BIOLÓGIA
ANGOL NYELVEN
EMELT SZINTŰ
ÍRÁSBELI VIZSGA
2011. május 11. 8:00

Az írásbeli vizsga időtartama: 240 perc

Pótlapok száma
Tisztázati
Piszkozati

NEMZETI ERŐFORRÁS
MINISZTÉRIUM
Important information

Read the following instructions carefully before you start your work.

You have 240 minutes to complete your advanced level examination.

Your written paper consists of two parts.
For answering correctly the **first part (tasks I-VIII), which is compulsory for everyone** you are awarded 80 points.
The **second part (task IX)** contains two versions (A and B). **YOU ONLY HAVE TO COMPLETE ONE OF THEM.**
You can be awarded the total of 20 points **FOR ANSWERING ONLY ONE OF THE TWO OPTIONAL TASKS.** It means that by answering both you cannot get more points. If you do start answering both optional tasks **CROSS OUT THE ONE WITH A PEN WHICH YOU DON NOT WANT TO BE INCLUDED.** If you fail to do this the examiners will automatically evaluate the ‘A’ version.

Your questions are either multiple choice or open-ended ones.
When answering **multiple choice questions** you need to write one or two CAPITAL LETTERS into the empty boxes. These are the letters of the correct answer or answers. Make sure that your answers are unambiguous, otherwise they will not be accepted. If you want to correct your answer **CROSS OUT THE WRONG ONE AND WRITE THE CORRECT LETTER NEXT TO IT.**

![Correct acceptable wrong examples]

When answering **open-ended questions**, you need to write technical terms, a few words, a whole sentence or several sentences. Mind your **GRAMMAR** because if your answer is not understandable because of bad grammar, or because it is ambiguous (e.g. it is not clear what the subject of the sentence is), it will not be acceptable even if it contains the correct terms.
Each correct answer is awarded 1 mark, unless otherwise indicated.

**Use black or blue pen.**

**Don’t write anything into the grey boxes.**

Good luck for your exam.
I. After forest fire 10 points

Some of the dolomite rock grasses in Hungary have been replaced by black pines of Balkan origin since 1860. Due to the shadowing effect of the pine trees and to the substances leached out of the litter layer, these pine forests almost completely changed the originally rich flora of rock grasses. The slowly decomposing pine needles and barks building up on the forest floor can easily catch fire. In 1993 huge areas of black pine forests were devastated by forest fires in the Buda Mountains. In the damaged areas the remaining trees were cut down in 1994. Researchers wanted to find out whether the original rock grass community would be restored. In order to find the answer, the changes in the composition of the flora were monitored between 1994 and 2003.

1. Based on the description above, what type of species interaction existed between the old black pine forest and the original populations of the rock grass community (the competition between the original community and the black pine in the root zone can be ignored).

……………………………………………………………..

2. What is the name of the process researchers investigated for ten years? Write the letter of the correct answer into the box.

A) Aspect, B) Succession, C) Diversity, D) Niche, E) Evolution

In the course of the investigation, five sampling squares of 8 m² each were designated in the burnt down forest area on both the north and the south slope (in the figure letter ‘N’ indicates north and ‘S’ south). As a comparison, (as a control) two areas, one on each side of the mountain were designated but this time in undisturbed territories (the one on the northern slope is indicated as NC, while the other one on the eastern slope as SC).

Figure No.1 shows the average number of species found in the sampling squares. Figure No.2 shows the average percentage of the area covered by plants. (Since more than one plant can grow in a given area, the total sum can exceed 100%.) year No1-5: 1994-98; year No10: 2003.

3. Describe the changes occurring in the number of species (increased, decreased) in the burnt down forest areas in the years 1-10.

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4. Compare the coverage of the burnt down areas and the control areas based on the graphs of Figure No. 2.

5. The graphs prove that in the control areas … (write the letter of the correct answer in the box)
   A) there was a climax community
   B) there were no aspects
   C) there were more than 100 plant species
   D) there were more species on the northern side (greater species richness)
   E) succession was in progress

During the process there were changes in the plant composition, which is shown in figure No.3. After studying the bar chart answer the following questions. NC: northern control area, SC: southern control area.

6. What percentage of the northern area was covered with black pine at the end of year No10? …………

7. Changes in which abiotic factors can account for the initial increase in the proportion of weed plants in the area under investigation?

8. What type of interactions between plant populations can explain the gradual decrease in the proportion of weed plants?
9. Identify one difference between the north and south control areas with regard to the coverage of the different types of plants expressed in percentages.

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10. Based on Figure 3, there will be further need for conservation interventions in the burnt down forest areas. Considering all this, what needs to be done if the ultimate aim is to restore the original species-rich communities? Give reasons to support your answer.

…………………………………………………………………………………………………

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II. Reproduction of animals and plants

11 points

Write the expressions about the reproduction of animals and plants into the appropriate boxes of the table below. A word or expression can be used more than once. There are a few odd ones out which do not fit anywhere.

- plant ovary, water drop, hermaphrodite, separate sexes, bisexual/complete flower, monosexual/incomplete flower, monoecious, dioecious, testis, insects, pollen tube, flagellum, animal ovary, zygote, anther

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<th>In angiosperm plants</th>
<th>In animals</th>
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1. It is here that the male sperm cells are formed:

2. It is here that the egg cells are formed:

3. This is what a species is called in which each individual produces both sperm and egg cells:

4. This is what a species is called in which an individual produces either sperm cells or egg cells:

5. With the help of this structure the sperm cells reach the egg cell:

6. The figure shows a rare Hungarian plant species called Dog's tooth violet (kakasmandikó). Of the expressions above which one applies to the flower of Dog's tooth violet. Give your reason to support your answer! (2 points)

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III. Behaviour of birds  

In an ethological experiment starlings were trained to fly in one particular cardinal direction. The upper two figures show the angle between their flight paths and the Sun at different times of the day. The direction in which the same trained birds flew when only artificial lightning was applied was also investigated. The results of the experiment are shown in the lower two figures. In the four figures the cardinal directions are the same.

1. What kind of behaviour was used to train the starlings to fly in a particular cardinal direction? **Write the letter of the correct answer into the box!**

   A. Conditional reflex.  
   B. Directed movement (taxis).  
   C. Operant conditioning.  
   D. Insight.  
   E. Copying.

2. In which cardinal direction were the starlings taught to fly?

   A. North.  
   B. South.  
   C. East.  
   D. West.  
   E. East and Southeast.

3. Which statements are correct according to the results of the experiments? (2 points)

   A. The angle between the flight path and the Sun is always the same.  
   B. The biological clock of the starling is upset by the artificial lighting.  
   C. When using artificial lighting at 3 o’clock pm (15h) the starling was not flying in the direction it was trained to.  
   D. At 3 o’clock pm (15h) the starling was always flying at a 25 degree angle to the source of light.  
   E. The source of light plays no role in the navigation of the starling.

4. How would you change the experimental procedure if the aim of the experiment was to determine whether the startling trained to fly in a given cardinal direction relies in its navigation on

   a) its sight:

   ........................................................................................................

   ........................................................................................................
b) the magnetic lines of force of the Earth:

In another ethological experiment the establishing of ranking (the so-called pecking order) in finches was studied. In the experiment, 4 male (♂) and 4 female (♀) individuals which had not met before were placed together. During their aggressive encounters the number of lost fights for each bird was recorded. The numbers in the table show how many times the individuals (marked from A to H in the top row) lost fights with the ones listed in the second column of the table:

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<th>sex</th>
<th>Symbol of individual</th>
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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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Answer the following questions by giving the appropriate number or letter:

5. How many times did individual ‘D’ lose fights while establishing the pecking order?

6. How many times did individual ‘E’ win while establishing the pecking order?

7. Of the females, which individual is at the top of the pecking order?

8. Which statements are correct according to the results of the experiment? (2 points)

A. None of the males lost fight with females during their aggressive encounters.
B. The males did not fight with the females.
C. The ranking of finches is monarchic (there is one top individual with no further ranking among the subordinates).
D. The ranking of finches is linear (‘A’ is dominant over ‘B’ and ‘B’ is dominant over ‘C’).
E. Ruling triangles are formed among finches (‘A’ pecks on ‘B’, ‘B’ pecks on ‘C’, but ‘C’ pecks on ‘A’).
IV. Vitamin C  

9 points

The following excerpt comes from an information leaflet attached to vitamin C tablets. After reading the text answer the following questions!

‘This medicine is available without prescription. In order to make use of its optimal effect it is crucial to be well informed about its proper administration. Approximately 4% of the 1.5 grams of vitamin C (ascorbic acid) stored in the body is lost each day. A diet rich in vitamins would ensure an adequate supply to replace the lost amount.

Vitamin C is recommended:
- to prevent or treat vitamin C deficiency
- in methemoglobin state (a certain type of disorder of the red blood cells)
- for increased vitamin C demand during pregnancy, while breastfeeding, while taking contraceptive pills, in iron deficiency, after surgical operation, at old age, for smokers and alcoholics.

It is not recommended for expecting mothers to take vitamin C in doses greatly exceeding the requirements of the body. On the one hand it can directly damage the foetus. On the other hand, if the foetus gets used to high doses of vitamin C, later in life he might suffer from vitamin C deficiency in spite of taking normal amounts of vitamin C.

Dosage: the daily average requirement of an adult is 100-500 mg which can exceptionally (infections, after operations) be raised to 1000 mg.’

1. Which one is true for vitamin C? (2 points)

A. It is a fat soluble vitamin.
B. Its deficiency leads to methemoglobin state
C. It can pass the placenta.
D. Certain living organisms can manufacture it.
E. The human organism can manufacture it.

2. What is the average amount of vitamin C being lost from the body’s reserves?

A. 4 mg
B. 1.5 g
C. 60 mg
D. 100–500 mg
E. 0.04 g

‘What is your opinion about the following statement? ‘The information is bound to be wrong because the figures provided as the daily average loss of vitamin C from the body's own reserves are not equal to the figures of its daily average requirement.’

3. Is it certain that the information is wrong due to the reason mentioned? Give your reason to support your answer.

..............................................................................................................................................................................................................................................................................................................................................
4. What would be your recommended daily dose of vitamin C for an expecting mother?

A. 60 mg  
B. 100 mg  
C. 600 mg  
D. 1000 mg  
E. 1500 mg  

5. Give your reasons to support your answer to question No 4. (2 points)

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In winter time potato is an important source of vitamin C for many people. The vitamin C content of fresh and raw potato can be as high as 30 mg % and it breaks down slowly during the winter with 30 % of the original content being lost until January, 50 % until April and 60 % until June. Under normal cooking conditions 40 % of the vitamin C supply remains in the food, 40 % of it is dissolved and only 20 % is broken down. (mg %: the vitamin C content in mg of 100 g potato)

6. Work out how many grams of cooked potato meet the vitamin C requirement of 100 mg/day of an adult in January. Let us suppose that the water used for cooking the potato was also made use of (e.g. to make a soup) and therefore the dissolved amount of vitamin was not wasted either. Record your calculations. (2 points)
V. Cell division

The different stages of a type of cell division are shown in the figure. The figures are not in chronological order. The number of cells produced as a result of the cell division is not shown either (only one of the cells produced is shown). Considering all this, study the series of figures and answer the questions!

1. What type of cell division is shown in the series of figures?

2. Put the letters of the different stages into chronological order. (2 points)

3. What kind of cells can be produced by the type of cell division shown in the figures? Write the appropriate letters into the empty boxes. (2 points)

A. Human sperm cells.
B. The spores of certain fungi.
C. The egg cells of angiosperms.
D. Human epithelial cells
E. Bacteria.

This is a schematic drawing and does not show every chromosome.

4. How many chromosomes are missing from figure ‘A’ if it is supposed to be a human cell?

.......... pieces
5. Which statement is true for stage ‘C’ in the figure? (2 points)

A. It shows a diploid cell.
B. It is at this stage that crossing over can take place.
C. At this stage it is possible to find alleles originating from both the father and mother (both paternal and maternal alleles).
D. It is possible that the chromosomes shown are only of paternal origin.
E. The cell is in a resting stage (interphase).

6. Which statement is true for stage ‘D’ in the series of figures? (2 points)

A. The chromosomes shown consist of two chromatides.
B. Spindle fibres are attached to the centromere of the chromosomes.
C. We can see the nucleus with 4 chromosomes in it.
D. The crossing over of chromosomes is shown.
E. The parting/segregation of chromatides is shown.

7. What might be the genotype of cell ‘F’, if the genotype of cell ‘E’ is DdEe and the two genes are independent? The point can only be given if all the possible genotype combinations are listed.

8. What might be the genotype of cell ‘F’, if the genotype of cell ‘E’ is Aa? The point can only be given if all the possible genotype combinations are listed.

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VI. Excretion  

A part of the human excretory organ system is shown in the Figure. Letter ‘C’ and ‘E’ indicate different body fluids.

1. Which structures can be seen in the Figure. Write the letter of the correct structures into the boxes. (2 points)

A. The beginning of the urethra.  
B. A Malpighian body.  
C. Part of the blood vessels of the kidney  
D. The collecting duct.  
E. Part of the ureter.

2. Give the name of the part indicated by letter ‘B’. ...........................................................

3. Which substance can be found in the fluid indicated by ‘E’ in a healthy person (on the spot indicated by the arrow)? (2 points)

A. Starch.  
B. Glucose.  
C. Proteins with a molecular weight higher than that of haemoglobin.  
D. Urea.  
E. Haemoglobin.

4. Decide how the pairs of statements relate to one another. Write the signs ‘<’, or ‘=’ or ‘>’ into the boxes as appropriate. The statements always refer to healthy individuals unless it is otherwise stated. (2 pont)

<table>
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<tr>
<th>The pressure found in the vessels indicated by letter ‘B’</th>
<th>The pressure found in the space indicated by letter ‘D’</th>
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<tr>
<td>The glucose concentration in the fluid indicated by ‘C’ in an untreated diabetic</td>
<td>The glucose concentration in the fluid indicated by ‘C’ in a healthy individual</td>
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VII. Regulation 7 points

Fill in the gaps marked by numbers with the matching expressions listed below. One expression can be used more than once.

reduced, does not change, increased, ADH/vasopressine, parathyroid gland, adrenal medulla, adrenal cortex, hypothalamus, aldosterone, adrenalin, active, passive

If the intake of sodium chloride is less than the required amount, the (1)................. reabsorption of sodium ions is (2).................. along the distal part of the renal tubules. This effect is achieved by an (3).................. production of the hormone involved in the regulation of salt levels in the body. The site of production of this hormone regulating salt levels is the (4)............... Following an increased water intake, the production of the hormone called (5).................. secreted by the (6).................. is (7).................. and, as a result, the amount of urine is increased.

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VIII. Blood groups

The first blood group system to be discovered by Karl Landsteiner was the AB0 blood group system.

1. Where are the antigens of the AB0 blood group system found? Write the letter of the correct answer into the box!

A) On the surface of the red blood cells
B) In the cytoplasm of the red blood cells
C) In the blood plasma
D) In the plasma cells
E) Attached to haemoglobin.

2. Where can the anti A antibodies be found in the blood of a person with blood group AB?

A) On the surface of the red blood cells
B) In the cytoplasm of the red blood cells
C) In the blood plasma
D) In the plasma cells
E) In none of the above.

By more sophisticated methods it could be shown that the ‘A’ blood group system is not uniform but can be divided into A1, A2 and A3 subgroups. Earlier the differences between the subgroups were not recognised because immunologically they do not differ. It means that the immune system of a person with blood group A1 does not regard the antigens of A2 and A3 blood groups as foreign.

The inheritance of the subgroups can be studied in the following family tree:
3. Determine the relationship between the alleles (I\textsuperscript{A1}, I\textsuperscript{A2}, I\textsuperscript{A3}, I\textsuperscript{B}, i) coding for the blood group. Write one of the following signs into the boxes between the alleles as appropriate: (4 points)

- Total dominance (with the open end towards the dominant allele): >
- Co-dominance: =
- Intermediate relationship: ~

IA1 □ □ IA2 □ IA3 □ IB □ i

In the followings, when referring to a particular person in the family tree, in your answer use the appropriate combination of his/her generation (I-III) and his/her serial number (1,2,3,…). (E.g. the person No3 in the first generation would be: I/3)

4. On the basis of which person’s genotype and phenotype can the relationship between allele I\textsuperscript{A1} and I\textsuperscript{A2} be determined? (2 points)

When referring to a genotype use the I\textsuperscript{A1}, I\textsuperscript{A2}, I\textsuperscript{A3}, I\textsuperscript{B} and i symbols!

It can be determined on the basis of person ………………, because his genotype is definitely ……………….., while his phenotype is ………………

5. Determine the types of blood groups and their probabilities which can be expected from the marriage of person III/1 and a person of blood group A\textsubscript{1}B. Show the inheritance of the blood groups by giving the genotypes of the parents and the offspring. (3 points)

6. A person of what blood group can donate blood to person III/1 if no blood of the same blood group (blood group A) is available?

……………………………………………………………………………………………

7. Blood serum is made from the blood of person II/1. Which of the followings can be found in the blood serum?

A. Anti A antibody
B. Anti B antibody
C. Anti A\textsubscript{1} and anti A\textsubscript{2} antibodies
D. Anti A\textsubscript{3} antibody
E. None of the above.

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IX. Optional tasks

A) Stomata  
Analysis of experiment

A simple experimental procedure is used to study the location and function of stomata. Geranium (a dicot land plant) is used as an experimental plant. It is kept in the dark for 2 days, after which two of its leaves are selected. One leaf is covered with wax on its upper side (leaf No1) while the other one on its lower side (leaf No2). The leaves are exposed to light for 2-3 hours. After removing them from the plant, the leaves are immersed in alcohol for their photosynthetic pigments to be dissolved from them so that the pigments do not disturb the subsequent investigation.

1. Name 2 pigments which are involved in photosynthesis and can be dissolved from the leaves by alcohol. (2 points)

2. The aim of the experiment is to determine which leaf has produced starch. In order to do so the leaves are placed in a solution containing a substance which gives a colour reaction with starch.

3. Which chemical substance gives a colour reaction with starch? Name this substance.

4. What kind of colour reaction is seen in the leaf containing starch?

5. Which leaf has shown the colour reaction indicating the presence of starch?
   A. Only leaf No1
   B. Only leaf No2
   C. Both leaves
   D. Neither of the leaves
   E. Both leaves but only on the side treated with wax.

6. What does the experiment prove?
   A. Stomata are involved in evaporation.
   B. Stomata are involved in taking up oxygen.
   C. Photosynthesis is a process requiring oxygen.
   D. Stomata are found on the upper side of the leaves in geranium.
   E. Stomata are found on the lower side of the leaves in geranium.

6. Give your reasons why it was necessary to keep the plants in the dark for 2 days at the beginning of the experiment to ensure the success of the experiment.

   …………………………………………………………………………………………………….
The structure and function of stomata  

Discuss the structure and function of stomata based on the following considerations:

- Name the cells making up the stomata, the type of tissue they belong to, and explain how these cells differ from the other cells of the same tissue.
- How can you explain the functioning of the stomata depending on the water content of the plant with special regard to the structural features of the cells making up the stomata.
- How do stomata respond to light and how can it be explained?

*Write your essay on page 18-19!*

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IX. Optional tasks

B) Vision  

Analysis of experiment  

The experimental setup of Pritchard, a Canadian researcher, is shown in the figure. A sharp image was projected by a miniature camera onto the spot of the retina where sharp image is formed in a healthy person. The camera was mounted on a contact lens which moved along with the cornea. However, the person could only see a blurred or partial image of the image projected.

1. Onto which spot of the retina the image was projected by Pritchard?

2. What is the unique feature of this spot on the retina?

3. What consequences can be drawn from the results of the experiment? (2 points)

A. In order to form a full sharp image it is essential that the eye ball scan the object with its minute movements.
B. If the image projected onto the retina is sharp there is no need for the orbital muscles to be involved to form a full, sharp image.
C. The total area of the retina is needed to form a full sharp image.
D. The eye lens has not been involved in forming an image in this experiment.
E. In this experiment the elimination of the effects of the orbital muscles led to the results obtained.
Conditions of vision 16 points

Discuss the most important conditions for sharp vision considering the following points:

- Light refractory media of the eye, the optical features of the image formed on the retina.
- The stimuli eliciting the pupil, the eyelid and the accommodation reflexes, the effector muscles of these reflexes and their roles in vision.
- The causes of glaucoma and its symptoms, the cause of old age farsightedness and its simplest correction.

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Marking teacher

Date: …………………………………..