REPORT

THE SIXTH IBO

2-9 JULY 1995

AT CHULALONGKORN UNIVERSITY

BANGKOK, THAILAND

To Commemorate

H.R.H. Princess Galyani Vadhana
Krom Luang Naradhiwas Rajanagarindra
on her 72nd Birthday Anniversary
Thailand is a Host country
for
The Sixth International Biology Olympiad

H.R.H. Princess Galyani Vadhana
Krom Luang Naradhiwas Rajanagarindra
opening the 6th IBO

The Inaugural Address
Delivered by
H.R.H. Princess Galyani Vadhana
Krom Luang Naradhiwas Rajanagarindra
At the Opening Ceremony of the Sixth International Biology Olympiad
Monday 3 July 1995
At Chulalongkorn University Auditorium, Bangkok, Thailand

It gives me much pleasure to join you this morning at the opening ceremony of the Sixth International Biology Olympiad which Thailand is privileged to host.

I consider the International Biology Olympiad an important event where exceptional students who have embraced Biology as their specialty are given an opportunity to fully develop their potential and to demonstrate their theoretical and practical capabilities to their peers from other participating countries.

I am pleased to note that 22 countries are competing in this Olympiad while five others are attending as observers. Such an international gathering should provide the participants with a forum where they may get to know one another, exchange knowledge and experiences, and build lasting friendships.

Since Thailand took part in the International Mathematics Olympiad for the first time in 1989, I have been personally following the progress and results of the International Science and Mathematics Olympiad with great interest. It is my firm belief that these Olympiads are extremely beneficial to the scientific and technological circles. Not only have they necessitated the standardization of relevant syllabi, but have also contributed to the development of human resources in science and technology. These participating students could one day become renowned scientists whose contribution to the cause of science is recognized both in their own countries and worldwide.

Finally, I would like to extend my sincere thanks to Dr. J. Hans Morelis, Chairman of the International Biology Olympiad Coordinators, the coordinators themselves, Professor Dr. Vitezslav Bicik, Co-chairman of the International Jury and Professor Dr. Pavol Elias, Secretary of the International Jury. On the Thai side, I would like to express my appreciation to the Advisory Board of the Organizing Committee of the International Biology Olympaid and its various Sub-committees, as well as other agencies from both the public and private sectors whose active support has made this event possible. As a result of your good deeds, may you be blessed with future happiness and prosperity. May all participants meet with success and advancement in your education and future careers.

The auspicious moment has now arrived, I declare the Sixth International Biology Olympiad open.

Foreword

The Sixth International Biology Olympiad took place in Bangkok, Thailand,from 2-9 July 1995. The timing of the event was most opportune in that it coincided with the auspicious 72th birthday anniversary of Her Royal Highness Princess Galyani Vadhana Krom Luang Naradhiwas Rajanagarindra,and provided us with an opportunity to pay tribute to Her Royal Highness, for the gracious support and patronage rendered to Thailand's participation in ther International Science and Mathematics Olympiad over the years.

The 6th IBO aimed to discover and encourage students who are specially gifted in biology, to foster friendly relations among the participating countries, and to create a forum for the exchange of information on school syllabi, activities and culture throughout the world.

Participation at the 6th IBO was by invitation. Each invited country with previous International Biology Olympiad experience was entitled to send a team consisting of two leaders and four student contestants. Out of the 26 countries invited by the Minister of Education, 22 accepted the invitation and were represented at the Olympiad. Also present were observers from 5 countries : Argentina, Great Britain, Japan, Switzerland, and Vietnam.

The 6th IBO was made possible by the generous support and active cooperation from many educational and professional Organizations in Thailand, both governmental and private. The major contributors were the Ministry of Education, the Institute for the Promotion of Teaching Science and Technology, Chulalongkorn University, and Charoen Pokphand Group of Companies.

The International Biology Olympiad was graciously opened by H.R.H. Princess Galyani Vadhana Krom Luang Naradhiwas Rajanagarindra. The contest took two days with one day's rest in between. The practical tests were constructed by the host country while the theoretical ones were prepared by the competing countries and selected by the host country. The practical and theoretical test items were originally prepared in English and Russian, and then discussed and finalised by a Jury of IBO Team Leaders under the chairmanship of Professor Dr. M.R. Putipong Woravudh. The selected questions were eventually translated into the mother tongues of the participants.

The contestants' papers were marked by the team leaders while the winners of gold, silver and bronze medals were decided by the Jury.

During their stay in Thailand, participants were given opportunities to become acquainted with the history, culture, natural beauty and the people of the host country through cultural and ecological tours, and social gatherings.

The medals were presented at the IBO Awards Presentation and Closing Ceremony on the afternoon of 8th July. Among the highlights of the ceremony were the presentation of the award medals, 8 gold, 17 silver, and 27 bronze, by the President of Chulalongkorn University. In the evening of that day Thailand hosted a Farewell Dinner for all participants which proved to be a successful event.

From their questionnaire replies, it was clearly evident that participants from abroad found their stay in Thailand most enjoyable and fruitful. Not only did this event provide the students and heads of delegation with constructive activities but also helped the participants to get to know and value one another. In conclusion, then, it can be said that the aims of the IBO were more than fulfilled.

Assist. Prof. Charuni Sutabutr
Director
The Institute for the Promotion of Teaching Science and Technology
Vice-Chairman, the 6th IBO Organizing Committee

CONTENTS

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26. Head of the International Mathematical and Science Olympiad Project (IPST) (Mrs. Sarunya Rugirekroungrong)

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1.	Professor Dr. M.R. Puttipongse Varavudhi	(Thailand)	Chairman
2.	Dr. Vitezslav Bicik	(Czech Repeulic)	Co-Chairman
3.	Dr. John Dearn	(Australia)	member
4.	Mr. Andrew Walter	(Australia)	member
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6.	Ms. Oalina Ramanavets	(Belarus)	member
7.	Ms. Helena Shalapyoanak	(Belarus)	member
8.	Mrs. Irene Popoff	(Belgium)	member
9.	Dr. Michel Asperges	(Belgium)	member
10.	Prof. Dr. Vassil Golemansky	(Bulgaria)	member
11.	Asst. Prof. Nevena Mouleshkova	(Bulgaria)	member
12.	RNDr. Jan Stoklasa	(Czech Republic)	member
13.	Prof. Dr. Erwin Habil Zabel	(Germany)	member
14.	Dr. Annett Hartmann	(Germany)	member
15.	Dr. Kadir Tuzlak	(Kazakistan)	member
16.	Dr. Coskun Bostanci	(Kazakistan)	member
17.	Dr. Cengiz Altuntas	(Kirgizistan)	member
18.	Dr. Hamit Ozkan	(Kirgizistan)	member
19.	Mr. Rashid Al-Shimali	(Kuwait)	member
20.	Ms. Wasmeyah Al-Marfaei	(Kuwait)	member
21.	Ms. Maruta Kusina	(Latvia)	member
22.	Mr. Uldis Kondatovics	(Latvia)	member
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24.	Drs. P (Paula) Van Kranenburg	(the Netherlands)	member
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26.	Prof. Enshan Liu	(P.R. China)	member
27.	Dr. Jan Fronk	(Poland)	member
28.	Prof. Bronislaw Cymborowski	(Poland)	member
29.	Mrs. Valeriya Kuchmenko	(Russia)	member
30.	Mr. Vladimir Pasechnik	(Russia)	member
31.	Prof. Ladislav Kostal	(Slovak Republic)	member
32.	Prof. Peter Bitusik	(Slovak Republic)	member
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40.	Prof. Ali Demirsoy	(Turkey)	member
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42.	Dr. Murat Suyokov	(Turkmenistan)	member
43.	Mrs. Lidiya Vatschenko	(Ukraine)	member
44.	Dr. Stanislov Strazhko	(Ukraine)	member
45.	Dr. Pavol Elias	(Slovak Republic)	Secretary

Preparatory Text for the 6th IBO
in Bangkok, Thailand
July 2 - 9, 1995

I. Theoretical Test

Time	:	Approximately 3 hours
Date	:	July 6,1995
Content	:	According to the CONTENT OF THE THEORETICAL PART OF IBO
Types	:	About 60% multiple - choice questions
		About 40% short - answer questions
Total Score	:	About 200

Examples of multiple - choice questions from IBO IV

1. (2pt) In Drosophila, the following crossing-over percentages were found;

gene	gene	crossing-over %
bi	ec	1.4
bi	fa	3.9
wi	ec	4.0
wi	fa	1.5

What is the order of these genes?

A. bi - ec - fa - wi

B. bi - ec - wi - fa

C. ec - bi - fa - wi

D. ec - bi - wi - fa

2. (1pt) Which form of natural selection can lead to differentiation in species and to polymorphism?

A. directional selection

B. stabilizing selection

C. disruptive selection

D. density dependent selection

Examples of short - answer questions from IBO IV

1. (3pt) Which of the tissues, parenchyma, collenchyma and sclerenchyma, can have (one of) the characteristics or functions below? Put a tick in the right column.

	parenchyma	**collenchyma**	**sclerenchyma**
secondary lignified cell walls			
contain chloroplasts			
lacking of protoplasts in matured cells			
can become meristematic			
cells are always elongated			

2. (3pt) In the digestive system of the human body, the ingested organic substances are digested (= broken down) to monomers (= simple substantces). Indicate the shortest way along which one of these monomers, glucose, can reach the kidneys from the intestine, by putting the numbers of the structures involved in the right sequence. These numbers are to be chosen from the following list :

1 = jugular veins
2 = inferior vena cava
3 = liver
4 = left atrium
5 = superior vena cava
6 = right atrium
7 = aorta
8 = renal arteries
9 = lungs
10 = right ventricle
11 = pulmonary veins
12 = left ventricle
13 = carotic arteries
14 = brain
15 = hepatic portal vein
16 = pulmonary arteries

Answer : .....

II. Practical Test

Time : 4 hours (Approximately 1 hour in each laboratory)
Date : July 4,1995
Theme : Biodiversity
Skills : According to the BASIC SKILLS OF THE PRACTICAL PART OF THE IBO
TOTAL SCORE : About 200

Lab no.1

Each competitor will be given a number of animals and asked questions to tes this or her skills of observation, grouping, relationship finding, specimen preparation and drawing through the use of basic biological equipments. A competitor will use basic concepts in biology to observe the given specimens. Competitors who have seen the animals before will have no advantages over those who will see them for the first time.

Lab no.2

Competitors will see a mini-ecosystem. Plant specimens from this ecosystem will be given to each competitor for observation, dissection, slide-preparation, drawing, grouping and relationship finding through the use of basic-biological equipments. Like lab no 1, a competitor will use biological concents in answering the questions instead of his or her prior acquaintance with the plants.

Lab no.3

Each competitor will perform a simple experiment involving a common-microorganism. In this experiment, he or she will use skills of simple chemical analysis, hypothesis formulation and result interpretation. A number of questions will test his or her ability to analyze, process and interpret both acquired and presented data.

Lab no.4

Each competitor will be given an ecological problem to solve, by applying skills in observation, calculation, statistical manipulation of data and ecological relationship finding.

III. Other Preparatory Guidelines

1. Competitors are required to bring with them the following :
   - lab gowns or lab coats to cover themselves during their practical examination,
   - simple non-programmable calculators and
   - standard stationeries (pens, pencils, rulers and erasers)

2. Test questions will be available in English and Russian languages for the team leaders to translate into their native languages. The questions will be typed in such a way to assure that there is enough space between the lines for the written translated text.

In case any team would like to type the exam paper on a computer, they must notify the organizer by the end of May, 1995, and specify the PC model they wish to have. They must bring their own word-processor programs.

The Test Author Committee

January, 1995

IBO VI

THEORETICAL TEST

July 6, 1995

Bangkok, Thailand

The IBO VI theoretical test consists of 2 parts :

Part I : multiple-choice questions	96 points
Part II : short-answer questions	70 points
Total score :	166 points

Total time : 3.30 hours

WRITE YOUR NAME AND ID NUMBER ON THE ANSWER SHEET OF BOTH PARTS

THEORETICAL TEST PART I
INSTRUCTIONS FOR STUDENTS

1. There are 100 multiple-choice questions. Choose only one correct answer. Each question has 1 point, unless otherwise indicated.
2. Students must use the separate ANSWER SHEET for part I
3. Write your name and ID number in ANSWER SHEET.
4. **Use the provided pencils only.** Mark your answer, in the ANSWER SHEET. as shown in the following example.

   Example : If you choose choice no.5 for your answer to question no.1, mark in the ANSWER SHEET as follows :

   1. ① ② ③ ④ ●

   Make sure the whole circle is black. **If you change your answer, erase the old answer completely.**

1) Which characteristics are found in club moss (Lycopodium) but not in horsetail (Equisetum)?

I. Spore has elaters.

II. Photosynthesis occurs in microphyll.

III. Sporophylls form a strobilus.

IV. Microphylls are arranged in a whorl.

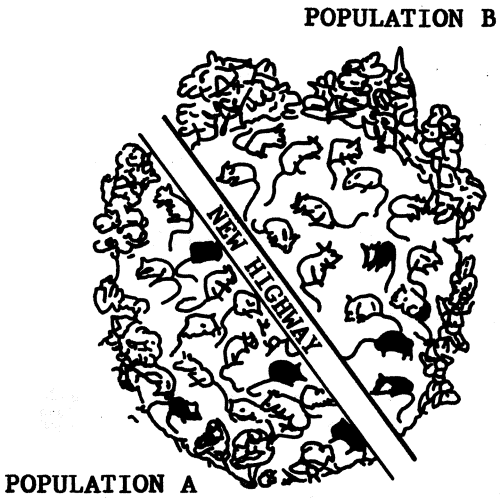
The correct answer is

1. I, II.
2. II, III.
3. II, IV.
4. III, IV.

2) Which is the first group of organisms that could successfully colonize a newly formed volcanic island?

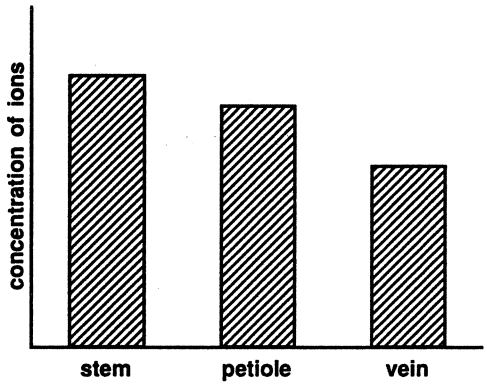
1. Ferns
2. Lichens
3. Liverworts
4. Algae

3) A population of mice originally inhabiting the entire area shown in the figure has become separated into two populations, A and B, by a new highway. If the environment inhabited by population A undergoes severe changes and the environment of population B does not, the rate of evolution of population A will probably be



1. initially slower than population B.
2. initially faster than population B.
3. equal to population B.
4. slower at first then faster than population B.

4) The concentration of ions in the sap of vessels of a tomato plant is investigated at three places (see the results in the figure).



The difference in concentration of ions between vein and stem is partly attributed to

1. evaporation of water from the stomata.
2. capillary force of the xylem vessels.
3. intake of ions by leaf cells.
4. intake of water by leaf cells.

5) What is the most important function of glycolysis in aerobic cells ?

1. To obtain fat from glucose
2. To obtain energy from glucose step by step
3. To allow carbohydrates to enter the Krebs cycle
4. Ability to divide the glucose molecule into two pieces

6) The frequencies of recombination between genes (loci) a, b, c, d, e, and f linked on the same chromosome are (a-c) 2.5%, (f-d) 8.5%, (b-d) 4.5%, (d-e) 4%, (c-e) 9.5%, (a-b) 20.5%, (f-a) 7.5%. The order of these genes (loci) is

1. a, c, d, e, f, b.
2. b, c, e, f, d, a.
3. a, c, f, e, d, b.
4. b, e, f, c, a, d.

7) Cells of the adrenal cortex produce hormones whose structure is similar to that of

1. hemoglobin.
2. cholesterol.
3. tyrosine
4. adrenalin.

8) In green plants, which event can continue in all four conditions shown below?

Sunny Partly cloudy Cloudy Raining

1. Increasing net photosynthesis
2. Water absorption
3. Respiration
4. Transpiration
5. Guttation

9) What type of behaviour is shown when a parent herring gull gives an alarm call and the young birds respond by hiding?

1. Imprinting
2. Conditioned reflex
3. Reaction to a sign stimulus
4. Displacement activity

10) Which characteristics belong to insects ?

I. A dorsal rope ladder nerve cord
II. Malpighian tubules
III. Open circulatory system
IV. Gas exchange via a tracheal system

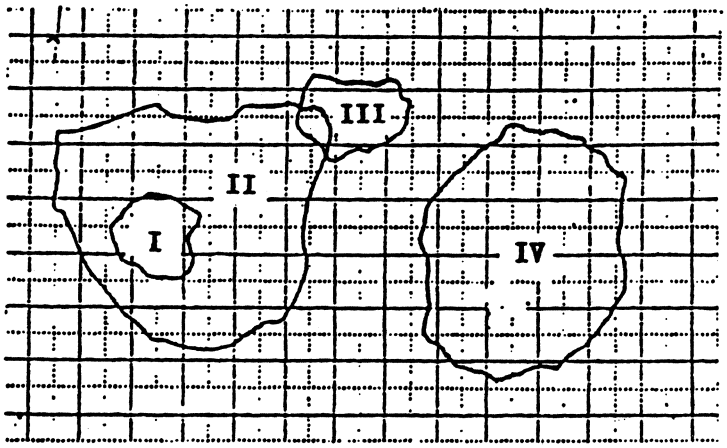
The correct answer is

1. I, III only.
2. II, III only.
3. I, II, IV.
4. II, III, IV.

11) In which animal cell would the Golgi apparatus be most abundant?

1. Voluntary muscle cell
2. Red blood cell
3. Gland cell
4. Ovum

12) In the diagram, the background squares represent environmental factors (space, temperature, etc.), and the irregular polygons enclosing a set of factors represent the ecological niches of species I, II, III, and IV.



Note : Each niche is continuous

Which species is in danger of elimination, if the resources are limiting?

1. I
2. II
3. III
4. IV

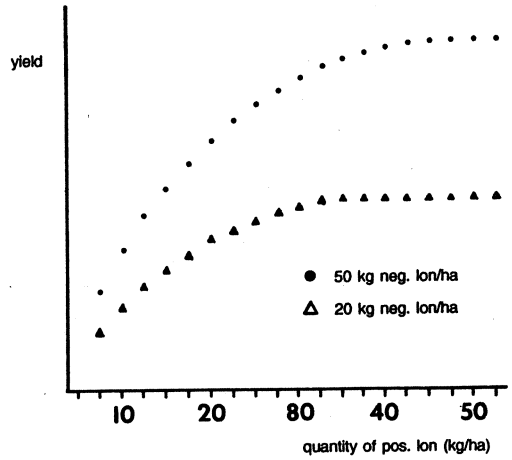
13) To determine that a green plant releases CO_2 during respiration, what is necessary in the experiment?

1. Using a plant with many leaves
2. Doing the experiment in the dark
3. Submerging the plant in water
4. Using a young plant

14) Which of the following is an example of active transport?

1. Chloride shift between red blood cells and plasma
2. Sodium reabsorption in the distal tubules of the kidney
3. Movement of oxygen from pulmonary alveoli into blood
4. Oxygen movement within a muscle fiber

15) The graph shows the relationship between the yield of a crop and the quantity of positive ions (cations) used to fertilize the field.



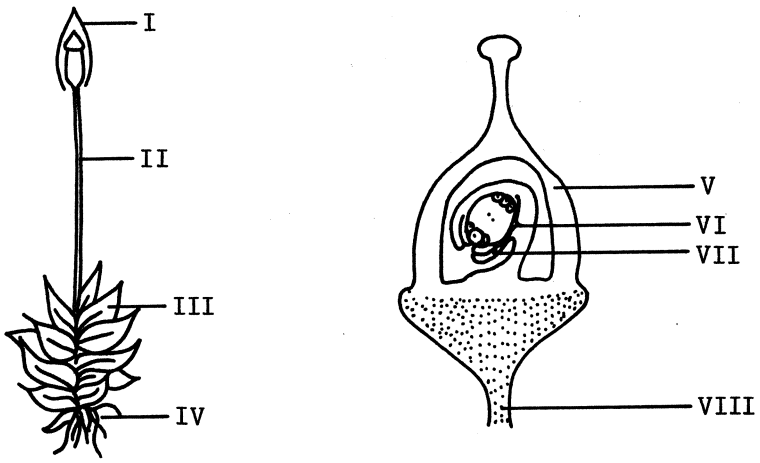
A field is fertilized with 20 kg/ha of the positive ions and 20 kg/ha of the negative ions (anions). Are the positive and negative ions under these conditions limiting factors for the yield?

1. No, neither of them
2. Only the positive ions
3. Only the negative ions
4. Yes, both of them

16) Incipient plasmolysis is the moment whereby

1. turgor pressure of the cell equals zero.
2. the protoplast completely shrinks away from the cell wall.
3. the cell volume is at a maximum.
4. the cell wall can stretch no further.

17)



Based on the figure above, identify plant parts of the same generation of the life cycle.

1. III and VI, I and VI
2. I and V, II and VI
3. III and V, III and VI
4. II and VII, IV and VIII

18) A condition necessary for speciation is

1. a high rate of gene mutation.
2. geographical separation of populations.
3. separation of a very small group of individuals from the initial large population.
4. behavioral, geographical, genetic or other barriers preventing gene flow between populations.

19) The group of anamniotes is

1. pigeon, salamander, marsupial.
2. dolphin, sea horse, seal.
3. salmon, toad, skate.
4. raven, woodpecker, newt.

20) In a gene pool with equal proportions of a dominant and a recessive alleles, complete selection against the recessive phenotype in each generation would

1. make little difference to the proportions of the genotypes.
2. decrease the proportion of the recessive genotype.
3. lead to the extinction of the recessive allele.
4. increase the proportion of heterozygotes.

21) Which of the following characters could be found in sea anemones and some sponges?

I. Pseudocoelom
II. Intracellular digestion
III. Radial symmetry
IV. Gastrovascular cavity

The correct answer is

1. I, II.
2. II, III.
3. III, IV.
4. I, IV.

22) Which of the following statements is <u>not</u> correct?

1. Phosphorylation of ADP occurs in the thylakoid membrane.
2. ATP is formed as protons diffuse through ATP synthase.
3. ATP is consumed during the dark reaction.
4. NADPH and ATP are produced in Photosystem II.

23) Which of the following is observed when the growth rate "r" equals zero?

1. The population is increasing, and a strong competition for food and shelter is expected.
2. The population is increasing, and high parasitic and predatory activities are expected.
3. The population is decreasing because of the accumulation of toxic waste.
4. The population is near its carrying capacity.

24) A mouse was allowed to breathe air containing a particular isotope of oxygen, $^{18}O_2$. In the mouse, the "labeled" oxygen atoms first showed up in

1. pyruvate.
2. carbon dioxide.
3. acetyl CoA.
4. water.

25) Which abiotic factors limit the distribution of life in the oceans, but do not usually limit the distribution of life on land?

I. Minerals
II. Light
III. Nitrogen
IV. Oxygen

The correct answer is

1. I, III.
2. I,IV.
3. II, III.
4. II,IV.

26) In higher plants, the evolution of the sporophyte has clearly dominated over that of the gametophyte (with respect to size, anatomic complexity, and duration within the plant's life cycle). The primary reason for this dominance is that the sporophyte

1. may reproduce vegetatively.
2. has a well developed parenchyma.
3. has a well developed conducting tissue.
4. has cells that divide by mitosis.

27) What would be observed when a grazer is removed from the ecosystem of a natural grassland?

I. An increase in the intensity of plant competition
II. A decrease in the intensity of plant competition
III. An increase in the variety of plant species
IV. A decrease in the variety of plant species

The correct answer is

1. I, III.
2. I, IV.
3. II, III.
4. II, IV.

28) In which of the following events is crossing over likely to occur?

1. Formation of spermatogonia
2. Formation of spores in a fern
3. Formation of egg in a liverwort archegonium
4. Formation of a second plant from a strawberry stolon

29) What is the immediate source of the energy used to make most of the ATP in animal cells?

1. The transfer of phosphate groups from glucose breakdown products to ADP.
2. The movement of hydrogen ions through a specific membrane.
3. The splitting of glucose into two molecules of pyruvic acid.
4. The movement of electrons along the electron transport chain.

30) In a seed, the food reserve tissues for the embryo are

1. haploid in gymnosperms, triploid in angiosperms.
2. diploid in gymnosperms, triploid in angiosperms.
3. diploid in gymnosperms, pentaploid in angiosperms.
4. haploid in gymnosperms, diploid in angiosperms.

31) Two cylinders, P and Q, are excised from a potato. P is placed for 1 hour in distilled water, and Q is placed for 1 hour in a salt solution with an osmotic value which is identical to the average value of cell sap of the potato cells. Determine whether the treated cylinders match their original holes in the potato.

1. P does not match, but Q does.
2. P does not match, and neither does Q.
3. P matches exactly, and so does Q.
4. P matches exactly, but Q does not.

32) Select characteristics specific for Class Mammalia. (2 points)

I. 4-chambered heart
II. Sweat gland
III. Diaphragm
IV. Homeothermy
V. Pinna
VI. Scrotum
VII. Hair
VIII. Viviparity

The correct answer is

1. I, II, IV, V.
2. III, VI, VII, VIII.
3. II, III, V, VI, VII.
4. I, IV, VI, VII, VIII.

33) A cross between two types of white-flowered sweet peas produced all purple-flowered peas in F_1. 382 purple-flowered and 269 white-flowered peas were observed in F_2. These numbers are consistent with the 9:7 ratio. If the purple F_1 were crossed to one of the parental types, what proportion of white-flowered peas would you expect among the progeny ? (2 points)

1. 1
2. 0.75
3. 0.5
4. 0.25
5. 0

34) One of the negative consequences of the overuse of antibiotics is

1. adaptation of the person undergoing treatment to ever increasing concentrations of the drug.
2. stimulation of the production of antibodies.
3. selection of antibiotic-resistant bacterial strains.
4. increased frequency of mutations, eventually causing cancer.

35) Which characteristics do sunflowers have?

	Inflorescence	Corolla	Number of stamens per floret	Number of seeds per floret
1.	umbel	free	2	2
2.	head	united	5	1
3.	head	free	5	many
4.	umbel	united	5	1

36) U is inserted between the 9th and 10th base (counting in 5'--> 3' direction) of the following mRNA: (2 points)

5' G* C U A U G C G C U A C G A U A G C U A G G A A G C 3'

G* = cap use genetic code table in question 69

and when it is translated into a peptide, the length of the peptide chain is

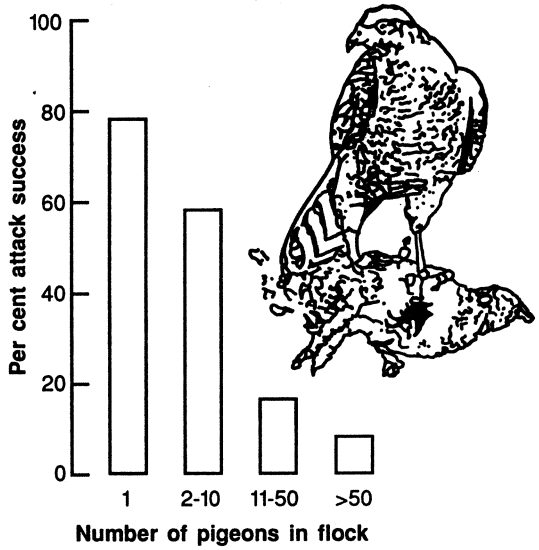
1. 4.
2. 5.
3. 8.
4. 9.

37) The F_1 genotypes resulting from a cross between a drone honeybee and a queen honeybee are males (AB, Ab, aB, ab) and females (AaBb, Aabb, aaBb, aabb).

What are the genotypes of the parents? (2 points)

1. aaBb x Ab
2. AaBb x ab
3. AAbb x aB
4. AaBb x Ab

38) The following graph represents the probability of capture of a wood pigeon (Columba palumbus) by a goshawk (Accipiter gentilis) as a function of the size of the flock.



I. A solitary wood pigeon has less chance of being captured by a goshawk than a pigeon in a flock.

II. Goshawks are less successful when they attack larger flocks of wood pigeons.

III. The goshawks attack only solitary wood pigeons.

IV. The percent attack success is inversely proportional to the number of pigeons in the flock.

Which of the above propositions are correct?

1. I, III
2. I, IV
3. II, III
4. II, IV

39) Which is the typical characteristic of an Old World Monkey?

1. Having a flat nose
2. Lacking a prehensile tail
3. Always having a long tail
4. Exclusively ground dwelling

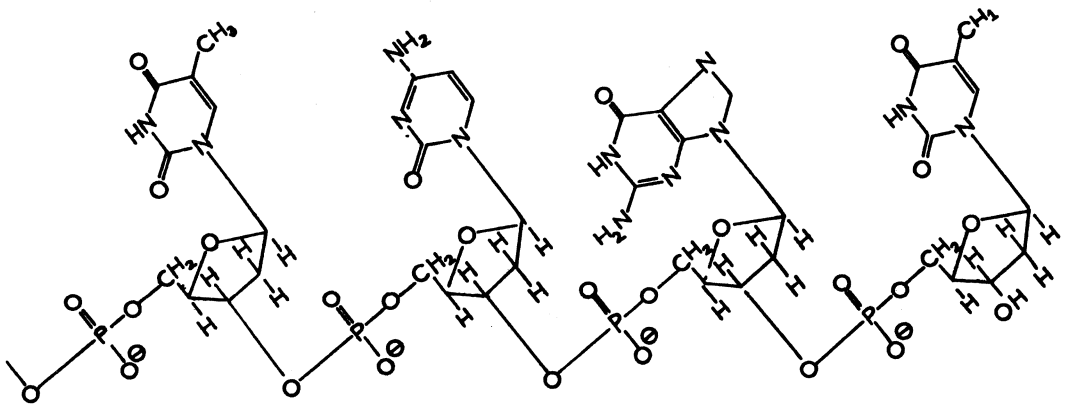
40) The hypothesis postulated by Oparin and experimentally tested by Miller suggests that

1. the primitive atmosphere contained molecular oxygen.
2. the primitive oceans contained high concentrations of proteins and nucleic acids.
3. bacteria appeared on earth 3.5×10^9 years ago.
4. organic molecules could have been formed without life.

41) The chief role of ATP in neurotransmission is to

1. inhibit transport of Na^+ and K^+ across the membrane.
2. induce an action potential.
3. increase an action potential when it is already formed.
4. maintain the resting potential.

42)



The above nucleotide chain is

1. DNA.
2. mRNA.
3. tRNA.
4. rRNA.

43) If frog tadpoles receive insufficient iodide from food and the surrounding water medium, which of the following may occur? (2 points)

I. Enlargement of thyroid gland
II. Over-secretion of TSH
III. Growth stimulation
IV. Exhibition of cretinism
V. Remaining in larval stage
VI. Enlargement of the pituitary gland

The correct answer is

1. I, II, III.
2. III, IV, VI.
3. II, IV, VI.
4. I, II, V.

44) Which of the following is typical for both Pinophyta (gymnosperm) and Magnoliophyta (angiosperm) plants?

1. Sporophylls differentiating into a carpel and a stigma
2. Haploid endosperm and vascular tissues with tracheids
3. Heterospory and nonflagellated sperm (male gamete)
4. Isogamy and wind pollination

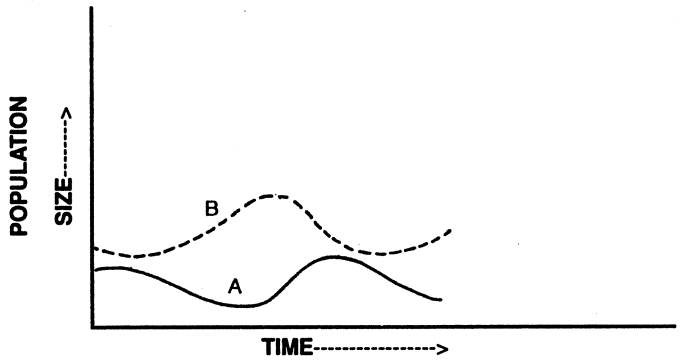
45) Which combination of the following human gametes will produce a Down syndrome male individual?

I. (23 + X)
II. (21 + Y)
III. (22 + XX)
IV. (22 + Y)

The correct answer is

1. I and II.
2. I and III.
3. I and IV.
4. II and III.
5. III and IV.

46) If A in the graph represents a population of hawks (Falconiformes) in a community, then what would most likely be represented by B?



1. A population of the hawks' predators
2. A population with which the hawks have a mutualistic relationship
3. Variation in the numbers of producers in that community
4. A population which is the hawks' prey

47) Which of the following cannot reproduce asexually?

1. 
2. 
4. 
5. 

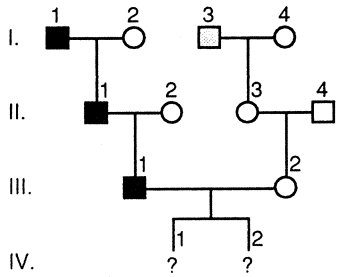
48) One locus has 5 alleles, A_1, A_2, ... A_5. How many different genotypes can exist in a population if the dominance hierarchy of these alleles is $A_1 > A_2 > A_3 > A_4 > A_5$? (2 points)

1. 5
2. 10
3. 15
4. 32

49) An average of 50 yeast cells per unit area was observed under the microscope. After 4 hours the liquid culture was diluted 10 times. Again a microscopic slide was prepared under the same conditions as before. An average of 80 cells per unit area was observed this time. What was the average time between cell divisions?

1. 1/4 hour
2. 1/2 hour
3. 1 hour
4. 2 hours

50) Consider the pedigree below.



■ = Autosomal dominant abnormality (AD)

□ = Sex-linked recessive abnormality (SLR)

If IV -1 is male and IV - 2 is female, which of the following statements is correct? (4 points)

1. The probability that IV-1 would have both AD and SLR abnormalities is 1/8.
2. The probability that IV-2 would have both AD and SLR abnormalities is 1/4.
3. The probability that IV-1 would manifest AD abnormality but not the SLR abnormality is 1/8.
4. The probability that IV-2 would manifest AD abnormality but not the SLR abnormality is 1/8.

51) Which are the possible conditions that could lead to serious hypoglycemia (low blood glucose level) and unconciousness? (2 points)

I. Type I diabetic patients (insufficient B-cells) who receive an insulin injection several hours before a meal

II. Type II diabetic patients (non-functional insulin receptors) who receive an excessive insulin injection

III. Patients with a tumor of the islets of Langerhans who receive an acute injection of insulin

IV. Injection of insulin to a normal subject after heavy exercise

The correct answer is

1. I, III.
2. I, IV.
3. I, II, III.
4. II, III, IV.

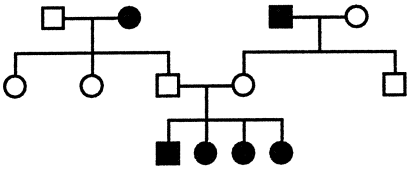
52) Through how many of membranes would a molecule have to pass from the interior of a chloroplast thylakoid to the mitochondrial matrix?

1. 3
2. 5
3. 7
4. 9

53) Substances can be transported across a membrane against their concentration gradient because

1. some membrane proteins are ATP-dependent carrier molecules.
2. some membrane proteins act as channels through which specific molecules can enter the cell.
3. the lipid bilayer is permeable to numerous small molecules.
4. the lipid bilayer is hydrophobic.

54)



● = Female having this genetic character (phenotype)

■ = Male having this genetic character (phenotype)

Of the following modes of inheritance, which one could describe the genetic character appearing in the above pedigree?

I. Autosomal dominant
II. Autosomal recessive
III. Sex-linked dominant
IV. Sex-linked recessive

The correct answer is

1. I.
2. II.
3. I or III.
4. II or III.
5. II or IV.

55) Which of the following is true for RNA?

1. (G + C) = (A + U)
2. (G + A) = (C + U)
3. (G + C) > (A + U)
4. None of the above

56) Which of the following numbers (lines) correctly matches stimuli specific for receptor cells A, B and C?

	A. Hair cells in cochlea	B. Olfactory epithelium	C. Rod cells
1.	change in gravity	change in air pressure	light
2.	touch	change in chemical compound	heat
3.	vibration	change in chemical compound	light
4.	stretch	change in air pressure	electric current

57) If the following DNA is transcribed in the direction shown,

5' G C A T T C G C C G A 3'

3' C G T A A G C G G C T 5'

<----------

The RNA product will be

1. 5' U C G G C G A A U G C 3'.
2. 5' G C A U U C G C C G A 3'.
3. 5' C G U A A G C G G C U 3'.
4. 5' A G C C G C U U A C G 3'.

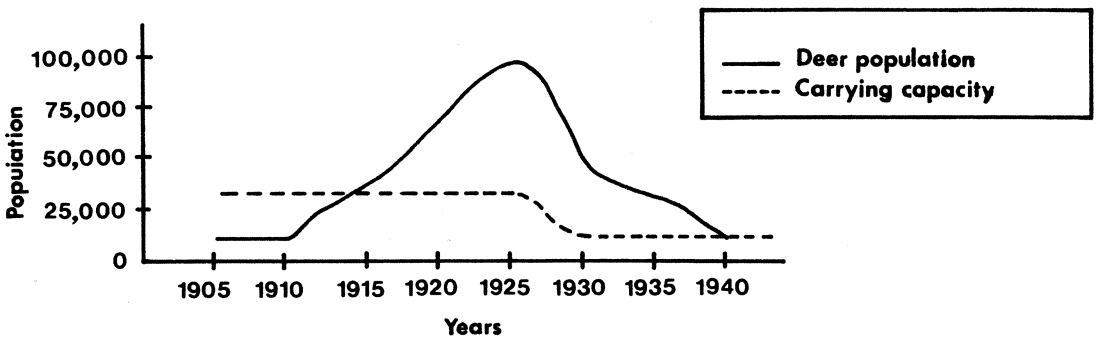
58) A suitable vector for inserting DNA into the genome of a human cell is

1. Ti plasmid.
2. phage.
3. retrovirus.
4. all of the above.

59) Touching the mantle of the siphon of the sea hare, Aplysia (Phylum Mollusca), normally triggers a reflex that protects the mantle by withdrawing it. If the mantle is touched repeatedly, the withdrawal response becomes progressively weaker. This type of behaviour is called

1. habituation.
2. a conditioned reflex.
3. trial and error.
4. a chain of reflex.

60) The graph below depicts changes in the population growth rate of the Kaibab deer.



About how many deer could this particular environment have supported in 1930 without some of them starving to death?

1. 12,000
2. 35,000
3. 50,000
4. 100,000

61) A given fungus fails to digest starch in a certain culture medium. What are possible causes of this lack of digestion?

I. This fungus contains no amylase.

II. The amylase in the fungal mycelium is not secreted.

III. There is some substance interfering with starch digestion by the fungus.

IV. The only respiratory substrate for this fungus is carbohydrate.

The correct answer is (2 points)

1. I, II only.
2. III, IV only.
3. I, II, III.
4. I, II, III, IV.

62) The figures I - IV illustrate transportation of substances and ions through the cell membranes. Which of the following statements is correct?

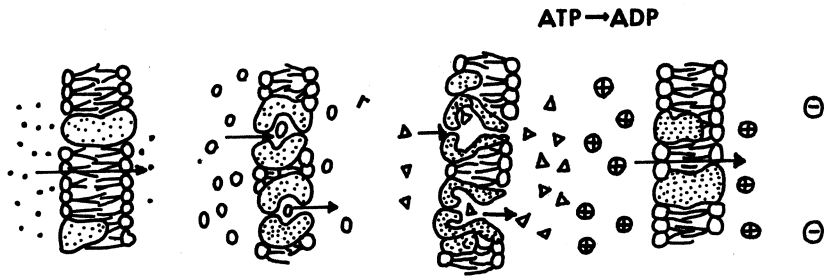


Fig I Fig II Fig III Fig IV

1. There is diffusion in all figures.
2. There is active transport in all figures.
3. There is active transport in Figs. II and III and passive transport in Figs. I and IV.
4. There is osmosis in Figs. I, II and IV.
5. There is active transport in Fig. III and passive transport in Figs. I, II, and IV.

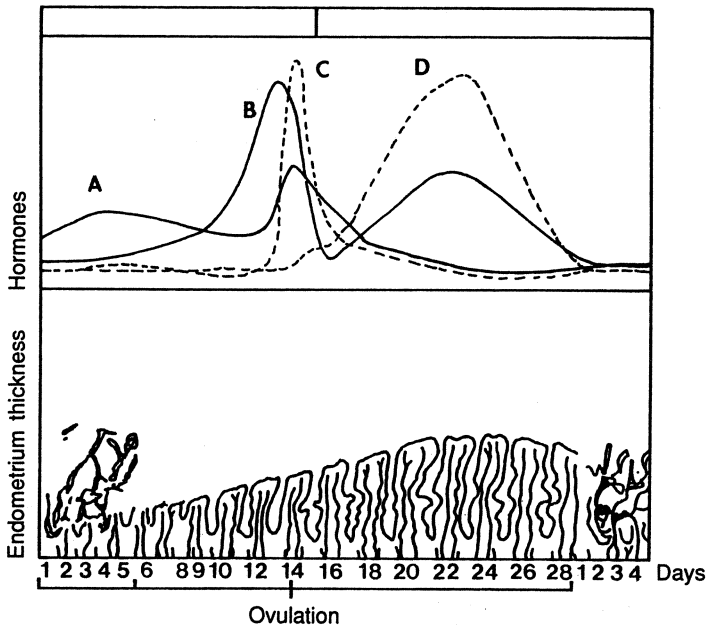
63) Which of the following belong to dicots (Magnoliopsida)?

1. Banana, coconut, cucumber
2. Water melon, cabbage, egg plant
3. Pineapple, onion, asparagus
4. Poppy (Papaver), hemp (Canabis), agave

64) Which of the following is <u>not</u> important for migrating birds in finding and determining routes?

1. Auditory stimulation
2. Infrared sensitivity
3. Rotational force of the Earth
4. Using the stars as a compass

65) Four major reproductive hormones measured from blood serum of a woman during a normal menstrual cycle are shown in the figure. If A is FSH, what are B, C and D?



	B	C	D
1.	estradiol	progesterone	LH
2.	LH	progesterone	estradiol
3.	estradiol	LH	progesterone
4.	LH	estradiol	progesterone

66) Which is the most suitable condition to store seeds of most tropical plants so that they can remain viable for the longest time?

1. In an ordinary refrigerator at 5°C
2. In a chamber at 5°C with 10% oxygen
3. In a chamber at 5°C with reduced pressure
4. In a chamber at 30°C with humidity maintained at 20%

67)

Culture Medium	Growing state
S.C.M	-
S.C.M. + V + Z	-
S.C.M. + U + Y	+
S.C.M. + Z + X	-
S.C.M. + V + Y	+
S.C.M. + U + X	-
S.C.M. + Y + Z	+

The above data show bacterial growth in various media (S.C.M. = Simple Culture Medium, and U, V, X, Y, Z represent different materials added to the medium). Which material can the bacteria not synthesize?

1. U
2. V
3. X
4. Y
5. Z

68) Which of the following are not the characters of xerophytic plants?

I. Short stem

II. Stomata present on both sides of leaf surfaces

III. Enlargement of leaf surface

IV. Hypodermis present

The correct answer is

1. I, II.
2. II, III.
3. III, IV.
4. I, IV.

69) Which codon can be mutated by one base change to a nonsense codon? See table of genetic code provided.

The Genetic Code*

First (5') letter	Second letter: U	Second letter: C	Second letter: A	Second letter: G	Third (3') letter
U	UUU, UUC Phe	UCU, UCC, UCA, UCG Ser	UAU, UAC Tyr	UGU, UGC Cys	U
	UUA, UUG Leu		UAA *Ochre* (terminator)	UGA *Opal* (terminator)	C
			UAG *Amber* (terminator)	UGG Tryp	A
					G
C	CUU, CUC, CUA, CUG Leu	CCU, CCC, CCA, CCG Pro	CAU, CAC His	CGU, CGC, CGA, CGG Arg	U
			CAA, CAG GluN		C
					A
					G
A	AUU, AUC, AUA Ileu	ACU, ACC, ACA, ACG Thr	AAU, AAC AspN	AGU, AGC Ser	U
	AUG Met (initiator)		AAA, AAG Lys	AGA, AGG Arg	C
					A
					G
G	GUU, GUC, GUA, GUG Val (initiator)	GCU, GCC, GCA, GCG Ala	GAU, GAC Asp	GGU, GGC, GGA, GGG Gly	U
			GAA, GAG Glu		C
					A
					G

* Each triplet nucleotide sequence or codon refers to the nucleotide sequence in mRNA (not DNA) that specifies the incorporation of the indicated amino acid or polypeptide chain termination.

1. G C C
2. G A A
3. G C A
4. G G C

70) Which enzyme is not normally found in humans?

1. DNA polymerase
2. hexokinase
3. chitinase
4. ATP synthetase

71) What is the anticodon corresponding to the codon 5' G U A 3' ?

1. 5' C A U 3'
2. 5' U T C 3'
3. 5' U A C 3'
4. 5' A U G 3'

72) The methods of agriculture used by humans have created serious insect problems chiefly because these practices

1. increase the rate of deforestation.
2. provide concentrated areas of food for insects.
3. increase the effectiveness of insecticides over a long period of time.
4. encourage insect resistance to their natural enemies.

73) Which are the differences between a higher plant cell and an animal cell and their respective mechanism of cell division?

I. Division of centromere
II. Division of cytoplasm
III. Function of spindle fibers
IV. Presence of centrioles

The correct answer is

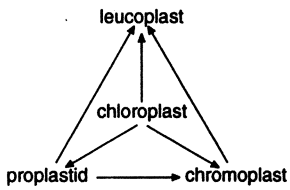
1. I, II.
2. I, IV.
3. II, IV.
4. III, IV.

74) Which of the following is the common characteristic of reptiles, birds and mammals?

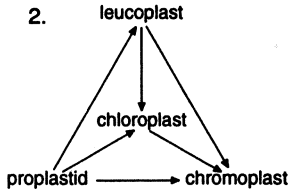
1. Teeth
2. Diaphragm
3. Oxygenated blood is totally separated from deoxygenated blood
4. Kidneys are in the type of metanephros

75) Plastids can develop from one another. Which figure is correct?

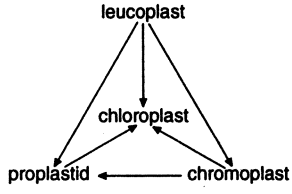
1.



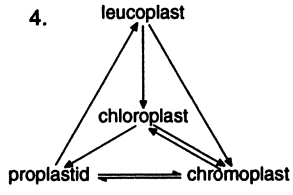
2.



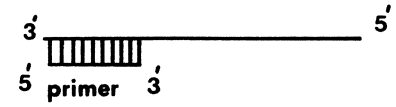
3.

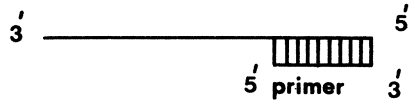


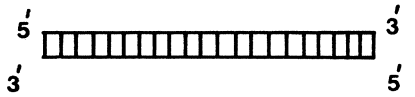
4.

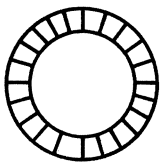


76) Which DNA is a substrate for DNA polymerase?

1. 

2. 

3. 

4. 

77) Messenger RNA was transcribed in vitro from a double-stranded DNA molecule, which was later separated into single strands. For each strand of the DNA, the base ratio was analyzed and compared with that of mRNA. On the basis of the data given in the table, which strand of the double-stranded DNA served as the template for the mRNA synthesis? (2 points)

	A	T or U	G	C
DNA-1	27.0	32.5	18.5	22.0
DNA-2	32.7	26.8	22.1	18.4
DNA-3	28.0	33.0	17.0	21.0
DNA-4	25.0	35.0	19.0	23.0
mRNA	27.0	33.0	17.0	23.0

1. DNA-1
2. DNA-2
3. DNA-3
4. DNA-4

78) By using a choice chamber, which procedure would be used to decide whether a response of animals to two different light intensities is taxis or kinesis?

1. Record the pathway of each animal.
2. Record the velocity of the animal movement.
3. Count, at intervals, the number of animals in each chamber.
4. Count, at intervals, the number of moving and stationary animals.

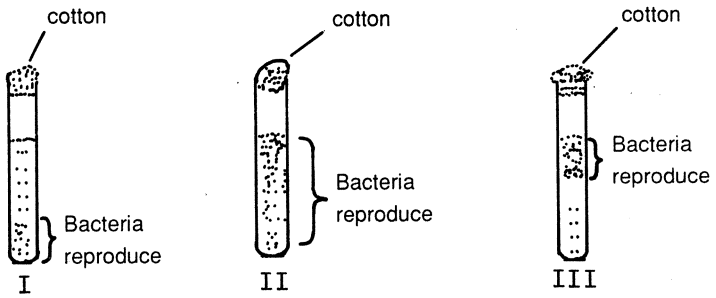
79) Which substances are found in pancreatic juice?

I. Bicarbonate
II. Secretin
III. Bile salts
IV. Pepsinogen
V. Lipase

The correct answer is

1. I, II.
2. I, V.
3. II, III, V.
4. III, IV, V.

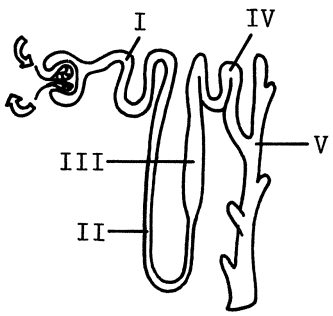
80)



To determine their need for oxygen, three types of bacteria were grown in three different tubes. The regions of bacterial growth are shown in the figures above. Which is the correct classification of the bacterial types?

	Can reproduce only in aerobic medium	Can reproduce only in anaerobic medium	Can reproduce in every medium
1.	III	I	II
2.	III	II	I
3.	I	II	III
4.	I	III	II
5.	II	I	III

81) Which part of the nephron is impermeable to water?



1. I
2. II
3. III
4. IV
5. V

82) A doctor has blood group O, Rh^- and his wife A, Rh^+. In an emergency situation the doctor quickly investigated the blood group of a patient. His own serum agglutinated with the patient's blood, but his wife's serum did not. What is the patient's blood group, and is it possible to conclude about his Rh factor too?

	Blood group	Rh factor
1.	A	yes
2.	A	no
3.	B	yes
4.	B	no

83) Which hormones increase and decrease blood glucose levels, respectively?

	Increase	Decrease
1.	triiodothyronine	insulin
2.	glucagon	cortisol
3.	adrenalin	insulin
4.	oxytocin	adrenalin

84) Which of the following animal phyla possess giant axon systems?

1. Coelenterata, Plathelminthes, Nematoda
2. Platyhelminthes, Nematoda, Annelida
3. Annelida, Arthropoda, Mollusca
4. Arthropoda, Mollusca, Chordata

❑❑❑❑❑

THEORETICAL TEST PART II
INSTRUCTIONS FOR STUDENTS

1. There are 25 short answer questions. The points for each question are indicated in the parenthesis.
2. Write your answer in the space provided on the test itself.
3. WRITE YOUR NAME AND ID NUMBER ON EVERY PAGE OF PART II

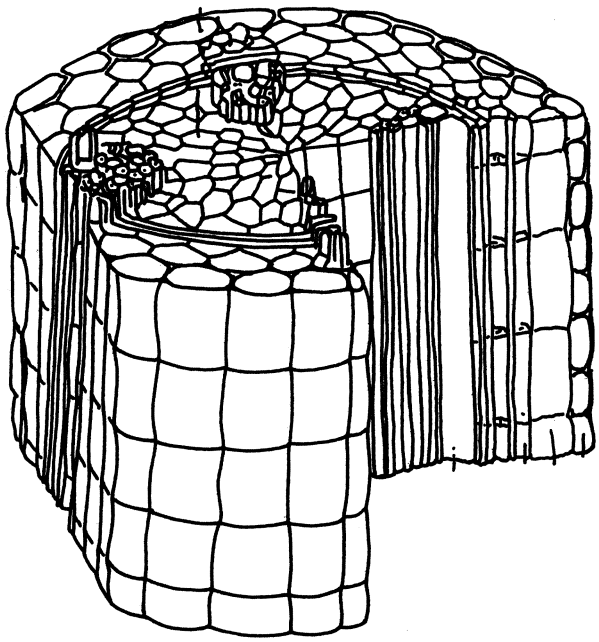
Name.....

Student's ID number.....

Theoretical Test Part II
Short-Answer Questions

Fill in the blanks with appropriate answers

101. From the figure given below, choose the answer code (s) to fill in the blanks.



Answer code

01 Polypodiophyta 04 primary growth

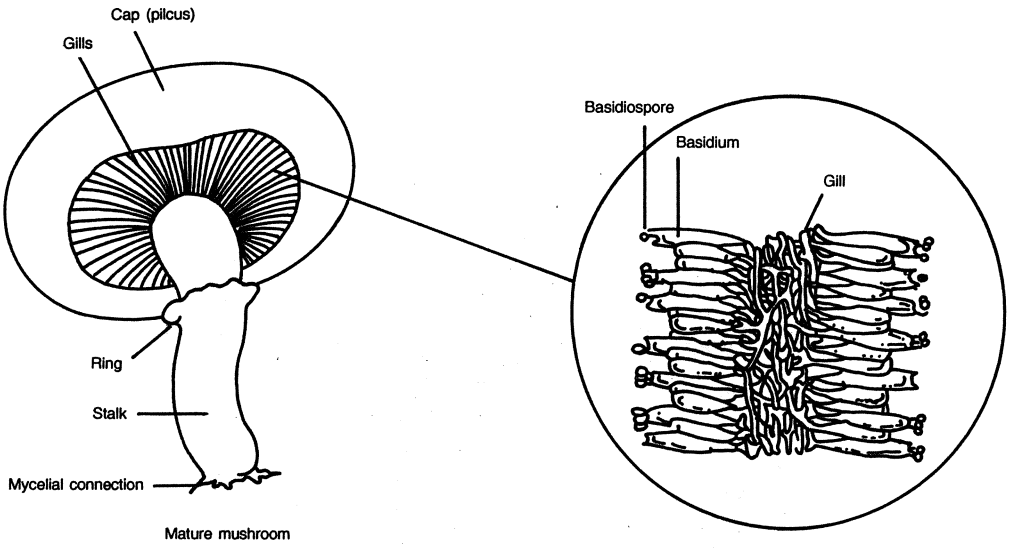
02 Magnoliophyta 05 secondary growth

03 Pinophyta

I. The figure is a plant stem in the Division (s)..... (1 point)

II. The stage of growth is (are) ..... (1 point)

102. From the figure of a mushroom (Basidiomycetes), choose the answer codes to answer the following questions.



Answer code

01 basidium

02 basidiospore

03 mycelium from basidiospore or primary mycelium

04 mycelium from stalk or secondary mycelium

05 zygote

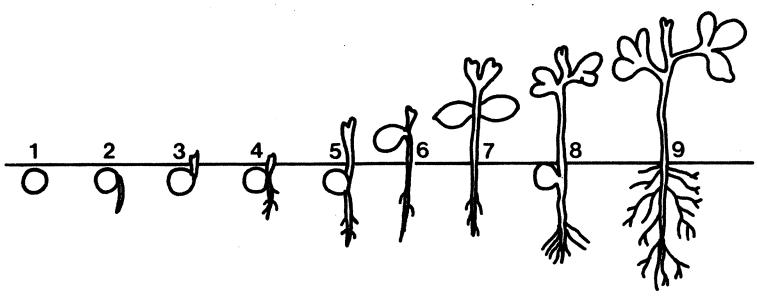
I. In which part of the mushroom does meiosis occur? ..... (1 point)

II. Where is the diploid zygote formed? ..... (1 point)

III. Which part of the mushroom is dikaryotic?..... (1 point)

103. Select plant numbers from the diagram below and write a correct order of the phases of seed germination and development of young plants.

Answer ..... (2 points)



104. Put X in the appropriate place to indicate whether each statement concerning photosynthesis in plant is **true** or **false**. (1.5 points)

	true	**false**
I. Photolysis occurs in photosystem I.	.....	.....
II. Oxygen is released.	.....	.....
III. NADH.H+ is formed.	.....	.....

105. Fill in each blank with one correct answer code. (4 points)

Name of plant tissue or organ	**Origin**	**Function**
collenchyma	ground meristem	support
chlorenchyma	(1)	(2) .....
primary xylem	(3)	conducting
cork cambium	(4)	producing cork
(5)	(6)	water absorption
pollen grain	(7)	reproduction
pericycle	(8)	origin of lateral root

Answer code

01 root cap	07 microspore
02 procambium	08 parenchyma
03 ground meristem	09 root hair
04 primary xylem	10 protoderm
05 photosynthesis	11 transpiration
06 reproduction	12 aerenchyma
	13 respiration

106. Fill in the blanks with answer codes to indicate the main edible parts of the following fruits. (5 points)

Answer code	
01 exocarp	05 perianth
02 mesocarp	06 endosperm
03 endocarp	07 cotyledon
04 receptacle	08 aril

I. Strawberry..... IV. Orange .....

II. Banana ..... V. Coconut.....

III. Peanut .....

107. List all possible characteristics from the answer code of the following organisms. (6 points)

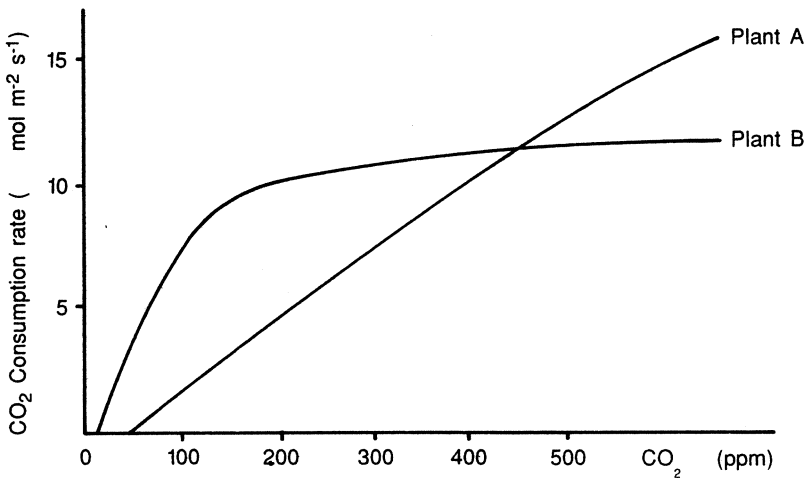
Answer code
01 autotrophic
02 heterotrophic
03 chlorophyll in protoplasm
04 having chloroplasts
05 having mitochondria
06 having nucleus
07 having main genetic materials in cytoplasm
09 having cellulose cell wall
10 having motility
11 having no motility

I. Bacteria: .....

II. Blue-green algae: .....

III. Fungi: .....

108. The figure below shows the response of net carbon dioxide consumption rates of a single leaf to ambient CO_2 concentration (ppm) at a light intensity of 75% full sun.



Indicate with + for true and - for false statements. (2.5 points)

..... I. Plant A is a C_4 type because it has a net greater CO_2 consumption rate at high CO_2 concentrations.

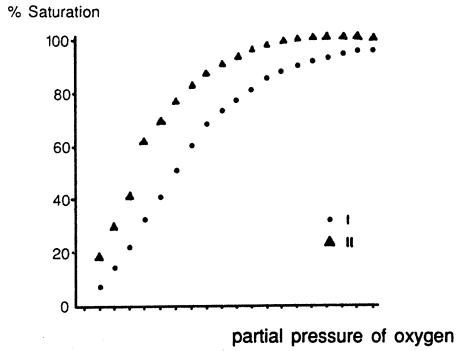
..... II. At a CO_2 consumption rate equal to zero, there is no photosynthesis and respiration for both plant A and B types.

..... III. The CO_2 consumption rate of plant A will ultimately reach saturation as the CO_2 concentration increases further if light intensity is held constant.

..... IV. C_4 plants have greater light use efficiency in photosynthetic process than C_3 plants at the CO_2 concentration of 200 ppm.

..... V. At a light intensity of 100% full sun, the CO_2 consumption rate of plant B will reach saturation at CO_2 concentration greater than above in the graph.

109. Saturation of blood hemoglobin with oxygen is influenced by the partial pressure of oxygen. This is investigated in four organisms: human adult, human fetus, llama (in the Andes) and cow. For two of them the results are shown in the figure. (3 points)



What could be the three possible pairs of I and II?

Answer code

code	I	II
01	human adult	llama
02	human fetus	llama
03	cow	llama
04	llama	human adult
05	human fetus	human adult
06	llama	cow
07	human adult	human fetus

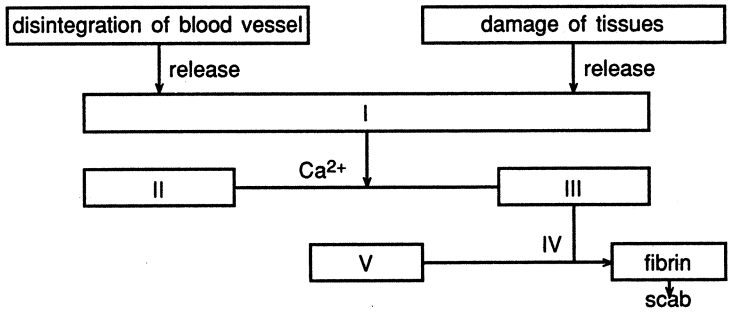
Answer

Possibility no. 1.....

Possibility no. 2.....

Possibility no. 3.....

110. The following diagram shows the pathway of blood coagulation.



What are I-V in the diagram? (2.5 points)

I. .....

II. .....

III. .....

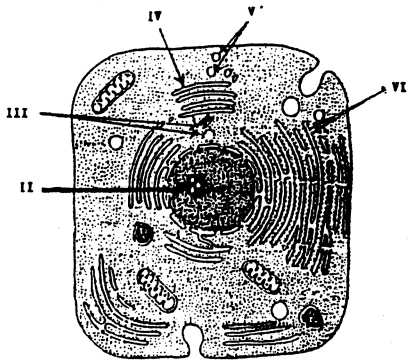
IV. .....

V. .....

Answer code

01 platelets	05 prothrombin
02 thrombin	06 Ca^{2+}
03 thrombokinase	07 Mg^{2+}
04 fibrinogen	08 vitamin K

111. What are II - VI in the diagram? (2 points)



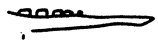
Answer code	
01 secretory vesicle	06 vacuole
02 microtubule	07 chromosome
03 ribosome	08 Golgi body (apparatus)
04 lysosome	09 centriole
05 mitochondria	10 nucleolus

Answer

I. ..... IV. .....

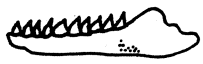
II. ..... V. .....

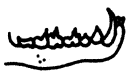
III. ..... VI. .....

112. I 

IV 

II 

V 

III 

VI 

Identify all lower jaws of mammals and non-mammalian vertebrates.

Answer

Mammals : ..... (1 point)

Non-mammalian vertebrates : ..... (1 point)

113. Match all possible animal groups in column B with each description in column A. (5 points)

Answer code

Column B	
01 Insect	05 Crocodile
02 Bird	06 Sea horse
03 Shark	07 Annelids (general)
04 Planaria	08 Hydra

Column A

I. No circulatory system

II. Open circulatory system

III. Closed circulatory system without heart chambers

IV. Heart with single-circuit circulation

V. Heart with 2 atria and 2 ventricles

Answer

Column A	Column B
I	
II	
III	
IV	
V	

114. Identify the following actions of the sympathetic and parasympathetic nervous systems.

Answer code

01 Prepare body to cope with stressful condition

02 Dilate pupil

03 Increase motility of the intestine

04 Stimulate adrenalin secretion

05 Decrease heart rate

06 Stimulate oxytocin release

Answer

I. Sympathetic nervous system : ..... (1.5 points)

II. Parasympathetic nervous system : ..... (1.5 points)

115. The cow heron bird (Ardeola ibis) exhibits different types of nesting and breeding which effect the success of offspring. The table shows the results.

Type of nesting	Average number (per nest) of off spring flying out	Average amount of food brought to the nest per day
1	1.90	65.1 ml
2	2.29	53.1 ml
3	2.33	68.3 ml

With these data it is possible to compare the efficiency in energy investment of the parent birds.

Which type of nesting (number 1, 2 or 3 from the table) has the lowest efficiency and which one has the highest?

Answer

I. The lowest efficiency :..... (1 point)

II. The highest efficiency : ..... (1 point)

116. While investigating and comparing the efficiency in energy investment of the parent birds, some conditions have to be considered. Choose two possible conditions below. (2 points)

Answer code

01 All young birds have to be about the same size during the investigation.

02 All parent birds have to have about the same mass.

03 The nests have to be close together.

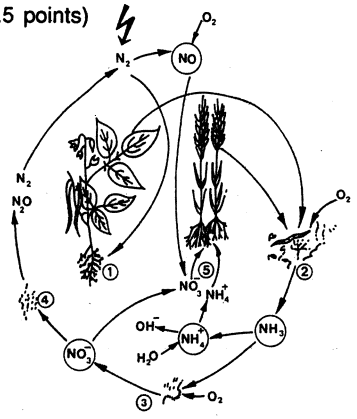
04 The food has to be at about the same distance from all the nests.

05 The experiment should last no longer than one year.

06 All the parent birds should feed their young the same type of food.

Answer :.....

117. Choose the correct number (1-5) from the given diagram of the nitrogen cycle to match each statement (I - V). (2.5 points)



I. Fixation of nitrogen by the bacteria in nodules.....

II. Absorption of nitrogen compounds by the roots.....

III. Action of nitrifying bacteria.....

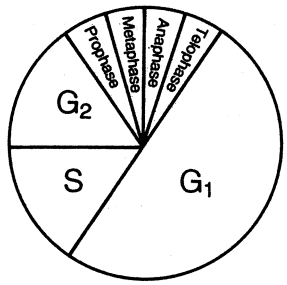
IV. Action of denitrifying bacteria.....

V. Action of decomposing bacteria.....

118. Assume the genotype AB/AB is test-crossed cross with recessive genotype and the F_1 offspring are mated at random to produce F_2 offspring consisting of 22 A-B-, 5 A-bb, 5 aaB- and 4 aabb. Estimate the recombination frequency between A and B? (4 points)

Answer .....

119. Let (x) be the amount of nuclear DNA in a gamete of a diploid organism. Fill in each blank the amount of nuclear DNA in different stages of the cell cycle of this organism.



The DNA amount per cell in the following stages of the cell cycle.

(Example : 0.5x, x, 2x or 4x.) (3 points)

I. mid S = ...

II. G_1 = ...

III. G_2 = ...

IV. Prophase = ...

V. Metaphase = ...

VI. Anaphase = ...

120. If the initial frequencies of genotypes A_1A_1, A_1A_2 and A_2A_2 are 0.04, 0.32 and 0.64, respectively, what are the genotypic frequencies after one generation of complete self-fertilization? (3 points)

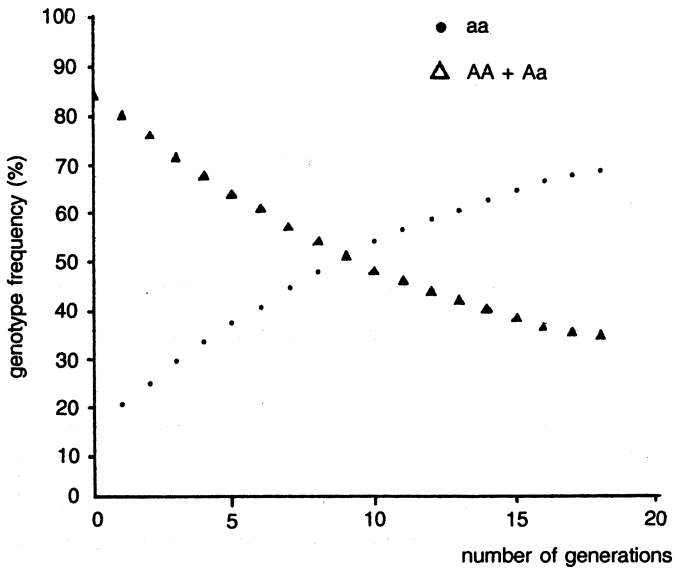
Answer

A_1A_1 .....

A_1A_2 .....

A_2A_2 .....

121. The diagram shows genotypic frequencies during subsequent generations in a population.



I. What was the frequency of allele A at generation 0, assuming a Hardy-Weinburg equilibrium at that point?

Answer Frequency of A is ..... (1 point)

II. What would be the frequency of aa after a very large number of generations?

Answer Frequency of aa would be ..... (1 point)

122. In a human population at equilibrium, the frequency of $I^A = 0.2$, $I^B = 0.4$ and $i = 0.4$. What are the phenotypic frequencies of blood group A, B, AB and O? (2 points)

Answer

Group A .....

Group B .....

Group AB .....

Group O .....

123. If the statement is correct for both chloroplasts and mitochondria, mark with +. If it is not correct for both, mark with -. (3 points)

..... I. Contain proteins

..... II. Contain coenzymes for binding hydrogen

..... III. Contain K^+ ions

..... IV. Lack DNA

..... V. Can produce ATP

..... VI. Can produce oxygen

124. What would sequentially happen if the sea was polluted with a large number of organic substances? Write the correct sequence of such changes using the answer code. (3 points)

Answer code

01 The amount of oxygen in water decreases.

02 The bacteria decomposing the dead organisms breed rapidly.

03 The amount of oxygen in water increases.

04 There is the growth of bacteria producing H_2S.

05 The planktonic algae reproduce rapidly.

Answer

The correct sequence is.....

Student's ID number.....

PRACTICAL TEST

Lab. No. 1

Total score 44 points

Time 60 minutes

Instruction

In a given land plot with relatively dense trees and shrubs, the soil was rather dark in color, rich in organic matter, and inhabited by diversed species of animals. The soil was randomly sampled to the depth of no more than 15 cm from various areas of the plot, and animals were collected in order to study their diversity in the surface soil. Most abundant species of animals were sorted out and preserved in 70% ethyl alcohol.

Each student is provided with 10 glass vials (labeled #1 through #10). There are two specimens in each vial preserved in 70% ethyl alcohol.

Task I-1 (20 points)

1.1 Fill in the answer code of the phylum for each specimen. (5 points)

Answer code

01 Annelida	04 Mollusca
02 Arthropoda	05 Nemathelminthes
03 Cnidaria (Coelenterata)	06 Platyhelminthes

Answer

Vial	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Phylum										

1.2 Fill in the answer code of the taxonomic units or groups for each specimen. (5 points)

Answer code

01 Chelicerata	07 Crustaceae
02 Chilopoda	08 Oligochaeta
03 Diplopoda	09 Diptera
04 Gastropoda	10 Polychaeta
05 Insecta	11 Thysanura
06 Hirudinae	12 Turbellaria

Answer

Vial	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10

1.3 Fill in the answer codes of 2 observed characteristics of the specimen in each vial. (10 points)

Answer code

01 antenna	08 head + thorax + abdomen	15 predatory
03 cephalothorax + abdomen	10 laterally-flattened body	16 setae for locomotion
05 cylindrical body	12 one pair of legs per segment	18 spinneret
06 dorso-ventrally flattened body		20 two pairs of legs
07 four pairs of walking legs	14 pedipalp	per segment

Answer

Vial	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Charac-										
teristics										

Task I-2 (10 points)

Based on each pair of characteristics provided, complete the diagrammatic dichotomous key on page 3 by filling in the answer codes of characteristics in the appropriate **spaces** (.....) and specimen numbers (#1 to #10) in the **boxes** (#)

Answer code

01 Body elongated.

02 Body oval-shaped.

03 Body divided into head, thorax and abdomen.

04 Not as above.

05 Base of abdomen constricted.

06 Base of abdomen broadly joins to thorax.

07 Appendages present.

08 Appendages absent.

09 Antenna elbowed with long first segment.

10 Antenna not elbowed.

11 One pair of prominent pincerlike appendages.

12 Appendages leglike.

13 One or two pairs of legs per body segment.

14 Not as above.

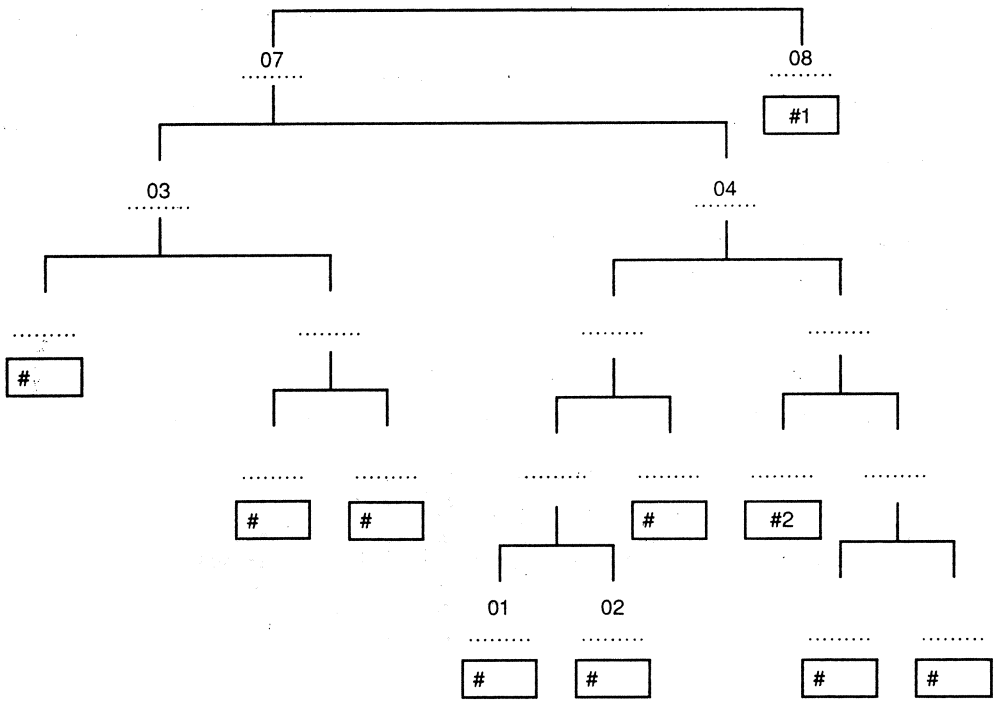
15 One pair of legs per body segment.

16 Two pairs of legs per body segment.

17 Abdomen with a forked appendage near posterior end.

18 Abdomen without the above appendage.

Answer



Student's ID number.....

Task I-3 (8 points)

3.1 Prepare a whole-mount slide of **one** specimen. The slide should clearly show antennae and mandibles. Use provided materials and Hoyer's mounting medium as mountant.

3.2 Label the slide indicating the number of the chosen specimen (#1 to #10) and the student's ID number.

3.3 Draw the **whole** specimen from the prepared slide and label the antenna and the mandible by using answer code.

Answer code	01 antenna	02 mandible

Answer **Drawing of specimen # .....**

Scoring	Correctness of spec. selection	Completeness of specimen	Ant.& mandible demonstration	Quality of slide	Drawing & labeling
Points	1	2	1	1	3
Points received					

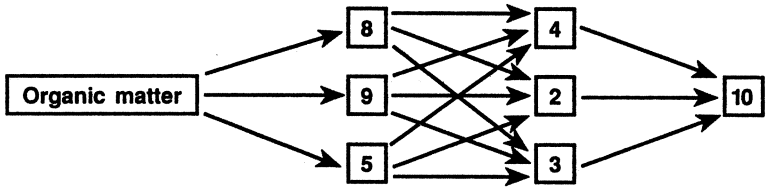
Task I-4 (6 points)

Complete two possible food chains below by filling in the numbers (#1 to #10) of appropriate animals in the boxes provided.

Given that

4.1 organic matter is a food source for primary consumer,

4.2 No specimen can be used twice for the same trophic level in the two different food chains.



Answer

First food chain

Organic matter	------>	#	------>	#	------>	#
		Primary consumer		Secondary consumer		Top consumer

Second Food Chain

Organic matter	------>	#	------>	#	------>	#
		Primary consumer		Secondary consumer		Top consumer

Student's ID number.....

PRACTICAL TEST

Lab. No. II

Total score 45 points

Time 60 minutes

A man-made mini-ecosystem is set up in front of the examination room. Twelve sample of plants with tagged-number from that artificial habitat are placed in trays on each competitor's desk. Using samples and tools provided, solving and answering the problems in each task.

Task II-1 : Plant Sample No.1 (3 points)

Study plant no.1, then choose the answer codes to label the appropriate parts in Fig.1.

Answer codes II-1

Code Term	Code Term	Code Term
01 ovary	04 receptacle	06 stigma
02 ovule	05 stamen	07 style
03 peduncle		

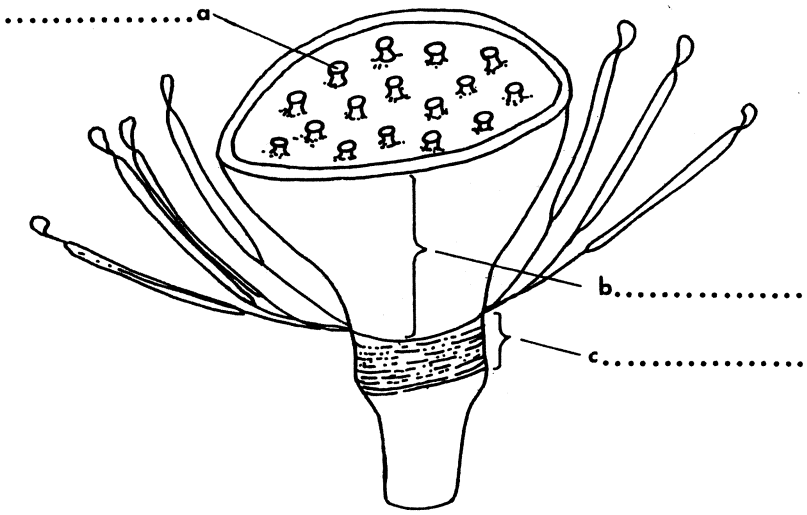


Fig. 1

Student's ID number.....

Task II-2 : Plant Sample No.2 (7 points)

Study plant no.2, draw the floral diagram and label the diagram using the following answer codes.

Answer codes II-2

Code	Term	Code	Term	Code	Term	Code	Term
01	anther	03	calyx	05	perianth	07	stamen
02	bract	04	corolla	06	pistil	08	stigma

Space for drawing

Task II-3 : Plant Sample No.3 (6 points)

Study plant no.3, then choose the answer codes to label Fig.3.

Answer codes II-3

Code	Term	Code	Term	Code	Term
01	anther	05	corolla	09	stamen
02	bract	06	filament	010	staminal column
03	bulbil	07	fruit	011	stigma
04	calyx	08	ovary	012	style

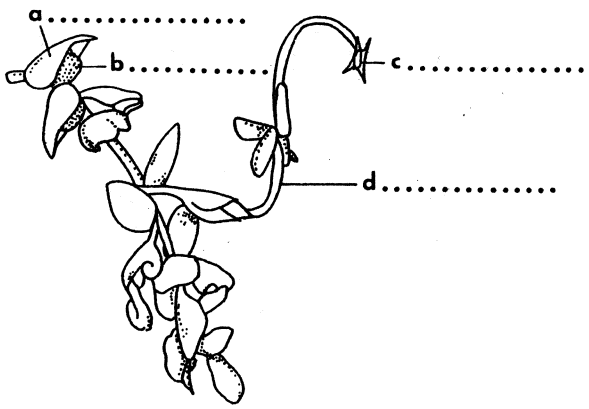


Fig. 3

Task II-4 : Plant Sample No.4 (14 points)

Prepare the cross-section of the stem of plant sample no.4.

4.1 Choose the answer codes to label Fig.4. (5 points)

Answer Code II-4 : 4.1, 4.2

Code Term	Code Term	Code Term
01 bundle sheath	010 lateral meristem	019 secondary cell wall
02 cambium	011 lignified wall	020 secondary xylem
03 collenchyma	012 middle lamella	021 sieve tube
04 cortex	013 parenchyma	022 tracheid
05 crystals	014 phloem fiber	023 vascular bundle
06 cytoplasm	015 primary cell wall	024 vessel (trachea)
07 fiber	016 vacuole	025 xylem
08 hypodermis	017 sclerenchyma	026 xylem fiber
09 intercellular space	018 sclereid	

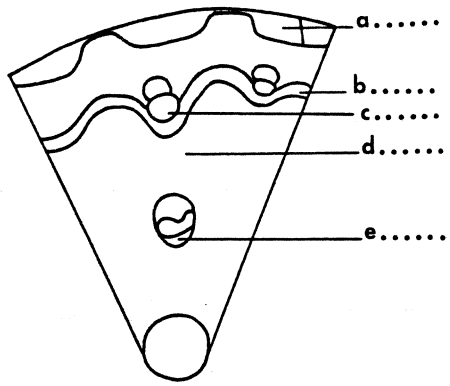


Fig.4

4.2 Draw 5 cells of the area "d" in Fig.4 and choose the answer codes to label the structure of those cells. (5 points)

Space for drawing

4.3 Study Fig.4, put X in the appropriate boxes a to e to indicate the tissue which has lignified cell wall. (3 points)

☐ a. ☐ b. ☐ c. ☐ d. ☐ e.

4.4 Put X in the box to indicate status of cell in position "a" in Fig.4 (1 point)

☐ living cells ☐ dead cells

Student's ID number.....

Task II-5 : Plant Sample No.5 (3 points)

Study plant sample no.5 and choose the appropriate answer codes to indicate the 3 major structures of the plant.

Answer codes II-5

Code	Term	Code	Term
01	corm	06	micropyle
02	cotyledon	07	pericarp
03	embryo	08	rhizome
04	endosperm	09	seed coat
05	integument	010	tuber

5.1 .....

5.2 .....

5.3 .....

Task II-6 : Plant Samples No.1-12 (12 points)

Classify the plant samples no.1-12 b y putting the sample number(s) in front of the Division(s) that it (they) should belong to.

Sample numbers	Divisions
.....	Ascomycota
.....	Basidiomycota
.....	Bryophyta
.....	Cyanophyta
.....	Chlorophyta/Charophyta
.....	Equisetophyta (Sphenophyta)
.....	Lycopodiophyta
.....	Magnoliophyta
.....	Pinophyta
.....	Polypodiophyta (Pterophyta/Filicophyta)
.....	Zygomycota

Student's ID number.....

PRACTICAL TEST

Lab No. III

Total score 37 points

Time 60 minutes

Task III-1

Population Ecology (22 points)

1.1 Sampling of cowpea weevil population

Cowpea weevil, *Callosobruchus maculatus* Fabricius (Coleoptera: Bruchidae), is one of the major pests of several beans, peas, and pulses. The larvae cause damage by feeding inside the seeds. Each adult makes one emerging hole in the seed. Damaged seeds are lighter in weight and float in water.

Question

Each student will be given a sealed bag of beans, some of which are infested with cowpea weevil. Devise an appropriate procedure for:

(1) estimating damaged seeds per 100 seeds and standard deviation (SD).

(2) estimating population density of cowpea weevil per 100 seeds and standard deviation (SD);

The materials for taking samples are provided. However, some materials may not necessarily be needed. Write down your data from sampling and show your calculation. (18 points)

Answer

Data from each sample should be in the following

Total no. of holes .....

Total no. of damaged seeds .....

Total no. of sampling seeds .....

Formula given : $SD = \sqrt{\frac{\Sigma(x-\bar{x})^2}{(n-1)}}$

SD - standard deviation

1.2 Estimation of the cowpea weevil population growth

Cowpea weevil has discrete generations. Each generation takes 24-26 days at 30-32°C, 70-80% RH (relative humidity). Under unlimited resources, the population growth of cowpea weevil females could be calculated from the following growth equation:

$$N_t = N_0 R^t$$

where

N_0 = initial population size of females,

N_t = population size of females at generation t,

R = net reproductive rate, or number of female offspring produced per female per generation (for cowpea weevil R = 2.6),

t = generation number.

Question

If a bag contains 36,000 beans, and the sex ratio of cowpea weevil is 1:1, predict the population of females in the third generation. Use your population density derived in Question 1.1 to calculate the initial female population. Show all procedures. (4 points)

Answer

Task III-2

Structure and Function of Insects (15 points)

Study the given insect specimens (A-H) and answer the following questions on the provided answer sheet on page 12, by entering the codes given in Answer Codes III-a, III-b, III-c and III-d.

1. What kind of food do the insects A, B and F eat? (see Answer Code III-a)
2. What are the special functions of the first pair of legs of the insects A, B, C, F and the third pair of legs of the insect H? (see Answer Code III-b)
3. Identify the body parts labelled with color or tied with thread in the insects A, C, D and E. (see Answer Code III-c)
4. What is the mode of living of the insects C and H? (see Answer Code III-d)

   What is the habitat of the insect G? (see Answer Code III-d)

Answer code

Answer Code III-a	
Code	**Term**
11	liquid
12	solid
13	solid and liquid

Answer Code III-b	
Code	**Term**
22	clinging
23	digging
24	grasping
25	jumping
26	swimming
27	walking

Answer Code III-c		
Code	**Term**	**Explanation**
31	coxa	the basal segment of the leg.
32	femur	the third leg segment located between the trochanter and the tibia.
33	haltere	a small knobbed structure on each side of the metathorax, representing a hind wing.
34	hamuli	minute hooks, a series of minute hooks on the anterior margin of the hind wing, with which the front and hind wings are attached together.
35	mesonotum	the dorsal sclerite of the mesothorax.
36	pronotum	the dorsal sclerite of the prothorax.
37	scutellum	a sclerite of the thoracic notum; the mesoscutellum, appearing as a more or less triangular sclerite behind the pronotum.
38	scutum	the middle division of a thoracic notum, just anterior to scutellum

Student's ID number.....

Answer Code III-d	
Code	**Term**
41	aquatic
42	ectoparasite
43	endoparasite
44	free living
45	predator
46	terrestial

Answer sheet

Task III-2 : Structure and Function of Insects (15 points)

Insect specimen	1. Type of food use Answer code III-a	2. Special function of legs use Answer Code III-b	3. Name the insect part that is colored or tied use Answer Code III-c	4. Mode of living or type of habitat use Answer Code III-d
A.	1.1_____	2.1_____	3.1_____	
B.	1.2_____	2.2_____		
C.		2.3_____	3.2_____	4.1_____
D.			3.3_____	
E.			3.4_____	
F.	1.3_____	2.4_____		
G.				4.2_____
H.		2.5_____		4.3_____

Student's ID number.....

PRACTICAL TEST

Lab IV

Total score 45 points

Time 60 minutes

Task IV-1 Permeability of Ions Across the Membrane of Yeast (25 points)

A living cell is surrounded by membrane barrier which is selective for various types of substances which are allowed to enter the cell. The following experiment is designed to demonstrate the permeability of the yeast cells to various ions.

Instruction for Student's Experiment

1. Dissolve 4 g of dry yeast into 50 ml of 0.5% Na_2CO_3 and swirl thoroughly.
2. Label 5 test tubes (no.1 to no.5). Add 5 ml of yeast suspension into each tube, and then add 1 ml of 0.02% neutral red and mix thoroughly.
3. Bring tube no.2 to a laboratory personnel who will put it in the water bath for 5 min for you.
4. Bring tubes no.1 and no.2 to a laboratory personnel who will centrifuge the tubes for you for 5 min. After that, observe the colour of supernatant and pellet.
5. Add 1 ml of 0.02 M NaOH to tube no.4 and 1 ml of 0.02 M NH_4OH to tube no.5, mix thoroughly and observe the colour of yeast suspension.
6. Record the results in the table and answer the following questions.

Table

Tube no.	Yeast (ml)	Neutral red (ml)	NaOH (ml)	NH_4OH (ml)	Colour
1	5	1	----------> Centrifuge		.....
2	5	1	---------->boil---------> Centrifuge		.....
3	5	1	0	0	.....
4	5	1	1	0	.....
5	5	1	0	1	.....

Task IV-2 Determination of Yeast Growth and Glucose Consumption (20 points)

Microorganisms, such as yeast, *Saccharomyces cerevisiae*, can grow in the presence of the nutrient source glucose. The following two experiments were done by a microbiologist to demonstrate the relationship between yeast growth, glucose consumption and pH of yeast cultures.

Study experiments I and II and use their results to answer two questions.

Experiment I

1. Yeast, *Saccharomyces cerevisiae* was grown in liquid medium containing glucose as carbon source. The initial pH of the culture was 5.5. At different time intervals residual glucose and growth were determined. Growth is measured by the increase of turbidity by measuring absorbance of light at 660 nm. According to data obtained, a graph showing time of growth and residual sugar was plotted in figure 1.
2. The yeast biomass contained 85% moisture.
3. A standard curve in figure 2 shows correlation between biomass dry weight and optical density.

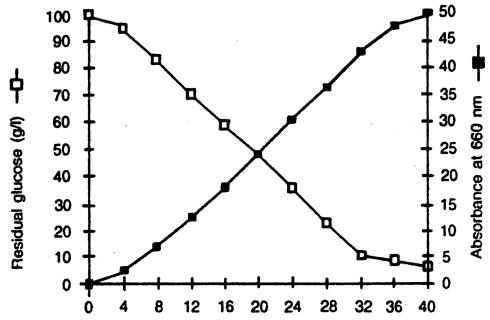


Figure 1. Glucose consumption and relative growth of yeast culture from the beginning to the end of the experiment.

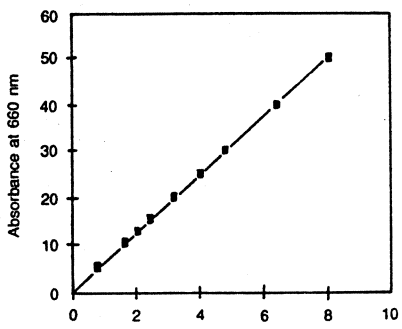


Figure 2. Correlation of yeast cultures between absorbance and biomass dry weight.

Experiment II

The experiment was repeated using the same microorganism, nutrient and growth conditions as those used in experiment I. Five samples (culture 1, 2, 3, 4, 5) were taken at five different times, absorbancy and pH of those five cultures were determined as shown in the following table.

Culture	Absorbance at 660 nm	pH
1	2.5	5.4
2	12.5	5.0
3	30.0	4.2
4	42.0	3.7
5	50.0	3.7

Questions.

1. Using information available from experiment I, fill in the table the culture age, biomass fresh weight and glucose consumed for the five culture samples described in experiment II. (15 points)

Culture	Culture age (hours)	Biomass fresh weight (g/l)	Glucose consumed (%)
1	.....	.....	.....
2	.....	.....	.....
3	.....	.....	.....
4	.....	.....	.....
5	.....	.....	.....

2. Plot a curve of time dependence of pH in experiment II. (5 points)

IBO 1995
Thailand

Answer key theoretical test

part I

1) 2	33 29) 2	67 57) 1
2) 2	34 30) 1	68 58) 3
3) 2	35 31) 1	69 59) 1
4) 3	36 32) 3	70 60) 1
6 5) 3	37 33) 3	71 61) 3
7 6) 3	38 34) 3	73 62) 5
8 7) 2	41 35) 2	74 63) 2
9 8) 3	42 36) 1	75 64) 1
10 9) 3	44 37) 2	76 65) 3
11 10) 4	45 38) 4	78 66) 2 or 3
12 11) 3	46 39) 2	79 67) 4
13 12) 1	47 40) 4	80 68) 2
14 13) 2	48 41) 4	81 69) 2
15 14) 2	49 42) 1	83 70) 3
16 15) 4	50 43) 4	85 71) 3
17 16) 1	51 44) 3	86 72) 2
18 17) 1	52 45) 3	88 73) 3
19 18) 4	53 46) 4	89 74) 4
20 19) 3	54 47) 1	90 75) 2
21 20) 2	56 48) 3	91 76) 1
23 21) 2	57 49) 3	92 77) 2
24 22) 4	58 50) 1	93 78) 1
25 23) 4	59 51) 1	95 79) 2
26 24) 4	60 52) 2	96 80) 1
28 25) 4	61 53) 1	97 81) 3
29 26) 3	64 54) 2	98 82) 2
31 27) 2	65 55) 4	99 83) 3
32 28) 2	66 56) 3	100 84) 3

de oorspronkelijke vraagnummers zijn er met de hand bijgeschreven.

Answer key theoretical test

part II

101) I = 02 (1 point)
II = 05 (1 point)

102) I = 01 (1 point)
II = 01 (1 point)
III = 04 (1 point)

103) 1, 2, 4, 5, 8, 9
or 1, 3, 4, 5, 8, 9
or 1, 4, 5, 8, 9 (2 points)

104)

	True	False
I		x
II	x	
IV		x

(1.5 points)

105) (1) 03 (5) 09
(2) 05 (6) 10
(3) 02 (7) 07
(4) 08 (8) 02 (4 points)

106) I = 04 IV = 03
II = 03 V = 06
III = 07 (5 points)

107) I. Bacteria: (01, 02, 07, 10, 11) (2 points)
II. Blue-green algae: (01, 03, 07, 10, 11) (2 points)
III. Fungi: (02, 05, 06, 09, 11) (2 points)

108) I. – IV. –
II. – V. +
III. + (2.5 points)

109) Possibility no. 1 = 01
Possibility no. 2 = 03
Possibility no. 3 = 07 (3 points)

110) I. = 03 IV. = 06
II. = 05 V. = 04
III. = 02 (2.5 points)

111) IV. = 08
II. = 10 V. = 01
III. = 09 VI. = 03 (2 points)

112) mammals : I, III, IV, VI (1 point)
non-mammalian vertebrates: II, V (1 point)

113)

Column A	Column B
I	4. 8
II	1
III	7
IV	3. 6
V	2, 5

(5 points)

114) I. Sympathetic nervous system 01, 02, 04 (1.5 points)
II. Parasympathetic nervous system 03,05 (1.5 points)

115) I. The lowest efficiency : 1
II. The highest efficiency : 2 (2 points)

116) 04, 06 (2 points)

117) I. = 1
II. = 5
III. = 3
IV. = 4
V. = 2 (2.5 points)

118) Any answers in the range of 30-35% (4 points)

119) I. = 3X V. = 4X
II. = 2X VI. = 4X
III. = 4X
IV. = 4X (3 points)

120) $A_1 A_1$ = 0.12
$A_1 A_2$ = 0.16
$A_2 A_2$ = 0.72 (3 points)

121) I. Frequency of A is 0.6 or 60% (1 point)
II. Frequency of aa would be 1 or 100% (1 point)

122) group A = 0.2
group B = 0.48
group AB = 0.16
group O = 0.16 (2 points)

123) I. +
II. +
III. +
IV. –
V. +
VI. – (3 points)

124) The correct order is 04, 03, 02, 05, 01 (3 points)

Results of the
6th INTERNATIONAL BIOLOGY OLYMPIAD 1995

COUNTRY	NAME	ID	THEORETICAL TEST			ADJUSTED	PRACTICAL TEST					GRAND TOTAL	RANK
			PART 1	PART 2	TOTAL		LAB I	LAB II	LAB III	LAB IV	TOTAL		
Thailand	Pakorn Kanchanawong	73	82.00	53.20	135.20	139.297	35.00	34.80	20.00	41.00	130.80	270.097	1
Thailand	Sirinya Matchacheep	76	81.00	51.30	132.30	136.309	36.00	37.90	22.00	33.00	128.90	265.209	2
P.R. China	Haibo Wang	23	83.00	48.70	131.70	135.691	31.00	25.50	24.00	37.00	117.50	253.191	3
Czech Republic	Pavla Fabianova	25	71.00	50.80	121.80	125.491	29.00	31.40	30.00	37.00	127.40	252.891	4
Thailand	Sippanont Keawtasi	75	78.00	45.50	123.50	127.242	33.50	33.50	15.00	43.00	125.00	252.242	5
P.R. China	Huadan Xue	22	82.00	48.70	130.70	134.661	27.00	24.05	29.00	36.00	116.05	250.711	6
Czech Republic	Jiri Libus	28	74.00	50.60	124.60	128.376	41.00	22.50	25.00	32.00	120.50	248.876	7
Australia	Llewellyn Reynders	02	79.00	47.40	126.40	130.230	25.50	27.35	26.00	39.00	117.85	248.080	8
Thailand	Siraprapha Sanchatjate	74	74.00	42.40	116.40	119.927	25.50	36.50	22.00	42.00	126.00	245.927	9
Ukraine	Oleksandr Golovachov	85	77.00	51.20	128.20	132.085	34.50	25.75	15.00	38.00	113.25	245.335	10
P.R. China	Su Lin	24	76.00	42.80	118.80	122.400	28.50	27.50	25.00	35.00	116.00	238.400	11
Australia	Vanessa Marsden	01	74.00	45.90	119.90	123.533	28.00	22.50	24.00	39.00	113.50	237.033	12
Ukraine	Nataliya Martinova	86	77.00	43.00	120.00	123.636	27.50	23.62	22.00	38.00	111.12	234.756	13
Poland	Artur Chmiel	54	82.00	49.50	131.50	135.485	21.50	23.55	27.00	23.00	95.05	230.535	14
Poland	Wieslaw Babik	53	84.00	41.30	125.30	129.097	29.50	19.50	13.00	39.00	101.00	230.097	15
Germany	Christiane Muhle	31	71.00	40.20	111.20	114.570	25.00	26.40	25.00	38.00	114.40	228.970	16
Australia	Trisma Peel	03	68.00	45.70	113.70	117.145	31.50	25.45	13.00	39.00	108.95	226.095	17
Germany	Ralf Kittler	30	74.00	41.90	115.90	119.412	23.50	30.80	16.00	35.00	105.30	224.712	18
Ukraine	Irina Kokina	87	74.00	44.70	118.70	122.297	25.00	24.30	16.00	31.00	96.30	218.597	19
Australia	Nicholas Hagan	04	74.00	41.60	115.60	119.103	24.00	18.50	18.00	38.00	98.50	217.603	20
Poland	Marcin Kaczor	56	79.00	36.90	115.90	119.412	21.50	22.50	21.00	29.00	94.00	213.412	21
Belarus	Vladimir Nekrasov	15	73.00	38.80	111.80	115.188	18.00	22.00	26.00	32.00	98.00	213.188	22
Czech Republic	Jan Mourek	26	62.00	40.30	102.30	105.400	38.50	29.10	13.00	27.00	107.60	213.000	23
Belarus	Victor Shtchiglinskiy	16	63.00	42.40	105.40	108.594	18.00	22.30	25.00	38.00	103.30	211.894	24
Russia	Irina Zotova	57	71.00	43.60	114.60	118.073	15.50	28.65	13.00	35.00	92.15	210.223	25
Russia	Vladimir Ivanov	59	74.00	41.70	115.70	119.206	15.00	22.90	16.00	32.00	85.90	205.106	26
Slovak Republic	Katarina Linkesova	61	57.00	36.30	93.30	96.127	33.50	28.10	17.00	29.00	107.60	203.727	27
Belarus	Inna Urbanovich	13	57.00	43.30	100.30	103.339	24.00	27.35	11.00	37.00	99.35	202.689	28
Russia	Ekaterina Pimenova	58	75.00	38.80	113.80	117.248	16.00	25.25	20.00	23.00	84.25	201.498	29
Czech Republic	Simona Weinbergerova	27	53.00	37.50	90.50	93.242	31.00	28.80	18.00	29.00	106.80	200.042	30
Belarus	Oksana Crichik	14	71.00	26.30	97.30	100.248	26.00	29.10	23.00	21.00	99.10	199.348	31
Ukraine	Andrey Chernisky	88	66.00	44.20	110.20	113.539	20.00	22.80	11.00	32.00	85.80	199.339	32
Bugaria	Jana Pavanova	17	65.00	34.10	99.10	102.103	24.00	24.70	18.00	30.00	96.70	198.803	33
Germany	Robert Fischer	29	55.00	30.80	85.80	88.400	26.00	28.95	22.00	33.00	109.95	198.350	34
the Netherlands	Geertje Dekkers	51	65.00	42.60	107.60	110.861	17.00	16.50	14.00	38.00	85.50	196.361	35
Russia	Evgenj Gorkov	60	69.00	45.00	114.00	117.455	13.50	23.45	16.00	24.00	76.95	194.405	36
the Netherlands	Sander Smits	50	62.00	40.60	102.60	105.709	19.50	19.30	16.00	32.00	86.80	192.509	37
the Netherlands	Maint Berkenbosch	52	68.00	28.60	96.60	99.527	25.50	19.25	9.00	39.00	92.75	192.277	38
Kazakistan	Saken Sherhanov	33	64.00	38.80	102.80	105.915	20.00	27.10	7.00	32.00	86.10	192.015	39
Turkey	Ibrahim Buttanri	77	71.00	37.40	108.40	111.685	11.50	19.75	14.00	34.00	79.25	190.935	40
Belgium	Maarten Leyssen	11	58.00	33.60	91.60	94.376	17.50	21.50	27.00	28.00	94.00	188.376	41
Poland	Marcin Golebiewski	55	66.00	39.00	105.00	108.182	18.00	21.50	6.00	31.00	76.50	184.682	42
the Netherlands	Eveline Steenbrink	49	65.00	32.10	97.10	100.042	19.00	21.80	14.00	29.00	83.80	183.842	43
Kazakistan	Nurbol Sihimbayev	34	67.00	35.00	102.00	105.091	19.50	20.10	11.10	25.00	75.70	180.791	44
Slovak Republic	Ivana Baranova	64	44.00	30.40	74.40	76.655	23.50	23.90	23.00	33.00	103.40	180.055	45
Slovak Republic	Peter Ihnat	62	52.00	26.00	78.00	80.364	22.50	21.80	25.00	29.00	98.30	178.664	46
Sweden	Erika Nilsson	67	63.00	35.10	98.10	101.073	10.00	10.90	14.00	41.00	75.90	176.973	47
Turkey	Ramazan Karaduman	78	61.00	40.30	101.30	104.370	19.00	14.75	15.00	22.00	70.75	175.120	48
Germany	Milena Malonek	32	55.00	30.60	85.60	88.194	23.50	21.60	10.00	30.00	85.10	173.294	49
Turkey	Murat Koseoglu	79	72.00	40.30	112.30	115.703	17.50	11.00	9.00	19.00	56.50	172.203	50
Sweden	Gunilla Persson	65	61.00	37.90	98.90	101.897	15.00	11.00	10.00	34.00	70.00	171.897	51
Turkey	Engin Ozkan	80	57.00	45.30	102.30	105.400	12.50	13.30	6.00	34.00	65.80	171.200	52

Gold Medals

Silver Medals

Bronze Medals

COUNTRY	NAME	ID	THEORETICAL TEST			ADJUSTED	PRACTICAL TEST					GRAND TOTAL	RANK
			PART 1	PART 2	TOTAL		LAB I	LAB II	LAB III	LAB IV	TOTAL		
Slovak Republic	Petra Hajkova	63	51.00	31.30	82.30	84.794	17.00	21.50	18.00	28.00	84.50	169.294	53
Kirgizistan	Rustem Iminov	40	56.00	40.70	96.70	99.630	14.50	14.45	9.00	30.00	67.95	167.580	54
Azerbaijan	Nihal Guliyev	07	55.00	40.10	95.10	97.982	14.50	18.00	9.00	28.00	69.50	167.482	55
Turkmenistan	Komur Kakacan	81	59.00	35.80	94.80	97.673	20.00	19.35	11.00	19.00	69.35	167.023	56
Bugaria	Dimitar Nikolov	19	70.00	34.70	104.70	107.873	13.50	7.00	20.00	18.00	58.50	166.373	57
Latvia	Gundega Dekena	48	50.00	33.80	83.80	86.339	17.50	19.00	13.00	29.00	78.50	164.839	58
Bugaria	Kalina Stoyanova	18	65.00	31.65	96.65	99.579	18.50	12.50	13.00	21.00	65.00	164.579	59
Azerbaijan	Mahir Mahdiyev	05	55.00	40.10	95.10	97.982	15.50	16.30	7.00	27.00	65.80	163.782	60
Kazakistan	Bakitkan Bahautdinov	36	63.00	34.70	97.70	100.661	18.50	17.00	10.00	17.00	62.50	163.161	61
Belgium	Cedric Vanderose	10	56.00	26.00	82.00	84.485	19.00	16.30	10.00	32.00	77.30	161.785	62
Belgium	Damien Ertz	09	38.00	24.80	62.80	64.703	31.00	20.75	12.00	30.00	93.75	158.453	63
Tacikistan	Ikram Gulyarov	69	56.00	38.50	94.50	97.364	13.50	19.50	11.00	17.00	61.00	158.364	64
Tacikistan	Mukim Mahkemov	71	55.00	35.70	90.70	93.448	15.50	19.35	9.00	20.00	63.85	157.298	65
Kirgizistan	Ruslan Kulubayev	38	59.00	38.20	97.20	100.145	16.50	12.30	9.00	14.00	51.80	151.945	66
Kirgizistan	Daniyar Mukasev	37	69.00	38.20	107.20	110.448	10.50	15.50	.00	15.00	41.00	151.448	67
Belgium	Liesbeth Van Meir	12	41.00	27.60	68.60	70.679	17.50	16.75	12.00	34.00	80.25	150.929	68
Tacikistan	Abdulkadir Arzukulov	70	59.00	31.90	90.90	93.655	14.00	11.00	10.00	20.00	55.00	148.655	69
Latvia	Anda Aizbalta	47	54.00	34.00	88.00	90.667	15.00	20.00	2.00	20.00	57.00	147.667	70
Azerbaijan	Seymur Yusufov	08	47.00	31.35	78.35	80.724	19.00	16.50	11.00	20.00	66.50	147.224	71
Latvia	Ieva Romane	46	50.00	32.80	82.80	85.309	17.00	11.00	10.00	23.00	61.00	146.309	72
Tacikistan	Ferhat Naimov	72	64.00	28.90	92.90	95.715	19.50	6.30	3.00	20.00	48.80	144.515	73
Turkmenistan	Hocayev Berdimchmet	82	60.00	31.90	91.90	94.685	16.50	7.00	12.00	14.00	49.50	144.185	74
Kirgizistan	Nurbek Cusupov	39	60.00	38.30	98.30	101.279	10.50	10.00	6.00	12.00	38.50	139.779	75
Bugaria	Irina Dimitroba	20	52.00	35.40	87.40	90.048	7.00	10.50	4.00	26.00	47.50	137.548	76
Kazakistan	Ekrem Mahmudov	35	49.00	34.30	83.30	85.824	16.50	12.80	11.00	11.00	51.30	137.124	77
Turkmenistan	Halliyev Maksat	83	53.00	32.40	85.40	87.988	12.00	17.60	8.00	11.00	48.60	136.588	78
Latvia	Agnese Kolodinska	45	40.00	28.30	68.30	70.370	9.00	19.40	13.00	24.00	65.40	135.770	79
Turkmenistan	Kerim Coskun	84	63.00	35.40	98.40	101.382	10.00	9.00	2.00	13.00	34.00	135.382	80
Azerbaijan	Samil Sadikov	06	49.00	29.60	78.60	80.982	18.50	13.20	10.00	12.00	53.70	134.682	81
Sweden	Bjorn Akerblom	68	47.00	31.60	78.60	80.982	11.50	7.00	12.00	22.00	52.50	133.482	82
Sweden	Fredrik Stal	66	43.00	15.90	58.90	60.685	9.50	13.50	7.00	18.00	48.00	108.685	83
Kuwait	Raghidaa Abdullah	43	37.00	22.60	59.60	61.406	7.50	10.50	3.00	23.00	44.00	105.406	84
Kuwait	Nagham Saleh	42	31.00	19.90	50.90	52.442	14.00	8.00	3.00	27.00	52.00	104.442	85
Kuwait	Hend Qaderi	41	33.00	21.10	54.10	55.739	10.00	7.00	4.00	17.00	38.00	93.739	86
Kuwait	Hana Husain	44	29.00	19.25	48.25	49.712	13.00	7.00	6.00	17.00	43.00	92.712	87

max. theore : 166 } 312
pract : 146 }

Distribution of Medals

Country	Gold	Silver	Bronze	Total
Australia	1	3		4
Belarus		2	2	4
Belgium			1	1
Bulgaria			1	1
Czech Republic	2	1	1	4
Germany		2	2	4
Kazakistan			2	2
the Netherlands			4	4
P.R. China	2	1		3
Poland		3	1	4
Russia		1	3	4
Slovak Republic			3	3
Sweden			2	2
Thailand	3	1		4
Turkey			4	4
Ukraine		3	1	4
Total	**8**	**17**	**27**	**52**

Evaluation of the Sixth International Biology Olympiad

It was an honour and privilege for Thailand to host the Sixth International Biology Olympiad which took place at Chulalongkorn University from July 2-9, 1995. Since her first participation in the International Mathematics Olympiad in 1989, the Thai government has continuously supported the program with a firm belief that these activities will result in a development of human resources in science and technology as well as the fostering of friendly international relations between students and teachers. Months of planning and preparation were carried out by the Organizing Committee in order that the aims of the Sixth International Biology Olympiad could be met. Questionnaires were prepared by the Evaluation Team to be answered by the student contestants and the national delegates or team leaders of the 6 th IBO. The information obtained from the questionnaire was to be used for research purposes and for better preparation and organization of the future International Olympiads.

Eighty-eight students from 22 countries received the questionnaires. They consisted of 54 males (61.4%) and 34 females (38.6%) with ages ranging from 15 to 19 years old. The average current grade was in grade 12. Among them, twenty students (22.7%) participated in the previous International Olympiad. Their comments regarding the 6 th IBO were as follows:

1. The impact of the Sixth International Biology Olympiad

- When asked how much the 6 th IBO contributed to the stimulation of the interest and enthusiasm of the students in their countries in studying biology, it was found that 38.6% felt it did so a great deal, 34.1% felt moderately so and 28% said the impact was little.

- Regarding the impact on youth encouragement to demonstrate their knowledge and talents in biology, 37.5% felt it did a great deal, 30.7% felt it did moderately and 28.4% felt it had little impact.

- As to the question on encouraging youths to develop their potentials, 34.1% agreed it did a great deal and 34.1% agreed it did moderately. Only 23.9% said it did very little and 3.4% said it had no impact.

- In view of promoting an exchange of knowledge and experiences between youths in their countries and their international counterparts, 46.6% agreed that it did so a great deal and 27.3% answered moderately, 21.6% felt it could promote only a little and 2.3% felt it did not promote and exchange of knowledge and experiences.

- Concerning the promotion of international relationship, 59% agreed it did a great deal, 31.8% and 6.8% felt it did so moderately and a little respectively.

2. A tendency for Thailand to host the International Olympiads in other subject areas in the future. It was found that 94.3% of the students said yes because the country had a beautiful cultural heritage and natural resources (84.3) ; the country was resourceful

in terms of knowledge, personnel and sites (42.2%) ; the country was well equipped for worldwide telecommunication and transportation (33.7%) ; the country was economically, socially and politically stable (21.7%). Only 3.4% disagreed because of the uncomfortable climate and high travelling expenses and cost of living.

3. Preparation for this Olympiad competition

- 25.0% of the participants informed that they undertook two years of intensive training prior to being selected to represent their countries 22.7% had no intensive training, 19.3% had one year training, 6.8% and 2.3% had intensive training for 3 and 4 years respectively.

The intensive training lasted one month each time (approximately). The average training occured 1 to 2 times a year.

- Most of the students (65.9%) were informed that they had been chosen to represent their countries only 1-3 months before the competition, 1.4% were informed 3-6 months before the competition. Only 3.4% knew a year ahead that they were chosen as representatives (Azerbaijan, Kazakistan and Tacikistan).

4. Opinions regarding the following aspects of the 6 th IBO:

4.1 Administration of the theoretical test:

- Venue arrangement : 90.9% felt suitable
- Time allotment : 68.2% felt suitable
- Difficulty of test items : 79.5% felt suitable
- Communication with test administrators : 79.5% had no difficulty
- Fairness of test administration : 85.2% agreed with the fairness. Students from Poland and Ukraine informed that the Russian version was unclear and difficult to read. It was suggested that it should be accompanied by the English papers.

4.2 Administration of the practical test:

Regarding the administration, venue arrangement, time allotment, 90.9% of the students felt suitable; 61.4% agreed on the suitability of difficulty level of test items; 94.3% agreed on the completeness of tools and apparatus supply; 94.3% agreed on the quality of tools and apparatus in good working condition; 80.7% had no difficulty in communication with test administrators; 81.8% agreed on the fairness of test administration and 72.7% felt the time allotment not suitable because the length of questions required more time in reading and making interpretation. They felt the practical test being difficult but interesting and impressive.

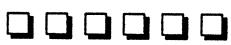
4.3 On welcoming and coordination aspect: the participants were very impressed by the warm welcome at the airport (75%) and at the opening ceremony (53.4%). They strongly agreed on the efficieney of coordinators (80.7%) and highly agreed on the suitability of accommodation (84.6%). Their level of satisfaction of foods was high (81.8%) and they agreed that information notes were very useful (65.9%).

4.4 Study tours: the participants were highly inpressed by the places they visited (90.9%). They felt the ease of travel was very high (79.5%); they received great benefits from study tours (75.0%) and derived much enjoyment from these (87.5%).

5. Impressions on the 6 th IBO

Participants revealed that what had impressed them most was the beautiful countryside, the beautiful and impressive cultural heritage, an atmosphere of friendship shown by the host country, especially by the student guides. They ware also impressed by the efficiency of coordinators.

Information collected from the questionnaires answered by the delegates (including observers) showed similar results with unsignificant variation in the degree of positiveness.



APPENDIX

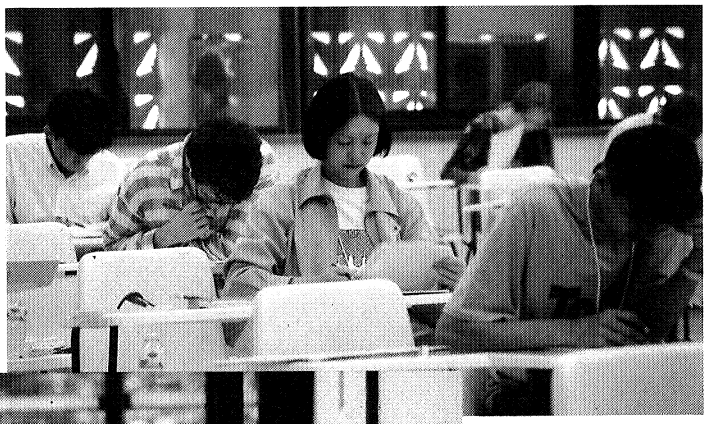
The IBO Trophy, a complimentary gift from Her Royal Highness, Krom Luang Naradhiwas Rajanagarindra, to circulate from one IBO host country to another annually.

Professor
M.R. Puttipongse Varavudhi,
Chairman of the Jury,
addressing the audience
at the opening ceremony.

The Jury discussion.

Members of Jury
during a meeting to
discuss the papers.

Students ponder their answers to the questions in the competition.



Laboratory examination.

A cultural tour of the Grand Palace.

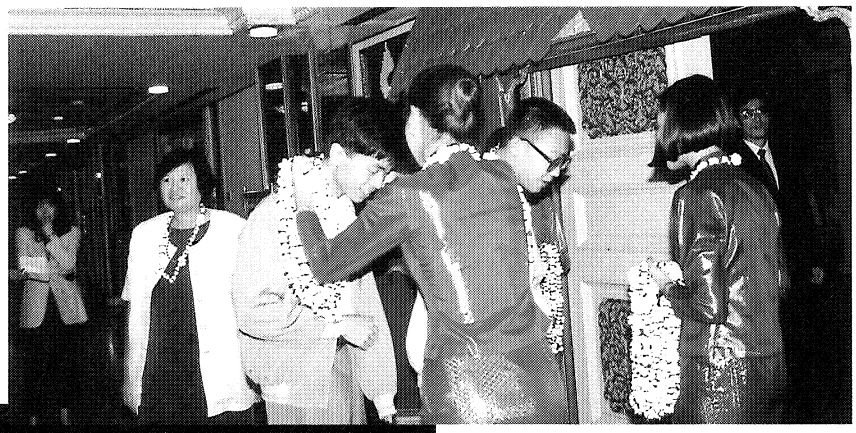
Musicians from a secondary school entertaining participants at Khao Yai National Park.

Country delegation, participants and Team Guides chatted before beginning the excursion at Khao Yai National Park.

A short ecological excursion into the forest at Khao Yai National Park.

Closing Ceremony.

Winners of the 6th IBO receiving their awards.



Farewell Party.

Programme
Opening Ceremony of
The Sixth International Biology Olympiad
Monday 3 July 1995
at Chulalongkorn University Auditorium

9.00 hrs. : Participating teams meet at Chulalongkorn University Auditorium and line up outside the Auditorium.

9.30 hrs. : Guests are properly seated in Chulalongkorn University Auditorium.

- Permanent Secretary for Education, President of Chulalongkorn University, Chairman of the IBO Coordinators, and Director of IPST wait in front of the Auditorium for the royal arrival.

10.00 hrs. : Arrival of H.R.H. Princess Galyani Vadhana Krom Luang Naradhiwas Rajanagarindra.

- President of Chulalongkorn University accompanies Her Royal Highness to the stage.
- Director of IPST presents the programme to Her Royal Highness
- Participating teams with individual countries' flags march into the Auditorium, line up their flags and take their seats.
- Report by the Permanent Secretary for Education
- Report by Chairman of the IBO Coordinators.
- Presentation of the IBO trophy to the Chairman of the IBO Coordinators.
- Opening address by H.R.H. Princess Galyani Vadhana Krom Luang Naradhiwas Rajanagarindra.
- Oath by Chairman and Co-chairman of the International Jury
- Oath by the competitors' representatives.
- Departure of H.R.H. Princess Galyani Vadhana Krom Luang Naradhiwas Rajanagarindra.

A Report
by
Mr. Taveesak Senanarong
Permanent Secretary for Education
At the Opening Ceremony of The Sixth International Biology Olympiad
Presided over by
H.R.H. Princess Galyani Vadhana Krom Luang Naradhiwas Rajanagarindra
Monday 3 July 1995
At Chulalongkorn University Auditorium

Your Royal Highness,

On behalf of the Advisory Board of the Sixth International Biology Olympiad, the International Biology Olympiad Coordinators, the Organizing Committee and the Sub-committee on the Thai side, and in my capacity as Permanent Secretary for Education, I would like to express my deepest gratitude to you for having graciously consented to preside over the opening ceremony of the Sixth International Biology Olympiad of 1995.

The International Biology Olympiad is a search for academic excellence in the field of Biology in the form of a competition among secondary students who are below the age of 20 from the international community. Since 1991, Thailand has been sending a team of four Thai youth representatives to compete in the event each year.

Thailand is honoured to host the Sixth International Biology Olympiad of 1995 at Chulalongkorn University in Bangkok. The event happily coincides with the auspicious seventy - second birth anniversary of Your Royal Highness this year and provides us with an opportunity to pay tribute to Your Royal Highness for your gracious support and patronage rendered to Thailand's participation in the International Science and Mathematics Olympiad over the years.

For this particular International Biology Olympiad, 22 countries have entered 88 competitors and 5 other countries have sent their observers to attend the event. The competition will be in two parts, practical and theoretical, to be held on one day each with a day of rest in between. The practical tests are constructed by the host country while the theoretical ones are constructed by the competing countries and selected by the host country. The tests are conducted in two languages - English and Russian.

To prepare the tests for this Olympiad, Thailand has set up a test committee, represented by Biology experts from several universities as well as two foreign guests - Professor Dr. Vitezslav Bicik from the Czech Republic and Professor Dr. Pavol Elias from the Slovak Republic. All test papers have been constructed and translated.

The competing students will have a chance to take two study visits - a cultural tour of the Grand Palace, the National Museum, the Vimanmek and Aphisek Dusit Throne Halls and an ecological tour at Khao Yai National Park.

I would also like to mention that the Sixth International Biology Olympiad is made possible by the excellent cooperation and support from several government agencies, state enterprises and private businesses.

With your gracious permission, may I call upon Dr. Duangtip Surintatip who will conduct the ceremony in English.

May it please Your Royal Highness.

Address by

Drs. Hans J. Morelis

Chairman of the Coordinators

Your Royal Highness,

On behalf of the coordinators from 22 countries, I would like to express my deepest gratitude to Your Royal Highness for your support of the International Biology Olympiad. It is the greatest honour for me to have this opportunity to address to Your Royal Highness about the history and the aims of the International Biology Olympiad,

In 1989 six countries, Bulgaria, Czechoslovakia, GDR, Belgium, Poland and the Soviet Union, founded the IBO in Czechoslovakia with the support of UNESCO. The first IBO took place in Czechoslovakia in 1990 with only 6 participating countries and with great success. In subsequent olympiads, the number of participating countries has increased rapidly, from 6 countries 6 years ago to 22 countries in the 6th olympiad in this beautiful tropical country,

The International Biology Olympiad has the coordinating center in Prague, and every winter a meeting of coordinators takes place at this center to prepare new proposals to improve future olympiads.

The International Biology Olympiad brings talented secondary school students together in a competition to test their ability in solving biology problems and doing biological experiments. It stimulates these students to pursue their special talents in their career as scientists. The olympiad focuses on biology as a beautiful and valuable subject. Many biological topics stress the importance of environmental protection, conservation of natural resources and sustainable development. It offers the opportunity for different countries to compare biology syllabuses and to improve biology education at both national and international levels.

To organize an olympiad, it requires a lot of human and material resources. So, I would like to thank Thailand for having accepted to be the host country for the Sixth International Biology Olympiad.

Lastly, on behalf of all coordinators, I am very impressed and grateful for the beautiful trophy, kindly bestowed upon all of us by Your Royal Highness. We promise that this trophy shall travel around the world with the IBO to promote biology education and understanding of mankind.

I would like to join the Thai people to celebrate the Year of Your Royal Highness' 72nd Birthday. Long Live Your Royal Highness.

PROGRAMME FOR THE SIXTH INTERNATIONAL BIOLOGY OLYMPIAD

CHULALONGKORN UNIVERSITY, BANGKOK, THAILAND

JULY 2 - 9 1995

SUNDAY JULY 2 1995

Arrival of participants.
- Students stay at the Mandarin Hotel.
- Jury and Observers stay at Vidhaya Nivej, Chulalongkorn University.

Registration at the Mandarin Hotel and Vidhaya Nivej.

MONDAY JULY 3 1995

09.00	Opening Ceremony at the Chulalongkorn University Auditorium.
12.00	Honorary Lunch at Sala Pra Keow, Chulalongkorn University.
13.00	Jury: Discussion on and Translation of Practical Test.
	Students and Observers: Chulalongkorn University Campus Tour.

TUESDAY JULY 4 1995

08.30-17.00	Jury and Observers: Arts and Culture Tour
	(Royal Grand Palace, National Museum, Wimanmek and Abhisek Dusit Museum).
09.00-16.00	Students: Practical Test at the Faculty of Science, Chulalongkorn University.

WEDNESDAY JULY 5 1995

08.30-17.00	Students: Arts and Culture Tour
	(Royal Grand Palace, National Museum, Wimanmek and Abhisek Dusit Museum).
	Observers: Free.
09.00	Jury: Discussion on and Translation of Theoretical Test.

THURSDAY JULY 6 1995

08.00-12.00	Students: Theoretical Test at the Borommarajakumari Building,
	Chulalongkorn University.
13.00	All participants: Trip to Khao Yai National Park.
	Stay overnight at Golden Valley Resort.

FRIDAY JULY 7 1995

06.00-11.30	All participants: Khao Yai National Park Tour.
11.30-13.00	Return to Golden Valley Resort after lunch on Khao Yai.
14.00	Return to Bangkok.
19.00	Announcement of the results of the tests in a jury meeting.

SATURDAY JULY 8 1995

09.00-12.00	Final meeting of the jury at the Saranitet Room of the Chulalongkorn University
	Auditorium (if necessary).
15.00-17.00	Official awards presentation and closing ceremony.

SUNDAY JULY 9 1995

Departure.

PROGRAMME FOR THE SIXTH INTERNATIONAL BIOLOGY OLYMPIAD
BANGKOK, THAILAND, JULY 2 - 9, 1995

Date	Jury	Students	Observers
Sun JULY 2			
	<---------- Arrival and check-in ---------->		
	<---------- Registration ---------->		
19.00	<---------- Dinner ---------->		
Mon JULY 3			
07.00	<---------- Breakfast ---------->		
09.00 - 12.00	<---------- Opening Ceremony (Chulalongkorn University Auditorium) ---------->		
12.00 - 13.00	<---------- Honorary Lunch (Sala Pra Keow) ---------->		
13.00	Discussion on and translation of practical test	<---------- Chulalongkorn University Campus Tour ---------->	
19.00	<---------- Dinner ---------->		
Tue JULY 4			
07.00	<---------- Breakfast ---------->		
08.30 - 17.00	Arts and Culture Tour		Arts and Culture Tour
09.00 - 16.00		Practical test	
19.00	<---------- Dinner ---------->		
Wed JULY 5			
07.00	<---------- Breakfast ---------->		
08.30 - 17.00		Arts and Culture Tour	
09.00	Discussion on and translation of theoretical test		Free
19.00	<---------- Dinner ---------->		
Thur JULY 6			
07.00	<---------- Breakfast ---------->		
08.00 - 12.00	Free	Theoretical test	Free
12.00 - 13.00	<---------- Lunch ---------->		
13.00 -	<--------- Trip to Khao Yai National Park (Stay overnight at Golden Valley Resort --------->		
Fri JULY 7			
06.00 - 11.30	<---------- Khao Yai National Park Tour ---------->		
11.30 - 13.00	<---------- Lunch ---------->		
14.00 -	<---------- Return to Bangkok ---------->		
19.00 -	Jury Meeting		
	<---------- Dinner ---------->		
Sat JULY 8			
07.00	<---------- Breakfast ---------->		
09.00 - 12.00	Final Meeting (if necessary)	Free	Free
15.00 - 17.00	<---------- Official awards presentation and closing ceremony ---------->		
19.00	<---------- Dinner ---------->		
Sun JULY 9			
07.00	<---------- Breakfast ---------->		
	<---------- Departure ---------->		

LIST OF PARTICIPANTS AND OBSERVERS

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	3. Dimitar Nikolov	M	
	4. Irina Dimitroba	F	
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	3. Ivana Baranova	F	
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