Az írásbeli vizsga időtartama: 120 perc

NÉMZETI ERŐFORRÁS
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.

A    D  correct
A  B C  acceptable  B    D  wrong

When answering open-ended questions technical terms, short answers of 1-or-2 words, a sentence or several sentences should be created. Your answers on open-ended questions should be written on the dotted (……) lines. 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.

Photo: David Attenborough: The first Eden   BBC Books, 1987
I. Carbohydrates 10 points

Choose the letters of the correct answers (carbohydrates) and write them into the empty spaces directly after the numbers. Each correct answer: 1 point
- A. glucose
- B. starch
- C. glycogen
- D. cellulose

The major stored nutrient of plants, 1. ……………., is taken up by humans and during digestion it is broken down into 2. ……………. molecules. 3. …………….. in the bloodstream is partially oxidized by cells and the remaining part is converted into 4. ……………. by liver cells. By ingesting plant food, another polysaccharide, 5. ……………., also gets into the alimentary canal but it remains intact during digestion. Only some unicellular organisms and fungi are able to digest 6. ……………., which is not soluble in water. As it is digested, 7. ………….. units are formed from this molecule, too. The presence of 8. ……………. in food can be detected by Lugol’s solution (Iodine-Potassium Iodide). 9. …………….. of the plant cell wall does not show this reaction, and nor does 10. …………….., the main stored carbohydrate of animals.

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II. Protists (Unicellular eukaryotes) 10 points

Put the serial numbers of the characteristics typical of the given organism in the appropriate circle (or intersections of circles). (*Euglena = zöldszemös ostoros, Paramecium= papucsállatka)

1. false feet (pseudopods)
2. able to perform heterotrophic metabolism
3. micronucleus and macronucleus
4. more or less fixed shape of the cell
5. endocytosis at a given part of the cell membrane
6. chloroplast
7. greatly changeable shape
8. cilia
9. both animal-like and plant-like characteristics
10. able to perform autotrophic metabolism

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III. Plant tissues and organs 7 points

1. Which plant organ is represented on this figure? Write the letter of the correct answer into the empty box.

A. Herbaceous stem of a monocot plant
B. Herbaceous stem of a dicot plant
C. Root of a monocot plant
D. Root of a dicot plant
E. Woody stem of a dicot plant

2. Which characteristic (histological) feature helped you to recognise the organ shown on this figure?

………………………………………………………………………………………………

3. The position of which tissue component helped you to recognise whether this plant is a monocot or dicot?

- tissue component: ………………………………………………………………
- its position: ………………………………………………………………………

4. Which characteristics are typical of the plant’s leaf, whose organ is represented above? Write the letter of the correct answer into the empty box.

A. It has reticulate (netted) venation.
B. It has parallel venation.
C. It is bordered by epithelial tissue on the outside.
D. It contains photosynthesizing ground tissue (mesophyl).
E. It contains storage ground tissue (parenchyma) for the young, germinating plant.

In the following section, answer by writing the name of the appropriate part of the figure on the dotted line and write its’ letter into the empty box.

5. Its cells contain chloroplasts: ……………………………………………………

6. It is responsible for the thickening of the given organ: ………………………

7. We put the cut-end of a leafy shoot of the plant above into ink-dyed water. Name the tissue component, in which the movement of the dye can be observed.

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IV. Worm, mouse and cat  

6 points

In the last scene of “The Tragedy of Man”, Lucifer illustrates Adam’s position with the following ecological example.

“But you, as a man of science, will have seen
A host of curious things - recall that worm
Which lives only inside a cat or kestrel*,
But nonetheless must spend the earliest phase
Of its life-cycle inside a common mouse.
No particular mouse is singled out
To feel the cat’s claw, or the kestrel’s talon**,
One that is careful could avoid them both
And die at home, at a venerable age.
But there’s an iron law which so requires,
That there be mice enough to go around
That even the defenceless worm survives
And prospers after many thousand years.”

Imre Madách: The Tragedy of Man (Scene 15, excerpt)
– translation: George Szirtes

* kestrel = vércse, ** talon = karom

Important! Worm in its original context means a kind that lives in the intestines

On the basis of this Madách quotation, name the population interactions between the following living organisms.

1. worm – mouse: ............................................

2. kestrel – cat: ..................................................

3. kestrel – mouse: .............................................

4. worm – kestrel: ..............................................

5. “But there’s an iron law which so requires” – Madách wrote. What does this law apply to?

A. To the highest possible lifespan of mice
B. To the number of animal species captured by kestrels and cats
C. To that into which predator’s body the captured mouse will get
D. To the condition of the long-lasting coexistence of the four populations
E. To that which mice are captured by cats or kestrels

6. The behaviour of mice is partially inborn (determined by inherited factors). Name the process, during which the genetically inattentive individuals are more likely to be eaten by cats than those which are more cautious.

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V. Come home my little birds, come!  

Indigo buntings\(^*\) migrate from the eastern part of North America to the South and overwinter in Central America. As they return in spring, they fly almost 4000km again. An American ethologist, Emlen, investigated the orientation techniques of the migrating Indigo buntings. He put the animals in a planetarium\(^**\) during their migratory period. He recorded the number of birds sitting on seat-branches facing to the four points of the compass. Springtime, the Indigo buntings gathered on the north facing seat-branches, and this matched well the migratory direction of their free companions. He projected different constellations to the birds and he demonstrated that birds orientate mainly on the basis of Polaris (North Star). When he projected false constellation to the birds, they chose the southern direction in spring.

\(^*\)Indigo bunting = indigópinty,  \(^**\)planetarium = a dome-shaped building in which the starry sky can be projected

1. On what basis do Indigo Buntings orientate according to experiments?  

(1 point)

2. Does the Earth’s magnetic field play an important role in their orientation? Explain your answer.  

(2 points)

The researcher wanted to know whether this method of orientation in Indigo buntings is inherited or learned. He captured young birds and raised them under different conditions. Some of them could observe the open sky, while others were kept in artificial lighting. He experienced that only those individuals were able to use the star-compass, who had seen the starry sky between the 4\(^{th}\) and 10\(^{th}\) days of their life. Others were flying at random directions in the migratory period. If other constellations were shown to the nestlings in this period, they tried to orientate on the basis of those ones.

Orientation of White storks has also been investigated. There are two populations of this species in Europe. Eastern storks fly round the Mediterranean Sea from the east at Bosporus, while the western storks cross Gibraltar as they migrate to the wintering area. When young, inexperienced storks were transported from Eastern Europe to the west or from Western Europe to the east, they started their autumn migration in the direction in accordance with their birthplace.
3. Direction of migratory routes is not learned in storks. What can you draw this conclusion from?  

4. Name that specific type of learning that Indigo buntings used in learning how to orientate on the basis of Polaris (North Star).  

5. From which fact could the researcher conclude that the type of learning named in the previous question had formed the orientation ability of Indigo buntings?  

 VI. Pimples  

The figure attached shows the structure of the skin with a pimple (acne).  

Write the letters of the appropriate structures after the definitions.  

6. Explain why there are no pimples (acne) on body surfaces such as the palm or the sole.  

Letter of the correct answer should be written into the empty box.
7. It is suggested that slightly acidic liquids should be used for cleansing the skin of the face. Explain why it is so. (1 point)

A. The acidic solutions neutralize the natural alkaline pH of the face.
B. The slightly acidic solutions peel the pimples off.
C. The surface of the skin is also slightly acidic due to the secretions of sweat glands and sebaceous glands.
D. The slightly acidic cleansers form beneficial salts with the materials of the sweat.
E. The acidic solution dries the skin more.

8. Explain why it is not advisable to squeeze acne skin at home. (2 points)

A. Because the pus can be forced into the deeper layers of the skin with this method.
B. Because the acne may turn into wart* during squeezing.
C. Because the pore may get infected by the entering microbes.
D. Because squeezing may damage our pressure receptors.

VII. Secretion and excretion 10 points

Compare human secretory and excretory functions on the examples of pancreas and kidney.

Letters for the correct answers should be written in the empty boxes.

Every correct answer: 1 point

A. Insulin-production of the pancreas
B. Excretory function of the kidney
C. Both of them
D. None of them

1. Hormone is released into the bloodstream in this process.
2. Enzymes are released into the digestive canal in this process.
3. Enzymes are released into the urine in this process.
4. It plays a role in maintaining homeostasis.
5. This life-process requires energy.
6. It takes part in the removal of excess materials of our body.
7. This process reduces blood glucose level in a healthy person.
8. It is regulated by the hormone produced by another organ.
9. The final product of this process is the filtrate.
10. Increasing blood sugar level inhibits this process.
VIII. Risks of hypertension

12 points

Read the following text carefully and answer the questions.

“According to international surveys, patients, whose systolic (maximum) blood pressure can be kept within the standard range are 4 or 5 times less likely to have a stroke and 10 times less likely to have kidney failures than those patients, whose systolic blood pressure exceeds the normal value.

Reducing blood pressure by 1 Hgmm decreases the chance of death caused by cardiovascular diseases by 1.5 percent on average. Hypertonia is more common in males under the age of 50. It becomes equally frequent in both sexes between 55-64 years of age and after that age range females are more endangered.

The relative incidence of hypertension also depends on the degree of obesity. This value is 24% in people with normal body-weight, 48% in overweight people and 55% in obese persons.”

* hypertonia = hypertension, high blood pressure, ** cardiovascular = szív- és érrendszeri

Unrecognized patients. Magyar Hírlap, 09/05/2006

1. On the basis of this text, compare the statistical risk of the formation of the given disease between the persons listed in pairs. Answer by using the symbols “<” or “>”. Write “=” if the risk is equal and “0” if the degree of risk cannot be stated on the basis of the text. Put the symbols into the empty boxes. (4 points)

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<td>The risk of hypertension in obese, 60 years old females</td>
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<td>The risk of kidney failures in adults with blood pressure permanently around 160/100 Hgmm</td>
<td>The risk of kidney failures in adults with blood pressure permanently around 120/80 Hgmm</td>
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<td>The risk of kidney failures in adults with blood pressure permanently around 120/80 Hgmm</td>
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2. In which phase of the cardiac cycle can systolic blood pressure be measured? Letters for the correct answers should be written in the empty boxes. (2 points)

A. During the contraction of atria.
B. During the contraction of ventricles.
C. After the closure of the flapped (atrioventricular) valves.
D. After the closure of the pocket (semilunar) valves.
E. After the opening of the flapped (atrioventricular) valves.
3. Which of the following effects raises the blood pressure? (2 points)

A. In case of stress
B. Dilation of blood vessels
C. Increasing parasympathetic effect of the nervous system
D. Atherosclerosis (hardening of the arteries)
E. Dilation of pupils

4. Name at least two typical symptoms that occur during a stroke. (2 points)

________________________________________________________________________
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5. Give advices about healthy lifestyle to a female office worker, who wants to avoid the development of hypertension. Give at least two different suggestions, one about her diet and another about her future lifestyle. (2 points)

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IX. Blood groups  

In a family, three children were born out of the marriage of Kázmér and Edit: Ottó, Aladár and Helga. Ottó married Zsuzsa and a son was born, Peter. Helga became the wife of János, their child is Magda. The pedigree (family tree) is shown on this figure and you can see the phenotypes of the family members next to it.

1. Name the relations of alleles (gene variations) responsible for the formation of AB0 and Rh blood group systems. Write your answer on the dotted lines. (2 points)

AB0

Rh

2. Give the genotypes of the persons listed in the table. Use the symbols: I^A, I^B, i and R, r. (3 points)

3. Considering both AB0 and Rh systems, give the possible blood groups of children born out of the marriage of Zsuzsa and Ottó. Write your answer on the dotted line. (Do not consider the chance of mutation!) (3 points)

4. According to the basic rules of blood transfusion, a patient can only be given the same blood group he or she has. In case of emergency other possible solutions are allowed, too. Is it permitted for Edit to give blood to her son, Otto, in extreme necessity? Give the reasons of your answer. (2 points)

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<td>B Rh^-</td>
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<td>Zsuzsa</td>
<td>B Rh^-</td>
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<td>Aladár</td>
<td>A Rh^+</td>
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<td>Helga</td>
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<td>0 Rh^-</td>
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<td>IX. Blood groups</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>80</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Score for the written exam \((\text{achieved score} \cdot 1.25)\) \[80 \cdot 1.25 = 100\]

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Correcting teacher

Date: ………………………………

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Assignments / Feladatsor (Score for the written exam / az írásbeli vizsgarész pontszáma) rounded up points to write in the software / programa beírt egész pontszám

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Correcting teacher / javító tanár

Registrar of the Board of Examiners / jegyző

Date/Dátum: ………………………………

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Irásbeli vizsga 0811 12 / 12 2011. május 11.