

Practical Exam

International Avicenna Olympiad in Biology
9-14 June, Bukhara

General information

Duration: 90 minutes

Total points: 50 points

This exam consists of total 3 tasks:

- Identification of fish species;
- Determination of morphological characteristics of fish;
- Constructing a phylogenetic tree.

General Instructions:

- **Do not forget to write your BARCODE on each page of your answer sheet. BARCODE looks like “ZOO-...”.**
- Wear a lab coat before starting the lab. Wear a face mask and gloves.
- The fish specimens presented to you are stored in 70% ethanol. Do not forget to close the lid of the container after taking the fish from the container.
- When working with a fish specimen, prevent it from drying out. To do this, you can or pour the water in front of you into a laboratory tray for use.
- When you are done with the fish specimen, return it to its container.
- Write your answers in the separate answer sheet provided. **Only answers in the answer sheet will be considered.**
- Stop answering and put down your pen immediately when you hear a signal at the end of the exam.
- No paper, materials or equipment should be taken out of the exam room.
- During the exam, hold up a red card if you want to go to the toilet, a blue card if you need drinking water and a yellow card for other questions and wait for the invigilator.
- Looking at the work of other participants, asking them something or talking to them is prohibited. This could lead to your disqualification from the Olympiad.

Good luck !

Laboratory task No. 1 (20 pts). You are given 5 fish specimens stored in 70% ethanol and they are numbered in a certain order. These specimens are real fish species common in the inland waters of Uzbekistan. You should identify these fish specimens to species level using the SHORT KEY provided below. Complete Table 1 below to show the sequence of steps in the fish species identification process.

A SHORT KEY
for identification of fish specimens presented from the ichthyofauna of Uzbekistan

1a	Body covered by scales	2
1b	Body smooth, scales absent	7
2a	Lateral line with 90 or more scales	<i>Schizothorax eurystomus</i>
2b	Lateral line with 60 or less scales	3
3a	Branched anal-fin rays more than 7	4
3b	Branched anal-fin rays less than 7	5
4a	Posterior margin of anal fin convex	<i>Petroleuciscus squaliusculus</i>
4b	Posterior margin of anal fin concave	<i>Alburnoides holciki</i>
5a	Pair of barbels on both sides of mouth and about 10 black spots on the lateral part of body	6
5b	Barbels absent on both sides of mouth, and dark stripe on lateral part body from posterior part of head to caudal fin origin	<i>Pseudorasbora parva</i>
6a	Snout blunt, mouth inferior, first unbranched ray of pectoral fin with small spines, posterior edge of dorsal fin significantly convex	<i>Abbottina rivularis</i>
6b	Snout pointed, mouth inferior, spines absent on first unbranched ray of pectoral fin, posterior edge of dorsal fin straight or slightly concave	<i>Gobio lepidolaemus</i>
7a	Three pairs barbels, rounded spots on both sides of body, upper lobe of caudal fin slightly longer than lower	<i>Triplophysa strauchii</i>
7b	Three pairs barbels, irregular blotches on both sides of body, lower lobe of caudal fin slightly longer than upper	<i>Triplophysa elegans</i>

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Tabel 1.

<p style="text-align: center;">Steps followed to identify the fish specimens</p> <p style="text-align: center;">Write every step followed, in BLOCK CAPITALS, with each step in a separate box. Start from the left-most box. You may use all or only some of the box.</p> <p>For each correct step, you earn 1 point. Additionally, 1 point will be given for each correctly identified fish species. Marks for the steps followed will be given for each correct answer from left to right, up to but not including the first incorrect step. In this case, even if the fish species is identified correctly, additional 1 point will not be given. The maximum points for this assignment is 20 pt.</p>								
Example steps followed:	1A	2A	3A	4A	5A			
Place an "X" on the correct species number.	X	<i>Xxxxxxx xxxxxx</i>			5	<i>Pseudorasbora parva</i>		
	2	<i>Alburnoides holciki</i>			6	<i>Schizothorax eurystomus</i>		
	3	<i>Gobio lepidolaemus</i>			7	<i>Triplophysa elegans</i>		
	4	<i>Petroleuciscus squaliusculus</i>			8	<i>Triplophysa strauchii</i>		
Fish in the 1st container								
Steps followed:								
Place an "X" on the correct species number.	1	<i>Abbottina rivularis</i>			5	<i>Pseudorasbora parva</i>		
	2	<i>Alburnoides holciki</i>			6	<i>Schizothorax eurystomus</i>		
	3	<i>Gobio lepidolaemus</i>			7	<i>Triplophysa elegans</i>		
	4	<i>Petroleuciscus squaliusculus</i>			8	<i>Triplophysa strauchii</i>		
Fish in the 2nd container								
Steps followed:								
Place an "X" on the correct species number.	1	<i>Abbottina rivularis</i>			5	<i>Pseudorasbora parva</i>		
	2	<i>Alburnoides holciki</i>			6	<i>Schizothorax eurystomus</i>		
	3	<i>Gobio lepidolaemus</i>			7	<i>Triplophysa elegans</i>		
	4	<i>Petroleuciscus squaliusculus</i>			8	<i>Triplophysa strauchii</i>		
Fish in the 3rd container								
Steps followed:								
Place an "X" on the correct species number.	1	<i>Abbottina rivularis</i>			5	<i>Pseudorasbora parva</i>		
	2	<i>Alburnoides holciki</i>			6	<i>Schizothorax eurystomus</i>		
	3	<i>Gobio lepidolaemus</i>			7	<i>Triplophysa elegans</i>		
	4	<i>Petroleuciscus squaliusculus</i>			8	<i>Triplophysa strauchii</i>		
Fish in the 4th container								
Steps followed:								
Place an "X" on the correct species number.	1	<i>Abbottina rivularis</i>			5	<i>Pseudorasbora parva</i>		
	2	<i>Alburnoides holciki</i>			6	<i>Schizothorax eurystomus</i>		
	3	<i>Gobio lepidolaemus</i>			7	<i>Triplophysa elegans</i>		
	4	<i>Petroleuciscus squaliusculus</i>			8	<i>Triplophysa strauchii</i>		
Fish in the 5th container								
Steps followed:								
Place an "X" on the correct species number.	1	<i>Abbottina rivularis</i>			5	<i>Pseudorasbora parva</i>		
	2	<i>Alburnoides holciki</i>			6	<i>Schizothorax eurystomus</i>		
	3	<i>Gobio lepidolaemus</i>			7	<i>Triplophysa elegans</i>		
	4	<i>Petroleuciscus squaliusculus</i>			8	<i>Triplophysa strauchii</i>		

Laboratory task No. 2 (15 pt). In the previous task, you identified 5 fish species of Uzbekistan using the key. Find the morphological and meristic characteristics given in the table below that match your identified species. In the boxes opposite the species shown in Table 2 below, fill in BLOCK CAPITAL LETTERS of the Latin alphabet given in front of the characteristics in the table below. **Complete the task based on the fish samples given to you.** Note that at least two characteristics correspond to each fish species. Please note that one characteristic given below is only suitable for one fish species. For each incorrect answer that is not concordant with a fish species, a penalty point of 0.25 points will be applied and deducted from your total score.

Table 2

<i>Example to fill out</i>					
<i>Abbottina rivularis</i>	A	B	C	D	E
Write your answers below					
<i>Abbottina rivularis</i>					
<i>Alburnoides holciki</i>					
<i>Gobio lepidolaemus</i>					
<i>Petroleuciscus squaliusculus</i>					
<i>Pseudorasbora parva</i>					
<i>Schizothorax eurystomus</i>					
<i>Triplophysa elegans</i>					
<i>Triplophysa strauchii</i>					

A	At the bottom of the eye, there is a spike that can be felt with a finger
B	Pelvic fin origin is significantly anterior to dorsal fin origin
C	6-9 black spots along the body on the lateral line
D	Mouth superior
E	Lower and upper lip with many furrows and papillae
F	The pectoral fin reaches pelvic fin
G	Dorsal fin origin is anterior to pelvic fin origin
H	Only chest part of the body is scaleless
I	Scales are very small
J	Adipose fin is developed
K	Three pair barbels
L	Scales absent on the body
M	One or two scales between pelvic fins
N	Two rows of bony scutes on the side of the body
O	Posterior edge of anal fin is concave
P	On the upper lobe of caudal fin a long filament
Q	Caudal fin rounded
R	Anal fin with 18-20 branched rays
S	The lateral line descends in the region of pelvic fin and then rises again.
T	Four pairs barbels
U	Lateral line is zigzag
V	Two pairs barbels
W	Small serrated spines on the inner side of the unbranched first ray of the dorsal fin
X	Semilunar spots, convexly facing backwards and located on the rear parts of the scales
Y	Two dorsal fin
Z	6-7 rows of scales above the lateral line

Laboratory task No. 3 (15 pt). The following table gives the genetic distances between eight fish species from Uzbekistan's ichthyofauna, calculated using the p-distance method and based on the mitochondrial COXI barcode gene sequence (682 bp). Based on the information given in the table, construct a phylogenetic tree of these eight species using the UPGMA method. When calculating, round numbers after the decimal point to one digit. For example, round 4.75 to 4.8; 6.18 to 6.2; 7.43 to 7.4. 1 pt is given for each correctly found topographic location of each fish species in the phylogenetic tree, and 0.5 pt for each correctly calculated topographic branch length.

		A	B	C	D	E	F	G
A	<i>Abbottina rivularis</i>							
B	<i>Alburnoides holciki</i>	16.6						
C	<i>Gobio lepidolaemus</i>	16.4	14.2					
D	<i>Petroleuciscus squaliusculus</i>	14.5	11.1	15.5				
E	<i>Pseudorasbora parva</i>	17.3	15.7	14.1	16.0			
F	<i>Schizothorax eurystomus</i>	16.0	16.3	15.4	13.9	18.0		
G	<i>Triplophysa elegans</i>	19.9	19.5	18.2	18.8	17.7	18.6	
H	<i>Triplophysa trauchii</i>	19.6	19.5	18.8	19.4	17.4	18.8	6.5