

1) A)

i) State **two** major environmental issues due to over exploitation of natural resources.

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.....

- Environmental pollution
- Loss of biodiversity
- Desertification

ii) What is metabolism?

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- The sum of all chemical reactions occurring in an organism

iii) State **two** major properties of water to maintain life on the earth.

.....  
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- Cohesive behavior
- Ability to moderate temperature
- Expansion upon freezing
- Versatility as a solvent

iv) State the monomers of following polysaccharides.

Inulin-.....

Pectin-.....

Inulin - fructose

Pectin - Galacturonic acid

v) Given below are the observations in a laboratory experiment conducted to demonstrate the activity of the amylase enzyme.

Time spent (minutes)	5	15	25	35	45
Colour observed	Black-blue	black-blue	blue	yellow - brown	yellow - brown

a) What is the compound formed due to the action of the amylase enzyme on starch in the aqueous solution?

.....

- Maltose

b) State one reason for each of the following observations.

i. Appearance of black-blue colour after 15 minutes - .....

.....

- Presence of starch

ii. Appearance of yellow-brownish appearance after 35 minutes.....

.....

- Absence of starch in the solution/ The end of starch in the solution

c) Why are the mixtures used in the above experiment kept in a water bath?

.....  
 .....

- To maintain the constant temperature during the time of reaction.

d) Which compound in the above experiment, does not **undergo** chemical change although it contributes to the chemical reaction.

.....

\* The enzyme amylase

B)

i) What is the type of enzyme present in lysosomes?

.....

- Hydrolytic enzymes

ii) Write two biological functions of lysosomes.

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 .....

- Digest food particles received by phagocytosis.
- Transport residue material out of cell by exocytosis.

iii) Name a common structure that can be seen in the mitochondrial matrix and in the stroma of chloroplasts.

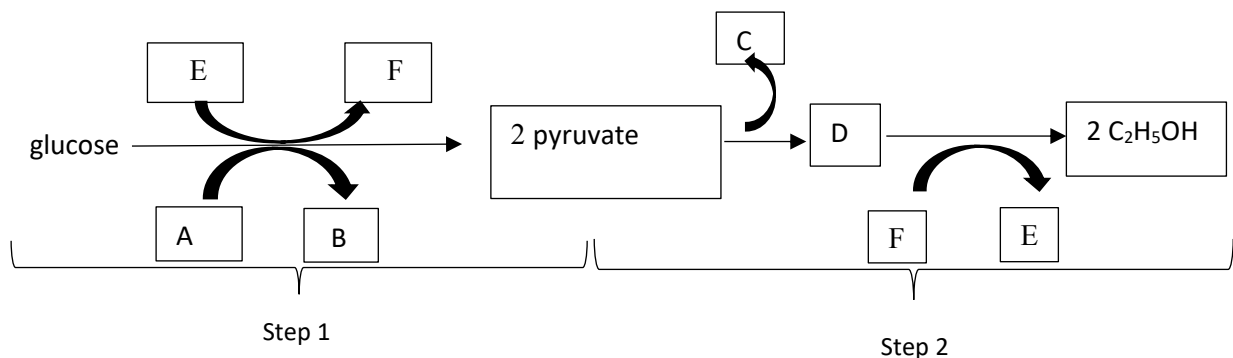
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- Circular DNA/ 70S ribosomes

iv) What are the processes of producing ATP on the sites given below?

- In the matrix of mitochondrium- .....
- Substrate phosphorylation
- On the thylakoid membranes of chloroplasts- .....
- Oxidative phosphorylation

v) Given below is a biological process that takes place in *Saccharomyces*.



a) Name the compounds stated as C, D, E and F in the above diagram.

C - .....  
 CO<sub>2</sub>

- D - .....  
**Acetaldehyde**
- E - .....  
**NAD<sup>+</sup>**
- F - .....  
**NADH**

b) How is the second step in the above diagram important for cell metabolism?

.....

- **Preventing NAD<sup>+</sup> being a limiting factor**

c) Write two economical usages of the end products of the above process.

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- **To produce alcohol/alcoholic solutions**
- **Bakery products**

C)

i) a) State two principles used by Lamarck to explain his hypothesis?

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- **Use and disuse**
- **Inheritance of acquired characteristics**

b) What is meant by classification science?

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**The scientific study of classifying, identifying, naming, and explaining organisms.**

ii) a) Name the genetic material found in protocell.

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**Ribo Nucleic Acid/RNA**

b) State two living characteristics of protocell.

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- **Growth/evolution/enzyme catalyzed reactions/replication**

iii) a) Name the eons in which animal evolution took place.

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- **Proterozoic**
- **Phanerozoic**

b) State one major function of each of the following structures?

pseudopodia - .....

- **locomotion/feeding**

tube feet - .....

- locomotion/feeding/respiration

iv) Write two unique structural characteristics of the phylum Annelida.

.....

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- Parapodia
- Setae
- clitellum

v) Name one plant genus which shows each of the characteristic given below?

Characteristic	Plant genus
a. Having a dioicous gametophyte	..... Nephrolepis
b. Having trimerous flowers	..... Cocos
c. Protonema present in the life cycle	..... Pogonatum
d. Bearing a fruit with two wing like structures	..... Dipterocarpus

2)

A) i) What is a stomata?

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- Stomata are pores surrounded by guard cells in the epidermis of the leaves and stems of plants which can open and close.

ii) a) What is the hypothesis which is used to explain the opening and closing of stomata?

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**K+ influx hypothesis**

b) ii) a) Write the basic steps related to the opening of stomata according to the hypothesis mentioned in (a) above?

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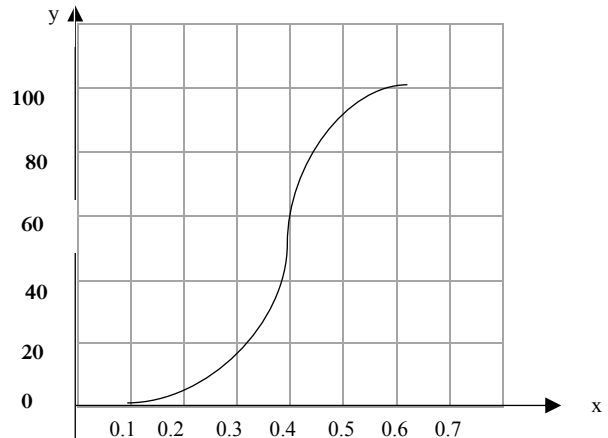
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- During the day time, the guard cells actively accumulate K+from neighboring epidermal cells.
- Lowering the water potential of guard cells, as the concentration of guard cells increases.
- Inflow of water by osmosis from the surrounding epidermal cells.
- The turgor pressure in guard cells increase, opening stomata.

iii) Given below is a graph drawn according to the data collected in order to find the solute potential of *Rhoeo* epidermal cells and a table of the solute potential of sucrose solutions.

Molarity of the sucrose solution (mol dm <sup>-3</sup> )	Solute potential ( KPa)
0.1	- 260
0.2	-540
0.3	-820
0.4	-1120
0.5	-1450
0.6	-1800



a) Name the two axes X and Y of the above graph?

x - ..... y - .....

**Molarity of sucrose solutions**

**Percentage of flaccid cells**

b) What is the assumption used in this experiment?

.....

**When the percentage of flaccid cells is 50%, the cells of the tissue are at initial flaccidity.**

c) State the value of solute potential of *Rhoeo* epidermal tissues according to the above data,?

.....

**- 1120KPa**

d) What is the reason for closing the petri dishes containing tissues in (iii) above?

.....

- **To prevent evaporation of water/ To prevent the change of concentration of sucrose solutions.**

B) i) a) State the major method of water entering from soil solution to root hair cells?

.....

- **Osmosis**

b) State the pathways of water movement through leaf mesophyll cells ?

.....

.....

- **Apoplastic route**
- **Symplastic route**
- **Transmembrane route**

ii) State two functions of the endodermis of plant root?

.....

.....

- Prevent entering unnecessary things and toxic things to the vascular tissue.
- Prevents solutes that have accumulated in the xylem from leaking back into the soil solution.

iii) What is meant by plant stress?

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 .....

- Certain factors in the environment that have potentially adverse effects on the survival, growth and reproduction of plants.

iv) State the abiotic stress condition for the following response.

- Increasing the proportion of unsaturated fatty acids in the cell membranes of cells-

.....

- Cold stress

- leaves roll into a tube -like shape .....

- Drought stress

- Increasing the level of solutes like sugar in cytoplasm - .....

- Cold stress

v) What is the plant growth regulatory substance, that removes  $K^+$  from the guard cells, in the scarcity of water?

.....

- Abscisic acid

vi) Name two chemical compounds which are produced in plants after being infected by pests and pathogens.

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- Phenolics/flavonoids
- Toxic compounds
- Enzymes

C) i) a) State the location of epithelial tissues.

.....

- Covers external or internal free surfaces and organs.

b) State three functions of epidermal tissues?

.....  
 .....  
 .....

- Protection
- Secretion
- Absorption

c) What is the structure found in human mouth which contains skeletal muscles?

.....

- tongue

ii) State three adaptations of the stomach lining to be protected from gastric juice.

.....  
.....  
.....

- Secretion of inactive enzymes
- Secretion of mucus
- Every three days, cell division adds a new epithelial cell layer which replaces the destroyed/damaged cells in the lining of the stomach.

iii) In which form, the end products of lipids are absorbed into the lacteal?

- .....
- As chylomicrons

iv) a) What are liver sinusoids?

- .....
- Blood vessels with incomplete walls located in liver lobules between pairs of liver column cells.

b) What is the reason for having a high concentration of nutritional materials in sinusoids?

- .....  
.....
- As a mixture of blood from both tiny branches of the portal vein and hepatic artery is supplied.

v) Name two essential nutrients to the human body.

- .....
- Essential amino acids
  - Essential fatty oils
  - Vitamins

vi)(a) i) State two **happenings** that occur when inhaled air travels through spaces in the nasal cavity.

- .....  
.....
- Air is filtered (by hairs)
  - Air is warmed.
  - Air is humidified

(b) State a respiratory function of the larynx?

- .....  
.....
- Helps to keep the airways open as the walls of the trachea are strengthened by cartilage.

3.

(i) A) a) Write two examples for antigen presenting cells.

- .....  
.....
- Macrophages

- Dendritic cells
- B cells

b) Name three major things that can act as antigens.

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- Viral proteins
- Bacterial toxins
- Bacterial cell walls/ chemical components of bacterial structures such as flagella.
- Incompatible blood cells
- Transplanted tissues

ii) a) Write one function of the following **effector cells**.

Cytotoxic T -cells - .....

- Directly killing the infected cells using toxic proteins.

Plasma cells- .....

- Producing antibodies and secreting them.

b) State two differences between effector cells and memory cells?

.....

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- Effector cells have a short life span while memory cells have a long life span.
- Effector cells create primary immunity responses while memory cells create secondary immunity responses.

iii) What are brain ventricles?

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- Irregular shaped cavities formed by the central canal in the brain.

iv) Name a structure that originates from the embryonic hindbrain which is a part of the brain stem.

.....

- Pons varolii /brain stem

v) Name phases of action potential and state a main difference in the ion channels of the cell membrane in each phase.

Phase	Change
.....	.....
.....	.....
.....	.....
depolarization	opening of Sodium ion channels
repolarization	Closing of Sodium channels/ opening of many Potassium channels
hyperpolarization	Closing of sodium channels/opening of Potassium channels

vi) What is a tropic hormone?

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- A hormone that redirects the chemical signals from hypothalamus to other endocrine glands

B) i ) What is the blood vessel that transports deoxygenated blood from the fetus to the placenta?

- Umbilical arteries/artery

ii ) Write a temporary birth control method that affects the following.

- Preventing implantation by making the endometrium thin.....
  - Depo Provera injection
- Blocks entering sperms to the uterus by thickening cervical mucus.....
  - oral contraceptives for females/Depo Provera injection

iii) a) What is infertility?

- Inability to conceive offspring

b) Write two methods of assisted reproductive technology used, to resolve infertility.

- IVF/In Vitro Fertilization
- ICSI/Intra-Cytoplasmic Sperm Injection

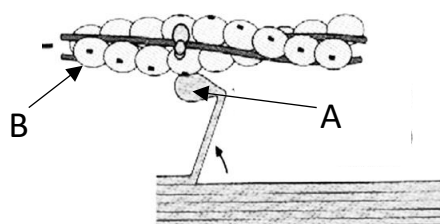
(iv)(a) Write two characteristic features of muscle tissue.

- irritability/ excitability
- extensibility
- contractility
- elasticity

(b) What is a sarcomere?

- Repeating contractile units present within a striated muscle cell.

v ) The diagram below shows a step that occurs when a muscle is contracting according to sliding filament theory.



(a) Name A and B in the above diagram.

A - ..... B - .....

Myosin head

Actin /thin filaments

b) Write two molecules/structures that can be attached with the part of the structure you mentioned in above (v) (a).

- ATP
- Actin filaments/Actin binding sites

d) Which ion is contributing to muscle contraction according to the sliding filament theory.

- $Ca^{+2}$

(C) i) Write two desirable properties of garden pea plants (*Pisum sativum*) used by Mendel for genetic experiments.

- Pea plants are available in many varieties with contrasting traits.
- The generation time is short.
- A large number of offspring is produced from each cross.
- Crossing between the plants could be strictly controlled.

ii) What is the probability of getting a homozygous genotype for both characters in a cross between two heterozygous organisms.

- 1/4

ii) State the two current occasions where Mendel's law of segregation can be applied.

- To genes located on different chromosomes (genes on non-homologous chromosomes)
- To genes located far apart on the same chromosome

iv) What is the probability of getting an offspring with yyBbRr genotype, by a cross between two offspring with genotypes YyBbRr and yyBbrr ?

- 1/8

v) (a) What is the main reason for the abnormality of the hemoglobin molecule of a person with sickle cell?

- anaemia?

(b) State a difference that can be seen in the blood of a person suffering from sickle cell anaemia.

- Sickle shape in red blood cells.
- Having a small amount of red blood cells.

4)(A) (i)(a) What is chromatin, that can be found in eukaryotic cells?

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- DNA histone protein complex inside the nucleus.

(b) What are the two structural differences that can be seen in the two types of chromatin found in eukaryotes?

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- Euchromatin is lightly packed, and heterochromatin is tightly packed.
- Euchromatin is rich in genes and heterochromatin has a lesser number of genes.

(ii) What is DNA replication?

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- The process which copies a double stranded DNA to produce two identical copies.

(iii) State two functions of DNA polymerase in DNA replication.

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- Adding the deoxyribonucleotides according to a correct order.
- Identifying mismatches and removing the incorrect nucleotide by exonuclease activity/proof reading activity.
- Replacing the RNA primer with DNA by identifying DNA-RNA hybrid.

(iv) Write two differences in the DNA replication between a prokaryotic and an eukaryotic.

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- Prokaryotes usually have one Ori while an Eukaryotic chromosome has several Ori.
- The DNA replication of the prokaryotes occurs continuously, where as in eukaryotes it happens only in the S-phase of cell cycle.
- The DNA polymerases in eukaryotes and prokaryotes are different from each other in their structure.

(v) State two health issues that can happen due to genetically modified organisms.

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- The possibility of horizontal gene transfer of antibiotic resistant genes is a potential health issue.
- Allergy development due to consumption of GM food or inhaling pollen of GM crops.

B)i) What is an environmental pyramid?

- The graphical representation of the trophic structure of an ecosystem.

ii) State two reasons why the trophic levels in a food chain are limited to four or five.

- At each trophic level in the food chain, a considerable fraction (about 90%) of the potential energy is lost as heat and respiration/ As a result, organisms in each trophic level pass on lesser energy (about 0%) to the next trophic level than they actually receive.

iii) Name a biome for each of the following.

- a) Presence of a layer of permanent frost layer of soil. - .....
- b) Fire resistant roots. - .....
- c) Conical shape trees with needle like leaves. - .....

**Tundra, Chaparral, Northern coniferous forest**

iv) How is peat is formed in marshes and swamp forests?

- Partially decomposed organic matter

v) Name an ecosystem in Sri Lanka in which the following plant species can be seen.

- a) *Terminalia chebula* - .....**Savanna**
- b) *Dipterocarpus zeylanicus* - .....**Tropical wet low land rainforests**
- d) *Cassia auriculata* - .....**Tropical thorn scrubs**

vi) Name an animal belonging to the following IUCN threatened category.

IUCN / Threatened category	Animal
Extinct (EX)	<b>Dodo/Wooly Mammoth</b>
Endangered (EN)	<b>Elephant/Etha, Aliya/Etha (s)</b>
Extinct in the wild (EW)	<b>Giant tortoise of Seychelles</b>

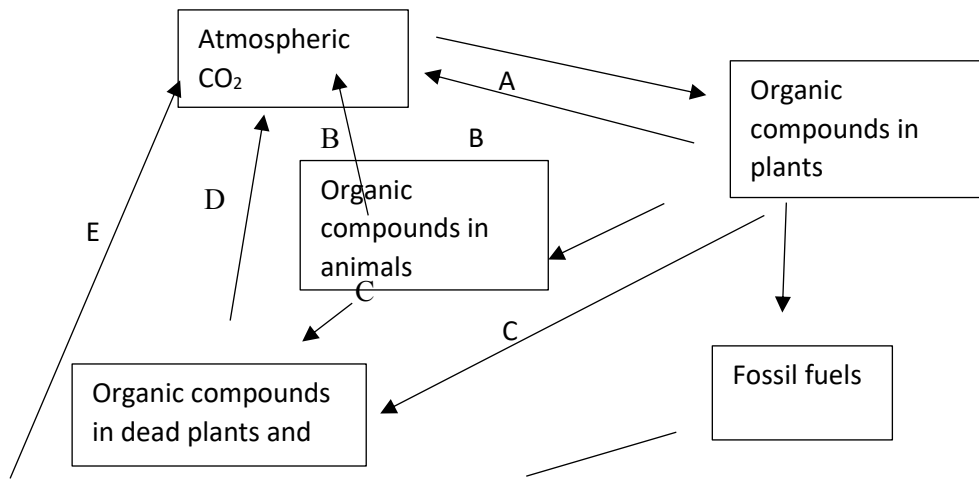
C) i ) a) Write two major eucaryotic groups of microorganisms that can be seen in the soil?

- Protista/Algae
- Fungi

b) What is the reason for decreasing fast, the amount of microorganisms deeper in the soil?

- As the factors Oxygen, light and moisture which are essential for the growth of microorganisms are getting decreased with increasing depth in the soil.

ii) Given below is a flow chart of C recycling in the nature.



a) Name the steps A,B,C,D, and E in the above C cycle.

- A - ..... **photosynthesis**      B - ..... **respiration**  
 C - ..... **death/dying**      D - ..... **decomposition**  
 E - ..... **combustion**

b) Name the step in above diagram which directly affects global warming.

- .....  
 • **E**

c) Name the international protocol to minimize the effect you mentioned above.

- .....  
 • **Kyoto Protocol**

(iii) (a) State two physical methods of controlling the diseases Dengue and Filaria.

- .....  
 .....  
 • **Destroying the places where mosquitoes are spreading.**  
 • **Environmental management**

(b) Write a special morphological feature of the adult filaria vector.

- .....  
 .....  
 • **The nervures of wings of adult mosquito are beset with brown or blackish scales.**  
 • **Posterior margin of the wings is fringed with bristle and scales.**

(c) Name a bacterial species which produces endotoxins that is used to kill mosquitoes.

- .....  
 • **Bacillus thuringiensis israelensis**

(iv) Name an ornamental plant which is successfully grown in polytunnels and propagate through layering, grafting and cuttings.

.....

- roses

(v) Write the major principle which is used in the given food preservative techniques.

- Drying with salt .....

- Preventing the growth and activity of microorganisms

- Use of radiation - .....

- Killing microorganisms

(vi) (a) Write two special characteristics shown by stem cells regarding cell division.

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- Can divide by mitosis without a limit.

- Divide at a relatively slow rate.

(b) State two medical uses of adult stem cells.

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- Divide at a relatively slow rate.

- To repair tissues such as damaged heart muscles and damaged spinal neurons.

- To replenish bone marrow of patients with leukemia.

- To identify birth defects.

- For gene therapy/ To change the genes for the supply of genes.