Undergraduate track program: Biology and biotechnology

1. Olympiad winner's skill set

To win the Olympiad, you should have a firm grasp of biology and biotechnology concepts, namely:

- key terms, patterns and laws related to the functioning, growth, and development of organisms and biological systems;
- structure and functions of cells, tissues and organs of plants, invertebrates, vertebrates, humans, fungi, as well as the structural organization of bacteria and viruses;
- classifying and identifying different types of organisms and identifying their characteristic features;
- principles of evolution and genetics, as well as their application in breeding;
- basics of biotechnology and its role in industry and medicine.

You should also have a solid command of the following skills:

- analyzing the interactions between organisms and their environment;
- understanding the structure of ecosystems and the biosphere;
- evaluating the impact of human activities on the state of natural and artificial ecosystems.

2. List of degree programs covered by subject area

2.1 List of bachelor's programs

06.03.01. Biology
05.03.06. Ecology and nature resource management
12.03.04. Biotechnical systems and technology

3. Content

Scientific field 1: Biology
Topics in Biology

1. Structure and functions of plant organs. Classification of higher plants, life cycles
2. Invertebrate systematics. Structure, vital activity, habitat, and habit of life
3. Vertebrate animals: systematics, structure, habitats, adaptations to habit of life, diversity.
4. Reproduction and individual development of organisms. Types of reproduction. Gametogenesis. Ontogenesis.
5. Human: structure and functions of organ systems and skin. Behavior, psyche. Human health.
6. Evolution: methods of study, micro- and macroevolution, factors, forms, and results of evolution. Anthropogenesis

Scientific field 2: Virology
Topics in Biology

1. Viruses. Structure, life cycle, taxonomy, prevention of viral diseases

Scientific field 3: Genetics and Heredity
Topics in Biology

1. Genetics: methods and patterns of inheritance of traits. Genetics of sex.
2. Hereditary and non-hereditary variability. Human genetics
3. Methods and achievements of plant and animal breeding

Scientific field 4: Microbiology

Topics in Biology

1. Mold fungi. Yeasts. Bacteria. Structure, reproduction, diversity, industrial use. Chemosynthesis. Types of fermentation.

Scientific field 5: Cell Biology

Topics in Biology

1. The structure of pro- and eukaryotic cells. Cell cycle. Mitosis, meiosis
2. Plant tissues. Types of tissues of the human body

Scientific field 6: Environmental Biology

Topics in Biology

1. Organisms and the environment. Environmental factors. Population.
2. Ecosystems and biosphere. Global environmental problems.

Scientific field 7: Biochemistry and Molecular Biology

Topics in Chemistry and Biology

1. Chemical components of the cell. Energy transfer. Protein synthesis

Scientific field 8: Biotechnology and Applied Microbiology

Topics in Chemistry and Biology

1. Biotechnology as a branch of industry. Obtaining antibiotics, proteins, vitamins. Microbiology of food products. Medical biotechnology

4. Recommended references

4.1. Reading list

Scientific field : Biology

Sources in English	Topic
1. Taylor D. J., Green N. P. O., Stout W. Biological Science 1, 2, 3, Cambridge: Cambridge University Press, 1986, 940 p. https://archive.org/details/dli.scoerat.3413biologicalscience1organisms-energyandenvironment https://archive.org/details/dli.scoerat.2904biologicalscience2/mode/2up	1. Structure and functions of plant organs. Classification of higher plants, life cycles 2. Systematics of invertebrate animals. Structure, vital activity, habitat, and habit of life. 3. Vertebrate animals: systematics, structure, habitats, adaptations to habit of life, diversity. 4. Reproduction and individual development of organisms. Types of reproduction. Gametogenesis. Ontogenesis. 5. Human: structure and functions of organ systems and skin. Behavior, psyche. Human health. 6. Evolution: methods of study, micro- and macroevolution, factors, forms, and results of evolution. Anthropogenesis.
2. Sadava D. E., Hillis D. M., Heller H. C., Berenbaum M.R. Life: The science of biology. 9th ed, The Courier Companies, Inc. 2009, 1392 p.	1. Structure and functions of plant organs. Classification of higher plants, life cycles. 6. Evolution: methods of study, micro- and macroevolution, factors, forms, and results of evolution. Anthropogenesis.

https://archive.org/details/LifeTheScienceOfBiology9thEd./mode/2up	
3. Burnie D. The Concise Nature Encyclopedia, Kingfisher Books Ltd, 2006, 320 p. https://archive.org/embed/nature-encyclopedia	1. Structure and functions of plant organs. Classification of higher plants, life cycles 2. Systematics of invertebrate animals. Structure, vital activity, habitat, and habit of life. 3. Vertebrate animals: systematics, structure, habitats, adaptations to habit of life, diversity. 4. Reproduction and individual development of organisms. Types of reproduction. Gametogenesis. Ontogenesis. 5. Human: structure and functions of organ systems and skin. Behavior, psyche. Human health. 6. Evolution: methods of study, micro- and macroevolution, factors, forms, and results of evolution. Anthropogenesis.

Sources in Russian	**Topic**
1. 1. Биология [Электронный ресурс]: в 3 томах : пер. с англ. / Д. Тейлор, Н. Грин, У. Стаут ; под ред. Р. Сопер. - Электрон. текстовые дан. (PDF 85,66 Мб). - Москва: Мир, 2004 Электронный аналог печатного издания: Биология: в 3 т. Т. 3 / Д. Тейлор, Н. Грин, У. Стаут; под ред. Р. Сопера ; пер. 3-го англ. изд. — 4-е изд., испр. — М.: БИНОМ. Лаборатория знаний, 2013. — 456 с.: ил https://jasulib.org.kg/wp-content/uploads/2023/03/Тейлор-Д.-Биология.-Т.-1.pdf	1. Structure and functions of plant organs. Classification of higher plants, life cycles 2. Systematics of invertebrate animals. Structure, vital activity, habitat, and habit of life 3. Vertebrate animals: systematics, structure, habitats, adaptations to habit of life, diversity. 4. Reproduction and individual development of organisms. Types of reproduction. Gametogenesis. Ontogenesis. 5. Human: structure and functions of organ systems and skin. Behavior, psyche. Human health. 6. Evolution: methods of study, micro- and macroevolution, factors, forms, and results of evolution. Anthropogenesis
2. Рис Д.Б., Урри Л.А., Кейн М.Л. Биология Campbell. Т.2. Механизмы эволюции, эволюция и биоразнообразие. Растительные формы жизни./ перевод Аверчева О.В., Андреева К.А., Барановская М.Д. М.: Диалектика, 2023. 576 с. URL:https://market.yandex.ru/product--biologiia-campbell-tom-2-mekhanizmy-evoliutsii-evoliutsiia-i-bioraznoobrazie-rastitelnye-formy-zhizni/1906323124?sku=102095647455&uniqueId=18155838&do-waremd5=Ffc8V4NM-RUlRIStRweVEQ&clid=703	1. Structure and functions of plant organs. Classification of higher plants, life cycles 6. Evolution: methods of study, micro- and macroevolution, factors, forms, and results of evolution. Anthropogenesis

3. Дзержинский Ф.Я., Васильев Б.Д., Малахов В.В. Зоология позвоночных. М: Академия, 2013. 464 с. URL:https://chembaby.ru/wp-content/uploads/2015/09/zoo.pdf	5. Human: structure and functions of organ systems and skin. Behavior, psyche. Human health.

Scientific field 2: Virology

Sources in English	**Topic**
1. Carter J., Saunders V. A. Virology: principles and applications, John Wiley & Sons, 2007, 383 p. https://www.pmf.unizg.hr/_download/repository/Virology_Principles_and_Applications_-_J._Carter_2C_V._Saunders__28Wiley_2C_2007_29_WW%5B3%5D.pdf	1. Viruses. Structure, life cycle, taxonomy, prevention of viral diseases.
2. Dimmock N. J., Easton A. J., Leppard K. N. Introduction to modern virology, John Wiley & Sons, 2015, 516 p. http://digilib.unkhair.ac.id/471/1/Introduction%20to%20Modern%20Virology%20%28%20PDFDrive%20%29OK.pdf	1. Viruses. Structure, life cycle, taxonomy, prevention of viral diseases.
3. Freeman S. Biological science, Pearson education, Inc., 2008. http://elibrary.mukuba.edu.zm:8080/jspui/handle/123456789/272	1. Viruses. Structure, life cycle, taxonomy, prevention of viral diseases.

Sources in Russian	**Topic**
1. Букринская А. Г. Вирусология. – М. Медицина 1986. – 336 с. URL:https://djvu.online/file/W8AD1zQCFBii1	1. Viruses. Structure, life cycle, taxonomy, prevention of viral diseases.
2. Земсков А. М. Основы общей микробиологии, вирусологии и иммунологии. М: Феникс, 2021. 635 с. URL:https://www.chitai-gorod.ru/product/osnovy-obshchey-mikrobiologii-virusologii-i-immunologii-uchebnik-2852650?productShelf=&shelfIndex=0&productIndex=1	1. Viruses. Structure, life cycle, taxonomy, prevention of viral diseases.
3. Пиневич А.В., Сироткин А.К., Гаврилова О.В., Потехин А.А. Вирусология: учебник, Изд-во Санкт–Петербургского университета, 2012, 432 с. URL:https://chembaby.ru/materialy/a-v-pinevich-a-k-sirotkin-o-v-gavrilova-a-a-potekhin-virusologiia	1. Viruses. Structure, life cycle, taxonomy, prevention of viral diseases.

Sources in Russian	Topic

Scientific field 3: Genetics and Heredity

Sources in English	Topic
1. Griffiths A.J.F., Gelbart W.M., Miller J.H., Lewontin R.C., Modern genetic analysis, 10th edition, W. H. Freeman and Company, New York, 1999, 712 p. https://archive.org/embed/moderngeneticana0000unse	1. Genetics: methods and patterns of inheritance of traits. Genetics of sex. 2. Hereditary and non-hereditary variability. Human genetics. 3. Methods and achievements of plant and animal breeding
2. Lewin, B., Krebs, J., Kilpatrick, S. T., & Goldstein, E. S. Lewin's genes X. Jones & Bartlett Learning, 2011, 968 p. https://archive.org/embed/lewinsgenesx0000unse	1. Genetics: methods and patterns of inheritance of traits. Genetics of sex. 2. Hereditary and non-hereditary variability. Human genetics.
3. Brooker R.J. Concepts of Genetics, 1st ed., Mc Graw Hill, New York, 2012, 804 p. https://archive.org/embed/Concepts_of_Genetics	2. Hereditary and non-hereditary variability. Human genetics. 3. Methods and achievements of plant and animal breeding.

Sources in Russian	Topic
1. Иванов В.И., Барышникова Н.В., Билева Дж.С., Дадали Е.Л., Константинова Л.М., О.В. Кузнецова, А.В. Поляков, Генетика. Учебник для вузов, ИКЦ «Академкнига», 2006, 638 с. https://chembaby.ru/wp-content/uploads/2015/12/Genetika_Ivanov.pdf	1. Genetics: methods and patterns of inheritance of traits. Genetics of sex. 2. Hereditary and non-hereditary variability. Human genetics. 3. Methods and achievements of plant and animal breeding.
2. Инге-Вечтомов *С. Г.* Генетика с основами селекции: Учеб. для биол. спец. ун-тов. М.: Высш. шк.,1989. 591 с.: ил. ISBN 5-06-001146-1 https://chembaby.ru/wp-content/uploads/2015/12/Genetika_s_osnovami_selektsii_Inge-Vechtomov.pdf	1. Genetics: methods and patterns of inheritance of traits. Genetics of sex. 2. Hereditary and non-hereditary variability. Human genetics.
3. Жимулев И.Ф. Общая и молекулярная генетика. Новосибирск: Сибирское университетское издательство, 2007.- 480 с. URL:https://chembaby.ru/materialy/i-f-zhimuliov-obshchaia-i-molekuliarnaia-genetika	1. Genetics: methods and patterns of inheritance of traits. Genetics of sex. 2. Hereditary and non-hereditary variability. Human genetics.

Scientific field 4: Microbiology

Sources in English	Topic

1. Schlegel H. G., Zaborosch C. General microbiology, Cambridge university press, 1993. https://archive.org/details/generalmicrobiol0000schl	1. Mold fungi. Yeasts. Bacteria. Structure, reproduction, diversity, industrial use. Chemosynthesis. Types of fermentation.
2. Willey J.M; Sherwood L.; Woolverton C.J; Prescott L.M. Prescott, Harley, and Klein's microbiology, Mc Graw Hill, New York, 2008, 1222 p. https://archive.org/embed/Microbiology_7_edition_by_Joanne_Willey_Linda_Sherwood_Chris_Woolverton	1. Mold fungi. Yeasts. Bacteria. Structure, reproduction, diversity, industrial use. Chemosynthesis. Types of fermentation.
3. Freeman S. Biological science. – Pearson education, Inc., 2008. http://elibrary.mukuba.edu.zm:8080/jspui/handle/123456789/272	1. Mold fungi. Yeasts. Bacteria. Structure, reproduction, diversity, industrial use. Chemosynthesis. Types of fermentation.

Sources in Russian	**Topic**
1. Общая микробиология: учебник для студ. высш. учеб. заве дений / А. И. Нетрусов, И. Б. Котова. — М.: Издательский центр «Академия», 2007. — 288 с. URL:https://library.tou.edu.kz/fulltext/buuk/b3190.pdf	1. Mold fungi. Yeasts. Bacteria. Structure, reproduction, diversity, industrial use. Chemosynthesis. Types of fermentation.
2. Шапиро Я.С. Микробиология. С-Петербург: Лань. 2020. 308 с. URL:https://www.chitai-gorod.ru/product/mikrobiologiya-uchebnoe-posobie-2789392?productShelf&shelfIndex=0&productIndex=5	1. Mold fungi. Yeasts. Bacteria. Structure, reproduction, diversity, industrial use. Chemosynthesis. Types of fermentation.
3. Нетрусов А.И, Котова И.Б. Микробиология. М: Академия. 2009, 352 с. URL:https://chembaby.ru/wp-content/uploads/2016/02/netrusov_a_i_kotova_i_b_mikrobiologiya.pdf	1. Mold fungi. Yeasts. Bacteria. Structure, reproduction, diversity, industrial use. Chemosynthesis. Types of fermentation.

Scientific field 5: Cell Biology

Sources in English	**Topic**
1. Alberts, B., Bray, D., Hopkin, K., Johnson, A. D., Lewis, J., Raff, M., & Walter, P. (2015). Essential cell biology. Garland Science. https://archive.org/details/essentialcellbio0000albe/mode/2up	1. The structure of pro- and eukaryotic cells. Cell cycle. Mitosis, meiosis. 2. Plant tissues. Types of tissues of the human body.

2. Lewin`s Cells. – 2nd ed., Jones & Bartlett Learning, 2011, 1088 p. https://archive.org/embed/lewinscells0000unse	1. The structure of pro- and eukaryotic cells. Cell cycle. Mitosis, meiosis. 2. Plant tissues. Types of tissues of the human body.
3. Pollard T. D., Earnshaw W. C., Lippincott-Schwartz J., Cell Biology E-Book. Elsevier Health Sciences, 2007, 928 p. URL: https://books.google.ru/books?id=Th1uDQAAQBAJ&lpg=PP1&hl=ru&pg=PA41#v=onepage&q&f=false	1. The structure of pro- and eukaryotic cells. Cell cycle. Mitosis, meiosis. 2. Plant tissues. Types of tissues of the human body.

Sources in Russian	**Topic**
1. Ченцов Ю. С. Введение в клеточную биологию. М: ИКЦ «Академкнига», 2005. — 495 с. URL:https://chembaby.ru/materialy/iu-s-chentsov-vvedenie-v-kletochnuiu-biologiiu-obshchaia-tsitologiia-pdf	1. The structure of pro- and eukaryotic cells. Cell cycle. Mitosis, meiosis. 2. Plant tissues. Types of tissues of the human body.
2. Албертс Б., Брей Д., Льюис Дж., Рэфф М., Робертс К., Уотсон Дж. Молекулярная биология клетки: В 3-х т. 2-е изд., перераб. М75 и доп. Т. 1. Пер. с англ.-М.: Мир, 1994.-517 с. URL:https://www.booksite.ru/localtxt/mol/ecu/lya/rna/yab/alberts.pdf	1. The structure of pro- and eukaryotic cells. Cell cycle. Mitosis, meiosis. 2. Plant tissues. Types of tissues of the human body.
3. Быков В.Л. Цитология и общая гистология. С-Петербург: Сотис. 2002. 237 с. URL:https://chembaby.ru/materialy/v-l-bykov-tsitologiia-i-obshchaia-gistologiia	1. The structure of pro- and eukaryotic cells. Cell cycle. Mitosis, meiosis. 2. Plant tissues. Types of tissues of the human body.

Scientific field 6: Environmental Biology

Sources in English	**Topic**
1. Odum, E. P., & Barrett, G. W. Fundamentals of ecology (Vol. 3, p. 5), Philadelphia: Saunders, 1971, 600 p. https://archive.org/details/fundamentalsofec0000odum	1. Organisms and the environment. Environmental factors. Population. 2. Ecosystems and biosphere. Global environmental problems.
2. Campbell biology, Concordia University of Edmonton, 2015, 1076 p. https://archive.org/details/isbn_9781269987172/page/n1/mode/2up	1. Organisms and the environment. Environmental factors. Population. 2. Ecosystems and biosphere. Global environmental problems.
3. Freeman S. Biological science. – Pearson education, Inc., 2008.	1. Organisms and the environment. Environmental factors. Population.

http://elibrary.mukuba.edu.zm:8080/jspui/handle/123456789/272	2. Ecosystems and biosphere. Global environmental problems.

Sources in Russian	Topic
1. Хамзина Ш. Ш., Жумабекова Б. К. Экология и устойчивое развитие. М.:Академия естествознания. 2015. 389 с. URL:https://monographies.ru/en/book/view?id=552	1. Organisms and the environment. Environmental factors. Population. 2. Ecosystems and biosphere. Global environmental problems.
2. Н.М. Чернова, А.М. Былова, Общая экология. Учебник, М.: Дрофа, 2004 URL: https://ekolog.org/books/26/	1. Organisms and the environment. Environmental factors. Population. 2. Ecosystems and biosphere. Global environmental problems.
3. Марфенин Н.Н. Устойчивое развитие человечества. Учебник (Серия: Классический университетский учебник), 2006, Издательство МГУ М.: 612 с. https://istina.msu.ru/publications/book/2093720/	1. Organisms and the environment. Environmental factors. Population. 2. Ecosystems and biosphere. Global environmental problems.

Scientific field 7: Biochemistry and Molecular Biology

Sources in English	Topic
1. Zubay, G. L. Biochemistry, Dubuque, Iowa: Wm. C. Brown Publishers, 1993, 1128 p. https://archive.org/details/biochemistry0000zuba_c8h0	1. Chemical components of the cell. Energy transfer. Protein synthesis.
2. Garret R.H., Grisham C.M., Biochemistry, Australia; United Kingdom: Brooks/Cole; Cengage Learning, 2010, 1192 p. https://archive.org/details/biochemistry0000garr_v5c4	1. Chemical components of the cell. Energy transfer. Protein synthesis.
3. Nelson, D. L., & Cox, M. M. Lehninger principles of biochemistry, W.H. Freeman, 2008, 1304 p. https://archive.org/details/lehningerprincip00lehn_1/page/n7/mode/2up	1. Chemical components of the cell. Energy transfer. Protein synthesis.

Sources in Russian	Topic
1. Наглядная биохимия / Я. Кольман, К.-Г. Рём; пер. с англ. Т. П. Мосоловой. — 6-е изд. — Москва: Лаборатория знаний, 2019. — 509 с. URL:https://www.chitai-gorod.ru/product/naglyadnaya-biohimiya-5-e-izdanie-pererabotannoe-i-dopolnennoe-2644014?utm_medium	1. Chemical components of the cell. Energy transfer. Protein synthesis.

Sources in Russian	Topic
2. Основы биохимии Ленинджера: в 3 т. Т. 1 : Основы биохимии, строение и катализ / Д. Нельсон, М. Кокс ; пер. с англ. — 5-е изд., перераб. и доп. — М. : Лаборатория знаний, 2022. — 703 с URL:https://glavkniga.su/filecont/49864.pdf	1. Chemical components of the cell. Energy transfer. Protein synthesis.
3. Биологическая химия с упражнениями и задачами: учебник / под ред. чл.-корр. РАМН С.Е. Северина. - М.: ГЭОТАР-Медиа, 2011.-. 11. – 624 с. URL:https://chembaby.ru/materialy/e-s-severin-biologicheskaia-khimiia-s-uprazhneniiami-i-zadachami	1. Chemical components of the cell. Energy transfer. Protein synthesis.

Scientific field 8: Biotechnology and Applied Microbiology

Sources in English	Topic
1. Renneberg R. Biotechnology for beginners, Academic Press, 2023. https://archive.org/details/biotechologyforb0000renn	1. Biotechnology as a branch of industry. Obtaining antibiotics, proteins, vitamins. Microbiology of food products. Medical biotechnology.
2. Ratledge C.; Kristiansen B. Basic Biotechnology, Cambridge, U.K.; New York: Cambridge University Press, 2006, 692 p. https://archive.org/details/basicbiotechnolo0000unse_g0f5	1. Biotechnology as a branch of industry. Obtaining antibiotics, proteins, vitamins. Microbiology of food products. Medical biotechnology.
3. Teasdale J. Biotechnology: selected topics, Cheltenham : Thornes, 1987, 132 p. https://archive.org/details/biotechnologysel0000teas/page/n1/mode/2up	1. Biotechnology as a branch of industry. Obtaining antibiotics, proteins, vitamins. Microbiology of food products. Medical biotechnology.

Sources in Russian	Topic
1. Бурова Т. Е. Введение в пищевую биотехнологию. 2-е изд., стер. — Санкт-Петербург : Лань, 2024. 160 с. URL:https://lanbook.com/catalog/?q=Бурова+Т.+Е.+Введение+в+пищевую+биотехнологи	1. Biotechnology as a branch of industry. Obtaining antibiotics, proteins, vitamins. Microbiology of food products. Medical biotechnology.
2. Музафаров Е. Н. Биотехнология. Основы биологии. С-Петербург: Лань. 2023. 168 с. URL:https://lanbook.com/catalog/?q=Биотехнология.+Основы+биологии%3A+учебное+пособие+для+вузов	1. Biotechnology as a branch of industry. Obtaining antibiotics, proteins, vitamins. Microbiology of food products. Medical biotechnology.
3. Князева О. А., Седых Т. А. Введение в биотехнологию. Уфа: БГПУ имени М.	1. Biotechnology as a branch of industry. Obtaining antibiotics, proteins, vitamins.

Sources in Russian	Topic
Акмуллы, 2023. — ISBN 978-5-907730-54-0. — Текст : электронный // Лань : электронно-библиотечная система. — URL: https://e.lanbook.com/book/407552 (дата обращения: 23.07.2024). — Режим доступа: для авториз. пользователей. — С. 1.). https://reader.lanbook.com/book/407552 https://e.lanbook.ru/book/407552	Microbiology of food products. Medical biotechnology.

4.2. Recommended online courses

Scientific field 1: Biology

Online courses in English	Link	Summary
1. Zygote Body 3D Anatomy Online Visualizer Human Anatomy 3D	https://www.zygotebody.com/	This web application covers the concepts on the topic: Human: structure and functions of organ systems and skin. Behavior, psyche. Human health.
2. Introduction to biology	https://www.coursera.org/specializations/introduction-to-biology	The course covers the following topics: Structure and functions of plant organs. Classification of higher plants, life cycles; Invertebrate systematics. Structure, vital activity, habitat, and habit of life; Vertebrate animals: systematics, structure, habitats, adaptations to habit of life, diversity; Evolution: methods of study, micro- and macroevolution, factors, forms, and results of evolution. Anthropogenesis.
3. Introductory Biology	https://ocw.mit.edu/courses/7-016-introductory-biology-fall-2018/video_galleries/lecture-videos/	The course is aimed at mastering the following topic: Human: structure and functions of organ systems and skin. Behavior, psyche. Human health.

Online courses in Russian	Link	Summary
1. Базовый курс по биологии	https://stepik.org/course/78909/promo?search=4745657904	Sections presented in the course: botany, zoology,

		anatomy, human physiognomy
2. Прикладная ботаника	https://stepik.org/course/104683/promo?search=4753308193	The course is designed to master the topic: Structure and functions of plant organs. Classification of higher plants, life cycles.
3. Наш богатый внутренний мир: об анатомии просто и интересно	https://stepik.org/course/194971/promo?search=4753325333	The course is devoted to the study of the basic principles of human anatomy.

Scientific field 2: Virology

Online courses in English	**Link**	**Summary**
1. Viruses & How to Beat Them I: Introduction to Cell Biology & Viruses	https://www.edx.org/es/learn/cellular-biology/tel-aviv-university-viruses-how-to-beat-them-i-introduction-to-cell-biology-viruses	The course covers the following topics: Viruses. Structure, life cycle, taxonomy, prevention of viral diseases
2. Unit 22: Viruses	https://www.khanacademy.org/science/biology/biology-of-viruses	This unit will help you master the basic terms and concepts on the topic: Viruses. Structure, life cycle, taxonomy, prevention of viral diseases
3. Introductory Biology	https://ocw.mit.edu/courses/7-016-introductory-biology-fall-2018/video_galleries/lecture-videos/	The course includes materials on the topic: Viruses. Structure, life cycle, taxonomy, prevention of viral diseases

Online courses in Russian	**Link**	**Summary**
1. Вирусы, насекомые и мы (Viruses, insects and us)	https://stepik.org/course/101153/promo?search=4745777354	Viruses, insect vectors, the diseases they carry and methods of controlling transmission vectors are considered in the course.
2. Микробилогия (Microbiology)	https://stepik.org/course/198511/promo?search=4745828983	The course examines bacterial, fungal, and viral infections. It also covers specifics of different types of bacteria, fungi and viruses, their properties and characteristics.
3. Курс лекций «Вирусология» Нетесов С.В. Lecture course “Virology” by Netesov S.V.	https://tube.sfu-kras.ru/video-lectures	Introduction to virology, the concept of viruses and viral infections, basic concepts of virology, classification and

		main families and their representatives.

Scientific field 3: Genetics and heredity

Online courses in English	Link	Summary
1. Biological Diversity	https://stepik.org/course/114959/promo	The course covers the following topics: Genetics: methods and patterns of inheritance of traits. Genetics of sex; Methods and achievements of plant and animal breeding.
2. Genetics & evolution	https://www.coursera.org/learn/genetics-evolution	The course includes materials on the following topics: Genetics: methods and patterns of inheritance of traits. Genetics of sex; Hereditary and non-hereditary variability. Human genetics.
3. Introduction to biology	https://www.coursera.org/specializations/introduction-to-biology	The following topics are covered in this course: Genetics: methods and patterns of inheritance of traits. Genetics of sex.

Online courses in Russian	Link	Summary
1. Генетика животных (Zoogenetics)	https://stepik.org/course/104685/promo?search=4745915982	The goal of the course is to master the basic concepts and methods of genetics and biometrics and their application in animal breeding.
2. Молекулярная биология и генетика (Molecular biology and genetics)	https://stepik.org/course/70/promo?search=4745915985	The course covers the basic concepts of molecular biology and genetics, ranging from cell organization to micro- and macroevolution.
3. Здоровье семьи: загадки родословной (Family health: the mysteries of ancestry)	https://stepik.org/course/114965/promo?search=4752733890	The course emphasizes a multivariate approach to assessing an individual's heredity and family health.

Scientific field 4: Microbiology

Online courses in English	Link	Summary

1. HarvardX: Food Fermentation: The Science of Cooking with Microbes	https://www.edx.org/learn/cooking/harvard-university-food-fermentation-the-science-of-cooking-with-microbes	The course covers the following topics: Molds. Yeasts. Bacteria. Structure, Reproduction, Diversity, Industrial Uses. Chemosynthesis. Types of fermentation.
2. How we organize life to study them? - Class 11	https://www.khanacademy.org/science/biology-essentials	The course includes content on the following topics: Molds. Yeasts. Bacteria. Structure, Reproduction, Diversity, Industrial Uses. Chemosynthesis. Types of fermentation.
3. Bacteria and Chronic Infections	https://www.my-mooc.com/en/mooc/bacteria-and-chronic-infections	The course covers key concepts in microbiology and bacteriology, such as single-celled organisms, biofilm formation, and acute and chronic infections.

Online courses in Russian	**Link**	**Summary**
1. Введение в общую микробиологию (Introduction to general microbiology)	https://stepik.org/course/68410/promo?search=4752792611	The objectives of the course include the study of: principles of taxonomy, morphology and physiology; features of biology and ecology of microorganisms; the role of microbes in the transformation of substances in nature and the basics of the doctrine of infection and immunity.
2. Бактерии vs человек (Bacteria vs humans)	https://stepik.org/course/85967/promo?search=4752792616	Course materials include the following topics: Molds. Yeasts. Bacteria. Structure, Reproduction, Diversity, Industrial Uses. Chemosynthesis. Types of fermentation.
3. Микробиология (Microbiology)	https://stepik.org/course/198511/promo?search=4752893631	This course examines bacterial, fungal, and viral infections. Students will also learn about different types of bacteria, fungi and viruses, their properties and characteristics.

Scientific field 5: Cell Biology

Online courses in English	Link	Summary
1. Biology archive	https://www.khanacademy.org/science/biology	The selected modules present materials on the following topics: Structure of Pro- and Eukaryotic Cells. Cell cycle. Mitosis, Meiosis; Plant Tissues. Types of tissues in the human body.
2. Introduction to biology	https://ocw.mit.edu/courses/7-012-introduction-to-biology-fall-2004/	The course covers the following topics: Structure of pro- and eukaryotic cells. The cell cycle. Mitosis, meiosis; Plant tissues. Types of tissues in the human body.
3. Introductory Biology	https://ocw.mit.edu/courses/7-016-introductory-biology-fall-2018/video_galleries/lecture-videos/	Topics within the course include structure of pro- and eukaryotic cells. The cell cycle. Mitosis, meiosis; Plant tissues. Types of tissues in the human body.

Online courses in Russian	Link	Summary
1. Каталог препаратов по общей гистологии (General Histology Drug Catalog)	https://stepik.org/course/175252/promo?search=4752907752	This course presents reliable images of histological slides with a brief description to help students learn to identify tissue samples.
2. Основы общей гистологии (Basics of general histology)	https://stepik.org/course/132557/promo?search=4752907758	The course consists of two main parts, one of which is General Histology. The objectives of the course are to study the patterns of structure, embryonic and evolutionary development, metabolism, and functions of tissues and non-cellular structures of animals.
3. Молекулярная биология клетки (Molecular biology of the cell)	https://stepik.org/course/9180/promo?search=4752955563	The course covers the following topics: Structure of pro- and eukaryotic cells. The cell cycle. Mitosis, Meiosis.

Scientific field 6: Environmental Biology

Online courses in English	Link	Summary

1. DartmouthX: Introduction to Environmental Science	https://www.edx.org/learn/environmental-science/dartmouth-college-introduction-to-environmental-science	The course covers the following topics: Organisms and the Environment. Environmental Factors. Population; Ecosystems and the Biosphere. Global Environmental Issues.
2. Environmental science	https://www.coursera.org/specializations/environmental-science	The course is designed to introduce the basic concepts of Organisms and the environment. Environmental factors. Population; Ecosystems and the Biosphere. Global environmental problems.
3. AP Environmental science	https://www.youtube.com/@Mr.Smedes/featured#	Concepts on the following topics are considered: Organisms and the Environment. Environmental Factors. Population; Ecosystems and the Biosphere. Global environmental issues.

Online courses in Russian	**Link**	**Summary**
1. Биогеоценоз + учебный проект (Biogeocenosis + training project)	https://stepik.org/course/72945/promo?search=4753470224	The course contains a short description of biogeocenosis. Forest, park, pond, flowerbed, etc. The complex relationships between organisms and their environment are examined.
2. Глобальные экологические проблемы современности (Global environmental challenges of our time)	https://academika.ru/course/kosygina-globalenvironmentalproblemsofourtime/	The course provides insight into important environmental issues - climate change, pollution, species extinction, and how environmental treaties work.
3. Экология | ЕГЭ 2022 (Ecology| Uniform State Exam 2022)	https://stepik.org/course/73434/promo?search=4745635503	The course covers the following topics: Organisms and the Environment. Environmental Factors. Population; Ecosystems and the Biosphere. Global Environmental Issues.

Scientific field 7: Biochemistry and Molecular Biology

Online courses in English	**Link**	**Summary**

1. General Biochemistry	https://ocw.mit.edu/courses/7-05-general-biochemistry-spring-2020/	The course covers the concepts of the following topics: Chemical components of the cell. Energy Transfer. Protein Synthesis.
2. HarvardX: Principles of Biochemistry	https://www.edx.org/course/principles-of-biochemistry?utm_medium=partner-marketing&utm_source=referral&utm_campaign=harvard&utm_content=HO-Website	The course covers the following topics: Chemical Components of the Cell. Energy Transfer. Protein synthesis.
3. Selected Chapters of Biology and Chemistry	https://stepik.org/course/64583/promo?search=4753796738	The course aims at mastering the basic concepts and terms of biochemistry and includes a detailed description of the kinetics of biological reactions.

Online courses in Russian	**Link**	**Summary**
1. Биохимия белков (Protein biochemistry)	https://stepik.org/course/124041/promo?search=4753026612	The course presents theoretical and practical material on the structure, properties, functions, and catabolism of proteins and amino acids.
2. Молекулярная биология и генетика (Molecular biology and genetics)	https://stepik.org/course/70/promo?search=4745915985	The course covers the basic concepts of molecular biology and genetics, from cell organization to micro- and macroevolution.
3. Введение в геномное редактирование (An introduction to genome editing)	https://stepik.org/course/90400/promo?search=4753069247	This course provides an introduction to the fundamentals of molecular biology. Students will explore essential molecular biology techniques and gain an understanding of bioinformatics. Additionally, the course will delve into genome editing technologies and their future potential.

Scientific field 8: Biotechnology and Applied Microbiology

Online courses in English	**Link**	**Summary**

1. Industrial biotechnology	https://www.coursera.org/learn/industrial-biotech	The course includes the following subjects: Biotechnology as an industry, the production of antibiotics, proteins, and vitamins, food microbiology, and medical biotechnology.
2. Industrial biotechnology	https://www.my-mooc.com/en/mooc/industrial-biotechnology	The course introduces students to key concepts and issues related to these topics: Biotechnology as an industry. Extraction of antibiotics, proteins, vitamins. Food microbiology. Medical biotechnology.
3.DelftX: Industrial Fermentation	https://www.edx.org/learn/engineering/delft-university-of-technology-industrial-fermentation	The course introduces students to key concepts and issues related to these topics: Biotechnology as an industry. Extraction of antibiotics, proteins, vitamins. Food microbiology. Medical biotechnology.

Online courses in Russian	**Link**	**Summary**
1. Биотехнологии: генная инженерия (Biotechnology: genetic engineering)	https://stepik.org/course/94/promo?search=4753084628	The course covers the basic concepts of genetic engineering such as recombinant DNA, PCR methods, molecular cloning, gene and protein synthesis.
2. БиоКвантум. Мобильный Кванториум 8-11 класс (BioQuantum. Mobile Quantorium 8-11 grade)	https://stepik.org/course/191743/promo?search=4753084636	The course covers the following topics: Biotechnology as an industry. Production of antibiotics, proteins, vitamins. Microbiology of food. Medical biotechnology.
3. Введение в молекулярную биологию и биомедицину (Introduction to molecular biology and biomedicine)	https://stepik.org/course/549/promo?search=4753084642	The course covers the following topics: Biotechnology as an industry. Production of antibiotics, proteins, vitamins. Microbiology of food. Medical biotechnology.