4. 3. Theoretical Test

General remarks:

This test consists of two parts, **A and B**. In part A there are 103 multiple choice questions, each having only **one** correct answer. In part B there are 46 questions, each of which may have **more** than one answer.

In order to eliminate the consequence of guessing in the marking of Type A questions, one point will be deducted for every 5 incorrect answers. Failing to answer a question will not result in any penalty.

In the marking of Type B questions a percentage of the total mark for that question will be deducted for each incorrect answer. The minimum mark for each question with deductions will be zero.

For the multiple choice questions (type A) mark the correct answer with a cross "X" in the blank space provided. If you want to change your answer with a new one in order to cancel it, you may draw a parallel line on your old mark.

correct	delete
X	~~X~~

4.3.1. Theoretical Test - Part A

CELL BIOLOGY

1. In which way are the proteins transported from the site of synthesis to the cell membrane for secretion?

___A) By cytoplasmic movement

___B) By some signal proteins in the cytosol

___C) By protein-carbohydrate complex carrying signals in the cytosol

___D) By cytoskeleton elements

___E) By vesicles

2. What is the major difference between a vacuole and a vesicle?

___A) The membrane is thick in the vacuole but thin in the vesicle

___B) The vesicle is pinched off only from the cell membrane; the vacuole is pinched off from the Golgi apparatus

___C) The vacuole membrane is carbohydrate rich; the vesicle membrane is protein rich

___D) The vacuole is near the nucleus; the vesicle is near the Golgi apparatus

___E) The vacuole has a comparatively slow movement; the vesicle moves rapidly

3. Which of the following is <u>not</u> a function of the Golgi apparatus?

___A) Addition of sugars to proteins

___B) Storage of lipids

___C) Package of secretion products

___D) Formation of glycolipids

___E) Synthesis of polysaccharides from simple sugars

4. Which of the following functions are carried out in the smooth endoplasmic reticulum?

I) Addition of carbohydrates to proteins

II) Synthesis of membrane phospholipids

III) Addition of carbohydrates to lipids

IV) Synthesis of cholesterol

V) Detoxification of drugs

___A) I, II, IV

___B) II, III, IV

___C) II, IV, V

___D) I, IV, V

___E) I, II, V

5. Deleted

6. Fibroblasts are cells which synthesize proteins of the extracellular matrix of the connective tissue (collagen fibers), glycoproteins (fibronectin) and proteoglycans (dermatan sulphate). According to these features which organelle/organelles has/have the greater function in these cells?

___A) Rough endoplasmic reticulum and smooth endoplasmic reticulum

___B) Golgi apparatus

___C) Rough endoplasmic reticulum and free ribosomes

___D) Golgi and rough endoplasmic reticulum

___E) Rough endoplasmic reticulum

7. Four structures (I-IV) and some related functional and structural features (1-7) are given below.

I. Cilia

II. Basal bodies

III. Centrosome

IV. Flagellum

1- There is a 9+2 arrangement in a ring around a pair of single microtubules

2- Most of these structures are longer than the cell

3- It is shorter than the cell

4- There are nine groups of three microtubules, fused into triplets with an empty core

5- These are the main structures for movement

6- They function in the synthesis of spindle fibers

7- They bind cilia and flagella to the cell membrane

Which of the combinations below for structure and function are correct?

___A)	I: 1, 3, 5	II: 3, 4, 5	III: 3, 4, 6	IV: 1, 2, 3
___B)	I:1, 4, 5	II: 1, 2, 7	III: 2, 3, 4	IV: 1, 3, 5
___C)	I:1, 4, 7	II: 3, 4, 5	III: 2, 3, 6	IV: 2, 3, 4
___D)	I:3, 4, 6	II: 2, 4, 7	III: 3, 4, 5	IV: 4, 5, 6
___E)	I:2, 4, 6	II: 2, 4, 7	III: 3, 4, 5	IV: 2, 4, 5

8. Which of the following contains a polar head and a non-polar tail in cell?

___A) Triglycerides ___B) Neutral lipids ___C) Wax

___D) Phospholipids ___E) All the above

9. Which of the following are the fibers that attach to the the cytoplasmic face of spot desmosomes?

___A) Collagen fibers

___B) Cytoskeleton fibers

___C) Elastic fibers

___D) Tubulin protein fibers

___E) Reticular fibers

10. Which of the following is the correct description of a microsome?

___A) It consists of vesicles detached from the Golgi apparatus

___B) It consists of vesicles containing waste products digested by the lysosomes

___C) It consists of various amounts of ribosomes and fragmented endoplasmic reticulum

___D) It is a vacuole that contains secretions

___E) It is a ribosome dimer

11. In aerobic respiration glucose is converted to pyruvate in the

___A) Inner mitochondrial membrane ___B) Cytoplasm

___C) Outer mitochondrial membrane ___D) Mitochondrial matrix

___E) Mitochondrial membrane interspace (intermembrane space)

12. Which of the following is the correct description for a porin?

___A) It is a protein in the structure of microtubules

___B) It is a protein located on the outer mitochondrial membrane

___C) It is a protein of the nuclear pores

___D) It is a lipid that functions in the addition of carbohydrates to proteins

___E) It is a protein that forms the cytoskeleton

13. How are the peroxisomes formed in a cell?

___A) Only by fission

___B) Only by detachment from a big peroxisome

___C) Both by fission and self-replication of a preexisting peroxisome

___D) Only by budding from plasma membrane

___E) Only by self-replication

14. In living cells there are

1. Ribosomes	**5. Introns**
2. ATP synthesis	**6. DNA polymerase**
3. Cell membrane	**7. Photosynthesis**
4. Nuclear envelope	**8. Mitochondria**

Which of them can exist <u>both</u> in prokaryotic <u>and</u> eukaryotic cells?

___A) 1, 2, 3, 6, 7 ___B) 1, 2, 3, 5, 7, 8 ___C) 1, 2, 3, 4, 7

___D) 1, 3, 5, 6 ___E) 2, 3, 7, 8

15. Specific inhibitor "X" of F_0F_1ATPase is added to a rat liver cell carrying out the oxidation of glucose under aerobic conditions. Which of the following would <u>not</u> occur as a result of this inhibition?

___A) Mitochondrial ATP formation will stop

___B) The citric acid cycle will slow down because of insufficient NAD^+ regeneration

___C) The rate of glucose consumption will decrease

___D) Glycolysis will be accelerated

___E) Oxygen consumption will be halted

16. Agarose gel electrophoresis was applied to the DNA samples given below. What will be the order of migration from the well, at the completion of the electrophoresis?

I- F^+ bacterial plasmid

II- F ' bacterial plasmid

III- Hfr *E. coli* chromosomal DNA

IV- *E. coli* chromosomal DNA

___A) I, II, III, IV ___B) II, III, I, IV ___C) IV, III, II, I

___D) III, IV, II, I ___E) IV, I, III, II

17. If you observe two DNA samples X and Y (each containing 1200 base pairs) migrating at different rates in an agarose gel, what would your interpretation be ?

___A) The amount of adenines in sample X is greater

___B) The amount of guanines in sample Y is greater

___C) The percentage of agarose in the gel is greater than 0.8 %

___D) There are intercalating agents in the agarose gel

___E) Samples X and Y have different conformations

18. The enzyme phosphofructokinase;

I- It is the major regulatory enzyme in glycolysis

II- ATP is the substrate for the enzyme

III- ATP is the negative modulator of the enzyme

IV- Citrate activates the enzyme

Which of the following is the correct answer for the above statements concerning the enzyme phosphofructokinase?

___A) Only IV is correct ___B) Only I and III are correct

___C) Only I, II and III are correct ___D) Only II and IV are correct

___E) I, II, III and IV are correct

19. If oligomycin and 2,4-dinitrophenol are both added;to a suspension of mitochondria containing substrates, P_i (inorganic phosphate), Mg^{++} and ADP;

___A) Both O_2 consumption and ADP phosphorylation will cease

___B) The rate of O_2 consumption will increase but ADP phosphorylation will cease

___C) Phosphorylation/O_2 consumption ratio will remain the same

___D) Phosphorylation/O_2 consumption ratio will increase

___E) O_2 consumption will decrease but ADP phosphorylation will continue

20. In anaerobic glycolysis 2 moles of inorganic phosphate (P_i) are used for one mole of glucose consumed. Which of the following enzymes catalyzes the reaction in which P_i is directly consumed?

___A) Hexokinase

___B) Phosphofructokinase

___C) Pyruvate kinase

___D) Glyceraldehyde-3-phosphate dehydrogenase

___E) Enolase

21. Which of the following cannot use ketone bodies for the generation of energy?

___A) The brain (in fasting)

___B) The heart muscle

___C) Erythrocytes

___D) The kidney cortex

___E) The skeletal muscle

22. Inside the choloplast the potential uses for the G3P (glyceraldehyde 3-phosphate) produced in the Calvin cycle include the synthesis of:

___A) Fatty acids

___B) Glycerol

___C) Glucose

___D) Amino acids

___E) All of the above

23. The following statements are about the effect of a competitive inhibitor in a reaction catalyzed by an enzyme.

I- V_{max} is unchanged

II- The inhibition can be reversed by increasing the concentration of the substrate

III- K_m increases

IV- The inhibitor binds to the enzyme at a different site than the active site

Which combination of statement(s) is/are true?

___A) I, II and III ___B) Only I and III ___C) Only II and IV

___D) Only IV ___E) I, II, III and IV

24. Which of the following bonds is <u>not</u> present in the structure of DNA?

___A) 3'-5' phosphodiester bond

___B) N-glycosidic bond

___C) H-bonds

___D) Hydrophobic interactions

___E) Disulphide bonds

25. Consider these two relationships and the four statements about the aminoacids/proteins and fatty acids/triglycerides

Left	**Right**	**Left**	**Right**
Amino acids:	**Proteins**	**Fatty acids:**	**Triglycerides**

I. Both molecules on the right consist only of repeated units of the molecules on the left

II. In the process of synthesis of both molecules on the right, at least some electrical charges are neutralized

III. In both relationships, the diversity in the molecules on the left result in the diversity in the molecules on the right

IV. In the synthesis of both molecules on the right, water is released

Which of the statement(s) is/are correct?

___A) I, II, III, and IV ___B) II, III and IV ___C) III and IV

___D) Only III ___E) Only IV

26. Five different cell cultures were treated with different radioactively labelled compounds as follows:

Compound	**Cell Culture**
Lactose	**Cell culture a**
Valine	**Cell culture b**
Thymidine triphosphate	**Cell culture c**
Glutamic acid	**Cell culture d**
Alanine	**Cell culture e**

After an hour the cells were washed, fixed and autoradiographed. In order to study nuclear activities *in vivo* which of the cell cultures is the best?

___A) Cell culture a ___B) Cell culture b ___C) Cell culture c
___D) Cell culture d ___E) Cell culture e

27. Which of the molecules is responsible for the autocatalytic excision of introns and splicing of exons in eukaryotic cells?

___A) RNA polymerase

___B) Ribonuclease

___C) Ribozyme

___D) Reverse transcriptase

___E) Endonuclease

28. The interaction between the anticodon of a tRNA molecule and the complementary codon of mRNA is achieved by:

___A) The catalysis by peptidyl transferase

___B) ATP energy

___C) The catalysis by amino-acyl-tRNA synthetase

___D) The covalent bonds formed with energy from GTP

___E) H-bonds

29. The lac (lactose) operon is an example of:

___A) Translational control

___B) Posttranslational control

___C) Replication control

___D) Transcriptional control

___E) All of the above

30. The breakdown of glucose in the cell is controlled by the activation or inactivation of enzymes present in the specific stages of glycolysis and the citric acid cycle. There are three key enzymes like this. The conditions that activate or inactivate these enzymes are given in the table below. Which combination is correct for the activation of all the three enzymes?

	ENZYMES		
	Phosphofructokinase	Citrate synthase	Isocitrate dehydrogenase
___A)	High level of ADP+ AMP	Low level of ATP+NADH	Low level of ATP+NADH
___B)	High level of ATP	High level of ATP+NADH	Low level of ATP+NADH
___C)	Low level of ATP	High level of ATP+NADH	Low level of ATP+NADH
___D)	High level of ADP andAMP	High level of ATP+NADH	High level of either ADP or NAD^+
___E)	High level of ATP	Low level of either ATP or NADH	High level of either ATP or NAD^+

31. Which of the following statements is <u>false</u> about prokaryotic RNA polymerase?

___A) The synthesis is in the 5'-3' direction

___B) There is only one RNA polymerase enzyme responsible for the synthesis of rRNA, m-RNA and t-RNA

___C) Its RNA product will hybridize with the DNA template

___D) The transcription starts from the AUG codon in the DNA

___E) The enzyme synthesizes a single transcript that codes for several polypeptide chains

32. Which of the following statement about the regulator gene in bacterial operon model is true?

___A) It codes for repressor protein

___B) It codes for inducer molecules

___C) It is the binding site of RNA polymerase

___D) It is the binding site of inducer molecules

___E) Provides the transcription or inhibition of transcription of the structural genes

33. Which of the following statements is <u>false</u> regarding to the procaryotic mRNA?

___A) It is polycistronic

___B) It does not involve introns

___C) It binds to ribosome from the 5'end.

___D) It is synthesized in the nucleus

___E) It can form a single transcript that codes for several polypeptides.

34. Which of the following statements is a <u>false</u> description for a codon?

___A) It consists of three nucleotides

___B) It is the basic unit of the genetic code

___C) There may be more than one codon for the same amino acid

___D) It is located on the t-RNA

___E) It can never code more than one amino acid

GENETICS AND EVOLUTION

35. A cross was made between two albinos and phenotypically identical F_1 generation was obtained. When F_1 was self-crossed, F_2 was observed as 9 normal and 7 albinos. Which of the following combinations suits this kind of inheritance?

	Parents	Offsprings (F_2)			
___A)	AAbb X aaBB	9A-B-	3aaB-	3A-bb	1aabb
___B)	aabb X AAbb	9A-B-	3aaBb	3Aabb	1aabb
___C)	AaBb X AaBb	9A-B-	3aaBb	3Aabb	1aabb
___D)	aaBb X Aabb	9A-B-	3aaB-	3A-bb	1aabb
___E)	AABB X aabb	9A-B-	3aaB-	3Aabb	1aabb

36. In an experimental population, the frequency of the O blood type is 25%, A is 24%, B is 39% and AB is 12%. Which of the following is the frequency of the alleles which are responsible for the blood types A, B and O?

	A	B	O
___A)	0.3	0.2	0.5
___B)	0.2	0.5	0.3
___C)	0.2	0.3	0.5
___D)	0.5	0.2	0.3
___E)	0.3	0.5	0.2

37. Deleted

38. Incomplete penetrance, sex-limited traits, sex-influenced traits, age-influenced traits and temperature-influenced traits are all examples of

___A) Linkage ___B) Conditional gene expression

___C) Epistasis ___D) Multiple alleles ___E) Partial dominance

39. Deleted

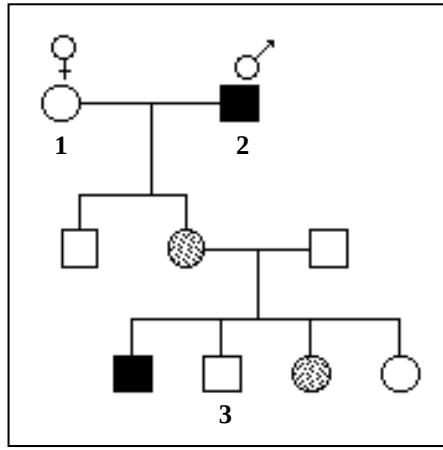
40. The fruit weights of a squash plant vary between 2 and 4 kg. The fruit weights are a product of pairs of additive polygenic genes. Which of the following is true for the F2 generation that resulted from a 2 kg squash being pollinated with a 4 kg one in terms of the number of individuals of any weight classes and also regarding the genotypes of the pollinated 2 kg and 4 kg squashes.

	4 kg	3.5 kg	3 kg	2.5 kg	2 kg	2 kg parent	4 kg parent
__A)	1	2	6	2	1	aabb	AABB
__B)	1	4	6	4	1	AaBb	aaBB
__C)	1	4	6	4	1	AAbb	aaBB
__D)	1	6	2	6	1	AABb	AABB
__E)	1	4	6	4	1	aabb	AABB

41. Which of the following is <u>not</u> a reason why recessive alleles are not observed in the phenotypes of heterozygotes?

___A) The recessive allele codes for a nonfunctioning protein
___B) The recessive allele is linked to the dominant allele
___C) The dominant allele produces so much product as to "swamp" the product of the recessive allele
___D) The recessive allele is normal, but the product of the dominant allele inhibits the function of the recessive allele
___E) The allele's product (e.g.an enzyme) is much less functional and therefore masked by the dominant allele's product

42.



Healthy : Empty Sick : Dark colored Carrier : Spotted

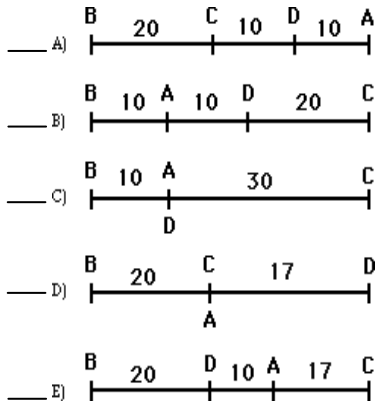
On the pedigree (family tree) given above which of the following would be the genotype of the individuals written as 1, 2 and 3?

	1	**2**	**3**
___A)	AA XX	a XY	A XY
___B)	Aa	Aa	aa
___C)	aa XX	A XY	A XY
___D)	aa	Aa	aa
___E)	Aa	AA	aa

43. An individual of the genotype AaBbCcDd was crossed with the one aabbccdd and the following results were obtained.

aBCD	42
Abcd	43
ABCd	140
abcD	145
aBcD	6
AbCd	9
ABcd	305
abCD	310

Which of the following shows the arrangement of the genes and their distance (in centimorgans)?



44. Genetic variations are important for populations

___A) So that males and females of parthenogenetic species might be distinguished

___B) So that evolution is directed

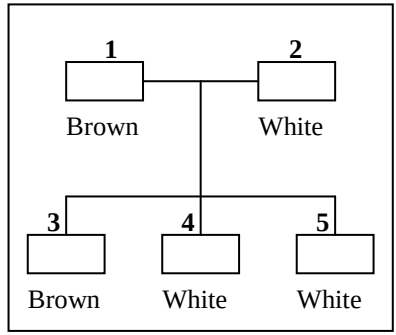
___C) Because they provide the raw material on which selection acts

___D) So that organisms might be classified

___E) To make them more interesting to study

45. When a dominant allele (A) is alone, it causes a brown fur color but when it is with another allel which has an epistatic effect, the fur color is white.

According to this, which of the following shows the true genotypes of the individuals in the family tree given above?



	1	2	3	4	5
___A)	Aabb	AaBb	Aabb	AaBb	aabb
___B)	AaBb	aabb	AaBb	aaBb	aabb
___C)	AaBb	aaBb	AaBb	Aabb	Aabb
___D)	AaBb	aabb	AaBb	aaBb	aabb
___E)	aaBb	AaBb	Aabb	aaBb	aabb

46. Deleted

47.

	Phenotypes of the individuals	
Genotypes	Female	Male
AA	∆	∆
Aa	∆	∆
aa	∆	Ø

An inheritance scheme of any character is given above. Which of the following is true for the inheritance type of this character?

___A) This character is sex linked

___B) This character is sex limited

___C) This character is sex influenced

___D) Incomplete penetrance is seen in the inheritance of this character

___E) Codominance is seen in the inheritance of this character

48. In cattle, the polled (hornless) condition is dominant to the horned condition. Coat colour can be red, white or roan (red with white patches). Both genes are carried on autosomes and they are not linked. A cross was carried out between a cow and a bull, both of which had the roan coat colour and both were heterozygous for the polled condition. Which of the following statements are true about the offspring from the cross, assuming that the cross was carried out several times to produce a lot of offspring?

1. **The chance of producing white polled and white horned offspring is the same.**
2. **The chance of producing roan polled offspring is three times that of producing roan horned.**
3. **There is an equal chance of producing red polled and white polled offspring.**
4. **Statistically there should be more roan horned offspring than any other type.**
5. **The chance of producing roan polled offspring is twice that of producing white polled.**

___A) 1 & 2

___B) 2 & 3

___C) 3 & 4

___D) 1, 2 & 3

___E) 2, 3 & 5

49. In guinea-pigs, there are several alleles involved in determining the animal's coat color. C^b - black; C^c - creamy; C^s - silver and C^z - albino. Analyze the results of the following crosses and determine the most suitable order of alleles referring to dominance-recessiveness relationships of these alleles.

Crosses	Phenotype of parents	Phenotype of offspring			
		Black	Silver	Creamy	Albino
1	black x black	22	0	0	7
2	black x albino	10	9	0	0
3	creamy x creamy	0	0	30	11
4	silver x creamy	0	23	11	12

___A) $C^b > C^c > C^s > C^z$

___B) $C^b > C^s > C^c > C^z$

___C) $C^c > C^z > C^b > C^s$

___D) $C^b > C^z > C^s > C^c$

___E) $C^b > C^c > C^z > C^s$

50. Deleted

51. Which of the following is <u>not</u> a proof that eukaryotic cells evolved by endosymbiosis?

___A) Similarity between spirochetes and flagellum

___B) Similarity between mitochondrial DNA and procaryotic DNA

___C) Similarity between bacterial and chloroplastic ribosomes

___D) Similarity between chloroplast and cyanobacteria

___E) Similarity of the inhibition of the protein synthesis between the eucaryotic cells and the mitochondria

52. Which of the following has the best evolutionary adaptation capacity?

___A) Primitive, heterogenous heredity material, high number of generation, short life span

___B) Highly specific, homogenous heredity material , high number of generation, long life span

___C) Highly specific feeding regime, living underground, asexual reproduction

___D) Living on high mountains, nocturnal, feeding on the most common plants

___E) Highly tolerant to hereditary changes, low offspring success, specific feeding regime

53. Which of the following is <u>not</u> a biological characteristic of desert organisms?

___A) No regular reproductive cycle

___B) Seeds germinate immediately after flowering and fruiting

___C) Fewer stoma (in plant)

___D) Specialized kidney capable of reabsorbing water (in animal)

___E) More succulent plants

54. Deleted

55. Biologists assume that the first heredity material to appear was RNA. Which of the following may be the main reason for that?

___A) RNA was produced in Miller's experiment

___B) RNA is structurally more primitive than DNA

___C) The RNA called ribozyme catalyses some chemical reactions

___D) DNA can not stay stable in hydrophobic medium

___E) RNA appears in all animals

56. Which of the following is <u>not</u> evidence that higher plants are derived from green algae?

___A) Some green algae have multicellular sporophyte and gametophyte phases

___B) Both plants and algae have cellulose in their cell walls

___C) Both plants and algae have similar photosynthetic and accessory pigments

___D) Both plants and algae synthesize starch as a main store product

___E) Green algae and higher plants have the same amount of DNA per cell

57. The statements below are about various pollination strategies in plants. Which one could be the most disadvantageous for evolutionof new species?

___A) The stigma can recognize the origin of pollen grains, and does not accept those from the same flower

___B) The stigma never emerges from the corolla, and only accepts pollen grains from the same flower

___C) The corolla forms a long tube, only allowing some specialized pollinators which carry pollen grains from the same species to enter

___D) The stamens and pistil mature at different times

___E) The stamens and pistil are located in different flowers

58. Which of the following triplets is <u>false</u> for the hearing organ?

	Structure	Animal	Function
___A)	Columella	Lizard	Transports the sound from the membrane to the cochlea
___B)	Weber bones	Fish	Transports the sound created by the vibration of the swim bladder to the brain
___C)	Tarsal bones	Salamander	Transports the vibrations from the soil to the inner ear
___D)	Some cranial	Whale	Transports the sound from water to the (otic) bones inner ear
___E)	Utricle (saccule)	Mole	Transports the vibrations from the soil to the inner ear

59. Deleted

PLANT ANATOMY AND PHYSIOLOGY

60. Which of the following can <u>not</u> be stated relating to cyclic photophosphorylation?

Note: $NADP_{red}$ = NADPH; $NADP_{ox}$ = $NADP^+$

___A) It is favored when the cell is more in need of ATP than $NADP_{red}$

___B) It is favored when $NADP_{ox}$ is in short supply

___C) An energized electron is first accepted by ferredoxin

___D) Plastocyanin is the last acceptor of an energized electron before it reaches the center

___E) In the system, cytochrome "f" connects ferredoxin to plastoquinone

61. Deleted

62.

I. It is required for activity of some dehydrogenases, decarboxylases, kinases, oxidases and peroxidases

II. Under its deficiency, plant tissues become soft and often flaccid even under low temperature and stress conditions

III. It is required for the photosynthetic reactions involved in the 0_2 cycle

Which of the following gives the best match of minerals to thestatements above?

	I	II	III
___A)	N	Ca	Mg
___B)	S	Mn	Mg
___C)	Mn	N	P
___D)	Mn	Ca	Cl
___E)	Cl	K	P

63. When the temperature is high and the amount of dissolved oxygen is higher than that of CO_2 in the chloroplasts, in which of the following plants does growth <u>not</u> slow down?

___A) Wheat

___B) Watermelon

___C) Sunflower

___D) Sugar cane

___E) Rice

64. Deleted

65. Deleted

66. Deleted

67. Deleted

68. Which of the following <u>cannot</u> be referred to as blue-light responses in higher plants and fungi?

___A) Phototropism in *Phycomyces*

___B) Carotenoid biosynthesis in *Neurospora*

___C) Stomatal opening in higher plants

___D) Chloroplast rearrangements

___E) Flavenoid synthesis

69. "Shooty"tumors are produced in the stem of an "X" plant infected by bacteria in which mutations occur in their T-DNA, while "rooty" tumors are formed in the stem of a "Y" plant. Which of the following is true for the effects mentioned above.

___A) In the "X" plant, the genes which are responsible for giberellin (giberellic acid(synthesis are inactivated while in the "Y" plant, genes which are responsible for abscisic acid synthesis are inactivated.

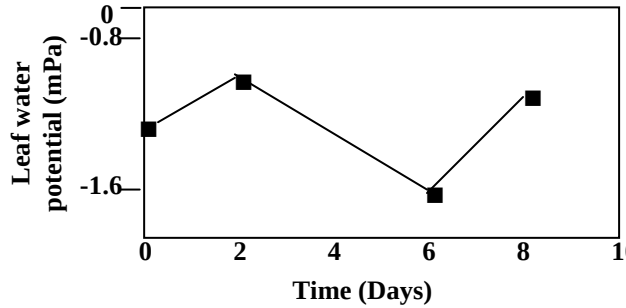
___B) In the "X" plant, the genes which are responsible for Indol acetic-acid synthesis are inactivated while in the "Y" plant, genes which are responsible for zeatin synthesis are inactivated.

___C) In the "X" plant, the genes which are responsible for zeatin synthesis are inactivated while in the "Y" plant, genes which are responsible for ethylene synthesis are inactivated.

___D) In the "X" plant, the genes which are responsible for abscisic acid synthesis are inactivated while in the "Y" plant, genes which are responsible ethylene synthesis are inactivated.

___E) In the "X" plant, the genes which are responsible for cytokinins synthesis are inactivated while in the "Y" plant, genes which are responsible for ethylene synthesis are inactivated.

70. In the figure, changes in water potential in the leaves of a plant over a period of time are shown. Which of the following is true according to this situation?



___A) The ABA (Abscissic acid) content decreased, and stomata resistance increased between the 2nd and 6th days; the process was reversed between the 6th and 8th days

___B) The ABA content did not change and stomata resistance decreased between the 2nd and 6th days; the process was reversed between the 6th and 8th days

___C) The ABA content increased and stomata resistance decreased between the 2nd and 6th days; the process was reversed between the 6th and 8th days

___D) The ABA content and stomata resistance increased between the 2nd and 6th days; the process was reversed between the 6th and 8th days.

___E) The ABA content decreased and stomata conductance increased between the 2nd and 6th days; the process was reversed between the 6th and 8th days.

71. Which of the following are limiting or near-limiting nutrients both in aquatic and terrestrial systems?

___A) Nitrogen-potassium ___B) Potassium-magnesium

___C) Phosphorus-nitrogen ___D) Calcium-magnesium

___E) Iodine-magnesium

72. Which of the following is <u>not</u> true for the auxin transport in plants?

___A) IAA transport usually does not take place in sieve tubes and xylem

___B) IAA transport usually occurs in parenchymatic cells adjacent to vascular bundles

___C) Auxin moves rather slowly within the plant

___D) IAA moves mainly from the apex to the base (basipetal direction)

___E) Auxin transport does not require energy

73. Light is perceived by all living organisms in one way or the other. The pigment which is chosen for this process of photoperception are carotenoids. Which of the following properties make carotenoids the right pigment for this function.

___A) Their ability to absorb most of the visible and ultraviolet light

___B) Their high capacity to store and transfer light energy as chemical energy

___C) As saturated organic compounds, their capability to preserve themselves against environmental factors such as high energy currents

___D) Their high affinity for proteins which have a role in perception

___E) The efficiency of long structures of alternating double bonds in their structure to initiate light sensitive stereoisomerism

74. The changes that take place in climacteric fruits when they ripen (colour, texture and chemical composition) are mainly due to:

___A) The CO_2 content in the atmosphere

___B) The temperature variation

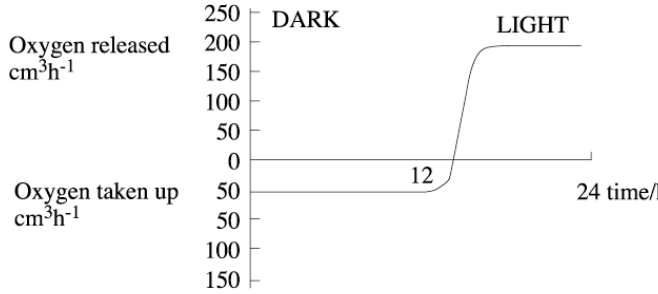
___C) The ethylene synthesis in the fruit

___D) The auxin concentration in the fruit

___E) Giberellin concentration in fruit

75. Deleted

76. The data were obtained relating to the rates of oxygen release and uptake in plants. The plants were placed in the dark for 12 hours followed by 12 hours in light. The temperature was constant throughout the experiment. The results are shown in the graph.



Which of the following is the most accurate estimate of the total volume of oxygen used by the plants for respiration during 24 hours of the experimental time?

___A) 50 cm^3 ___B) 600 cm^3 ___C) 1000 cm^3

___D) 1200 cm^3 ___E) 1800 cm^3

77. In which aspect does C_4 photosynthesis differ from Crassulacean acid metabolism (CAM)?

___A) PEP carboxylase is only used in C_4 photosynthesis

___B) CO_2 fixation in CAM plants occurs at night while it occurs in C_4 plants during the day time

___C) Organic acids with four carbons are only produced in C_4 photosynthesis

___D) Only plants with crassulacean acid metabolism can carry out photosynthesis in arid environments

___E) Only plants with C_4 photosynthesis can economize water

78. Which of the following <u>cannot</u> be stated with relation to the shoot apex?

___A) There is only one apical cell in vascular non-flowering plants

___B) There is more than one apical cell in each cell layer in gymnosperms

___C) There are different apical cells in more than one tissue layer in angiosperms

___D) An apical cell is pyramidal shaped in non-flowering plants

___E) A shoot apex with a distinct tunica and corpus is found in gymnosperms

79. Which of the following <u>cannot</u> be stated for the collenchyma?

___A) It is a living tissue found in developing organs

___B) It is formed in the roots only under the effect of light

___C) Its location in petiols is peripheral

___D) It is located at the periphery of woody stems

___E) It is located at the periphery of lamina

80. Which of the following <u>cannot</u> be referred to as a function of the sporoderm (exine)layer of pollens?

___A) The storage of enzyme proteins for the reactions

___B) Playing a role in the reaction between pollen and stigma

___C) Production of the pollen tube

___D) Protection of pollen against external factors

___E) Realizing pollination

81. Deleted

82. In a flower, flower symmetry is radial, calyx 4 and fused, corolla 4 and is separate, the androecium has 5 stamens and is connected to the corolla, the gynoecium is compound in 5 parts, superior and syncarpous. According to the description given above, which of the formulae in the following is correct?

___A) + $K_{(4)}$ $[C_4A_{(5)}]\underline{G_{(5)}}$ ___B) + $K_{(4)}$ $C_4A_{(5)}G_{(5)}$

___C) $^{*}K_4$ $C_4A_5\underline{G_5}$ ___D) $^{*}K_{(4)}$ $[C_4A_{(5)}]\underline{G_{(5)}}$

___E) $^{*}K_4$ $[C_4A_5]\underline{G_5}$

83. Which of the following is true for a C_4 plant in which some leaves can carry out C_3 photosynthesis while others can carry out C4 photosynthesis?

___A) In fact, it is a C_3 plant

___B) The leaves which carry out C_3 photosynthesis lack Kranz anatomy

___C) PEP (phosphoenolpyruvate) is not synthesized in the leaves which carry out C_4 photosynthesis

___D) It indicates that the C_4 pathway was evolved from the C_3 pathway

___E) Both C_3 and C_4 photosynthesis do not occur on the same leaf

84. Deleted

BIOSYSTEMATICS

85. Deleted

86.

I. A small dry single-seeded, indehiscent fruit

II. A fruit with a single ovary consisting of a single carpel

III. Dehiscent fruit is formed by two carpels with a septum between the carpels and its length is less than three times of its width

The above statements describe three different fruit types.

I II III

Which of the following combinations are correct for the fruit types?

	I	II	II
___A)	Siliqua	Legume	Achene
___B)	Legume	Siliqua	Achene
___C)	Siliqua	Achene	Legume
___D)	Achene	Siliqua	Legume
___E)	Achene	Legume	Siliqua

87. Deleted

88. Deleted

89. Which one of the following is <u>not</u> a characteristic of a deuterostomian animal ?

___A) Radial cleavage during the embriyonic development

___B) Regulative development during the embriyonic period

___C) Enterocoelom

___D) Pharyngeal slits on the pharynx

___E) Original (evolutionary origin) bilateral symmetry

90. The <u>main reason</u> for echinoderms living only in the sea is because;

___A) They were adapted to be sessile so they do not have a great distribution

___B) They appear first in the seas

___C) They live in different habitat types in the sea

___D) They have no excretory system

___E) There are safer places in the deep sea

91. Which one of the following structures of earthworms has similar functions to the liver of vertebrates?

___A) Typhlosolis

___B) Coelomocytes

___C) Chloragogen cells

___D) Cells that line the inner surface of the small intestine

___E) Calcium gland cells

92. The metanephridia of annelids and molluscs are functionally and structurally similar to the vertebrate kidneys. During the formation of urine, filtration, reabsorption and secretion processes occur. Where does filtration occur in the nephridium of mussels?

___A) On the nephrostom in the nephridium

___B) On the cardiac wall and pericardial glands

___C) On the tubules that are connected to the nephrostom

___D) On the wall of the intestine

___E) On the gill capillaries

93. Which one of the following is not a characteristic of molluscs (Mollusca)?

___A) Mantle

___B) Radula

___C) Trochophore larva

___D) Spiral cleavage

___E) Regulative development

94. Deleted

ANIMAL ANATOMY AND PHYSIOLOGY

95. Deleted

96. Which of the following is an important feature of primitive aquatic life forms?

___A) Partially oxygenated blood

___B) An open circulation with no small blood vessels or capillaries

___C) Significantly decreased blood pressure

___D) Highly acidic blood

___E) Carriage of most of the O_2 in the the plasma

97.

I- Partial O_2 pressure

II- pH

III- Amount of 2,3-diphosphoglycerate

IV- Partial CO_2 pressure

V- Body temperature

The factors affecting the dissociation of O_2 from hemoglobin in the human circulatory system are given above. In which of the following alternatives does this dissociation occur <u>most easily</u>?

___A) I increases	III decreases	IV increases
___B) II increases	V decreases	III increases
___C) I decreases	IV increases	III increases
___D) V increases	IV decreases	I increases
___E) II decreases	III decreases	V decreases

98. A nerve-skeletal muscle isolated preparation is placed in a Ca^{2+} - free medium appropiate for its survival. If the nerve is electrically stimulated, which of the following events will occur?

___A) The muscle will not be stimulated

___B) The muscle will be stimulated but will not contract

___C) The muscle will be both stimulated and contract

___D) The muscle will not be stimulated, but even if it is, it will not contract

___E) The muscle may be stimulated, and may contract but it will not relax

99. Which of the following is <u>false</u> about the differences between the vertebrate skeletal muscles and smooth muscles?

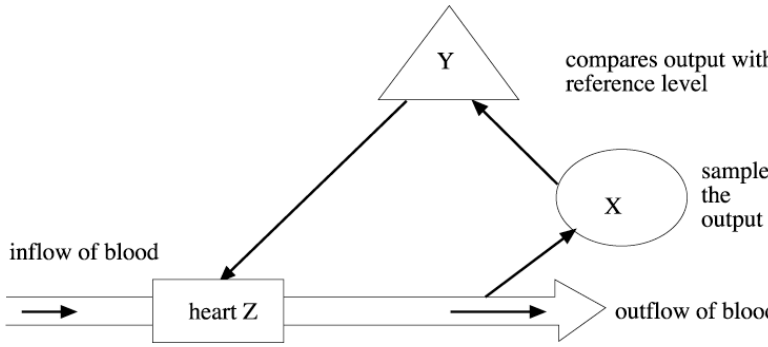
___A) Skeletal muscle is more sensitive to electrical stimulation while smooth muscle is more sensitive to chemical stimulation

___B) Skeletal muscle has a certain length in the resting state; smooth muscle has not

___C) Smooth muscle contracts more than skeletal muscle after stretching

___D) Skeletal muscle consumes 10% less of the energy than that of smooth muscle for the same degree of contraction

___E) Without a nerve connection, skeletal muscle cannot function normally but smooth muscle can



100. The figure shows a feedback system for the control of the output of blood from the heart (cardiac output). Which of the following gives the correct description of the parts played by the components X, Y and Z?

	X	Y	Z
___A)	Monitor	Receptor	Effector
___B)	Monitor	Effector	Receptor
___C)	Receptor	Monitor	Effector
___D)	Receptor	Effector	Monitor
___E)	Effector	Monitor	Receptor

101.

I- The magnitude of the impulse is dependent on the size of the stimulus

II- The number of fibres which are stimulated increases with the size of the stimulus

III- The speed at which the impulse travels increases with the size of the stimulus

IV- The speed at which the impulse travels depends on whether or not the nerve has a myelin sheath

V- The speed of the impulse conduction is directly proportional to the diameter of the axon

Which of the following is the correct combination of the statements given above about the nerve conduction?

___A) I, II and III ___B) II, III and IV ___C) II, IV, and V

___D) III, IV and V ___E) I, III and V

102. Deleted

103. The figure shows some parts of a mammalian eye numbered 1-5. If light suddenly strikes the eye, which of the following will be the nervous pathway for the evoked unconditional pupil reflex? (CNS= Central Nervous System)

___A) From 4 to the CNS and then to 3

___B) From 1 to 4 then to the CNS and then to 2

___C) From 3 to the CNS and back to 3

___D) From 5 to 1 then to 2

___E) From 4 to the CNS and then to 5

104. When an epinephrine (adrenalin)solution is dropped on the surface of a frog muscle(*M. gastrocnemius*) *in vitro*, the muscle displays a strong contraction. However,when the epinephrine solution is injected into the muscle cell, nothing happens. Which of the following is the reason for this?

___A) Epinephrine induced the antagonistic effect inside the cell

___B) Epinephrine induced the side-effect inside the cell

___C) Epinephrine was not processed by proteolytic enzyme

___D) Epinephrine did not find the receptor inside the cell

___E) Epinephrine was degraded inside the cell

105. Which of the following alternatives constitute the cell groups that function effectively in the human immune system?

___A) T lymphocyte – B lymphocyte – Macrophage

___B) T lymphocyte – Macrophage – Erythrocyte

___C) B lymphocyte – Kupffer cell – Lipocyte

___D) Dendritic cell – Neutrophilic leukocyte – Fibroblast

___E) Microglia – Histiocyte – Megakaryocyte

106. The left-hand diagram shows a frog sciatic nerve lying across a number of electrodes. The electrodes A and B are used for stimulating and C and D for recording. The right-hand diagram shows a typical recorded action potential. Based on this information, which of the following statements is correct?

___A) The duration of the recorded action potential (d) will be independent of the distance between electrodes C and D

___B) The magnitude of the recorded action potential (m) will be independent of the distance between electrodes C and D

___C) The first deflection on the recording occurs when electrode C is negative with respect to D

___D) The duration of the recorded action potential will depend on the distance between B and C

___E) The recorded action potential can be made monophasic by applying a local anesthetic at A

107. Deleted

108. Which one of the following is incorrectly matched?

___A) Bird – Discoidal cleavage – Erythrocyte with nucleus

___B) Frog – Mesonephrose kidney – Holoblastic inequal cleavage

___C) Reptile – Viviparous organisms – Telolecithal egg

___D) Fish – Deuterostomia – Radial cleavage

___E) Mussel – Protostomia – Mosaic development

109. Diagram shows the rates of filtration (F), reabsorption (R) and excretion (E) of a substance (X) in relation to its plasma concentration by the kidneys. Which one of the following statement is <u>incorrect</u>?

___A) The reabsorption of X is dependent on its plasma concentration

___B) The filtration rate of X is directly proportional to its plasma concentration

___C) When the plasma concentration of X reaches a certain value, its excretion rate suddenly increases

___D) The concentration of X in the urine is expected to be higher than its amount filtered in the glomerulus

___E) The filtration rate of X in the glomerulus is fixed

110. Which of the following hormonal conditions of a woman is suitable in her late pregnancy?

___A) Estrogen increases, progesterone increases

___B) Estrogen decreases, progesterone decreases

___C) Estrogen increases, progesterone decreases

___D) Estrogen decreases, progesterone increases

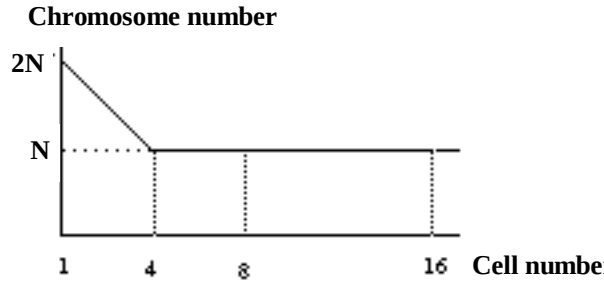
___E) Luteinizing Hormone increases, Human Chorionic Gonadotropin increases

111. Deleted

112. Deleted

113. Deleted

114.



Which of the following can be said according to the graph given above?

I Gamete formation in human

II- Gamete formation in phanerogamia

III- Gamete formation in queen honey bee and the development of the male bee

IV- Spore formation and development in ferns

___A) I and II ___B) III and IV ___C) II and IV

___D) I, II and IV ___E) I, II and III

115. Which one of the following is true about determination (developmental fate of cells)?

___A) Differentiation occurs before determination

___B) In animals, the cells that appear after the first two division are determined

___C) A determined cell will keep its features wherever it is transported in the embryo

___D) When a cell is determined its structure (shape) will begin to change

___E) A determined cell has the same transcription model as a differentiated one

BEHAVIOUR

116. In the picture, a flying dummy (silhouette) of a bird is illustrated. If the dummy is moved over hatched chicks of a pheasant (*Phasianus colchicus*) from left to right (upper arrow) or from right to left (ie. moving backward) (lower arrow), the chicks will react as follows (mark the correct answer with an "X"):

I. In both cases the chicks will react to the silhouette by crouching

II. In both cases the chicks will not react at all

III. During the movement of the silhouette from left to right (upper arrow) the chicks will not react

IV. During the movement of the silhouette from right to left (lower arrow) the chicks will not react

V. During the movement of the silhouette from right to left (lower arrow) the chicks will react by crouching

VI. During the movement of the silhouette from left to the right (upper arrow) the chicks react by crouching

___A) Only I ___B) Only II ___C) III and V

___D) IV and VI ___E) III and VI

117. "Animal aggression comes out in several cases and aggresion is also motivated by various conditions such as an external stimulus".

Which of the following is <u>not</u> an agressive behaviour?

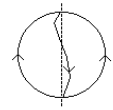
___A) The behaviour of the prey that is under the threat of being killed
___B) Behaviour that does not reflect the normal behaviour and specifications of a group
___C) The behaviour against intruder in order to protect their territory
___D) Behaviour towards other animals that try to steal their own food
___E) Behaviour of a predator against its prey

118.

The location of the food-supply Tail-wagging dance

When honeybees find a food-supply, they can show the exact place of the supply to other individuals of the colony by a " tail-wagging dance". An example of this behaviour is illustrated above

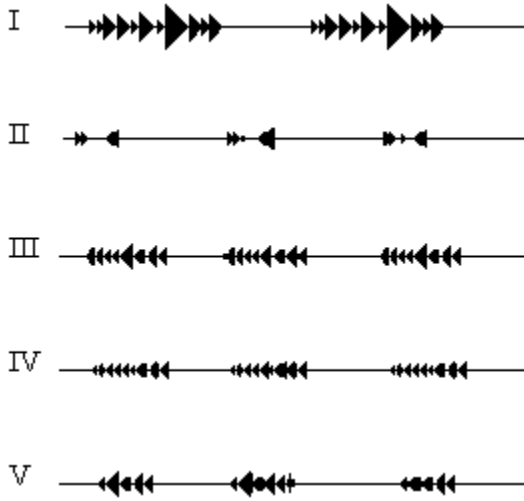
According to this example, for a honeybee that makes the illustrated tail-wagging dance below, which one of the following shows the location of the food-supply ?



__A) ___B) ___C)

___D) ___E)

119.



It is known that some grasshopper species may make a sound in order to court the opposite sex and these sounds are species specific. It is also observed that these sounds seem very different when a close relative species live in the same area.

The sonograms of the "mating songs" of the five different species of male grasshoppers from the genus *Chorthippus* is given above. Which of the species (I-V) are living together in the same area?

___A) I and II

___B) III and IV

___C) III and V

___D) IV and V

___E) III, IV and V

120. "When a goose notices an egg outside her nest, she rises, extends her neck, touches the egg with her beak, and then rolls it back in very gently. She completes the same recovery behavior whether the objects she sees is a beer bottle or golf ball, even when the object is removed after she has begun to reach for it."

Which of the following statements is correct according to the situation above?

___A) The reason why the goose rolls back the objects that do not structurally look like an egg is her lack of recognition

___B) This behaviour is caused by instinct

___C) In order to fill her nest to provide suitable incubation conditions

___D) This behavior is learnt from the parents.

___E) The goose recognises her own egg shape. For this reason, egg rolling is a fixed action pattern and continues without another stimulus

ECOLOGY

121. Deleted

122. Which one of the following environmental conditions affects the dispersal trend of a population positively?

___A) The conditions that cause high mortality sometimes create empty habitats

___B) Very frequent disturbances in the habitat conditions

___C) Absence of suitable habitats very close to each other

___D) A low level of natality causing the differences between the habitats

___E) A breakdown at any level of the food chain

123. Deleted

124. According to the population growth curves given below, which population has reached equilibrium by responding properly to negative feedback mechanisms with time?

___A) limit K

___B) limit K

___C) limit K

___D)

limit K

___E)

limit K

125. Deleted

126. A mosquito species which lives in hot and highly humid environment generally chooses little isolated aquatic habitats to reproduce and completes its larval development. This species gives many generations by reproducing in late May and early October. To increase its population in a given area which in the following is the most important limiting factor for this species which is very sensitive to the chemical changes in the habitat water .

___A) Increase in the saturation deficit in the air during the reproductive season

___B) Predation

___C) Competition with another species in the microhabitat

___D) Increase in the shadow factor

___E) Increase in relative humidity

127. Which one of the following explanations cannot be given about the relationship between the carrying capacity and the environmental response of populations with a high density?

___A) Competition increases

___B) The natality (birth) rate decreases

___C) The negative feedback mechanism works

___D) The environmental response decreases

___E) The mortality rate increases

128. Deleted

129. Deleted.

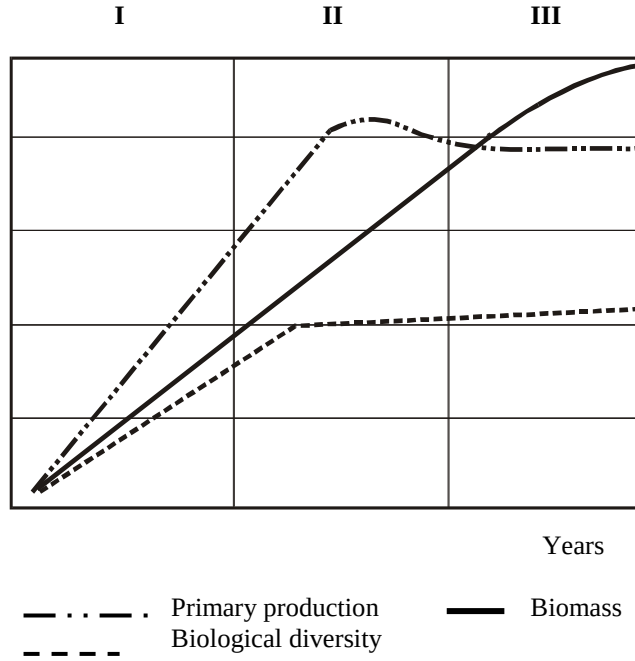
130. Deleted

131. Which one of the following <u>cannot</u> be said about the distribution of populations?

132. A park was built in a place that was occupied by a lot of species"A"trees. A long time ago they were all cut down no species ''A'' trees remained. Later gardeners planted more species "A" trees and also species "B" trees and species "C" trees had species B and C never grew in that region before. Nobody took care of this garden. After 100 years there were a lot of new "A" trees and "B" trees, but no young "C" trees . Which processes refer to the "A", "B" and "C" trees in that park?

	A	B	C
___A)	Introduced,	Acclimatized,	Reacclimatized
___B)	Acclimatized,	Introduced,	Reacclimatized
___C)	Introduced,	Reacclimatized,	Acclimatized
___D)	Reacclimatized,	Acclimatized,	Introduced
___E)	Acclimatized,	Reacclimatized,	Introduced

133. The graph represents the changes in the biomass, diversity and primary production in the ecological succession. Which blocks on the graph represent the first settler stages and the climax stage, respectively.



___A) I and II

___B) II and III

___C) I and III

___D) I, II and III

___E) None

134. An ecologist wants to investigate if there are any differences in the vegetation on the north and south facing sides of a valley. She lays down a rope from the top to the bottom of the slope and every 2 meters she places a 1 m^2 quadrat next to the rope. Standing above the quadrat she estimates and records the area occupied by each plant species. This technique involves which of the following?

1. The use of a point quadrat

2. The recording of % cover

3. The plotting of the results on a kite diagram

4. Random sampling

5. The use of a belt transect

___A) 1 & 2

___B) 2 & 3

___C) 3, 4 & 5

___D) 1, 2 & 3

___E) 2, 3 & 5

135. Deleted

4. 4. Answer Key to the Theoretical Test

4.4.1. Part A

1. D
2. E
3. B
4. C
5. Deleted
6. D
7. A
8. D
9. B
10. C
11. B
12. B
13. C
14. A
15. C
16. D
17. E
18. C
19. B
20. D
21. C
22. E
23. A
24. E
25. B
26. C
27. C
28. E
29. D
30. A
31. D
32. A
33. D
34. D
35. A
36. C
37. Deleted
38. B
39. Deleted
40. E
41. B
42. A
43. C
44. C
45. A
46. Deleted
47. B
48. E
49. B
50. Deleted
51. E
52. A
53. A
54. Deleted
55. C
56. E
57. B
58. E
59. Deleted
60. E
61. Deleted
62. D
63. D
64. Deleted
65. Deleted
66. Deleted
67. Deleted
68. E
69. B
70. C
71. D
72. E
73. E
74. C
75. Deleted
76. D
77. B
78. E
79. D
80. E
81. Deleted
82. D
83. D
84. Deleted
85. Deleted
86. E
87. Deleted
88. Deleted
89. D
90. D
91. C
92. B
93. E
94. Deleted
95. Deleted
96. C
97. C
98. A
99. D
100. C
101. C
102. Deleted
103. A
104. D
105. A
106. A
107. Deleted
108. C
109. E
110. A
111. Deleted
112. Deleted
113. Deleted
114. B
115. C
116. C
117. C
118. A
119. A
120. E
121. Deleted
122. A
123. Deleted
124. C
125. Deleted
126. A
127. D
128. Deleted
129. Deleted
130. Deleted
131. A
132. D
133. A
134. E
135. Deleted