BIOLÓGIA
ANGOL NYELVEN
KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA
2008. május 16. 8:00

Az írásbeli vizsga időtartama: 120 perc

Pótlapok száma
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OKTATÁSI ÉS KULTURÁLIS
MINISZTÉRIUM
Important information

Read this information sheet before you start working.

You have 120 minutes to complete the intermediate level examination. The following assignments are multiple choice or open-ended questions.

When answering multiple choice questions one or more CAPITAL LETTERS should be written into the empty boxes. These are the codes for the right answer(s). Make sure that your letters are unambiguous, because uncertain answers will not be accepted. In case of correction you are asked TO CROSS OUT the wrong letter clearly and TO WRITE THE CODE FOR THE RIGHT ONE BESIDE.

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<th>A</th>
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When answering open-ended questions technical terms, short answers of 1-or-2 words, a sentence or several sentences should be created. Take care of GRAMMATICAL CORRECTNESS. Grammatically ambiguous or unintelligible answers (e.g. uncertain subject in a sentence) will not be accepted even if the right answer is included.

Use black or blue ink.

Don’t write into the grey-coloured boxes

We wish you a good work.
I. Three living organisms 9 points

A student took photographs of three creatures during his excursions. Unfortunately he could not find the name of the first one in his guidebooks, but he identified the other two organisms. Study carefully the photos and answer the questions. *Put the letter(s) of the correct answer(s) in the empty cells of the table. Every correct row is awarded 1 point.*

![Unknown species with sori (spore-cases) on undersides of leaves](image-url)

<table>
<thead>
<tr>
<th>Unknown species with sori (spore-cases) on undersides of leaves</th>
<th>Fritillary</th>
<th>Death cap</th>
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<tbody>
<tr>
<td>A) Unknown species</td>
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<td>B) Fritillary</td>
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<td>C) Death cap</td>
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<td>D) All three of them</td>
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<td>E) None of them</td>
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1. It has a thaloid body.

2. It transports nutrients in its vascular tissue.

3. It has flower and fruit at certain times.

4. It is surely heterotrophic.

5. It is a Pteridophyte.

Decide whether these statements are true or false (T – F).

6. Symptoms of death cap poisoning appear only 8-24 hours after consumption.

7. We can neutralize death cap toxins by pouring boiling water on it.
Fritillary is a protected plant in Hungary, therefore the student kept an eye on the scheduled projects affecting the Liliom-rét, one of the natural habitats of this species. Local authorities suggest creating a pond for boating by damming up the Teknős-patak that flows across the meadow. According to the plans, this pond will be located in the widening valley between the springs supplying the Teknős-patak and the Liliom-rét. Village farmers urge soil improvement by adding nitrogen-containing fertilizers to the poor soil of Liliom-rét. This way more grass can be cut every year.

The student has checked the environmental requirements of fritillary in his „Növényismeret” book. He found that it prefers moisture, is an inhabitant of marshland meadows, lives on slightly limy habitat poor in nitrogen, and does not tolerate disturbance. He asked for permission to speak in the next meeting of the local authority.

8. Outline what prospective ecological consequences the student could point out. Formulate two arguments on ecological bases. (2 points)

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II. Grouping of animals  
8 points
Write the numbers of the listed animal species in the appropriate circles of the following figure. One number can be put just in one place. Every correctly placed number is awarded 1 point.

1. The **common cuttlefish**\(^*\) can escape rapidly by pushing water out of its mantle cavity.  
\(^*\) = közönséges tintahal

2. Both the larva and the imago (emerging from the pupa) of the **lady beetle**\(^*\) are useful **aphid**\(^{**}\)-eaters.  
\(^*\) = hépettyes katicabogár  \(^{**}\) = levéltető

3. The **southern hawker**\(^*\) flies quickly with its two pairs of wings and catches smaller insects. Its larva climbs up onto a reed before its last moulting (shedding) and the imago emerges from its burst larval skin.  
\(^*\) = sebes acsa

4. The ever caught biggest specimen of the **giant squid**\(^*\) was 21 metres long with its tentacles. Its giant, bulblike eyes similar to those of humans may reach 40 centimetres in diameter.  
\(^*\) = óriáskalmár

5. Both larva and pupa forms of the **malaria mosquito** are aquatic and can move on their own. The imago spreads a dangerous disease with its bite.

6. **Milk white planarian** is native to our freshwaters. It stuffs fish larvae and spawn into its branched digestive cavity through the only opening of it and digests them there.

7. The smallest Hymenoptera species belongs to the **proctotrupid wasps**\(^*\) (small parasitic wasps). The larvae develop in the body of living insects as parasites and they also develop into pupa there.  
\(^*\) = törpefürkészek

8. Considering their shapes and nutrition, larva form and imago of **desert locust**\(^*\) are very similar to each other. They do serious damage to crops by their chewing even today.  
\(^*\) = vándorsáska

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III. Microscopic slides in a box  

A student’s task was to put boxes full of histological slides into order in the biology preparation room. He found only four slides in an old box with a label listing seven names. After studying the microscopic pictures, it was easy to identify the four slides.

1. Write the names of the tissues under the pictures. (Four correct answers: 1 point)

BLOOD SMEAR  STRIATED MUSCLE TISSUE  EPIDERMAL TISSUE

STRATIFIED, CORNIFIED SQUAMOUS EPITHELIUM  VASCULAR TISSUE

BONE TISSUE  NERVOUS TISSUE

A

B

C

D

*
The bodies of which animal species might have been these slides made from? Put the letters of the appropriate slides in the empty cells (3 points)

2. From the common wall lizard (the most common domestic reptile species).
3. From the jointed leg of the common European cockchafer. (= májusi cserebogár)
4. From the leaf of a terrestrial Angiosperm.

5. There is a strange cell in slide “C” that the student has marked with a star. Name this type of cell. Explain which gases are exchanged and how it makes the regulation of this gas-exchange possible. (3 points)

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1.  2.  3.  4.  5.  total

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IV. Respiration and photosynthesis 11 points

Put the letters of the appropriate processes in the third column of the table. Each correct answer: 1 point.

A. Photosynthesis
B. Biological (aerobic) oxidation
C. Both of them
D. None of them

1. During one of its reactions, water is split and oxygen is produced.
2. One of its end-products is carbon dioxide.
3. Reductive process (the entering carbon-containing compound becomes reduced by the end of the process.)
4. Its reactions start in the cytoplasm, but they end in the mitochondrion.
5. Hydrogens become attached to transport molecules (coenzymes) during the process
6. Gross equation of the process: \( C_6H_{12}O_6 + 6O_2 = 6CO_2 + 6H_2O + \text{energy} \)
7. It also happens in the cells of mesophyll (chlorenchyma/ food-producing ground tissue).
8. No ATP is produced during the process.
The following three curves show the intensity of photosynthesis of a plant species under the influence of different environmental factors. All three curves show a saturation phase, in which (the intensity of) oxygen production stops growing.

9. Which environmental factor limits the level of oxygen-production in the saturation phase of the 3rd curve? (1 point)

10. Which environmental factor limits the level of oxygen-production in the saturation phase of the 2nd curve? (1 point)

11. The natural concentration of carbon dioxide in air is often artificially increased in greenhouses. In which of the following situations does increased CO₂ level help plants grow better? *The letter for the correct answer should be written in the empty cell.* (1 point)

A) During night, because plants respire only then.  
B) In sunny periods, because photosynthesis happens in light.  
C) Both days and nights, because respiration is a continuous process.  
D) On cloudy days, when dim light limits photosynthesis.

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V. The route of a nutrient 7 points

A child is eating a croissant. He is munching it slowly. He feels a sweet taste in his mouth. Follow the fate of the croissant’s components. Which terms are missing from this text? Fill the gaps with your solutions. Each correct answer is awarded 1 point.

The major component of the croissant is a polysaccharide called (1) ....................... . Its digestion begins in the oral cavity by the enzyme of the digestive juice named (2) ............ . Digestion of the croissant’s carbohydrate is completed in the (3) ................. . A large gland’s secretion, the (4) ....................... , continues its digestion here. The digested nutrients are absorbed in the small intestine and circulation carries them to the (5) ......................... , which stores important nutrients for the entire body. If its concentration is too high in the blood plasma, the body stores it in the form of a carbohydrate called (6) ....................... . This process is stimulated by a regulatory hormone called (7) ....................... .

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VI. Art and nature 9 points

The following excerpt comes from Giordano Bruno, a 16\textsuperscript{th} century philosopher. In the dialogues of this writing, one of the characters, Teophilo, tells Bruno’s teaching. Compare his train of thought and our modern knowledge and answer the questions. Each correct answer: 1 point.

TEOPHILO With certain restrictions, the relationship between the material and form of arts is valid for the material and form of nature, too. Forms change endlessly in arts if this is possible at all, while material always remains the same, such as after the form of wood we can see the beam, the table, the desk, the stool, the box or the comb, etc. – but wood always remains wood. Similarly, material is always the same in nature, while forms follow one another in an infinite sequence of changes.

GERVASIO And how is this parallel going on?

TEOPHILO Don’t you see that what seed was, turns into grass, from grass to ear*, ear becomes bread and from bread ....... blood, from this semen and then embryo, human being and a corpse. The corpse turns into ground, rock or anything else and so on, and everything can take any natural shapes. .... There must be a single and same thing, that is not stone, nor ground, nor corpse, nor human, nor embryo, nor blood or anything else: that becomes embryo after being blood, and will turn into human being from embryo ...., just as the substrate** of arts: after being wood it becomes a board,… and what was a board becomes a door.

*ear* = kalász **substrate** = (alap)anyaga

G. Bruno: On Cause, Principle and Unity (excerpt)
1. What shapes (forms) can material take in the hand of a creative man (a) and in living nature (b)? Give two examples of each from the text.
   a) ............................................................
   b) ............................................................

2. According to our modern knowledge, a certain type of molecule as information-carrier plays an important role in the formation of shapes and features of living organisms. Which molecule is this?
   ............................................................

3. “What seed is, it turns into grass” - Bruno wrote. A stored nutrient of the wheat grain turns into the main building material of the cell wall in the growing young plant. On the grounds of our present knowledge, name both the starting molecule and the compound arising from it.
   stored nutrient (polysaccharide) ---------> structural material of the cell wall (polysaccharide)

4. “What grass is, it becomes ear”. The source of carbohydrates in the growing cereal plant is not the seed yet, but inorganic materials taken up from the environment. What molecules are these?
   ............................................................ and ............................................................

5. “What bread was, becomes blood.” – as Bruno wrote. The carbohydrate content of bread gets into the blood plasma in the form of a molecule. What is this molecule?
   ............................................................

6. “Blood turns into semen”. This strange belief was a widespread idea until the 19th century: according to this, semen, the male gamete, directly originates from blood. It “collects” the inherited characteristics from there. As we do know now, which organ produces male gametes (sperm cells)?
   ............................................................

7. “Semen turns into embryo” - as the text writes. G. Bruno adopted that ancient and renaissance idea, that sperms alone are responsible for shaping and inheritance. Nowadays we are aware of the fact that only half of the genetic material comes from the father. However there are some characteristics (or rather genes determining them) that can be inherited only from the father. Where are the genes of these characteristics located?
   ............................................................

8. “And will turn into human being from embryo …, just as the substrate of arts: after being a wood it becomes a board”. Bruno wrote the embryo, the developing foetus and the child really possess the same “substrate”, thus it remains the same human being, because its every (somatic) cell contains the same information. What sort of cell division is responsible for the production of somatic cells?
   ............................................................
9. There are significant differences between the shapes (body structures) of a foetus and a newborn baby. Mention an essential difference about the circulatory system of a foetus and that of a baby.

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VII. Types of learning

7 points

Compare associative learning (classical conditioning), operant conditioning and insight learning. Put the numbers of the appropriate statements into the proper circles. Each correct answer is awarded 1 point. One number can be put only in one place. If one number is written in more places, no points will be awarded.

1. It can be found in human beings, too.
2. It results in behaviours formed by association.
3. A formerly neutral stimulus is coupled with an innate reflex action.
4. Training of animals is predominantly based on it.
5. Mammals only with developed nervous system are able to alter their behaviour this way.
6. Saliva-production of a dog starts at hearing the bell ringing.
7. It makes adaptation to the changing environment possible.

1. 2. 3. 4. 5. 6. 7. total
VIII. Self or foreign (“not-self”)? 7 points

Study carefully both the description of the following experiments and the figure. On the grounds of your knowledge, answer the questions. Every correct answer is awarded 1 point.

An Australian biologist, **F. MacFarlaine Burnet** (1899-1985) recognised the basic rules of the immune system. Burnet and his colleague, Medawar made transplantation experiments with mice of different races (genetically different mice).

a) If a skin graft of one type of mouse (shown in grey on the figure) was transplanted to the wound of another one (white on this figure), it remained for a while, but it died and was rejected in 10-20 days. If the same transplantation was repeated on the same recipient mouse again, the skin graft was rejected after 6 days.

b) Medawar prepared a tissue extract from the embryos of the grey mouse (indicated with a small circle on the figure) and gave it to a one-day-old white mouse.

c) He experienced that the white mouse previously treated this way would accept organs and tissues of the grey one when grown-up. (Tissues from different sorts of mice are still rejected – just as in case of an untreated mouse.)

1. Why is a transplanted tissue rejected?

2. Why was the repeatedly transplanted tissue rejected more rapidly in this experiment? Write the letter of the correct answer into the box.

   A) Antibodies produced by the lymphocytes have changed.
   B) A specific immune-response occurred this time instead the initial non-specific immune-response.
   C) Memory cells produced after the first transplantation have speeded up the second response.
   D) The first immune-response was passive, while the second one was already active.
   E) On the first occasion only one type of lymphocyte, but on the second occasion both types of lymphocytes took part in the immune-response.
3. There was no tissue rejection in experiment “c”. Why is it so?

A) The activity of the immune system in the white mouse embryos stopped or strongly decreased in the course of the experiment.

B) The immune system of the treated white mice could not recognise their own cells.

C) The immune system of the treated white mice recognised the cells of the grey ones as their own cells.

D) No antibody production started in the treated white mice against the tissues of the grey ones.

E) Antibody production started in the transplanted tissues of the grey mouse against the cells of the treated white mouse.

4. What conclusions can we draw from the results of these three experiments?

A) The immune system is not active in the embryonic age.

B) The immune system is not able to distinguish between different antigens during embryonic age.

C) The immune system has its own memory.

D) The immune systems of grey and white mice work in different ways.

E) The immune system gives antigen-dependant (specific) answers.

5. The immune system plays an important role in the struggle against pathogens. What similarity of the pathogenic bacteria and the surface of cells in the transplanted tissue explains that the body recognises both of them as foreign?

6. According to Burnet’s experiences, one of the most important rules of human tissue and organ transplantation is that the tissue to be transplanted must originate from a genetically more similar person. A person whose genetic constitution is almost identical to the patient would be an ideal donor. Do two such people exist in reality? If yes, who? If no, why not?

7. Sometimes parents offer help to their child in case of organ transplantation. What percentage of their genetic material is common?

A) 12.5%

B) 25%

C) 50%

D) 75%

E) 100%
IX. The human ear 7 points

The structure of a human ear is shown on the figure. Some details are labelled with letters.

1. Name the auditory ossicles (tiny bones of the middle ear) in the sequence they transmit the stimulus to each other. (3 points)

\[ \text{\underline{\hspace{2cm}}} \quad \text{\underline{\hspace{2cm}}} \quad \text{\underline{\hspace{2cm}}} \]

2. Which part of the outer ear is indicated with letter F? (1 point)

\[ \text{\underline{\hspace{2cm}}} \]

Match the followings statements and the appropriate letters of the figure. (3 points)

| 1. It contains receptors responsible for sound detection. | A |
| 2. It is directly connected to the upper respiratory tract. | C |
| 3. It is responsible for the detection of the accelerating movements of the head. | B |

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X. Inheritance of a genetic disorder 8 points

The inheritance of a genetic disorder called cystic fibrosis can be followed through three generations on this pedigree chart. (Individuals with cystic fibrosis are indicated with dark colour.) A healthy woman and an unhealthy man have three healthy sons, a daughter with cystic fibrosis and a healthy daughter. The latter one has married a healthy man. Both healthy and affected (unhealthy) boys and girls were born from this marriage.

The disease is caused by the insufficient activity of those glands that produce mucus in the lungs, pancreatic juice in the pancreas and sweat in the skin. The patient has severe difficulties in breathing and is not able to digest lipids because of the missing digestive juices. The disorder is caused by a defective version (allele) of a gene that is located on an autosome.

Study the pedigree chart and answer the questions.

1. Decide whether a dominant or a recessive allele inherits this disorder. Give reasons for your answer.               (2 points)

2. Secretions of endocrine glands of the human body are released into body fluids, while those of exocrine glands are not. Disorders of endocrine or exocrine glands cause the above mentioned symptoms of this disease?              (1 point)

3. Determine the genotypes of the individuals A, D and E for this disorder. Mark the alleles with F and f. If more genotypes are possible, give all.  (4 points)

4. By knowing the genotypes of parents, calculate the chance (%) of having a child with cystic fibrosis from the marriage of individuals B and C. Give reasons for your answer.                             ( 1 point)

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<td>I. Three living organisms</td>
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Score for the written exam (**achieved score · 1.25**) = 80 · 1.25 = 100

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correcting teacher

Date: …………………………

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assigned

score written into the program/ programba beírt pontszám

Assignments/ Feladatsor (Score for the written exam/ az írásbeli vizsgarész pontszáma)

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correcting teacher/ javító tanár

Registrar of the Board of Examiners/ jegyző

Date/ Dátum: ……………………

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irásbeli vizsga 0802

2008. május 16.