4. Theoretical and Practical Tests
4.1. Practical Test

4.1.1. Laboratory I:

Plant Anatomy, Morphology and Taxonomy

Dear Competitor,

This laboratory consists of two separate tasks.

you will begin with either Task I or Task II. you will move to the other task after 30 minutes.

Please make sure that the task paper given to you fits the task on your table.

COUNTRY: _____

FIRST NAME: _____

LAST NAME: _____

CODE:_____

Task 1: Making Sections of Plant Tissues. Identification of Tissue Types. Interpretation of Structures (30 minutes; 25 points)

Materials: Plant tissue samples

İnstruments:

- Razor blade
- Stains
- Slides and cover slips
- Microscope (10x and 40x)

1. Make a transverse section of the leaf sample no.1 . If necessary, use a foam slice (make a split in the foam with a razor blade and place some fragment of the sample in it and obtain a section). Prepare a wet mount, and examine tissues. Choose one correct answer code to fill in the blanks 1.1 and 1.2.

1.1. The order of the major tissues. Which of the following is the correct sequence of tissues? Fill in the blank with one correct answer code. (5 points)

01. Upper epidermis, mesophyll consisting of one cell type, lower epidermis.
02. Upper epidermis, palisade parenchyma, spongy parenchyma, palisade parenchyma, lower epidermis.
03. Upper epidermis, palisade parenchyma, spongy parenchyma, lower epidermis.

Answer code: _____

1.2. Leaf type according to the arrangement of tissues. Fill in the blank with one correct answer code. (2 points)

01. Dorsiventral / Bifacial
02. Unifacial
03. Equifacial

Answer code: _____

2. Obtain a <u>transverse</u> section of the stem sample no:2 and prepare a wet mount. Make sure that your section is thin enough to examine cell types. Take the water medium out from one side of the cover slip by a filter paper and at the same time add a few drops of the Phloroglucine (Flg-HCl) stain from the other side until the stain covers all the cover slip square. Wait for a few minutes until some cell walls get pink-red in colour. Go through 2.1 and 2.2.

2.1. First, examine the general histological structure of the stem at a magnification of 10x, then choose correct answer code to fill in the blanks 2.1.1 and 2.1.2.

2.1.1. Which of the following does the stem sample belong to ?
Fill in the blank with one correct answer code. (6 points)

01. The stem sample belongs to a dicotyledon.
02. The stem sample belongs to a horsetail.
03. The stem sample belongs to a monocotyledon.
04. The stem sample belongs to a clubmoss.
05. The stem sample belongs to a cycad.
06. The stem sample belongs to a fern.

Answer code:_____

2.1.2. Which of the following is the stele type of the stem sample?
Fill in the blank with one correct answer code. (4 points)

01. Stele type is actinostele - Xylem arranged in star shape
02. Stele type is plectostele – Vascular tissue arranged centrally but irregular shaped
03. Stele type is haplostele - Cylindrical core of xylem surrounded by phloem
04. Stele type is solenostele – Phloem is inside and outside of xylem
05. Stele type is atactostele – Vascular bundles scattered
06. Stele type is eustele - Vascular bundles surrounding a central pith

Answer code: _____

2.2. Now, magnify a single vascular bundle at a magnification of 40x and examine it in detail, then choose correct answers to label the appropriate parts shown as W, X, Y and Z in Figure 1.
(4 points)

code	term	code	term
01.	Fiber	02.	Protoxylem canal
03.	Phloem	04.	Tracheid
05.	Metaxylem vessel	06.	Xylem parenchyma

Answer codes: W:_____, X:_____, Y:_____, Z:_____

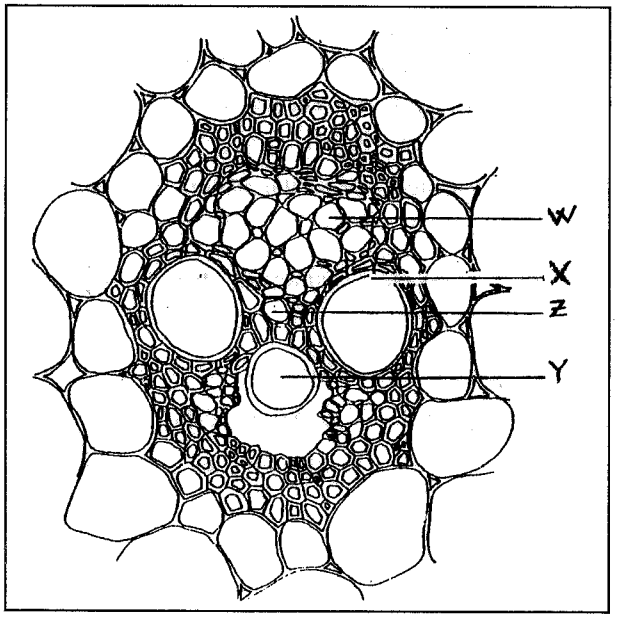
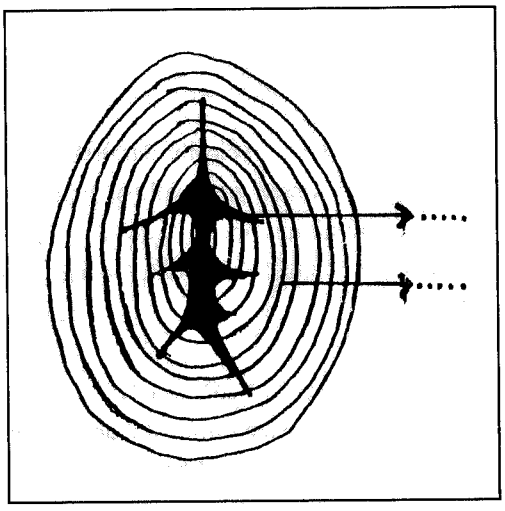


Figure 1

3. Prepare a slide of a thin section of the cotyledons of a bean (*Phaseolus*) seed (sample no 3) by shaving with a razor blade and drop some Iodised Potassium Iodide (IKI) onto these pieces to stain. Place a cover slip carefully on the preparation. Draw a starch grain and label the hilum with an asterisk. (4 points)



Task 2: Identification and Grouping of the Plants and Making Interpretations (30 minutes, 25 points).

Objective: To identify the plant species by using a key. Interpretation of the morphological characteristics. Finding the relationships between the body parts of the plants.

Materials and Instruments: Samples of various plant groups. Sample of seeds and leaves. A stereo binocular microscope, forceps, dissection needles, a ruler, razor blades.

Introduction:

Monocotyledons: The leaves are typically parallel or pinnate parallel veined, laminae are usually linear and without petiole. Flowers have usually sepal and petal with nectarium.

Dicotyledons: Leaves are typically reticulate veined with petiole and wide laminae.

IDENTIFICATION OF PLANTS USING A KEY

Ten plant specimens belonging to ten different plant species are given to you. Each specimen is numbered. Write the numbers of these specimens on the appropriate blanks in the key. Eight different diagnostic characteristics are given in the the tables (1-7) Using the characteristics in these tables and the key, identify the specimens.

DESCRIPTION OF SOME CHARACTERISTICS:

Figure 1.

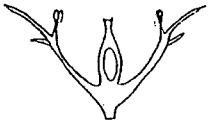
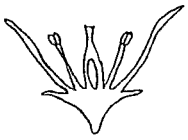
TYPES OF OVARY		
Inferior ovary	**Half-inferior ovary**	**Superior ovary**
		

Figure 2.

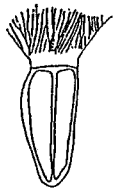
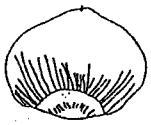
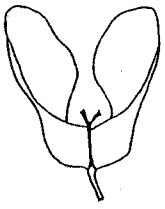
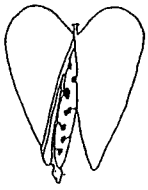
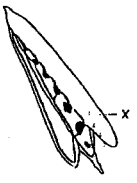
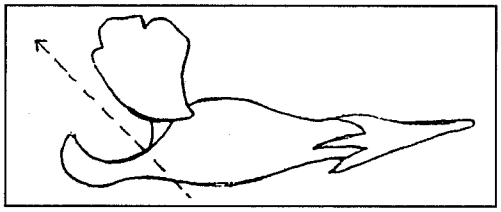
TYPES OF THE FRUITS			
			
A) Achene	B) Nut	C) Caryopsis	D) Samara
			
E) Follicle	F) Silicula	G) Siliqua	H) Legume

Figure 3. Flower Symmetries:

Zygomorphic flowers: Single (one) symmetric flowers.



Actinomorphic flower: Multiple (more than two) symmetric flowers.

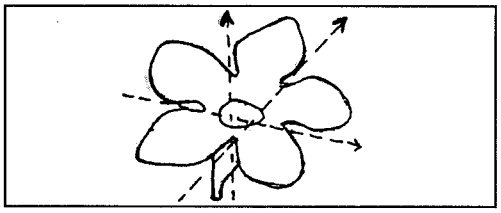


Figure 4.

Flower Parts

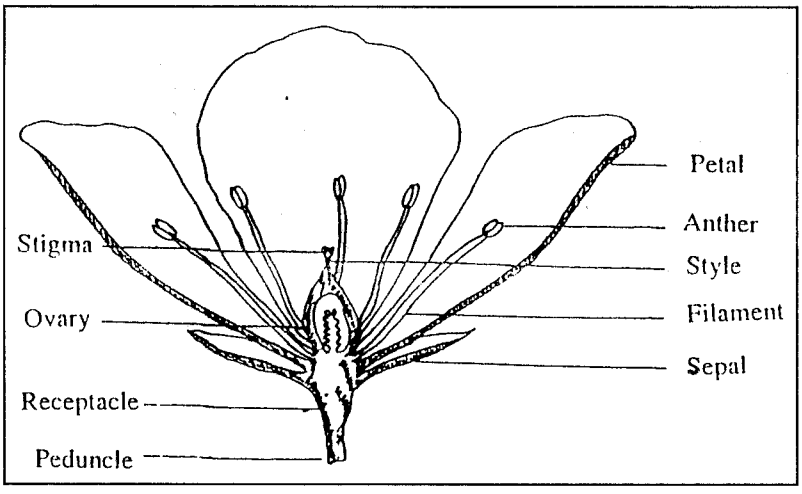


Figure 5.

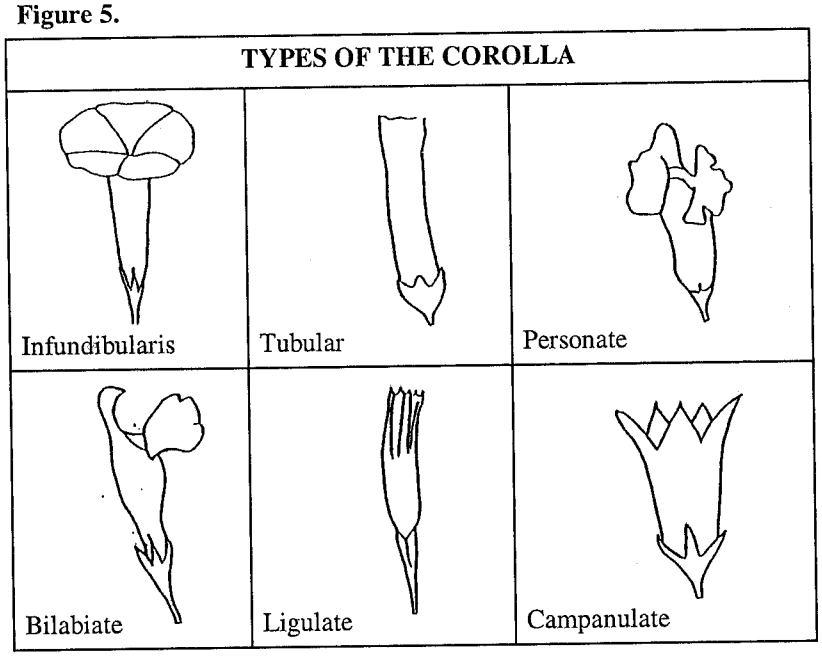


Figure 6.

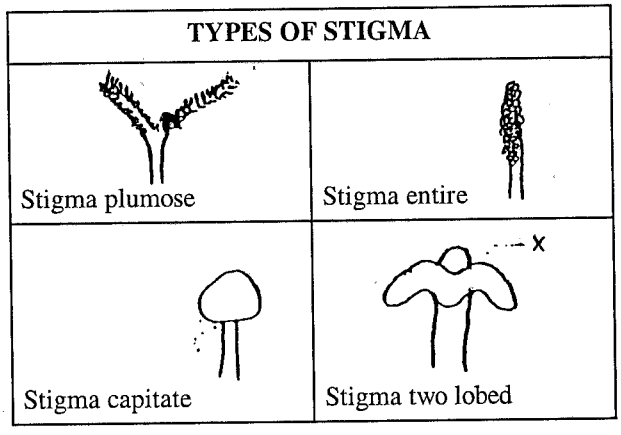
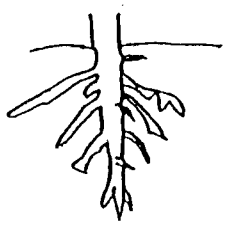
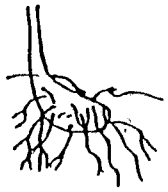


Figure 7.

TYPES OF THE ROOTS AND THE STEMS		
		
A) Tap root	B) Fibrous root	C) Woody root
		
D) Tuber	E) Scapose	F) Fleshy root

2.1. IDENTIFICATION BY USING A KEY

Write the numbers of the plants given below in the blanks in the key. Each correct answer is 1.5 points (Total 15 points).

1. Alyssum corsicum
2. Onosma isauricum
3. Senecio vernalis
4. Nepeta racemosa
5. Muscari neglectum
6. Moltkia coerulea
7. Lamium garganicum
8. Delphinium staphisagria
9. Ptilostemon chamaepeuce
10. Linum mucronatum

1- Plant monocotyledons..... ___
1- Plant dicotyledons
  2- Ovary inferior
    3- Achene 2-3 mm; corolla yellow..... ___
    3- Achene 3.5-5 mm; ligulate flowers pink..... ___
  2- Ovary superior
    4- Flowers actinomorphic symmetric
      5- Stamens 6..... ___
      5- Stamens 5
        6- Petals free ..... ___
        6- Petals compound
          7- Stigma entire; stamens arise from the corolla ..... ___
          7- Stigma small, capitate or bilobed; stamens included in corolla tube..... ___
    4- Flowers zygomorphic symmetric
      8- Sepal 5; fruit follicle ..... ___
      8- Sepal 5 or many; fruit nutlets
        9- Bracteoles (small bracts) 3-10.5 mm; calyx teeth (notches) 2-9 mm ..... ___
        9- Bracteoles (small bracts) 2-3 mm; calyx teeth (notches) 1-2 mm ..... ___

2.2. IDENTIFICATION OF THE TYPES OF THE PLANT PARTS

Using the table of root and stem types given above (Figure 7), fill in the blanks with a code from the figure, to identify A and B in sample 11 (4 points).

Sample 11 A)_____

Sample 11 B)_____

2.3. IDENTIFICATION OF THE FRUIT TYPES

You will find some fruit samples numbered as 12, 13 and 14 on your table. Using the fruit types in the figure given above (Figure 2), write the code of the fruit types on the blanks (6 points).

Sample 12: _____

Sample 13:_____

Sample 14:_____

4.1.2. Laboratory II:

Animal Anatomy, Morphology and Taxonomy

Dear Competitor,

This laboratory consists of two separate tasks.

You will begin with either task i or task ii. you will move to the other task after 30 minutes.

Please make sure that the task paper given to you fits the task on your table.

You will be guided by the instructors during the desk change .

COUNTRY: _____

FIRST NAME: _____

LAST NAME: _____

CODE:_____

Laboratory II- Task 1:

Calculating Biomass of Microscopic Animals By Using Their Body Length (30 minutes; 25 points)

Objectives:

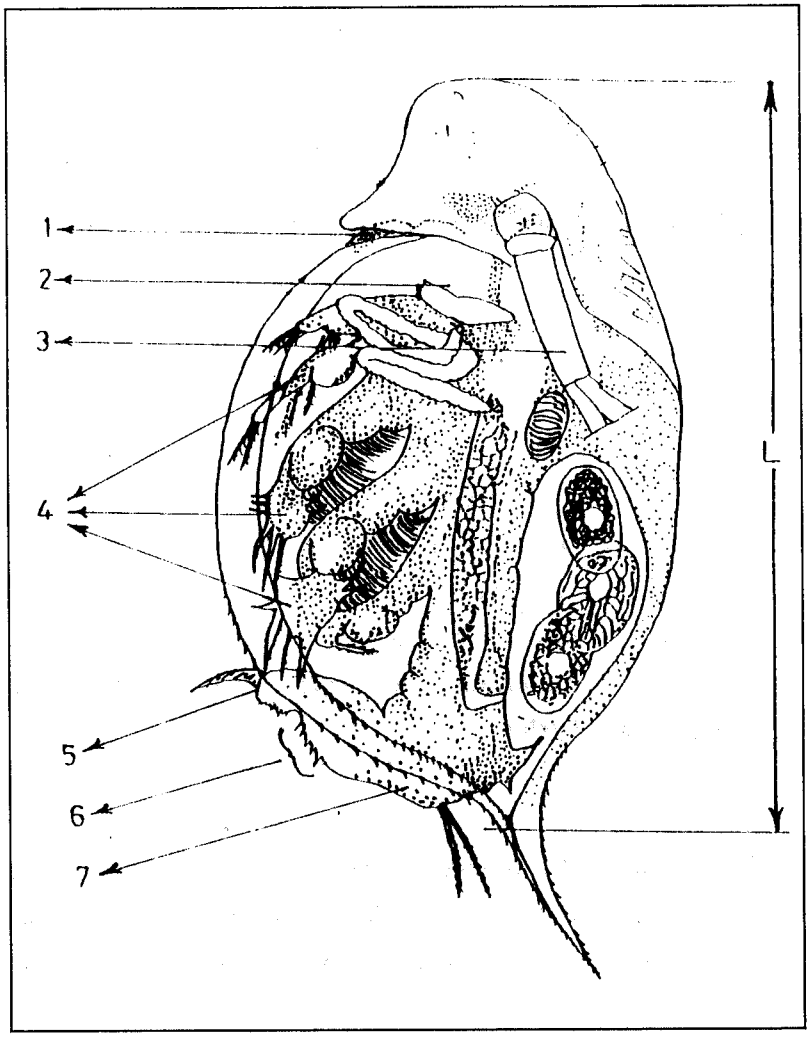
To evaluate the ability of the competitors to make biological preparations

To evaluate the ability of the competitors to use a microscope

To evaluate the ability of the competitors to make measurements under a microscope

To evaluate the ability of the competitors to use the obtained results in a formula

Dear Competitors, you are given on your table, slides, cover slips, glycerine, water, forceps, a stage micrometer, an ocular micrometer (already mounted in the microscope), a light microscope, a calculator and specimens of a species from Crustacea (in a petri dish).



1- Take 3 of these specimens and make a preparation. Examine your preparation under the light microscope.

After observing the morphology of the animal, answer the following questions:

1. 1. How many compound and ocelli (simple) eyes does this animal have? (1 Point).

Number of compound eyes: _____

Number of ocelli (simple) eyes: _____

1. 2. Which number in the figure refers to the main structure that enables the animal to move in the water? (1 point).

_____

1. 3. About the antennal structure of the animal:

What are the number of segments on the dorsal and ventral branches? (6 points).

Number of segments on the dorsal branch _____**(2 points)**

Number of segments on the ventral branch _____**(2 points)**

Total number of setae on dorsal branch _____**(1 point)**

Total number of setae on ventral branch _____**(1 point)**

1. 4. Which number in the figure refers to the mouth and the anus of this animal? (2 points).

Mouth: _____

Anus: _____

1. 5. According to the structure of the legs and other body parts of this animal, which of the following can be said about its feeding style?(Mark the correct alternative with an "X"). (2 points)

___A) Detritovorous

___B) Predator

___C) Filtrate-feeder

___D) Parasitic

2- Determine the total body length of each specimen by using the micrometers and write them in the blanks. (4 points).

A) Total body length of the 1st specimen (L_1): _____mm

B) Total body length of the 2nd specimen (L_2): _____mm

C) Total body length of the 3rd specimen (L_3): _____mm

D) Arithmetic mean of the total body lengths L_M:= _____mm

$$L_M = \frac{L_1 + L_2 + L_3}{3}$$

3. Calculate the lnW and biomass (W) by applying the mean total body length (L_M), "lna" and "b" values (lna= 1.6729 and b= 2.6880) that you have found, in the formula below (3 points).

$\ln W = \ln a + b \ln L_M$

(lna= 1.6729 and b= 2.6880)

a) lnW: _____

b) W: _____µg

Task 2:

Systematic Zoology: Grouping By Using Systematical Characters and Constructing a Key; Drawing a Phylogenetic Tree; Making Conclusions About the Life Styles Based On These Characters (30 minutes; 25 points)

Objectives:

Realizing the taxonomical characters by the naked eye or by a microscope.

Grouping characters

Constructing a key based on the characters

Making conclusions about the life styles based on the characters

Instruments: Binocular microscope, dissection pins, forceps.

Material: Specimens of 7 insect species.

PS. As the materials are dry, please be careful not to break the body parts. Examine the specimens by holding only from the pins.

Introduction: It is generally assumed that all living organisms have a phylogenetically common ancestor. During their evolutionary development they have adapted to their habitats. By looking at these characteristics it becomes possible for us to determine (by constructing keys), interpretations about their common ancestors and life styles.

2.1. Construction of a key

Living things have some common characters which become gradually more specific along the line from large taxonomic categories down to the individual level. Based on these characteristics, living things are classified and keys are constructed for their identification.

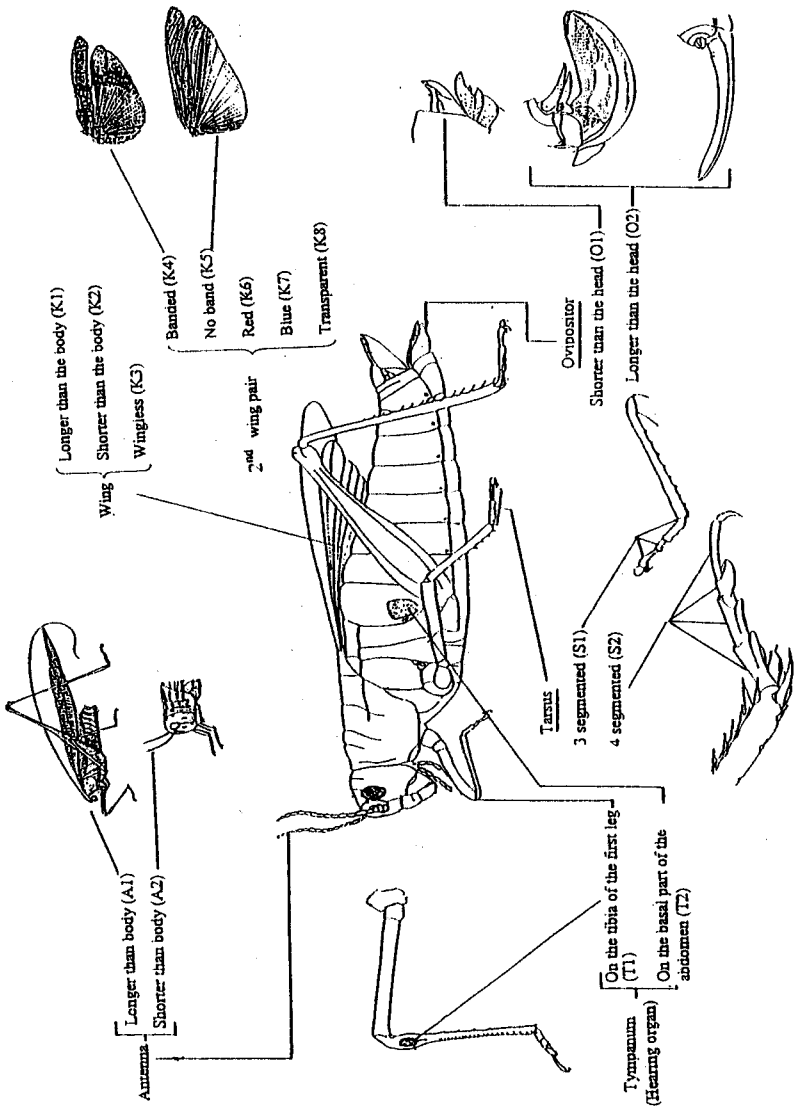
In order to determine a given specimen or to make identification keys for the living things from different groups their characteristics have to be known and grouped. In choosing these characteristics the degree of differentiation shows their degree of relatedness. Therefore grouping them starting from the ones with the most different structures and using these in the identification keys and constructing the phylogenetic trees according to these is the basis of the procedure.

For this purpose a hypothetical figure of grasshoppers (Orthoptera: Caelifera and Ensifera) is given.

In this figure, in order to guide you to find the places of these characteristics, characteristics of different groups and species are given in a combined manner. Naturally, all these characters may not be found on the same individual. While some of them can be seen with the naked eye, others can be seen more clearly with a stereo binocular microscope like the one on your table.

There are specimen belonging to 7 different insect species on your table. Of these, the ones numbered from 1 to 6 belong to two different families.

The seventh specimen on the other hand belongs to a different family and will be used later for another purpose in the section 2.3. Group the numbered specimen from 1 to 6 by using the characters that are given to you in the hypothetical figure. You may group them starting from general to more specific features. In other words group them by starting from the most general character and work through until you reach a characteristic that is found only in one specimen. Use the groupings to construct a dichotomous key. While doing this, consider the common characteristis of the specimens and separate them first on the family basis and then according to their species.


Longer than the body (K1)
Shorter than the body (K2)
Wingless (K3)
Wing
Banded (K4)
No band (K5)
Red (K6)
Blue (K7)
Transparent (K8)
2nd wing pair
Ovipositor
Shorter than the head (O1)
Longer than the head (O2)
Tarsus
3 segmented (S1)
4 segmented (S2)
Longer than body (A1)
Shorter than body (A2)
Antenna
On the tibia of the first leg (T1)
On the basal part of the abdomen (T2)
Tympanum (Hearing organ)

A model key (The codes used here are arranged in order to guide you).

1.Character code: A1, T2, K3 etc __4_, __6__ (species) (Family-A).....2

--A2, T1, K1 etc __1_, __2__, __3__, __5__ (species) (Family-B)....3

2.K2, S1 ..... ___ (species)

--K4, S2 etc ..... ___ (species)

3..... 4

-- 5

4..... ___ (species)

-- ..... ___ (species)

5..... ___ (species)

..... ___ (species)

By using these characteristics, construct a key according to their family and species. You may use the codes of the characteristics in the figure and put them in the key given below or you may make a key of your own (15 points).

1.Character code: ..... ____, ____, (species) (Family-A).....2

-- ..... ___, ____, ____, ____,(species) (Family-B)....3

2..... ___ (species)

-- ..... ___ (species)

3..... 4

-- 5

4..... ___ (species)

-- ..... ___ (species)

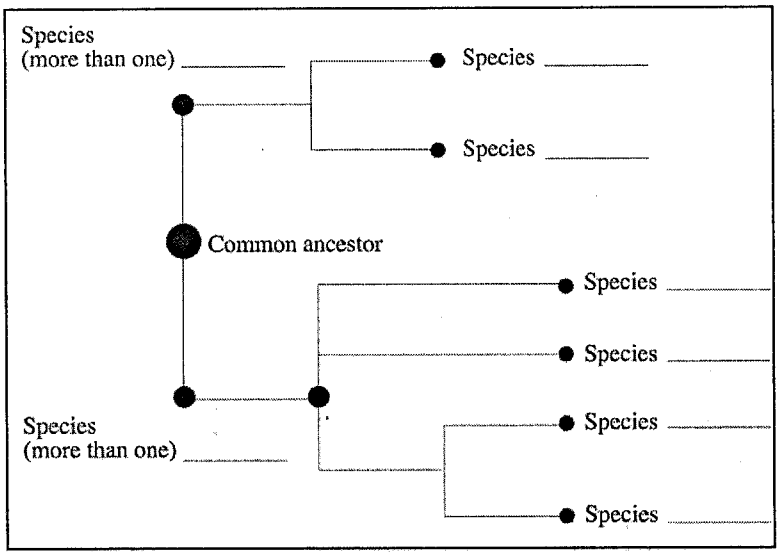
5..... ___ (species)

..... ___ (species)

2.2. Construction of a phylogenetic tree (5 points)

During the evolution process the last separated (branched) populations (here species) are the ones which have the most close ancestor and therefore have much more similar characteristics. Handle the specimens from this point of view.

After examining the specimen morphologically design a schema for a phylogenetically branched relationship tree by using similar characteristics.



2.3. Determination of the Characteristics and Establishing the Relationships Between the Characteristics and the Life-Style (5 points).

It is a biological reality that there is a close relationship between the morphological characters of the living creatures and their life-styles. It is therefore possible to make deductions about the life-styles or their biology depending on their morphological characteristics. In the table below, the biological characteristics are given in the left column relating to specimens 1 to 7. Mark with an "X" in the appropriate boxes for each species. Some species may have more than one characteristics and many species may show the same characteristic.

	Specimen number						
Characters	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Lives in steppes							
Lives underground							
Lives in herbs and shrubs							
Tympanal (auditory) organs are on the first leg							
Tympanal (auditory) organs are on the body							
Raptorial type feet (feet modified for grasping)							
Jumping type feet							
Digging type feet							

4.1.3. Laboratory III:

Biochemistry (60minutes; 50 Points)

Task: Agarose Gel Electrophoresis of DNA and Stain Samples

Notice !

One power supply is for three students

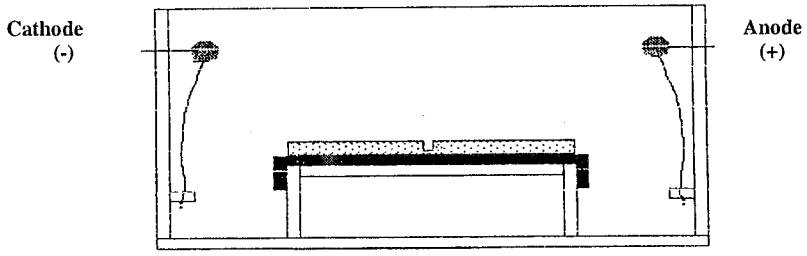
After loading the samples remove the black paper under the electrophoresis tank

COUNTRY: _____

FIRST NAME: _____

LAST NAME: _____

CODE:_____



Electrophoresis Tank

Introduction:

Electrophoresis is an analytical method frequently used in molecular biology and medicine. The net charge on the molecules effect their migration in an applied electric field. The electrophoresis technique depends on this principle.

Agarose gel electrophoresis is used to provide information for ;

- identification of DNA and RNA isolated for several purposes
- to check the purity of DNA
- to determine in what form it is
- to estimate the size of DNA

Purified agarose, in powdered form, is insoluble in water at room temperature. In order to dissolve it one might boil it in buffer or water. When it starts to cool, it undergoes polymerization. After polymerization the samples are loaded in the lanes preformed in the gel.

The factors that affect the migration rate of molecules in the agarose gel are as follows;

- molecular size
- agarose concentration
- applied voltage
- molecular conformation and size
- temperature
- the composition of electrophoresis buffer

EXPERIMENTS

Reagents:

- Stains:
  - Trypan blue
  - Acid yellow
  - Bismarck brown
  - Methyl green
  - Fuchsin
  - Marker stain
- DNA samples:
  - DNA sample I
  - DNA sample II

(A stain that binds to DNA is added to the DNA samples to visualize it)

- 40% sucrose solution
- 1% agarose gel (previously prepared)
- Tris-Borate-EDTA Buffer (1mM Tris, 0.1 mM Boric acid, 2 mM EDTA, pH 8.3)

Material and Equipment

- 2- 20 µl micropipets + pipet tips
- 1.5 ml eppendorf tubes and tube holders
- gloves
- electrophoresis tank and gel tray
- power supply
- marker pencil

PRELAB NOTES

You have been given five organic stains, one marker stain [mixture of three stains; orange II (MW=350), xylene cyanole (MW= 538.6), bromophenol blue (MW=691)] and two separete DNA samples [human genomic DNA (~ 3 x 10^9 bp) and plasmid DNA (less than 5 x 10^3 bp)]. In this experiment agarose gel with preformed lanes is ready made for you. Load your samples in the gel as follows and evaluate your results.

Please wear your gloves throughout the experiment.

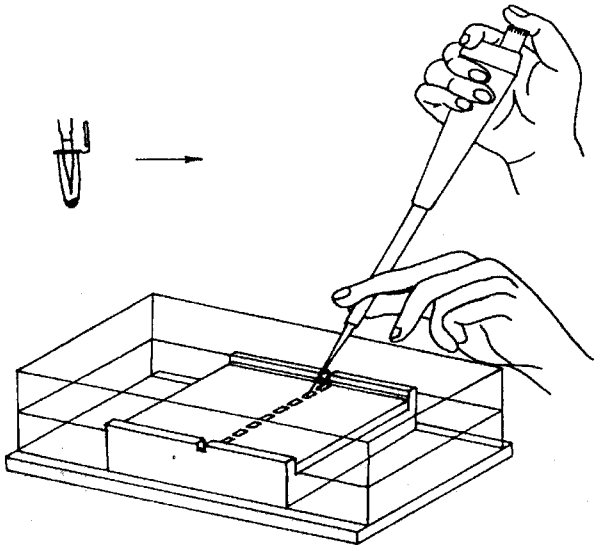
Step 1: Preparation of Samples

Add to each of the tubes which contains a stain or a DNA sample, 5µl of the 40% sucrose solution. Use a fresh pipet tip for each reagent.

Tube No			
1.	5µl Trypan blue	+	5µl 40% sucrose
2.	5µl Acid yellow	+	5µl 40% sucrose
3.	5µl Bismarck brown	+	5µl 40% sucrose
4.	5µl Methyl green	+	5µl 40% sucrose
5.	5µl Fuchsin	+	5µl 40% sucrose
6.	5µl Marker stain	+	5µl 40% sucrose
7.	5µl DNA sample I	+	5µl 40% sucrose
8.	10µl DNA sample II	+	5µl 40% sucrose

Step 2: Loading Samples in the Lanes

Tris-Borate-EDTA buffer (pH 8.3) have been poured over the gel in the electrophoresis chamber before. Place each sample prepared in step 1 into its separate lane in the middle of the agarose gel in the order on page 50 Use a clean micropipet tip for each sample. Insert the tip of the micropipet above the well. When loading samples in the gel, be careful not to puncture the bottom of the well.



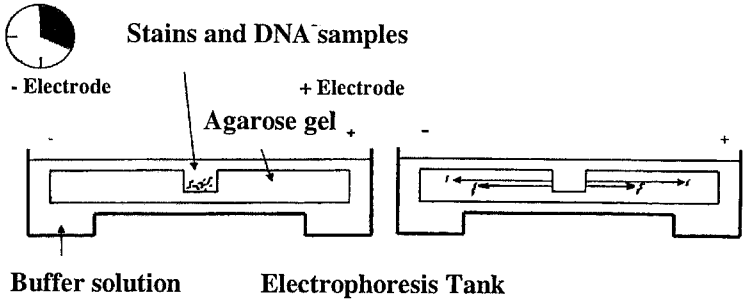
Step 3:

Close the lid of the electrophoresis chamber and attach the leads on the lid to the power supply. Turn the power supply on. (Red to positive and black to negative)

Step 4

Run the gel at approximately 90 volt for 20 minutes.

Caution! Do not touch the chamber or place fingers in the buffer once power has been turned on



Note: During this waiting period of the experiment, answer the Group A questions on page 53 about the application of electrophoresis.

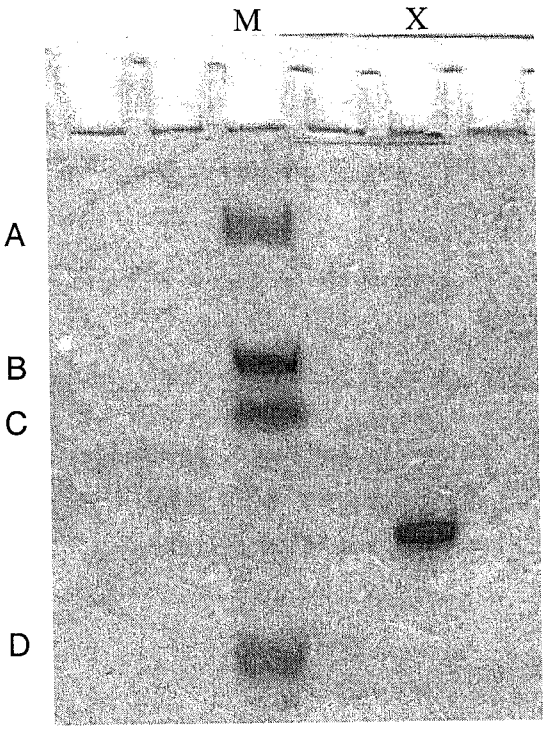
Step 5

Turn the power supply off and remove the leads from the power supply. Observe the gel profile and draw the gel profile on the diagram given on page 12 and answer the B group questions.

QUESTIONS

Group A questions (about the application of electrophoresis)

I. Given below is the SDS-PAGE (Sodium dedocyl sulphate-polyacrylamide gel electrophoresis) profile of protein (X) purified in the laboratory and molecular weight standards (M).

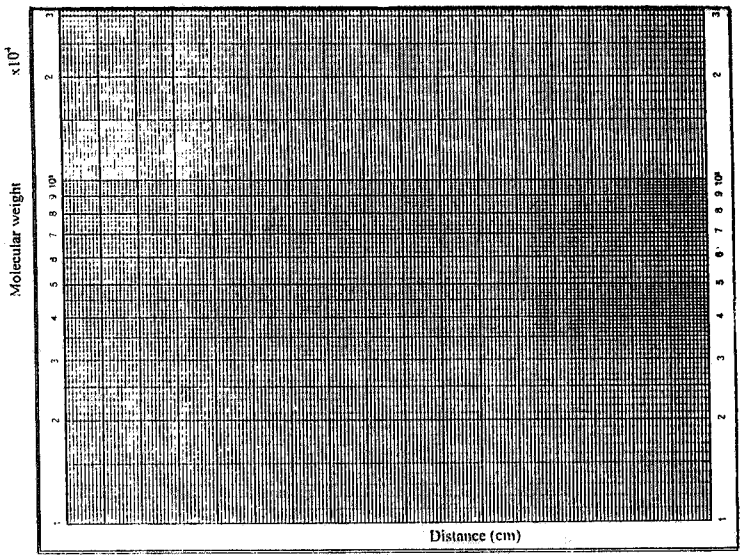


The molecular weights of the protein standards are given in the table below .

Protein	Subunit molecular weight	Migration distance (cm)
Protein-A	140.000	_____
Protein-B	100.000	_____
Protein-C	86.000	_____
Protein-D	45.000	_____
Protein-X	?	_____

1. **Measure in centimeters, the distance each protein migrated in the gel (from the well to the middle of the protein band). Fill in your measurements in the table above.**

2. Plot the molecular weights versus the migration distance (cm) on the semilogarithmic paper below. (10 points)

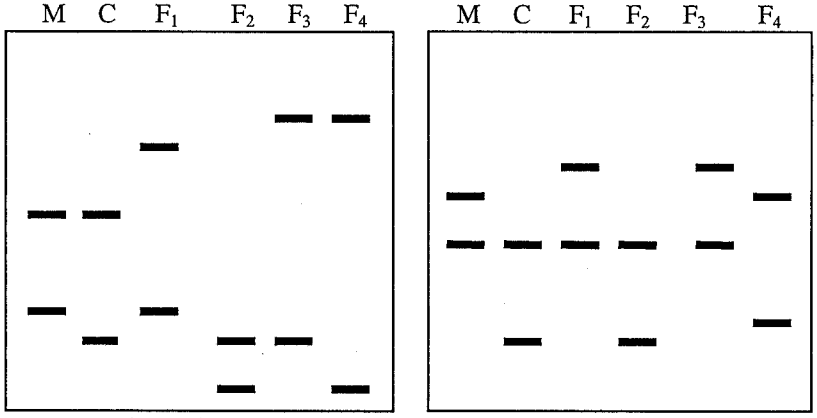


3. What is the subunit molecular weight of protein X ? (5 points)

_____

II. To settle a paternity dispute, DNA fingerprinting is used in the forensic laboratory. The same two DNA loci from the child, mother and possible fathers which appear in a randomly repeated fashion in the genome have been chosen for analysis. These fragments are called variable number tandem repeats (VNTRs); each individual should inherit one allele of a particular size containing a VNTR from one parent and a homologous but not

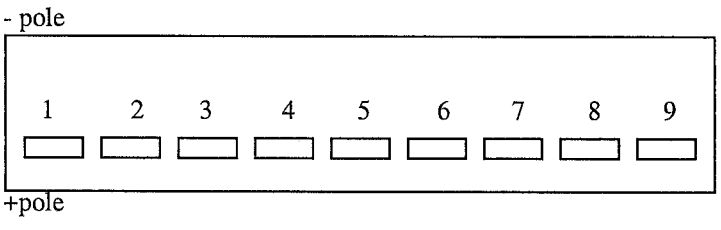
necessarily identical allele with the same VNTR from the other parent. In this experiment two VNTR DNA's of each individual have been amplified by PCR and PCR fragments were run on the agarose gel. Shown below are the results of DNA fingerprinting gel profiles. Based on this fingerprinting analysis who (F_1, F_2, F_3, F_4 or none) can be the true biological father ? (10 points) MARK THE CORRECT ANSWER BELOW WITH AN "X".



(M= mother, F= father, C= child)

___A) F_1 ___B) F_2 ___C) F_3 ___D) F_4 ___E) none

Group B Questions (answer these questions after you finish the electrophoresis)



Draw the gel profile (bands) on the diagram above (1point) and answer the following questions.

I. Fill in the blanks with the appropriate well number.

1. The stain/stains in lane/lanes number _____ is/are neutral. (3 points)
2. The stain/stains in lane/lanes number _____ is/are positively charged. (3 points)
3. The stain/stains in lane/lanes number _____ is/are negatively charged. (3 points)
4. The sample in lane number _____ is plasmid DNA. (3 points)
5. The sample in lane number _____ is human genomic DNA. (3 points)
6. The stains in lane/lanes number_____ can be used to stain DNA. (3 points)
7. Of the two stains that move toward the positive electrode the MW of stain _____ is larger than the MW of stain_____ . (3 points)
8. Of the two stains that move toward the negative electrode the MW of stain _____ is larger than the MW of stain_____. (3 points)

4.1.4. Laboratory IV:

Ecology

Task: Determination of the Community Structures In Different Soil Horizons (60 minutes; 50 points).

COUNTRY: _____

FIRST NAME: _____

LAST NAME: _____

CODE:_____

Introduction

Soil is very important for terrestrial ecosystems because it includes biotic elements and is a source of abiotic components for these elements.

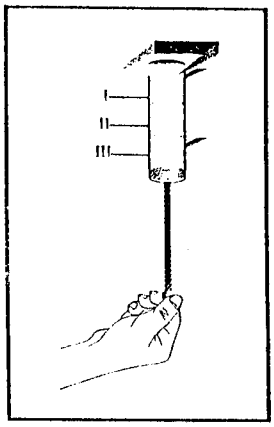
Soil is not only an environmental factor for the organisms being a suitable place for sheltering, finding food and dispersal but also the living organisms and their waste products are added to the formation of the soil by mixing with it. A cross section from the surface to the depth is referred to as the soil profile. If a profile of this kind is observed with the naked eye, one might see different layers called horizons. The structure and content of a soil horizon determines the dispersal of its plants and animals, depending on their ecological requirements.

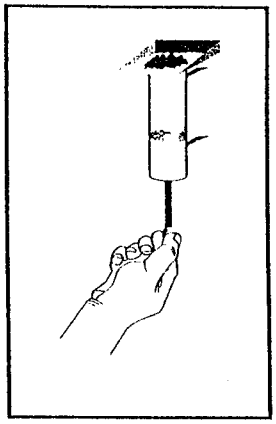
An experimental soil profile is given to you consisting of three horizons. The aim of the experiment is to distinguish these three horizons, to determine their faunistic structure and to determine the structure of the soil community under the light of knowledge that is given to you in the material and methods section.

Material and Methods:

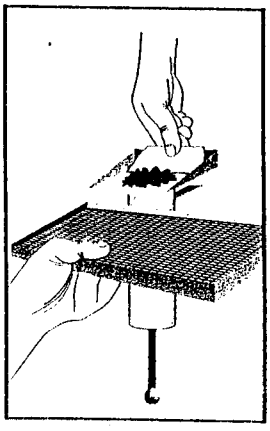
1. Examine the soil profile in the experimental design that is given to you and distinguish the different soil horizons.

Move the piston by using the screw under the mechanism until it rises to the place where two different horizons intersect.

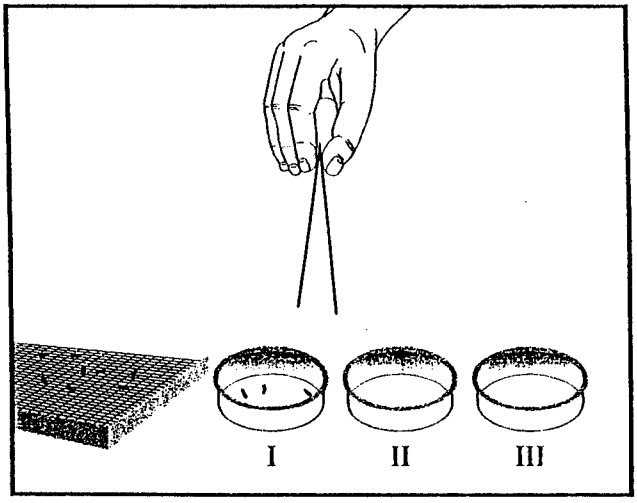




Sweep the soil and sift through it with the spatula



Put the organisms of this horizon into a petri dish



Repeat this process for each horizon

2. **Determine the organisms of each horizon systematically according to the categories given in Table 1. (See page 63)**

   You may use the instruments provided like spatula, forceps, petri dish etc. You can use the water in the petri dish, if you have trouble distinguishing objects in the dusty sample, with your naked eye.

3. **Fill in Table 1 by counting the organisms for each horizon. (5.5 points)**

   To do this, identify all the organisms according to the categories given in Table 1 and count them all for each horizon. Write the data for each category in Table 1.

4. **Calculate the abundancy and diversity of the organisms for each category in each horizon. Marks: (Abundancy: 11 points; Diversity: 9 points)**

In order to make the calculations you may use the following formulas. Write the results in the related boxes in Table 1 for every specimen, in every horizon. The abundancy shows the proportional distribution of a given species in a community and can be calculated using the formula presented below. According to the given formula write the data to the referred boxes in the Table 1 and make the calculations for each horizon and each specimen.

$$\text{Abundancy} = \frac{n}{N} x100$$

N = Total number of individuals in all categories

n = Number of individuals in a category

Diversity is the richness of a community and can be calculated by the given formula. Write the results of the total diversity data for each horizon in the appropiate box.

$$Diversity = \frac{(S-1)}{\ln N}$$

N = Total number of individuals in all categories.

S= Total number of categories.

Table 1

	Horizon I			Horizon II			Horizon III		
Category	Number	% Abundancy	Diversity	Number	% Abundancy	Diversity	Number	% Abundancy	Diversity
(A) Myriapoda (Centipedes+ Millipedes)			xxxx			xxxx			xxxx
(B) Isopoda (Wood Lice)			xxxx			xxxx			xxxx
(C) Orthoptera (Grasshoppers Crickets)			xxxx			xxxx			xxxx
(D) Coleoptera (Beetles)			xxxx			xxxx			xxxx
(E) Hemiptera (True Bugs + Sapsuckers)			xxxx			xxxx			xxxx
(F) Hymenoptera (Ants + Bees + Wasps)			xxxx			xxxx			xxxx
(G) Homoptera (Cicadas + Aphids)			xxxx			xxxx			xxxx
TOTAL		**100**			**100**			**100**	

5. Calculate the similarity among the different horizons depending on their faunistic contents. (6 points)

Similarity refers to the degree of similarity among different communities and in order to find this, communities are compared two

by two with each other at a time. The similarity of any community to itself is 1.00 (i.e. 100%).

Please notice some important points while calculating.

Use the similarity formula given below in your calculations.

While performing your task, consider the **morphological differences** between organisms that you have found in each horizon (you can notice these differences by eye or by the magnifier). Although they are in the same category, assume that these are **different species called MS** due to their morphological differences. Make your calculations according to this assumption.

Write the results in the similarity table (Table 2) and make the proportional search.

$$\text{Similarity} = \frac{2A}{2A + B + C}$$

A= The number of common species (MS) between the communities

B= The number of species (MS) that is found only in the first community

C= The number of species (MS) that are only found in the second community.

Table 2

	Horizon I	Horizon II	Horizon III
Horizon I	**1.00**		
Horizon II		**1.00**	
Horizon III			**1.00**

6. Answer the following questions according to your results. (12.5 points)

6. 1. Which category shows the highest abundance in each of the three horizons (According to Table 1)? (Mark with the category label A-G on Table 1) (4.5 points)

Horizon I: _____

Horizon II: _____

Horizon III: _____

6. 2. Which horizon shows the highest diversity? (2 points)

Horizon _____

6. 3. Which horizon shows the lowest diversity? (2 points)

Horizon _____

6. 4. Which horizons show the highest similarity? (2 points)

Horizon _____ and horizon _____

6. 5. Which horizons show the lowest similarity? (2 points)

Horizon_____ and horizon _____

LOGARITHMIC TABLE

X	ln X	X	ln X	X	ln X	X	ln X
0	.....	3	1,09861	6	1,79176	9	2,19722
0,1	-2,30256	3,1	1,1314	6,1	1,80829	9,1	2,20827
0,2	-1,60944	3,2	1,16315	6,2	1,82455	9,2	2,2192
0,3	-1,20397	3,3	1,19392	6,3	1,84055	9,3	2,23001
0,4	-0,91629	3,4	1,22378	6,4	1,8563	9,4	2,24071
0,5	-0,69315	3,5	1,25276	6,5	1,8718	9,5	2,25129
0,6	-0,51083	3,6	1,28093	6,6	1,88707	9,6	2,26176
0,7	-0,35667	3,7	1,308303	6,7	1,90211	9,7	2,27213
0,8	-0,22314	3,8	1,335	6,8	1,91692	9,8	2,28238
0,9	-0,10536	3,9	1,36098	6,9	1,93152	9,9	2,29253
1	0	4	1,38629	7	1,94591	10	2,30259
1,1	0,09531	4,1	1,41099	7,1	1,96009	10,1	2,31254
1,2	0,18232	4,2	1,43508	7,2	1,97408	10,2	2,32239
1,3	0,26236	4,3	1,45862	7,3	1,98787	10,3	2,33214
1,4	0,33647	4,4	1,4816	7,4	2,00148	10,4	2,34181
1,5	0,40547	4,5	1,50408	7,5	2,0149	10,5	2,35138
1,6	0,47	4,6	1,52606	7,6	2,02815	10,6	2,36085
1,7	0,53063	4,7	1,54786	7,7	2,04122	10,7	2,37024
1,8	0,58779	4,8	1,56862	7,8	2,05412	10,8	2,37955
1,9	0,64185	4,9	1,58924	7,9	2,06686	10,9	2,38876
2	0,69315	5	1,60944	8	2,07944	11	2,3979
2,1	0,74194	5,1	1,62924	8,1	2,09186	11,1	2,40695
2,2	0,78846	5,2	1,64866	8,2	2,10413	11,2	2,41591
2,3	0,83291	5,3	1,66771	8,3	2,11626	11,3	2,4248
2,4	0,87547	5,4	1,6864	8,4	2,12823	11,4	2,43361
2,5	0,91629	5,5	1,70475	8,5	2,14007	11,5	2,44235
2,9	1,06471	5,9	1,77495	8,9	2,18605	11,9	2,47654
						12	2,48491