SECTION A (40 marks)

*Answer **all** questions.*

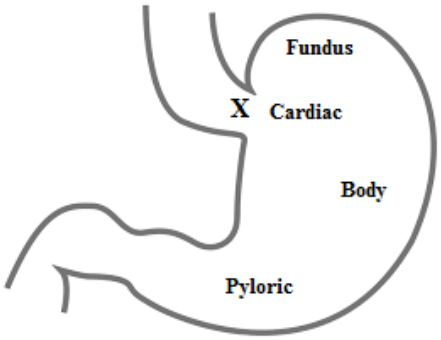
Question 1.

(a) ***For each question, there are four alternatives A, B, C and D. Choose the correct alternative and circle it. Do not circle more than ONE alternative. If there are more than one circled, NO score will be awarded.*** **[15]**

(i) Which of the following is a symbiotic nitrogen fixing bacterium?

A Anabena
B Azotobacter
C Clostridium
D Rhizobium

(ii) The diagram given below shows the different regions of a human stomach.



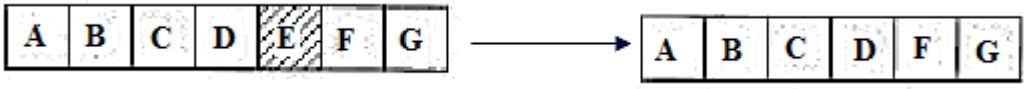
The function of the region marked X is to

A check the regurgitation of food.
B increase the surface area of digestion.
C transfer food from the pharynx to the stomach.
D prevent the predigested food from entering the duodenum.

(iii) The following are advantages of small metabolically active cells **EXCEPT**

A takes time to repair.
B large surface to volume ratio.
C higher nucleocytoplasmic ratio.
D intake of nutrients and oxygen are quicker.

(iv) The diagram below shows chromosomal mutation which bring about variations in organisms.



Identify the chromosomal mutation represented in the above diagram.

A Translocation
B Duplication
C Inversion
D Deletion

(v) The change in affinity of RUBP carboxylase towards oxygen during photorespiration is affected by CO_2 and temperature. This change is caused by

A high temperature, low O_2, high CO_2.
B low temperature, high O_2, low CO_2.
C high temperature, high O_2, low CO_2.
D low temperature, low O_2, high CO_2.

(vi) Antiviral proteins produced by T-lymphocytes against virus are called

A toxoid.
B antibodies.
C antibiotics.
D interferons.

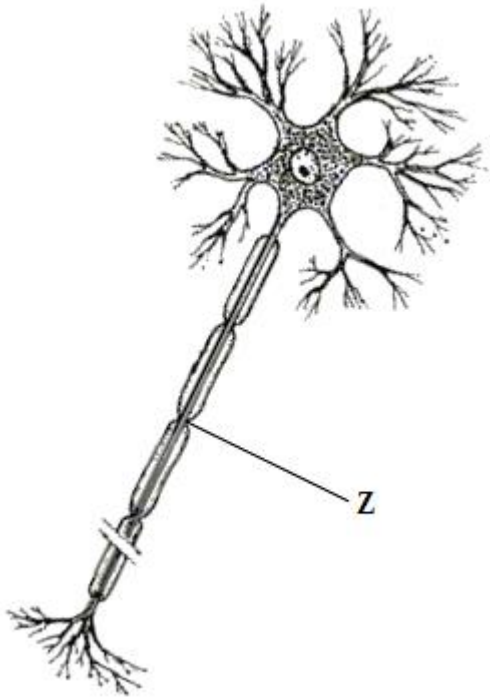
(vii) Meiosis brings about the reduction in the number of chromosomes. The resulting cells are

A diploid.
B haploid.
C tetraploid.
D triploid.

(viii) Xerophytic grasses often roll their leaves to prevent the loss of water. This adaptation is attributed to the turgidity of the

A spine.
B oily surface.
C bulliform cells.
D sunken stomata.

(ix) The part labelled 'Z' in the diagram is the



A axon.
B dendron.
C myelin sheath.
D node of Ranvier.

(x) The process of breaking down glucose to pyruvate during anaerobic respiration is called
A glycolysis.
B glycogenesis.
C fermentation.
D glycogenolysis.

(xi) The characteristics of homologous organs are
A same appearance and origin but different functions.
B same appearance and function but different origins.
C different in appearance but same in function and origin.
D different in appearance and functions but have common origin.

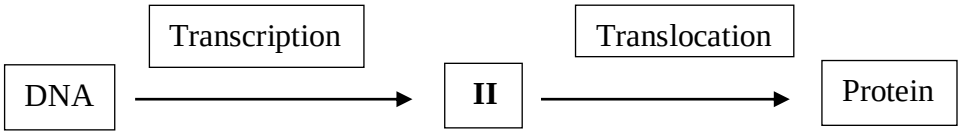
(xii) Fertilization in angiosperm is essential for the production of viable seeds. The following equation represents a type of fertilization.

Male gamete + Y $\longrightarrow$ Primary endosperm

Which component is represented by 'Y'?

A egg cell
B synergids
C polar nuclei
D antipodal cells

(xii) The flowchart below depicts the flow of genetic information.



Box II represents

A RNA
B mRNA
C rRNA
D tRNA

(xiv) The part of the human reproductive system where a male gamete becomes motile and physiologically active is the

A epididymis.
B vasa rectae.
C vasa deferens.
D seminiferous tubules.

(xv) The following information show the symptoms of a deficiency of a hormone.

- Formation of dilute urine in huge amount
- Feels thirsty

The name of the hormone is

A insulin.
B glucagon.
C vasopressin.
D aldosterone.

(b) Fill-in-the-blanks with appropriate word/s. **[5]**

(i) The goblet cells of the epithelial layer secrete …….

(ii) The inner most layer of cortical cells that have casparian strips are called …….

(iii) The first stable product formed in C_4 plant is …….

(iv) The circular chromosomal DNA molecules present in prokaryotic cells are called …….

(v) Zeko transfers pollen grains from a male flower to the stigma of a female flower borne in the same plant. Such plants are classified as …….

(vi) Heliophytes are the plants that require ……. intensity of light for optimum photosynthesis to take place.

(vii) When bees transfer pollen grains from the anther of one flower to the stigma of another flower of dioecious plant, it is called …….

(viii) A codon comprises of ……. nitrogenous bases of mRNA in a specific sequence.

(ix) The lateral roots originate from the ……. of cells.

(x) Young actively dividing cells at the growing points of plants are called …….

(c) ***Match each item of Column A with the most appropriate item of Column B. Rewrite the correct pairs by writing the number and the corresponding alphabet in the spaces provided.*** **[5]**

Column A	**Column B**
(i) Secretin	(a) ascending limb of loop of Henle
(ii) Incomplete break down of glucose	(b) rennin
(iii) Motor neuron	(c) secretion of pancreatic juice
(iv) Hypotonic urine	(d) phytochrome
(v) Parallel venation	(e) anaerobic respiration
(vi) Sensory neuron	(f) effector
(vii) Y-shaped xylem	(g) descending limb of loop of Henle
(viii) Pancreozymin	(h) monocot leaf
(ix) Hypertonic urine	(i) receptor
(x) Mobile electron carrier	(j) monocot stem
	(k) aerobic respiration
	(l) cytochrome
	(m) contraction of gall bladder

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(d) Correct the following statement by changing the words given in BOLD. Rewrite ONLY the correct answer. DO NOT copy the whole sentence. **[5]**

(i) **Glottis** is a leaf like cartilage that closes the trachea when food is swallowed.

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(ii) Biosynthesis phase of photosynthesis takes place in the **stoma** of chloroplast.

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(iii) Gene mutation which occur due to change in a single nucleotide are called **gross** mutation.

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(iv) Animals whose immature stage develops on or within the insect host, ultimately killing the host are called **pathogens**.

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(v) In active transport mechanism, molecules are transported by carrier molecules called **cytochrome**.

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(e) I. Give suitable reasons for the following: **[3]**

(i) Muscle fibres have special property of contractility.

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(ii) Secretory phase of menstrual cycle is also called luteal phase.

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(iii) In recombinant DNA technology, plant cells are treated with enzyme cellulase.

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II. Define the following terms: **[3]**

(i) Gene pool

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(ii) DNA sequencing

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(iii) Biomass gasification

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III. Differentiate between the following pairs based on what is given in brackets. **[2]**

(i) Sieve tube and companion cells (*presence of nucleus*)

Sieve tube cells	**Companion cells**

(ii) Abductor muscles and adductor muscles (*antagonistic nature)*

Abductor muscles	**Adductor muscles**

IV. Answer the following questions. **[2]**

(i) The common ancestry of organisms have been confirmed by evidences. One such evidence is from analogous organs. On what basis are the wings of insect and the wings of birds considered analogous organs?

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(ii) One of the strategies to conserve biodiversity is coppicing.
How is coppicing helpful in the conservation of biodiversity?

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SECTION B (60 marks)

Answer any SIX questions.

Question 2.

(a) Saltatory conduction of nerve impulse occurs only in myelinated fibres. Why? **[2]**

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(b) Photorespiration is an important biochemical process in tropical plants.
However, it is harmful to plants. Do you agree? Justify. **[3]**

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(c) Industrial melanism in peppered moth is an example of natural selection. If industrialization in Europe had not occurred, how would it have affected the moth population? **[3]**

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(d) (i) What is crenation? **[1]**

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(ii) List down **TWO** types of concentric vascular bundles. **[1]**

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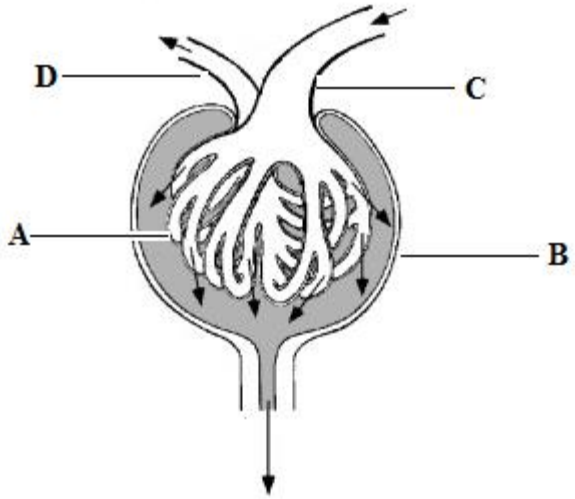
Question 3.

(a) The diagram given below represents the structure of a Malpighian capsule. Study the diagram and name the parts labelled A, B, C and D. **[2]**



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(b) (i) Explain missense mutation. **[1]**

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(ii) *E.coli* and *Streptococcus faecali*s share a symbiotic relationship in the large intestine of human beings. Explain. **[2]**

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(iii) The micropyle acts a gate way for the entry of pollen tube into the ovule during fertilization. This pore remains as a fine pore on the surface of a mature ovule. Mention its role at the time of germination. **[1]**

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(c) (i) Usually only one male gamete fuses with a female gamete to produce a zygote in human beings. However, a single ejaculate contains millions of sperm but only a few reaches the fallopian tube for fertilization. Why? **[2]**

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(iii) Explain the term 'threatened species'. **[1]**

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(iv) Mention the role of DNA ligase during splicing in the construction of a recombinant DNA molecule. **[1]**

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Question 4.

(a) (i) Define ethnogynaecolgy. **[1]**

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(ii) 'All living beings exhibit basic unity indicating monophyletic origin'. Based on this statement mention **ONE** similarity each for the following components: **[2]**

- Structural organization
- Life processes

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(iii) Energy is required for muscle contraction and during strenuous work, one often gets muscle fatigue. Explain why? **[2]**

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(iv) Rubisco enzyme is dual in nature. Therefore, Rubisco is called RUBP carboxylase-oxygenase. Why? **[2]**

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(b) Daughter cells produced by mitosis are identical while daughter cells produced by meiosis are not identical. Why? **[1]**

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(c) (i) In light-dependent reaction of photosynthesis, light energy excites electrons in chlorophyll and the energy from the excited electron is used to generate certain substances required for the reduction of carbon dioxide. Name **TWO** of these substances. **[1]**

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(ii) What is 'venation' in plant? **[1]**

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Question 5.

(a) Draw a labelled diagram of the ultra-structure of chloroplast. **[2]**

(b) Accessory glands of the male reproductive system in human beings produce different kinds of secretions. One such gland is the seminal vesicles.
Write **TWO** roles of its secretion. **[2]**

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(c) (i) Some humans are born with abnormalities like impaired eye, deformed bone, etc. This is due to change in normal genetic constitution. Do you agree? Justify. **[2]**

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(ii) Production of nuclear energy releases dangerous radioactive gases. However, it is preferred over coal-fired energy. Give **TWO** reasons. **[1]**

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(iii) What are the benefits of biodiversity conservation through national parks to the local community? **[2]**

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(d) What is spermatogenesis? **[1]**

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Question 6.

(a) Complete the following table. **[2]**

Cells	**Secretion**	**Function**
Chief cells of gastric gland	***1.***	Converts pepsinogen to pepsin
Argentaffin cells of gastric gland	Serotonin	***2.***
3.	Bile	Emulsification of fats
Beta cells of pancreas	Insulin	***4.***

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(b) Explain axosomatic synapse and axodendritic synapse. **[2]**

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(c) Describe the internal structure of an isobilateral leaf. **[2]**

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(d) State the difference between floating respiration and protoplasmic respiration based on the substrate. **[2]**

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(e) Growth of long bones is bidirectional. Mention the role of periosteum and endosteum in increasing the growth of bones. **[2]**

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Question 7.

(a) The specificity of base pairing ensures accurate replication in DNA synthesis. However, proof reading is necessary. Why? **[2]**

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(b) Introduction of biogas plant has made rural life better. Do you agree? Justify. **[2]**

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(c) (i) What is Emerson's first effect? **[1]**

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(ii) Study from paleontology confirms that organisms have a common ancestry. *Archaeopteryx lithographica* is a fossil of reptile. Do you agree? Justify. **[2]**

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(d) (i) The human population suffer from several genetic disorders. Adenosine deaminase (ADA) deficiency is one such disorder. Gene therapy offers a potential treatment for such heredity diseases. However, gene therapy treatment is not a permanent cure for the disease. Why? **[2]**

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(ii) Define resolution of a microscope. **[1]**

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Question 8.

(a) (i) Pollens of maize are light and winged. Why? **[1]**

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(ii) Nephrons are the structural and functional units of kidney. It consists of long tubules in which the urine courses through. Describe the part of the tubule in which counter-current mechanism of urine formation takes place. **[2]**

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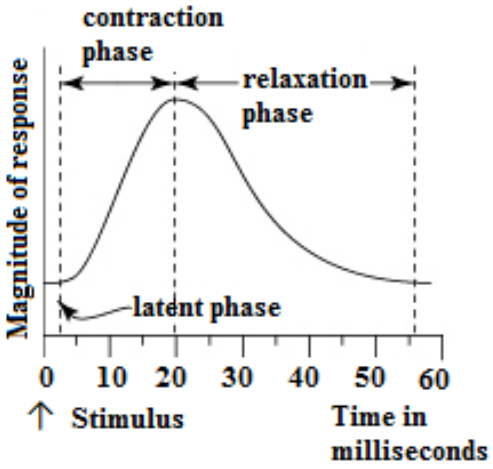
(b) The graph below represents phases of a single muscle twitch.
Study the graph carefully and describe any **TWO** phases. **[2]**



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(c) (i) Define synapsis. **[1]**

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(ii) Classify the following seed as albuminous and non-albuminous. **[1]**

(a) Maize

(b) Bean

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(d) (i) Define sympatric speciation. **[1]**

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(ii) Simpson's index of diversity of a community is 0.2. What does this value indicate? **[1]**

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(iii) Expand SCID. **[1]**

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For ROUGH WORK

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