3-10 July 1994, Varna, Bulgaria

REPORT OF THE 5th INTERNATIONAL BIOLOGY OLYMPIAD

Report of the 5th International Biology Olympiad

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University of Sofia "St. Kliment Ochridski"

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The Emblem

PREFACE

The 5th International Biology Olympiad (IBO) is already a fact. It was held from 3rd to 10th of July, 1994 in the town of Varna, Bulgaria and was a successful proof once again for the desire and abilities of the international biology community for co-operation in the field of teaching in biology. Not only the great number of participating countries in it with competition teams, is in favor of the aforesaid, but also the number of the countries-observers which show interest and desire to be involved in the international biology olympic movement. 18 countries took part in the 5th IBO with regular teams of four competitors and two leaders. Five countries sent observers. For the first time in the biology olympic movement were involved Azerbaijan, Kazakhstan and Kirghizistan. Kuwait, Lithuania, Israel, Tadzhikistan and Turkmenistan sent observers. Official representative of the Co-ordination Centre of IBO in Prague was its secretary, Mrs. J. Mahackova.

We chose Varna and the Institute for Teaching Proficiency "Dr. Petar Beron" as a place where the 5th IBO to be held for various reasons. One of them is that Varna is one of the most beautiful and hospitable Bulgarian towns, of rich ancient history and nature places of interest. Our guests' stay at Varna and their visit to some resorts nearby, historical and nature places of interest, nature reserves, etc., let them know and feel closer the beautiful and hospitable Bulgarian Black Sea coast. Another reason is that the Institute for Teaching Proficiency and Teachers' Qualification in Varna has a modern base for teaching and laboratory experience and its administrative and teaching staff is of high quality, abilities and promptness to organize such events. The marvellous community of teachers and scientists – biologists in the town with their willingness and initiative helped the 5th IBO to be held. On behalf of the National Organization Committee of the Olympiad, we express our gratitude to all colleagues and co-operators as well as to the representatives of the Town administration.

The difficult commencement of the organization of the 5th IBO was started by a small staff of three persons: Prof. Dr. Vassil Golemanski, from the Institute of Zoology of the Bulgarian Academy of Sciences; Ass. Prof. in chief Nevena Mouleshkova from the Faculty of Biology at the University of Sofia and Mrs. Valya Vladova, chief expert in biology at the Ministry of

Science and Education in Bulgaria. Other eminent specialists have been involved later: teachers and scientists from the Faculty of Biology at the University of Sofia, Higher Medicine Institute in Varna, Bulgarian Academy of Sciences, teachers in biology from Sofia and Varna , administrative officials from the Ministry of Science and Education and others. Without their efforts the Olympiad organizing would have been impossible. All of them devoted much time and great efforts. Their professional skills and devotion contributed much to the good organization and carrying out the 5th IBO in Varna. We owe sincere appreciation and cordial gratitude to all colleagues as well as to many technical assistants during the preparation of the Olympiad. The tasks preparation for the two tests of the Olympiad – theoretical and practical – was, naturally, the most responsible and difficult activity. The main point of the preparation of the theoretical test was undertaken by N. Mouleshkova and for the practical test – by V. Golemanski. For the preparation of the theoretical test which comprised 122 tasks in different fields of biology, we have been helped by some countries-participants like Turkey, Belgium, Czech Republic, Slovakia, Russia, Thailand and China which sent on time their proposals for theoretical tasks. At the end, the theoretical test of the Olympiad was discussed and approved by the members of the scientific jury and the National Organization Committee in accordance with the organization rules of IBO. The four tasks of the practical test were subject to the main topic: Biodiversity and Ecology. We would like to express our gratitude especially to our colleagues from the countries-participants for sending us in advance their tasks and proposals as well as to Bulgarian colleagues who took part in the preparation of both theoretical and practical tests.

We prepared and submitted to the international scientific jury of the 5th IBO 122 theoretical tasks which were a product of an almost 10-hour serious and responsible preliminary creative discussion just before the competition. By consent 110 theoretical tasks have been approved and they formed the theoretical test of the Varna Olympiad. This way the proposal of the Council of Co-ordinators of the Countries-Participants made in December '1993 in Prague to reduce the tasks' number in the theoretical test was put into practice. The 4th IBO in The Netherlands (1993) when the competitors were given 130 tasks, proved that the participants were too short of time to solve them within 4 hours. The practical test was also subject of a deep discussion. It comprised 4 topics: Cytology and Histology; Biodiversity; Phytoecology and Zooecology. We express our sincere gratitude to all foreign and Bulgarian experts who, due to their competence and professional skills, contributed to a calm and creative discussion of the tests for the 4th IBO. Following the pattern of our Dutch colleagues who organized

the 4th IBO in Utrecht (1993), various computer specialists have been involved in carrying out and mainly in reading the results and processing the participants ranking. Dutch colleagues and Dr. H. Morellis in person kindly submitted to us the computer program "Lotus" which was used for reading the results of the 4th IBO. To our great surprise, our computers (or computer experts?) made a "small" mistake for the final ranking, which kept the participants and hosts "on nails" almost for 5 hours. The most unpleasant was the revision of the participants' places at the final ranking. Some of them were deeply disappointed, others were satisfied and happy. Organizers received a bitter lesson not to believe too much to computers and always during such responsible competitions to make simultaneously the infallible classic test according to the algebra rules valid since the time of Aristotle and Pitagoras. To all the participants – leaders and competitors who shared with us the stress and the unpleasant moments of the failed first computer ranking we owe our sincere apology.

Financial help in conformity with the proposal of Utrecht '1993, provided Belgium, China, Germany, The Netherlands, Sweden, Thailand, Turkey. The beautiful rewards (medals, statues and posters) which were given to the eminent competitors of the 5th IBO were kindly provided by our colleagues from Fatih Erkek Lissesleri (Istanbul). We express gratitude for their friendly gesture and sponsorship. Help for the organizing was provided on behalf of Varna municipality and Black Sea Fleet Club.

The 5th IBO belongs to the past. In spite of inevitable organization failures and weak sides, the 5th IBO is undoubtedly a positive step in the international biology olympic movement and demonstrates not only higher interest on behalf of all the countries – both participants and observers, but on behalf of the competitors as well. They showed high knowledge and skills. Bulgarian National Organization Committee cordially wishes to the countries which will organize the next IBO great success and higher achievements in organizing and promoting the authority and prestige of the International Biology Olympiad at higher level!

Sofia, November 1994

V. Golemanski
N. Mouleshkova
V. Vladova

NATIONAL SCIENTIFIC JURY OF THE 5TH IBO

Prof. Dr. **Vassil Golemanski**, Director of the Institute of Zoology, Bulgarian Academy of Sciences (BAS)
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Associate Prof. **Mihaela Kozhouharova**, Faculty of Biology, University of Sofia
Associate Prof. **Marin Simeonovski**, Faculty of Biology, University of Sofia
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Ass. Prof. in chief **Roumen Pankov**, Faculty of Biology, University of Sofia
Research worker **Dobri Ivanov**, Botany Garden, Varna
Research worker **Dessislava Petkova**, Institute of Botany, BAS
Ass. Prof. **Sophia Semerdzhieva**, Pedagogic Institute, Smolyan

MEMBERS OF THE NATIONAL ORGANIZATION COMMITTEE

Associate Prof. **Julieta Savova**, Deputy Minister of Secondary Education
Krassimir Valchanov, Director of the National Centre of Out-of-School Activities
Valya Vladova, Expert in Biology, Ministry of Science and Education
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Stella Ivanova, Director of IIIrd Secondary School on Nature Studies and Mathematics, Varna
Krastina Gradinarova, Expert in biology at the Regional School Inspectorate, Silistra

GUIDES OF THE NATIONAL TEAMS

(students from Ist Language School and
from United Secondary School "Al. Pushkin", Varna)

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Iveta Katreva
Valentina Gueorgakieva
Galya Zhelyazkova
Miroslava Guerova
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Petya Yonova, Ist English Language School , Varna
Dolya Popova – IVth French Language School , Sofia
Milena Barneva, German Language School, Sofia
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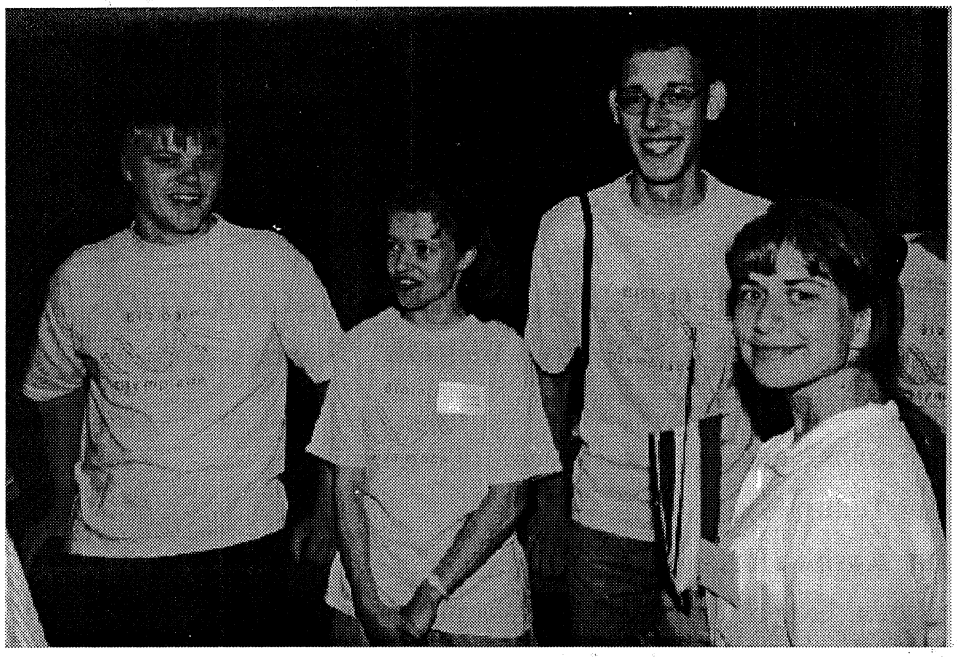
INSTITUTE FOR TEACHERS' QUALIFICATION "Dr. PETAR BERON", Varna

Assoc. Prof. **Maria Kambourova**, Director of the Institute
Senior teacher **Todor Tsvetkov**
Senior teacher **Rashka Hristova**
Milena Nedkova, Expert in informatics (computer equipment)
Nedyalko Nedelchev, Technical assistant
Pavlina Dimitrova, Technical assistant

The opening ceremony



DELEGATION LEADERS PROGRAM

Sunday - 03.07.1994

	Arrival and check-in
18.30	Dinner
19.30	Discussions on the olympiad's organization

Monday - 04.07.1994

8.00 - 9.00	Breakfast
9.30	Travel to the ceremonial hall for the opening ceremony of the olympiad
10.00 - 12.00	Opening ceremony
13.30	Lunch
14.30	Discussion on and translation of the practical test
19.00	Dinner

Tuesday - 05.07.1994

8.00	Breakfast
9.00 - 12.00	Sight-seeing Varna
12.30	Lunch
14.00 - 18.00	Sailing on a research ship
19.00	Dinner

Wednesday - 06.07.19947

7.30	Breakfast
8.30	Discussion on and translation of the theoretical test
12.30	Lunch
19.00	Dinner

Thursday - 07.04.1994

7.30	Breakfast
8.30 - 12.30	Visit to the Botany Garden of Balchick and the "Baltata" reserve
13.30	Lunch
14.30 - 17.30	Session of the International Jury
19.00	Dinner

Friday - 08.07.1994

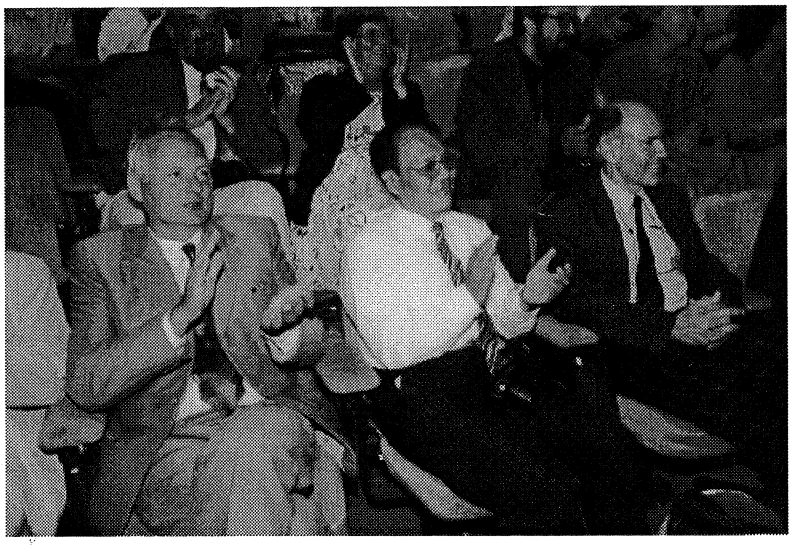
7.30	Breakfast
8.00 - 18.00	Visit to "Srebarna" reserve by the river of Danube. Lunch.
19.00	Official dinner

Saturday - 09.07.1994

8.00	Breakfast
10.00 - 12.00	Official rewarding of the winners and closing ceremony
14.00 - 19.00	Free time
19.00	Dinner

Sunday - 10.07.1994

8.00	Breakfast
	Departure



Folk dances and music contributed to the nice mood

STUDENTS PROGRAM

Sunday - 03.07.1994

	Arrival and check-in
18.30	Dinner
19.30	Instructions about the Olympiad's organization

Monday - 04.07.1994

8.00 - 9.00	Breakfast
9.30	Travel to the ceremonial hall for the opening ceremony of the olympiad
10.00 - 12.00	Opening ceremony
13.30	Lunch
14.30 - 18.30	Sightseeing Varna
19.00	Dinner

Tuesday - 05.07.1994

7.30	Breakfast
8.30 - 12.30	Practical test
13.00	Lunch
14.00 - 18.00	Sailing on a research ship
19.00	Dinner

Wednesday - 06.07.19947

8.00	Breakfast
9.00 - 18.00	Visit to the "Aladja" monastery, "Baltata" reserve, the Botany garden in the town of Balchik and Kaliakra cape.
19.00	Dinner

Thursday - 07.04.1994

7.30	Breakfast
8.30 - 12.30	Theoretical test
13.00	Lunch
15.00 - 17.00	Visit to the dolphinarium - Varna
19.00	Dinner

Friday - 08.07.1994

7.30	Breakfast
8.00 - 18.00	Visit to "Srebarna" reserve-by the river of Danube. Lunch.
19.00	Official dinner

Saturday - 09.07.1994

8.00	Breakfast
10.00 - 12.00	Official rewarding of the winners and closing ceremony of the olympiad
13.00	Lunch
14.00 - 19.00	Free time
19.00	Dinner

Sunday - 10.07.1994

8.00	Breakfast
	Departure

Communicating students became soon friends

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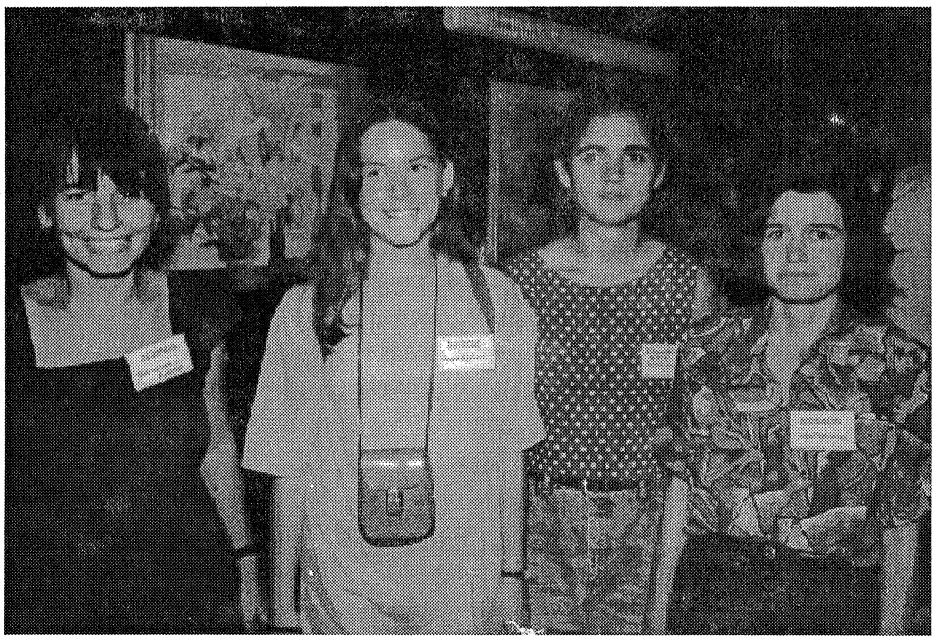
Guests Private School

Ekrem	Solmaz	Turkey
Nihal Atsiz	Okan	Turkey
Nuri Fatih	Savran	Turkey
Mesut	Sener	Turkey

The Czech team



The mood of the Bulgarian students is of full palette

ANALYSIS OF THE 5th INTERNATIONAL BIOLOGY OLYMPIAD TESTS AND THE PARTICIPANTS' ACHIEVEMENTS

In accordance with the rules of IBO, the tests were criterial and kept to standards via procedures (methods) of expert evaluations.

Expert evaluation of the tasks: The complex of tasks is worked up and submitted to the National Organization Committee by the countries-participants – in accordance with the fields of biology which are required as a content by rules. The final content of tasks is balanced in compliance with the content and percentage of the regulation as well as the time aimed at Olympiad holding. The tasks are evaluated according to their difficulty from 1 to 3 points score and are differential depending on the tasks' type: part A – the multiple choice part with 115 questions requiring selection of one true answer from 5 given as possible; part B with 7 questions requiring to construct the true answer on the base of 2 and more answers given. In accordance with the practical part announced – "Biodiversity and Ecology", practical tasks have been worked out in four sections :

I section : Cytology and Histology with maximum score of 36 points
II section : Biodiversity with max. score 33 points
III section : Phytoecology with max. score 20 points
IV section : Zooecology with max. score 35 points

124

After the International Jury evaluation and correcting both theoretical and practical tests proposed, the final version of the tasks and the system of evaluation of their solution was accepted. (**Table 1** Answer Key; Appendices – Theoretical and Practical Test). The maximum score both for the theoretical and the practical tests, is 124.

The final version of the test for the IBO'94 as topic proportions is represented on **Table 2** and **6**. On **Table 3** and **4** are represented the topic proportions for Part A of the Theoretical test, the number of the relevant questions as well as the part of the correct answers (P).
On **Table 5, 7, 8, 9** and **10** is represented the part of the correct answers of the tasks of the Theoretical test – part B and of the Practical test.
The participants in IBO'94 represent a group which have high achievements at national level and because of it the range, naturally, of the results shown at international level is not wide: for the final ranking it scores 84 points, 40 points for the Theoretical Test and 60 points for

Table 1. THEORETICAL TEST. ANSWER KEY, PART A

	1	2	3	4	5	6	7	8	9	0
1 to 20	A	C	A	A	B	D	C	A--B	D	D
11 to 20	A	C	C	C	A	C	A2	A	A	A
21 to 30	C	C	B	C	C	B	C	D	B	A
31 to 40	B	B	C	C	C	D	A	C	B	A
41 to 50	B/C/	A	A	C	D	C	D	C	B	D
51 to 60	A	D	D	B	B	A	C	E	D	A
61 to 70	D	E	D	A	C	C	E	E	D	D2
71 to 80	C	B2	D	C	D	D	B	D	C	D2--D
81 to 90	D	D--D2	C2	D2	B	D	A	D	A	D--E
91 to 100	C	C	B	D2	C	B	A	E	A	A
101 to 110	E	C	B	D	D2	D	D	D	B2	C
111 to 115	B	C	B2--B	D	D					

C Skipped questions

A--B Answers or number of points corrected

B /C/ Correction of the answer, technical mistake

Maximum number of points is 111

ANSWER KEY, PART B

1. (2.5 pts.)

	Fig. A	Fig. B
Stage of cell division	C	E
Number of chromosomes in a diploid cell	2	6

2. (2 pts.) nucleic acid A, D; protein A, D; polysacharides B, C, D

3. (1 pt.) A, C

4. (1.5 pt.) B, D, E

5. (3 pts.) D, B, A, A, D, C

6. (2 pts.) A - genotype TT: 36%; B - genoptype TTRR: 9%

7. (1 pt.) D - gene flow; C - sexually reproducing species; E - natural selection; A - mutation; B - genetic drift

Total number of questions is 7. The correct answer is evaluated at a rate between 1 and 3 points. Maximum number of points is 13

Table 2. Variety of the Theoretical test. Thematic proportions

	According to the rules of IBO	Accepted
Cell Biology (CB)	25%	32%
Plant Anatomy and Physiology (PAP)	15%	11%
Animal Anatomy and Physiology (AAP)	15%	17%
Ethology (ET)	5%	2%
Genetics and Evolution (GE)	15%	14%
Ecology (EC)	15%	14%
Biosystematics (B)	10%	10%

Table 3. Distribution of the questions of the Theoretical Test over the topics

	1	2	3	4	5	6	7	8	9	0
A. 1 to 10	CB	CB	CB	-	CB	CB	CB	CB	CB	CB
11 to 20	CB	CB	CB	CB	CB	CB	CB2	CB	CB	CB
21 to 30	CB	CB	CB	-	CB	CB	-	CB	CB	CB
31 to 40	CB	CB	-	CB	CB	PAP	PAP	PAP	PAP	PAP
41 to 50	PAP	PAP	PAP	-	PAP	PAP	PAP	PAP	PAP	PAP
51 to 60	AAP	AAP	AAP	AAP	AAP	AAP	AAP	AAP	AAP	AAP
61 to 70	AAP	AAP	AAP	AAP	AAP	AAP	AAP	AAP	AAP	ET2
71 to 80	GE	-	GE	GE	-	GE	GE	GE	GE	GE
81 to 90	-	GE2	GE2	GE2	EC	EC	EC	EC	EC	EC
91 to 100	EC	EC	EC	EC2	EC	-	-	-	EC	EC
101 to 110	-	EC	EC	EC	B2	B	B	B	B2	B
111 to 115	B	B	B	B	B					
B. 1 to 7	CB2.5	CB2	AAP	AAP1.5	CB3	GE2	GE			

Table 4. Mean values of P for the different domains
Part A – Theoretical test

	Number of questions	P
Cell Biology (CB)	31	0.78
Plant Anatomy and Physiology (PAP)	14	0.81
Animal Anatomy and Physiology (AAP)	19	0.76
Ethology (ET)	1	0.65
Genetics and Evolution (GE)	11	0.66
Ecology (EC)	16	0.73
Biosystematics (B)	11	0.74
Total Part A	103	0.734

Table 5. Theoretical Test - part B

Questions number	P	Correct answers	Correct answers (not full)	Incorrect answers
1	0.33	24	45	3
2	0.06	4	53	15
3	0.71	51	21	-
4	0.40	29	41	2
5	0.33	24	47	1
6	0.38	27	-	45
7	0.68	49	22	1

Table 6. Variety of the Practical Test - Biodiversity and Ecology

Number of sections	Number of scores	Thematic proportions and scores
I	36	CB 24 AAP 12
II	33	B 33
III	20	B 8 EC 12
IV	35	B 10 EC 25
Total	124 pts	CB24 AAP12 EC37 B51 Score in %: 19% 10% 30% 41%

Table 7. Practical Test. I Section: Cytology and Histology

Questions NB	1. 1. A	1. 1. B	1. 2. C	1. 2. D	1. 3. E	1. 3. F	1. 4. G	1. 4. H	2.1	2.2	3.1	3.2	4.1	4.2	4.3	4.4
Correct answers	48	63	69	50	47	63	42	58	42	59	56	57	55	71	68	66
%	67	88	96	69	65	88	58	81	58	82	78	80	76	99	94	92

Table 8. Practical Test. II Section: Biodiversity

	Correct answers		Correct answers (not full)	Incorrect answers
	%	number		
Defining the belonging of 6 individuals shells to 6 genus of snails Task 1 18 pts.	89	64	-	8
Defining the belonging of 6 individuals shells to 6 genus of mussels Task 2 15 pts.	25	18	46	8

Table 9. Practical Test. Section III: Phytoecology

	Correct answers		Correct answers (not full)	Incorrect answers
	%	number		
Classifying of 17 plant individuals in 4 groups and their enumeration Task 1.1. 8 pts.	28	20	20	32
% participation and forrage value determining Task 1.1.1.-1.1.3. 8 pts.	56	40	-	32
Weight defining and determining primary production Task 1.2. 4 pts.	28	20	41	11

Table 10. Practical Test. Section IV: Zooecology

	Correct answers		Correct answers (not full)	Incorrect answers
	%	number		
Classifying of 15 animal individuals in 5 classes and their enumeration Task 1.1.-1.2. 10 pts.	85	61	6	5
% participation defining Task 1.3. 5 pts.	81	58	6	8
Defining of number of individuals per sq. m for each group Task 2.1. 10 pts.	72	52	9	11
Defining the weight (g) and determining of biomass (g/sq.m) Task 2.2. and 2.3. 10 pts.	78	56	5	11

Fig. 1. Scores of the students

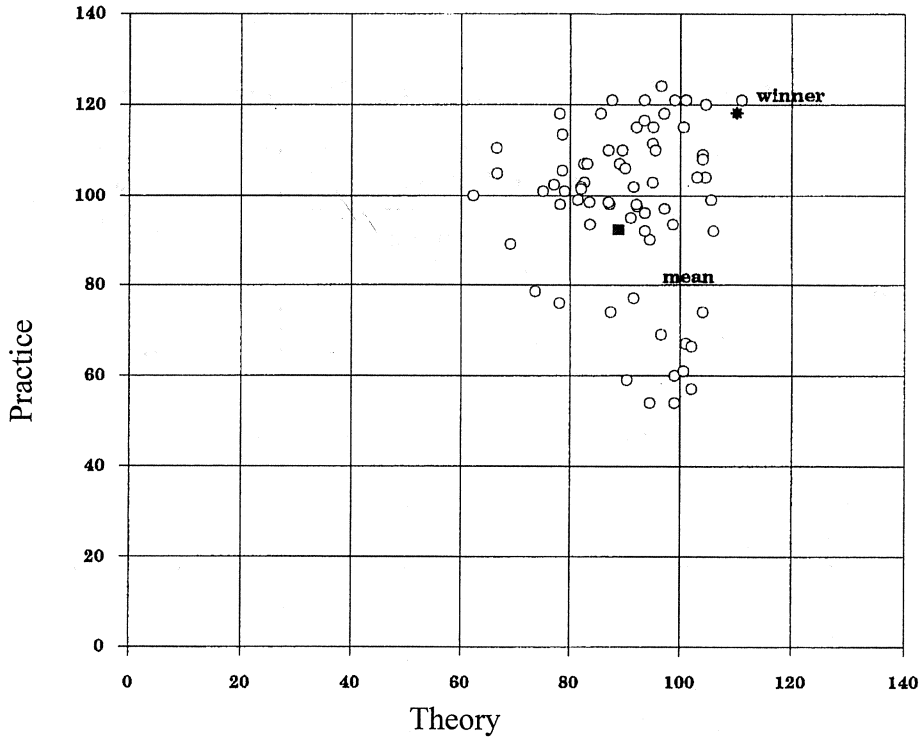


Fig. 2. Final Results

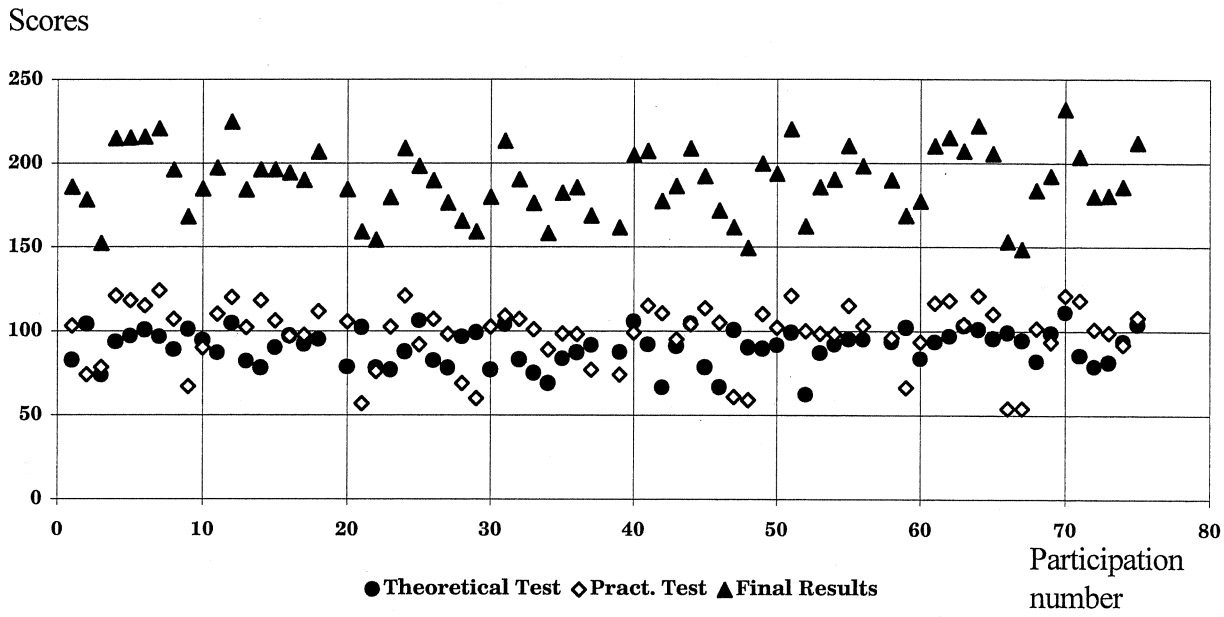
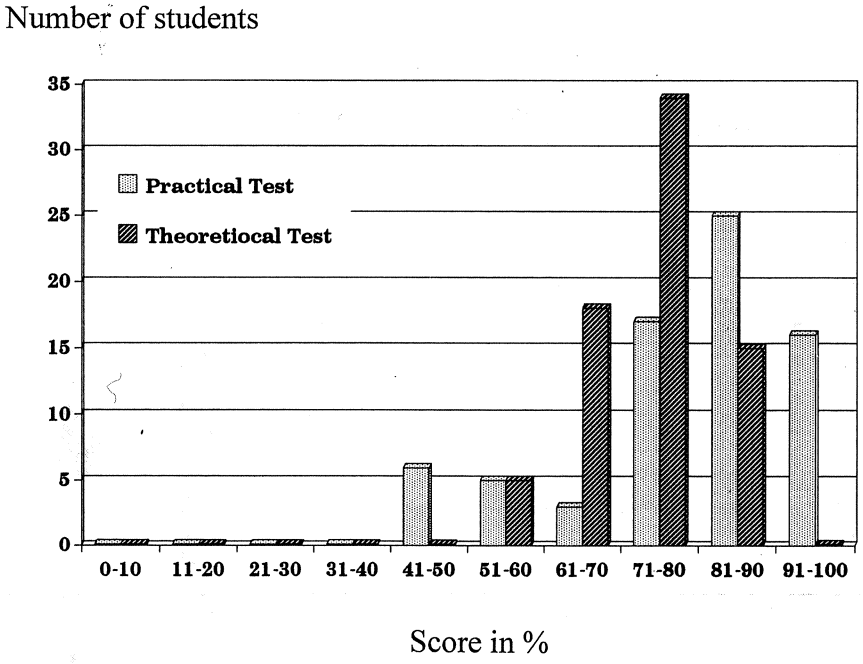


Fig. 3. Results Practical & Theoretical Test



the Practical one (**Fig 1 and 2**). As for the final ranking,all the participants reached 60% and over 60% of the maximum score of points – 248. (**Fig. 3**).In particular 50% of the students gave correct answer to the 93 of al the 103 tasks from part A of the Theoretical test. Individually the maximum or nearly the maximum score of points was reached: for the Practical test (124p.), for part B of the Theoretical test (12,5p.), for part A of the Theoretical test (99 p.). The results indicated are reasonable to read a high degree of criterial and content validity of the test applied as a whole.

Evaluation of the participants' achievements is realised by the applied cards with correct answers and their significance in points (page 22 and 35).

The standard for success in the olympiad is defined empirically via an expert evaluation and in accordance with the rules of IBO for awarding medals: the minimum score for achieving a medal is 186 points. Medals distribution is shown on page 50.

In comparison to previous Olympiads, the trend for increasing the number of competitors who have high results remains persistent at IBO'94. The average score in % of the maximum score of points for the different sections of the Practical test and for both parts of the Theoretical test are represented on **Fig. 4, 5** and **6** . They vary from 52% – for section III of the Practical test– to 89% – for section II of the same one. As for the Theoretical test, 74% refers to part A and 62% – to part B.

Fig. 4. Results in the different tests

Mean scores in %

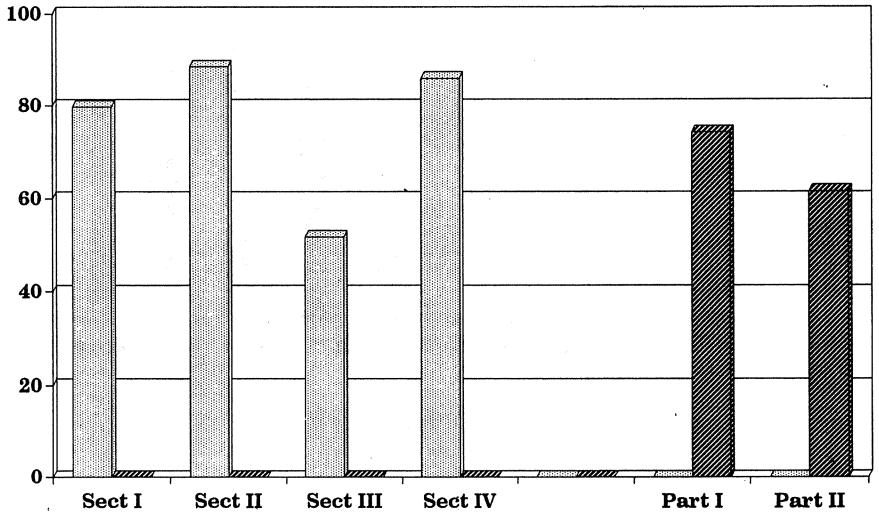


Figure 5. Results Theoretical Test

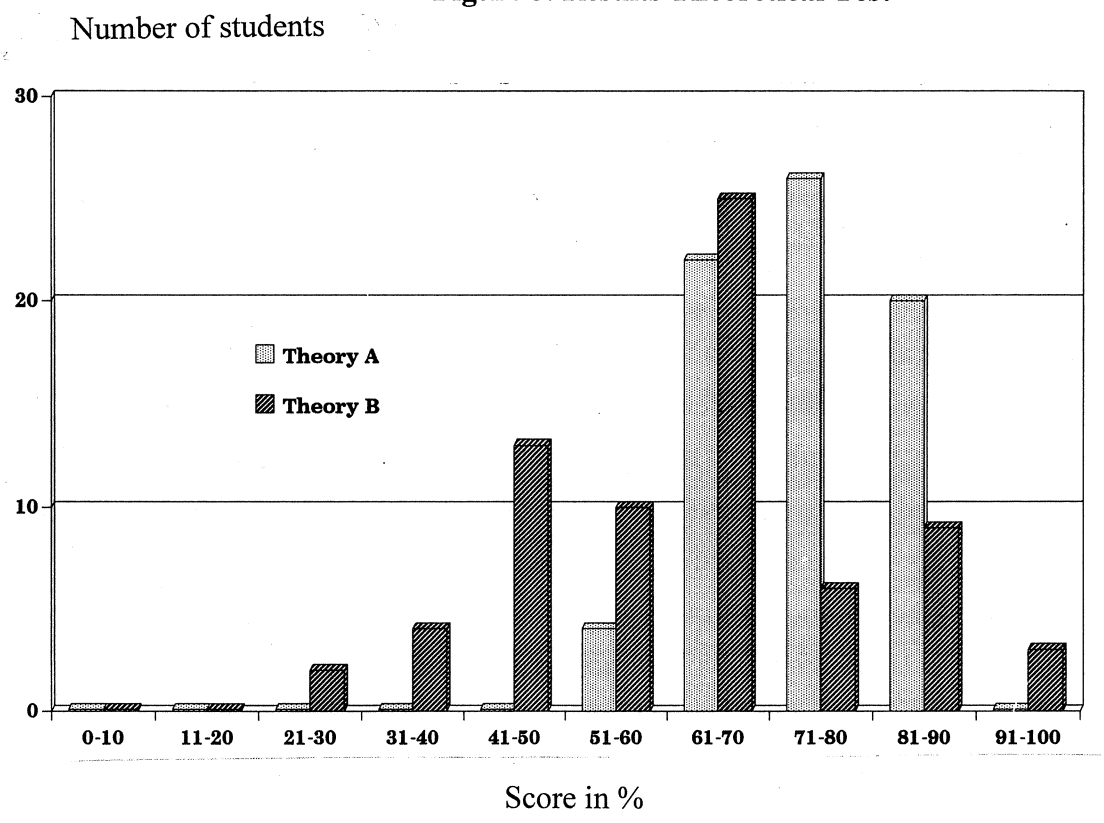
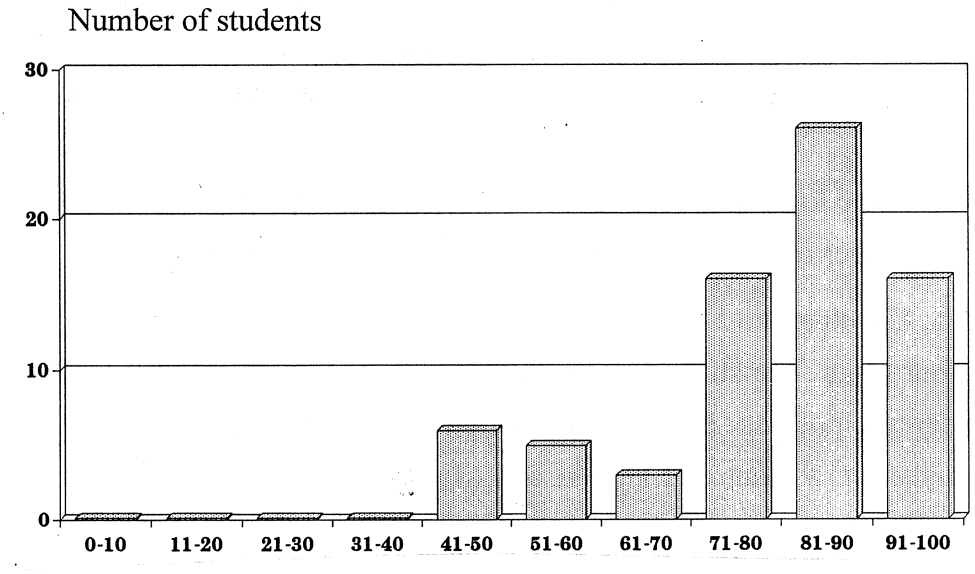


Figure 6. Results Practical Test



41 competitors received between 80% and 100% at the tasks of the Practical test.As for the Theoretical test, there are no participants who won results between 90 and 100% of the maximum score of points, but 49 competitors received between 70% and 90% of the maximum, 15 of them – between 80% and 90%.

The highest result of the Theoretical test received Roman Ivanov from Russia (111 points from the maximum score of 124) and he won the gold medal. As for part B, the participant Mahir Mehdiev from Azerbeidjan received 12,5 points from 13 possible. He is followed by Zheng Chun yang (China) and Roman Ivanov (Russia) – they have by 12 points.

The Practical test showed wider range of results: from 44% to 100% (the latter achieved by Adam Petrushek from Czech Republic). The Theoretical test showed results between 50% and 90% both for part A and B. The tasks of part A (Cell Biology) have been solved right by 82% of the participants. As for the tasks of Plant Anatomy and Physiology – by 81%.

The results concerning Genetics and Evolution are lower – 66% of the participants gave the right answer.But tasks No.16,35,85 and 94 have low percentage of right answers.

The values of P (the part of right answers to each of the questions of part A of the Theoretical test) is represented on a separate **Table 12** ans **13** and **Figure 7**. Over 98% of the competitors gave correct answers to two of the tasks concerning Cell Biology. The percentage of correct answers is over 80% for major part of the questions and we consider it as a result of adequacy tasks and good preparation of the competitors, but not because of easyness and low threshold.

Part B promotes the better prepared and thoughtful competitors. Only one competitor almost reached the maximum score of points (from Azerbaijan).The highest percentage of right and full answers for the task No.3 is only 71% and as for the task No.2 it is only 6%.The task No. 6 has 63% of wrong answers.

The tasks of part B require more logic and not only concrete knowledge, but skills to apply it and to compare. Great number of participants gave correct but not complete answers.

Practical Test. Section I: Cytology and Histology

The section comprises four tasks. The students have been given 8 slides, while the tasks' solution requires the students to possess : skills for operating with a microscope; knowledge of the mitosis characteristics in a plant and animal cell (Task No 1); knowledge of the eucariotic cell protein synthesis site, of the ribosomes organic structures, as well as of the site of ribosomes subunits building up (Task No. 2); knowledge about chromatine histological characteristics and organic structure (Task No. 3). As for Problem No. 4, knowledge is required about: the terms of "basophilic" and "acidophilic", about the erythrocyte cytological

characteristics of the vertebrate classes, skills for comparative cytological data interpretation, knowledge of the three group blood cells cytological characteristics and skills for their recognizing, as well as for their functions. The solutions to each task do not correlate between each other.

Task No. 1 solution results are as follows: 8 of the students have covered 100% of the scores, and 59 students, totally, have scored over 50%. The poorest achievement is of 25%. As a whole, the task are adequate, with regard to their content, to the students' training.

Task No 1 solution results indicate that 35% of the students have been trained insufficiently hard, regarding plant cell mitosis specifics.

Task No. 2 solution results indicate that the students are familiar with the protein synthesis cell site, as well as with the ribosome subunits building up. The students associate correctly protein synthesis with the ribosomes. Only 7% of the students have answered incorrectly that proteins synthesis takes place in the nucleus (task 2.2). Meanwhile, 41% of the students point out that answer "D" is correct (task 2.1). This systematic mistake is made because of incorrect description of the task 2.1 terms: intensive staining is associated with cell organelles for protein synthesis, instead with the organic structure of a certain organelle or of a overmollecular complex. The latter has made answer "D" an unreliable (not good) distractor. It is possible to explain in the same way why 8% of the students have given answer "B" in Task 2.2.

Task No 3 has been solved successfully by nearly 80% of the students. Total of 10% of the students are not familiar with the neuron cell cytological characteristics or with the heart muscular cell (answers "A" and "B" of Task 3.1 have been marked incorrectly). The remaining 10% of the students are not familiar with the liver cell cytological characteristics (answer "D" of Task 3.1 has been marked wrongfully).

Nearly 6% of the students have not defined correctly the tissues where final cell differentiation is observed (answer "A" of Task 3.2 has been marked incorrectly). Nearly 13% of the students associate the lack of staining with the chromatine complex protein disintegration (answer "D" of Task 3.2). Task 3.2 terms text should be improved in order to increase the "D": distractor reliability.

Task 4 have been solved correctly by over 90% of the students, as far as the following parts are concerned: 4.2, 4.3 and 4.4. Almost every student knows the blood cell cytological characteristics of the vertebrate classes. The comparative histological data have been interpreted correctly, which suggests existence of physics and biochemistry knowledge. Only 3% of the students have associated incorrectly the erythrocytes size with the haemoglobine biochemical activity (answer "C" of task No. 4.3). Task No. 4.4 solution results are the same:

almost every student knows the erythrocyte and leukocyte functions, associates them with the indicated disease and is able to recognize it by specific marks. Only 6% of the students answer incorrectly to Task 4.4 (answers "A" and "C"). Task 4.1 solution results indicate the highest percentage (nearly 22%) of incorrect answers: these students are not familiar with the "basophilic" and "acidophilic" terms. As a whole, Section I tasks reveal poorer knowledge with regard to staining methods applied in cytology. Despite these methods significance, their percentage involvement in the task solutions total results is higher than it is necessary.

Practical Test. Section II: Biodiversity

This section comprises two tasks. The task terms consist of: diagrammatic pictures with marked morphological characteristics of mussels and snail shells and a "key" to defining their classes. The "key" indicates: a morphological characteristics complex; sequence of morphological characteristics definition; morphological characteristics of 6 classes of mussels and snails – presented in a table. Students have been given 12 specimen shells, marked with numbers. The tasks' solutions require from the students to possess skills for applying the "key" in order to classify: recognizing certain specimen morphological characteristics; defining the specimen pertaining to a genus, given the specimen morphological characteristics. The task solutions are not intercorrelating. The total points are 33.

The task solutions results are as follow: task No 1 has been solved correctly by 64 students (89%), 8 students have answered incorrectly. Task No 2 has been solved by 18 students, 8 students have answered incorrectly. The remaining 41 students have defined correctly the genusof the 5 mussels shells, but incorrectly the genus of one of the mussel shells. The correct answer requires to associate the shells with one and the same genus, and none of the shell belongs to one of the classes. 56% of the students have made such a mistake, following the reckoning stereotype – giving an answer to each of the mussels genus and not using the "key" for defining. Other 5 students have defined incorrectly the tow shells genus, leaving one of the genera with no specimens attached to – following the "key", not the reckoning stereotype. It is necessary, in order the tasks to be more reliable, that: the given systematic groups number do not coincide with the classified specimens number; the number of specimen, belonging to certain systematic groups, to be different. A group of 23 students has surmounted the reckoning stereotype as for Task No. 2. 16 students of that group are among the prize winners in the final results.

Practical Test. Section III: Phytoecology

The section comprises one task, presenting 17 specimen, placed on an area of 0.01 sq. m. The tasks requires the students to have knowledge of the Grasses, Legumes, Composites, Umbellifers groups' morphological characteristics; to have skills for recognizing these characteristics in plant specimen, to calculate percentage participation, determining forage value, weight measurement, defining and calculating primary production. The correct determining of the forrage value depends on the proper classifying and calculation of the percentage participation. These skills are rated at 16 points. Weight measurement and mathematical transformation skills (of weight, from grams into kilograms; area – from 0.1 sq. m into 1 sq. m) are rated at, totally, with 4 points.

18 students have achieved a maximum of 100% points, and 36 students, as a total, have achieved 50% and over 50% of the points. Only 6 students, of different national teams, have revealed poor training on plant systematics (Section III total score of 0 points).

The analysis of every task stage performance results are as follow: Total of 40 students (nearly 58%) have determined correctly the forage value, as the ways for reaching the correct answer and plant groups characteristics knowledge are different. Only 20 students have classified correctly all the 17 plant specimen, as well as have determined each group percentage participation and the corresponding forage value. Other 10 students have classified correctly all the 11 specimen that pertain only to he Grasses and Legumes groups. In this way, the students have reached their correct determining of the forage value. There is a third group of 10 students that have classified correctly only 6 specimen of the Grasses group, also reaching the forage value correct answer.

The results indicate that knowledge of the plant groups characteristics differ considerably. Major part of the students (nearly 56%) know and recognize the Crasses group characteristics. 42% of the participants are familiar and can recognize as plant specimen the Legumes group characteristics. Only 28% of the students are familiar with and can recognize the Composites and Umbellifers groups characteristics.

20 participants have determined correctly the primary productivity of every plant group. Meanwhile, 41 students more have determined the primary productivity only of several plant groups.

The above mentioned data indicate that a total of 61 students (over 80%) know the meaning of primary productivity, but have made mistakes in the classifying, mathematical calculations, or have not given answers.

Practical Test. Section IV: Zooecology

The section comprises two tasks. The students have been given 15 animal specimens. The tasks solutions require the students to: possess skills for magnifying glass and microscope scrutinizing, for weighing by means of scales; possesss knowledge of the animal systematic groups morphological characteristics and skills for their recognizing in certain specimen, for calculating the group percentage participation, as well as density, defining and calculating the biomass. The correct percentage participation, as well as the correct definition of density depend on the correct classifying of the 15 animal specimen into 3 types and 5 classes. This correlation in the solution has lead to indirect clustering of a total of 25 points, given for knowledge of the systematic animal groups morphological characteristics and for the skills to recognize the characteristics in certain specimen. Weight measurement and biomass defining, required in tasks 2.2 and 2.3 are not in direct dependence on the Tasks 1.1 and 1.2 specimen correct classifying, in the appraisal: Weight measurement and biomass defining skills are rated at with 10 points. The students knowledge and skills of the ecological characteristics, percentage participation, productivity and biomass, in Sections III and IV are rated at 22 points.

The solutions results of the both tasks are high – between 56 and 61 students are familiar with and recognize the Oligochaeta, Gastropoda, Crustacea, Myriapoda and Insecta morphological characteristics. The remaining answers distribution in "correct not complete" and "incorrect" groups is provisional: 1 or 2 mistakes have been made in the first group of answers, 3 or 4 mistakes have been made in the second group of answers. The mistakes in classifying are almost evenly distributed with regard to the five classes. These mistakes are rather casual. The incorrect answers number increase, as from Task 1.1 to 2.1 is due to the lack of knowledge with regard to the density defining manner and to mathematical calculations mistakes. The five students that have made 3 or 4 mistakes at the classifying, have made mistakes in the biomass determining as well.

It is necessary that the monotonous numerous calculations, such as of the percentage participation, density, productivity and biomass fell off in order to minimize the mathematical calculations knowledge and skills influence on the overall biological task mark. Meanwhile, it is necessary that, as it is in questions 1.1 and 2.3, distinction be made between checking up and evaluating of relatively differentiated students' knowledge and skills (classifying of plant and animal specimen – determining of productivity, density, biomass).

Practical Test – Answer key
II. Section. Biodiversity

Task 1

Genus	Combination of morphological features					No
	shape	thickness	surface	colour	H/W	
PATELLA	1a	2b	3a	4b	5b	10
RAPANA	1c	2b	3b	4b	5a	7
PLANORBISS (CORETUS)	1b	2a	3a	4b	5a	9
HELIX	1c	2a	3a	4b	5a	8
ZEBRINA	1d	2a	3a	4a	5a	11
HELICELLA	1b	2a	3a	4a	5a	12

Task 2

Genus	Combination of morphological features					No
	teeth apparatus	share	sculpture	colour	luster	
CUNEARCA	1a	2b	3c	4a	5b	3,5
DONAX	1b	2b	3a	4a	5a	4
CARDIUM	1b	2a	3c	4a	5b	-
MYA	1c	2b	3a	4a	5b	6
MYTILUS	1d	2c	3a	4b	5b	1
OSTREA	1d	2a	3b	4a	5b	2

11 answers x 3 pts. = 33 pts.

III. Section. Phytoecology

Task 1

PLANT GROUP	QUANTITATIVE PARTICIPATION OF PLANT GROUPS		WIEGHT OF EACH GROUP	PRIMARY PRODUCTION
	NUMBER OF INDIVIDUALS	%		
GRASSES	6 (2 pts)	35.0-35.3 (1 pts)	X	X/100 (1 pts)
LEGUMES	5 (2 pts)	29.0-29.4 (1 pts)	Y	Y/100 (1 pts)
COMPOSITES	4 (2 pts)	23.5-24.0 (1 pts)	Z	Z/100 (1 pts)
UMBELLIFERS	2 (2 pts)	11.8-12.0 (1 pts)	n	n/100 (1 pts)

Forage value: very good (–), good (+), average (–), (4 pts.)

IV. Section. Zooecology

Task 1

Phila	Clases	Number of individuals	% of the sample
Worms (Vermes)	Bristle-footed worms (Oligochaeta)	4	26.7-27.0
Molluscs (Mollusca)	Naked snails (Gastropoda)	2	13.0-13.3
Arthropods (Arthropoda)	Crustaceans (Crustacea)	5	33.0-33.3
	Multipedes (Myriapoda)	1	6.7-7.0
	Insects (Insecta)	3	20

5 ans. x 2 pts. = 10 pts. 5 ans. x 1 pt. = 5 pts.

Task 2

Classes	Number pwr sq m	Weight (g)	Biomass g/sq m
Bristle-footed worms (Oligochaeta)	4x4 == 16	a	a x 4
Naked snails (Gastropoda)	2x4 = 8	b	b x 4
Multipedes (Myriapoda)	1x4 = 4	c	c x 4
Crustaceans (Crustacea)	5x4 = 20	d	d x 4
Insects (Insecta)	3x4 = 12	e	e x 4

5 ans. x 2 pts. = 10 pts. 5 ans. x 2 pts. = 10 pts.

I. Section: Cytology and Histology

Task 1.1.

A(-)	B(+)	C(+)	D(-)	E(-)	F(+)	G(-)	H(+)
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5

Task 2.1.	C	3.0	Task 2.2.	C	3.0
Task 3.1.	D	3.0	Task 3.2.	B	3.0
Task 4.1.	B	3.0	Task 4.2.	C	3.0
Task 4.3.	A	3.0	Task 4.4.	B	3.0

12 ans. x 3 pts. = 36 pts.

Correlation index values (R), between the students' achievements in every section of the competition and the final stages of the entire group ranking, as well as the "bright" and "poor" groups of the final results are represented on **Table 14**.

The achievements of the Practical Test Total (Pr. T; R = 0.85) correlate, to the greatest extent in the final results, concerning the group as a whole. The correlating valuesof every section are, in particular, $0.47 \geq R \geq 0.69$. The Theoretical Test-Total achievements are of considerable correlation (Th. T; R = 0.44) as well, as for Part B – R = 0.63 and for Part A – R = 0.33.

As for "bright" students-final results (the first 21 students that have been awarded golden and silver medals), the results of Practical Test (R = 0.61) correlate to the greatest extent. The Section I (R = 0.53) and Section III (R = 0.39) correlation indexes are also high. The Section IV results (R = 0.0033) correlate poorly. As for the same group of prize winners, the Theoretical Test correlation indexes (R = 0.51), as well as the Th. A. ones (R = 0.53) are also high. The Th. B correlative index is low (R = 0.14).

The Th. A. results correlate to a great extent, with the results of the group as a whole, as for Th. T (R = 0.98), as well as with the "bright" students results in Th. T (R = 0.98).

Discrimination index D varies between -1 and +1. D = 0 means: bright and poor students perform equally; D < 0 means: poor students answer this question better than the bright students; D > 0 means: bright students answer this question better than poor students. Discrimination index part A questions for "bright" and "poor" groups final results is represented on **Table 15**.

Good discriminating questions with $D \geq 0.05$ were: Nos 8, 11, 12, 17, 21, 29, 31, 49, 53, 55, 56, 61, 62, 86, 115. The best were Nos 17 and 29 (both of D = 0.19). Poor discriminating questions are: 41, 51, 67, 99, ,109, 110.

Discrimination index of part A questions for "bright" and "poor" groups of the results from the part A are represented on **Table 16**. Tricky questions were Nos 28, 34, 42, 51, 58, 59, 68, 85, 110 ($-0.19 \leq D \leq -0.24$); question No 51 of D = -0.29 was really very tricky. Good discriminating questions with $0.14 < D < 0.24$ were: Nos 17, 20, 52, 77, 84, 86, 108, 115.

Theoretical Test, Part A, is, as a whole, of high content validity (corresponds to the national teams training in the regulated fields of Biology), but most of the questions are of poor or none discriminating power.

Correlation index values (R) between the achievements of the students on the questions of part B and the final ranking stages are represented on **Table 17**.

The Theoretical Test, Part B results (Th. B), to a fair extent, correlate, as a whole, with the Th. T. group results (R = 0.39) and with the bright students Th. T. results R = 0.54.

Figure 7. Theoretical Test

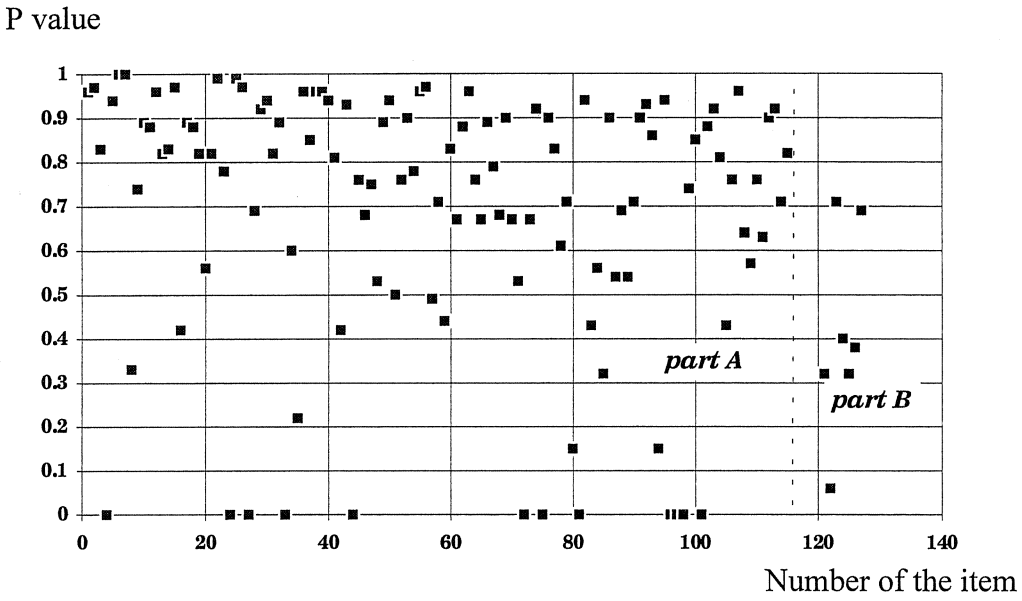


Table 12. Theoretical test, part A: % of correct answers

No Question	%	No Question	%	No Question	%	No Question	%
80	15.28	61	66.67	115	81.94	113	91.67
94	15.28	73	68.06	3	83.33	43	93.06
35	20.83	90	68.06	14	83.33	92	93.06
85	29.17	28	69.44	60	83.33	5	94.44
16	40.28	68	69.44	77	83.33	30	94.44
42	41.67	88	69.44	37	84.72	40	94.44
105	43.06	79	70.83	18	86.11	82	94.44
59	44.44	114	70.83	93	86.11	95	94.44
83	44.44	58	72.22	100	86.11	1	95.83
57	47.22	99	72.22	11	87.50	12	95.83
8	50.00	9	73.61	49	87.50	36	95.83
51	50.00	45	75.00	62	87.50	38	95.83
71	51.39	47	75.00	102	87.50	39	95.83
48	52.78	52	76.39	10	88.89	50	95.83
87	52.78	54	76.39	17	88.89	63	95.83
20	54.17	64	76.39	32	88.89	107	95.83
84	54.17	67	76.39	66	88.89	2	97.22
34	56.94	106	76.39	29	90.28	15	97.22
89	56.94	110	76.39	53	90.28	22	97.22
109	56.94	23	77.78	69	90.28	26	97.22
78	62.50	41	80.56	76	90.28	55	97.22
111	62.50	104	80.56	86	90.28	56	97.22
108	63.89	13	81.94	91	90.28	7	98.61
65	65.28	19	81.94	112	90.28	25	98.61
70	65.28	21	81.94	74	91.67	6	100.00
46	66.67	31	81.94	103	91.67		

Table 13. Theoretical test, part A: students answers

No. Item	A	B	C	D	E	Number of answers	%
1	0	1	1	1	0	69	95.83
2	0	0	0	2	0	70	97.22
3	0	1	11	0	0	60	83.33
4	0	0	0	0	0	0	0.00
5	1	0	0	3	0	68	94.44
6	0	0	0	0	0	72	100.00
7	1	0	0	0	0	71	98.61
8	26	0	4	6	0	36	50.00
9	6	3	10	0	0	53	73.61
10	1	0	3	0	4	64	88.89
11	0	2	5	2	0	63	87.50
12	2	0	0	1	0	69	95.83
13	7	2	0	4	0	59	81.94
14	6	1	0	5	0	60	83.33
15	0	1	0	1	0	70	97.22
16	6	27	0	10	0	29	40.28
17	0	0	3	5	0	64	88.89
18	0	1	6	3	0	62	86.11
19	0	1	3	8	1	59	81.94
20	0	12	3	18	0	39	54.17
21	6	4	0	3	0	59	81.94
22	1	0	0	0	0	70	97.22
23	1	0	13	2	0	56	77.78
24	0	0	0	0	0	0	0.00
25	0	0	0	1	0	71	98.61
26	1	0	1	0	0	70	97.22
27	0	0	0	0	0	0	0.00
28	22	0	0	0	0	50	69.44
29	3	0	3	1	0	65	90.28
30	0	4	0	0	0	68	94.44
31	10	0	0	3	0	59	81.94
32	5	0	2	1	0	64	88.89
33	0	0	0	0	0	0	0.00
34	9	5	0	17	0	41	56.94
35	9	16	0	32	0	15	20.83
36	1	0	2	0	0	69	95.83
37	0	7	1	3	0	61	84.72
38	2	0	0	1	0	69	95.83
39	0	0	1	1	1	69	95.83
40	0	0	1	2	1	68	94.44
41	6	4	0	4	0	58	80.56

No. Item	A	B	C	D	E	Number of answers	%
42	0	0	0	2	40	30	41.67
43	0	5	0	0	0	67	93.06
44	0	0	0	0	0	0	0.00
45	7	8	3	0	0	54	75.00
46	3	9	0	12	0	48	66.67
47	4	1	5	0	8	54	75.00
48	1	5	0	27	1	38	52.78
49	0	0	2	5	2	63	87.50
50	2	1	0	0	0	69	95.83
51	0	30	0	5	0	36	50.00
52	8	2	7	0	0	55	76.39
53	3	3	1	0	0	65	90.28
54	1	0	0	15	1	55	76.39
55	0	0	2	0	0	70	97.22
56	0	1	0	1	0	70	97.22
57	11	4	0	23	0	34	47.22
58	6	5	8	1	0	52	72.22
59	6	13	21	0	0	32	44.44
60	0	7	0	4	1	60	83.33
61	10	11	3	0	0	48	66.67
62	8	0	0	1	0	63	87.50
63	3	0	0	0	0	69	95.83
64	0	12	5	0	0	55	76.39
65	2	9	0	13	0	47	65.28
66	2	4	0	2	0	64	88.89
67	2	0	8	7	0	55	76.39
68	7	0	9	6	0	50	69.44
69	1	4	2	0	0	65	90.28
70	7	10	8	0	0	47	65.28
71	21	12	0	2	0	37	51.39
72	0	0	0	0	0	0	0.00
73	5	16	2	0	0	49	68.06
74	0	0	0	5	1	66	91.67
75	0	0	0	0	0	0	0.00
76	2	0	4	0	0	65	90.28
77	1	0	11	0	0	60	83.33
78	3	11	13	0	0	45	62.50
79	1	6	0	14	0	51	70.83
80	25	7	10	0	19	11	15.28
81	0	0	0	0	0	0	0.00
82	2	1	0	0	0	68	94.44

No. Item	A	B	C	D	E	Number of answers	%
83	1	22	0	0	17	32	44.44
84	12	2	2	0	16	39	54.17
85	22	0	14	15	0	21	29.17
86	0	0	7	0	0	65	90.28
87	0	5	10	19	0	38	52.78
88	12	2	8	0	0	50	69.44
89	0	5	16	10	0	41	56.94
90	1	1	0	19	0	49	68.06
91	3	3	0	1	0	65	90.28
92	0	3	0	2	0	67	93.06
93	1	0	9	0	0	62	86.11
94	5	28	3	0	25	11	15.28
95	3	0	0	1	0	68	94.44
96	0	0	0	0	0	0	0.00
97	0	0	0	0	0	0	0.00
98	0	0	0	0	0	0	0.00
99	0	9	2	9	0	52	72.22
100	0	1	7	2	0	62	86.11
101	0	0	0	0	0	0	0.00
102	1	0	0	0	8	63	87.50
103	0	0	2	4	0	66	91.67
104	3	5	2	0	4	58	80.56
105	14	18	9	0	0	31	43.06
106	4	1	11	0	0	55	76.39
107	3	0	0	0	0	69	95.83
108	8	5	13	0	0	46	63.89
109	6	0	11	7	7	41	56.94
110	0	2	0	15	0	55	76.39
111	9	0	16	2	0	45	62.50
112	0	0	0	2	5	65	90.28
113	4	0	2	0	0	66	91.67
114	12	8	1	0	0	51	70.83
115	1	0	12	0	0	59	81.94

Considerable degree of correlation ($0.34 \geq R \geq 0.66$), for the group as a whole, is ascertained between the results of questions Nos 1, 2, 3, 6 and the Th. B. and final results ranking (the same questions results correlate with the Pr. T. results: $0.26 > R > 0.53$). The values of the remaining questions – Nos 4, 5, 7 – are positive ($0.13 > R > 0.40$).

Meanwhile, the Th. B. correlation degree in the bright group is high only for question Nos 1, 5, 6, 7 ($0.30 > R > 0.73$), whereas it is low (No 2), as far as the rest are concerned, or $R < 0$ (No 4). The bright group final results degree of correlation is fair only for question No 7 ($R = 0.22$), for question Nos 2 and 4 it is low, and for No 1 and 6 $R < 0$. The former data indicate that the necessary level of correspondence has not been achieved, in compliance with the constructive validity of the subtest questions, as well as between the subtests. The latter are not orientated and adequate enough for the knowledge system, intellectual and practical skills of the students, in order to differentiate in one direction the "bright" and the "poor" groups.

Comparatively fair is No 7. Its results correlate with the whole group final results, in Th. T., Th. B, Th. A, and Pr. T, as well as with the "bright" group final results in Th. T., Th. B, Th. A.

Questions No 2, 4, and 6 are good and their results correlate with the group as a whole, in the final results; with the Th. T., Th. B, Th. A, Pr. T. They also correlate with the "bright" group final results, but not at every stage of the competition,

Discrimination Index (D) and diffculty (p) for questions of Part B – "bright" and "poor" group final results, are represented on Table 18, 19, 20 and 21.

The degree of difficulty of the Part B seven questions is fair ($26 \geq p \geq 93$) if taking in mind the correct and complete students' answers only – of the "bright" and "poor" groups. Summarizing the completely correct with the incompletely correct answers, only the Nos 2 and 6 questions' values are fair ($p = 26$; $p = 69$). 3 of the "bright" students have answered question No 2 correctly and completely, 17 have answered correctly but incompletely and 1 has answered wrongfully. Neither student of the "poor" group has answered correctly and completely, 11 have answered correctly but incompletely, and 10 have answered wrongfully. The question No 2 discriminating power, with regards to only complete and correct answers, isn't very high ($D = 0.14$) – considering the existence of correct but incomplete answers – $D = 0.43$. Question No 6 is of high degree of difficulty ($p = 69$) and discriminating power ($D = 0.43$). 11 of the "bright" students have answered correctly and completely question No 6, 10 have answered wrongfully. Only 2 students of the "poor" group have answered question No 6 correctly and completely, the remaining 19 have answered wrongfully.

Theoretical Test, Part B, as a whole, contributes considerably to the students differentiation. It is necessary that problems of such difficulty and structure are of greater number, and their

Table 14. Correlation index (R) values of the student's achievements throughout all competition stages and the final stage of ranking for the whole group, for "bright" and "poor" groups of final results)

Section, part or test		Student No. from-to		R	Section, part or test		Student No. from-to		R
I	Pr.T	0	72	0.6044	Pr.T	Th.T	0	72	-0.0946
I	Pr.T	0	21	0.6007	Pr.T	Th.T	0	21	-0.3707
I	Pr.T	51	72	0.3057	Pr.T	Th.T	51	72	-0.8477
I	Final	0	72	0.6727	Pr.T	Final	0	72	0.8526
I	Final	0	21	0.5288	Pr.T	Final	0	21	0.6111
I	Final	51	72	0.5006	Pr.T	Final	51	72	0.6467
II	Pr.T	0	72	0.6128	Th.A	Th.B	0	72	0.2016
II	Pr.T	0	21	-0.0106	Th.A	Th.B	0	21	0.3549
II	Pr.T	51	72	0.5486	Th.A	Th.B	51	72	-0.1351
II	Final	0	72	0.4743	Th.A	Th.T	0	72	0.9801
II	Final	0	21	0.1096	Th.A	Th.T	0	21	0.9776
II	Final	51	72	0.2791	Th.A	Th.T	51	72	0.9921
III	Pr.T	0	72	0.7660	Th.A	Final	0	72	0.3320
III	Pr.T	0	21	0.8500	Th.A	Final	0	21	0.5321
III	Pr.T	51	72	0.6569	Th.A	Final	51	72	-0.1825
III	Final	0	72	0.6918	Th.B	Th.T	0	72	0.3921
III	Final	0	21	0.3932	Th.B	Th.T	0	21	0.5439
III	Final	51	72	0.3841	Th.B	Th.T	51	72	-0.0094
IV	Pr.T	0	72	0.8224	Th.B	Final	0	72	0.6307
IV	Pr.T	0	21	0.1932	Th.B	Final	0	21	0.1380
IV	Pr.T	51	72	0.8055	Th.B	Final	51	72	0.3191
IV	Final	0	72	0.6055	Th.T	Final	0	72	0.4397
IV	Final	0	21	0.0033	Th.T	Final	0	21	0.5087
IV	Final	51	72	0.4325	Th.T	Final	51	72	-0.1436

Table 15. Discrimination index (D) for part A questions: "bright" and "poor" groups of the final results

No. of question	Discriminative power D	Number of students bright	poor	overall
1.	0.05	21	20	41
2.	0.00	20	20	40
3.	0.00	17	17	34
4.				
5.	-0.05	20	21	41
6.	0.00	21	21	42
7.	0.00	21	21	42
8.	0.14	13	10	23
9.	-0.05	16	17	33
10.	-0.10	18	20	38
11.	0.10	20	18	38
12.	0.10	21	19	40
13.	-0.10	16	18	34
14.	-0.14	16	19	35
15.	-0.05	20	21	41
16.	0.05	9	8	17
17.	0.19	21	17	38
18.	-0.14	17	20	37
19.	-0.05	18	19	37
20.	-0.10	10	12	22
21.	0.10	19	17	36
22.	0.00	21	21	42
23.	-0.10	16	18	34
24.				
25.	0.00	21	21	42
26.	-0.10	19	21	40
27.				
28.	0.14	17	14	31
29.	0.19	21	17	38
30.	-0.05	20	21	41
31.	0.10	19	17	36
32.	-0.14	18	21	39
33.				
34.	0.05	15	14	29
35.	-0.05	4	5	9
36.	0.00	21	21	42
37.	0.00	18	18	36
38.	0.00	20	20	40
39.	-0.05	20	21	41
40.	0.00	21	21	42
41.	-0.29	14	20	34
42.	-0.05	10	11	21
43.	-0.05	18	19	37
44.				
45.	0.05	17	16	33
46.	-0.05	13	14	27
47.	0.00	17	17	34
48.	-0.05	11	12	23
49.	0.14	20	17	37
50.	0.00	20	20	40
51.	-0.19	9	13	22
52.	-0.14	14	17	31
53.	0.05	19	18	37
54.	-0.10	15	17	32
55.	0.05	21	20	41
56.	0.10	21	19	40
57.	0.14	12	9	21
58.	-0.14	14	17	31
59.	-0.10	9	11	20
60.	-0.14	17	20	37
61.	0.05	15	14	29
62.	0.05	19	18	37
63.	0.05	21	20	41
64.	-0.14	14	17	31
65.	-0.05	13	14	27
66.	-0.10	19	21	40
67.	-0.19	14	18	32
68.	0.00	14	14	28
69.	-0.10	18	20	38
70.	-0.10	13	15	28
71.	-0.10	9	11	20
72.				
73.	-0.14	13	16	29
74.	-0.05	19	20	39
75.				
76.	-0.05	19	20	39
77.	0.00	18	18	36
78.	0.00	12	12	24
79.	-0.14	13	16	29
80.	0.10	4	2	6
81.				
82.	-0.05	19	20	39
83.	-0.10	10	12	22
84.	-0.05	12	13	25
85.	-0.05	6	7	13
86.	0.05	19	18	37
87.	0.10	12	10	22
88.	-0.10	15	17	32
89.	-0.05	12	13	25
90.	-0.05	14	15	29
91.	0.00	19	19	38
92.	0.00	20	20	40
93.	-0.05	17	18	35
94.	0.00	3	3	6
95.	-0.05	20	21	41
96.				
97.				
98.				
99.	-0.19	14	18	32
100.	-0.05	18	19	37
101.				
102.	0.05	19	18	37
103.	-0.05	19	20	39
104.	0.14	19	16	35
105.	-0.05	9	10	19
106.	0.10	18	16	34
107.	0.00	20	20	40
108.	0.00	14	14	28
109.	-0.24	10	15	25
110.	-0.24	14	19	33
111.	0.10	15	13	28
112.	-0.14	17	20	37
113.	0.00	21	21	42
114.	-0.05	15	16	31
115.	0.14	20	17	37

Table 16. Discrimination index (D) for part A questions: "bright" and "poor" groups of the results Theoretical test, part A.

No. of question	Discriminative power D	Number of students bright	poor	overall
1.	0.00	20	20	40
2.	0.05	21	20	41
3.	0.00	16	16	32
4.				
5.	0.05	21	20	41
6.	0.00	21	21	42
7.	-0.05	20	21	41
8.	0.00	12	12	24
9.	0.05	15	14	29
10.	-0.05	18	19	37
11.	0.00	17	17	34
12.	0.05	21	20	41
13.	-0.14	16	19	35
14.	-0.14	15	18	33
15.	-0.10	19	21	40
16.	-0.10	6	8	14
17.	0.19	20	16	36
18.	-0.14	17	20	37
19.	-0.10	16	18	34
20.	0.24	13	8	21
21.	0.00	17	17	34
22.	0.00	20	20	40
23.	0.05	16	15	31
24.				
25.	-0.05	20	21	41
26.	-0.10	19	21	40
27.				
28.	-0.19	12	16	28
29.	0.10	20	18	38
30.	0.00	20	20	40
31.	0.00	17	17	34
32.	-0.10	17	19	36
33.				
34.	-0.24	9	14	23
35.	-0.05	5	6	11
36.	-0.05	19	20	39
37.	-0.05	16	17	33
38.	0.00	20	20	40
39.	-0.10	19	21	40
40.	-0.10	19	21	40
41.	0.10	18	16	34
42.	-0.19	7	11	18
43.	0.00	19	19	38
44.				
45.	-0.14	15	18	33
46.	-0.10	13	15	28
47.	-0.10	14	16	30
48.	-0.14	10	13	23
49.	-0.05	19	20	39
50.	0.05	21	20	41
51.	-0.29	7	13	20
52.	0.19	16	12	28
53.	0.10	20	18	38
54.	-0.19	14	18	32
55.	0.10	21	19	40
56.	0.00	21	21	42
57.	-0.14	9	12	21
58.	-0.24	12	17	29
59.	-0.24	5	10	15
60.	-0.10	16	18	34
61.	0.10	16	14	30
62.	0.10	19	17	36
63.	0.00	20	20	40
64.	0.10	17	15	32
65.	0.00	13	13	26
66.	-0.14	17	20	37
67.	-0.10	16	18	34
68.	-0.24	12	17	29
69.	-0.10	18	20	38
70.	-0.10	11	13	24
71.	0.05	10	9	19
72.				
73.	0.10	15	13	28
74.	0.00	19	19	38
75.				
76.	0.00	19	19	38
77.	0.14	18	15	33
78.	-0.05	13	14	27
79.	-0.05	14	15	29
80.	-0.05	3	4	7
81.				
82.	0.05	20	19	39
83.	-0.05	9	10	19
84.	0.19	12	8	20
85.	-0.19	6	10	16
86.	0.19	21	17	38
87.	-0.10	10	12	22
88.	-0.14	13	16	29
89.	-0.10	11	13	24
90.	0.00	14	14	28
91.	0.00	19	19	38
92.	0.10	21	19	40
93.	0.05	19	18	37
94.	0.10	4	2	6
95.	0.10	21	19	40
96.				
97.				
98.				
99.	-0.10	13	15	28
100.	-0.10	17	19	36
101.				
102.	0.00	18	18	36
103.	-0.10	17	19	36
104.	-0.05	17	18	35
105.	-0.05	9	10	19
106.	-0.05	15	16	31
107.	0.05	20	19	39
108.	0.14	14	11	25
109.	-0.10	11	13	24
110.	-0.24	14	19	33
111.	-0.05	12	13	25
112.	-0.05	18	19	37
113.	-0.14	18	21	39
114.	0.05	14	13	27
115.	0.14	19	16	35

Table 17. Correlation index (R) values between the achievements of the students on the questions of Part B and the final ranking stages: for the whole group, for "bright" and "poor" group of the final results

No. quest.	Part or test	Student No. from-to		R
1	Th.A	0	72	0.0148
1	Th.A	0	21	-0.1120
1	Th.A	51	72	-0.2678
1	Th.B	0	72	0.5371
1	Th.B	0	21	0.3098
1	Th.B	51	72	0.6954
1	Th.T	0	72	0.1228
1	Th.T	0	21	-0.0307
1	Th.T	51	72	-0.1820
1	Final	0	72	0.4693
1	Final	0	21	-0.1339
1	Final	51	72	0.5304
2	Th.A	0	72	0.1263
2	Th.A	0	21	-0.0087
2	Th.A	51	72	-0.0601
2	Th.B	0	72	0.4516
2	Th.B	0	21	0.0351
2	Th.B	51	72	0.5973
2	Th.T	0	72	0.2102
2	Th.T	0	21	0.0001
2	Th.T	51	72	0.0152
2	Final	0	72	0.4668
2	Final	0	21	0.0852
2	Final	51	72	0.2681
3	Th.A	0	72	-0.0313
	Variable row has equal values			
3	Th.A	51	72	-0.4350
3	Th.B	0	72	0.4536
	Variable row has equal values			
3	Th.B	51	72	0.4337
3	Th.T	0	72	0.0626
	Variable row has equal values			
3	Th.T	51	72	-0.3840
3	Final	0	72	0.5132
	Variable row has equal values			
3	Final	51	72	0.4615
4	Th.A	0	72	0.2972
4	Th.A	0	21	0.3662
4	Th.A	51	72	0.3283
4	Th.B	0	72	0.1935
4	Th.B	0	21	-0.0805
4	Th.B	51	72	0.0412
4	Th.T	0	72	0.3183
4	Th.T	0	21	0.3106
4	Th.T	51	72	0.3366
4	Final	0	72	0.1840
4	Final	0	21	0.0609
4	Final	51	72	0.1052
5	Th.A	0	72	-0.0901
5	Th.A	0	21	0.1101
5	Th.A	51	72	-0.2834
5	Th.B	0	72	0.3999
5	Th.B	0	21	0.2973
5	Th.B	51	72	0.2051
5	Th.T	0	72	-0.0036
5	Th.T	0	21	0.1658
5	Th.T	51	72	-0.2600
5	Final	0	72	0.1290
5	Final	0	21	-0.2003
5	Final	51	72	0.3555
6	Th.A	0	72	0.0652
6	Th.A	0	21	0.1064
6	Th.A	51	72	-0.1243
6	Th.B	0	72	0.6636
6	Th.B	0	21	0.7336
6	Th.B	51	72	0.6229
6	Th.T	0	72	0.1958
6	Th.T	0	21	0.2608
6	Th.T	51	72	-0.0464
6	Final	0	72	0.3391
6	Final	0	21	-0.0080
6	Final	51	72	-0.0954
7	Th.A	0	72	0.2214
7	Th.A	0	21	0.3219
7	Th.A	51	72	0.3292
7	Th.B	0	72	0.1895
7	Th.B	0	21	0.3188
7	Th.B	51	72	0.2954
7	Th.T	0	72	0.2463
7	Th.T	0	21	0.3608
7	Th.T	51	72	0.3698
7	Final	0	72	0.1557
7	Final	0	21	0.2170
7	Final	51	72	0.0078

solutions, respectively, to ensure higher percentage of the theoretical test total scores.
The achievements of each of the four sections correlate with the Pr. T. result ($0.61 > R > 0.82$), with regard to the whole group of students. Higher degrees of correlation are observed between the achievements of Sections I and III and the Pr. T. results ($R = 0.60$; $R = 0.85$), as far as the "bright" students are concerned. The achievements of Sections IV correlate poorly, and those of Section II have negative correlation.
The practical and theoretical test are supplementary with regard to their contents – they check on the students' knowledge and skills in the various fields: the values, reflecting correlation between the Pr. T. and the Th. T. achievements are negative.
The students' achievements vary, as a result of the kind of preliminary training the participants have had.

Discrimination index (D) and difficulty (P) values for the questions of Part B: "bright" and "poor" groups of the final results

Table 18

No. quest.	Difficulty /p/	number of students bright	poor	overall
1.	59.52	13	4	17
2.	92.86	3	0	3
3.	26.19	21	10	31
4.	57.14	11	7	18
5.	73.81	7	4	11
6.	69.05	11	2	13
7.	28.57	17	13	30

Table 19

No. quest.	Difficulty /p/	number of students bright	poor	overall
1.	7.14	21	18	39
2.	26.19	20	11	31
3.	0.00	21	21	42
4.	2.38	21	20	41
5.	0.00	21	21	42
6.	69.05	11	2	13
7.	2.38	20	21	41

Table 20

No. quest.	Discr. index D	number of students bright	poor	overall
1.	0.43	13	4	17
2.	0.14	3	0	3
3.	0.52	21	10	31
4.	0.19	11	7	18
5.	0.14	7	4	11
6.	0.43	11	2	13
7.	0.19	17	13	30

Table 21

No. quest.	Discr. index D	number of students bright	poor	overall
1.	0.14	21	18	39
2.	0.43	20	11	31
3.	0.00	21	21	42
4.	0.05	21	20	41
5.	0.00	21	21	42
6.	0.43	11	2	13
7.	-0.05	20	21	41

Participation number and name of each student, followed by a code for each question.

.	correct answer
*	skipped question
-	not answered
A, B, C, D, or E	incorrect answer

1	Katherine Sophla	...*.....E	..A..B...D	B..*.A*A..	..*DB.....	..B*..ED..	BA.D..A.C.
		....A.DC.B	B*B.*.....	*..EA...D.	...C.***..	*...B...D.	C..B.
2	Samil	...*......	.....B....	...*..*...	..*.D.....	.E.*...D..	B..D....B.
		....	.*B.*....A	*...A.D..D	...B.***..	*........D	.....
3	Sophie	...*....C.	..DD.....B	...*.C*...	.A*DD.....	D..*BD....	B.....AAD
		...BDBDDCA	.*..*...DE	*.BCC.....	..CB.***DC	*.DEB.....	AE...
4	Elena	...*....A.	.........D	...*..*...	..*.....	...*.....	.....D...
		...C..C..C	A*.D*....E	*.BACC..C.	...E.***..	*...B..CD.	C....
5	Vencislava	...*...A..	...A.D...D	...*..*...	..*.B.B...	...*.....	.....B.C.
		...B.....	B*..*..B.C	*...C...D.	.....***..	*...A..AED	.D...
6	Wang	...*.....	.......C..	...*..*...	..*.B.....	.E.*.....	B.....DA..
		B.....C...	A*..*.C.DA	*.E.D...C.	...B.***..	*...B.....	.....
7	Adam	...*...A..	.....D...B	...*..*...	..*.D.....	...*...D..	.....C.
		....B.....	B*..*..B.E	*.BB....DD	...E.***..	*...C..CA.	...B.
8	Robert	...*...A..	..A....C.B	...*..*..B	DC*.....	BE.*.B.D..	.ABD...D.B
		....A..D..	A*B.*..C..	*.EE..CA..	.....***D.	*....CABD.	...B.
9	Saken	...*.....	.....B..D.	...*..*...	..*.D.....	.E.*A..D..	B.....B.
		....	.*B.*....A	*.....D..D	...BA***..	*.....	.....
10	Roustam	.D.*.....	.....B....	...*..*...	..*.B.....	.E.*...D..	B..D....B.
		....	.*B.*....A	*..E..D..D	...B.***..	*.....	.D...
11	Edith	...*.....	.........D	...*..*...	A.*BA.....	BE.*.....	BC....A...
		B.....D..A	B*..*.C.DA	*AB.A..A..	.BCE.***BC	*.....C..	A..A.
12	Bogdan	..C*....C.	....	...*..*...	..*.D.D...	...*.....	...D.....
		....B....B	A*..*.....	*.....	...E.***..	*.....A.	C
13	Denis	..B*...DC.	..A..D...B	...*..*A..	..*BB.....	AE.*.D....	DC.....AC.
		BA..B..A..	.*..*.CB.B	*..EC.D.C.	.....***..	*..ABC.CED	.....
14	Ivor	...*....C.	...ADA....	..C*..*...	..*A....D.	.EB*BBE...	.C....AAAD
		B..BD.C..B	.*..*-.C..	*.B.C.CACD	...C.***B.	*.D.B...C.	.....
15	Pontus	...*...D..	B........B	..C*..*...	.A*.....	DE.*...D..	.A....D...
		B.........	B*A.*C.B.A	*.E.D..AB.	A.CE.***..	*...B...CD	.....
16	Yodyind	...*...A..	.......DD	A.D*..*A..	..*.D.....	...*.B....	B.....ABC.
		....	A*..*...DC	*..C...A..	...B.***..	*.....B	.....
17	Hikmet	..C*...A..	.....D....	...*..*...	..*DD.....	.E.*.B.D..	D.....A...
		.......A..	A*AD*...BC	*.BEC.....	...E.***D.	*A..A.....	.....
18	Maksim	...*.....E	....	..D*..*...	..*.D.BD..	...*..E...	..C.....
		...B...C.C	B*B.*..CBC	*.B.A...CA	...B.***D.	*.....C..	...A.
20	Lachlan Eills	..C*...A.C	...D.D....	..C*..*A..	..*.B.....	A..*.DE...	BC.....CC.
		A..B....AA	.*..*..BAC	*B..ACCA..	B..B.***..	*...AC..CD	C..A.
21	Mehman	...*.....	.....B.DD.	...*..*...	..*.D.....	.E.*C..D..	B..D....B.
		....	.*..*....A	*...C.D..D	...B.***..	*.....	.....
22	Luc	...*A.....	..DB.B.D.D	...*..*...	..*.D.....	A.B*.D.DDA	.....D
		.A.BBADCC.	.*..*..CDB	*.B.A.D...	..CA.***BC	*E..C...CD	DE...
23	Sergei S.	...*...ACE	C....AD..D	A*C*..*A..	..*DA.....	.E.*B.A....	..A.C.....
		.A.C.B....	A*.E*AC.BA	*..ED.C.C.	...E.***..	*...C..C..	.....
24	Diliana	B..*...ABA	....	...*..*...	..*.B.C.E.	.E.*...D..	...D..D.C.
		.....B...B	A*..*....C	*-E.....C.	...B.***..	*..A.B.CED	A...C
25	Zhou	...*...A..	....	...*..*...	..*.B.....	...*.....	.....
		....	A*..*....B	*.E.D...C.	...E.***D.	*...B.....	.....
26	Jan	...*D..CC.	...D.....	..C*..*...	..*BA....D	...*BD.B..	.C....D..B
		....B.....	B*..*.CC..	*.EEA...BD	.DCBA***..	*.....A.	C
27	Henk	..C*.....	C.....CB.	...*..*A..	A.*ADC....	.E.*A.....	B......CCE
		.....D....	.*B.*..B.A	*.EAA.DCC.	...E.***..	*...B...DD	.E.A.
28	Nourbol	...*.....	.....B.DD.	...*..*...	..*DD....E	.E.*...D..	B..D..ABB.
		....	.*..*....A	*...A.B..D	...B.***..	*.....	.....
29	Daniyar	...*.....	.....B....	...*..*...	.C*D.....	.E.*...D..	B..D....B.
		....	.*B.*....A	*...A.D..D	...B.***..	*.....	.....
30	Stefan	...*...AA.	..A.....D	B.C*..*A..	A.*D.....	...*..E.D.	D.....D.C.
		A....DAA..	.*C.*...DE	*.BAA..C..	...B.***.C	*...C..CD.	...AC
31	Liliana	...*...A..	....	..C*..*A..	..*.D.....	...*.....	....
		.........B	.*..*....C	*.E...C...	.....***DC	*.DB.....	C....
32	Vladimir	...*.....	....	...*..*.AB	..*DD....C	...*.B.B..	B......ACB
		B.....C...	.*..*C.CD.	*.E.A.BCC.	...E.***B.	*...C..C.D	C....
33	Michal	...*...A..	.....B...DB	D.C*..*...	A.*AB..A..	...*..CD..	.B....BCC.
		BD.B-.D...	.*A.*..A.E	*.BAC...CD	...EA***..	*EDBB.....	C...C
34	Anders	...*.....	B....B....	...*..*A..	.A*B.C....	.E.*BDA.E.	...D..DACB
		AA....DCBB	A*.D*CCB.A	*.B-D.BA..	B.CC.***..	*....A..CD	C.ABC
35	Chatchawan	...*...A..	.....B...D	...*..*A..	..*.D.....	.E.*.B.D..	.......BB.
		....	A*..*..CD.	*.E....A..	...E.***D.	*...CC..A.	C....
36	Ibrahim Bulent	...*..A...	C....DD...	...*..*...	A.*A.....	.E.*...D..	BA....D...
		....D..D.A	A*..*....E	*.B.D.C.D.	...E.***.C	*E..A..A..	C....

37 Andrei	...*...DB.	....	..C*..*...	..*DB.....	DE.*.....	B.B...D...
	...BD..A..	A*BD*...DE	*.BE.C.AB.	...E.***..	*...C.....	C....
39 Stephen Anthony	..C*...A..	...D.B....	.A.*..*AD.	..*.A....D	AE.*C.A...	B.....D.C.
	A...D..C..	.*..*..BBE	*..A...A..	.....***..	*...A.A...	C.AA.
40 Mahir	...*.....	.....B..D.	...*..*...	..*.D.....	.E.*A..D..	B..D....B.
	B.........	.*B.*....A	*...D.D...	.D.B.***..	*.....	.....
41 Laurent	C..*...A..	....	...*..*...	..*B....C.	AE.*.DA...	B......C..
	.......DBB	.*..*.C..E	*.BAA.....	...A.***..	*..C.....D	A.C..
42 Sergei F.	...*D..ABC	..A..B.CCC	B..*..*AA.	A.*.A.B...	.E.*.B..DB	-A....D.CB
	C..CB.CD.A	.*..*..C.B	*..ACCB.B.	B....***BB	*...AC.CCD	A..B.
43 Petia	...*....C.	.....D...B	D..*..*...	..*.BAD...	.D.*.....	......A.C.
	A..BB....C	B*A.*.....	*.EB......	...B.***..	*.....BE.	.E..C
44 Zhao	...*.....	.........D	...*..*...	..*.B.....	.D.*.....	.....
	.....	A*..*....E	*..E.....D	...B.***C.	*...B.....	C....
45 Tomas	...*D.....	...A..D..C	..A*..*...	.A*DB.....	AE.*.D.D..	.A....D.CD
	BA..D....A	.*B.*.C..A	*.BAA....D	...B.***B.	*...A-..A.	...A.
46 Milena	..C*...CC.	C.DA.B...D	B.C*..*..B	DA*D..B...	.E.*..EDC.	D.....BC.B
	..A.BA...A	A*..*...BB	*.BAC.DCC.	...E.***B.	*...BC.BD.	...A.
47 Akram	...*.....	.....B..E.	...*..*...	..*.D.....	.E.*...D..	B..D....B.
	.....	.*A.*....A	*...A.D..D	...B.***..	*.....	.....
48 Rouslan	...*.....C	.....B.CD.	...*..*...	.D*.D.....	.E.*A..D..	B.......B.
	..A.....	.*B.*....A	*...D.D..B	.B.B.***..	*..E.C....	..A.C
49 Sander	...*...CA.	..A......D	...*..*A..	..*DD.....	.E.*B.E...	B.....D...
	.....B....	.*..*...DA	*.B.C.DC.-	...BD***B.	*..B...AED	...A.
50 Marek	...*...A..	.....BC...	...*..*...	..*.D.....	...*A..D..	......D.A.
	...B.....	.*..*C...E	*.B.D..CC.	.....***..	*E.BA..C..	C
51 Aleksei	...*...A..	.....B...D	...*..*...	..*AB.....	B..*.....	...D..D...
	C	A*..*.....	*..EA...D.	.....***..	*...BC.CC.	.....
52 Tomas	...*....C.	..DABA.BCC	D..*D.*A..	A.*DB.B...	...*.ABB..	BB....D.A.
	A...D.ADBC	B*..*..A..E	*.E....CDD	D..E.***CC	*EC.AA.AD.	A.CA.
53 Marhus	..C*...A..	.A...B...B	...*..*A.B	..*DA.....	BE.*.DC...	.......C..
	A.....C...	.*..*..B.A	*.AAC..B..	..CE.***..	*...B...CD	..AA.
54 Supot	..C*...A..	.....B....	...*..*.C.	..*.D.....	...*..C...	BCB.....C.
	....D.....	A*..*.CCDA	*.E.D.D.C.	.B.B.***D.	*.....	C....
55 Mine	...*...A..	.....B....	...*..*...	..*AD.D...	...*...B..	......A...
	C...D....B	A*..*....B	*...A.C.D.	...A.***.D	*E..AA....	.....
56 Oksana B.	...*...C..	.....D....	...*..*...	D.*.A.....	...*BB....	...D..DC..
	...C..C..C	B*..*...DC	*.B.A.....	.....***..	*....C.CE.	.....
58 Amy Louise	...*.....	.....A...D	...*..*A..	..*AD..A..	...*...DD.	......B.A.
	AA.CD..A.B	A*..*..A.A	*......A..	A....***..	*...B...C.	A..B.
59 Ebutalib	...*.....	.....B....	...*..*...	..*.D.....	.E.*C..D..	B..D....B.
	.....	.*B.*....A	*.....D..D	...B.***..	*.....	.....
60 Benoit	...*...D..	.....BC.D.	...*..*AC.	A.*D.....	.E.*.D....	.....BDCC.
	....B.DAB.	.*.D*..CD.	*ABEA...D.	...E.***..	*..A.....	.....
61 Oksana G.	...*...A.E	...A.....D	...*..*A..	..*.D.....	...*BBE...	..A...D...
	...B.....	D*..*....E	*..ECC....	..AE.***..	*...C...C.	A...C
62 Iana	...*.....	.....	A..*..*...	..*.D.....	...*...DE.	......A.C.
	.....C..C	B*..*..B.C	*.......C-	...A.***..	*...A..AED	C
63 Zheng	...*...D..	.....	A..*..*...	..*.B.....	.E.*..C...	.......B..
	B......C..	.*..*..B.B	*.E.D.D...	...A.***..	*...B.....	C....
64 Pavel	...*.....	.....	...*..*...	..*.....	...*.D....	B...C.D...
	.....A..	.*B.*.....	*.EE.C...D	...E.***..	*..B...BA.	...B.
65 Ralf	...*...A..	.........D	...*..*...	..*.A.....	.E.*.A.B..	B.....D...
	....D.....	.*..*....E	*.EED.CC..	...B.***..	*..EA..A..	.....
66 Bakhytjan	...*.....	..B..B....	...*..*...	..*.D.....	.E.*...E..	B..E....B.
	.....	.*B.*....A	*...A.D..D	...B.***..	*.....	.....
67 Nourbek	...*.....	.....A.C..	...*..*...	..*.D.....	.E.*A..A..	D.AA....B.
	A.....	.*B.*..C.A	*...A.D..D	...B.***..	*.....	DE...
68 Antoine	.DC*...AA.	.AA......B	A.C*..*A..	A.*AD.....	.E.*....C.	.....DD...
	AA..D..C..	.*..*..C.E	*.B.D.B.B.	...E.***..	*..C.A..C.	...A.
69 Radostaw	...*...A..	......D..B	A.C*..*...	..*.D.B...	.E.*A.....	.........C.
	.A.....C..	A*C.*....C	*..ED.....	.....***..	*...C..A..	C....
70 Roman	...*.....	.....D....	...*..*...	..*.....	...*.....	.....
	.....	B*..*....E	*.B.C.....	...E.***..	*...A..B..	.....
71 Katarina	...*...AC.	...D.B...D	...*..*AC.	..*.....	.E.*..CD..	BC....A..B
	C..B...C..	.*..*ACCDA	*..A....DD	..CB.***B.	*...B.....	A....
72 David	..C*....A.	CDB...D..B	...*..*A..	A.*D..B...	D.B*....DA	.........A.
	..A......B	.*..*..A.E	*..A..CBD.	A.CE.***..	*..E.CAA.B	...CA
73 Ing-on	D.C*....A.	D....BC.CB	...*..*AA.	..*DA.....	.E.*.A....	BA....A.C.
	....D.....	D*..*.C.BE	*.....DAC.	...B.***D.	*EC.BC....	C....
74 Ahmet	...*.....	D....D....	...*..*...	..*AD.....	...*.D....	.A....D...
	C	A*..*....A	*..EA.C...	...E.***.D	*E..A.....	C
75 Aleksandar	...*...D..	.....A...D	..C*..*...	..*.D.....	..B*...D..	.......B..
	B.........	.*..*....E	*.E.DC....	...E.***..	*.....	...B.

Hier 75 lln

een
rem.

Distribution of medals

Country	Gold	Silver	Bronze
Russia	2		2
Czech Republic	2		2
Bulgaria	2	1	1
China	1	2	1
Belorussia	1	1	
Poland	1	1	2
Ukraine		2	1
Turkey		1	3
Germany		1	1
Slovakia		1	1
Azerbajan		1	
Belgium		1	
Australia			3
The Netherlands			3
Thailand			2
Sweden			2
Kirghizistan			1
Total	**9**	**12**	**25**

26

vreemde verhouding van de medailles

Russians are forecasting the success is theirs

Nr	Name	Surname	Country	PRACTICAL PART					THEORITICAL PART			FINAL RESULT
				I	II	III	IV	total	A	B	Total	
70	Roman	Ivanov	Russia	36	30	20	35	121	99	12	111	232
12	Bogdan	Jakieta	Poland	36	33	16	35	120	96	8.5	104.5	224.5
64	Pavel	Hulva	Czech Republic	36	30	20	35	121	91	10	101	222
7	Adam	Petrusek	Czech Republic	36	33	20	35	124	86	10.5	96.5	220.5
51	Aleksei	Solovtchenko	Russia	36	30	20	35	121	91	8	99	220
6	Wang	Xiaoting	China	27	33	20	35	115	90	10.6	100.6	215.6
5	Vencislava	Kamenova	Bulgaria	33	30	20	35	118	88	9	97	215
62	Iana	Angelova	Bulgaria	33	30	20	35	118	87	10	97	215
4	Elena	Truchatchova	Belorussia	36	30	20	35	121	85	8.5	93.5	214.5
31	Liliana	Krasinska	Poland	33	33	12	31	109	95	9	104	213
75	Aleksandar	Gorbulitch	Ukraine	36	33	4	35	108	93	11	104	212
55	Mine	Durusu	Turkey	33	27	20	35	115	87	8.1	95.1	210.1
61	Oksana	Grichik	Belorussia	28.5	33	20	35	116.5	83	10.5	93.5	210
24	Diliana	Valentinova	Bulgaria	33	33	20	35	121	79	8.6	87.6	208.6
44	Zhao	Ge xin	China	27	30	12	35	104	96	8.5	104.5	208.5
63	Zheng	Chun yang	China	24	33	12	35	104	91	12	103	207
41	Laurent	Minet	Belgium	30	30	20	35	115	84	8	92	207
18	Maksim	Poliakov	Ukraine	34.5	30	12	35	111.5	85	10	95	206.5
65	Ralf	Kittler	Germany	33	30	12	35	110	87	8.5	95.5	205.5
40	Mahir	Mehdiyev	Azerbaijan	30	30	4	35	99	93	12.5	105.5	204.5
71	Katarina	Linkesova	Slovakia	33	30	20	35	118	77	8.5	85.5	203.5
49	Sender	van Doorn	The Netherlands	30	33	12	35	110	79	10.5	89.5	199.5
25	Zhou	Yan	China	27	33	9	23	92	95	11	106	198
56	Oksana	Breus	Ukraine	36	21	11	35	103	87	8	95	198
11	Edith	Raats	The Netherlands	33	30	12	35	110	78	9	87	197
15	Pontus	Lindorholm	Sweden	33	30	12	31	106	81	9	90	196
8	Robert	Fischer	Germany	27	33	12	35	107	78	11	89	196
14	Ivor	Svetlansky	Slovakia	33	30	20	35	118	69	9	78	196
16	Yodying	Dangprapai	Thailand	30	30	6	31	97	89	8.1	97.1	194.1
50	Marek	Niedoszytko	Poland	33	30	4	35	102	86	5.5	91.5	193.5
69	Radostaw	Tomalski	Poland	25.5	30	11	27	93.5	88	10.6	98.6	192.1
45	Tomas	Valenta	Czech Republic	28.5	30	20	35	113.5	71	7.5	78.5	192
32	Vladimir	Ivanov	Russia	27	33	12	35	107	76	7.1	83.1	190.1
54	Supot	Nimanong	Thailand	27	33	3	35	98	84	8	92	190
58	Amy Louise	Warren	Australia	27	30	4	35	96	82	11.6	93.6	189.6
17	Hikmet	Koseoglu	Turkey	28.5	30	8	31	97.5	83	9.1	92.1	189.6
26	Jan	Mourek	Czech Republic	30	33	9	35	107	77	5.5	82.5	189.5
43	Petia	Zarzalanova	Bulgaria	30	30	20	15	95	82	9	91	186
74	Ahmet	Nalcacioglu	Turkey	27	30	0	35	92	88	5.6	93.6	185.6
1	Katherine Sophla	Bergamaschi	Australia	30	30	8	35	103	74	8.6	82.6	185.6
53	Marhus	Persson	Sweden	25.5	30	8	35	98.5	78	9	87	185.5
36	Ibrahim Bulent	Buttanri	Turkey	30	30	3	35	98	79	8.2	87.2	185.2
10	Roustam	Iminov	Kirghizistan	27	30	10	23	90	92	2.5	94.5	184.5
20	Lachlan Eills	Molony	Australia	28.5	30	12	35	105.5	71	7.6	78.6	184.1
13	Denis	Baev	Russia	30	30	7	35	102	75	7	82	184
68	Antoine	Bos	The Netherlands	16.5	30	20	35	101.5	74	8	82	183.5
35	Chatchawan	Paewsawat	Thailand	25.5	30	8	35	98.5	75	8.5	83.5	182
73	Ing-on	Arunakul	Thailand	30	30	4	35	99	74	7.4	81.4	180.4
72	David	Mjureke	Sweden	24	30	12	35	101	73	6	79	180
30	Stefan	Uitdehaag	The Netherlands	28.5	33	8	33	102.5	70	7	77	179.5
23	Sergei	Semionov	Belorussia	25.5	30	12	35	102.5	73	3.9	76.9	179.4
2	Samil	Sadixov	Azerbaijan	27	30	4	13	74	94	10	104	178
60	Benoit	Lete	Belgium	34.5	30	3	26	93.5	77	6.6	83.6	177.1
42	Sergei	Fedjanin	Belorussia	25.5	30	20	35	110.5	59	7.5	66.5	177
27	Henk	Groth	Germany	27	33	3	35	98	72	6.1	78.1	176.1
33	Michal	Mego	Slovakia	24	30	12	35	101	69	6	75	176
46	Milena	Malonek	Germany	27	33	10	35	105	61	5.6	66.6	171.6
59	Ebutalib	Agayev	Azerbaijan	28.5	30	3	5	66.5	96	6	102	168.5
37	Andrei	Pustovalov	Ukraine	33	24	8	12	77	82	9.5	91.5	168.5
9	Saken	Sherhandy	Kazakhstan	27	15	0	25	67	95	6	101	168
28	Nourbol	Silliedev	Kazakhstan	24	15	3	27	69	91	5.5	96.5	165.5
52	Tomas	Kamensky	Slovakia	30	30	5	35	100	57	5.2	62.2	162.2
47	Akram	Mahmudov	Kazakhstan	24	27	0	10	61	95	5.6	100.6	161.6
39	Stephen Anthony	Rose	Australia	24	15	8	27	74	80	7.4	87.4	161.4
21	Mehman	Mustafajev	Azerbaijan	27	24	0	6	57	94	8	102	159
29	Daniyar	Moukachev	Kirghizistan	18	12	3	27	60	95	4	99	159
34	Anders	Westermark	Sweden	24	30	4	31	89	62	7	69	158
22	Luc	Vandenberghe	Belgium	15	30	0	31	76	68	10	78	154
66	Bakhytjan	Bakhaohtdinov	Kazakhstan	27	24	0	3	54	95	4	99	153
3	Sophie	Vos	Belgium	22.5	30	8	18	78.5	68	5.6	73.6	152.1
48	Rouslan	Koulubaew	Kirghizistan	30	18	3	8	59	86	4.3	90.3	149.3
67	Nourbek	Joussoupov	Kirghizistan	9	30	6	9	54	89	5.5	94.5	148.5
MAXIMUM SCORES POSSIBLE				36	33	20	35	124	111	13	124	248

Gold Medals

Silver Medals

Bronze Medals

51

Hier maar 72 Kln.?
zie blz 49

MINUTES OF THE 9TH MEETING OF COORDINATORS IN VARNA (BULGARIA), JULY 7, 1994

On the regular 9th meeting of coordinators met the following representatives:

1) Coordinators or their deputies of Australia, Azerbaijan, Belgium, Belorussia, Bulgaria, China, Czech Republic, Germany, Kazakhistan, Kirgizhistan, The Netherlands, Poland, Russia, Slovak Republic, Sweden, Thailand, Turkey, Ukraine.

2) Observers of Israel, Kuwait, Latvia, Tadzikhistan, Turkmenhistan

3) Head of IBO Coordinating Centre: J. Machackova

Programme

a) Future Olympiads

b) Action taken on decisions made last year

c) Changes of Organization rules

Discussion

i) Mgr. Machackova spoke to the report of the IBO Coordinating Centre activities and all coordinators received a written summary. Letters had been obtained from Uzbekistan and Australia saying they were unable to hold Olympiads in the near future. This has left the problem of where to hold the 1996 and 1997 Olympiads and this matter would need to be discussed in Prague on ISAB meeting.

The presented report was agreed and accepted.

ii) All countries that have not yet sent their text books were urged to do it immediately. It was also requested that national assessments tasks be sent in as required.

iii) It was recommended to the Coordinating Centre (J. Fronk, Poland) to contact again international organizations.

iv) The Thailand representatives were asked to give an indication of the nature of the practical tasks for the next Olympiad. Thailand said that a committee to look at this issue had only just been assembled and they could provide information as requested in accordance with the Organization Rules. An information package on the next Olympiad was given out.

v) Dr. Ehn (Sweden) suggested that possibility of charter flights to Thailand from Europe should be explored. Dr. Asperges (Belgium) asked that one person be given the responsibility of organizing the charter flights.

vi) J. Fronk said it was important that in future the practical tasks should test problem solving, not the ability to follow a receipt. Dr. Morelis confirmed that this was in fact in the rules even if it was not being followed.

vii) Dr. Asperges suggested that an evening be held at the next Olympiad for showing videos of previous Olympiads.

viii) Dr. Morelis confirmed that countries agreeing to participate in the Olympiad have to hold and Olympiad within 10 years. A total of 6 countries were due to hold Olympiads: Poland, Germany, Belorussia, Belgium, Sweden, Australia. Each of these countries briefly explained their current position. Belgium said that their Prime Minister had agreed in principle to hold a Biology Olympiad in 1998. This were to be confirmed in Thailand.

ix) Dr. Morelis restated the problem of where to hold the 1996 and 1997 Olympiads. Uzbekistan said they would get confirmation at the December ISAB meeting. Dr. Bicik (Czech Republic) said that positive or negative confirmation was needed by the end of September at the latest. Dr. Voogt (Netherlands) said a fast-feedback was needed in case that Uzbekistan cannot confirm.

x) Also China said it might be possible to host an Olympiad in 1997 and would attempt to confirm this also by December. Ukraine then said it might be able to organize the 1996 Olympiad in Kiev though considerable financial difficulties needed to be solved. They promised to confirm this by September.

xi) Dr. Morelis asked that the observer countries (Kuwait, Latvia, Israel, Tadzikhistan and Turkmenhistan) become new members of the IBO. This was agreed to. There was some discussion whether new members should agree to hold an Olympiad in a particular year on joining but it was decided that this would be an unreasonable request.

xii) Dr. Morelis then raised the question of whether only national teams should compete in the Olympiads. Dr. Fronk suggested that there could be circumstances where participation of non-official teams could be a stimulus for the official teams. Russia pointed out the difficulties of a non-member team not having to aside by the IBO rules. Turkey then explained the difficulties that occurred for an official national team if another team from that country was competing. Poland said non-official teams could be restricted to countries that were not competing. Czech Republic said that team must be the winners of their national competitions. Poland said the participation of non-official team could be at the decision of the host country.

xiii) Mgr. Machackova informed that Coordinating Centre received no comments or suggestions to the material "Basic Skills for the Practical Part of IBO" prepared by S. Promboon and J. Stoklasa which was finalised at the ISAB 1993 and distributed as a part of the Information 5/3. This material should be accepted at 10th meeting of coordinators in Thailand.

xiv) Each country had been asked to bring along a list of biological terms they required their students to know. Dr. Fronk wanted the value of such a list to be discussed but Dr. Morelis pointed out that this had been agreed to at the last Olympiad and was not for discussion here.

However Dr. Ehn (Sweden) said that changes to the list of terms would require changes in the curriculum but it should be curriculum that determined the terms. He urged that we have to handle this issue with care.

xv) Dr. Morelis then asked all countries to send 20 questions to Thailand spread over the topics. Turkey asked that some consideration should be given to standardising questions. It is urgently stressed to exclude questions which are only testing knowledge.

xvi) It was discussed and decided that some evaluating remarks are made about the work of the jury during the passed olympiads. The question is posed whether it would be a good thing to create some regulations for the jury. Those with ideas concerning this point are invited to send their suggestions to the Coordinating Centre. If so, this can be discussed during the next ISAB meeting.

Those who remarks on the answerkey of the theoretical test are invited to sent their comments to the organizers of the 5th IBO.

xvii) Finally, Dr. Morelis asked that suggestions for the ISAB 1994 meeting in Prague should be sent to Coordinating Center.

Conclusions - changes to OR of IBO: OR, § 7, 1):

1) Each participating country is requested to send a delegation consisting of no more than four competitors (during the last two years pupils of schools in this country and the winners of the national BO) and no more than two accompanying members. *Only official national team could be accepted for the competition.*

5th INTERNATIONAL BIOLOGY OLYMPIAD

VARNA 3-10 JULY 1994

THEORETICAL TEST

Dear competitors,

The theoretical test consists of two **Parts - A** and **B**.

Part A consists of 115 multiple choice questions. You have got two answering sheets for test **A**. There is only one correct answer for each question in Part A.

Your task is to select the correct answer and to encircle the appropriate letter in the answering sheet. If, when checking your answers, you need to change an answer, then mark the final correct answer with a square.

Part B consists of 7 open questions or questions with more than one answer.

For this **Part B** you have to fill out your answers in the given space on the test itself.

For each question in Par A and B the obtainable scores are indicated in brackets.

You have **three hours and a half** to complete the test.

Before starting be sure that your name and participant number are correctly indicated on the two answering sheets of **Part A** and on **Part B** itself.

5th INTERNATIONAL BIOLOGY OLYMPIAD

VARNA 3-10 JULY 1994

THEORETICAL TEST

PART A

SCORE POINTS .....

Name .....

Participant .....

Country .....

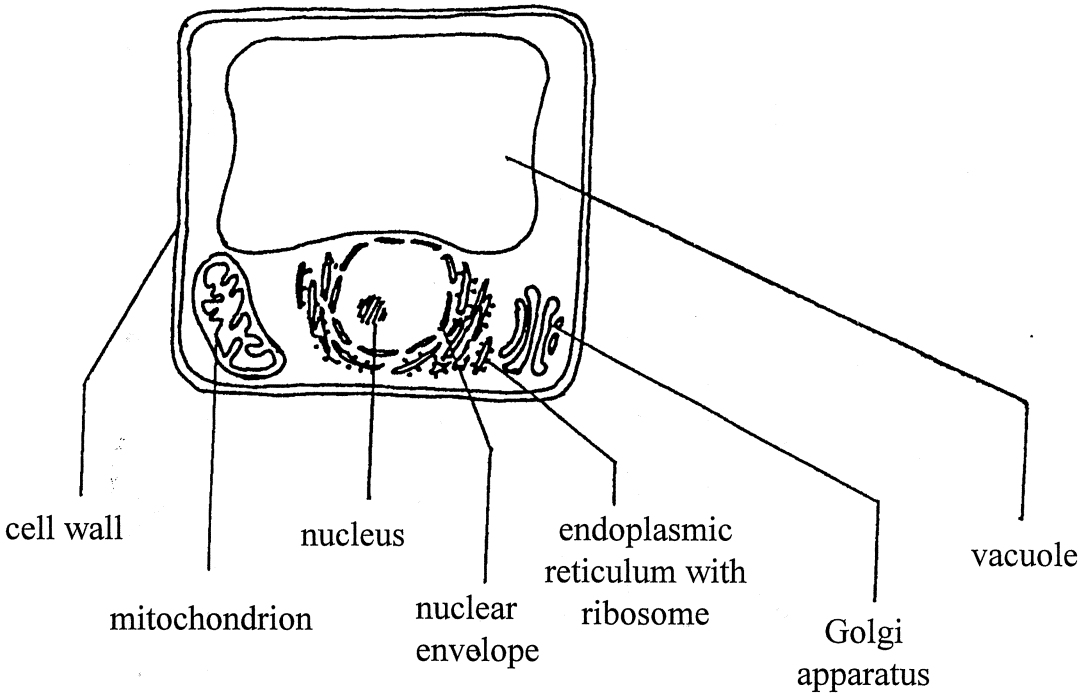
JURY MEMBERS

QUESTION No.	ANSWER				
1.	A	B	C	D	E
2.	A	B	C	D	E
3.	A	B	C	D	E
4.	skipped				
5.	A	B	C	D	E
6.	A	B	C	D	E
7.	A	B	C	D	E
8.	A	B	C	D	E
9.	A	B	C	D	E
10.	A	B	C	D	E
11.	A	B	C	D	E
12.	A	B	C	D	E
13.	A	B	C	D	E
14.	A	B	C	D	E
15.	A	B	C	D	E
16.	A	B	C	D	E
17.	A	B	C	D	E
18.	A	B	C	D	E
19.	A	B	C	D	E
20.	A	B	C	D	E
21.	A	B	C	D	E
22.	A	B	C	D	E
23.	A	B	C	D	E
24.	skipped				
25.	A	B	C	D	E
26.	A	B	C	D	E
27.	skipped				
28.	A	B	C	D	E
29.	A	B	C	D	E
30.	A	B	C	D	E
31.	A	B	C	D	E
32.	A	B	C	D	E
33.	skipped				
34.	A	B	C	D	E
35.	A	B	C	D	E
36.	A	B	C	D	E
37.	A	B	C	D	E
38.	A	B	C	D	E
39.	A	B	C	D	E
40.	A	B	C	D	E
41.	A	B	C	D	E
42.	A	B	C	D	E
43.	A	B	C	D	E
44.	skipped				
45.	A	B	C	D	E
46.	A	B	C	D	E
47.	A	B	C	D	E
48.	A	B	C	D	E
49.	A	B	C	D	E
50.	A	B	C	D	E
51.	A	B	C	D	E
52.	A	B	C	D	E
53.	A	B	C	D	E
54.	A	B	C	D	E
55.	A	B	C	D	E
56.	A	B	C	D	E
57.	A	B	C	D	E
58.	A	B	C	D	E

QUESTION No.	ANSWER				
59.	A	B	C	D	E
60.	A	B	C	D	E
61.	A	B	C	D	E
62.	A	B	C	D	E
63.	A	B	C	D	E
64.	A	B	C	D	E
65.	A	B	C	D	E
66.	A	B	C	D	E
67.	A	B	C	D	E
68.	A	B	C	D	E
69.	A	B	C	D	E
70.	A	B	C	D	E
71.	A	B	C	D	E
72.	skipped				
73.	A	B	C	D	E
74.	A	B	C	D	E
75.	skipped				
76.	A	B	C	D	E
77.	A	B	C	D	E
78.	A	B	C	D	E
79.	A	B	C	D	E
80.	A	B	C	D	E
81.	skipped				
82.	A	B	C	D	E
83.	A	B	C	D	E
84.	A	B	C	D	E
85.	A	B	C	D	E
86.	A	B	C	D	E
87.	A	B	C	D	E
88.	A	B	C	D	E
89.	A	B	C	D	E
90.	skipped				
91.	A	B	C	D	E
92.	A	B	C	D	E
93.	A	B	C	D	E
94.	A	B	C	D	E
95.	A	B	C	D	E
96.	skipped				
97.	skipped				
98.	skipped				
99.	A	B	C	D	E
100.	A	B	C	D	E
101.	skipped				
102.	A	B	C	D	E
103.	A	B	C	D	E
104.	A	B	C	D	E
105.	A	B	C	D	E
106.	A	B	C	D	E
107.	A	B	C	D	E
108.	A	B	C	D	E
109.	A	B	C	D	E
110.	A	B	C	D	E
111.	A	B	C	D	E
112.	A	B	C	D	E
113.	A	B	C	D	E
114.	A	B	C	D	E
115.	A	B	C	D	E

THEORETICAL TEST
PART A

1. (1 pt.) A scientist made several sections of a living cell at different levels. After viewing these sections under an electron microscope, he drew a complex diagram as shown on the Figure.



It would be reasonable to conclude that this cell is **NOT**:

A. photosynthetic,
B. respiratory,
C. eucaryotic,
D. a plant cell.

2. (1 pt.) The two types of cell organelles that transform energy are:

A. chromoplasts and leucoplasts;
B. mitochondria and leucoplasts;
C. mitochondria and chloroplasts;

D. mitochondria and chromoplasts.

3. (1 pt.) A centriol is:

A. stable structure in the cytoplasm near the nucleus;
B. stable structure within the nucleus;
C. structure, appearing during the mitosis;
D. structure which is a part of the chromosome.

4. (1 pt.) Which one of the following statements is **INCORRECT**:

A. DNA is present in the nucleus, hence it is absent in the cytoplasm;
B. there are no chloroplasts in the cells of any kind of green plant tissues;
C. there are mitochondria in any kind of plant cell;
D. there is no centrosome in any kind of plant cell.

5. (1 pt.) How is it possible that cells of one and the same kind can contain different number of plasmids:

A. it is because of the circular structure of plasmids;
B. because plasmids are able to replicate independently of chromosomes;
C. it depends on the molecular weight of plasmids;
D. because plasmids are usually smaller than chromosomes.

6. (1 pt.) In eukaryotic cells DNA may be found in the:

A. nuclei;
B. mitochondria;
C. chloroplasts;
D. all of these.

7. (1 pt.) A poison that interferes with the synthesis of proteins is most likely to interfere with the function of the:

A. cytoplasm;
B. centromeres;
C. ribosomes;
D. vacuoles.

8. (1 pt.) Which one of the following characteristics **does not** correspond to the properties of water:

A. bad heat conductor;
B. bad electrical insulator;
C. good solvent for majority of substances in cells;
D. it takes part in majority of chemical reactions in cells.

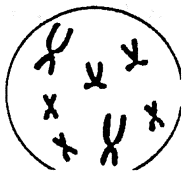
9. (1 pt.) According to the fluid-mosaic model of the cell membrane:

A. proteins and phospholipids form a regular repeating structure;
B. the membrane is a rigid structure;
C. phospholipids form a double layer, with the polar parts facing each other;
D. proteins are fairly free to move laterally within a double layer of phospholipids.

10. (1 pt.) Which one of the following statements is **NOT** correct.
Active transport of a substance:

A. can occur against the concentration gradient;
B. can occur against the electrochemical gradient;
C. can be slowed by a factor of at least two by lowering the temperature by 10°C;
D. is unaffected by metabolic poisons;
E. shows saturation properties.

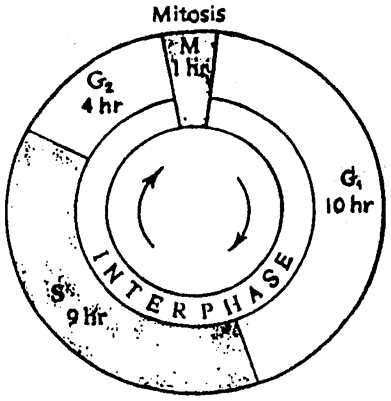
11. (1 pt.) An abnormal specimen of some animal species was produced by sexual reproduction. The figure below shows the chromosomes of a somatic cell of this organism:



One of the gametes that contributed to this specimen had a wrong number of chromosomes. How many chromosomes were contained in this gamete:

A. 4;
B. 5;
C. 6;
D. 7.

12. (1 pt.) This question refers to the following diagram.



During the S phase of cell cycle the cell:

A. undergoes cytokinesis;
B. undergoes meiosis;
C. replicates its DNA;
D. undergoes mitosis;
E. enters interphase.

13. (1 pt.) The chromosome number in tomato plants is 24. A tomato cell undergoes meiosis. Three of the resulting cells degenerate. The last cell immediately undergoes three mitoses. How many cell nuclei will you find; how many chromosomes does each of this nuclei contain:

A. 4 nuclei with 12 chromosomes each;
B. 4 nuclei with 24 chromosomes each;
C. 8 nuclei with 12 chromosomes each;
D. 8 nuclei with 24 chromosomes each.

14. (1 pt.) Repair regeneration means:

A. General property of the tissue and organs to renew throughout cell life and aging;
B. physiological changes that take place during the period of differentiation and specialization of cells;
C. restoration of tissues and organs after induced injury;
D. replacing of old cells with new ones.

15. (1 pt.) The unique properties of each amino acid are determined by its particular:

A. R group;
B. amino group;
C. type of the peptide bonds;
D. number of the bonds with other amino acids.

16. (1 pt.) A mutation that changes an alanine residue in the interior of a protein molecule to valine is found to lead to a loss of activity. The reason is:

A. valine is acidic but alanine is basic;
B. alanine is necessary for α-helix formation, whereas valine is not;

C. valine occupies more space than alanine, hence the shape of the protein molecule is changed;
D. the presence of valine changes the isoelectric point of the protein.

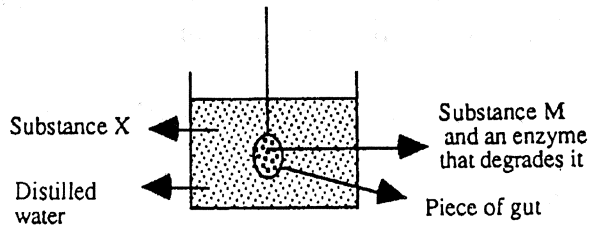
17. (2 pt.) Poly-L-leucine in an organic solvent like dioxane is α-helical, whereas poly-L-isoleucine is not. The reason for this behaviour of poly-L-isoleucine is:

A. the methyl group attached to the β-carbon of isoleucine sterically interferes with the α-helix formation;
B. the peptide bond in poly-L-leucine is different;
C. isoleucine is less soluble in organic solvents than leucine;
D. the isoelectric point of isoleucine is higher.

18. (1 pt.) The enzyme succinic dehydrogenase normally catalyzes a reaction involving succinic acid. Another substance, malonic acid, sufficiently resembles the succinic acid to forming temporary complexes with the enzyme, although malonic acid itself cannot be catalyzed by the succinic dehydrogenase. In this example succinic acid and malonic acid are, respectively:

A. the substance, a competitive inhibitor;
B. a competitive inhibitor, the substance;
C. a positive modulator, a negative modulator;
D. a negative modulator, a positive modulator.

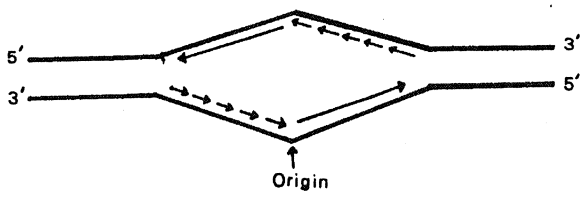
19. (1 pt.) A piece of gut which contains a substance M and an enzyme that degrades this substance in it is immersed in a container with distilled water. When the water is examined on the next day it is observed that it contains only a substance X.



Based on this observation which one of the following statements **cannot** be speculated:

A. Substance X is degraded by the enzyme M;
B. Substance M is degraded in the gut;
C. Substance X is the constituent of substance M;
D. Substance X can penetrate the gut wall;
E. Molecular weight of substance M is greater than that of substance X.

20. (1 pt.) The diagram below represents a student's view of DNA synthesis occurring in an animal cell. The arrows represent newly synthesized DNA. This diagram is:



A. correct as shown;
B. incorrect because DNA synthesis in animal cells is unidirectional;
C. incorrect because DNA synthesis proceeds in 3' - 5' direction;
D. incorrect because DNA synthesis is proceeding in wrong direction on two of the strands.

21. (1 pt.) A synthetic mRNA has only two nucleotide types; it contents five times as much U as C:

A. there are 4 possible codons;
B. there are 6 possible codons;
C. there are 8 possible codons;
D. there are 16 possible codons.

22. (1 pt.) The exact replication of DNA is possible due to:

A. the genetic code;
B. mitosis;
C. the base-pairing rules;
D. the fact that the DNA molecules are enclosed within a nuclear membrane.

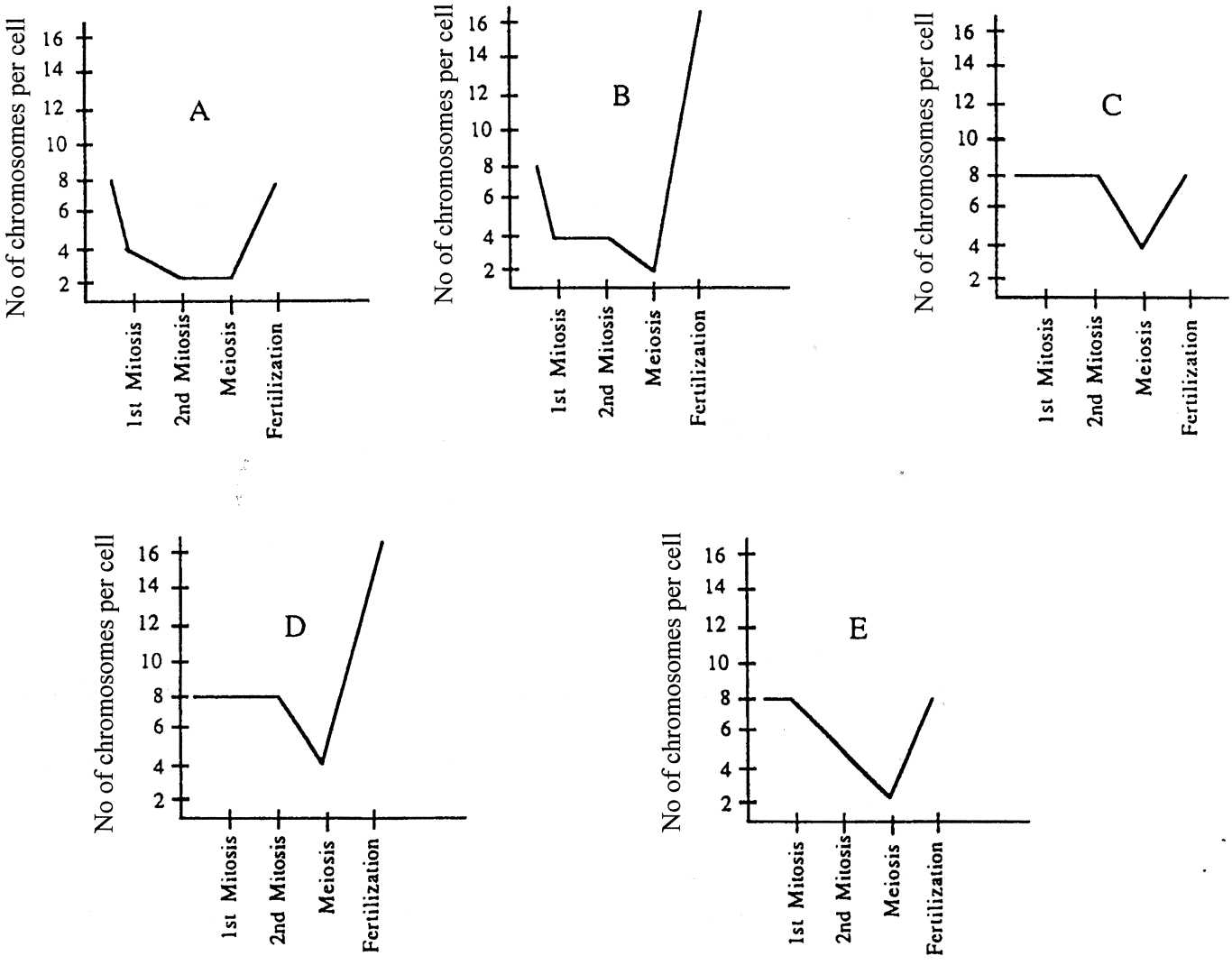
23.(1 pt.) Which one of the following statements explains why penicillin does work as an antibiotic:

A. Penicillin inhibits the nucleic acid synthesis;
B. Penicillin inhibits murein synthesis, the material necessary for building of bacterial wall;
C. Penicillin inhibits protein synthesis among procaryotes;
D. Eukaryotes rapidly decompose penicillin.

24. (1 pt.) A nucleus containing radioactive chemicals is transfered to a non-radioactive amoeba. If afterwards the amoeba with the new nucleus has radioactive ribosomes in its cytoplasm, this would be evidence in support of the:

A. chromosomal theory of inheritance;
B. existence of DNA code;
C. functioning of messenger RNA;
D. single gene - single enzyme hypothesis.

25. (1 pt.) A cell with eight chromosomes undergoes two mitoses and one meiosis. One of the daughter cells is fertilized. Which one of the following figures represents the changes in the chromosome number of the above mentioned cell.



26. (1 pt.) Which one of the following statements refers to a human cell with (22+X) chromosomes?

A. it is a fertilized egg;
B. it is a cell which has undergone a meiosis;
C. it is a somatic cell;
D. it is a cell which has undergone a mitosis;
E. it is a polyploid cell.

27. (1 pt.) Which one of the following properties is responsible for the formation of weak (non-covalent) bonds in the protein molecule:

SKIPPED

A. presence of amino groups;
B. presence of carboxyl groups;
C. type of the radical;
D. other properties.

28. (1 pt.) Which one of the following substances could be subjected to denaturation:

A. only proteins;
B. only nucleic acids;
C. only lipids;
D. nucleic acids and proteins.

29. (1 pt.) Which one of the following statements is correct?
Denaturation is a process of:

A. losing of the secondary and tertiary structure and destroying the primary structure;
B. losing of the secondary and tertiary structure without destroying the primary structure;
C. only losing of quaternary structure;
D. reducing of the chemical reactivity of the polymers

30. (1 pt.) The Krebs cycle takes place in the:

A. mitochondria;
B. cytoplasm;
C. chloroplasts;
D. nucleus.

31. (1 pt.) The Krebs cycle is a source of:

A. only ATP;
B. nucleoside triphosphates and important intermediate metabolits;

C. only glucose;
D. only pyruvic acid.

32. (1 pt.) Which of the following substances are products of aerobic respiration:

A. only CO_2 and H_2O;
B. CO_2, H_2O and ATP;
C. oxalic acid;
D. citric acid.

33. (1 pt.) The enormous diversity of protein molecules is due mostly to the diversity of:

A. amino groups of the amino acids;
B. R groups of the amino acids;
C. aminoacid sequences within protein molecules;
D. peptide bonds.

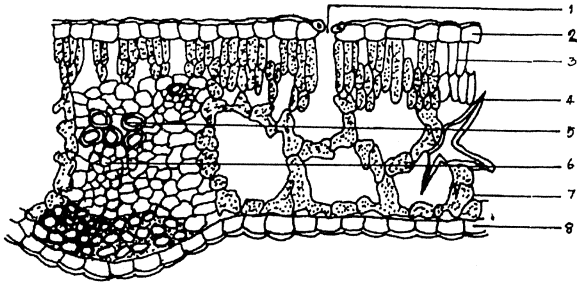
34. (1 pt.) Which one of the following statements is **NOT** correct?
Allosteric affect on the enzyme activity is a way for:

A. regulation of metabolic processes;
B. activation of enzyme activity;
C. competitive inhibition of enzyme activity;
D. non-competitive inhibition of enzyme activity.

35. (1 pt.) The main functions of the glycocalyx are:

A. structural and protective;
B. mechanosupporting and protective;
C. maintaining the environment immediately around the cell, fulfilling of the selective permeability of compounds necessary for the cell and extracellular digestion;
D. cell contact, carrying out of the intercellular exchange.

36. (1 pt.) This figure is a cross section of one kind of leaf. What is the type of tissue (cell) of number 4?



A. palisade cell;
B. parenchyma;
C. sponge cell;
D. sclereid.

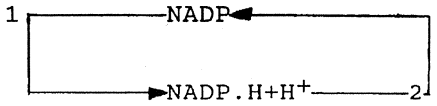
37. (1 pt.) Cells of xylem vascular bundles are in the period of their activity:

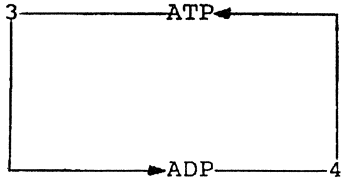
A. dead;
B. alive, only their cell membranes become woody;
C. alive, only their nucleolus disappears;
D. alive, with a big vacuole inside of the cell.

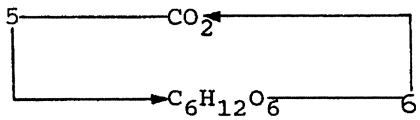
38. (1 pt.) Some blue-green algae (Cyanobacteria) are both autotrophic (photosynthetic) and heterotrophic (being able to assimilate organic compounds). It has been shown by experiments that light promotes the assimilation of organic compounds by them (the CO_2 of the ambient atmosphere is usual). Which one of the following is the most probable explanation of this phenomenon:

A. the presence of organic compounds inhibits photosynthesis;
B. the uptake and utilization of organic compounds by blue-green algae consume no energy;
C. the assimilatory power (ATP and NADPH) produced in photosynthesis can be used for the uptake and further transformation of organic compounds;
D. blue-green algae can fix atmospheric nitrogen.

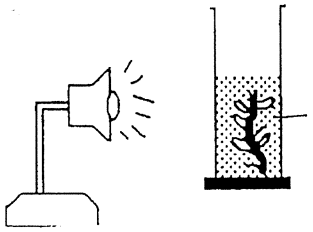
39. (1 pt.) Which one of the following processes constitute a part of to the light-dependent photosynthetic reactions:







A. 1, 3, 6; **B.** 1, 4, 8; **C.** 2, 3, 6; **D.** 2, 4, 5; **E.** 2, 5, 7.



40. (1 pt.) Which of the following **<u>does not</u>** affect the number of gas bubbles per unit of time in the above figure:

A. volume of the glass container;
B. intensity of the light;
C. number of the leaves on the plant;
D. amount of CO_2 dissolved in the water;
E. temperature of the water.

41. (1 pt.) In C_3-photosynthesis the CO_2 acceptor is:

A. 3-phosphoglycerine aldehide;
B. pyruvic acid;
C. ribulose-1,5-diphosphate;
D. ferredoxin.

42. (1 pt.) In photosynthesis, **IN CONTRAST** to mitochondrial respiration:

A. water is decomposed;
B. water is formed;
C. electrons are transported with the aid of cytochromes, among others;
D. participation of colourful metallocompounds;
E. more than one of the above are characteristic for photosynthesis only.

43. (1 pt.) In the 1930s, C. B. van Niel correctly hypothesized that oxygen atoms in the oxygen gas released by plants come from:

A. H_2O;
B. CO_2;
C. $C_6H_{12}O_6$;
D. O_3.

44. (1 pt.) Mineral elements are transported in plants by the same way as water. Why is energy needed to make their transport possible?

A. because the active transport needs less energy;
B. because the ions cannot move by passive diffusion;
C. because passive transport through semipermeable membrane goes slower than water diffusion;
D. because energy used in ATP synthesis is released during the active transport.

45. (1 pt.) Auxins function as:

A. stimulators of leaves and fruit drop;
B. stimulators of lateral bud growth;
C. inhibitors of length growth;
D. stimulators of cell elongation and root development.

46. (1 pt.) Besides the three factors - photoperiod, temperature and nutrition, another factor which also controls the flowering of plants is:

A. the rate of photophosphorylation;
B. the rate of the transport of organic substances within the plant;
C. the age of the plant;
D. the pH of soil solution.

47. (1 pt.) Plant cells were incubated for several hours in the presence of radioactive (tritium-labelled) uridine. Afterwards cells were collected, gently homogenized and fractionated to obtain various organelles. Radioactivity will be found CHIEFLY in:

A. nucleolus, plastids and Golgi apparatus;
B. nucleus, nucleolus and lysosomes;
C. nucleus, ribosomes and vacuoles;
D. nucleus, nucleolus, ribosomes and chloroplasts;
E. all of the mentioned organelles will exhibit roughly the same level of radioactivity.

48. (1 pt.) The number of seeds in a pod is determined by the number of:

A. pistils in the flower;
B. carpels in the pistil;
C. ovules in the ovary;

48. (1 pt.) **D.** embryos in the ovular sac;
E. stigmata in the pistil.

49. (1 pt.) Which of the following refers to the sporophyte in plants:

A. diploid and produces haploid cells by mitosis;
B. diploid and produces haploid cells by meiosis;
C. haploid and produces gametes by meiosis;
D. haploid and produces gametes by mitosis;
E. produced by meiosis.

50. (1 pt.) When the root cap of a maize seedling is excised, a new root cap will be formed within about 5 days. But in a flying spaceship, there is no regeneration of the root cap. What is the reason:

A. root cap formation is related to the CO_2 content of the atmosphere;
B. root cap formation is related to photoperiod;
C. root cap formation is related to temperature difference between day and night;
D. root cap formation is related to gravity.

51. (1 pt.) In healthy adult humans, red blood cells are formed only in:

A. sternum, ribs and vertebrae bodies;
B. thigh and shank bones (femur, tibia);
C. liver;
D. spleen.

52. (1 pt.) As blood flows through the heart the valves open and close at the correct moments. These valves are forced open by:

A. the contraction of the powerful muscles of the ventricles;
B. small muscels in the valves themselves;
C. strings attached to them called chordae tendineae;
D. the pressure of the blood itself.

53. (1 pt.) Which of the following statements explains the **persisting** abnormally high level of glucose in the human blood:

A. insufficient filtration by the kidneys;
B. excessive amount of thyroid hormones in the blood;
C. muscles in a total resting state;

D. insufficient hormone secretion by the pancreas;
E. an excessive amount of glucose absorbed by the intestines.

54. (1 pt.) Why the human organism cannot be fed only by carbohydrates is:

A. because the human body is composed mainly of proteins;
B. because man for his life needs many other substances, that cannot produce himself;
C. because the calorific value of the carbohydrates is not very high;
D. because the carbohydrates do not contain nitrogen and the human organism cannot assimilate it from the air.

55. (1 pt.) A student added saliva to starch solution at the following conditions and expected the starch to be converted into mono and disaccharides. Which one of the following is the best condition for his experiment:

A. the mixture was kept at 0°C;
B. the mixture was kept at 30°C;
C. the mixture was boiled and then kept at 30°C;
D. the mixture was kept at 70°C.

56. (1 pt.) Basal metabolic rate is:

A. the minimal amount of energy needed to maintain life under exactly defined conditions;
B. issue of energy after obtaining nutrition - 100 g of proteins;
C. issue of energy by effort - ten knee-bends;
D. amount of energy needed for converting 1 g of lipids.

57. (1 pt.) Mammalian species X and Y have similar overall shapes and body cover and exhibit similar locomotory activity; however, individuals of species X are twice as large (in linear dimension) as those of species Y.

The loss of heat through their surface, per unit of body mass, for these species will be **ABOUT**:

A. for X twice as large as for Y;
B. for X four times as large as for Y;
C. for Y twice as large as for X;
D. neither of the given answers is correct.

58. (1 pt.) A muscle has built up an oxygen debt. When there is enough oxygen for aerobic respiration to resume, all of the following will occur **except**:

A. lactic acid will be converted into pyruvic acid;
B. O_2 will be used up;
C. acetyl CoA will be converted into CO_2 and H_2O;
D. pyruvic acid will be converted into acetyl CoA;
E. an excess of $NADH.H^+$ will accumulate.

59. (1 pt.) Excessive concentration of thyroxine causes uncoupling of mitochondria, i.e., in spite of the electrons flowing along the oxidative chain no ATP is produced. Based on this fact one should expect people with excessive activity of the thyroid to be:

A. obese in spite of consuming small amounts of food and with body surface colder than in healthy individuals;
B. obese in spite of consuming small amounts of food and with body surface warmer than in healthy individuals;
C. lean in spite of consuming large amounts of food and with body surface colder than in healthy individuals;
D. lean in spite of consuming large amounts of food and with body surface warmer than in healthy individuals.

60. (1 pt.) Blood hydrostatic pressure powers the process of:

A. filtration across the glomerulus;
B. reabsorption of water and dissolved substances at the venule end of capillary;
C. sodium gradient maintenance in the kidney tubule;
D. salt and glucose reabsorption in the kidney tubules;
E. Na^+ recycling in the loop of Henle.

61. (1 pt.) In the mammalian embryo, the first structure to develop relationship with the wall of the uterus is:

A. the amnion;
B. the chorion;
C. the allantois;
D. the trophoblast.

62. (1 pt.) Which of the following is a common function of the adrenal glands, the pancreas and the liver in humans:

A. regulation of the metabolic rate;
B. construction of the blood vessels;
C. synthesis of urea and uric acid;
D. digestion of fats;
E. taking part in the regulation of glucose level in the blood.

63. (1 pt.) The structure of hormones cannot be:

A. amino acid derivatives;
B. peptides and proteins;
C. steroids;
D. carbohydrates.

64. (1 pt.) In an individual with short-sightedness (myopia):

A. the eye tends to be longer than average from lens to retina;
B. use of appropriate biconvex lens corrects the defect;
C. close vision is more seriously affected than distant vision;
D. a circular object tends to appear oval.

65. (1 pt.) A drug that inactivates acetylcholineesterase:

A. inhibits the release of acetylcholine from presynaptic endings;
B. inhibits the attachment of acetylcholine to its receptor protein;
C. increases the duration of acetylcholine stimulating muscle contraction;
D. all of above.

66. (1 pt.) All the following diseases are caused by a protozoan except:

A. malaria;
B. sleeping sickness;
C. rabies;
D. amoebic dysentery.

67. (1 pt.) Which one of the following statements referring to the axon is **not correct**:

A. the axon is the long projection of the neuron;
B. the myelin sheath accelerates the nerve impulse conduction;
C. the axons could be longer than two meters;
D. some axons have not myelin sheath;
E. the speed of nerve impulse conduction does not depend on the axon diameter.

68. (1 pt.) Haemopoietic organs are:

1. marrow;
2. thymus;
3. islets of Langerhans;
4. spleen;
5. lymph nodes;
6. core of the adrenal gland.

Answers:

A. 1, 2, 3 and 4;
B. 3, 4 and 6;
C. 1, 2, 4 and 6;
D. 1, 2, 5 and 6;
E. no correct answer.

69. (1 pt.) To reach the right hand the blood from the stomach and intestines must pass through:

1. the heart (once);
2. the heart (twice);
3. do not pass through the heart;
4. the lungs;
5. the liver;
6. the brain.

Answers:

A. only 2;
B. 1 and 4;
C. 2, 4 and 6;
D. 2, 4 and 5;
E. 3, 4 and 5.

70. (2 pt.) A hungry brown rat was placed in a closed metal box with a food slot and a food-releasing lever. The rat was allowed to poke around randomly until it accidentally tripped the lever and released a food pellet. The rat soon learned to trip the lever whenever it wanted food. What type of learning is this:

A. imprinting;
B. habituation;
C. sensitisation;
D. trial and error.

71. (1 pt.) Which process of cell division is essential if Mendel's First Law (The Law of Segregation) is to be fulfilled:

A. a division of the centromere;
B. duplication of chromosomes;
C. pairing of homologous chromosomes;
D. formation of chiasmata.

72. (2 pt.) A man of blood group A has two children. Plasma from the blood of one of them agglutinates his red cells while that from the other does not:

A. father must be heterozygous in group A;
B. children must have had different mothers;
C. "agglutinating" child could be group O;
D. mother of the "agglutinating" child must be group O;
E. "non-agglutinating" child could be group AB.

73. (1 pt.) Man A has a rare X-linked recessive factor which is expressed as trait A. Man B has a rare dominant autosomal factor which is expressed only in males as trait B. Would you distinguish these two cases just by studying the pedigrees:

A. No, because the progeny of man A and man B can have just the same trait of their respective male ancestors;
B. Yes, because in the progeny of man A and man B would not be women with trait B;
C. No, because man A would not have sons with trait A, and man B would not have sons with trait B;
D. Yes, because the sons of man A's daughter could be with trait A, whereas the sons of man B's daughter and the sons of his son could both be with trait B.

74. (1 pt.) In numerous bird species males have very colourful and ornate plumage (feathers). Choose the best explanation for the evolutionary stabilization of such a feature:

A. Ornate plumage is a good camouflage among colourful tropical plants;
B. This feature is neither advantageous, nor detrimental, so is neither selected for, nor against;
C. Females mate preferentially with ornate males, so the genes "causing" this feature spread among the population;
D. ornate plumage makes it easier for the birds of the same species to recognise each other, thus potentially dangerous encounters with individuals of other

species are being avoided;
E. bright and ornate plumage serves as a warning against dangerous (often poisonous) species.

75. (1 pt.) Which one of the following statements about the natural selection is **NOT** correct:

A. in the same environment, the contribution of individuals with different genotypes to the gene pool of progeny are different;
B. in different environment, the contribution of individuals with different genotypes to the gene pool of progeny are different;
C. in different environment, the contribution of individuals with the same genotypes to the gene pool of progeny are different;
D. in the same environment, the contribution of individuals with different genotypes to the gene pool of progeny are the same.

76. (1 pt.) Very similar species of fish release their eggs and sperm into the same water, but the sperm of one species cannot penetrate the eggs of the other species. This is an example of prezygotic isolation by:

A. ecological isolation;
B. behavioral isolation;
C. mechanical isolation;
D. gametic isolation.

77. (1 pt.) In silk worms, silk gland cells are specialized in the synthesis of large quantities of the protein known as silk-fibroin. These same cells do not make blood specific proteins. One would expect that silk-gland cells have:

A. only silk fibroin genes;
B. the genes for both blood protein and silk fibroin;
C. silk fibroin genes and some other genes, but not blood protein genes;
D. fewer genes than the zygote.

78. (1 pt.) Pleiotropic gene activity could be revealed mainly through:

A. studying of genes;
B. studying the interaction of genes of the organism;
C. studying pedigrees (genealogy);
D. studying of phenotypic changes, caused by gene mutations.

79. (1 pt.) Which of the following conditions have enabled the appearance of the living organisms on dry land:

A. decreasing of the vulcanic activity and tectonic processes;
B. decreasing of the sea level and enlarging of the land surface;
C. formation of the ozone layer in the atmosphere;
D. general warming of the climate, increasing of humidity, appearing of the "green-house" effect.

80. (1 pt.) Comparing the skeleton of man and other primates the following peculiarities could be determined:

1. The thorax of man is laterally flattened and this of the primates is almost cylindrical, with massive bones to which strong muscles are attached;
2. The bones of the foot of man are shorter;
3. In man the aperture of the lower part of the skull, serving for the connection between the brain and the spinal cord is situated backwards, while in the primates it is driven more forward.
4. The mollars of man are with U-shaped surface and these of the primates sre with X-shaped surface.

Answers:

A. only 1 and 3;
B. only 1, 2 and 3;
C. only 2 and 3;
D. only 2 and 4;
E. all answers are correct.

81. (1 pt.) Non-chromosomal inheritance is characterized by:
1. non-chromosomal genes have no alleles;
2. non-chromosomal inheritance is typical only for plants;
3. features, determined by the non-chromosomal inheritance are inherited through the cytoplasm;
4. features, determined by the non-chromosomal inheritance do not segregate, as a rule, and if there is, yet partial segregation of the features, no quantitative regularities could be established.

Answers:

A. only 1, 2 and 3;
B. only 2 and 4;
C. only 2 and 3
D. only 1, 3 and 4;
E. all answers are correct.

82. (2 pt.) In a family the father has blood group A and his son has blood group B and is a haemophylic. What is the possible genotype of the mother, the son and the father in that family:

1. father - AOXHY; mother - BBXHXH; son - BOXhY;
2. father - AOXHY; mother - BOXHXh; son - BOXhY;
3. father - AOXhY; mother - ABXHXh; son - BOXhY;
4. father - AAXhY; mother - BOXHXh; son - BOXHY;

Answers:

A. only 1 and 3;
B. only 2 and 4;
C. only 1 and 4;
D. only 2 and 3;
E. only 2, 3 and 4.

83. (2 pt.) What is the most probable sequence of the genes ABCD if the distance between them is: A - B: 1.5 map units; B - C: 18 map units and A - D: 18.5 map units.

1. ABCD;
2. BACD;
3. ABDC;
4. ACBD.

Answers:

A. only 1;
B. only 2;
C. only 3;
D. only 4;
E. all answers are incorrect.

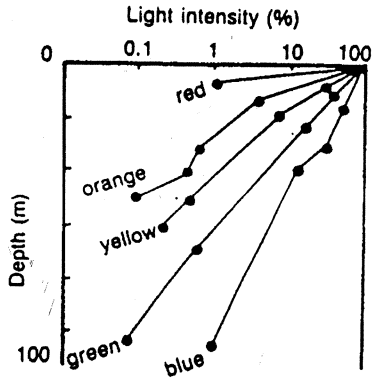
84. (2 pt.) After crossing a guinea-pig with black hairs and guinea-pig with white hairs, all F_1 individuals were with black hairs. After analyzing the progeny of a F_1-female crossed with a homozygous recessive individual the phenotypes in the backcross were in the following ratio: 3 white : 1 black. What are the possible genotypes of the parents and individuals of F_1?

1. AA; aa; Aa;
2. AAbb; aaBB; AaBb;
3. AABB; AAbb; AABb;
4. AABB, aabb; AaBb.

Answers:

A. only 1;
B. only 2;
C. only 3;
D. only 4;
E. all answers are incorrect.

85. (1 pt.)



The graphic shown indicates the amount and colour of light penetration in the sea. Considering this data, one would expect the lower limit of phytoplancton to be closest to:

A. 5 m;
B. 10 m;
C. 20 m;
D. 40 m;

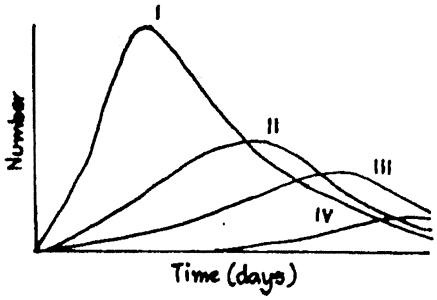
86. (1 pt.) A plant, living in a hot, dry environment is likely to have:
A. large, dark green leaves with many stomata on both sides;
B. large, light green leaves with stomata on one side only;
C. medium, light-coloured hairy leaves with stomata mostly on the underside;
D. small, thick leaves with few stomata.

87. (1 pt.) An epiphyte has a growth form adapted for gaining access to:
A. light;
B. pollinators;
C. water;
D. nutrients.

88. (1 pt.) The highest osmotic pressure is characteristic for the cells of:

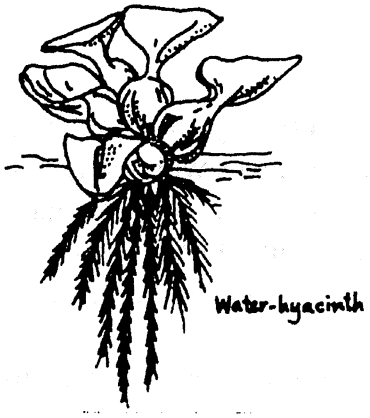
A. hydrophytes;
B. mesophytes;
C. xerophytes;
D. halophytes.

89. (1 pt.) A class of students inoculated a flask of leaf broth with some pond mud and kept in darkness. Samples were taken daily to ascertain the abundance of microorganisms in the broth over a ten-day period. The results are shown. Which one of these statements is **NOT** a valid conclusion:



A. organism I is probably a producer;
B. organism II probably eats organism I;
C. organism II succeeds organism I;
D. organism IV is probably a predator.

90. (1 pt.)



The water-hyacinth was introduced into a tropical country and has become a major menace to boating, clogging rivers and lakes. A single plant can produce 1000 offsprings in 50 days. The reason for its success would be:

A. lack of predators;
B. good climate;

C. high reproductive rate;
D. the empty niche it occupied.
E. all of the above answers could be correct.

91. (1 pt.) Plants with soft stems and badly developed supportive tissue, few stem parenchyma cells with large intercellular spaces and with a thin cuticule, belong to which ecological group?

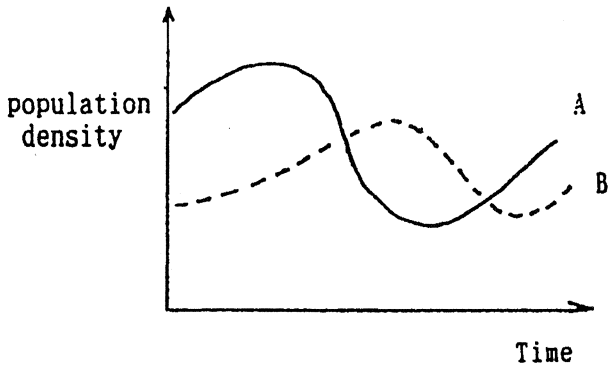
A. mesophytes;
B. xerophytes;
C. hydrophytes;
D. halophytes.

92. (1 pt.) Plants that have mutualistic relations with nitrogen fixing bacteria provide the bacteria with:

A. N_2;
B. enzymes;
C. sugars;
D. nitrites.

93. (1 pt.) The figure represents the changes in the density of population of species A and species B. What is the most possible relationship between species A and B:

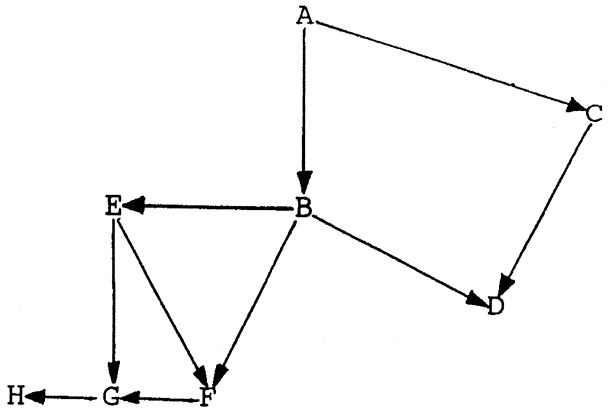
A. parasite - host;
B. predator - prey;
C. competition;
D. symbiosis.



94. (2 pt.) Organisms belonging to two closely related animal species were placed in a container with all parameters kept constant, and a LIMITING supply of food. There is no direct interspecies interaction. In the state of equilibrium:

A. there will be constant numbers of animals of both species (static equilibrium), irrespective of the initial numbers;
B. there will be oscillating numbers of animals of both species (dynamic equilibrium);
C. there will be constant numbers of animals of both species (static equilibrium), determined by the initial numbers;
D. animals of only one species will survive;
E. each of the above situations may take place, depending on the species used for the experiment.

95. (1 pt.)



If the above ecosystem represented by the food web above were sprayed with DDT, the greatest concentration of this insecticide would be expected in:

A. A;
B. B;
C. G;
D. F.

96. (1 pt.) Besides the area where the species lives, the ecological niche is characterized by:

A. exponential growth of abiotic components of the environment;
B. relation of the mentioned species to other organisms;
C. preference to heterozygotes;
D. the number of species occupying the niche.

97.(1 pt.) Future development of a population could be deduced from the occurrence of:

A. individuals in reproductive age;
B. different species in the ecosystem;
C. parasites and predators;
D. dominant homozygotes.

98. (1 pt.) Which of the following is one of the typical characteristics of a community:

A. competition with strong physical and chemical factors increases the diversity;
B. there are few species represented by a small number of individuals;
C. there are few species represented by a large number of individuals;
D. extreme environmental climatic and biological conditions increase the mutualistic relationships;
E. there is a homogenous distribution in the area.

99. (1 pt.) A potential danger to an isolated population that has been greatly reduced in number is the:

A. loss of genetic variability;
B. tendency toward assortative mating;
C. reduced gene flow;
D. Hardy-Weinberg disequilibrium.

100. (1 pt.) The struggle for existence is a consequence of:

A. each organism leaving more offspring than needed to replace itself;
B. innate competitive tendencies;
C. the inevitable difficulty of coping with climatic conditions;
D. territories and dominance hierarchy.

101. (1 pt.) Pollution is one of the most popular problems concerning man today. From this point of view, which of the following can be considered a natural relationship in natural environments:

A. industrial liquid wastes causing the extinction of certian species;
B. intensive chimney gases being harmful for the flora;
C. opening new farm lands increases the erosion rate;
D. pollution originating from the natural systems is not persistent;
E. gradual increase in the pollution originating from the natural systems.

102. (1 pt.) In a stable ecosystem of a pond sudden heavy pollution causes death of all plants. The first visible change in pond water composition will be decrease in the concentration of:

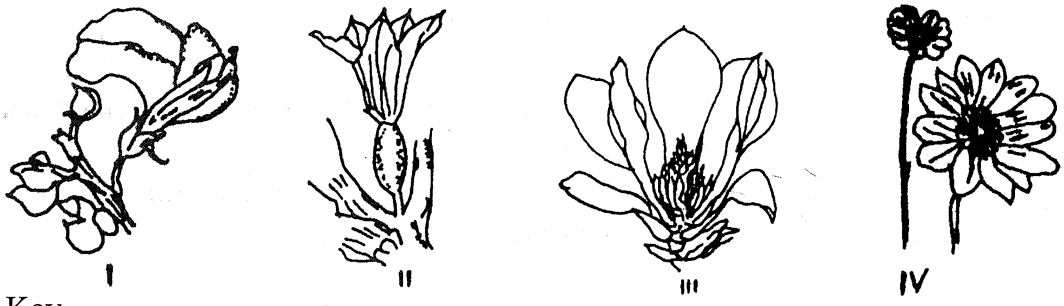
A. carbon dioxide;
B. nitrates;
C. oxygen;
D. phosphates;
E. answers A and C are correct.

103. (1 pt.) Which of the following promotes diversity of living things:

A. classification of organisms;
B. natural selection in different environments;
C. inheritance from a common ancestor;
D. homeostatic regulation.

104. (1 pt.) Which of the following **cannot** be a result of the ecological succession:
A. increase in the trophic levels in the food chain;
B. increase in the productivity;
C. increase in the stability of the community;
D. gradual decrease in the organic material (humus);
E. increase in the species diversity.

105. (2 pt.)



Key
1a. single flower;
1b. inflorescence.
2a. pistil flower and perfect flower;
2b. perfect flower only.
3a. one ovary in a flower;
3b. many ovaries in a flower.

Study the pictures and the above key. Which picture fits Key 2a:
A. I; **B.** II; **C.** III; **D.** IV.

106. (1 pt.) Secondary growth of the stem is typical for:

A. Bryophyta (mosses), Gymnospermae (Pinophyta) and Angiospermae (Magnoliophyta);
B. Angiospermae;
C. Dicotyledonae;
D. Gymnospermae and Dicotyledonae.

107. (1 pt.) The most diverse and widespread of all contemporary plants are:

A. Mosses;
B. Ferns;
C. Conifers;
D. Angiosperms.

108. (1 pt.) In what way is the growth of a flowering plant most different from the growth of a mammal:

A. parts of the organism grow at different rates;
B. the growth of one part might be controlled by another part;
C. the total mass of the organism remains relatively constant once maturity is reached;
D. growth tends to become confined to special groups of cells.

109. (2 pt.) Which of the following structures is common in fish, bird and mammalian auditory (hearing) organ:

A. auriculum;
B. semicircular canals;
C. auditory (hearing) canal;
D. Eustachian tube;
E. a well developed cochlea.

110. (1 pt.) Choose the correct statement:

A. Reptiles like fish and amphibians have a body temperature regulating mechanism;
B. The bodies of reptiles are covered by moist, soft scales that help protection against dehydratation;
C. due to the development of kidney tubules as water conserving structures, reptiles are able to survive in the desert;

D. reptiles secrete nitrogenous wastes as urea.

111. (1 pt.) Of the following groups the first animals to serve as pollinators were:

A. ants;
B. beetles;
C. bees;
D. humming birds.

112. (1 pt.) The sense organ of balance in the crayfish is the:

A. claws;
B. ears;
C. antennal statocyst;
D. first mouth appendages;
E. eye stalks.

113. (1 pt.) Heart with two atria and one ventricle can be found in:

A. sparrow (Passer);
B. toad (Bufo);
C. ray (Raja);
D. carp (Cyprinus).

114. (1 pt.) Which animal can reproduce by parthenogenesis as a normal process:

A. hydra;
B. the tapeworm;
C. the earthworm;
D. the honey bee.

115. (1 pt.) Approximately what percentage of existing animal species are invertebrates:

A. 20 %;
B. 50 %;
C. 70 %;
D. 95 %.

THEORETICAL TEST
PART B

1. (2.5 pt.) Study the following diagrams of cell division and fill in the Table in English or Russian. For "stage of cell division" choose one alternative from the list below - write the letter in the table.

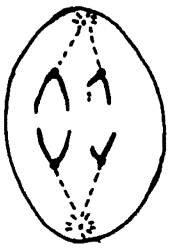


Fig.1

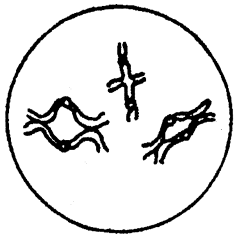


Fig.2

Stage of cell division		
Number of 2n chromosomes		

A. mitotic prophase
B. mitotic metaphase
C. mitotic anaphase
D. mitotic telophase
E. prophase I of meiosis
F. anaphase I of meiosis
G. metaphase II of meiosis
H. anaphase II of meiosis

2. (1 pt.) The following biopolymers: nucleic acids, proteins and polysacharides are characterized by the following features:

A. linear, almost never branched;
B. linear or branched;

C. homopolymers;
D. heteropolymers.

Put the correct answer into the table using the respective letters:

biopolimers	characteristics
nucleic acids	
proteins	
polysacharides	

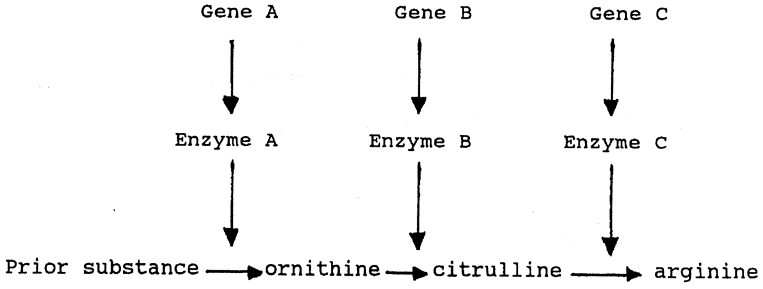
3. (1 pt.) Which one of the following statements is correct?

	protein	**function**
A.	antibodies	bind to parts of the antigene
B.	antibodies	fix oxygen
C.	haemoglobine	binds to oxygen
D.	haemoglobine	binds parts of the antigene

4. (1,5 pt.) The following statements refer to the female reproductive system. Mark the correct statements with a circle.

A. both oestrogen and progesterone are necessary for the ovulation to take place;
B. oestrogen tends to inhibit the production of FSH by the anterior pituitary gland;
C. fertilization of the ovum by the sperm normally takes place in the uterus;
D. progesterone production is largely under the control of LH;
E. through out the part of the menstrual cycle that follows ovulation, there is a slight rise of body temperature.

5. (3 pt.) The next items refer to the following information about the bread mould, Neurospora. The bread mould normally produces its own amino acids from raw materials through a system of enzymes.



Use this key for the next six items:

A. a logical hypothesis based on the diagram;
B. an illogical hypothesis;
C. a hypothesis unrelated to the diagram;
D. a restatement of information given by the diagram

(.....) Enzyme A catalyzes the reaction in which ornithine is formed from the prior substance;
(.....) If gene B were not present, arginine would be formed directly from ornithine;
(.....) If gene A were destroyed, the mould would survive if ornithine were added to the medium;
(.....) If gene B were destroyed, the mould could survive if enzyme B is added to the medium;
(.....) Gene C directs the formation of enzyme C;
(.....) Different moulds have different amino acid requirements.

6. (2 pt.) T = a dominant allele controlling tallness in plant A, a cross-fertilizing plant, t = a recessive allele controlling short stem,
R = a dominant allele controlling green stem,
r = a recessive allele, controlling purple stem.
In a random-mating population of plant A, the following phenotypic frequencies are found:

Phenotypes	%
Tall, green stem	63
Tall, purple stem	21
Short, green stem	12
Short, purple stem	4

A. What is the percentage of the plants having the TT genotype?

Answer: .....
B. What is the percentage of the plants having the TTRR genotype?

Answer: .....

7. (1 pt.) Match the evolution concepts appropriately

(.....) gene flow
(.....) sexually reproducing species
(.....) natural selection
(.....) mutation
(.....) genetic drift

A. the sole source of new alleles;
B. chance increase or decrease in relative allele frequences of a population;
C. one or more populations, the members of which interbreed and produce fertile offspring;
D. change in allele frequences in a population due to immigration, emigration;
E. differential survival and reproduction of variant members of population.

5th INTERNATIONAL BIOLOGY OLYMPIAD

VARNA 3-10 JULY 1994

PRACTICAL TEST
(ANSWER KEY)

SCORE POINTS .....

Name .....

Participant .....

Country .....

JURY MEMBERS

No of the participant: .....

PRACTICAL TEST

I. SECTION CYTOLOGY AND HISTOLOGY

Total points: 36 points.
Time: 45 min.

TASK 1.

There are two cyto-slides (**No1** and **No2**) infront of you. They illustrate the process of mitosis of plant and animal cells.

1.1. Scrutinize the slides carefully and point out the main differences between the process of mitosis of plant and animal cells. Mark each of the following statements with a "+" if correct and a "-" if incorrect:

A. In animal cells the cytokinesis is carried out formation of the cell plate.
B. The devision spindle in plant cells is formed without the participation of the centrioles.
C. The devision spindle in animal cells is formed with the participation of the centrioles.
D. The devision of plant cells takes place without a division spindle.
E. The devision of the plant cell goes on by means of a contractile ring.
F. The devision of the animal cell is accomplished by means of a contactile ring.
G. the cytokinesis in plant cells is carried out by a cell wall, built up by the remnants of the devision spindle.
H. the devision of plant cell is accomplished by a cell wall, a product of the Golgi apparatus.

TASK 2.

Slide **No3** is a section of the spinal cord of a cow, stained with Cresil violet.

2.1. Locate scrutinize carefully the neurons. Scrutinize the cytoplasm of the neuron. You will find in it more intensively stained spots. They correspond to a cell organelle, actively synthesizing proteins.
Which is this organelle. Mark the correct answer with a circle:

A. Golgi apparatus;
B. smooth endoplasmic reticulum;
C. rough endoplasmic reticulum;
D. Ribosomes devided in small and big subunits, clustered in different spots of the cytoplasm.

2.2. Look carefully at the neuron nuclei, which are lightly stained. You will find a darker structure in some of them. This is the nucleolus. Define why the nucleolus is stained by the same dye that stain the cytoplasm organelles too. Mark the correct answer with a circle:

A. because proteins are actively synthesized in the nucleolus;
B. because there is a great amount of compact DNA;
C. because the ribosomes subunits are formed in the nucleolus.

TASK 3.

Slides **No4** and **No5** are sections of an organ. The shape of the cells that built this organ are polyhedrical (3-dimensional polyangular).

3.1. Having in mind the shape of the cells, define the organ:

A. heart;
B. brain;
C. lungs;
D. liver.

3.2. Look at the slides **No4** and **No5**. Both are stained with Feulgen stain. This is a method for proving DNA. Why the nuclei on slide **No4** are not stained. Mark the correct answer with a circle:

A. The cells on slide **No4** have undergone final differentiation and there are no nuclei in them;
B. The cells on slide **No4** are pretreated with an enzyme that decomposes DNA;
C. The cells on slide **No4** are pretreated with an enzyme that decomposes RNA;
D. The cells on slide **No4** are pretreated with an enzyme that decomposes particularly the nucleic proteins.

TASK 4.

4.1. There are three slides - blood spreads, numbered 6, 7, 8. The slides are stained with Giemsa (after Romanovski).
Scrutinize the slide **No6**. Bearing in mind that Giemsa dye is a mixture of two simple stains - methyl-blue (basic dye, staining in blue) and eosine (acid dye, staining in red) define to which of the following groups the stained blue nucleus belongs. Mark the correct answer with a circle:

A. acidophilic structures;
B. basophilic structures;
C. neutral structures.

4.2. Look at slides **No6** and **No7** paying attention to the red blood cells. Define the classes to which the animal species which blood is used for the slides belong. Which one of the following statements is correct? Mark the correct answer with a circle:

A. Slide **No6** is from a mammal, and slide **No7** is from a bird;
B. Both slides are from mammals;
C. Slide **No6** is from blood of an amphibia, and slide **No7** is from a mammal;
D. Both slides are from blood of birds.

4.3. Minimizing of the erythrocytes in the course of evolution is considered to be a progressive feature because: (Mark the correct answer with a circle)

A. the surface area to volume ratio is higher for smaller erythrocytes;
B. in smaller erythrocytes the haemoglobine is much more active.
C. smaller erythrocytes form clots rarely.

4.4. Leukaemya is a desease that causes a several times increasing of the number of one of the main blood cells groups. Define which one of the slides **No7** or **No8** is made from blood of an ill man. Mark the correct answer with a circle:

A. slide **No7**;
B. slide **No8**;
C. neither of the slides;
D. both slides.

No of the participant: .....

PRACTICAL TEST

II. SECTION BIODIVERSITY

Total: 33 points.
Time: 45 min.

The two largest classes of phylum Molluska are Snails (Gastropoda) and Mussels (Bivalvia, Lamellibranchia).

The Class Gastropoda includes about 90 000 species. Its body consists of a foot, visceral mass, mantle cavity and a shell. The shell is entire, conical and usually spirally curved. (Fig. 1).

The Class Bivalvia includes about 20 000 species. They have a laterally flatten body and reduced head. Their shells consist of two valves, which binds on the back-side by means of an elastic bond, called **ligament** and **teeth apparatus**, consisting of definite number of teeth. In most of the mussels the teeth of the one half of the shell enter the respective cavities of the other and on the opposite (Fig. 2).

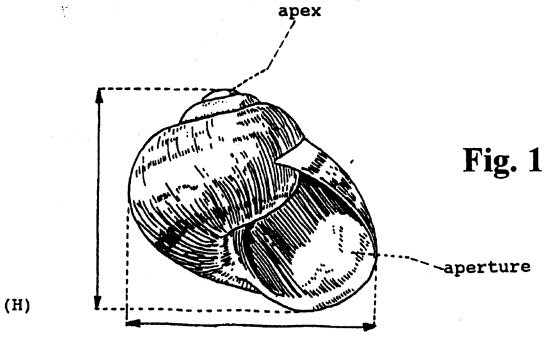


Fig. 1. Drawing of a snail shell

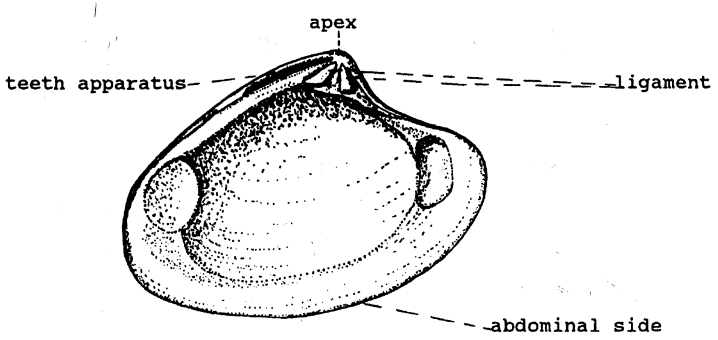


Fig. 2. Drawing of the inner surface of a mussel shell.

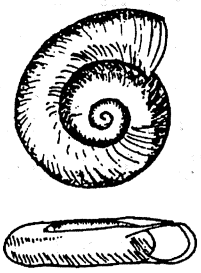
TASK 1.

Shells of sea, fresh-water and land snails are infront of you. They are numbered from No7 to No12. Define the genus to which they belong having in mind Fig. 1 and the morphological features, based on the shell peculiarities that are used for the identification of Gastropoda species:

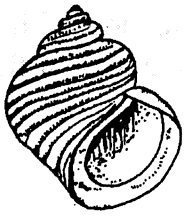
MORPHOLOGICAL FEATURES:

A. Shape of the shell:
According to their shape the shells are:

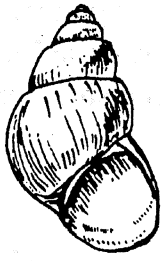
conical **(1a)**



discoid (flattened) **(1b)**



oval **(1c)**



spindle shaped **(1d)**

B. Thickness of the shell wall:
According to the thickness of their walls the shells are:
thinwalled **(2a)** and thickwalled **(2b)**

C. Surface of the shell:
It could be smooth **(3a)** and rough **(3b)**

D. Colour of the shell:
The shells are: light (white) **(4a)**
dark (brown, greenishbrown) **(4b)**.

E. Height/breadth ratio (H/B):
It could be: H/B > 1 **(5a)** or H/B < 1 **(5b)**.

Using Table 1, identify the snail shells from **No7** to **No12**. The genera to which these snail shells belong are listed in the table. Each shell from the respective genus is characterized by a combination of morphological features, marked with a figure and a letter (given above).
You have to read carefully this information and to write down in Table 2 the number of the shell which features corresponds to these of the respective genus. To ease your work do the following:

A. classify the shells firstly by shape, and afterwards following the other features.
B. measure with the rulers the height (H) and the breadth (B) of the shells. Calculate the ratio H/W.

Table 1.

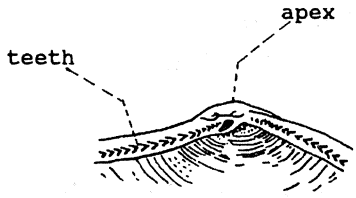
Genus	Combination of morphological features					No.
	shape	thickness	surface	colour	H/W	
PATELLA	1a	2b	3a	4b	5b	.....
RAPANA	1c	2b	3b	4b	5a	.....
PLANORBIS (CORETUS)	1b	2a	3a	4b	5a	.....
HELIX	1c	2a	3a	4b	5a	.....
ZEBRINA	1d	2a	3a	4a	5a	.....
HELICELLA	1b	2a	3a	4a	5a	.....

TASK 2.

The following morphological features of the shell are important for the identifying of the Bivalvia species: teeth apparatus of the shell, shape, size, surface, colour and lustre.

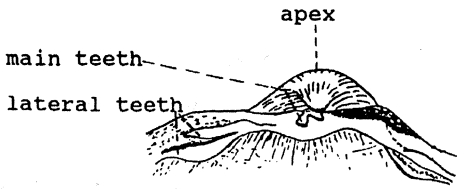
Morphological features:
A. Teeth apparatus type:
Taxodontous type: it is built of approximately similar in shape teeth, arranged one next to the other **(1a)**.
Heterodontous type: it is built of some triangular, just below the apex of the shell teeth - the main teeth and some lamella thin-shaped teeth - the lateral teeth **(1b)**

Desmodontous type: there are no teeth, but they are replaced by a spoon-like structure - hondrophor **(1c)**.
Disodontous type: the teeth are reduced (they are missing)**(1d)**.



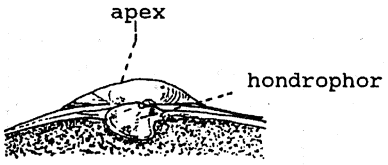
(1a)

Taxodontous



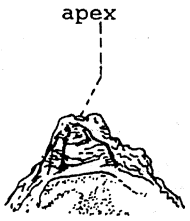
(1b)

Heterodontous



(1c)

Desmodontous



(1d)

Disodontous

B. Shape of the shell:

C. Surface:
- the shells can be smooth on their outer surface and only the stribes of growing to be distinguished **(3a)**.
- there are concentric ribs or lamelles on the surface **(3b)**.
- there are radial ribs on the surface **(3c)**.

D. Colour of the shell:
- light (white, yellow, light brown) **(4a)**;
- dark (black, dark blue, dark brown) **(4b)**

E. Lustre:
- shining (glazed) **(5a)**;
- not shining (opal) **(5b)**

Using **Table 2**, identify the genus of the mussel shells numbered from 1 to 6. The six genera to which the shells belong are inlisted in the Table. Each shell from the respective genus is characterized by a combination of morphological features, marked with a figure and a letter (given above).
You have to read carefully this information and to write down in the table the number of the shell which features coinsides with these of the respective genus. To ease your work do the following:

A. Classify the shells by the type of the teeth apparatus;
B. Classify the shells by shape, type of the surface, colour and lustre.

Table 2.

Genus	Combination of morphological features					No.
	teeth apparatus	shape	sculpture	colour	luster	
CUNEARCA	1a	2b	3c	4a	5b	.....
DONAX	1b	2b	3a	4a	5a	.....
CARDIUM	1b	2a	3c	4a	5b	.....
MYA	1c	2b	3a	4a	5b	.....
MYTILUS	1d	2c	3a	4b	5b	.....
OSTREA	1d	2a	3b	4a	5b	.....

No of the participant: .....

PRACTICAL TEST

III. SECTION PHYTOECOCLOGY

Total points: 20 points
Time: 45 min.

Different plant groups take part in the formation of herbaceous communities (legumes, grasses, composites, umbellifers and others). The quantitative participation of the grasses, legumes and the other palnt groups determines the forage value of the herbaceous association. It is "VERY GOOD" when the legumes prevail, "GOOD" when the grasses prevail and "AVERAGE" when the percentage of composites and umbellifes predominates over the legumes and grasses.

TASK 1.

Here is a total of ..... plant specimens of different plant groups. They are collected from an area of about 0.1 m^2 (10x10 cm^2). To determine the weight of the plant material a pair of scales is at your disposal.

1.1. Classify the plants from the paper dishes into the four groups mentioned above on the base of their structure. Put each group on the given paper plates.

1.1.1. Calculate the percentage of each plant group from the whole plant material.
1.1.2. Put the calculated data in columns 2 and 3 in the table below.
1.1.3. Evaluate the forage value of this herbaceous community following the answers of the task. The forrage value indicate with "+" or "-" in the boxes below the Table.

1.2. Calculate the primary production only of each plant and legumes in this herbaceous association. To do this:

1.2.1. Determine the weight of each group and calculate their primary productivity (kg/m^2).
1.2.2. Fill the data in columns 4 and 5 of the Table.

TABLE in which the results from the phytoecological task are to be presented:

Plant group	Quantitative participation of plant groups		Weight of each group (g)	Primary production (Kg/m2)
	Number of individuals	%		
1	2	3	4	5
Grasses				
Legumes				
Composites				
Umbellifers				

Forrage Value: Very Good ☐ Good ☐ Average ☐

No of the participant: .....

PRACTICAL TEST

IV. SECTION ZOOECOLOGY

Total: 35 points.
Time: 45 min.

A great number of soil living animals inhabit the forest soils. They play a significant role for the maintanance of biodynamics of soil, transformation and recycling of substances and energy. The soil fertility depends, to a great extent, on their species diversity, number and biomass.

From one site from a deciduous forest with the following parameters: area - 0.5x0.5 m and 5 cm thickness of the soil layer, invertebrates of different phyla and classes that live in the upper ground layer are collected. They are fixed in a solution of 70 % ethyl alcochol and are in front of you.

TASK 1.

Pour out the fixed organisms in the petri dishes infront of you.

1.1. Scrutinize carefully with a magnifying glass the soil invertebrates in the soil specimen and separate them in phyla and classes (See Table I) in the watch glasses.

1.2. Determine the number of the individuals of each class and insert the results in the column 3 of Table 1.

1.3. Calculate the percentage of individuals from each class from the total number of individuals in the specimens and put the data calculated in column 4.

Phyla	Classes	Number of individuals	% of the sample
1	2	3	4
Worms (Vermes)	Bristle-footed worms (Oligochaeta)		
Molluscs (Mollusca)	Naked snails (Gastropoda)		
Arthropods (Arthropoda)	Crustaceans (Crustacea)		
	Multipedes (Myriapoda)		
	Insects (Insecta)		

TASK 2.

The influence of each organism in an association or ecosystem depends on the species to which it belongs, as well as on the individuals which take part in the ecosysytem.

The number of individuals or biomass of the population per unit area or volume determine the density of the population.

Using the data in Table 1. calculate:

2.1. The number of individuals from each class per $1m^2$ and put the results in the column 2 of Table 2.

2.2. Determine the weight of the individuals from each class and put the calculated data (in grams) in column 3.

2.3. Determine the biomass of each class of soil invertebrates in g/m^2 and put the calculated data in column 4.

Classes	Number within 5 cm of the surface (per 1 m2)	Weight (g)	Biomass (g/m2)
1	2	3	4
Bristle-footed worms (Oligochaeta)			
Naked snails (Gastropoda)			
Multipedes (Myriapoda)			
Crustaceans (Crustacea)			
Insects (Insecta)			