**Entrance exam**
**Faculty of biology, Shenzhen MSU-BIT University**
**Summer 2022**

The entrance exam of the English-medium Bachelor/Undergraduate programme in biology is conducted in the form of the two-part interview where applicants give answers to specialized questions primarily meant to assess their knowledge of biology and less specialized and more general questions aimed at assessing their English language proficiency. Each applicant is allocated 10 minutes.

The final score is 100 points, divided equally between the assessment of an applicant's knowledge in biology (50%) and assessment of the English language proficiency (50%).

The overall minimum score required for the positive mark is 60 points.

The score of 60-74 points equals a satisfactory mark (3)

The score of 75-85 points equals a good mark (4)

The score of 86-100 points equals an excellent mark (5)

**Biology**

**Basic requirements**

The applicants of the English-medium Bachelor/Undergraduate programme in biology are expected to demonstrate good knowledge of the fundamentals of modern and classic biology at the secondary school level, knowledge of the basic facts about biological objects, such as the structure with necessary details, the functions of organs and whole organisms and processes taking place in cells and organisms; and also have a general understanding of the modern trends in biology, as well as demonstrate high personal motivation and commitment to the study of biology.

**Entrance exam questions**

### I.     Living organisms

**Bacteria**. The structure and activity of bacteria. Distribution of bacteria in the air, soil, water, living organisms.
**Viruses.** Structure and life.

**Algae.** The structure and activity of unicellular algae. Algae reproduction. Filamentous algae.
**Fungi.** General characteristics. Mushrooms, mold mushrooms, yeast - structure, nutrition, reproduction.
**Lichens.** Structure. Symbiosis. Food. Reproduction. The role of lichens in nature and economy.
**Plants.** Flowering plant and its structure. Seed, root, leaf, stem, shoot, flower, fruit - structure and function. Pollination. Vegetative reproduction of plants. Classification of plants - monocotyledons and dicotyledons, the main families. Mosses, horsetails, club mosses, ferns, gymnosperms, angiosperms.
**Animals.** Main characteristics. Unicellular animals. Types coelenterates, flatworms, roundworms, annelids, mollusks, arthropods (crustaceans, arachnids, insects), chordates - general characteristics,

external and internal structure, nutrition, respiration, excretion, nervous system, reproduction, special characteristic features. Variety of chordates (lancelet, fishes, amphibians, reptiles, birds, mammals).

## II.     Human

Anatomy and physiology of the body. Structure, functions, reproduction of cells. Tissues (epithelial, connective, muscle and nervous).

Musculoskeletal system. Bones, joints, muscles, reflex arc.

Internal environment – blood, tissue fluid, lymph - composition, functions. Blood groups.

Circulation. Heart and blood vessels (arteries, capillaries, veins). Systemic and pulmonary circulation or circuit. Heart, its structure and function.

Respiration - respiratory organs, structure and function. Gas exchange in the lungs and tissues. Breathing movements.

Digestion. Digestion, enzymes and their role in digestion. Digestive organs.

Metabolism. Water and other inorganic substances, proteins, fats and carbohydrates metabolism.

Excretory system. Organs of the system. The functions of the kidneys.

Skin. The structure and functions of the skin. The role of the skin in the regulation of heat transfer and excretion.

Nervous system. The value of the nervous system. The structure and functions of the spinal cord and regions of the brain. Cerebral hemispheres of the brain. The value of the cerebral cortex.

The structure and functions of the organs of vision and hearing.

Higher nervous activity. Unconditioned and conditioned reflexes. Formation and biological significance of conditioned reflexes. Inhibition of conditioned reflexes. Human consciousness and thinking as functions of the higher parts of the brain.

Endocrine glands. Structure and functions. Hormones. Humoral regulation in the organism.

Human reproduction and ontogenesis. Reproductive organs and sex cells. Fertilization. The development of the human embryo.

## III.     General biology

**Biological evolution**. Criteria of a biological species. Population as a unit of species and evolution. Factors of evolution: heredity, struggle for existence, variability, natural selection. The leading role of natural selection in evolution. Adaptations. Speciation. Artificial selection.

**Development of the organic world**. The main directions of evolution. Aromorphosis, idioadaptation. The ratio of different directions of evolution. Biological progress and regress. Brief history of the development of the organic world.

**Human origin**. Human races, their origin and unity.

**Ecology**. Environmental factors. Biogeocenosis. The relationship of populations in biogeocenosis. Food chains. Ecological pyramid rule. Self-regulation. Change of biogeocenoses.

**Cell biology**

Cell theory. A cell as a structural and functional unit of the living. The structure and function of the nucleus, cytoplasm and its main organelles. Structural features of cells of prokaryotes and eukaryotes.

The chemical composition of the cell. Water and other inorganic substances, organic substances: lipids, ATP, biopolymers (carbohydrates, proteins, nucleic acids). Enzymes, their role in life processes. DNA replication.

**Metabolism.** Catabolism (energy conversion). The importance of ATP.

Anabolism. Photosynthesis. Biosynthesis of proteins. Gene and its role in biosynthesis. Genetic code.

**Reproduction and individual development of organisms**

Mitosis. Preparation of the cell for division. Replication of DNA molecules. Chromosomes. Sexual and asexual reproduction of organisms. Gametes. Meiosis. The development of egg cells and spermatozoa. Fertilization.

The development of the embryo (on the example of animals). Postembryonic development.

**Genetics**

Mono- and dihybrid crossing. The laws of inheritance established by G. Mendel. Dominant and recessive traits. Alleles. Phenotype and genotype. Homozygosity and heterozygosity. Genes interaction. Genetic linkage. Crossing over. Genetic determination of sex. Chromosomal theory of heredity. Mutations and modifications. Genetic processes in populations and biological evolution.

## Grading

The biology assessment constitutes 50% of the total score and is based on three criteria that an applicant to SMBU must demonstrate at the exam:

1. Knowledge of the structure and life of different groups of living organisms, knowledge of the main groups of plants and the classification of animals, knowledge of biological terminology;

2. Knowledge of the most important concepts, laws and regularities concerning the structure, life and development of living organisms and the development of wildlife;

3. The competent ability to produce and justify conclusions, operate with concepts when explaining the natural phenomena. This skill is given special importance, since it will indicate the meaningfulness of knowledge and the deep understanding of the presented material by an applicant.

The maximum score per each criterion is 15 points. If an applicant's knowledge or competence is below 10, the applicant is given 0 for the criterion. The cumulative/overall minimum score required for the positive mark for the knowledge of biology is 30 and maximum 45 points. 5 extra points may be awarded by the examiners as an addition to the overall score for the general positive impression and high motivation.

## Grading rubric

| Criteria | 10 | 13 | 15 |
|---|---|---|---|
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| 1. Knowledge of the structure and life of different groups of living organisms, knowledge of the main groups of plants and the classification of animals, knowledge of biological terminology. | -Limited knowledge of biology of different groups of organisms; -Minimal knowledge of biodiversity of organisms or even its absence; - Errors in biological terminology using. | - Confident knowledge of biology of different groups of organisms maybe with small mistakes; -good knowledge of biodiversity and classification of organisms; - Minimal errors or uncertain using of biological terminology. | - Confident knowledge of biology of different groups of organisms maybe with small mistakes; -Confident knowledge of biodiversity and classification of organisms; - Good knowledge of biological terminology. |
|---|---|---|---|
| 2. Knowledge of the most important concepts, laws and regularities concerning the structure, life and development of living organisms and the development of wildlife. | - Weak knowledge of the most important concepts, laws and regularities concerning the structure, life and development of living organisms and the development of wildlife especially in the field III. General Biology; | 2. Mosaic knowledge of the most important concepts, laws and regularities concerning the structure, life and development of living organisms and the development of wildlife; incomplete understanding of them. | - Confident knowledge of all points. |
| 3. The competent ability to produce and justify conclusions, operate with concepts when explaining the natural phenomena. This skill is given special importance, since it will indicate the meaningfulness of knowledge and the deep understanding of the presented material by an applicant. | - Occasional ability to make scientific conclusions from biological facts; - Occasional ability to justify some conclusions given by examiner; - Occasional ability tj synthesize few conclusions to the concept. | - Good ability to make scientific conclusions from biological facts; - Good ability to justify some conclusions given by examiner; - Good ability tj synthesize few conclusions to the concept with rare mistakes. | - Confident ability to make scientific conclusions from biological facts; - Successful ability to justify some conclusions given by examiner; - Confident ability tj synthesize few conclusions to the concept. |

**English language assessment at the entrance exam**

English language assessment is an integral part of the entrance exam in biology and constitutes 50% of the total score.

**Basic requirements**

Developed by Alexander Kim, Lilia Shevyrdyaeva, Olga Fleonova

The applicants of the English-medium Bachelor/Undergraduate programme in biology are expected to demonstrate the English language proficiency at the level of B1 (or pre-intermediate to intermediate level) according to CEFR, namely they must be able:

to interact with a degree of fluency and spontaneity that makes regular successful interaction in English possible;

to speak on a wide range of subjects within the discipline and explain a viewpoint on a topical issue describing options and providing arguments.

## Entrance exam questions

### General
In what ways can the knowledge of biology improve the quality of a person's life?

In what ways can the knowledge of biology improve the life of the society?

What do you expect from the field of biology in the next 10 years?

Do you think biologists should work closely with other scientists, like physicists, chemists or geographers? Why? Why not? Give arguments.

What other fields can benefit from research in biology? (*follow-up trigger questions*: sports, farming, culinary arts)

### Cell and molecular biology
What are the benefits of cell research?

What benefits has cell research provided?

Do you think genetic engineering is changing the world for the best or for the worst?

Why do you think some people object to genetic engineering?

### Physiology
Should every person have basic knowledge of the human body? Why? Why not? Give arguments.

### Microbiology
How can bacteria benefit people in everyday life?

### Ecology
How can a single person contribute to preventing climate change?

What can you personally do to protect wild animals?

What can you personally do to protect sea (~~marine~~) life?

Is protecting nature (*plants, animals, wildlife*) the responsibility of governments or of each individual? Give arguments.

Why is it important to conserve ecosystems?

## Grading

English language assessment constitutes 50% of the total score and encompasses three criteria: knowledge of vocabulary, knowledge of grammar and communicative competence. The maximum score per each criterion is 16 points. If an applicant's knowledge or competence is below 10, the applicant is given 0 for the criterion. The cumulative/overall minimum score required for the positive

mark for the English language proficiency is 30. 2 extra points may be awarded by the examiners as an addition to the overall score for the general positive impression.

## Grading rubric

| | 10 | 13 | 16 |
|---|---|---|---|
| **Vocabulary (range and accuracy)** | -limited knowledge of general and academic vocabulary<br>-minimal knowledge of scientific vocabulary; uses mostly general vocabulary<br>-pauses searching for words and recalls/finds words with difficulty<br>-repetitive use of the same vocabulary<br>-incorrect use of some words<br>-errors in collocations<br>-occasional errors in the pronunciations of words<br><br>*Vocabulary weaknesses impede communication; however, overall it is possible to understand the applicant.* | -a wide range of context-appropriate general and academic vocabulary<br>-some lack of the knowledge of scientific terminology, but is able to rephrase, explain by providing details etc. to replace the term and make oneself understood | -a wide range of context-appropriate general and academic vocabulary<br>-a good command of technical vocabulary/scientific terminology (adequate for the level)<br>-good knowledge of collocations<br>-correct pronunciation of general, academic and technical vocabulary |
| **Grammar (range and accuracy)** | -(numerous) sentence structure errors (SVO, position of clauses)<br>-basic grammar errors (s-v agreement, verb tense and verb form errors, etc)<br><br>*Grammar errors impede understanding; however, overall it is possible to understand the applicant.* | -occasional sentence structure errors (SVO, position of clauses)<br>-occasional grammar errors (s-v agreement, verb tense and verb form errors, etc)<br><br>*Isolated errors reduce clarity but do not impede understanding.* | -accurate, error-free use of grammatical structures;<br>-sentence structure is varied; complex grammatical constructions and a variety of clauses are used (adequate for the level)<br>-error-free use of grammar (s-v agreement, verb tense and verb form errors, etc) |
| **Communicative competence** | -occasionally misunderstands questions<br>-occasional irrelevant answers<br>-repetitions<br>-long pauses | -the applicant understands questions<br>-answers questions but with some delay | Communicates without difficulty:<br>-understands all the questions |

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| -weak strategies to cope with communication breakdown<br>-needs the examiner's help to continue the answer<br><br>*However; in spite of these difficulties the examiners are able to understand the answer* | -occasional incoherence that does not impede understanding<br>-some knowledge of repair strategies to cope with communication breakdown<br><br>*The clarity of the answer is reduced; however, the communication is successful.* | -answers accurately and competently without hesitation<br>-utterances are coherent<br>-demonstrates good strategies to cope with misunderstanding (is able to ask a question; initiate a conversational move; uses humor, etc)<br><br>*The student communicates successfully.* |