use platform Kialo for structured debates. One student writes claims that support thesis. Another students have to use comments to suggest improvements or to ask questions about this claim on https://www.kialo-edu.com/debate-topics-and-argumentative-essay-topics/93297 and a new debate issue *The GMO Debate: Food Security vs. Safety Concerns Issue: Companies patent genetically modified organisms and other biotech innovations. Should living organisms and biological processes be patented for profit?*

Task 12. Try to solve futuristic problems issue: *Biotechnology has made life-saving treatments like gene therapy and synthetic insulin possible, but they are often expensive and inaccessible to many people. How can society ensure equitable access to these medical advancements?* Submit your solutions and ask Chat GPT for feedback. Discuss feedback with other students.

Task 13. Build branching storylines in https://twinery.org/2/#/stories/654631b7-e69e-44c8-9de1-22ea5335cba by writing text in passages for the following topics: "How Biotechnology Shapes Food Security", "Bioremediation: Cleaning the Environment with Science". Use vocabulary from the task 10.1.

Vocabulary focus. *Task 14.*

Match each word with its corresponding definition

1. Biological Maturity Index	a. The use of biological agents, such as viruses or toxins, by terrorists to cause harm.
2. Bioterrorism	b. A measure of a society's capability to assess and balance the risks and benefits associated with

	biotechnological advancements, linked to public awareness and education.
3. Social Impact Assessment (SIA)	c. A key social concern in biotechnology related to the long-term environmental and resource-based impacts of technological innovations.
4. Sustainability	d. A public policy tool used to predict, monitor, and manage the social impacts of technologies, particularly focusing on future societal challenges.
5. Economic Justice	e. Fair distribution of economic benefits and opportunities resulting from biotechnological advancements.

Task 14.1.

Read the following article https://jehsd.ssu.ac.ir/article-1-250-en.pdf and find words for the following categories

Social issues

Ethical concerns

Task 14.2.

Answer the questions for the article below:

1. Comprehension Questions

Define biotechnology and explain its impact on economic structures according to the article.

What are the two approaches through which biotechnology entered the market?

Describe the “biological maturity” index and its significance.
Identify the four main social concerns associated with biotechnology as mentioned in the text.
What role does Social Impact Assessment (SIA) play in managing biotechnological advancements?
According to the article, why is it challenging to predict the environmental consequences of biotechnology?

2. Critical Thinking Questions

The article emphasizes the importance of public trust in biotechnology. What measures could be taken to improve public confidence in this field?
Considering the ethical debates surrounding genetic engineering, how should policymakers balance innovation and societal values?
Discuss the potential consequences of bioterrorism and how international regulations might address this threat.
Evaluate how sustainability concerns in biotechnology could influence future policy decisions. Provide examples of sustainable practices in biotechnology.
Do you agree with the article’s assessment that developing countries face significant challenges in controlling the social impacts of biotechnology? Why or why not?
Reflect on the ethical implications of using animals in biotechnology. What regulations could be introduced to mitigate ethical concerns?
Tech-savvy tasks for reading comprehension. *Task 15.* Participate in a debate on ethical, environmental, and societal risks connected with Biotechnology. Use platforms Kialo for structured debates. One student writes claims that support the thesis https://www.kialo-edu.com/. Other students have to use comments to suggest improvements or to ask questions about this claim and a new debate issue *Should the development and*

use of biotechnology be tightly regulated to prevent ethical, environmental, and societal risks, even if it limits innovation and economic growth? Use vocabulary from https://jehsd.ssu.ac.ir/article-1-250-en.pdf.

Task 16. Choose an issue concerning Biotechnology and Society (*Bioterrorism and Biosecurity; Ethical Dilemmas in Biotechnology; Public Trust in Biotechnology*). Write a catchy slogan and brief persuasive text explaining the issue's importance. Use AI-generated visuals to illustrate risks and benefits. Present your content in a short written rationale (100-150 words) explaining your design choices and key messages. Use vocabulary from https://jehsd.ssu.ac.ir/article-1-250-en.pdf.

Additional texts

Biotechnology Innovations in Developing Nations

Traditionally, the United States has been viewed as the world leader in biotechnology innovation, with over 1,200 biotech companies employing almost 200,000 workers in fields ranging from human product development to food and agriculture services. Yet, as globalization becomes more prominent and technology spreads worldwide, other nations have come to the forefront of the biotech arena. Successful research and development in biotechnology is occurring in developing countries such as Brazil, China, Cuba, Egypt, India, Kenya, South Africa, and South Korea. Although these nations are at varying points in their respective economic development, each can be considered an "innovating developing country" in biotechnology with both public and private industry support (Saha 2004). A focus on local health issues as well as national education and healthcare, government involvement, leveraging

core competencies, and private sector funding are all key identifiable factors for success in many innovative developing countries, which speaks volumes about what it takes to be successful in burgeoning markets.

The biotechnology industries in the United States and Western Europe tend to focus on high-cost solutions for the kinds of chronic diseases that are predominant, namely, cardiovascular disease, diabetes, and tobacco-related conditions. Of the 1,393 new products marketed by Western biotechnology companies from 1975 to 1999, only 16 were for so-called "tropical diseases" and tuberculosis — the major public health issues in developing nations (Troullier 2002).

What are the new innovations in biotech?

Each day we discover things and as days go by, we usually strive towards improving and making the best out of our discoveries. Trends in Biotech have propelled speedy innovations.

The innovations have very well led to industry expansion. As at last year September the global biotechnology market was valued at 752.8 billion and growing.

It is important for companies to understand these trends. The sole purpose is to profit from the massive growth.

Biotech is surely undergoing an evolution. Some of the trends in Biotech include:-

Drug research.

This is one of the most promising Biotech trends. In the past, a lot of time was taken in the production. It could run for years. Getting participants for the trials was also a big hustle. Biotech companies can now quickly analyze data from current trials and revisit data from previous trials. The introduction of new machines that enable them to carry out tests and get

instant results. This advancement has played a very key role, especially in providing more accurate diagnosis. Other than it has helped in devising enhanced medicines and treatment paths for patients.

Personalized medicine.

Reduced time and cost has led to the growing of personalized medicine. The first genome sequencing project (genome sequencing is the process of determining the entirety or nearly entirety of the DNA sequence of an organism's genome at a single time.) that began in 1990 took about 13 years and $ 2.7 billion to complete. As at now, one is able to access a quick at-home genome sequencing test for around $299. Personalized biotech has made it possible for medical professionals to analyze genetics to identify medical risks in patients. It has played a vital role in helping doctors develop unique, tailor-made health solutions.

Big data

There is a lot of data to be analyzed. Sensor integration and the Internet of Things allow biotech researchers to fuel their innovations with unparalleled access to data.

Synthetic Biology

It involves redesigning organisms for useful purposes by engineering them to have new abilities. Examples include; biofabricated electronic film, and automated coronavirus testing using sequencing. Etc.

Artificial intelligence

Biotech companies have placed artificial intelligence to ensure the smooth running of a variety of operational processes through enhanced automation.

The current world has placed a massive interest in biotech. The aforementioned trends are going to continue as the growth in the industry continues.

The Most Influential Biotechnology Innovations

1. Human Genome Project. One simple example is the overturning of the central dogma — which up until the completion of the project, was that one gene coded for one protein. Since there were about a hundred thousand known proteins, scientists had concluded there must be the same number of genes. However, it turned out that in human beings, there were about 30,000 genes and they are read in a variety of unexpected ways to code for those 100,000-plus genes.

The project launched officially in 1990 and drew on laboratories and institutions from around the world, including the U.S. Department of Energy, the U.S. National Institutes of Health (NIH), the UK's Sanger Centre (later the Wellcome Sanger Institute), and 17 university and laboratory sequencing centers.

2. First IVF Baby. This year was the 41st birthday of the first so-called "test-tube baby," Louise Brown, who was born on July 25 in 1978. The process is in vitro fertilization. Now commonplace, the procedure was incredibly controversial at the time. Louise's mother, Lesley Brown, hadn't been able to conceive naturally as the result of blocked Fallopian tubes. She had been trying to conceive for nine years when she signed up for IVF, which was then an experimental procedure. She was one of 282 women who tried the procedure. At that time, doctors attempted 457 egg collections, but only 167 cycles led to fertilization. From 12 embryos that were successfully implanted, five became pregnant. Louise was the only live birth. Since then, about six million children have been born via IVF.

3. CRISPR. CRISPR stands for clustered regularly interspaced short palindromic repeats, which is otherwise a fast and easy way to edit DNA. CRISPR-Cas9 allows researchers to easily identify specific gene sequences, clip them out and replace them. It has been cited as one of the most important and recent biotechnology innovations that could lead to new therapies and treatments for numerous diseases. In November 2018, it hit the spotlight with a major controversy when He Jiankui, a researcher in Shenzhen, China, announced he had utilized CRISPR-Cas9 to alter the DNA of embryos for seven couples. He used CRISPR to disable a gene called CCR5. CCR5 codes for a protein that allows HIV to enter a cell. In theory, the children born from the procedure should be resistant to HIV. The fathers all had HIV infections that were strongly suppressed by standard HIV drugs. The announcement was met by wide international condemnation, the eventual moratorium on using CRISPR germline editing, and He Jiankui being investigated by the Chinese government.

4. Genetic Fingerprinting. Perhaps more accurately described now as forensic DNA analysis, genetic fingerprinting is a way of using DNA samples in criminal investigations to identify perpetrators (and victims). It was first introduced in 1984 by a researcher at the University of Leicester in the UK, Alec Jeffreys. The first practical application was in a 1985 immigration case, which was followed by a paternity case. The first criminal forensic case was applied to the case of two girls who were raped and murdered in the Enerby area of Leicestershire. There was a confession for one of the murders. They used the forensic test in an attempt to prove he committed the second, but unexpectedly, the test proved he was innocent of both murders. The police force then conducted blood draws and genetic profiles on the entire male population of that area.

Again, no matches were found until a man named Colin Pitchfork bragged about how he had convinced a friend to provide the sample. He was a match for both rape and murders.

5. 23andMe. 23andMe was founded in 2006 by Linda Avey, Paul Cusenza and Anne Wojcicki. It began by marketing a saliva-based direct-to-consumer personal genome test. However, the U.S. Food and Drug Administration (FDA) forced the company to pull it from the market because it was advertised as a medical device, which required FDA approval, which 23andMe did not have. The kits are still available, but health-related reports that came with them were no longer included. The company has since inked deals with major pharma companies, such as Pfizer, to use its genomics data in disease and drug research and development. In March 2018, the FDA approved 23andMe's BRCA1 and BRCA2 genetics tests as the first-ever FDA approval for a DTC consumer genetic test for cancer risk, in this case, breast, ovarian, and prostate cancer. This advancement made it one of the best biotechnology innovations in the genome testing field of the industry.

6. Dolly. Although it seems like a distant memory, Dolly was the first mammal to be cloned from the cell of an adult. This was in 1996. Dolly was a sheep. Dolly was cloned by researchers at The Roslin Institute who were working to develop a better way to produce genetically modified livestock. The research was led by Ian Wilmut. Dolly was cloned from a cell acquired from the mammary gland of a six-year-old Finn Dorset sheep and an egg from a Scottish Blackface sheep. She was born to her Scottish Blackface surrogate mother on July 5, 1996. Oddly enough, because her DNA was taken from a

mammary gland cell, she was named after country singer Dolly Parton.

7. Engineered Organ. In 1999, Anthony Atala and his research group grew bladders in the laboratory and successfully implanted them into patients, which became one of the unique biotechnology innovations. Atala is the W.H. Boyce professor and director of the Wake Forest Institute for Regenerative Medicine and chair of the Department of Urology. Atala and his team took a bladder biopsy from each patient, isolated muscle and specialized urothelial cells, and grew them in the laboratory. They then implanted them onto a bladder-shaped scaffold where they grew for seven to eight weeks. They then attached the engineered bladder to the patient's own bladder and followed the progress for up to five years. The bladder function improved without any of the side effects generally linked to implanting bowel tissue. The research paved the way for bioprinting of organs.

8. Beyond Meat Burger. Beyond Meat developed a plant-based burger that mimics the taste of hamburger. The first plant-based burger was sold commercially in 2016. As of June 2019, the company had a $10 billion market cap and led the way for a variety of other companies to produce what are essentially genetically modified vegetables that use a variety of ingredients, such as heme, to mimic the taste of beef. Although nutritionally about the same as beef — typically they have caloric levels similar to beef, with higher carbohydrate and salt levels with generally lower fat levels — the primary benefit is taking animals out of the protein production chain, which may have benefits for decreasing climate change.

9. Golden Rice. The Golden Rice Project notes that Golden Rice "is the first purposefully created biofortified food." The great biotechnology innovations behind Golden Rice were donated in 2000 by its inventors, Ingo Potrykus and Peter Beyer. Golden Rice is a not-for-profit project that involved genetically modified rice to address vitamin A deficiency, which affects about 250 million children around the world. Potrykus was then a professor at the Swiss Federal Institute of Technology in Zurich, teamed with Peter Beyer from the University of Freiberg in Germany.

10. Kymriah. Perhaps it would have been more appropriate to identify Immunotherapy or Immuno-Oncology as one of the projects, rather than Novartis' Kymriah , even though Kymriah was the first CAR-T immuno-oncology therapy approved. The entire field of immuno-oncology has exploded in the last decade, revolutionizing cancer treatments, and is beginning to make progress in other indications as well. The other approved CAR-T product is Gilead Sciences' Yescarta. They are approved for slightly different, but sometimes overlapping patient populations. Kymria is approved for pediatric and young adult acute lymphocytic leukemia (ALL) and recurrently relapsing (r/r) aggressive lymphomas. Yescarta is approved for similar aggressive lymphomas.

CAR-T is a type of therapy where blood samples are taken from a patient, and the patient's white blood cells are processed to be supercharged to attack their cancer cells, then reinfused into the patient. It is a type of "living therapy" where the patient's immune system is programmed to better attack cancer.

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