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 alternatives, NO score will be awarded.** **[15]**

i. The chemical which forms a band on the root endodermis that checks the entry of passage of water into pericycle is

A hemi-cellulose.

B cellulose.

C suberin.

D pectin.

ii. Read the following statements.

I. Cell wall is thin and elastic.

II. Has lost the power of cell division.

III. Cytoplasm is dense with distinct nucleus.

IV. Has undergone growth and differentiation.

Which of the following are characteristics of meristematic tissue?

A I and III

B II and III

C II and IV

D IV and I

iii. Given below are the sets of muscles. Which of the following pair is **NOT** an antagonistic muscle?

A Pronators and supinators

B Levators and depressors

C Invertors and evertors

D Abductors and rotators

iv. For intensive farming, cultivation of high-yield variety crops require heavy dosage of chemical fertilisers and pesticides which bring about series of impact to the environment. One of the impacts of intensive farming is the enhancement of

A algal growth in water bodies.

B genetic diversity.

C wildlife habitat.

D soil fertility.

v. The forelimbs of animals X and Q are constructed on the same pentadactyl pattern and those of animals P and Y are built on different basic pattern. Forelimbs of P and Y are meant for flight but those of X and Q have a different function.

The pair of animal that exhibits homology of forelimbs is

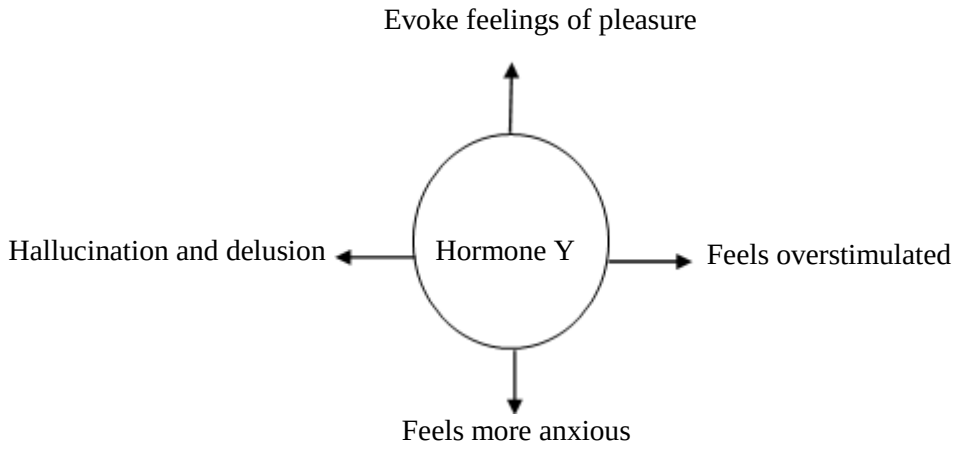
A P and Y.

B P and Q.

C X and Y.

D X and Q

vi. The diagram given below shows the effects of a hormone 'Y'. This hormone is increasingly released as a result of consumption of nicotine. Name the hormone 'Y'.



A Melatonin

B Endorphin

C Dopamine

D Adrenalin

vii. Which of the descriptions given below best describes cambium?

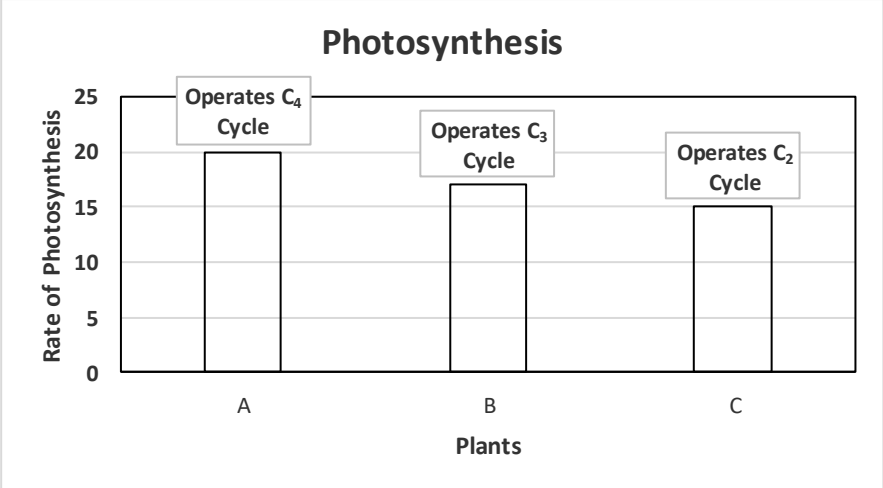
A It is a single row of barrel shaped cells without intercellular spaces.

B It is a strip of thin-walled cells responsible for secondary growth.

C Sclerenchyma cells with thickened and lignified walls.

D The cells are arranged in multiple layers.

viii. The graph given below represents the rate of photosynthesis in three different plants.



From the graph we can deduce that the rate of photosynthesis is highest in plant 'A', because

A Kranz anatomy is absent.

B more ATP and NADPH are present.

C photorespiration does not take place.

D light reaction excesses the dark reaction.

ix. When the semi-digested food from the stomach enters the duodenum, secretin is released which stimulates the salt secretion of

A mucus.

B gastric juice.

C intestinal juice.

D pancreatic juice.

x. The part of a sperm which responsible for providing energy for the movement of sperm tail is

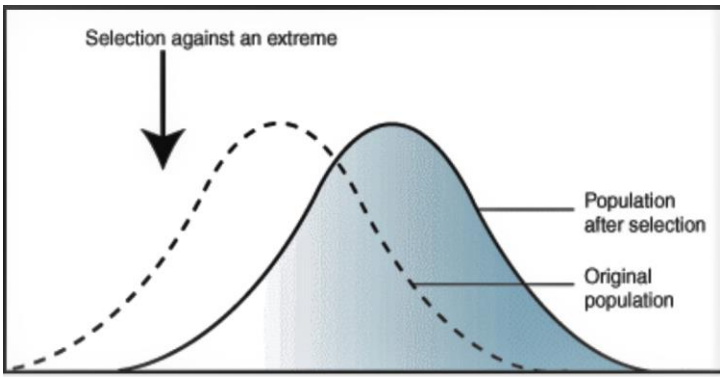
A head.

B neck.

C acrosome.

D middle piece.

xi. Which form of Natural Selection is depicted in the graph given below?



A Disruptive selection

B Diversifying selection

C Directional selection

D Stabilising selection

xii. The matching pairs given below are the parts of a nephron and its functions. Which pair is **INCORRECT**?

A Bowman's capsule → ultrafiltration

B Proximal convoluted tubule → releases urea

C Loop of Henle → counter current mechanism

D Distal convoluted tubule → reabsorption of water

xiii. The degenerate code provides protection to organisms against many harmful mutations and stabilises phenotype by lessening the effects of random mutation. One example of degenerate code is Serine: UCU, UCC, UCA, UCG

Why is it considered as a degenerate code?

A Degeneracy occurred at second position of triplet codon.

B Different codon is used for same amino acids.

C The first two bases are Wobbly base.

D All codons given above are same.

xiv. Which one of the following is **NOT** a significance of Krebs cycle?

A Krebs cycle provide common pathways for the oxidation of carbohydrates, fatty acids and amino acids.

B Intermediate products of Krebs cycle provide carbon skeleton or raw materials for various pathways.

C Krebs cycle is the major pathway for the release of energy.

D Krebs cycle fixes carbon dioxide in the bundle sheath.

xv. Read the following:

I. Bisexuality

II. Cleistogamy

III. Dichogamy

IV. Unisexuality

V. Homogamy

Which of the above favours cross pollination?

A I and II

B I and V

C II and V

D III and IV

b) Correct the following statements by changing the word(s) given in BOLD. Rewrite ONLY the correct word(s). DO NOT copy the whole sentence. **[5]**

i) Regurgitation of food from the stomach is checked by **pyloric sphincter**.

ii) **Heliophytes** are plants that require low intensity of light for optimum photosynthesis.

iii) The process of introducing foreign DNA into host cells is called **DNA sequencing.**

iv) In ribonucleic acid, thymine of DNA is substituted by **adenine**.

v) **Dominant species** is defined as the number and abundance of each species that live in a particular ecosystem.

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

Column A		Column B	
i)	Homologous chromosome	a)	synaptic fatigue
ii)	Combination of two lenses	b)	insulin
iii)	Temporary suspension of impulses at synapse	c)	coacervates
		d)	synapsis
iv)	In situ-conservation	e)	simple microscope
v)	Human protein made by recombinant DNA technology	f)	compound microscope
vi)	Hormones released from corpus luteum towards the end of pregnancy	g)	malacophily
		h)	natural habitat
vii)	The colloidal aggregates of macromolecules	i)	relaxin
		j)	photosystem II
viii)	Differentiated mesophyll tissue	k)	isobilateral leaf
ix)	Cyclic photophosphorylation	l)	chiropterophily
x)	Pollination by snail	m)	dorsiventral leaf
		n)	photosystem I

Column A	Column B
i)	
ii)	
iii)	
iv)	
v)	
vi)	
vii)	
viii)	
ix)	
x)	

d) Fill in the blanks with appropriate word **[5]**

i.	The particles present in the thylakoid membrane of chloroplast that are capable of carrying out photosynthesis are called _____.	
ii.	The primary component of cell wall of fungus is chitin. In the process of recombinant DNA technology, enzyme _____is used to dissolve fungal wall.	
iii.	A chromosome appears studded with_____during the prophase I of meiosis I.	
iv.	The species diversity within local community is called _____.	
v.	The point of light intensity at which the rate of photosynthesis matches the rate of respiration exactly is termed as _____.	
vi.	The anatomical feature which brings about curling of leaves in certain grass species to minimize loss of water is_____	
vii.	During the fertilization in angiosperm, the pollen tube enters ovule through three different routes. The condition when the pollen tube enters through the integuments is called_____.	
viii.	The group of steroid hormones called_____promotes male secondary sexual characteristics.	
ix.	The rudimentary non-functional organs present in an organism which shows origin from common ancestor is called_____.	
x.	A chemical that transmits impulse from cholinergic presynaptic neuron to postsynaptic neuron is called_____	

e) Answer the following questions. **[10]**

i. Mention the presence of reticulate venation in the following plants. [1]

Sl. No.	Name of plant	Presence of reticulate venation? Yes/No
1	Wheat	
2	Maize	

ii. Name the extra chromosomal circular DNA strand in the cytoplasm of a bacteria. [1]

iii. Study the incomplete the equation given below. [1]

Casein $\xrightarrow{x}$ paracasein + whey proteins

The '*x*' in the equation represents:

iv. Define the term glycosuria. [1]

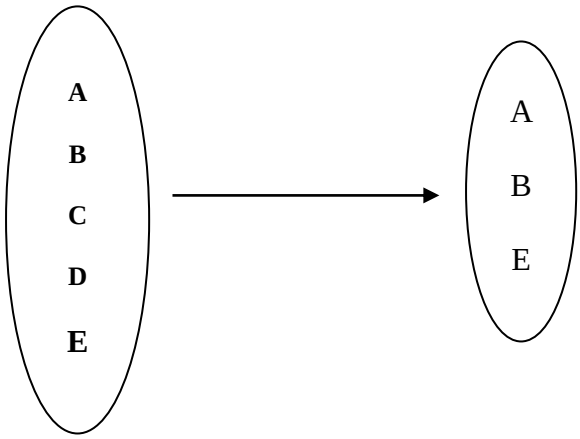
v. Fill in the box. [1]

Foreign DNA + Vector DNA → ☐

vi. White muscle fibres get fatigued faster than red muscle fibres. Why? [1]

vii. Species ‘P’ is the missing link between ‘T’ and ‘R’. What characteristics would species ‘P’ have? [1]

viii. What type of chromosomal mutation is shown in the diagram given below? [1]



ix. What is the function of Quiescent centre? [1]

x. Write **TWO** causes of land degradation. [1]

SECTION B (60 MARKS)
ATTEMPT ANY **SIX** QUESTIONS

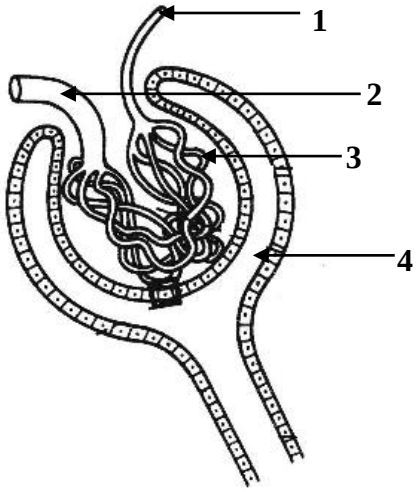
Question 2

a) What happens to the tone and length of a muscle **[2]**

i. when force exceeds the resistance while lifting an object?

ii. when there is no movement at joint while gripping an object?

b) Study the diagram given below and answer the following questions. **[3]**



i. Name the parts labelled 3 and 4.

Part	Name of the parts
3	
4	

ii. State the process occurring in the parts labelled 3 and 4 during urine formation.

iii. If the lumen of structure labelled '1' is wider than the structure labelled '2', what will be the consequence?

c) i. Fatty acids and glycerol are important nutrients needed by our body. However, it is not absorbed directly into blood. Why? **[1]**

ii. The acidic food entering the duodenum from stomach undergoes digestion catalyzed by enzymes that function only in alkaline medium. How is it possible? **[2]**

d) i. Are the following points 'significances of meiosis'? **[1]**

Sl. No.	Significances	Yes/No
1	Introduction of varieties	
2	Stability of a species	

ii. What do you understand by codon? **[1]**

Question 3

a) 'As modernity and consumerism take hold, Bhutan is facing a host of problems. Amongst many others youth unemployment is a serious issue'. Do you think, installing waste recycling units is the answer to solving this issue? **[2]**

b) i. 'DNA finger printing is the analysis of genetic material taken from samples of blood, semen, hair or tissue. It is based on the concept that each person's DNA is unique'. Can DNA finger printing solve the following problems? **[2]**

Sl.No.	Problem	Yes/No
1	Detection of HIV/AIDs	
2	Indentification of suspected criminals	

ii. When cells undergo mitosis, two daughter cells are formed with diploid chromosome. However, when cells undergo meiosis, it produces four duaghter cells with haploid chromosome though there are two successive cell divisions. Why? **[1]**

iii. Write **ONE** significance of Haversian system of mammalian compact bone. **[1]**

c) i 'The Jomolhari mountain region is suitable for snow leopard and its prey, the blue sheep'. How is climate change a threat to snow leopard population in Bhutan? **[2]**

ii. Observe Flow charts 'A' and 'B' given below and state which chart conveys the meaning of 'differential reproduction'. **[1]**

CHART A

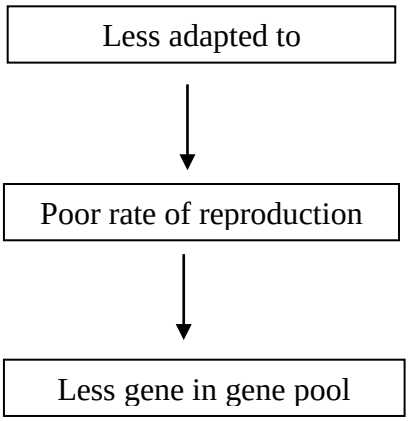
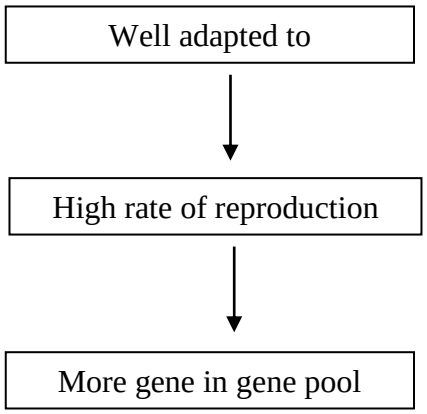


CHART B



iii. Define calcination of bone. **[1]**

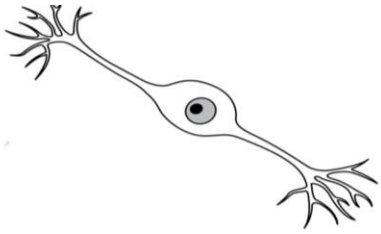
Question 4

a) i. Mention **ONE** function of villikinin secreted by intestinal mucosa. **[1]**

ii. Anaerobic respiration takes place in plants and some microbial cells in the presence of little or no oxygen. Mankind has used this process for centuries in industries to make goods. Name **TWO** such industries which use this process. **[1]**

iii. 'The P-chain of haemoglobin is formed of 146 amino acids. The P-chain of species 'A' differs from the P-chain of species 'B' by one amino acid and from species 'C' by two amino acids and from 'D' by 27 amino acids'. From this statement, what can you conclude based on 'evolutionary context'. **[1]**

iv. On the basis of its structure, identify the type of neuron given below. **[1]**



b) Why is sugar cane better adapted to grow in hot and dry conditions? **[2]**

c) i. Fertilization in angiosperms is referred as double fertilization. Why? **[2]**

ii. A patient diagnosed with neurological disorder at neuromuscular junction leads to difficulty in movement. Explain this condition. **[2]**

Question 5

a) 'Chloroplast is a semi-autonomous cell organelle'. Support the statement. **[2]**

b) 'Secretory phase of menstrual cycle is called luteal phase as well as progesterone phase'. Give **TWO** reasons. **[2]**

c) i. What are the functions associated with calyptra of root? **[2]**

ii. Explain with the help of an example how Biogenetic law shows evidence of organic evolution? **[1]**

iii. What would be the effect on the volume of urine production, if the release of ADH is more? **[1]**

d) Give **TWO** significances of haemochorial placenta. **[2]**

Question 6

a) 'Kranz anatomy is a special feature in C_4 plants'. Write **TWO** characteristics of Kranz anatomy. **[2]**

b) i. All cells acquire usable energy through cellular respiration. What is the advantage of producing ATP as the end product of cellular respiration? **[1]**

ii. Yeast when subjected to anaerobic respiration produces alcohol. What would yeast produce from starch in the presence of oxygen? **[2]**

c) Draw a L.S of long bone and label the following: **[2]**

spongy tissue and compact tissue

d) i. Human beings are different from each other in terms of size, colour and looks but belong to the same species'. Why? Give **TWO** reasons. **[2]**

ii. Why is meiosis I called reduction division? **[1]**

Question 7

a) i. Establishment of Eco-tourism will benefit community at large. What are your views on this statement? **[2]**

ii. Introduction of exotic species is a threat to biodiversity. Do you agree? Justify. **[1]**

b) Draw a diagram of: **[3]**

i. Axodendritic synapse
ii. Axosomatic synapse
iii. Axoaxonic synapse

i.	
ii.	

iii.

c) i. Write a short note explaining missense mutation. **[2]**

ii. **‘**Genetic code is unambiguous and specific’. Give a reason. **[1]**

iii. What is incipient plasmolysis? **[1]**

Question 8

a) i. Entomophily is a condition when pollination is brought about by the insects. Mention **FOUR** characteristics of Entomophilous flower. **[2]**

ii. Why are viruses used as vectors in the process of gene therapy? **[2]**

b) Bhutan sees its future in the establishment of more hydropower plants than other forms of energy sources. Give **TWO** reasons. **[2]**

c) i. Microscope is an instrument that has a combination of lenses used to magnify and observe minute objects distinctly. Briefly explain **TWO** important properties of microscope. **[2]**

ii. Why do you think it is important to focus on the conservation of a species even though it may not have direct economic value? Give **TWO** reasons. **[2]**

For Rough Work

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