

**BIOLOGY-2023-05**  
**UNIVERSITY OF HRADEC KRALOVE – Faculty of Science –**  
**Department of Biology**

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**Written part of the entrance examination of BIOLOGY**

Department of BIOLOGY   
**Variant: 05**

Date: .....



**Surname and first name:** .....

Birthdate: ..... Application number: .....

Previous study: .....

<b>TASK (question):</b> <i>There is <b>ONLY ONE CORRECT ANSWER</b> in each task, unless a different number of solutions (answers) is explicitly required in the task specification.</i>	Point assessment
<b>1. What is the technical name for a diagram that shows the phylogenetic relationships between organisms and takes the form of a branching tree?</b> a) telegram, <b>b) cladogram</b> , c) pedigree, d) chromatogram	5 points
<b>2. What is the science of molluscs called?</b> a) mammalogy, <b>b) malacology</b> , c) mycology, d) ichthyology, e) ornithology, f) bryology	5 points
<b>3. Who discovered the causative agent of tuberculosis (<i>Mycobacterium tuberculosis</i>)?</b> <b>a) Robert Koch</b> , b) Louis Pasteur, c) Robert Hooke, d) Jan Evangelista Purkinje, e) Thomas Morgan, f) Theodor Schwann	5 points
<b>4. What is <u>NOT</u> a part of mitochondria?</b> a) cristae, b) matrix, c) ribosomes, d) DNA, <b>e) granum</b>	5 points
<b>5. During which stage of mitosis do chromosomes line up in pairs on the equatorial plane?</b> a) telophase, b) anaphase, <b>c) metaphase</b> , d) leptotene, e) prophase, f) interphase	5 points
<b>6. Insects with perfect metamorphosis do <u>NOT</u> include:</b> <b>a) <i>Nepa cinerea</i></b> , b) <i>Oiceoptoma thoracicum</i> , c) <i>Cydia pomonella</i> , d) <i>Dichrostigma flavipes</i> , e) <i>Myrmeleon formicarius</i>	5 points
<b>7. Wingless insects <u>INCLUDE</u>:</b> a) <i>Embioptera</i> , b) <i>Plecoptera</i> , <b>c) <i>Zygentoma</i></b> , d) <i>Megaloptera</i>	5 points
<b>8. Tunicata or Urochordata are:</b> a) predators, b) herbivores, <b>c) filter feeders</b> , d) insectivores, e) none of the above options	5 points
<b>9. What type of scales <u>ARE FOUND</u> in sharks?</b> a) cycloid scales, b) ctenoid scales, <b>c) placoid scales</b> , d) ganoid scales	5 points

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<p><b>10. Match exactly one organism from the left column of the table (A to E) to one related expression from the right column of the table (1 to 7).</b>  <i>Note: Assign exactly one number (1 to 7) for each letter (A to E), i.e. that at least one term from the right column of the table (1-7) remains unassigned.</i></p> <p><b>PLACE FOR YOUR ANSWER: A...4..., B...6..., C...1..., D...2..., E...3...</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">A) <i>Rhodophyta</i></td> <td style="width: 50%;">1) diatomaceous earth</td> </tr> <tr> <td>B) <i>Penicillium</i> sp.</td> <td>2) lichen acids</td> </tr> <tr> <td>C) <i>Ochrophyta</i></td> <td>3) water bloom</td> </tr> <tr> <td>D) <i>Cetraria islandica</i></td> <td>4) agar</td> </tr> <tr> <td>E) <i>Cyanobacteria</i></td> <td>5) haemoglobin</td> </tr> <tr> <td></td> <td>6) blue mould cheese</td> </tr> <tr> <td></td> <td>7) inflorescence</td> </tr> </table>	A) <i>Rhodophyta</i>	1) diatomaceous earth	B) <i>Penicillium</i> sp.	2) lichen acids	C) <i>Ochrophyta</i>	3) water bloom	D) <i>Cetraria islandica</i>	4) agar	E) <i>Cyanobacteria</i>	5) haemoglobin		6) blue mould cheese		7) inflorescence	5 x 1 point
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<p><b>11. The cold, oxygenated water of mountain streams with rocky bottoms is typical for:</b>  a) bream zone, b) barbel zone, c) <b>trout zone</b>, d) grayling zone</p>	5 points														
<p><b>12. A body formed by a thallus is <u>NOT</u> found in the group:</b>  a) <i>Fungi</i>, b) <i>Rhodophyta</i>, c) <i>Cyanobacteria</i>, d) <i>Coleoptera</i></p>	5 points														
<p><b>13. What is the name of plants with unisexual flowers that have flowers of different sexes on different individuals?</b>  a) monoecious, b) <b>dioecious</b>, c) polygamous, d) annual, e) unisex</p>	5 points														
<p><b>14. Which plant tissue consists of thin-walled cells but thickened at the corners?</b>  a) parenchyma, b) sclerenchyma, c) <b>collenchyma</b>, d) prosenchyma, e) aerenchyma</p>	5 points														
<p><b>15. In which of the following families <u>DO</u> WE FIND the umbel?</b>  a) <i>Brassicaceae</i>, b) <i>Poaceae</i>, c) <b><i>Apiaceae</i></b>, d) <i>Asteraceae</i>, e) <i>Fabaceae</i></p>	5 points														
<p><b>16. Decide whether each of the five statements (A to E) is true, then circle either YES (if you think the statement is true) or NO (if you think the statement is false) next to the statement in the right-hand column of the table.</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">A) Spores with elaters are the product of asexual reproduction of horsetails.</td> <td style="width: 30%; text-align: center;">YES/NO</td> </tr> <tr> <td>B) The fern stem is reduced to a rhizome.</td> <td style="text-align: center;">YES/NO</td> </tr> <tr> <td>C) <i>Dryopteris filix-mas</i> is a heterophyllous fern (it forms two types of leaves: trophophylls and sporophylls).</td> <td style="text-align: center;">YES/NO</td> </tr> <tr> <td>D) Ferns reached their greatest development during the Mesozoic.</td> <td style="text-align: center;">YES/NO</td> </tr> <tr> <td>E) Cycad seeds are edible.</td> <td style="text-align: center;">YES/NO</td> </tr> </table>	A) Spores with elaters are the product of asexual reproduction of horsetails.	YES/NO	B) The fern stem is reduced to a rhizome.	YES/NO	C) <i>Dryopteris filix-mas</i> is a heterophyllous fern (it forms two types of leaves: trophophylls and sporophylls).	YES/NO	D) Ferns reached their greatest development during the Mesozoic.	YES/NO	E) Cycad seeds are edible.	YES/NO	5 x 1 point				
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<p><b>17. What is the fruit of <i>Tilia platyphyllos</i>?</b>  a) folliculus, b) <b>nux</b>, c) nucula, d) achene, e) siliqua, f) capsula</p>	5 points														
<p><b>18. The osmotic phenomenon in a plant cell in a hypertonic environment is called:</b>  a) plasmorhysis, b) plasmoptysis, c) <b>plasmolysis</b>, d) plasmophysis</p>	5 points														

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<p><b>19. What is vernalization?</b>  a) freezing of plants in the spring due to low temperatures, b) periods of higher temperatures that prepare plants for the transition to the flowering phase, c) the effect of the length of daylight on plant development, <b>d) no option is correct</b></p>	5 points														
<p><b>20. What is the basic unit of the nervous system called?</b>  a) nephron, <b>b) neuron</b>, c) synapse, d) tubule, e) neuroglia, f) axon</p>	5 points														
<p><b>21. Purkinje fibres are located in the:</b>  a) cerebellum, <b>b) hearth</b>, c) kidney, d) liver, e) testes, f) pancreas</p>	5 points														
<p><b>22. Pituitary gland (hypophysis) is located under the brain in the sella turcica, which consists of:</b>  a) <i>os occipitale</i>, <b>b) os sphenoidale</b>, c) <i>os pubis</i>, d) <i>os parietale</i>, e) <i>os temporale</i></p>	5 points														
<p><b>23. Erythrocytes live an average of:</b>  a) 6 hours, b) 12 days, c) 12 days, <b>d) 120 days</b>, e) 12 months, f) 2 years</p>	5 points														
<p><b>24. Match exactly one gland from the left column of the table (A to E) to one hormone from the right column of the table (1 to 7).</b>  <i>Note: Assign exactly one number (1 to 7) for each letter (A to E), i.e. that at least one term from the right column of the table (1-7) remains unassigned.</i></p> <p><b>PLACE FOR YOUR ANSWER: A...4..., B...5..., C...1..., D...7..., E...6...</b></p> <table border="1"> <tr> <td>A) adenohipofyza</td> <td>1) antidiuretick hormon</td> </tr> <tr> <td>B) thyroid gland</td> <td>2) adrenalin</td> </tr> <tr> <td>C) neurohypophysis</td> <td>3) parathyroid hormone</td> </tr> <tr> <td>D) adrenal cortex</td> <td>4) somatotropin</td> </tr> <tr> <td>E) ovaries</td> <td>5) calcitonin</td> </tr> <tr> <td></td> <td>6) estrogens</td> </tr> <tr> <td></td> <td>7) aldosterone</td> </tr> </table>	A) adenohipofyza	1) antidiuretick hormon	B) thyroid gland	2) adrenalin	C) neurohypophysis	3) parathyroid hormone	D) adrenal cortex	4) somatotropin	E) ovaries	5) calcitonin		6) estrogens		7) aldosterone	5 x 1 point
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<p><b>25. Which statement is <u>NOT</u> TRUE?</b>  a) oxygenated blood flows from the left ventricle of the heart to the aorta, b) tricuspid valve is located between the right atrium and the right ventricle, c) semilunar valve is located between the left ventricle and the aorta, <b>d) oxygenated blood returns through the pulmonary artery from the lungs to the left atrium</b>, e) contraction of the heart is called systole and relaxation of the heart is called diastole, f) systolic pressure is higher than diastolic pressure</p>	5 points														
<p><b>26. Human <i>apendix</i> is:</b>  a) relict, <b>b) rudiment</b>, c) atavism, d) artefact</p>	5 points														
<p><b>27. What blood group can children inherit if father has blood group 0 and mother has blood group B?</b>  a) only blood group 0, b) only blood group B, <b>c) blood group B or 0</b>, d) only blood group A, e) only blood group AB, f) blood group AB or B</p>	5 points														
<p><b>28. Which type of bond is <u>NOT</u> in DNA?</b>  a) hydrogen bond, b) glycosidic bond, <b>c) peptide bond</b>, d) phosphodiester bond</p>	5 points														

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<p><b>29. Name the first successfully cloned animal:</b>  a) a bull called Herman, b) a cow called Holly, c) a dog called Laika,  <b>d) a sheep called Dolly</b>, e) a hen called Zora</p>	5 points										
<p><b>30. The protein part of the enzyme is called:</b>  a) <b>apoenzyme</b>, b) cofactor, c) holoenzyme, d) coenzyme, e) hemienzyme, f) protease</p>	5 points										
<p><b>31. A bacterial cell reproduces by:</b>  a) mitosis, b) meiosis, c) <b>division</b>, d) disintegration, e) sexually</p>	5 bodů										
<p><b>32. Which of the listed types does <u>NOT</u> correspond to the division of bacteria according to the composition of the cell wall?</b>  a) Gram-negative, b) Gram-labile, c) Gram-positive, <b>d) Gram-palatable</b></p>	5 points										
<p><b>33. What is the technical name for an organism feeding on the excrement of other animals?</b>  a) phytophage, b) zoophage, c) saprophage, <b>d) coprophage</b>, e) necrophage, f) fecesiophage</p>	5 points										
<p><b>34. In mountain pool, the water is transparent, in small pond on the edge of the village in the lowlands, it is already opaque, green at a small depth. Choose the most likely explanation:</b>  a) in the pond, the fish muddy the water by moving their tails, while no fish live in the mountain pool, <b>b) there is much less nitrogen and phosphorus in a mountain pool than in a pond</b>, c) mountain molluscs excrete clear urine, while lowland molluscs excrete cloudy urine, d) it rains less in the mountains, so the water in the pool stands much longer and therefore has time to clean itself, e) pond water is oligotrophic, while pool water is eutrophic</p>	5 points										
<p><b>35. From which period do the first Gymnosperms originate?</b>  a) from the Jurassic, b) from the Ordovician, c) from the Silurian, d) from the Devonian,  <b>e) from the Carboniferous</b>, f) from the Permian</p>	5 points										
<p><b>36. Label the abused substance that causes miosis (narrowing of the pupils).</b>  a) cocaine, b) LSD, c) <b>heroin</b>, d) marijuana</p>	5 points										
<p><b>37. Malaria is transmitted by:</b>  a) protozoa of the genus <i>Plasmodium</i>, b) male <i>Aedes</i> mosquito, c) female <i>Aedes</i> mosquito,  <b>d) female <i>Anopheles</i> mosquito</b>, e) <i>Glossina</i>, f) <i>Ciliophora</i></p>	5 points										
<p><b>38. Formalin is used for fixing biological material and embalming human remains. What kind of solution is it?</b>  a) <b>aqueous solution of formaldehyde</b>, b) aqueous solution of dimethylformamide,  c) aqueous solution of potassium fluoride, d) aqueous solution of sodium fluoride</p>	5 points										
<p><b>39. Decide whether each of the five statements (A to E) is true, then circle either YES (if you think the statement is true) or NO (if you think the statement is false) next to the statement in the right-hand column of the table.</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">A) <i>Struthio camelus</i> has nidicolous young.</td> <td style="text-align: center; padding: 2px;">YES/NO</td> </tr> <tr> <td style="padding: 2px;">B) <i>Aythya fuligula</i> has nidicolous young.</td> <td style="text-align: center; padding: 2px;">YES/NO</td> </tr> <tr> <td style="padding: 2px;">C) <i>Cynclus cynclus</i> has nidicolous young.</td> <td style="text-align: center; padding: 2px;">YES/NO</td> </tr> <tr> <td style="padding: 2px;">D) <i>Dryocopus martius</i> has nidicolous young.</td> <td style="text-align: center; padding: 2px;">YES/NO</td> </tr> <tr> <td style="padding: 2px;">E) <i>Coturnix coturnix</i> has nidicolous young.</td> <td style="text-align: center; padding: 2px;">YES/NO</td> </tr> </table>	A) <i>Struthio camelus</i> has nidicolous young.	YES/NO	B) <i>Aythya fuligula</i> has nidicolous young.	YES/NO	C) <i>Cynclus cynclus</i> has nidicolous young.	YES/NO	D) <i>Dryocopus martius</i> has nidicolous young.	YES/NO	E) <i>Coturnix coturnix</i> has nidicolous young.	YES/NO	5 x 1 point
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<p><b>40. Carbon dioxide is an important greenhouse gas. What is its formula?</b>  a) CO, <b>b) CO<sub>2</sub></b>, c) CO<sub>3</sub>, d) CaCO<sub>3</sub>, e) CaO</p>	5 points										