Az írásbeli vizsga időtartama: 120 perc
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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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. Ants

1. Two different ant species are shown on this picture. Even though their appearance is dissimilar, both of them belong to the group (class) of Insects. From what can you draw this conclusion? Name at least one characteristic of the ant seen on the left-hand side, that proves this. (1 point)

2. Chitin covering the integumentum of Insects is not merely for protection. What role does it play in their locomotion? (1 point)

3. What does an ant perceive with its antennae? (What stimuli can the receptors located in their antennae detect?) (1 point)

4. Ants are able to see, but their vision is not as good as that of the horse fly. The electromicrograph illustrates a detail of the horse fly’s eye. State the major difference between the structure of the insect eye and the human eye in one sentence. (1 point)

Ants play a diverse and important role in the life of ecosystems. For example the Red (Southern) Wood Ant kills most caterpillars. Ants are the favourite food of the birds Green Woodpecker* and Wryneck**. Many ant species grow fungi on chewed leaves in their anthill and they eat the hyphae. Other species guard and protect aphids*** in exchange for the sweet secretions produced by them. (*= zöld küllő **= nyaktekercs ***= levéltetvek)

On the basis of this text, determine the type of ecological interaction between the following living organisms (Each correct answer is awarded 1 point) (4 points)


6. fungus-growing ants – grown fungus species: ………………………………………..

7. aphids – ants: …………………………………………………………………………..

8. leafy trees – aphids on trees: ………………………………………………………..
II. From flower to flower  

1. Letters on the figure indicate different parts of an Angiosperm flower. Choose the four appropriate terms out of the following ones and write them in the empty boxes marked with letters.  

SEPAL, ANther, OVARY, FILAMENT, STIGMA, PETAL  

![Diagram of an Angiosperm flower with labeled parts A, B, C, and D.]

2. What is the collective term for A and C together?  

3. Figures "E" and "F" show two plant species belonging to two different groups (classes) of plants. Which two groups are these? Give reasons for your answer by describing two typical characteristics of the given groups that are visible on the figures.  

Species "E":  

Species "F":  

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III. Groups of living organisms

Study the set figure above and put the numbers of the listed (printed in bold type letters) organisms in the appropriate circles. **Warning! One number can be put only in one place. (No points for numbers written in more than one place.) Every correctly placed number is awarded 1 point.**

1. The **Colorado Potato Beetle** has spread all over the world from the State of Colorado, United States. The imago (adult) can be easily recognized by its stripes on the hardened outer wings. Both the imago and its larva eat the leaves of plants belonging to the Potato family. (*= burgonybogár)
2. Blood-sucking **ticks** grab the skin of their victims with their eight legs. Although they have been always present in our forests, nowadays their number increased greatly in many mountains.
3. A **bacterium** living in the body of the tick causes Lyme disease if it gets into humans. It has been always found in Hungary.
4. **Ragweed** has come from North America to Europe. Its pollen is an allergen. (*=parlagfű)
5. In the days of the Crusades, a **bacterium causing plague** was spread by plague fleas that came to Europe (including medieval Hungary) from Asia as a parasite of the common rat.
6. The **Peregrine falcon** is a widespread bird of prey on Earth. It also occurs in Hungary, but it is rare. (*= vándorsólyom)
7. The **Common juniper** had lived in the Carpathian Basin before the Hungarian conquest and it became widespread as a result of pasturing for example in the Kiskunság. (*= közönséges boróka)
8. The **Malaria mosquito** is a Diptera (two-winged insect) native to the Carpathian Basin as well. Its bite still spreads malaria’s pathogen in tropical countries.
9. In Hungarian forests, we often meet the native **Common burying beetle** as they bury carcasses of a vole or a mouse into the ground. Their larvae develop in these decaying organisms. (*= temetőbogár)

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**Parasites**
**Arthropods**
**Insects**
**Parasites**
**Living organisms**
IV. In the depths of our lakes

You can see a simplified food web of a lake in this figure. Arrows indicate the direction of food flow. The term „zooplankton” means tiny floating animals (mainly eukaryotic unicellular organisms), while ”phytoplankton” refers to floating plants or unicellular eukaryotes with the ability to photosynthesize.

After studying the figure, answer the following questions.

English names of species represented on this figure:
- Szürke gém = Grey Heron
- Csuka = Pike
- Sügér = Perch
- Béka = Frog
- Ponty = Carp
- Réce = Duck
- Csíbor = Great Silver Water Beetle
- Tüskés pikó = Stickleback Fish
- Rovarlárvák = Insect larvae
- Puhatestűek = Mollusks
- Rákok = Crustaceans
- Vízinövények = Aquatic plants
- Zooplankton = Zooplankton
- Gyűrűsférgek = Segmented worms (Annelids)
- Fitoplankton = Phytoplankton
- Törmelék = Debris

1. Which organisms on this figure are top predators? (1 point)
   …………………………………..          and           …………………………………..

2. Which organisms on this figure are producers? (1 point)
   ………………………………….. and  …………………………………………….

3. On the basis of the figure, name two organisms (groups of organisms) that are (entirely or partially) decomposers. (1 point)
   ………………………………….. and  ……………………………………………

4. On the basis of the figure, name two organisms (groups of organisms) that are primary consumers at least partially. (1 point)
   …………………………………..    and  ……………………………………………

5. Which creatures on this figure are omnivores? (1 point)
   …………………………………..  and  …………………………………………
6. Is there a predator Arthropod on the figure? Which one? (1 point)

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V. Viruses 9 points

New mutation of bird influenza can be alarming
„Changes in the genetic material of H5N1 may enable the virus to bind to the receptors of human nose and throat.
Scientists have analysed the genetic material of viruses that caused two death cases in Turkey this January and found a new mutation in one of these viruses. According to experts, this change can enable H5N1 virus line to infect humans rather than animals, and to attack the area of nose and throat instead of lungs. Both new abilities may increase the chance of spreading among human beings. For a pandemic (worldwide epidemic), much more mutations should appear in the genetic material of the virus – scientists believe.”

Source: http://www.origoegeszseg.hu/cikk/0540/001676/madarinfluenzadosszi_1.php

On the grounds of this text and your former studies, answer the following questions.

1. Which molecules are viruses made of? (2 points)

2. The steps of viral infection are listed below. Put the steps in the correct sequence. Write the numbers of correct sequence in the empty boxes. (1 point)

1. Viruses bind to the receptors of the host cell.  
The virus injects its genetic material into the cell of the host organism.  
The host cell dies and viruses are set free.  
They dissolve the cell membrane/cell wall with enzymes.  
Making use of its materials, the host cell produces viruses.

3. Which of the listed phenomena are mutations? Write the letters of the correct answers in the empty boxes. (1 point)

A. A structural change of genes.  
B. A long-lasting, non-inheritable change in the phenotype of individuals.  
C. A permanent structural change of chromosomes.  
D. A change in the base sequence of the DNA molecule.  
E. A change in the lipid molecules of the cell.

4. On the grounds of research results, why are H5N1 mutations dangerous to humans? (1 point)


5. Distinguish an infection from an epidemic. Define both terms and give one example for each term. (4 points)

VI. Life of the cell

The figure illustrates the general structure of a cell. Study the figure and decide whether the following statements are true (T) or false (F). Write the appropriate letter in the empty box after the statement. (3 points)

1. The figure represents an eukaryotic cell.
2. The figure represents a plant cell.
3. Ribosomes can be observed in the cell shown in this figure.

4. Name cell parts indicated by letters from A to C. (3 points)

A: ......................................... B: ................................................. C: ………………………

The cell represented above produces large amounts of proteins, which are released into the surroundings. The following questions refer to the production of these proteins. Put the letter of the appropriate cell part(s) in the empty box(es). (3 points)

5. Site for DNA → mRNA transcription
6. The ready-made mRNA moves across the pores of this cell part
7. Site for the production of ATP required for protein synthesis

1. 2. 3. 4. 5. 6. 7. total
**VII. Cellular (solid) components of human blood**

Put the letter of the appropriate blood component in the third empty column of the table.

A. Red blood cells/corpuscles  
B. White blood cells  
C. Platelets  
D. All of them  
E. None of them

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<td>1.</td>
<td>Red cells without nucleus.</td>
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<td>2.</td>
<td>They are made in the red bone marrow.</td>
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<td>3.</td>
<td>Abnormal decrease in their number may result in anaemia.</td>
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<td>4.</td>
<td>Enzymes released from them play an important role in launching blood-clotting.</td>
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<td>5.</td>
<td>Phagocyte is one type of them.</td>
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<td>6.</td>
<td>Antigens of their plasma membrane are significant in blood group determination.</td>
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<td>7.</td>
<td>They transport respiratory gases.</td>
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<td>8.</td>
<td>Growth in their number suggests inflammatory disease.</td>
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<td>9.</td>
<td>Copper-containing blood pigment gives their colour.</td>
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VIII. Expiration, inspiration

The figure shows the positions of a human rib during calm expiration and inspiration. (The marked two positions indicate the intermediate state of expiration/inspiration.) The arrow indicates the direction of turning. Study the figure and answer the questions. Each correct answer is awarded 1 point.

1. Which group of vertebrae does vertebra "A" belong to?

2. The rib is connected to a bone (not illustrated on this figure) at site "B". Name this bone.

3. What sort of joint makes the slight relative movements between the ribs and the bone they are attached to at site "B" possible?

4. In which of the two positions shown on the figure is the pressure lower inside the thorax (ribs/cage)?

5. Changing the position of ribs is only one of the ventilation movements. Which other muscle takes part in changing the thoracic volume during calm breathing? Name the most important one.

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Evoking learned helplessness in rats
Two rats were placed in two separate parts of a cage divided by a wall. The floor was connected to an electric circuit and occasionally unpleasant electric shock hit the animals. The rat in the left part could prevent the shock by pressing a lever at the appropriate time, so this rat could learn how to control the process. Although both animals were hit by the same number of shocks, there were no essential changes found in the body of the animal, that had learned to control the process. On the other hand, the animal condemned to helplessness has lost initiative ability, showed all the symptoms of long-lasting stress and typical changes in its brain were found after its dissection.

Evaluate the result of the following experiment.

1. A lamp flashed 5 seconds before each electric shock in the left cage. If the rat pressed the lever immediately, there was no shock. What sort of learning did the rat use to attain the effective behaviour? (1 point)

2. Name the hormone released in great quantity as a result of a short-term, harmful stimulus (stress). Name the organ and the particular area where this hormone is produced. (2 points)
   - Gland: .................................................................
   - Hormone: .............................................................

3. How does short-term stress affect blood pressure, blood sugar level and the activity of the animal (human)? (3 points)
   - Blood pressure: ..................................................
   - Blood sugar level: ................................................
   - Activity: .............................................................
4. Compare the two animals of the experiment and formulate what caused real (long-term) stress for the rat located in the right box. (1 point)

5. Although every other condition is identical, animals exposed to long-term stress fall ill and die more rapidly than their luckier companions. What conclusion can be drawn from this fact concerning the relationship between the neuro-hormonal system and the immune system? (1 point)

The behavioural effect of long-term and unavoidable stress is known as learned helplessness. Its characteristics can be compared with the symptoms of human depression very well.

**Comparison of learned helplessness (animals) and depression (human)**

<table>
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<tr>
<th></th>
<th>learned helplessness (animals)</th>
<th>depression (human)</th>
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<tbody>
<tr>
<td>Typical behaviour</td>
<td>Passivity</td>
<td>Passivity</td>
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<tr>
<td>Learning skill</td>
<td>Small</td>
<td>He believes it senseless</td>
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<td>Agressiveness</td>
<td>It has ceased.</td>
<td>It is often directed against himself</td>
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<td>Nutrition</td>
<td>Weight-loss, lack of appetite</td>
<td>Lack of appetite</td>
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</tbody>
</table>

6. After studying the table, formulate one typical difference between the behavioural effects of short-term stress and that of long-term, unavoidable stress. (1 point)
X. Bases of inheritance 8 points

Read the following text carefully. Choose the appropriate terms and write them into the empty spaces directly after the numbers. There is no need to use all the terms and the same term can be used for more than once. Each correct answer: 1 point

<table>
<thead>
<tr>
<th>HOMOZYGOUS</th>
<th>HOMOLOGOUS</th>
<th>INCOMPLETE DOMINANCE</th>
<th>AB</th>
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<td>HETEROZYGOUS</td>
<td>ANALOGOUS</td>
<td>LINKED</td>
<td>IDENTICAL</td>
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<td>HAPLOID</td>
<td>CODOMINANT</td>
<td>INDEPENDENT</td>
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<td>DIPLOID</td>
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Somatic cells of the human body are (1) ......................................... cells, therefore every autosome has its (2) ................................. chromosome pair identical in size and shape. In a (3)......................... genotype, (4)......................... alleles of a given gene can be found on members of this chromosome pair, such as the case with the blood-group genes of a person with blood-group AB. The relationship of alleles performing blood-group AB is (5) ........................ .. , because the effects of both alleles are apparent in phenotype.

In a family, where only babies with blood-group AB can be born, both parents have (6)......................... genotypes, but their phenotypes are (7)......................... .

AB0 and Rhesus blood-group systems are not located on the same chromosome, therefore their inheritance is (8)................................. .

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<td>I. Ants</td>
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<td>V. Viruses</td>
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<td>VII. Cellular (solid) components of human blood</td>
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Score for the written exam (achieved score · 1.25)

Correcting teacher

Date: ...........................................

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

Correcting teacher/ javító tanár

Registrar of the Board of Examiners / jegyző

Date/ Dátum: ...................................