

ÉRETTSÉGI VIZSGA • 2021. október 27.

**BIOLÓGIA
ANGOL NYELVEN**

**EMELT SZINTŰ
ÍRÁSBELI VIZSGA**

**JAVÍTÁSI-ÉRTÉKELÉSI
ÚTMUTATÓ**

EMBERI ERŐFORRÁSOK MINISZTERIUMA

Instructions for marking the written paper

1. Always use **red ink**.
2. Put a tick next to each correct answer. Each correct **tick is worth one point**. Half a point is not to be given. If a question which is worth two points is answered correctly, put two ticks.
3. If there is a correct answer to a question which is not included in the marking scheme you can still accept it. The same principle applies to synonyms. (e. g.: *platelets* — *thrombocytes*)
4. The equally acceptable, alternative answers are separated with a **backslash (/)** in the marking scheme.
5. At the end of each task **add up the points** in the grey boxes.
6. At the end of the examination paper fill in the **summary table** by giving the achieved score of each task and by adding them up calculate the total score.
7. **Mark each correct answer with a tick** on the margin in the optional essay. In the marking scheme only the most important terms and expressions are included in the correct logical order. You can also accept the answers if they are logically built up even if this logic is different from the one given in the marking scheme, unless it is otherwise stated in the given task. In the end, please add up the points of the correct answers and write them into the appropriate boxes of the summary chart.
In the essay, points can only be given for answers responding to the guiding questions.
8. If the candidate started answering both optional tasks (A and B) act according to the instructions given under the heading of 'Important Information'.
9. If the candidate is expected to **formulate an answer in full sentences** (e.g. reasoning and explanations) only grammatically correct sentences can be accepted. **Do not subtract points for spelling mistakes but do not accept ambiguous sentences and contradictory answers!**

Good luck for your work!

I. Meiosis in plants

11 points

The task is based on the following chapter of the detailed curriculum: 6.2.

Source of figure: https://www.researchgate.net/figure/Schematic-of-Arabidopsis-thaliana-nectarium-Arabidopsis-flowers-have-four-nectaries-that_fig1_26672832

1. Chromosomes consisting of two chromatids / double chromatid chromosomes move towards the opposite poles of the cell / homologous pairs part company. 1 point
(Alternative wording is also acceptable.)
2. D 1 point
3. 10 1 point
4. 5 1 point
5. B and C 1+1 = 2 points
6. E 1 point
7. Crossing over / the exchange of certain stretches of homologous chromosomes / exchange of genes / exchange of alleles / recombination 1 point
Independent assortment/segregation / combination of homologous chromosomes 1 point
(The order of the two answers is optional.)
8. $2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$ 1 point
9. B 1 point

II. A peculiar lizard

12 points

The task is based on the following chapters of the detailed curriculum: 2.1.6., 3.1.1., 3.4.2., 4.4.5., 5.4.1. and 5.1.1.

National Geographic 2015. szeptember 8. Színt valló kaméleon című cikk felhasználásával készült.

Figure: <https://matramuzeum.nhmus.hu/hu/virtualis-muzeum/termeszettudomany/zonazoo/sisakos-kameleon>

1. reptiles
it can be recognised by the scaly skin (covering the entire body) 1 point
2. Their alimentary canal has **two** openings and can be divided into **three** parts. They hunt by shooting out their tongue in a flash. Their closed circulatory system consists of **two** circuits and a **four**-chambered heart. The partition between the ventricles is incomplete.
Each correct answer is 1 point, a total of 4 points
3. C and E 1+1 = 2 points
4. D 1 point
5. cold-blooded / ectotherm(ic) 1 point
6. (vitamin) D 1 point
7. calcium / Ca / Ca²⁺ 1 point
8. D 1 point

III. Deadwood

12 points

The task is based on the following chapters of the detailed curriculum: 2.1.4.; 2.3. 5.1.1 és 5.4.1.

Source of text: :

DINPI_Tanulmánykötet_Az_erdogazdalkodas_hatasa_az_erdok_biologiai_sokfelesegere_2016május.pdf

1. cellulose 1 point
2. B, D 1+1 = 2 points
3. B, D 1+1 = 2 points
4. The rate of decomposition increases since the surface area of the organic matter increases. /The fungal hyphae can spread more easily. / The decomposing organisms can get more oxygen. 1 point

5. The decaying trees provide shelter/home for many different decomposing species (and for their consumers). /
The deadwood is not removed. *Alternative wording is also acceptable.* 1 point
6. A 1 point
7. B 1 point
8. D 1 point
9. C 1 point
10. E 1 point

IV. Our ancestors

8 points

The task is based on the following chapters of the detailed curriculum: 6.3.1., 6.3.2. and 6.4.2.

Source of figures:

https://commons.wikimedia.org/wiki/File:Peninj_mandible._Paranthropus_boisei.jpg,

<http://www.matud.iif.hu/2011/08/03.htm>

1. Fossilised / mineralised remains of animals or plants 1 point
2. Herbivore / consumed plants as well / omnivore, because the massive mandible allowed larger muscle to attach to it / served as an insertion site for larger muscle / underdeveloped canines / larger molars 1 point
3. D 1 point
4. No it is not possible because it is too old / fossilised / there is no organic matter / DNA left in it./ It would only be possible if organic matter had remained in it. 1 point
5. The position of the foramen magnum. 1 point
6. E 1 point
7. The more time elapsed since the divergence of the two species took place, the larger the genetic difference / the higher the number of mutations which occurred in their shared genome. 1 point
The method: the comparison of the (homologous) DNA stretches of the species under study. 1 point
Alternative wording is also acceptable.

V. Digestion of protein

12 points

The task is based on the following chapter of the detailed curriculum: 4.4.2.

Source of figure: original

1. Control experiment: water + acid/alkali + protein 1 point
Reasoning: it proves that it is not the acid/alkali that digest the egg white. 1 point
2. The temperature of the solution / the concentration of the pepsin / concentration of the substrate / the size of the egg white / *Other correct answers are also acceptable.* 1+1 = 2 points
3. D 1 point
- 4.

The name of the protein digesting enzyme acting in the duodenum.	trypsin
The site of secretion of the enzyme.	pancreas
The optimal pH value for the working of the enzyme.	pH 8 / slightly alkali

Each correct answer is 1 point, a total of:

3 points

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5. Name of part 'A': (micro)villi 1 point
 Function of part 'A': they increase the rate of absorption by increasing the absorptive surface / it is here that the channels / transport proteins responsible for absorption are found. 1 point
6. Name of part 'B': mitochondrion 1 point
 Function of part 'B': To provide energy / ATP for absorption / to satisfy the energy / ATP requirement of the active transport. 1 point

VI. Investigation in sports physiology 7 points

The task is based on the following chapters of the detailed curriculum: 4.2.3.; 4.8.1.; 4.8.3.; 4.8.4.; 4.8.5.; 6.1.2.

1. $70 \cdot 72 = 5040 \text{ cm}^3 = \mathbf{5.04 \text{ dm}^3}$ 1 point
2. From 1 dm^3 blood: 50 cm^3
 From 5.04 dm^3 blood: $50 \text{ cm}^3 \cdot 5.04 = \mathbf{252 \text{ cm}^3 \text{ (ml)O}_2}$ 1 point
If the examinee arrived at a wrong result in the previous question and carried on working with the wrong number according to sound logic the point can be given.
3. pulse rate: $72 \cdot 2.1 = 151.2 / \text{minute}$
 $100 \cdot 151.2 = 15120 \text{ cm}^3 \text{ (ml)} \rightarrow \mathbf{15.12 \text{ dm}^3}$ 1 point
If the examinee worked out the pulse rate incorrectly but carried on working with the wrong number according to sound logic the point can be given.
4. From 1 dm^3 blood: 100 cm^3
 From 15.12 dm^3 blood: $100 \cdot 15.12 = 1512 \text{ cm}^3 \text{ (ml)}$.
 $1512/252 = 6.0 \rightarrow \mathbf{\text{It increases by six times.}}$ 1 point
If the examinee carried on working with the wrong numbers deriving from the previous question but according to sound logic the point can be given.
5. B 1 point
6. Because of the increased levels of carbon dioxide / carbonic acid, and 1 point
 the increased levels of lactic acid. 1 point

VII. Hereditary muscle weakness 12 points

The task is based on the following chapters of the detailed curriculum: 2.3.4, 4.8.1, 6.1.1, 6.1.2, 6.2.1. and 6.3.4
The excerpt of the task is the altered version of the original (shortened, simplified grammar) but the integrity of the original text was preserved

Sources::article/cikk: <https://gendiagnosztika.hu/oroklodo-periferias-neuropatiak-genetikai-vizsgalata/family-tree/csaladfa>: <https://www.nejm.org/doi/full/10.1056/NEJM199307083290205>

1. C 1 point
2. B 1 point
3. The diameter / thickness of the nerve fibre: The larger the diameter, the faster the nerve impulse conduction. 1 point
 The presence of myelin sheath: the presence of myelin sheath makes the nerve impulse conduction faster. 1 point
4. Ulna 1 point
5. The myelin sheath might be absent / thinner in the case of diseased people, therefore the speed of nerve impulse conduction is lower than in healthy people. (*Specifically referring to letters and contrasting them is also acceptable.*)
 Also possible: the fibre diameter might be smaller in those suffering from the disease than in the healthy individuals. 1 point
 By measuring the thickness of the myelin sheath it could be shown whether it is smaller for the diseased people / whether the diameter of fibres is the same. Other arguments e.g. lack of functional PMP protein is also correct answer. 1 point
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- | | | |
|----|--|---------|
| 6. | B, E, I, J / each person suffering from the disease in the family tree | 1 point |
| 7. | F: aa | 1 point |
| | E: Aa | 1 point |
| | The probability that person E passes on allele 'A' to his child is 0.5, therefore the probability of <i>both</i> children being ill is: $(0.5)^2=0.25$ | 1 point |
| 8. | $1/2500 \cdot 0.8 \cdot 9800000 = 3136$, which means that there are 3136 such people living in the country. | 1 point |

VIII. Nitrogen fixation

6 points

The task is based on the following chapters of the detailed curriculum: 5.4.1.

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|----|--|------------------|
| 1. | ammonia / ammonium ion | 1 point |
| 2. | Because the bacteria receive sugar / energy source, (from which they can cover the high energy / ATP requirement of nitrogen fixation.) / the oxygen concentration is lower in the root nodules. | 1 point |
| 3. | into proteins / nucleic acids /DNA /RNA (any two) | 1 + 1 = 2 points |
| 4. | root nodule | 1 point |
| 5. | less artificial fertiliser is needed / results in reduced nitrate pollution | 1 point |

Optional Tasks

IX. A) Hormonal regulation of the female reproductive cycle

20 points

The hormones and their effects

10 points

The task is based on the following chapters of the detailed curriculum: 4.8.4.

Source of figure: original

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|----|---|---------|
| 1. | The letter indicating the developing follicle: C | 1 point |
| | The letter indicating the ruptured follicle: D | 1 point |
| 2. | The letter indicating the hormone: a | 1 point |
| | Name of the hormone: oestrogen(s) / hormone(s) of the follicle | 1 point |
| 3. | Name of the hormone: luteinising hormone / LH | 1 point |
| | Site of production: hypophysis / pituitary gland | 1 point |
| 4. | The egg cell is released from the ruptured follicle and finds its way into the oviduct / fallopian tube / uterine tube | 1 point |
| 5. | The letter 'M' and the straight line over the period of the first 5-7 days. | 1 point |
| 6. | Dizygotic: two different/independent egg cells are fertilised / implanted therefore the gender of the twins can be different. | 1 point |
| | Monozygotic: one egg cell is fertilised / the two twins originate from one zygote, therefore their gender is the same. | 1 point |
- Alternative wording is also acceptable.*

The second phase of the female reproductive cycle – essay

10 points

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|----|--|---------|
| 1. | The Luteinising Hormone / LH induces | 1 point |
| | the corpus luteum | 1 point |
| | to produce progesterone | 1 point |
| | which maintains the thickened state of the lining of the uterus / endometrium. | 1 point |

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2. High levels of progesterone exerts a negative feedback / inhibitory effect on the production of LH, 1 point
 which results in the regression of the corpus luteum 1 point
 which, in turn, causes the level of progesterone to drop, 1 point
 which ultimately elicits menstruation. 1 point
 3. The hormone hCG/pregnancy hormone is produced (by the developing embryo and later the placenta) and causes , 1 point
 the levels of progesterone to remain high after implantation. 1 point

IX. B) Get some fresh air! 20 points

Air pollutants 10 points

The task is based on the following chapters of the detailed curriculum:5.5.

Source of figure: <http://astro.u-szeged.hu/szakdolgozok/vegiandras/felhasznalas/uveghazhatas.html>

1. CH₄, methane /or other hydrocarbons 1 point
 natural gas production / rice cultivation / raising ruminant livestock/animals /
 melting/thawing of frozen soil/permafrost as a result of climate change 1 point
2. The reflected radiation (Y) has shorter wavelength / larger frequency / higher energy /
 than the one marked by X / the Y is light, while the X is heat radiation 1 point
3. Greenhouse effect. 1 point
4. Causes skin cancer / mutations / sunburn. 1 point
5. Breaks down ozone / causes the depletion of ozone layer /
 and as a result increases the extent of UV radiation. 1 point
6. Origin: burning crude oil / combustion engine / aeroplane engine 1 point
 Effect: photochemical smog / breaking down of ozone / acidification / secondary
 greenhouse effect 1 point
7. The use of coal / crude oil derivatives/ natural gas /
 combustion processes / forest burning (deforestation alone is not acceptable)
Any two appropriate examples 1 point
8. The amount of CO₂ emitted by a given population / manufacturing products/
 performing an activity. 1 point
Alternative wording is also acceptable e.g. based on the ecological footprint:
 The area of land needed to absorb the carbon dioxide emitted.
 The quantity of any matter / any unit area as a measurement of unit. E.g. g/m²

Lifestyle changes – essay 10 points

1. Fossil fuels are energy carriers of biological origin containing carbon, 1 point
 which took a long time to form 1 point
 Renewable energy sources are used up and replenished at approximately the same rate
 Fossil fuels: coal / crude oil / natural gas; Renewable: hydro / sun / wind
Any two suitable examples 1 point
2. The burning of forests increases the CO₂ levels of the atmosphere 1 point
 The reduction of growing area / erosion reduces the amount of CO₂ fixation. /
 increases CO₂ levels. 1 point

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3. Biodiesel / bioethanol / firewood – two examples 1 point
 Against: the amount of harmful substances produced in the course of burning them is the same as in any other kind of burning process,
 / takes up valuable crop growing area / reduces biodiversity /
 / its production is energy requiring. *Other suitable arguments are also acceptable* 1 point
 For: renewable energy sources. /
 does not increase the CO₂ of fossil origin significantly. 1 point
4. Urban transport: public transport / bicycle / walking / other traffic control solutions/measurements / *Other good answers are also acceptable* 1 point
 Long distance transport: use of railway rather than highways/ reducing travel for leisure purposes
Other good answers are also acceptable. 1 point