

ÉRETTSÉGI VIZSGA • 2020. május 13.

**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. Flowers and seeds

8 points

This task is based on the following points of the Detailed Curriculum: 3.4.1. and 3.4.3.

Source of Figure: http://users.atw.hu/banokisk/viragos_novenyek.php

1. The anther and the carpel do not mature at the same time / the pollen and carpel of the same flower are incompatible. *Alternative wording is also acceptable.* 1 point
2. No, they are not / they are different because they are the products of meiosis / independent assortment of homologous pairs / because of the possible recombination. 1 point
3. C: petal/corolla D: sepal / calyx *Both have to be named for:* 1 point
4. A 1 point
5. D 1 point
6. D 1 point
7. From the central cell fertilised by one of the male sex cells. 1 point
8. Fertilisation independent form water is made possible. *Alternative wording is also acceptable.* 1 point

II. DDT resistant mosquitos

11 points

This task is based on the following points of the Detailed Curriculum: 4.8.1 and 6.1.2

1. The frequency of allele KDR minus $q=0.2$ 1 point
The individuals heterozygous ($2pq$) and homozygous (q^2) for the allele KDR minus are resistant for DDT:
 $2pq+q^2=0.32+0.04=0.36$ / 36% of the population is resistant. 1 point
The two alleles can be marked by different letters as well.
2. In the presence of DDT the individuals carrying the allele KDR minus have a reproductive / selective advantage, as a result, the KDR minus alleles are passed on to the next generation in higher proportions / with higher probability (which resulted in a continuous increase in the frequency of the allele.) 1 point
3. Because of the continuous selection taking place. / the fitness of the alleles are not the same / the allelic frequencies are changing. 1 point
4. A, C, D 1+1+1 = 3 points
5. DNS 1 point
6. mRNS 1 point
7. order of amino acids / primary structure 1 point
8. spatial structure / conformation 1 point

III. Bones and muscles

13 points

This task is based on the following points of the Detailed Curriculum: 4.3.1., 4.3.2. and 6.3.2. Photos: eredeti (Párizs, Anatómiai Múzeum)

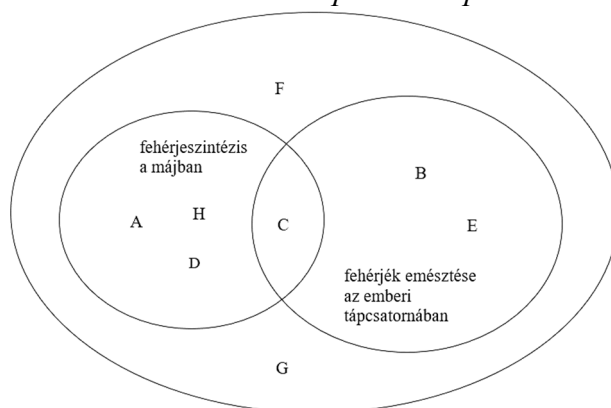
- | | |
|---|---------|
| 1. Decreases | 1 point |
| 2. Radius, | 1 point |
| Ulna | 1 point |
| 3. $k_1 \cdot C = k_2 \cdot X$ | |
| $28 \cdot 100 = 2 \cdot X$ | 1 point |
| $1400 = X$, that is 1400N force has to be exerted by the muscle. | 1 point |
| 4. Humerus / upper arm bone | 1 point |
| 5. Common origin / same basic arrangement/pattern / bones connected in the same order, although they have different functions. | 1 point |
| 6. Because of the longer bones the contraction of muscles can bring about larger displacement / movements of the limbs (compared to dolphins), which is connected to the mode of life of the cheetah:
the animal has to run fast on land to hunt its prey. | 1 point |
| <i>Alternative wording is also acceptable. The answer should refer to the link between maximum speed on land and the length of bones.</i> | |
| 7. A | 1 point |
| 8. C | 1 point |
| 9. B | 1 point |
| 10. A | 1 point |
| 11. D | 1 point |

IV. The liver – the body’s central laboratory

13 points

This task is based on the following points of the Detailed Curriculum: 2.1., 2.2.1., 4.4.2. and 4.4.3..

- | | |
|---|------------------|
| 1. A and D or A and B or D and B | 1 + 1 = 2 points |
| 2. A: glycogen, B: glucose, C: energy/ATP | 1+1+1=3 points |
| 3. <i>Each letter in the correct place is 1 point</i> | 8 points |



Fehérjésintézis a májban – protein synthesis in the liver

Fehérjék emésztése – digestion of proteins in the human alimentary canal

V. Impulse conduction of nerve fibres **6 points**

This task is based on the following points of the Detailed Curriculum: 4.8.1., 6.2.2.

Source of Figure: <https://www.quora.com/Why-is-myelination-of-neurons-important>

Source of Data:

https://www.tankonyvtar.hu/hu/tartalom/tamop425/2011_0001_524_Elettan/ch04s06.html

Szirmai Imre: Neurológia Medicina 2011.

1.

Name of the part	Letter
Glial cell / Schwann cell	D
Axon /node of Ranvier	E

Each line correctly filled in is 1 point, the total: 2 points

2. The nerve fibre with larger diameter conducts the impulse faster.
Acceptable without a pair of data. 2 points
3. E.g. The human A α fibres are narrower (15 μ m) than the axons of the cockroach but they can still conduct nerve impulses faster.
(Other data pairs are also acceptable.) 1 point
The myelinated nerve fibres conduct the impulse faster because the impulse skips from node to node (Ranvier node) / impulse propagates in a saltatory fashion (while in a bare axon it propagates from point to point). 1 point
Alternative wording is also acceptable.

VI. Sclerosis multiplex **6 points**

1. In sclerosis multiplex the myelin sheath/layer of the nerve fibres is damaged, and that is why the conduction velocity is reduced. 1 point
2. D and E 1 + 1 = 2 points
3. Its inheritance cannot be linked to the X chromosome because if it was linked then more men would suffer from the disease than women. 1 point
4. The genome/genetic constitution of monozygotic twins are (almost perfectly) the same, therefore the heritability of the disease / the effects of the genetic and/or environmental factors can be investigated effectively in twin studies. 1 point

VII. Dangerous steroids

11 points

This task is based on the following points of the Detailed Curriculum: 2.1., 2.3.1., 4.3.4. and 4.8.4..

Sources of Figures:

https://eatmore.blog.hu/2014/08/29/13_1_teny_es_tevhit_a_szteroidokrol_523

http://hu.drlahlali.org/testosteron_vyrobotka-testosterona-u-muzhchin.html

- | | |
|--|------------------|
| 1. C | 1 point |
| 2. A | 1 point |
| 3. A and D | 1 + 1 = 2 points |
| 4. hypothalamus (small neurosecretory cells) | 1 point |
| 5. B and C | 1 + 1 = 2 points |
| 6. follicle stimulating hormone/FSH and luteinising hormone/LH | 1 + 1 = 2 points |
| <i>(Note: the order is irrelevant)</i> | |
| 7. negative feedback | 1 point |
| 8. High levels of steroids in the blood inhibit the hormone production of hypothalamus and hypophysis / the hormone production of organs regulating the working of the testis. As a result, the testis does not receive signals to produce their hormones. | 1 point |
- Alternative wording is also acceptable.*

VIII. Metabolic pathway identification key

12 points

This task is based on the following points of the Detailed Curriculum: 2.2, 2.3.3. and 6.1.1..

- | | |
|--|----------------|
| 1. <i>Each process correctly identified is 1 point, a total of</i> | 8 point |
| <i>process I: glycolysis</i> | |
| <i>process II: light phase of photosynthesis</i> | |
| <i>process III: terminal oxidation</i> | |
| <i>process IV: protein synthesis (translation)</i> | |
| <i>process V: RNA transcription</i> | |
| <i>process VI: DNA replication</i> | |
| <i>process VII: dark phase of photosynthesis</i> | |
| <i>process VIII: citric acid/Krebs cycle</i> | |
| 2. A and E | 1+1 = 2 points |
| 3. C and D | 1+1 = 2 points |

IX.A. Optional task – Hormones and the nervous system **20 points**

This task is based on the following points of the Detailed Curriculum: 3.4.4., 4.8.1., 4.8.4..

While driving **10 points**

- | | |
|---|---------|
| 1. A | 1 point |
| 2. E | 1 point |
| 3. The adrenal medulla | 1 point |
| Increases blood sugar level / responsible for the fight-or-flight response
(an any reaction of the fight-or-flight response) | 1 point |
| 4. An increase in the osmotic concentration of the blood | 1 point |
| 5. ADH / Vasopressin | 1 point |
| Hypothalamus | 1 point |
| 6. In the cerebral cortex / in the frontal lobe | 1 point |
| 7. In the semi-circular canals / in the inner ear | 1 point |
| 8. When swallowing the Eustachian tube opens up allowing air pressure in the middle ear
and the outer air pressure to equilibrate.
<i>Alternative wording is also acceptable.</i> | 1 point |

Our organ of hearing – essay **10 points**

- | | | |
|----|--|---------|
| 1. | | |
| • | The soundwaves/vibration travelling in the air makes the tympanic membrane | 1 point |
| • | vibrate, which is passed on to | |
| • | the hammer, anvil, stirrup found | 1 point |
| • | in the middle ear . | 1 point |
| • | Through the oval window | 1 point |
| • | the vibration is passed on to organ of Corti | 1 point |
| • | in the cochlea found | 1 point |
| • | in the inner ear . | 1 point |
| 2. | | |
| • | In the organ of Corti the hair cells on the basilar membrane | 1 point |
| • | are moved due to the vibration of the fluid | 1 point |
| • | and touch the tectorial membrane which leads
to the generation of a nerve impulse. | 1 point |

IX.B. Optional task – Ecological webs

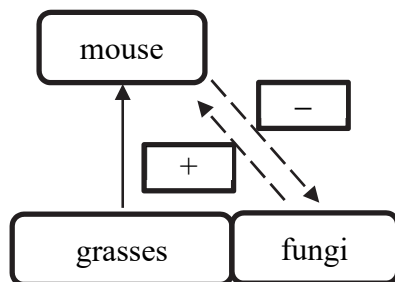
20 points

This task is based on the following points of the Detailed Curriculum: 5.1. and 5.4

Food web

10 points

- | | |
|--|---------|
| 1. B | 1 point |
| 2. E | 1 point |
| 3. competition | 1 point |
| 4. competition | 1 point |
| 5. Correct symbols used for the type of interaction: | 1 point |



- | | |
|-----------------|-----------------|
| 6. A, C and E | 1+1+1 = 3 point |
| 7. commensalism | 1 point |
| 8. parasitism | 1 point |

The route of carbon compounds along the food chain – essay

10 points

This task is based on the following points of the Detailed Curriculum: 2.1.4; 2.2.2; 2.2.3 and 3.4.3.

1. Inorganic carbon compounds / carbon dioxide is reduced
 - in the **chlorenchyma tissue** of the leaves / herbaceous stem
 - in the **chloroplasts**
 - with the help of **light energy**. 3 points
2. The plant food storage is
 - **starch**, which is
 - during digestion in the reaction of **hydrolysis** is
 - broken down into **glucose units**. 3 points
3. In the absence of oxygen
 - in the cell **cytoplasm** in the process of **fermentation**
 - the glucose is broken down into **smaller organic molecules / lactic acid**, 2 points

In the presence of oxygen

 - in the process of biological oxidation taking place in the cell **cytoplasm and mitochondria**
 - the glucose is broken down into **carbon dioxide and water**. 2 points