4.3.2. Theoretical Test - Part B

CELL BIOLOGY

1. Deleted

2. Deleted

3. Deleted

4. In the left column below, you can see some proteins and in the right one there are some protein functions (1 – 8). Match the functions with the proteins by writing their numbers in the blanks. (A protein may have more than one function) (7 points).

___	Dynein	1. Shows channel protein characteristics
___	Na^{+}-K^{+}-	2. Possesses ATPase activity
___	Nexin	3. Fasciliates transport through membrane
___	Connexon	4. Transport protein
___	Porin	5. Ion transport protein
___	Keratin	6. Attaches the microtubules
___	Desmin	7. Attaches Z bands to the myofibers in muscle
		8. Exists in the cytoskeleton of epithel cells

5.

A) (5') A G C C T A A T G G C C T A (3')

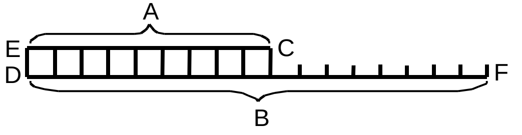
B) (3') T C G G A T T A C C G G A T (5')

The DNA above is replicated in the direction of the arrow. Write the appropriate letter showing the templates for leading strand and lagging strand synthesis in the blanks. (2 points)

template for the lagging strand __________

template for the leading strand __________

6.



A suitable substrate for DNA polymerase is shown above. Fill in each blank below with a corresponding letter on the diagram. (3 points).

Primer __________

Template __________

3’ end of the primer __________

5’ end of the primer __________

3’ end of the template strand __________

5’ end of the template strand __________

7. Two molecules of DNA (I and II) are the same size (1000 bp) but differ in base composition. The first one contains 42% and the second one 66% A+T. (1.5 points).

A) How many G residues are there in DNA I and II? (1 point).

I: ________

II: ________

B) Which molecule (I or II) has a higher T_m. (T_m =dissociation point) (0.5 point)

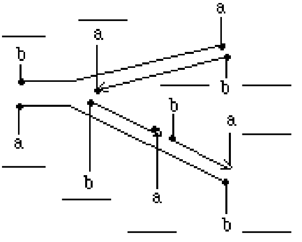
____

8. Match the enzymes involved in the procaryotic replication at the left with their function at the right by putting the appropiate numbers in the blanks. (3 points).

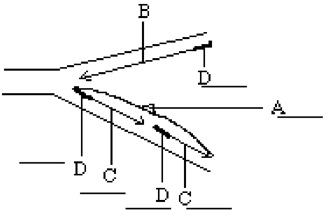
DNA Helicase__________	1. Synthesis of RNA primers in the replication of the lagging strand
Primase___________	2. Unbinds double stranded DNA
DNA polymerase I 3'→ 5' exonuclease activity__________	3. Removes RNA primers.
DNA Ligase__________	4. Seals nicks in the DNA at the boundaries between Okazaki fragments.
Topoisomerase II__________	5. Removes mismatched bases
DNA Polymerase I 5'→3' exonuclease activity__________	6. Releaves the topological stress produced by the unwinding of double stranded DNA.

9. Below is a diagram that shows DNA replication. On the diagram, mark: (5.4 points).

A) 3' ends with the letter "a" and 5' ends with the letter "b", (2 points).



B) The lagging strand with letter "A", the leading strand with letter "B" , Okazaki Fragments with letter "C", and RNA primers with letter "D". (1.4 points).



C) Match the enzymes with the reaction it catalyzes. Put the letter in front of the enzyme in the appropriate blanks below. (2 points).

E. Primase
F. Ligase
G. DNA Polymerase II
H. DNA Polymerase III
I. DNA Polymerase I

- Enzyme ____________catalyzes the synthesis of fragment I
- Enzyme ____________catalyzes the synthesis of fragment II
- Enzyme ____________catalyzes the synthesis of RNA primer
- Enzyme ____________seals the nick shown as III in the diagram

10. Compare RNA polymerase with DNA polymerase III that function in the transcription and replication processes in *E. coli* on the basis of the parameters (A-H) with their characteristics given in the table. Put the letters in the appropriate boxes. (5 points).

A) Promotor	B) Origin	C) 3’→5’	D) 5’→3’
E) dNTP	F) NTP	G) Yes (+)	H) No (-)

	RNA Polymerase	DNA Polymerase III
The DNA region initially recognized and bound by the polymerase		
The direction of the polymerization		
The direction of enzyme movement on the template strand		
The type of the nucleotide substrates added to the growing chain		
3’→5’ exonuclease activity (Proof reading ability)		

11. Deleted

12. Deleted

13. For each of the following statements, indicate with a “P” if the statement applies only to prokaryotes, with an “E” if the statement applies only to eukaryotes, and with an “E-P” if the statement applies to both eukaryotes and prokaryotes. (2.7 points).

___ A single RNA polymerase transcribes genes that encode mRNA, tRNA and rRNA.
___ Polimerisation of DNA is in the 5`→ 3`direction.
___ Sigma (σ) subunit detaches from RNA polymerase shortly after transcription has initiated
___ The 5’ end of the mature mRNA begins with a triphosphate
___ Polymerisation of RNA is in the 5`→ 3` direction
___ They carry circular DNA
___ There are no introns in mRNA

14. The template strand for mRNA is given below. (5 points).

(5’) CTT TGA TAA GGA TAG CCC T$\overset{*}{\text{T}}$C (3’)

A) What is the base sequence of the mRNA that can be transcribed from this strand?

____

B) Using the genetic code table given on the next page, write the amino acid sequence of the polypeptide coded by this mRNA.

____

C) Suppose the other (complementary) strand is used as a template for the transcription. What is the amino acid sequence of the resulting peptide?

____

D) If the labeled base above in the template strand is converted to “A” instead of “T”, what would be the type of the mutation? Transition (X), transversion (Y), deletion (Z) or insertion (W) Write the correct letter on the line below.

____

E) What is the type of this mutation? Neutral (N), silent (S), missense(M), or nonsense (NS)? Write the correct letter on the line below.

____

BASE II

BASE I	U		C		A		G		BASE II
U	UUU	phe	UCU	ser	UAU	tyr	UGU	cys	U
U	UUC	phe	UCC	ser	UAC	tyr	UGC	cys	C
U	UUA	leu	UCA	ser	UAA	stop	UGA	stop	A
U	UUG	leu	UCG	ser	UAG	stop	UGG	trp	G
C	CUU	leu	CCU	pro	CAU	his	CGU	arg	U
C	CUC	leu	CCC	pro	CAC	his	CGC	arg	C
C	CUA	leu	CCA	pro	CAA	gin	CGA	arg	A
C	CUG	leu	CCG	pro	CAG	gin	CGG	arg	G
A	AUU	ile	ACU	thr	AAU	asn	AGU	ser	U
A	AUC	ile	ACC	thr	AAC	asn	AGC	ser	C
A	AUA	ile	ACA	thr	AAA	lys	AGA	arg	A
A	AUG	met	ACG	thr	AAG	lys	AGG	arg	G
G	GUU	val	GCU	ala	GAU	asp	GGU	gly	U
G	GUC	val	GCC	ala	GAC	asp	GGC	gly	C
G	GUA	val	GCA	ala	GAA	glu	GGA	gly	A
G	GUG	val	GCG	ala	GAG	glu	GGG	gly	G

15. Deleted

16. Deleted

17.

A) The heart muscle while working aerobically

B) A bacterium culture that cannot grow in the dark

C) A propionic acid bacteria that can grow under anaerobic conditions in the dark

D) Erythrocytes

Fill in the blanks with the suitable letters above.(2 points)

______ provides ATP requirement by photosynthesis

______ provides ATP requirement by converting glucose to lactate

______ provides ATP requirement by fermentation

______ provides ATP requirement by oxidative phosphorylation

18. Atmospheric nitrogen (N_2) is chemically very stable. Only a few prokaryotic species can convert atmospheric nitrogen into usable form by plants. One of the characteristics of these organisms is that they possess the nitrogenase enzyme complex that can fix the nitrogen. O_2 irreversibly inhibits this enzyme. Considering that we live in an oxidizing environment, nitrogen fixing organisms must have a variety of mechanisms for protection from O_2.

A) Below are given some characteristics of bacteria. Put an " X " in the blank for the ones that can fix nitrogen. (4 points).

______A free living bacterium under soil like Clostridium
______Cyanobacteria like *Nostoc muscorum* possess thick cell walls
______Bacteria like E.coli that are inhabitants of the intestinal tract
______Symbiotic bacteria like Rhizobium of leguminous plants that possess specialized protein leghemoglobin
______High mutation rate bacteria like Salmonella typhimurium

B) Which is the major product of the nitrogenase enzyme complex? (Mark with an "X")

______ammonia ______nitrite ______nitrate ______nitrogen gas

GENETICS AND EVOLUTION

19. Consider cases of unknown paternity where the ABO blood group phenotype of concerned individuals is to be used to help identify fathers. The frequency of blood group allels in the population is as follows: p (A) = 0.2, p (B) = 0.3, p (O) = 0.5. Blood group assessments are made by routine laboratory procedures, which can assess blood group *phenotypes*. (4 points)

a. In a case where the mother`s blood group is A and the child`s blood group is AB, what is the probability that a man chosen at random from the population will be proven not to have fathered the child purely on the basis of his blood group. (2 points)

Answer:________

b. In a case where the mother`s blood group is A and the child`s blood group is O, what is the probability that a man chosen randomly from the population will be proven not to have fathered the child purely on the basis of his blood group. (2 points)

Answer:________

20. In a certain human population 64% is able to roll their tongue.

This ability is based on a dominant allele.

A roller marries a non-roller.

Calculate the chance of having a roller baby. (4 points)

Answer:____________________%

21. Deleted

22. In peas, the allele for green seed color (A) is dominant over the allele for yellow seed color (a) and the allele for normal leaf (B) is dominant over the allele for rolled leaf (b). The F_1 generation is obtained by crossing AABB x aabb. When these F_1 plants are tested again, the following results are found;

117 green seed / normal leaf

115 yellow seed / rolled leaf

76 green seed / rolled leaf

80 yellow seed / normal leaf

$\chi^2 = \sum \left[(O-E)^2 / E \right]$

O: Observed value E: Expected value (6 points)

A) Degree of freedom: _________

B) Calculate the χ^2 value and check from the table: _________

C) According to the result of choice B, decide whether these genes are linked or not (mark with the letter "X")

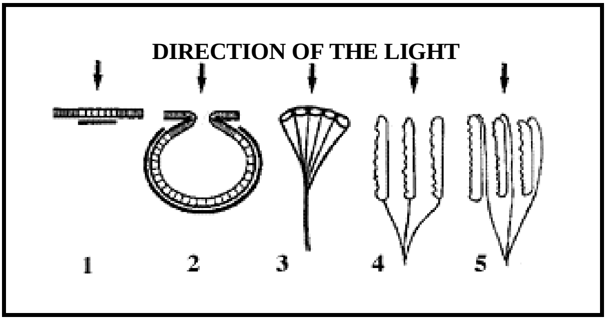
Genes are linked: _________

Genes are not linked: _________

D) If these genes are linked, calculate the distance between the genes

The distance between the genes is _________ map units

23. (2.5 points).



According to the structure and the location of the light sensors illustrated on the scheme above, match the followings

<u>Animal group</u>

________Earthworm

________Squid

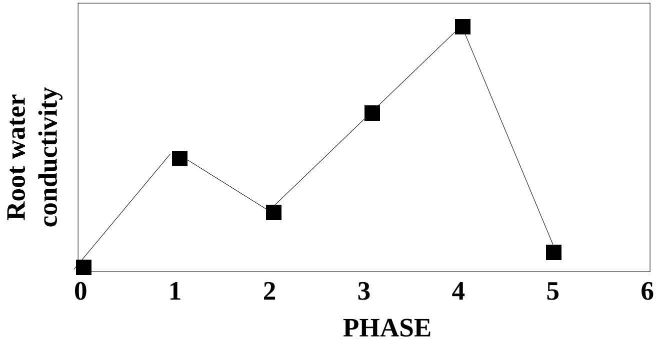
________Human being

________Insect

________Planaria

PLANT ANATOMY AND PHYSIOLOGY

24. (2 points)



The graph represents the water conductivity of a root. Mark the true alternative(s) with an "X".

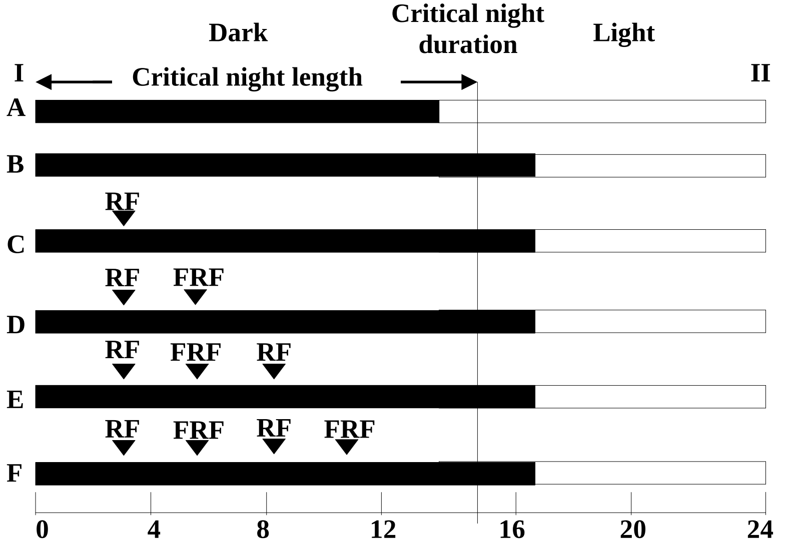
___A) The temperature decreases between the phases 1-2 and 4-5

___B) CN^- is added to the medium between the phases 0-1 and 2-4

___C) There is enough oxygen between the phases 1-2 and 4-5

___D) The root cannot get enough nutrient between the phases 1-2 and 4-5

25. (3.6 points)



RF : red or white flash **FRF: far red flash**

The figure represents exposure of long-day and short-day plants to a variety of light regimes. Decide whether long-day (short-night) and short-day (long-night) plants will flower (+) or not (-) under the conditions given above.

	Long day (short-night) plant	Short-day (long-night) plant
A)		
B)		
C)		
D)		
E)		
F)		
	I	**II**

26. Deleted

27. Deleted

28. Deleted

29. Deleted

30. Label the figure using the numbers (2.1 points)

01 Anther	05 ~~Phyllary~~
02 Ovarium	06 Nectar
03 Stigma	07 Pappus
04 Corolla	

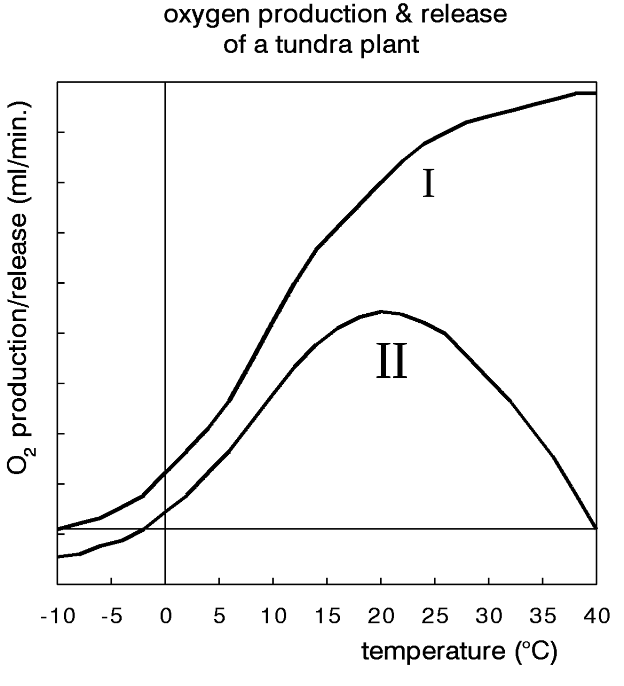
31. A student is studying <u>a tundra plant</u> at different temperatures.

He investigates:

The production of oxygen by means of photosynthesis, and

The net amount of oxygen released into the environment

The diagram shows the results. It is up to you to decide which curve is production and which curve is release. (2 points)



Now answer the following two questions:

31.1. At which temperature(s) are both the ATP-production and the ATP-consumption approximately equal? (1 point)

___A) At 20 ^{o}C

___B) At -2,5 ^{o}C and at +40 ^{o}C

___C) Only in between -10 ^{o}C and -2,5 ^{o}C

___D) Only in between -10 ^{o}C and + 10 ^{o}C

___E) In between -10 ^{o}C and + 40 ^{o}C

31.2. At which temperature(s) are the production of oxygen by photosynthesis and the consumption of oxygen by dissimilation equal to each other? (1 point)

___A) At 20 ^{o}C

___B) At -2,5 ^{o}C and at +40 ^{o}C

___C) Only in between -10 ^{o}C and -2,5 ^{o}C

___D) Only in between -10 ^{o}C and + 10 ^{o}C

___E) In between -10 ^{o}C and + 40 ^{o}C

32. Select numbers from the answer key and mark the parts of the different fruit types (3 points)

Answer key:

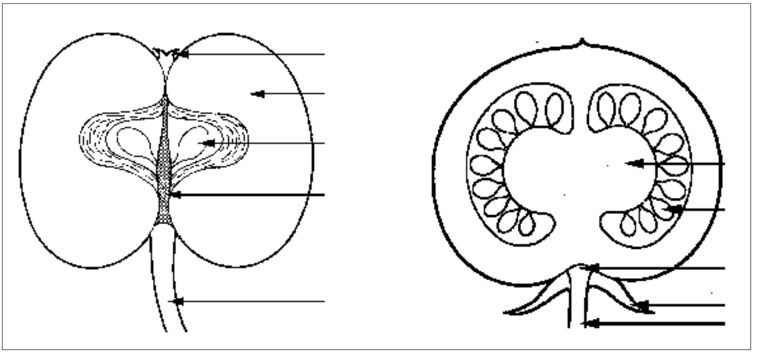
1- Remains of sepals

2- Receptacle

3- Seed

4- Placenta

5- Pedicel



33. Deleted

34. Deleted

35. Which of the following can be expected to happen when glucose is added to the mineral solution in which plant cells are bathed. Put a cross (X) in the related boxes.

35. 1. (1 point)

	Increases	Decreases
Membrane potential		
pH of the medium		

35. 2 (1 point)

	Taken up	Not taken up
Glucose		

BIOSYSTEMATICS

36. Deleted
37. Deleted

38. Which of the following descriptions about vertebrates is/are correct? Mark the correct ones with an “X”. (2.5 points)

_______The scales of fish are epidermal scales
_______The scales of snakes are epidermal scales
_______The scales of lizards are epidermal scales
_______The scales of pangolins are epidermal scales
_______The hairs of humans are derivatives of epidermis
_______The horns of deers are epidermal in origin
_______The horns of cattles are epidermal in origin
_______The horns of rhinoceros are epidermal in origin

39. Deleted

40. Deleted

41. **I. Rhynia** **II. Spirogyra** **III. Rhizopus/Mucor**
IV. Lycopodium **V. Equisetum**

Establish the relationships between the given genera names above with the terms below (You can use any term more than once.) (3.6 points).

_______ It appeared in the Carboniferous period
_______ The sporangia are generally cluster shaped
_______ The zoospores never appear
_______ The oldest plant that has no leaves
_______ The first real roots are seen in this group
_______ The prothallus reaches sexual maturity in 12-15 year’s time
_______ The chloroplasts are helozonic (spiral shaped)
_______ Xylem is made of ringed and spiral tracheids
_______ In the cross section, the xylem appears star or plate shaped

42. Deleted

ANIMAL ANATOMY AND PHYSIOLOGY

43. Some animals and some of their characteristics are shown in the table . Match these characteristics correctly with the given animals (mark the appropriate box with an "X") (3.6 points).

	Fresh water fish (carp)	Bird (pigeon)	Marine fish (sea bass)	Lizard (Chameleon)	Marine mammal (whale)	Terrestrial mammal (Mouse)
Drinks water regularly						
Does not drink water						
Wastes are discarded as ammonia						
Wastes are discarded as urea						
Wastes are discarded as uric acid						
Actively secretes salt						
Actively absorbs salt						
Excretes hipotonic urine relative to the body fluids						
Excretes isotonic urine relative to the body fluids						
Excretes hipertonic urine relative to the body fluids						

44.

In the figure, some parts of a mammalian nephron are numbered (I-V). Match these numbers with the events or properties given in the table (a number can be used more than once). (2.5 points).

Cl^- is actively pumped out	
Blood is filtered	
Almost all glucose is reabsorbed	
Urine becomes acidic	
Na^+ is reabsorbed under aldesterone control	

45. In humans, some mechanisms are activated in the case of a serious decrease in the red blood cell count. Some sources (organs/tissues), secreted substances, targets and biological responses are given in the list (1-13). Examine them and put appropriate numbers in the appropriate boxes in the table. (2 points).

1. **Liver**
2. **Kidneys**
3. **Heart**
4. **Erythopoeitin**
5. **Lungs**
6. **Spleen**
7. **Bone marrow**
8. **Antidiuretic hormone**
9. **Renin**
10. **Androgens**
11. **Adrenaline**
12. **Increase in erythropoiesis**
13. **Increase in the blood glucose level**

Stimulus	Stimulated organ/tissue	Secreted Substance	Target	Biological Response
Decreased red blood cell count				

46. Deleted

47. In the figure, 4 parameters varying according to the different parts of the human circulation system (aorta, arteries, arterioles, capillaries, venules, veins, and vena cava) are plotted (I-IV). Match the numbers of the curves with the parts of the circulation system (Put the appropriate number in front of each part.). (2 points).

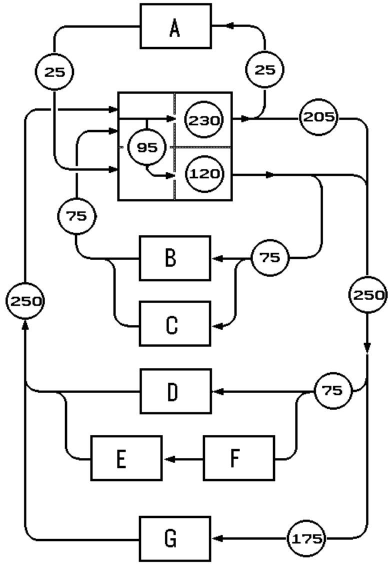
______ Total cross-sectional area

______ Blood pressure

______ Blood velocity

______ Vessel diameter

48. Inspect the following scheme representing the blood circulation of a human embryo just before birth. The numbers respresent the blood flow in ml/min per kg body mass of the embryo. (2 points).



48. 1. Indicate the letter of the box which represents the placenta. (1 point).

Answer:________(fill in a letter)

48. 2. Calculate the ratio of blood flow through the lungs just before and few days after the birth, assuming that the total amount of blood leaving the heart at both are equal. (1 point).

Answer: (Ratio) Before / After =__________

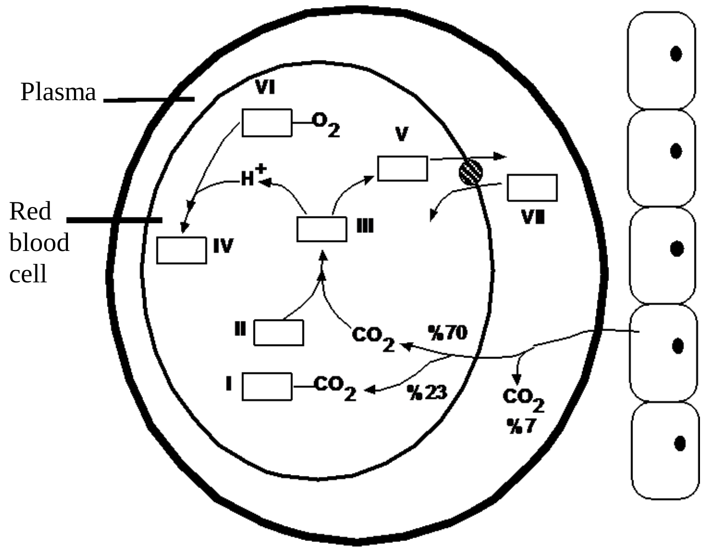
49. In the human circulation various mechanisms are activated when blood pressure decreases below or rises above its normal level. This question is related to a situation where the blood pressure exceeds its normal level. Indicate the events that take place at various parts of the circulation system to return the pressure back to its normal level by marking the appropriate boxes in the table with an "X" .(3 points).

Stretch receptors		Cardioaccelatory center		Cardioinhibitory center		Vasomotor center	
stimulated	inhibited	stimulated	inhibited	stimulated	inhibited	stimulated	inhibited

Cardiac output		Arterioles	
increases	decreases	constricted	dilated

50. Deleted

51.



The figure shows the reactions occuring during gas and electrolyte exchange between blood capillaries loaded with O_2 and the tissue cells. Fill in the empty boxes in the figure and below with the appropriate numbers out of the 13 substances given below. (3.5 points).

1. Hb (hemoglobin)	6. H_2PO_4	11. HCO_3
2. H_2CO_3	7. H_2SO_4	12. HbO_2
3. H_2O	8. Cl^-	13. HHb
4. CO_2	9. Na^+	
5. $NaHCO_3$	10. Ca^{2+}	

I	II	III	IV	V	VI	VII

52. The respiratory quotient RQ of an organism is defined as

RQ = CO_2 (produced)/O_2(used) ....(in a given time)

The theoretical RQ values of important substrates are approximately:

substrate (completely oxidised)	RQ
Carbohydrate	1,0
Fat	0,7
Protein	0,9

In practice, the values of RQ will be higher or lower than the theoretical ones.

What is the effect of the following circumstances on RQ? (2 points).

Put an "X" in the correct boxes in the following table.

	RQ higher	RQ lower
Anaerobic respiration of substrate		
Incomplete oxidation of substrate		
Fixation of CO_2 as $CaCO_3$		
Converting carbohydrate into fat		

53. Figure shows 5 saturation curves of O_2 with hemoglobin each obtained from a different animal (I-V). The shape of these curves differ according to the basal metabolism of the animal. Match these curves with the animals given below (Put the number of the curve in front of the name of the animal.) (2.5 points).

_____ Elephant _____ Snake _____ Bird (sparrow)

_____ Man _____ Mouse

54. Mark the correct change in the arterial chemoreceptors, respiratory rate, H^+ excretion rate in the kidneys and blood partial CO_2 pressure that takes place in order to correct a <u>drop</u> in blood pH. (2 points).

Arterial chemoreceptors		Respiratory rate	
stimulation	inhibition	increase	decrease

H^+ excretion in the kidneys		Blood partial CO_2 pressure	
increase	decrease	increase	decrease

55. Write the numbers which refer to the extra-embryonic membranes amnion (1), allantois (2), yolk-sac (3) and chorion (4) that are seen during the development of organisms given below. (1.4 points)

Fish _______

Frog _______

Reptile _______

Bird _______

Mammal _______

56. The following statements are about calcium and its regulation in humans. Match correctly the substances given in the answer key with the statements (put the letter of the substance in front of the statements). (2 points).

______It is the vitamin which promotes the accumulation of calcium in the body

______It is the gland which secretes calcitonin, the hormone causes calcium accumulation

______It is the the place where calcium accumulates in great amounts in the body

______It is the gland which secretes hormone that increases the calcium level in the blood

Answer key:

A. Vitamin D

B. Bones

C. Thyroid

D. Blood

E. Parathyroid gland

F. Vitamin C

G. Adrenal gland

57. Some human endocrine and exocrine glands are numbered in the figure . In the following statements some functions related to these glands are given. Match the statements with the glands in the figure (Put the number of the gland in front of the statements). (3 points)

______It secretes a hormone which increases the reabsorption of Na^{+} into the blood

______Its secretion is increased when blood Ca^{2+} concentration drops below its normal level

______If its secretion is decreased the basal metabolic rate also decreases

______Its secretion is necessary for the development of cellular immunity

______Its hormone induces red blood cell production in bone marrow

______Without its hormone, there will be an excessive water loss from the body

______Its secretion is increased after a carbohydrate rich meal

______Acidic compounds stimulate its hormone secretion

______Its secretion is necessary for the chemical breakdown of proteins

58. Deleted

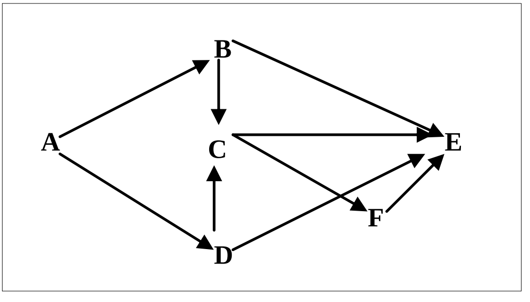
59. Deleted

60. Deleted

ECOLOGY

61. Deleted

62. A food web including 6 different species (A to F) in an ecosystem is shown in the figure illustrated below. The arrows refer to the energy flow directions. Match the following according to that figure. (3.5 points).



Producer species	______
Decomposer species	______
Consumer species on the first trophic level	______
Consumer species on the second trophic level	______
Consumer species on the third trophic level	______
The species in which biomagnification is seen at the highest level	______

63. Age distribution in human populations can be shown in three different types as developing type, stable type and regression type. Mark the stable type age distribution among the following figures. (1 point).

64. In the tables below, one might see the relationships among the populations and the results of these influences. Mark the correct answer(s) by an ellipse in each box. For clarity, an example has been given for competition. (3.5 points).

Competition

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

Predation

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

Parasitism

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

Neutralism

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

Mutualism

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

Commensalism

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

Amensalism

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

65. In the figure illustrated below the energy flow between the organisms on different trophic levels in a food web is shown. On the scheme given below, please fill in the blanks with the numbers given below for the producers, and 1^o, 2^o, 3^o trophic level consumers according to their levels. (3.6 points).

Producers _____ 1^0 consumers _____

2^0 consumers _____ 3^0 consumers _____

66. Deleted

67. The figure given below represents the carbon cycle. Fill in the blanks with the suitable numbers that corresponds to the processes concerning the cycle given to you. (2 points).

<u>Processes</u>:

Combustion	______________
Consumption	______________
Death	______________
Photosynthesis	______________
Respiration	______________
Decomposition	______________

68. In the table, the principle components that form an aquatic ecosystem are given. Put the organisms, and components, in their places in the table given below. (2 points).

I. Fungi

II. Phytoplankton

III. Inorganic components

IV. Zooplankton

The part of the ecosystem	**The organism or component**
Abiotic substance	
Producer	
Consumer	
Decomposer	

69. Deleted

70. The density of a population that reaches equilibrium is known as the carrying capacity in that species for that habitat. When a population approaches the carrying capacity of any habitat, which of the following shows a tendency to increase? Mark all correct answers with an "X". (2.5 points).

_________ Competition for resources

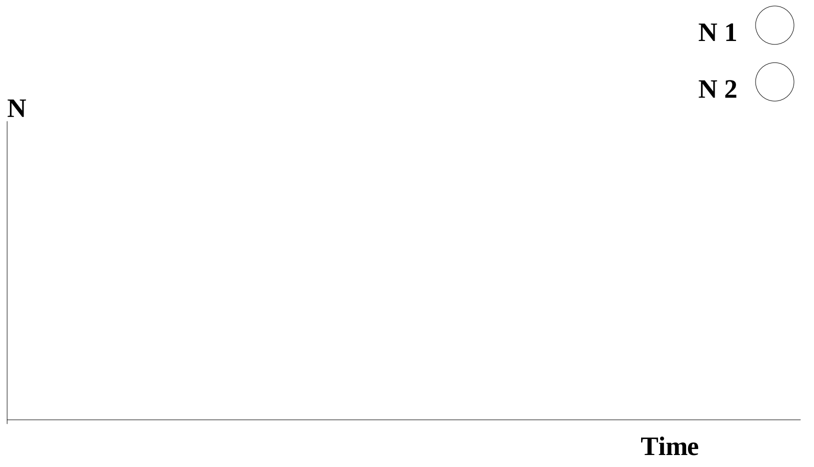
_________ Competition for shelters

_________ Competition for mating areas

_________ Immigration

_________ Accumulation of toxic wastes

71. In any habitat that includes a predator species and its prey, it is known that both of their populations show linked fluctuations. Show the curve belonging to the predator species by putting an "X" in the circle. (1 point).



BEHAVIOUR

72. Thorleif Schjelderup- Ebbe reported the results of a study about the social organization carried out in a poultry yard with Leghorn hens . He found that there was a kind of order (arrangement) in the peck that was related with a real hierarchy in the group.

The following matrix shows the peck frequency within a group of 13 females (from A to M). Each datum indicates the times that the hen identified by the letter in the horizontal line is pecked by one in the vertical line. (4 points)

	M	L	K	J	I	H	G	F	E	D	C	B	A
A	53	45	38	51	35	36	41	29	33	34	41	39	-
B	42	34	37	28	36	29	40	46	43	53	47	-	-
C	36	29	26	44	31	38	24	42	37	32	-	-	-
D	35	27	39	29	36	52	43	31	26	-	-	-	-
E	48	30	27	43	41	40	36	35	-	-	-	-	-
F	43	39	42	40	39	33	31	-	-	-	-	-	-
G	39	38	28	36	41	39	-	-	-	-	-	-	-
H	35	52	47	-	37	-	-	-	-	-	-	-	-
I	37	41	42	54	-	-	-	-	-	-	-	-	-
J	33	29	31	-	-	32	-	-	-	-	-	-	-
K	42	37	-	-	-	-	-	-	-	-	-	-	-
L	39	-	-	-	-	-	-	-	-	-	-	-	-
M	-	-	-	-	-	-	-	-	-	-	-	-	-

72.1. Which of the following female has the highest hierarchy within the group? (2 points)

___A) A ___B) B ___C) J ___D) H ___E) M

72.2. Deleted

72.3. Deleted

72.4. Which ones of the following may be the advantages of a hierarchy of dominance? (2 points).

___A) To suppress the aggression.

___B) To diminish the time and the energy invested in fights.

___C) To diminish the mortality of individuals because of the wounds caused in the combat

___D) A and B.

___E) All the above

73. The "coefficient of relatedness" (r) between various kin pairs that changes according to the relationships in any diploid animal ((For example a mammalian like *Canis lupus* (Canidae)) is given in the table below. (3.5 points).

Parent < > Offspring	**0.50**
Identical twins	**1.00**
Grandparent < > Grandchild	**0.25**
First cousins	**0.125**
Uncle < > nephew	**0.25**

73.1. In view of this, in a haplodiploid bumblebee species *Bombus terrestris* L, 1758 (Apoidea: Hymenoptera), show the coefficient of relatedness (r) in the situations given below. (2.5 points).

Mother < > Daughter _________
Father > Daughter _________
Mother < > Son _________
Sisters _________
Brothers _________

73.2. If you take into consideration the knowledge given in the table above, which of the following statements about the sterilization of the worker bees given as I, II, III and IV is true? (1 point).

I- For the transmission of the genetic knowledge to the next generation, the sterilization of the worker bee, is harmful for it.

II- For the transmission of the genetic knowledge to the next generation, the sterilization of the worker bee, is benefical for it.

III- For the transmission of the genetic knowledge to the next generation, there is no difference on the individual level.

IV- This is an example of altruism.

___A) Only I

___B) Only IV

___C) II and III

___D) II and IV

___E) III and IV

4.4.2. Part B Answer Key

1. Deleted
2. Deleted
3. Deleted
4.

2, 6

2, 3, 4, 5

6

1, 3, 5

1, 3, 5

8

7

5.

A

B

6.

A

B

C

E

D

F

7.

A) I: 580, II: 340

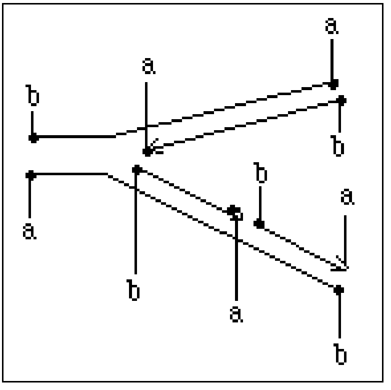
B) I

8.

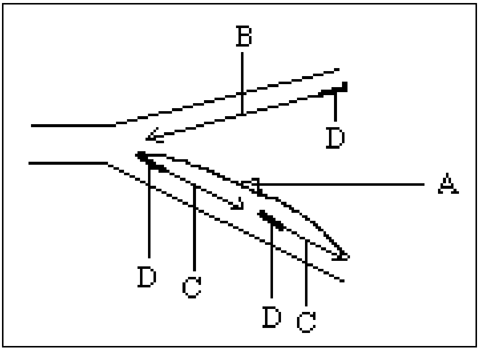
DNA Helicase___2___
Primase___1___
DNA polymerase I 3'→ 5' exonuclease activity___5____
DNA Ligase___4____
Topoisomerase II___6___ _
DNA Polymerase I 5'→3' exonuclease activity____3____

9.

A)



B)



C)

H
H
E
F

10.

A	B

D	D
C	C
F	E
H	G

11. Deleted

12. Deleted

13.

P
E, P
P
P
E, P
P,E
P

14.

A) 5'GAA GGG CUA UCC UUA UCA AAG
B) Glu-Gly-Leu-Ser-Leu-Ser-Lys-
C) Leu-stop-stop
D) Б
E) H

15. Deleted

16. Deleted

17.

B

D

C

A

18.

A)

__X__

__X__

______

__X__

______

B)

__X__ammonia

______ nitrite

______ nitrate

______ nitrogen gas

19.

a. 0.49

b. 0.25

20.

5/8 or 62.5%

21. Deleted

22.

A) 3
B) 14.98 or 15.0 > 7.815 - 387.45 or 387 > 7.815
C) Genes are linked
D) Deleted

23.

1
4
5
3
2

24.

A, D

25.

A)	+	-
B)	-	+
C)	+	-
D)	-	+
E)	+	-
F)	-	+

26. Deleted

27. Deleted

28. Deleted

29. Deleted

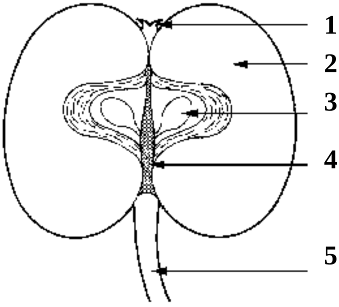
30.

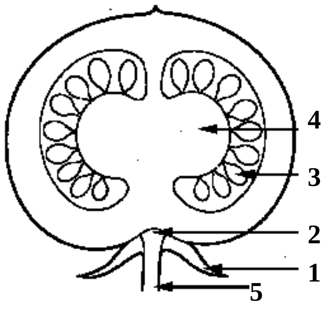
31.

31.1. E

31.2. B

32.





33. Deleted

34. Deleted

35.

35.1.

	Increases	Decreases
Membrane potential		X
pH of the medium	X	

35. 2.

	Taken up	Not taken up
Glucose	X	

36. Deleted

37. Deleted

38.

____
___X__
___X__
___X__
___X__
____
___X__
___X__

39. Deleted

40. Deleted

41.

V
III
II
I
IV
IV
II
I
IV

42. Deleted

43.

	Fresh water fish (carp)	Bird (pigeon)	Marine fish (sea bass)	Lizard (Chameleon)	Marine mammal (whale)	Terrestrial mammal (Mouse)
Drinks water regularly		X	X			X
Does not drink water	X			X	X	X
Wastes are discarded as ammonia	X		X			
Wastes are discarded as urea					X	X
Wastes are discarded as uric acid		X		X		
Actively secretes salt			X			
Actively absorbs salt	X					
Excretes hipotonic urine relative to the body fluids	X					
Excretes isotonic urine relative to the body fluids			X			
Excretes hipertonic urine relative to the body fluids		X		X	X	X

44.

II
I
III
IV
V

45.

Stimulus	Stimulated organ/tissue	Secreted substance	Target	Biological Response
Decreased red blood cell count	2	4	7	12

46. Deleted

47. IV
I
III
II

48.1. G

48.2. 1:7

49.

Stretch receptors		Cardioaccelatory center		Cardioinhibitory center		Vasomotor center	
Stimulated	inhibited	stimulated	inhibited	stimulated	inhibited	stimulated	inhibited
X			X	X			X

Cardiac output		Arterioles	
increases	decreases	constricted	dilated
	X		X

50. Deleted

51.

1	3	2	13	11	1	8
I	II	III	IV	V	VI	VII

52.

RQ higher	RQ lower
X	
	X
	X
X	

53.

II
V
IV
III
I

54.

Arterial chemoreceptors		Respiratory rate	
stimulation	inhibition	increase	decrease
X		X	

H^+ excretion in the kidneys		Blood partial CO_2 pressure	
increase	decrease	increase	decrease
X			X

55.

3

____

1, 2, 3, 4

1, 2, 3, 4

1, 2, 3, 4

56.

A

C

B

E

57.

5

3

2

4

9

1

7

8

6

58. Deleted

59. Deleted

60. Deleted

61. Deleted

62.

A
E
B,D
C
F
F

63.

64.

Competition	
Species	
A	B
-	-
+	-
0	0
+	+
+	0
-	0

Predation	
Species	
A	B
-	-
+	-
0	0
+	+
+	0
-	0

Parasitism	
Species	
A	B
-	-
+	-
0	0
+	+
+	0
-	0

Neutralism	
Species	
A	B
-	-
+	-
0	0
+	+
+	0
-	0

Mutualism	
Species	
A	B
-	-
+	-
0	0
+	+
+	0
-	0

Commensalism	
Species	
A	B
-	-
+	-
0	0
+	+
+	0
-	0

Amensalism	
Species	
A	B
-	-
+	-
0	0
+	+
+	0
-	0

65. <u>12</u>

<u>7</u>, <u>8</u>, <u>9</u>, <u>10</u>, <u>11</u>

<u>1</u>, <u>2</u>, <u>3</u>, <u>4</u>, <u>5</u>, <u>6</u>

<u>1</u>, <u>2</u>, <u>3</u>, <u>5</u>

66. Deleted

67. <u>9</u>

<u>3</u>

<u>4,5,7</u>

<u>1</u>

<u>2,8,10</u>

<u>6</u>

68. <u>III</u>

<u>II</u>

<u>IV</u>

<u>I</u>

69. Deleted

70. __X__

__X__

__X__

______

__X__

71. N2

72.1. A

72.2. Deleted

72.3. Deleted

72.4. E

73.1. <u>0.50</u>

<u>1.00</u>

<u>0.50</u>

<u>0.75</u>

<u>0.50</u>

73.2. D